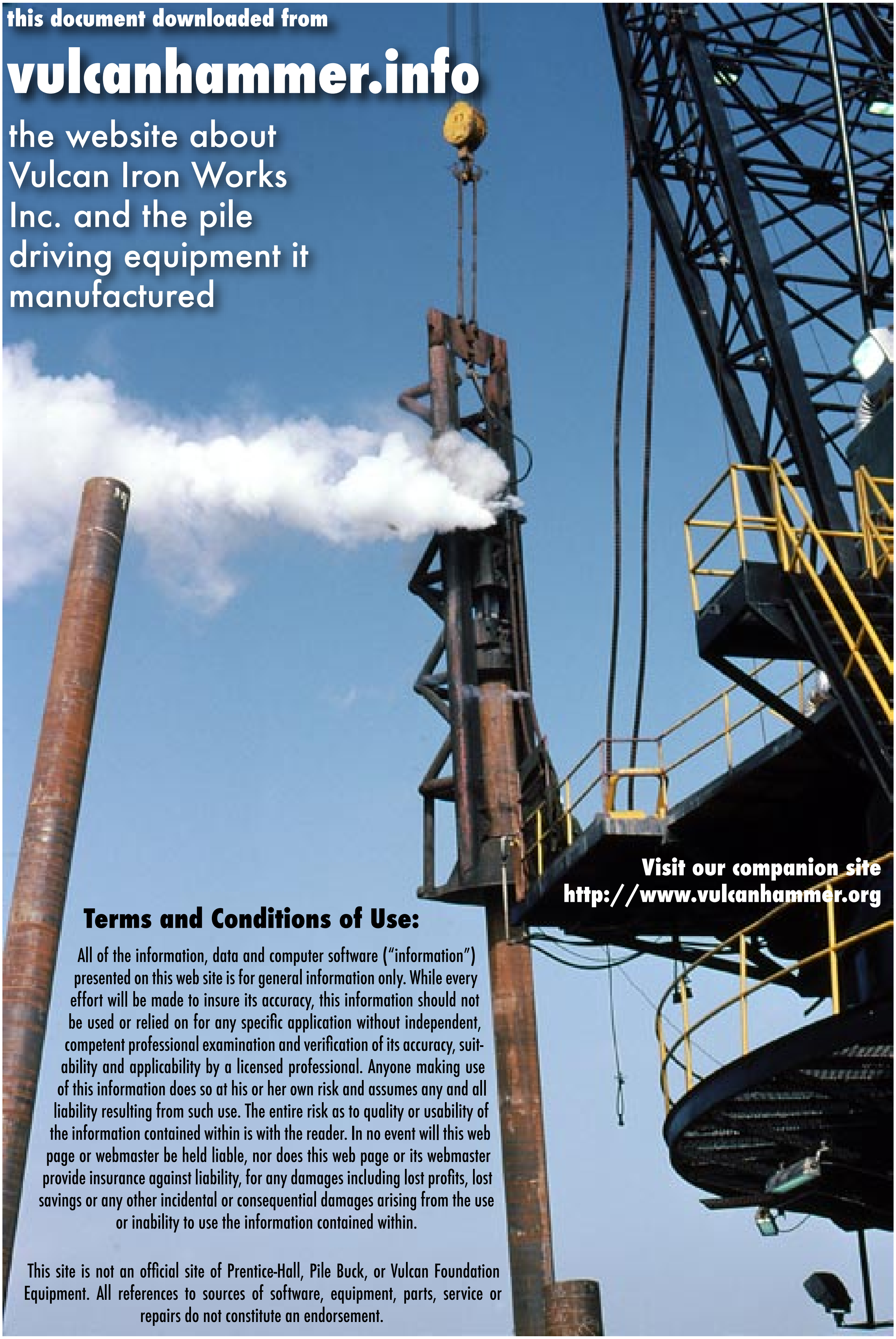

Critical Tension Stresses

G. G. Goble

When reinforced or prestressed concrete piles are driven in easy driving tension stresses are reflected from the pile tip back onto the downward traveling compression stresses. This can produce resultant tension stresses in the pile that can be sufficiently large enough to cause tension cracking of the concrete. This problem can be analyzed by use of a "Wave Equation" analysis. If measurements are made they are usually made with transducers located near the pile top. However, the critical tension stress location will not be at the gage location so the magnitude of maximum tension stresses cannot be readily determined. In this paper a procedure will be presented for determining the maximum tension stress in the pile given measurements at the pile top. In addition a procedure will be discussed for calculating maximum tension stress using a closed form solution of a continuous model of the pile.

Because excessive tension stresses are most likely to occur during easy driving, at times when the soil resistance is small in comparison to the maximum hammer force delivered, one can make a rough approximation of the time and location of the maximum tension stress by consideration of the hammer force wave alone. In Figure 1, hammer force pulse, idealized for clarity, is shown in various stages of propagation. While the shape of this wave is not realistic, it embodies the important characteristics of observed hammer-induced waves: A rapid rise time to the force peak and a gradual decay with time of the force. The time from impact to the maximum force is denoted by t_p. The ends of the rod are considered to be free, and a wave is reflected from a free end as a force wave of the same shape but opposite sign. Hence, upon encountering the pile toe, the compression wave from the hammer is reflected in tension. The stress at any section after $t = L/c$, as shown in Figure 1b, is given by the difference between the upward traveling tension wave and the downward traveling compression wave (the so-called tail). The maximum tension force will occur when the difference between these two is the greatest. However, to complicate matters, when the hammer wave returns to the pile top, it is reflected a second time from a free end, and becomes compression again. So, the location of the maximum tension stress is as shown in Figure 1c, a distance of $t_p/2$ from the pile top, where c is the speed of wave propagation in the pile. This depth will be referred to as x_c, the critical section. The compression force induced in the pile at the critical section and time (x_c, $t = 2L/c + t_p/2$) serves to reduce the maximum force by superposition. Examination of Figure 1c shows that this force is $F(2L/c)$, where F, as defined above, is the input force at the pile top. This force value will be denoted by F_t, the so-called "tail" force. Close consideration will reveal that the use of a more realistic force wave will yield the same results.

Now consider a more realistic case where top measurements are available as shown in Fig. 2. The force and velocity measurements at the pile top are shown. The force in the reflection wave is related to the measured force and velocity at a time 2L/c after impact, the time necessary for the original impact wave to travel the length of the pile, reflect and return to the measuring location. If we define

$$\phi = v(EA/c) - F$$

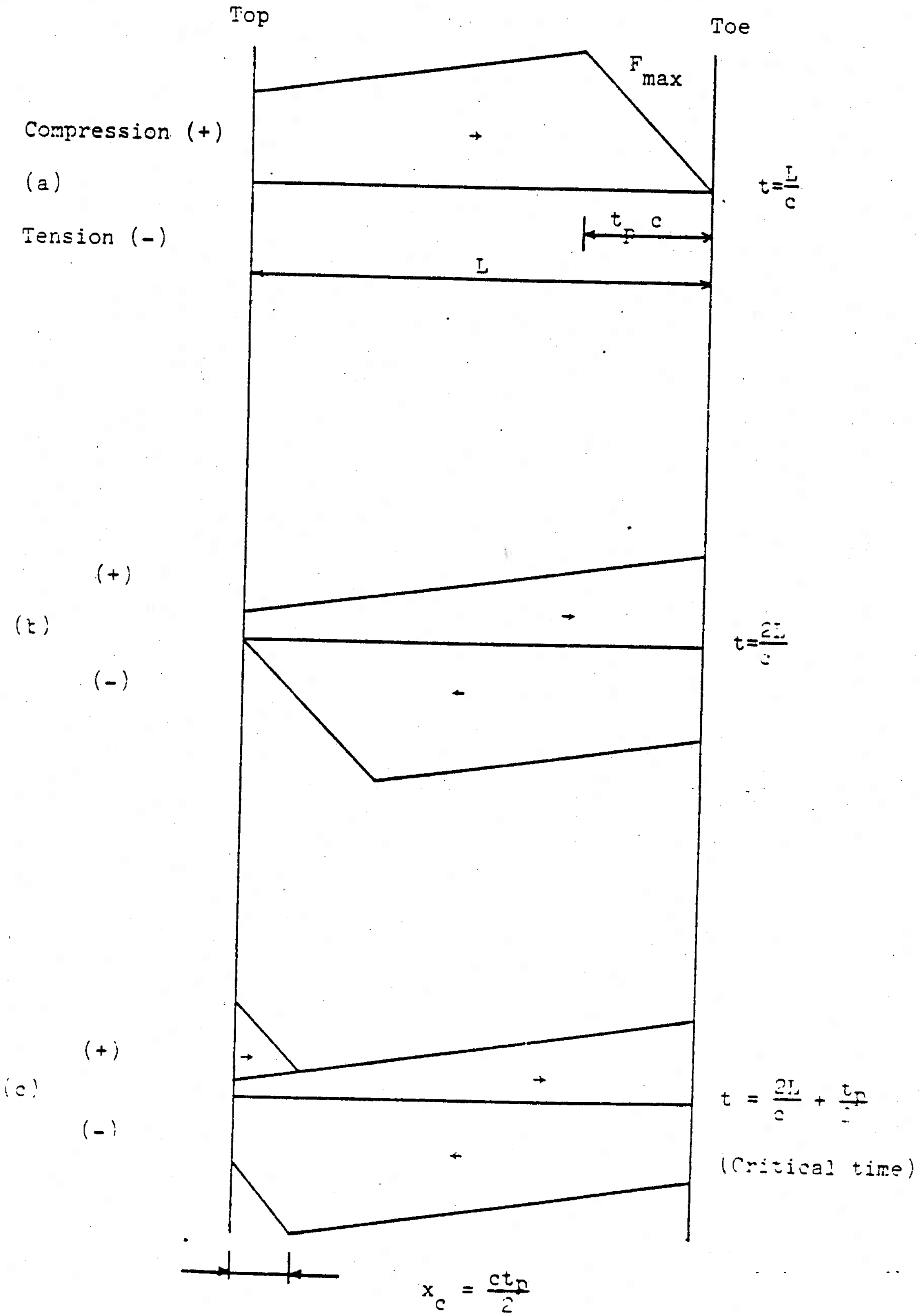

Figure 1. Determination of Critical Location

at time 2L/c then the force in the tension reflection T_R is $\phi/2$.

As shown in Fig. 2, the tension force at any location x (which occurs at a time (2L-x)/c after impact) is the sum of the reflected tension force and the input wave measured at time 2x/c before 2L/c. If the input wave exceeds the tension reflection force T_R, then no net tension exists. This approach can be used for all locations along the pile so that a tension envelope, T(x), is obtained and from it the maximum tension. The tension envelope is given by superposition with the velocity input wave. Thus,

$$T(x) = \phi/2 - (EA/c)\ v\ (\{2L-2x\}/c) \geq 0$$

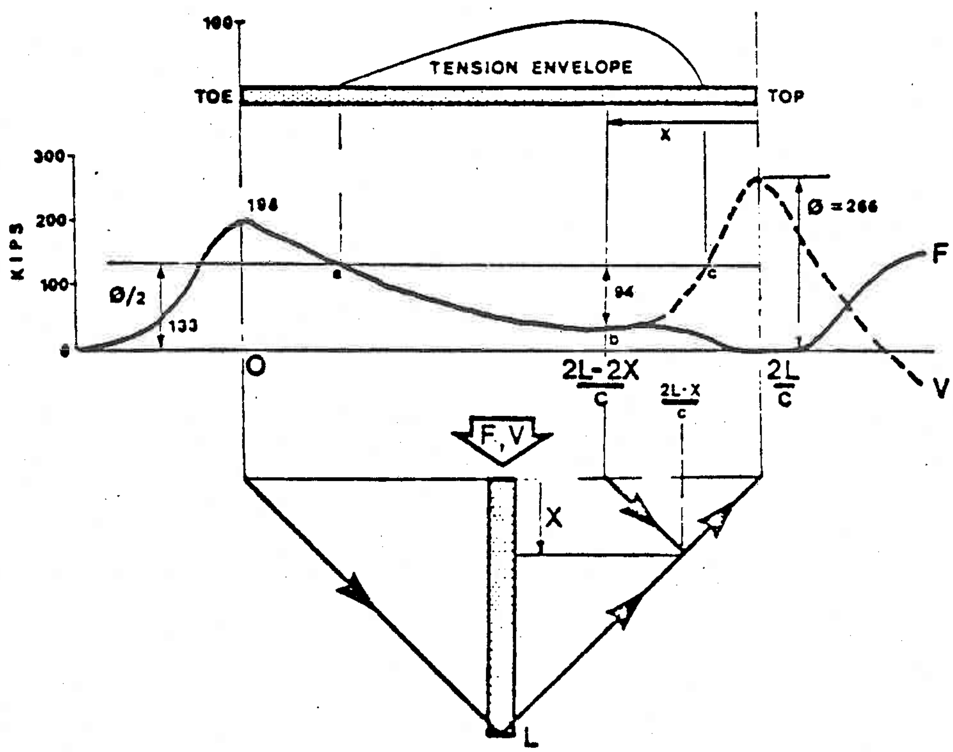

Figure 2. Maximum Tension Example

The concepts used above can be used to obtain a direct solution to the problem without the necessity of a "Wave Equation" computer analysis. Referring again to Figure 1 it can be seen that to solve the problem F_{max} and t_p must be known together with the shape of the "tail" of the curve. In addition the reduction of the reflected tension by tip resistances must also be known. This problem was solved by Parker (Reference) for air/steam hammers using a model shown in Figure 3. By writing the equations of motion of the masses and imposing a boundary condition relating the cushion spring force and the pile top velocity two third order differential equations are obtained. The solution can be of two forms.

$$F(t) = V_h e^{-2t}(A\cos wt + B\sin wt)$$

$$F(t) = V_h(Pe^{-s_1 t} + Qe^{-S_2 t})$$

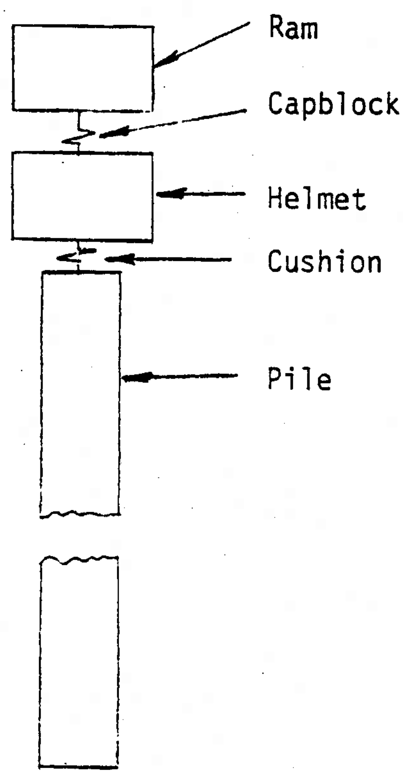

Figure 3. Pile Model by Parker

The constants α, ω, A, B, S, S_2, P, Q are complicated in their definition. Therefore, they have been tabulated for a variety of typical values of driving system parameters.

In application this method is used by obtaining the values for F_{max} and t_p from the tables in the Appendix. If t_p is known the location of the critical tension stress is known and therefore the associated time for calculating the force coming into the pile in the "tail" of the curve.

The method will be illustrated by a numerical example. The following nine-step procedure can be used to estiamte the maximum tension stress in a pile.

Step 1 Establish Driving System Constants

Weights of Ram and Helmet (R and H) in Kips

Stiffness of Capblock and Cushion (K and C) in Kips/Inch

V_h = Hammer Impact Velocity (ft/sec)

$= \sqrt{2 \text{ g h (eff)}}$

where

g = Acceleration of Gravity (ft/sec^2)

h = Stroke (ft)

eff = Hammer Efficiency

c = Wave Speed

$= \frac{Eg}{\gamma}$

where

E = Young's Modulus (kips/ft^2)

γ = Weight Density of Pile (kips/cu ft)

NOTE: Convert c to ft/Msec for use with method

Step 2 Find Force Pulse Constants from the Appendix

Step 3 Find Critical Depth

$$x_c = c\ t_p/2$$

Step 4 Find Maximum Force Delivered by Hammer

$$F_{max} = (F/V)\ V_h$$

Step 5 Find F_t, Hammer Force at Time Delay 2L/c

$$t_d = 2L/c$$

TYPE I Solution

$$F_t = V_h\ e^{-\alpha t_d} \{A \cos(\omega t_d) + B \sin(\omega t_d)\}$$

TYPE II Solution

$$F_t = V_h \{P\ e^{-s_1 t_d} + Q\ e^{-s_2 t_d}\}$$

Step 6 Find F_s, Effect of Soil Resistance at Critical Section

Use Table 1

Step 7 Find F_d, Effect of Soil Damping

$$F_d = 2\ J_c\ F_{max}$$

Step 8 Find Maximum Tension Force, T_{max}

$$T_{max} = F_{max} - F_t - F_s - F_d$$

Step 9 Find Maximum Tension Stress

$$\sigma_t = \frac{T_{max}}{A}$$

EXAMPLE

Situation

An 80-foot long, 20-inch square HC pile has a prestress of 1.0 ksi. A Vulcan 020 Hammer has been chosen to assure that this pile can attain its highest ultimate capacity. To reach a sufficiently strong stratum, the piles must first pierce a thin, hard layer overlaying softer material. The geotechnical consultant predicts that this layer will exert a side force of 40 tons on the pile during driving and recommends a Case damping constant of $J_c = 0.1$.

Problem

Select a cushion made of 3/4-inch plywood sheets to prevent pile breakage.

Solution

Try a cushion of three sheets of 3/4-inch plywood.

Step 1 Establish Driving System Constants

Hammer: R = 20.0 kips

Stroke = 36 inches

$V_h = \sqrt{2\ g\ h\ (eff)}$ (Assume 80% efficiency)

$= 12.4$ ft/sec

Helmet: H = 2.2 kips

K = 60000. kips/inc

Cushion: $C = \frac{AE}{L}$

$A = 400\ in^2$ (Pile top area)

E = 30.0 ksi (Assumed for plywood)

L = 3(3/4")(p.75) (25% shortening assumed)

C = 7100 k/in

Wave Speed: $c = \frac{Eg}{\gamma}$

$= \frac{(4000. \times 144)(32.2)}{0.15}$

= 11,120 ft/sec = 11.12 ft/Msec

Step 2 Find Force Wave Constants

NOTE: Since this cushion stiffness falls between the Type I and Type II solutions tabulated in the Appendix, values of F_t will be found for the two closest cushion stiffnesses, and an interpolated value will then be used.

$C = 6000$	$C = 8000$
$\alpha = 0.291$	$s_1 = 0.547$
$\omega = 0.071$	$s_2 = 0.217$
$A = -12.6$	$P = -202$
$B = 737.2$	$Q = 215$

$C = 7100$

$t_p = 2.8$

$F/V = 73.2$

Step 3 Find Critical Depth

$$x_c = c\ t_p /2$$
$$= 11.12(2.8) /2$$
$$= 15.6 \text{ ft}$$

Step 4 Find F_{max}

$$F_{max} = (F/V)\ V_h$$
$$= (73.2)\ 12.4$$
$$= 908 \text{ kips}$$

Step 5 Find F_t

$$t_d = \frac{2L}{c} = \frac{2(80)}{11.12} = 14.4 \text{ Msec}$$

TYPE I Solution (C=6000)

$$F_t = 12.4\, e^{-.291 \times 14.4} \{-12.6 \cos (.071 \times 14.4) + 737.2 \sin (.071 \times 14.4)\}$$

$$= 117 \text{ kips}$$

TYPE II Solution (C-8000)

$$F_t = 12.4 \{-202\, e^{-.547 \times 14.4} + 215\, e^{-.217 \times 14.4}\}$$

$$= 116 \text{ kips}$$

Interpolating for C=7100

$$F_t = 116.6 \text{ kips}$$

Step 6 Find F_s

For a side force:

$$F_s = \tfrac{1}{2} R$$

$$= \tfrac{1}{2} (40 \text{ tons}) = 20 \text{ tons}$$

$$= 40 \text{ kips}$$

Step 7 Find F_d

$$F_d = 2\, J_c\, F_{max} = 2(0.1)(908)$$

$$= 182 \text{ kips}$$

Step 8 Find T_{max}

F_{max}	908
$-F_t$	-117
$-F_s$	- 40
$-F_d$	-182
T_{max}	569 kips

Step 9 Find Maximum Tension Stress

σ_t = 569/305 = 1.87 ksi

occurring at approximately 15.6 feet below the top of the pile.

This stress exceeds the prestress, so a thicker cushion is required.

Try nine sheets of 3/4-inch plywood.

Step 1 Driving System Constants

All constants remain the same except C.

$$C = \frac{400 \times 30}{(9 \times 3/4)(0.75)}$$

= 2370 k/in

Step 2 Find Force Wave Constants

α = 0.122 t_p = 5.9

ω = 0.139 F/V = 56.0

A = -12.7

B = 147.3

Step 3 Find Critical Depth

x_c = 11.12(5.9) /2

= 31.1 ft

Step 4 Find F_{max}

F_{max} = (56)(12.4)

= 694 kips

Step 5 Find F_t

t_d = unchanged = 14.4 Msec

TYPE I Solution

$$F_t = 12.4\ e^{-.122 \times 14.4}\ \{-12.7 \cos(.139 \times 14.4) + 147.3 \sin(.139 \times 14.4)\}$$

$$= 298 \text{ kips}$$

Step 6 Find F_s

Same as above:

F_s = 40 kips

Step 7 Find F_d

F_d = 2(0.1)(694)

= 138 kips

Step 8 Find T_{max}

F_{max}	694
$-F_t$	-298
$-F_s$	- 40
$-F_d$	-138
T_{max}	218

Step 9 Find Maximum Tension Stress

σ_t = 218/305 = 0.71 ksi

Occurring at approximately 31.1 feet below the pile top.

The tension stress is less than the prestress, so the cushion is sufficient.

REFERENCE

Parker, Eric J., "Tension Cracking in Concrete Piles Driven by Air/Steam Hammers", Masters thesis, Department of Civil, Environmental and Architectural Engineering, University of Colorado, 1979.

APPENDIX

PILE TABLES

Constant	Units
α	$Msec^{-1}$
ω	$Msec^{-1}$
A	K-Sec/Ft
B	K-Sec/Ft
t_p	Msec
F/V	K-Sec/Ft
s_1	$Msec^{-1}$
s_2	$Msec^{-1}$
P	K-Sec/Ft
Q	K-Sec/Ft

RAM WEIGHT = 3.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 10 INCH SQUARE
AREA = 100.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 36.0						E = 6000. KSI I = 44.1					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H = .85	250.	.056	.137	-3.6	13.4	6.7	8.9	.053	.138	-4.5	13.1	6.5	9.2
K = 20000.	500.	.092	.187	-3.6	19.9	4.7	11.6	.083	.192	-4.4	19.3	4.8	12.2
	750.	.128	.221	-3.6	25.5	4.5	13.3	.112	.230	-4.4	24.4	4.4	14.1
	1000.	.164	.245	-3.6	30.7	2.9	14.6	.141	.259	-4.4	29.0	3.0	15.6
	1500.	.235	.274	-3.6	41.4	2.8	16.7	.200	.301	-4.4	37.6	2.7	18.0
	2000.	.307	.282	-3.6	53.6	2.6	17.8	.258	.327	-4.4	46.1	2.7	19.5
H = .85	250.	.056	.137	-3.7	13.4	5.5	8.7	.054	.138	-4.5	13.0	6.6	9.2
K = 30000.	500.	.092	.187	-3.6	19.9	3.9	11.4	.083	.192	-4.5	19.3	5.1	12.1
	750.	.128	.221	-3.6	25.5	3.8	13.4	.112	.230	-4.4	24.4	3.9	14.2
	1000.	.164	.245	-3.6	30.7	3.8	14.6	.142	.259	-4.4	29.0	3.7	15.7
	1500.	.236	.273	-3.6	41.4	2.3	16.5	.200	.300	-4.4	37.6	2.3	17.9
	2000.	.308	.281	-3.6	53.8	2.2	18.0	.259	.327	-4.4	46.2	2.3	19.7
H =1.00	250.	.055	.134	-3.5	13.2	6.8	8.7	.053	.135	-4.3	12.8	6.8	9.0
K = 20000.	500.	.091	.183	-3.5	19.6	5.1	11.3	.082	.188	-4.3	19.0	5.0	11.9
	750.	.127	.216	-3.5	25.1	3.1	12.8	.111	.225	-4.3	24.0	3.3	13.6
	1000.	.163	.239	-3.5	30.3	3.0	14.4	.141	.253	-4.3	28.5	3.1	15.3
	1500.	.235	.265	-3.5	41.1	2.9	16.3	.199	.293	-4.2	37.1	2.9	17.6
	2000.	.307	.270	-3.5	53.8	2.8	17.2	.258	.317	-4.2	45.8	2.8	19.0
H =1.00	250.	.055	.134	-3.5	13.2	7.1	8.7	.053	.135	-4.3	12.8	6.9	8.9
K = 30000.	500.	.091	.183	-3.5	19.6	4.1	11.2	.082	.188	-4.3	19.0	4.2	11.8
	750.	.127	.216	-3.5	25.1	4.1	13.1	.112	.225	-4.3	24.0	4.2	13.9
	1000.	.163	.239	-3.5	30.3	4.0	14.2	.141	.253	-4.3	28.5	3.8	15.3
	1500.	.236	.265	-3.5	41.2	2.4	16.3	.200	.293	-4.3	37.2	2.5	17.6
	2000.	.308	.270	-3.5	53.9	2.4	17.6	.259	.317	-4.3	45.8	2.4	19.3

RAM WEIGHT = 3.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 12 INCH SQUARE
AREA = 144.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI, I = 51.8						E = 6000. KSI, I = 63.5					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H = .90	300.	.058	.150	-5.2	14.1	5.4	10.1	.059	.150	-6.3	13.6	5.0	10.4
K = 20000.	500.	.078	.192	-5.2	18.8	4.7	12.5	.075	.194	-6.3	18.3	4.6	12.9
	1000.	.128	.264	-5.1	27.9	3.1	16.3	.115	.270	-6.3	27.1	3.3	17.1
	1500.	.177	.312	-5.1	35.7	2.9	18.9	.156	.323	-6.2	34.2	2.9	20.1
	2000.	.227	.346	-5.1	42.9	2.7	20.6	.196	.365	-6.2	40.6	2.7	22.1
	3000.	.325	.388	-5.0	57.6	2.3	22.5	.276	.424	-6.1	52.5	2.3	24.7
H = .90	300.	.058	.150	-5.2	14.1	5.5	10.1	.059	.150	-6.4	13.6	5.2	10.4
K = 30000.	500.	.078	.192	-5.2	18.8	5.0	12.4	.075	.193	-6.3	18.3	4.3	12.9
	1000.	.128	.264	-5.2	27.9	3.6	16.3	.116	.269	-6.3	27.1	3.7	17.1
	1500.	.178	.312	-5.1	35.7	2.5	18.8	.156	.323	-6.3	34.2	2.6	19.9
	2000.	.228	.346	-5.1	42.9	2.4	20.8	.197	.365	-6.3	40.6	2.4	22.3
	3000.	.327	.387	-5.1	57.7	2.2	23.3	.278	.424	-6.2	52.6	2.3	25.2
H = .95	300.	.058	.149	-5.1	14.0	5.3	10.0	.058	.149	-6.3	13.6	5.1	10.3
K = 20000.	500.	.078	.191	-5.1	18.7	4.8	12.4	.074	.192	-6.3	18.2	4.6	12.8
	1000.	.127	.262	-5.1	27.8	3.1	16.2	.115	.268	-6.2	27.0	3.1	17.0
	1500.	.177	.310	-5.0	35.5	2.9	18.8	.155	.321	-6.2	34.0	2.9	19.9
	2000.	.227	.343	-5.0	42.8	2.7	20.5	.196	.362	-6.1	40.4	2.8	21.9
	3000.	.326	.384	-5.0	57.5	2.3	22.2	.276	.421	-6.0	52.3	2.3	24.4
H = .95	300.	.058	.149	-5.1	14.0	5.5	10.0	.058	.149	-6.3	13.6	5.3	10.3
K = 30000.	500.	.078	.191	-5.1	18.7	5.1	12.3	.075	.192	-6.3	18.2	4.3	12.8
	1000.	.128	.262	-5.1	27.8	3.8	16.1	.115	.268	-6.2	26.9	3.8	17.0
	1500.	.178	.309	-5.1	35.5	2.5	18.6	.156	.321	-6.2	34.0	2.8	19.8
	2000.	.227	.343	-5.1	42.8	2.4	20.7	.197	.362	-6.2	40.4	2.4	22.1
	3000.	.327	.384	-5.0	57.6	2.2	23.0	.278	.421	-6.1	52.4	2.3	25.0

RAM WEIGHT = 3.0 KIPS

PILE SIZE 14 INCH SQUARE
AREA = 196.0 SQ. IN.

TYPE I
(TYPE II)

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 70.5						E = 6000. KSI I = 88.4					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H = .95	500.	.074	.192	-7.0	17.9	4.2	13.1	.076	.192	-8.5	17.3	3.9	13.4
K = 30000.	1000.	.111	.270	-6.9	26.6	3.6	17.3	.106	.272	-8.5	25.9	3.3	18.0
	2000.	.184	.369	-6.9	39.6	2.6	22.7	.165	.377	-8.4	38.3	2.2	23.8
	3000.	.257	.434	-6.8	50.7	2.2	26.0	.224	.452	-8.3	48.5	2.4	27.4
	4000.	.329	.479	-6.8	61.3	2.0	28.0	.283	.508	-8.2	57.6	2.2	29.9
	5000.	.401	.511	-6.7	72.0	2.0	29.1	.342	.552	-8.2	66.4	1.8	32.1
H = .95	500.	.074	.192	-7.0	17.9	4.5	13.0	.076	.192	-8.5	17.3	3.7	13.4
K = 40000.	1000.	.111	.270	-6.9	26.6	3.4	17.4	.106	.272	-8.5	25.9	3.3	18.0
	2000.	.184	.369	-6.9	39.5	2.2	22.6	.165	.377	-8.4	38.3	2.5	23.8
	3000.	.257	.434	-6.8	50.7	2.2	26.0	.225	.451	-8.4	48.5	2.1	27.9
	4000.	.330	.479	-6.8	61.3	2.0	28.3	.284	.508	-8.3	57.7	1.7	30.4
	5000.	.403	.510	-6.8	72.1	2.0	29.6	.343	.552	-8.3	66.4	1.6	32.3
H =1.00	500.	.074	.191	-6.9	17.8	4.3	13.0	.075	.191	-8.4	17.2	4.0	13.3
K = 30000.	1000.	.110	.268	-6.8	26.4	3.6	17.2	.105	.270	-8.4	25.8	3.3	17.8
	2000.	.183	.366	-6.8	39.4	2.4	22.6	.164	.375	-8.3	38.1	2.2	23.6
	3000.	.256	.430	-6.7	50.5	2.0	25.6	.224	.448	-8.2	48.2	2.5	27.1
	4000.	.329	.475	-6.7	61.1	2.1	27.7	.283	.504	-8.1	57.4	2.2	29.5
	5000.	.401	.506	-6.7	71.8	1.8	28.9	.342	.548	-8.1	66.1	1.8	31.8
H =1.00	500.	.074	.191	-6.9	17.8	4.6	12.9	.075	.191	-8.4	17.2	3.7	13.3
K = 40000.	1000.	.110	.268	-6.9	26.4	3.5	17.3	.105	.270	-8.4	25.8	3.4	17.9
	2000.	.184	.366	-6.8	39.3	2.2	22.5	.165	.375	-8.3	38.1	2.5	23.6
	3000.	.257	.430	-6.8	50.5	2.3	25.8	.224	.448	-8.3	48.2	1.9	27.5
	4000.	.330	.475	-6.7	61.1	2.1	28.1	.284	.504	-8.2	57.4	2.2	29.9
	5000.	.403	.505	-6.7	71.9	2.0	29.4	.343	.548	-8.2	66.1	1.8	32.2

RAM WEIGHT = 5.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 10 INCH SQUARE
AREA = 100.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI, I = 36.0						E = 6000. KSI, I = 44.1					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H = .85	250.	.049	.109	-4.0	18.6	8.7	11.4	.045	.111	-4.9	18.1	8.4	11.9
K = 20000.	500.	.085	.146	-4.0	28.1	6.5	14.5	.075	.152	-4.9	26.9	6.3	15.5
	750.	.121	.168	-4.0	36.8	4.9	16.6	.104	.179	-4.8	34.4	4.8	17.9
	1000.	.157	.180	-3.9	45.8	4.6	17.8	.133	.198	-4.8	41.5	4.6	19.5
	1500.	.228	.183	-3.9	67.8	3.1	20.0	.191	.221	-4.8	56.0	3.1	22.0
	2000.	.299	.156	-4.0	106.0	2.9	21.5	.249	.227	-4.8	72.6	2.9	23.9
H = .85	250.	.049	.109	-4.0	18.6	8.6	11.4	.045	.111	-4.9	18.1	8.4	11.9
K = 30000.	500.	.085	.146	-4.0	28.1	6.6	14.5	.075	.152	-4.9	26.9	5.9	15.5
	750.	.121	.168	-4.0	36.8	5.3	16.5	.104	.179	-4.9	34.5	5.3	17.8
	1000.	.157	.180	-4.0	45.9	4.0	18.0	.133	.198	-4.8	41.6	4.1	19.6
	1500.	.229	.182	-4.0	68.0	3.7	19.7	.192	.221	-4.8	56.1	3.8	21.9
	2000.	.300	.154	-4.0	107.1	2.5	21.5	.250	.227	-4.8	72.9	2.5	23.7
H =1.00	250.	.049	.108	-3.9	18.4	9.0	11.2	.045	.109	-4.8	17.9	8.5	11.7
K = 20000.	500.	.085	.144	-3.9	27.9	5.4	14.3	.074	.150	-4.7	26.7	6.4	15.2
	750.	.121	.165	-3.9	36.6	5.1	16.3	.104	.176	-4.7	34.1	5.1	17.6
	1000.	.157	.177	-3.9	45.6	4.9	17.4	.133	.195	-4.7	41.2	4.9	19.1
	1500.	.228	.177	-3.9	68.3	3.2	19.8	.191	.217	-4.7	55.8	3.3	21.8
	2000.	.299	.146	-3.9	110.0	3.0	21.1	.249	.221	-4.7	72.8	3.0	23.5
H =1.00	250.	.049	.108	-3.9	18.4	8.0	11.2	.045	.109	-4.8	17.9	8.1	11.7
K = 30000.	500.	.085	.144	-3.9	27.9	6.1	14.4	.074	.150	-4.8	26.7	6.3	15.3
	750.	.121	.165	-3.9	36.6	4.3	16.2	.104	.176	-4.8	34.1	4.4	17.5
	1000.	.157	.177	-3.9	45.7	4.2	17.8	.133	.195	-4.7	41.3	4.3	19.3
	1500.	.229	.177	-3.9	68.5	2.6	19.5	.192	.216	-4.7	55.9	4.0	21.3
	2000.	.300	.145	-3.9	111.2	2.8	21.3	.250	.221	-4.7	73.1	2.6	23.5

RAM WEIGHT = 5.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 12 INCH SQUARE
AREA = 144.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 51.8						E = 6000. KSI I = 63.5					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H = .90	300.	.048	.121	-5.7	19.6	7.3	13.2	.047	.122	-7.0	19.1	7.2	13.6
K = 20000.	500.	.068	.154	-5.7	26.2	6.2	16.1	.063	.156	-6.9	25.5	5.9	16.9
	1000.	.118	.207	-5.6	39.5	4.6	20.6	.104	.214	-6.9	37.8	4.5	21.9
	1500.	.167	.238	-5.6	51.5	3.2	23.4	.144	.253	-6.8	48.3	3.5	25.2
	2000.	.216	.256	-5.5	63.7	3.0	25.6	.184	.281	-6.7	58.1	3.1	27.8
	3000.	.314	.264	-5.5	92.7	2.7	28.0	.263	.314	-6.7	77.7	2.7	31.0
H = .90	300.	.048	.121	-5.7	19.6	7.4	13.2	.047	.122	-7.0	19.1	7.2	13.6
K = 30000.	500.	.068	.154	-5.7	26.2	6.0	16.1	.063	.156	-7.0	25.5	5.8	16.9
	1000.	.118	.207	-5.7	39.5	4.3	20.6	.104	.214	-6.9	37.8	4.3	22.0
	1500.	.168	.238	-5.6	51.5	3.9	23.3	.145	.253	-6.9	48.3	3.8	25.2
	2000.	.218	.256	-5.6	63.9	2.6	25.4	.185	.281	-6.8	58.2	2.8	27.5
	3000.	.316	.263	-5.6	93.4	2.4	28.5	.265	.314	-6.8	78.1	2.5	31.3
H = .95	300.	.048	.121	-5.7	19.5	7.4	13.1	.047	.121	-6.9	19.0	7.2	13.6
K = 20000.	500.	.068	.153	-5.6	26.1	6.1	16.0	.063	.156	-6.9	25.4	5.9	16.8
	1000.	.118	.206	-5.6	39.3	4.7	20.4	.103	.213	-6.8	37.7	4.6	21.8
	1500.	.167	.237	-5.5	51.4	3.3	23.3	.144	.252	-6.8	48.1	3.4	25.1
	2000.	.216	.255	-5.5	63.7	3.0	25.5	.184	.279	-6.7	57.9	3.1	27.7
	3000.	.314	.261	-5.5	92.9	2.7	27.7	.263	.312	-6.6	77.6	2.7	30.7
H = .95	300.	.048	.121	-5.7	19.5	7.6	13.1	.047	.121	-6.9	19.0	7.2	13.6
K = 30000.	500.	.068	.153	-5.6	26.1	6.0	16.1	.063	.156	-6.9	25.4	5.9	16.8
	1000.	.118	.206	-5.6	39.3	4.3	20.6	.104	.213	-6.9	37.7	4.3	21.9
	1500.	.168	.237	-5.6	51.4	3.9	23.1	.144	.252	-6.8	48.2	3.8	25.0
	2000.	.218	.255	-5.6	63.8	2.8	25.3	.185	.279	-6.8	58.0	2.8	27.4
	3000.	.316	.260	-5.6	93.6	2.4	28.3	.265	.312	-6.7	77.9	2.5	31.2

RAM WEIGHT = 5.0 KIPS

PILE SIZE 14 INCH SQUARE
AREA = 196.0 SQ. IN.

TYPE I
(TYPE II)

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 70.5						E = 6000. KSI I = 86.4					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H = .95	500.	.062	.156	-7.7	25.0	5.7	17.1	.060	.157	-9.4	24.4	5.3	17.7
K = 30000.	1000.	.098	.216	-7.6	37.1	4.3	22.5	.090	.220	-9.3	36.1	4.1	23.6
	2000.	.171	.288	-7.5	56.2	2.9	28.5	.149	.300	-9.2	53.7	3.1	30.5
	3000.	.243	.330	-7.5	73.7	2.5	32.6	.208	.353	-9.1	68.7	2.6	35.2
	4000.	.315	.352	-7.4	92.0	2.3	35.0	.266	.390	-9.0	82.9	2.4	38.3
	5000.	.386	.359	-7.4	112.6	2.1	36.6	.324	.415	-8.9	97.2	2.1	40.5
H = .95	500.	.062	.156	-7.7	25.0	5.7	17.1	.060	.157	-9.4	24.4	5.3	17.7
K = 40000.	1000.	.098	.216	-7.7	37.1	4.4	22.4	.090	.220	-9.4	36.1	4.2	23.5
	2000.	.171	.288	-7.6	56.2	3.3	28.5	.150	.300	-9.3	53.7	3.2	30.5
	3000.	.244	.329	-7.5	73.8	2.3	32.5	.209	.353	-9.2	68.8	2.4	35.1
	4000.	.316	.351	-7.5	92.3	2.1	35.4	.268	.390	-9.1	83.1	2.2	38.5
	5000.	.388	.358	-7.5	113.2	2.0	37.2	.326	.415	-9.1	97.5	2.0	40.9
H =1.00	500.	.061	.156	-7.6	25.0	5.9	17.0	.060	.156	-9.3	24.3	5.4	17.6
K = 30000.	1000.	.098	.215	-7.6	37.0	4.3	22.4	.090	.219	-9.3	36.0	4.2	23.5
	2000.	.171	.287	-7.5	56.0	2.8	28.4	.149	.298	-9.1	53.5	3.0	30.4
	3000.	.243	.328	-7.4	73.6	2.5	32.4	.208	.351	-9.0	68.5	2.6	35.0
	4000.	.315	.349	-7.4	92.0	2.3	34.8	.266	.387	-8.9	82.8	2.4	38.1
	5000.	.386	.355	-7.4	112.8	2.1	36.3	.324	.413	-8.9	97.1	2.1	40.2
H =1.00	500.	.061	.156	-7.6	25.0	5.8	17.0	.060	.156	-9.4	24.3	5.3	17.6
K = 40000.	1000.	.098	.215	-7.6	37.0	4.2	22.3	.090	.219	-9.3	36.0	4.2	23.4
	2000.	.171	.287	-7.5	56.0	3.3	28.3	.150	.299	-9.2	53.5	3.3	30.3
	3000.	.244	.328	-7.5	73.7	2.3	32.4	.209	.351	-9.1	68.6	2.4	35.0
	4000.	.316	.349	-7.4	92.2	2.2	35.2	.268	.387	-9.1	82.9	2.2	38.3
	5000.	.388	.355	-7.4	113.3	2.1	37.0	.326	.412	-9.0	97.3	2.1	40.7

RAM WEIGHT = 5.0 KIPS

PILE SIZE 16 INCH SQUARE
AREA = 256.0 SQ. IN.

TYPE I
(TYPE II)

HELMET	CUSHION (K/IN)	E = 4000. KSI, I = 92.1						E = 6000. KSI, I = 112.8					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =1.50	500.	.058	.150	-9.2	23.3	5.4	17.0	.059	.149	-11.3	22.4	4.9	17.5
K = 30000.	1000.	.086	.210	-9.2	34.5	4.6	22.6	.082	.212	-11.2	33.6	4.2	23.5
	2000.	.142	.288	-9.1	51.2	3.1	29.7	.127	.295	-11.1	49.7	3.1	31.3
	3000.	.197	.340	-9.0	65.5	2.8	34.0	.173	.353	-11.0	62.7	3.1	35.8
	4000.	.253	.376	-8.9	79.0	2.5	36.7	.218	.397	-10.9	74.5	2.8	39.1
	6000.	.363	.418	-8.8	106.6	1.5	40.6	.307	.461	-10.7	96.6	1.9	44.4
H =1.50	500.	.058	.150	-9.2	23.2	5.5	17.0	.059	.149	-11.3	22.4	5.0	17.5
K = 50000.	1000.	.086	.210	-9.2	34.4	4.1	22.7	.082	.212	-11.3	33.5	4.1	23.5
	2000.	.142	.288	-9.1	51.2	2.5	29.0	.128	.295	-11.2	49.6	3.3	30.9
	3000.	.198	.340	-9.1	65.5	2.4	34.2	.174	.353	-11.1	62.7	2.5	36.3
	4000.	.254	.376	-9.1	79.1	2.3	37.6	.219	.397	-11.1	74.6	2.4	40.2
	6000.	.366	.418	-9.0	107.0	2.1	41.4	.310	.461	-11.0	96.8	2.1	45.2
H =1.60	500.	.057	.149	-9.1	23.1	5.4	16.9	.059	.148	-11.1	22.3	5.0	17.4
K = 30000.	1000.	.085	.209	-9.0	34.2	4.7	22.4	.082	.210	-11.1	33.4	4.2	23.2
	2000.	.141	.286	-8.9	50.9	3.1	29.5	.127	.292	-10.9	49.3	3.1	31.0
	3000.	.197	.336	-8.9	65.2	2.9	33.7	.172	.350	-10.8	62.4	2.9	35.8
	4000.	.253	.372	-8.8	78.7	2.6	36.2	.217	.394	-10.7	74.1	2.8	38.6
	6000.	.363	.413	-8.7	106.5	1.4	40.3	.307	.456	-10.6	96.2	1.8	43.9
H =1.60	500.	.057	.149	-9.1	23.1	5.6	16.8	.059	.148	-11.1	22.3	5.1	17.3
K = 50000.	1000.	.086	.209	-9.1	34.2	4.1	22.5	.082	.210	-11.1	33.3	4.1	23.3
	2000.	.142	.285	-9.0	50.9	2.6	28.8	.128	.292	-11.0	49.3	3.4	30.5
	3000.	.198	.336	-9.0	65.2	2.4	34.0	.173	.350	-11.0	62.3	2.5	36.1
	4000.	.254	.372	-8.9	78.8	2.3	37.3	.219	.394	-10.9	74.2	2.4	39.8
	6000.	.366	.412	-8.9	106.8	2.1	40.8	.310	.456	-10.8	96.4	2.2	44.6

RAM WEIGHT = 5.0 KIPS

PILE SIZE 18 INCH SQUARE
AREA = 324.0 SQ. IN.

TYPE I
(TYPE II)

HELMET	CUSHION (K/IN)	E = 4000. KSI, I = 116.6 ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	E = 6000. KSI, I = 142.8 ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =1.70 K = 40000.	1000.	.081	.209	-11.3	33.0	4.3	23.2	.081	.209	-13.8	32.0	3.9	23.9
	2000.	.125	.291	-11.2	48.8	3.0	30.9	.117	.294	-13.7	47.6	2.9	32.2
	3000.	.169	.348	-11.1	61.6	2.7	36.1	.152	.356	-13.6	59.8	2.4	37.5
	4000.	.213	.393	-11.1	73.2	2.8	39.0	.188	.406	-13.5	70.5	2.8	41.5
	6000.	.301	.457	-10.9	94.8	2.1	44.0	.260	.482	-13.3	89.6	1.8	47.3
	8000.	.388	.497	-10.8	116.3	1.1	4[illegible].8	.330	.537	-13.2	107.3	1.6	52.2
H =1.70 K = 60000.	1000.	.081	.209	-11.3	33.0	3.9	23.2	.081	.209	-13.9	32.0	3.8	24.0
	2000.	.125	.291	-11.3	48.8	3.6	30.6	.117	.294	-13.8	47.5	3.2	31.9
	3000.	.170	.348	-11.2	61.6	2.3	35.9	.153	.356	-13.7	59.8	2.5	37.8
	4000.	.214	.393	-11.2	73.2	2.5	39.7	.189	.405	-13.7	70.5	2.3	42.3
	6000.	.302	.456	-11.1	94.9	2.1	45.2	.261	.481	-13.5	89.6	2.3	47.8
	8000.	.391	.497	-11.0	116.5	2.0	47.9	.333	.537	-13.4	107.4	1.8	52.4
H =1.80 K = 40000.	1000.	.080	.207	-11.1	32.8	4.4	23.0	.080	.207	-13.6	31.8	3.9	23.7
	2000.	.125	.288	-11.1	48.5	3.1	30.6	.116	.292	-13.5	47.3	2.9	31.9
	3000.	.169	.346	-11.0	61.3	2.8	35.8	.152	.353	-13.4	59.4	3.0	37.1
	4000.	.213	.390	-10.9	72.8	2.8	38.6	.188	.402	-13.3	70.1	2.8	41.0
	6000.	.301	.452	-10.8	94.4	2.2	43.5	.259	.477	-13.2	89.1	1.8	46.7
	8000.	.388	.492	-10.7	116.0	1.1	47.5	.330	.532	-13.0	106.8	1.5	51.7
H =1.80 K = 60000.	1000.	.080	.207	-11.1	32.8	4.0	23.0	.080	.207	-13.7	31.8	3.8	23.8
	2000.	.125	.288	-11.1	48.5	2.5	29.9	.116	.292	-13.6	47.2	3.3	31.6
	3000.	.169	.345	-11.1	61.2	2.4	35.7	.153	.353	-13.5	59.4	2.5	37.5
	4000.	.214	.389	-11.0	72.8	2.5	39.4	.189	.402	-13.5	70.0	2.3	42.0
	6000.	.302	.452	-10.9	94.4	2.2	44.7	.261	.477	-13.4	89.1	2.3	47.3
	8000.	.390	.491	-10.9	116.1	2.0	47.3	.333	.532	-13.3	106.9	1.8	51.8

RAM WEIGHT = 5.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 20 INCH SQUARE HC
AREA = 400.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 144.0						E = 6000. KSI I = 178.3					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.078	.202	-13.0	31.0	3.4	22.9	.081	.201	-15.9	29.9	3.3	23.8
K = 40000.	2000.	.114	.284	-12.9	46.0	3.1	31.0	.110	.285	-15.8	44.9	3.0	32.0
	4000.	.185	.390	-12.8	68.3	2.9	39.5	.168	.398	-15.6	66.4	2.8	41.5
	6000.	.257	.462	-12.6	87.1	1.9	44.8	.226	.478	-15.4	83.7	1.8	48.1
	8000.	.328	.515	-12.4	104.7	1.3	50.1	.284	.541	-15.2	99.3	1.5	53.9
	10000.	.400	.553	-12.2	122.1	1.2	54.7	.341	.591	-14.9	113.9	1.3	59.0
H =2.20	1000.	.078	.201	-13.0	31.0	4.1	23.0	.081	.200	-15.9	29.8	3.7	23.6
K = 60000.	2000.	.114	.283	-13.0	46.0	2.7	30.6	.110	.285	-15.9	44.8	2.7	31.9
	4000.	.186	.390	-12.9	68.3	2.2	40.4	.168	.398	-15.8	66.3	2.2	42.2
	6000.	.258	.462	-12.8	87.1	2.2	46.3	.227	.478	-15.6	83.7	2.4	48.4
	8000.	.330	.514	-12.6	104.7	1.9	49.5	.285	.540	-15.5	99.3	1.9	53.5
	10000.	.401	.552	-12.5	122.1	1.0	52.6	.344	.590	-15.3	113.9	1.6	57.0
H =2.40	1000.	.077	.199	-12.6	30.6	3.4	22.6	.079	.198	-15.5	29.5	3.3	23.5
K = 40000.	2000.	.113	.280	-12.6	45.5	3.2	30.6	.108	.281	-15.4	44.3	3.2	31.5
	4000.	.184	.384	-12.4	67.5	2.7	39.3	.167	.393	-15.2	65.6	2.9	40.8
	6000.	.256	.455	-12.3	86.2	2.1	44.1	.225	.471	-15.0	82.8	1.8	47.2
	8000.	.328	.506	-12.1	103.8	1.3	49.3	.283	.532	-14.8	98.2	1.4	53.0
	10000.	.400	.543	-11.9	121.3	1.2	53.8	.341	.581	-14.5	112.9	1.3	58.0
H =2.40	1000.	.077	.199	-12.7	30.6	4.2	22.7	.079	.198	-15.5	29.5	3.8	23.3
K = 60000.	2000.	.113	.279	-12.6	45.4	2.7	30.2	.109	.281	-15.5	44.3	2.7	31.4
	4000.	.185	.384	-12.5	67.5	2.3	39.7	.167	.392	-15.4	65.5	2.7	41.4
	6000.	.257	.454	-12.4	86.2	2.2	45.4	.226	.471	-15.2	82.7	2.2	48.2
	8000.	.329	.505	-12.3	103.8	1.9	48.4	.284	.532	-15.1	98.2	1.9	52.3
	10000.	.401	.542	-12.2	121.3	1.0	51.8	.343	.580	-14.9	112.9	1.2	55.9

RAM WEIGHT = 10.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 14 INCH SQUARE
AREA = 196.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI, I = 70.5 ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	E = 6000. KSI, I = 86.4 ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H = .95	500.	.050	.113	-8.3	38.4	8.1	23.6	.046	.115	-10.2	37.4	8.1	24.7
K = 30000.	1000.	.087	.152	-8.2	57.9	6.1	30.2	.076	.157	-10.1	55.5	6.0	32.2
	2000.	.159	.188	-8.1	93.6	4.2	37.0	.135	.206	-9.9	85.3	4.2	40.4
	3000.	.231	.193	-8.0	136.4	3.2	40.8	.194	.230	-9.7	114.2	3.4	45.2
	4000.	.302	.170	-8.0	205.2	2.7	43.9	.251	.239	-9.6	146.6	2.8	48.9
	5000.	.371	.105	-8.0	413.1	2.6	45.9	.308	.233	-9.6	187.0	2.6	51.5
H = .95	500.	.050	.113	-8.3	38.4	8.3	23.6	.047	.115	-10.2	37.4	8.0	24.7
K = 40000.	1000.	.087	.152	-8.3	57.9	6.1	30.1	.076	.157	-10.1	55.5	6.0	32.2
	2000.	.160	.188	-8.2	93.8	4.0	37.0	.136	.206	-10.0	85.4	4.2	40.4
	3000.	.232	.193	-8.1	137.1	3.5	40.8	.195	.230	-9.9	114.5	3.5	45.3
	4000.	.304	.169	-8.1	208.0	2.3	43.6	.253	.238	-9.8	147.4	2.8	48.6
	5000.	.375	.100	-8.1	439.6	2.3	46.1	.311	.232	-9.7	189.0	2.4	51.5
H =1.00	500.	.050	.113	-8.3	38.3	8.1	23.6	.046	.114	-10.1	37.3	8.1	24.7
K = 30000.	1000.	.087	.151	-8.2	57.8	6.1	30.1	.076	.157	-10.0	55.4	6.0	32.1
	2000.	.159	.187	-8.1	93.5	4.2	36.9	.135	.205	-9.9	85.1	4.2	40.3
	3000.	.231	.192	-8.0	136.6	2.9	40.7	.194	.230	-9.7	114.1	3.3	45.1
	4000.	.302	.169	-8.0	206.3	2.7	43.8	.251	.237	-9.6	146.6	2.8	48.8
	5000.	.372	.102	-8.0	425.7	2.6	45.7	.308	.231	-9.6	187.4	2.6	51.3
H =1.00	500.	.050	.113	-8.3	38.3	8.3	23.6	.046	.114	-10.2	37.3	8.0	24.7
K = 40000.	1000.	.087	.151	-8.2	57.8	6.1	30.0	.076	.157	-10.1	55.4	6.0	32.1
	2000.	.160	.187	-8.1	93.7	4.0	36.9	.136	.205	-9.9	85.2	4.2	40.3
	3000.	.232	.192	-8.1	137.3	3.8	40.7	.195	.229	-9.9	114.4	3.5	45.1
	4000.	.304	.167	-8.1	209.1	2.4	43.5	.253	.237	-9.8	147.5	2.7	48.5
	5000.	.375	.096	-8.1	454.4	2.3	46.0	.311	.230	-9.7	189.4	2.5	51.5

RAM WEIGHT = 10.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 16 INCH SQUARE
AREA = 256.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI, I = 92.1						E = 6000. KSI, I = 112.8					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =1.50	500.	.045	.112	-10.4	36.3	8.1	24.3	.043	.113	-12.7	35.4	7.8	25.2
K = 30000.	1000.	.073	.154	-10.3	53.8	6.0	31.8	.066	.157	-12.6	52.3	5.8	33.4
	2000.	.128	.204	-10.1	82.2	4.4	39.9	.111	.213	-12.4	78.1	4.4	43.0
	3000.	.183	.230	-10.0	109.2	3.4	45.4	.156	.249	-12.2	100.5	3.5	49.3
	4000.	.238	.241	-10.0	138.5	3.1	49.0	.201	.273	-12.1	122.2	3.1	53.7
	6000.	.346	.226	-9.9	220.0	2.8	52.7	.288	.296	-11.9	168.2	2.6	59.1
H =1.50	500.	.045	.112	-10.4	36.3	8.2	24.3	.044	.113	-12.7	35.4	7.8	25.2
K = 50000.	1000.	.073	.154	-10.4	53.8	6.0	31.8	.066	.157	-12.7	52.3	5.8	33.4
	2000.	.129	.204	-10.3	82.3	4.2	40.2	.112	.213	-12.6	78.2	4.3	43.1
	3000.	.185	.230	-10.2	109.6	3.7	44.9	.157	.249	-12.4	100.7	3.7	49.0
	4000.	.240	.241	-10.2	139.4	2.6	48.9	.203	.273	-12.4	122.7	2.8	53.5
	6000.	.350	.224	-10.1	224.6	2.6	53.8	.292	.295	-12.3	169.9	2.4	60.1
H =1.60	500.	.045	.112	-10.3	36.2	8.2	24.2	.043	.112	-12.6	35.3	7.8	25.1
K = 30000.	1000.	.073	.153	-10.2	53.7	6.0	31.6	.066	.157	-12.5	52.1	5.8	33.3
	2000.	.128	.202	-10.1	82.0	4.3	39.7	.111	.212	-12.3	77.8	4.3	42.8
	3000.	.183	.228	-10.0	109.1	3.4	45.2	.156	.248	-12.1	100.2	3.5	49.1
	4000.	.238	.239	-9.9	138.6	3.2	48.7	.201	.271	-12.0	121.9	3.2	53.4
	6000.	.346	.223	-9.9	221.6	2.5	52.1	.288	.294	-11.9	168.3	2.7	58.6
H =1.60	500.	.045	.112	-10.3	36.2	8.2	24.2	.043	.112	-12.6	35.2	7.8	25.0
K = 50000.	1000.	.073	.154	-10.3	53.7	6.0	31.6	.066	.157	-12.6	52.1	6.0	33.3
	2000.	.129	.202	-10.2	82.1	4.2	40.0	.112	.212	-12.4	77.9	4.4	42.9
	3000.	.185	.228	-10.1	109.4	3.8	44.5	.157	.248	-12.4	100.4	3.8	48.6
	4000.	.240	.239	-10.1	139.4	2.7	48.8	.203	.271	-12.3	122.4	2.8	53.3
	6000.	.350	.220	-10.1	226.1	2.6	53.5	.292	.293	-12.2	170.0	2.5	59.8

RAM WEIGHT = 10.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 18 INCH SQUARE
AREA = 324.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI, I = 116.6						E = 6000. KSI, I = 142.8					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =1.70	1000.	.065	.156	-12.9	51.7	5.9	33.3	.062	.158	-15.8	50.4	5.7	34.7
K = 40000.	2000.	.109	.213	-12.7	77.1	4.5	43.0	.097	.218	-15.6	74.6	4.6	45.5
	3000.	.153	.249	-12.6	99.1	3.4	49.2	.133	.260	-15.4	94.4	3.5	52.8
	4000.	.197	.274	-12.5	120.3	3.0	54.0	.168	.292	-15.2	112.4	3.1	58.3
	6000.	.283	.299	-12.4	164.9	2.6	59.9	.238	.335	-15.0	146.8	2.7	65.7
	8000.	.368	.298	-12.3	219.3	2.3	63.1	.308	.360	-14.8	181.7	2.3	70.4
H =1.70	1000.	.065	.156	-12.9	51.7	5.8	33.3	.062	.158	-15.8	50.4	5.7	34.7
K = 60000.	2000.	.110	.213	-12.8	77.1	4.3	43.1	.098	.218	-15.7	74.6	4.2	45.6
	3000.	.154	.249	-12.7	99.2	3.8	49.2	.134	.260	-15.6	94.4	3.7	52.7
	4000.	.198	.274	-12.7	120.5	2.7	53.4	.170	.292	-15.5	112.6	3.0	57.8
	6000.	.285	.298	-12.6	165.7	2.4	60.6	.241	.335	-15.3	147.3	2.5	66.2
	8000.	.372	.297	-12.6	221.8	2.2	64.6	.311	.360	-15.2	182.9	2.2	71.4
H =1.80	1000.	.065	.155	-12.8	51.5	6.0	33.1	.061	.157	-15.6	50.2	5.7	34.5
K = 40000.	2000.	.109	.212	-12.6	76.9	4.6	42.8	.097	.217	-15.4	74.3	4.6	45.3
	3000.	.153	.248	-12.5	98.8	3.4	49.0	.133	.259	-15.3	94.1	3.5	52.5
	4000.	.196	.272	-12.4	120.0	3.0	53.8	.168	.290	-15.1	112.1	3.2	58.0
	6000.	.283	.297	-12.3	164.8	2.7	59.4	.239	.333	-14.9	146.5	2.7	65.2
	8000.	.368	.295	-12.3	220.0	2.3	62.5	.308	.357	-14.8	181.6	2.3	69.8
H =1.80	1000.	.065	.155	-12.8	51.5	5.8	33.2	.062	.157	-15.7	50.2	5.7	34.5
K = 60000.	2000.	.109	.212	-12.7	76.9	4.3	42.9	.098	.217	-15.6	74.3	4.2	45.4
	3000.	.154	.248	-12.6	98.9	3.8	48.8	.134	.259	-15.4	94.1	3.7	52.4
	4000.	.198	.272	-12.6	120.2	2.7	53.2	.169	.290	-15.4	112.3	2.9	57.5
	6000.	.285	.296	-12.5	165.7	2.4	60.3	.241	.333	-15.2	147.0	2.5	65.8
	8000.	.372	.294	-12.5	222.4	2.3	64.1	.311	.357	-15.1	182.7	2.3	71.0

RAM WEIGHT = 10.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 20 INCH SQUARE
AREA = 400.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 144.0						E = 6000. KSI I = 176.3					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.061	.154	-15.3	49.5	5.8	33.9	.059	.155	-18.7	48.2	5.4	35.0
K = 40000.	2000.	.096	.214	-15.1	73.2	4.5	44.4	.088	.217	-18.5	71.3	4.2	46.6
	4000.	.167	.285	-14.8	110.6	3.1	57.0	.146	.297	-18.1	105.9	3.2	60.8
	6000.	.237	.327	-14.7	144.9	2.8	63.7	.203	.349	-17.8	135.3	2.7	69.1
	8000.	.307	.350	-14.6	180.2	2.3	67.9	.259	.386	-17.6	162.9	2.3	74.9
	10000.	.375	.358	-14.5	219.4	1.6	72.5	.315	.412	-17.4	190.4	1.9	79.8
H =2.20	1000.	.061	.154	-15.3	49.4	5.9	33.8	.060	.155	-18.8	48.1	5.4	35.0
K = 60000.	2000.	.097	.214	-15.2	73.2	4.4	44.6	.089	.217	-18.6	71.2	4.2	46.6
	4000.	.168	.285	-15.0	110.7	2.9	56.8	.147	.297	-18.4	105.9	3.0	60.7
	6000.	.239	.327	-14.9	145.3	2.6	64.8	.205	.349	-18.2	135.5	2.6	69.8
	8000.	.309	.349	-14.9	181.1	2.4	69.3	.262	.386	-18.0	163.5	2.3	75.8
	10000.	.379	.357	-14.8	221.3	2.2	72.1	.319	.412	-17.9	191.6	2.2	79.9
H =2.40	1000.	.060	.153	-15.0	49.1	5.8	33.6	.059	.154	-18.4	47.8	5.3	34.7
K = 40000.	2000.	.096	.212	-14.9	72.7	4.4	43.9	.088	.215	-18.2	70.8	4.2	46.2
	4000.	.167	.282	-14.6	110.0	3.3	56.5	.146	.294	-17.9	105.2	3.3	60.2
	6000.	.237	.323	-14.5	144.4	2.8	62.8	.203	.346	-17.6	134.6	2.8	68.3
	8000.	.307	.345	-14.4	180.0	2.3	66.9	.259	.382	-17.4	162.3	2.4	73.9
	10000.	.376	.352	-14.4	219.9	1.6	72.0	.315	.407	-17.2	190.0	1.8	79.0
H =2.40	1000.	.060	.153	-15.1	49.1	6.0	33.5	.059	.154	-18.5	47.8	5.4	34.6
K = 60000.	2000.	.096	.212	-15.0	72.7	4.4	44.2	.088	.215	-18.3	70.7	4.8	46.2
	4000.	.168	.282	-14.8	110.1	2.9	56.4	.147	.294	-18.1	105.2	3.0	60.2
	6000.	.239	.323	-14.7	144.7	2.6	64.1	.204	.346	-17.9	134.8	2.7	69.1
	8000.	.309	.344	-14.7	180.9	2.4	68.3	.262	.382	-17.8	162.8	2.5	74.8
	10000.	.380	.351	-14.6	221.7	2.3	70.9	.319	.407	-17.7	191.0	2.3	78.7

RAM WEIGHT = 10.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 20 INCH SQUARE HC
AREA = 305.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 109.8						E = 6000. KSI I = 134.4					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.066	.152	-11.6	51.2	5.9	32.0	.062	.154	-14.2	49.9	5.8	33.5
K = 40000.	2000.	.113	.205	-11.5	76.9	4.8	40.8	.100	.212	-14.1	73.9	4.6	43.5
	4000.	.206	.258	-11.4	122.7	3.1	51.4	.176	.280	-13.9	112.8	3.3	55.6
	6000.	.299	.272	-11.4	174.6	2.8	55.8	.251	.316	-13.7	149.8	2.8	61.8
	8000.	.390	.253	-11.4	249.1	1.6	58.8	.325	.332	-13.7	189.7	2.3	65.5
	10000.	.481	.195	-11.5	403.4	1.4	63.7	.399	.331	-13.7	237.0	1.5	70.2
H =2.20	1000.	.066	.152	-11.7	51.2	6.0	32.1	.062	.154	-14.3	49.8	6.0	33.4
K = 60000.	2000.	.113	.205	-11.6	76.9	4.5	41.3	.100	.212	-14.2	73.9	4.4	43.8
	4000.	.207	.258	-11.5	122.9	2.7	51.4	.177	.280	-14.1	113.0	2.8	55.5
	6000.	.301	.271	-11.5	175.5	2.6	57.3	.253	.316	-14.0	150.2	2.6	62.9
	8000.	.393	.251	-11.5	252.2	2.5	59.9	.328	.332	-13.9	190.8	2.4	67.1
	10000.	.486	.189	-11.6	418.8	2.3	61.3	.403	.330	-13.9	239.6	2.2	69.4
H =2.40	1000.	.066	.151	-11.4	50.8	6.1	31.8	.061	.153	-14.0	49.5	6.0	33.2
K = 40000.	2000.	.113	.203	-11.4	76.4	3.8	40.3	.099	.210	-13.9	73.5	4.5	43.0
	4000.	.206	.255	-11.2	122.3	3.3	50.8	.176	.277	-13.7	112.3	3.3	55.1
	6000.	.299	.267	-11.2	175.0	2.9	54.9	.251	.312	-13.6	149.4	2.8	60.9
	8000.	.391	.246	-11.3	252.5	1.6	58.5	.326	.327	-13.5	189.8	2.3	64.4
	10000.	.482	.182	-11.4	424.8	1.4	63.4	.400	.325	-13.5	238.4	1.5	69.8
H =2.40	1000.	.066	.151	-11.5	50.8	6.3	31.8	.061	.153	-14.1	49.5	6.1	33.1
K = 60000.	2000.	.113	.203	-11.4	76.4	4.5	40.9	.100	.210	-14.0	73.4	4.5	43.4
	4000.	.207	.255	-11.4	122.5	2.8	51.0	.176	.277	-13.9	112.4	2.9	55.1
	6000.	.301	.266	-11.3	175.8	2.6	56.7	.253	.312	-13.8	149.8	2.7	62.3
	8000.	.394	.244	-11.4	255.5	2.6	59.1	.328	.327	-13.7	190.8	2.5	66.1
	10000.	.486	.176	-11.5	441.5	2.3	60.1	.404	.323	-13.8	240.8	2.3	68.2

RAM WEIGHT = 10.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 22 INCH SQUARE HC
AREA = 351.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 126.3						E = 6000. KSI I = 154.7					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.063	.153	-13.4	50.3	5.8	33.1	.060	.155	-16.4	49.0	5.6	34.3
K = 40000.	2000.	.103	.210	-13.3	74.7	4.6	42.8	.093	.215	-16.2	72.5	4.4	45.2
	4000.	.184	.274	-13.1	115.2	3.2	54.4	.159	.290	-15.9	108.7	3.2	58.4
	6000.	.264	.305	-12.9	155.3	2.8	60.0	.224	.336	-15.7	140.8	2.8	65.7
	8000.	.344	.313	-12.9	201.2	2.4	63.2	.288	.365	-15.6	172.6	2.3	70.5
	10000.	.422	.301	-13.0	260.7	1.4	68.0	.352	.381	-15.5	206.2	1.7	75.0
H =2.20	1000.	.063	.153	-13.4	50.2	6.1	33.0	.060	.155	-16.4	49.0	5.8	34.2
K = 60000.	2000.	.104	.210	-13.3	74.7	4.4	43.1	.093	.215	-16.3	72.4	4.3	45.4
	4000.	.185	.274	-13.2	115.4	2.8	54.3	.160	.290	-16.1	108.8	2.9	58.2
	6000.	.266	.305	-13.1	155.9	2.6	61.3	.226	.336	-16.0	141.1	2.6	66.6
	8000.	.347	.312	-13.1	202.7	2.4	64.9	.291	.365	-15.9	173.4	2.4	71.7
	10000.	.427	.299	-13.2	264.4	2.2	66.9	.356	.380	-15.8	207.8	2.2	74.9
H =2.40	1000.	.062	.152	-13.2	49.9	6.0	32.8	.060	.153	-16.1	48.7	5.8	34.0
K = 40000.	2000.	.103	.208	-13.1	74.2	4.6	42.2	.093	.213	-16.0	72.0	4.3	44.8
	4000.	.184	.271	-12.9	114.7	3.3	53.8	.159	.287	-15.7	108.1	3.3	57.8
	6000.	.264	.301	-12.8	155.1	2.8	59.1	.224	.332	-15.5	140.2	2.8	64.8
	8000.	.344	.308	-12.8	201.8	1.6	62.5	.289	.360	-15.4	172.2	2.3	69.4
	10000.	.423	.294	-12.8	263.5	1.4	67.6	.353	.375	-15.3	206.3	1.6	74.4
H =2.40	1000.	.062	.152	-13.2	49.9	6.2	32.7	.060	.153	-16.2	48.6	5.9	33.9
K = 60000.	2000.	.103	.208	-13.1	74.2	4.5	42.7	.093	.213	-16.1	71.9	4.4	44.9
	4000.	.185	.271	-13.0	114.8	2.8	53.9	.159	.287	-15.9	108.1	3.0	57.8
	6000.	.266	.301	-13.0	155.6	2.6	60.6	.226	.332	-15.8	140.5	2.7	65.9
	8000.	.347	.307	-13.0	203.1	2.5	64.0	.291	.360	-15.7	172.9	2.5	70.7
	10000.	.427	.291	-13.0	267.0	2.3	65.7	.357	.374	-15.6	207.7	2.2	73.8

RAM WEIGHT = 15.0 KIPS

PILE SIZE 16 INCH SQUARE
AREA = 256.0 SQ. IN.

TYPE I
(TYPE II)

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 92.1						E = 6000. KSI I = 112.8					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =1.50	500.	.040	.093	-10.8	46.5	10.1	29.3	.037	.094	-13.3	45.3	9.8	30.6
K = 30000.	1000.	.068	.125	-10.7	69.7	7.5	37.7	.060	.129	-13.1	67.2	7.1	40.0
	2000.	.123	.158	-10.5	110.5	5.2	46.5	.105	.171	-12.9	102.1	5.1	50.6
	3000.	.178	.168	-10.4	155.6	3.8	51.6	.150	.194	-12.7	134.9	4.2	56.9
	4000.	.232	.160	-10.4	217.1	3.5	55.5	.194	.205	-12.5	169.7	3.5	61.6
	6000.	.339	.058	-10.3	889.6	2.8	59.8	.281	.198	-12.3	260.8	2.8	67.4
H =1.50	500.	.040	.093	-10.9	46.5	10.0	29.3	.037	.094	-13.3	45.3	9.8	30.6
K = [illegible]0000.	1000.	.068	.125	-10.8	69.8	7.5	37.6	.060	.129	-13.2	67.2	7.3	40.0
	2000.	.124	.158	-10.7	110.8	5.2	46.4	.106	.171	-13.1	102.3	5.2	50.5
	3000.	.179	.168	-10.6	156.6	4.1	51.8	.151	.194	-12.9	135.4	4.2	57.1
	4000.	.235	.159	-10.6	220.4	2.9	54.7	.196	.205	-12.9	171.0	3.7	61.3
	6000.	.344	.038	-10.6	1377.3	2.6	60.7	.285	.196	-12.7	266.9	2.7	68.0
H =1.60	500.	.040	.092	-10.8	46.4	10.1	29.2	.037	.093	-13.2	45.2	9.8	30.5
K = 30000.	1000.	.068	.125	-10.6	69.6	7.5	37.5	.060	.129	-13.0	67.0	7.3	39.9
	2000.	.123	.158	-10.5	110.4	5.3	46.3	.105	.170	-12.8	101.9	5.4	50.4
	3000.	.178	.167	-10.4	155.6	3.8	51.5	.150	.193	-12.6	134.7	4.1	56.7
	4000.	.232	.159	-10.3	217.9	3.6	55.3	.194	.204	-12.5	169.7	3.5	61.4
	6000.	.339	.051	-10.3	1012.0	3.0	59.5	.281	.197	-12.3	261.9	3.2	67.1
H =1.60	500.	.040	.092	-10.8	46.4	10.1	29.2	.037	.093	-13.2	45.2	9.8	30.5
K = 50000.	1000.	.068	.125	-10.7	69.6	7.5	37.5	.060	.129	-13.1	67.0	7.3	39.9
	2000.	.124	.158	-10.6	110.7	4.9	46.2	.106	.170	-13.0	102.1	5.3	50.3
	3000.	.179	.167	-10.6	156.6	4.2	51.6	.151	.193	-12.9	135.3	4.3	56.8
	4000.	.235	.158	-10.5	221.1	2.8	54.6	.196	.204	-12.8	171.0	3.7	60.9
	6000.	.344	.026	-10.6	1981.8	2.6	60.6	.285	.194	-12.7	267.9	2.5	67.6

RAM WEIGHT = 15.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 18 INCH SQUARE
AREA = 324.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 116.6						E = 6000. KSI I = 142.8					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =1.70	1000.	.059	.129	-13.5	66.5	7.1	40.1	.054	.131	-16.5	64.7	7.1	42.0
K = 40000.	2000.	.103	.171	-13.3	100.9	5.1	50.8	.090	.179	-16.3	96.3	5.3	54.5
	3000.	.147	.195	-13.1	132.7	4.4	57.2	.125	.210	-16.0	123.3	4.4	62.2
	4000.	.190	.208	-13.0	166.2	3.4	62.0	.161	.231	-15.9	149.1	3.6	67.9
	6000.	.275	.205	-12.9	251.4	3.0	68.7	.230	.255	-15.6	202.2	3.0	76.1
	8000.	.360	.163	-12.9	418.3	2.6	72.3	.299	.258	-15.4	264.4	2.7	81.2
H =1.70	1000.	.059	.129	-13.5	66.5	7.3	40.1	.054	.131	-16.6	64.7	7.1	42.0
K = 60000.	2000.	.103	.171	-13.4	100.9	5.4	50.8	.090	.179	-16.4	96.3	5.3	54.4
	3000.	.147	.195	-13.3	133.0	4.1	57.5	.126	.210	-16.3	123.5	4.2	62.3
	4000.	.191	.208	-13.2	166.9	3.8	61.9	.162	.231	-16.1	149.5	3.8	67.8
	6000.	.278	.204	-13.2	254.5	2.8	68.5	.233	.254	-16.0	203.6	2.8	75.9
	8000.	.364	.158	-13.1	434.7	2.5	73.4	.303	.257	-15.9	268.0	2.5	81.9
H =1.80	1000.	.059	.128	-13.4	66.3	7.1	39.9	.054	.130	-16.4	64.5	7.1	41.9
K = 40000.	2000.	.103	.171	-13.2	100.7	5.1	50.7	.090	.178	-16.2	96.1	5.3	54.3
	3000.	.147	.195	-13.1	132.6	4.4	56.9	.125	.209	-16.0	123.1	4.4	61.9
	4000.	.190	.207	-13.0	166.2	3.4	61.8	.161	.230	-15.8	148.9	3.7	67.7
	6000.	.276	.203	-12.9	252.2	3.0	68.4	.230	.253	-15.5	202.2	3.0	75.8
	8000.	.360	.160	-12.9	424.1	2.7	71.8	.299	.256	-15.4	264.9	2.7	80.8
H =1.80	1000.	.059	.128	-13.4	66.3	7.3	39.9	.054	.130	-16.5	64.5	7.1	41.9
K = 60000.	2000.	.103	.171	-13.3	100.7	5.4	50.5	.090	.178	-16.3	96.1	5.3	54.2
	3000.	.147	.195	-13.3	132.9	4.2	57.3	.126	.209	-16.2	123.3	4.2	62.0
	4000.	.191	.207	-13.2	166.8	3.8	61.5	.162	.230	-16.1	149.3	3.8	67.5
	6000.	.278	.202	-13.1	255.2	2.8	68.3	.233	.253	-15.9	203.5	2.8	75.7
	8000.	.364	.155	-13.1	440.8	2.5	73.1	.303	.255	-15.8	268.4	2.5	81.7

RAM WEIGHT = 15.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 20 INCH SQUARE
AREA = 400.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 144.0						E = 6000. KSI I = 178.3					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.053	.129	−16.2	63.8	7.2	41.4	.051	.130	−19.8	62.2	6.9	43.0
K = 40000.	2000.	.089	.176	−16.0	95.1	5.4	53.6	.080	.180	−19.5	92.0	5.1	56.6
	4000.	.159	.227	−15.6	147.5	3.6	67.1	.137	.242	−19.1	138.4	3.8	72.4
	6000.	.229	.250	−15.5	200.8	3.1	74.8	.193	.278	−18.7	180.0	3.2	81.9
	8000.	.297	.252	−15.4	264.1	2.8	79.3	.249	.300	−18.5	221.8	2.8	88.1
	10000.	.365	.236	−15.4	351.2	2.4	82.5	.304	.310	−18.3	266.6	2.4	92.7
H =2.20	1000.	.054	.129	−16.2	63.8	7.2	41.3	.051	.130	−19.9	62.2	6.9	43.0
K = 60000.	2000.	.089	.176	−16.1	95.1	5.2	53.5	.080	.180	−19.7	92.0	5.1	56.6
	4000.	.161	.227	−15.9	147.9	3.9	66.4	.138	.242	−19.4	138.6	3.8	72.0
	6000.	.231	.250	−15.8	202.0	2.9	75.2	.195	.278	−19.2	180.7	3.0	82.1
	8000.	.301	.251	−15.7	267.2	2.6	80.7	.252	.300	−19.0	223.4	2.7	89.1
	10000.	.370	.232	−15.7	359.5	2.5	84.0	.309	.309	−18.9	269.8	2.5	93.8
H =2.40	1000.	.053	.128	−16.0	63.5	7.3	41.1	.050	.129	−19.6	61.9	6.9	42.7
K = 40000.	2000.	.089	.175	−15.8	94.6	5.5	53.1	.079	.179	−19.3	91.6	5.1	56.2
	4000.	.159	.226	−15.5	147.1	3.7	66.7	.137	.240	−18.9	137.8	3.8	71.9
	6000.	.229	.247	−15.4	200.7	3.2	74.1	.193	.276	−18.6	179.5	3.2	81.2
	8000.	.298	.249	−15.3	265.0	2.8	78.4	.249	.297	−18.4	221.5	2.8	87.2
	10000.	.366	.231	−15.3	355.1	2.0	81.7	.304	.307	−18.2	266.9	2.4	91.8
H =2.40	1000.	.053	.128	−16.1	63.5	7.1	41.1	.051	.129	−19.7	61.9	6.9	42.7
K = 60000.	2000.	.089	.175	−15.9	94.7	5.2	53.1	.080	.179	−19.5	91.6	5.1	56.3
	4000.	.160	.226	−15.7	147.4	3.3	65.8	.138	.240	−19.2	138.0	3.8	71.4
	6000.	.231	.247	−15.6	201.8	2.9	74.8	.195	.276	−19.0	180.2	3.0	81.6
	8000.	.301	.247	−15.6	268.0	2.7	80.0	.252	.297	−18.9	223.1	2.7	88.4
	10000.	.371	.228	−15.6	363.3	2.5	83.0	.309	.306	−18.8	270.0	2.5	92.8

RAM WEIGHT = 15.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 22 INCH SQUARE
AREA = 484.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 174.2						E = 6000. KSI I = 213.3					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.051	.130	-19.6	62.3	6.9	42.9	.050	.130	-24.0	60.7	6.3	44.3
K = 40000.	2000.	.080	.180	-19.3	92.2	5.1	56.5	.074	.183	-23.6	89.8	5.1	59.2
	4000.	.138	.241	-18.9	138.8	3.6	72.1	.121	.250	-23.0	133.1	3.7	76.9
	6000.	.195	.277	-18.5	180.9	3.2	81.5	.167	.295	-22.5	169.5	3.2	88.1
	8000.	.252	.298	-18.3	223.4	2.8	87.6	.213	.326	-22.1	203.3	2.8	95.9
	10000.	.307	.307	-18.1	269.4	2.4	92.1	.258	.349	-21.8	236.5	2.5	101.9
H =2.20	1000.	.051	.130	-19.7	62.3	6.9	42.9	.050	.130	-24.1	60.6	6.4	44.3
K = 60000.	2000.	.080	.180	-19.5	92.2	5.1	56.5	.074	.183	-23.9	89.8	5.1	59.1
	4000.	.139	.241	-19.2	139.0	3.8	71.7	.122	.250	-23.5	133.2	3.8	76.8
	6000.	.197	.277	-19.0	181.6	3.0	81.7	.169	.295	-23.1	170.0	3.0	88.3
	8000.	.255	.298	-18.8	225.1	2.7	88.6	.216	.327	-22.8	204.5	2.7	96.6
	10000.	.312	.306	-18.7	272.8	2.5	93.2	.262	.349	-22.6	238.6	2.5	102.6
H =2.40	1000.	.051	.129	-19.4	62.0	6.9	42.6	.050	.130	-23.7	60.4	6.4	44.1
K = 40000.	2000.	.080	.179	-19.1	91.7	5.1	56.0	.074	.182	-23.4	89.4	5.1	58.8
	4000.	.138	.239	-18.7	138.3	3.6	71.6	.121	.249	-22.8	132.5	3.7	76.4
	6000.	.195	.275	-18.4	180.4	3.2	80.8	.167	.293	-22.3	168.9	3.2	87.4
	8000.	.252	.295	-18.2	223.2	2.8	86.7	.213	.324	-22.0	202.8	2.9	95.1
	10000.	.308	.304	-18.0	269.8	2.4	91.2	.258	.346	-21.7	236.1	2.5	101.0
H =2.40	1000.	.051	.129	-19.4	62.0	6.9	42.6	.050	.130	-23.8	60.3	6.4	44.0
K = 60000.	2000.	.080	.179	-19.3	91.7	5.1	56.1	.074	.182	-23.6	89.3	5.1	58.7
	4000.	.139	.239	-19.0	138.5	3.8	71.1	.122	.249	-23.2	132.6	3.8	76.2
	6000.	.197	.275	-18.8	181.1	3.0	81.2	.169	.293	-22.9	169.3	3.0	87.7
	8000.	.255	.295	-18.6	224.8	2.7	87.9	.216	.324	-22.6	203.9	2.7	95.8
	10000.	.312	.303	-18.5	273.0	2.5	92.2	.262	.347	-22.4	238.1	2.5	101.7

RAM WEIGHT = 15.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 20 INCH SQUARE HC
AREA = 305.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 109.8						E = 6000. KSI I = 134.4					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.061	.126	-12.3	66.3	7.6	38.7	.055	.128	-15.1	64.4	7.3	40.8
K = 40000.	2000.	.107	.165	-12.2	101.8	5.3	48.7	.093	.174	-14.9	96.4	5.4	52.4
	4000.	.200	.192	-12.1	174.7	3.5	59.5	.169	.221	-14.6	152.1	3.6	65.2
	6000.	.292	.173	-12.1	290.9	2.8	64.3	.243	.236	-14.5	212.5	3.1	72.3
	8000.	.382	.079	-12.2	845.1	2.8	67.2	.316	.228	-14.5	292.3	2.8	76.3
	10000.	(.653)	(.289)	(-221.)	(233.)	1.6	70.8	.389	.194	-14.5	427.2	2.1	79.1
H =2.20	1000.	.061	.126	-12.4	66.3	7.6	38.6	.055	.128	-15.2	64.4	7.1	40.7
K = 60000.	2000.	.108	.165	-12.3	101.9	4.9	48.6	.093	.174	-15.0	96.4	5.1	52.3
	4000.	.201	.192	-12.2	175.4	3.0	58.7	.170	.221	-14.9	152.5	3.9	64.4
	6000.	.294	.171	-12.2	295.3	2.8	65.8	.245	.236	-14.8	213.9	2.8	72.9
	8000.	.386	.067	-12.3	996.7	2.7	69.1	.320	.226	-14.8	296.7	2.8	77.6
	10000.	(.669)	(.286)	(-212.)	(224.)	2.5	70.8	.394	.189	-14.8	443.0	2.5	80.6
H =2.40	1000.	.060	.125	-12.2	66.0	7.7	38.4	.055	.128	-14.9	64.1	7.4	40.5
K = 40000.	2000.	.107	.164	-12.1	101.4	5.6	48.3	.093	.173	-14.8	95.9	5.5	52.0
	4000.	.200	.190	-12.0	174.8	3.5	59.2	.169	.219	-14.5	151.7	3.6	64.8
	6000.	.292	.169	-12.0	294.5	2.9	63.6	.243	.234	-14.4	212.7	3.2	71.7
	8000.	.383	.065	-12.1	1006.5	2.8	66.2	.317	.224	-14.4	294.3	2.8	75.3
	10000.	(.661)	(.283)	(-210.)	(223.)	1.5	70.9	.390	.188	-14.5	436.9	2.0	78.5
H =2.40	1000.	.061	.125	-12.3	66.0	7.2	38.3	.055	.128	-15.0	64.1	7.1	40.5
K = 60000.	2000.	.108	.164	-12.2	101.5	4.9	48.4	.093	.173	-14.9	96.0	5.1	52.0
	4000.	.201	.190	-12.1	175.5	3.0	58.6	.170	.219	-14.7	152.1	3.2	64.0
	6000.	.294	.167	-12.1	298.9	2.8	65.4	.245	.233	-14.6	214.1	2.9	72.5
	8000.	.386	.052	-12.2	1280.0	2.7	68.5	.320	.222	-14.6	298.7	2.8	77.0
	10000.	(.676)	(.280)	(-203.)	(215.)	2.6	69.8	.395	.182	-14.7	453.0	2.5	79.6

RAM WEIGHT = 15.0 KIPS

PILE SIZE 22 INCH SQUARE HC
AREA = 351.0 SQ. IN.

TYPE I
(TYPE II)

HELMET	CUSHION (K/IN)	E = 4000. KSI, I = 126.3 ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	E = 6000. KSI, I = 154.7 ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.056	.128	-14.2	64.9	7.4	40.2	.052	.129	-17.4	63.3	7.2	42.0
K = 40000.	2000.	.097	.171	-14.0	97.8	5.4	51.3	.085	.178	-17.1	93.8	5.2	54.7
	4000.	.177	.214	-13.8	157.2	3.5	63.5	.151	.233	-16.8	143.7	3.7	69.0
	6000.	.257	.221	-13.7	227.0	3.1	70.1	.215	.262	-16.5	191.6	3.1	77.4
	8000.	.335	.199	-13.7	333.8	2.9	73.4	.279	.272	-16.4	244.4	2.8	82.5
	10000.	.412	.137	-13.8	602.8	1.8	76.3	.342	.268	-16.3	308.5	2.4	86.2
H =2.20	1000.	.056	.128	-14.3	64.9	7.1	40.1	.052	.129	-17.5	63.2	7.1	42.0
K = 60000.	2000.	.097	.172	-14.1	97.8	5.2	51.2	.086	.178	-17.3	93.9	5.2	54.7
	4000.	.179	.213	-14.0	157.7	4.0	62.5	.152	.233	-17.1	144.0	3.9	68.5
	6000.	.259	.220	-13.9	228.9	2.7	70.5	.217	.262	-16.9	192.6	2.9	77.7
	8000.	.339	.197	-13.9	340.7	2.7	75.1	.282	.272	-16.8	246.7	2.6	83.7
	10000.	.418	.128	-14.0	651.5	2.4	77.4	.347	.266	-16.8	313.9	2.5	87.5
H =2.40	1000.	.056	.127	-14.0	64.6	7.5	39.8	.052	.129	-17.2	62.9	7.1	41.7
K = 40000.	2000.	.097	.170	-13.9	97.3	5.5	50.9	.085	.176	-17.0	93.4	5.2	54.3
	4000.	.177	.212	-13.7	157.0	3.6	63.1	.151	.231	-16.6	143.2	3.7	68.6
	6000.	.257	.218	-13.6	227.6	3.2	69.4	.215	.259	-16.4	191.4	3.2	76.7
	8000.	.336	.195	-13.6	338.1	3.0	72.4	.279	.269	-16.3	244.7	2.8	81.6
	10000.	.413	.128	-13.8	639.5	1.7	76.2	.342	.264	-16.3	310.3	2.3	85.3
H =2.40	1000.	.056	.127	-14.1	64.6	7.2	39.8	.052	.129	-17.3	62.9	7.1	41.7
K = 60000.	2000.	.097	.170	-14.0	97.4	4.9	50.9	.085	.177	-17.1	93.4	5.2	54.3
	4000.	.178	.212	-13.9	157.4	3.1	62.3	.152	.232	-16.9	143.5	3.8	67.8
	6000.	.259	.217	-13.8	229.4	2.8	70.2	.217	.259	-16.8	192.2	2.9	77.3
	8000.	.339	.192	-13.8	345.0	2.8	74.4	.282	.269	-16.7	246.9	2.7	83.0
	10000.	.418	.119	-13.9	695.7	2.6	76.6	.347	.262	-16.7	315.5	2.5	86.5

RAM WEIGHT = 15.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 24 INCH SQUARE HC
AREA = 399.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI, I = 143.6						E = 6000. KSI, I = 175.9					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.053	.129	-16.1	63.8	7.2	41.3	.051	.130	-19.8	62.3	6.9	43.0
K = 40000.	2000.	.089	.176	-15.9	95.1	5.4	53.5	.080	.180	-19.5	92.0	5.1	56.6
	4000.	.160	.227	-15.6	147.7	3.6	67.0	.137	.241	-19.0	138.5	3.8	72.3
	6000.	.229	.249	-15.4	201.2	3.1	74.7	.194	.278	-18.7	180.2	3.2	81.8
	8000.	.298	.251	-15.3	264.9	2.8	79.2	.250	.299	-18.4	222.1	2.8	88.0
	10000.	.366	.234	-15.3	353.2	2.4	82.4	.304	.309	-18.3	267.1	2.4	92.6
H =2.20	1000.	.054	.129	-16.2	63.8	7.2	41.3	.051	.130	-19.9	62.2	6.9	43.0
K = 60000.	2000.	.089	.176	-16.1	95.1	5.2	53.4	.080	.180	-19.7	92.0	5.1	56.6
	4000.	.161	.227	-15.9	148.0	3.9	66.3	.138	.242	-19.4	138.7	3.8	72.0
	6000.	.232	.249	-15.7	202.4	2.9	75.1	.196	.278	-19.1	180.9	2.9	82.0
	8000.	.302	.250	-15.7	268.1	2.7	80.6	.253	.299	-19.0	223.7	2.7	89.0
	10000.	.371	.231	-15.7	361.6	2.5	83.9	.309	.309	-18.8	270.4	2.5	93.7
H =2.40	1000.	.053	.128	-16.0	63.5	7.3	41.0	.050	.129	-19.5	62.0	6.9	42.7
K = 40000.	2000.	.089	.175	-15.8	94.7	5.5	53.1	.079	.179	-19.3	91.6	5.1	56.2
	4000.	.160	.225	-15.5	147.3	3.7	66.6	.137	.240	-18.9	137.9	3.8	71.8
	6000.	.230	.247	-15.3	201.1	3.2	74.1	.194	.276	-18.5	179.7	3.2	81.2
	8000.	.299	.248	-15.3	265.9	2.8	78.3	.250	.297	-18.3	221.9	2.8	87.1
	10000.	.366	.229	-15.3	357.2	2.0	81.6	.305	.306	-18.2	267.5	2.4	91.7
H =2.40	1000.	.053	.128	-16.0	63.5	7.1	41.0	.051	.129	-19.6	61.9	6.9	42.7
K = 60000.	2000.	.089	.175	-15.9	94.7	5.2	53.1	.080	.179	-19.5	91.6	5.1	56.2
	4000.	.161	.225	-15.7	147.6	3.3	65.7	.138	.240	-19.2	138.1	3.8	71.4
	6000.	.232	.247	-15.6	202.2	2.9	74.7	.196	.276	-19.0	180.4	3.0	81.6
	8000.	.302	.247	-15.6	268.9	2.7	79.9	.253	.297	-18.8	223.4	2.7	88.3
	10000.	.371	.226	-15.6	365.5	2.5	82.9	.309	.305	-18.7	270.8	2.5	92.7

RAM WEIGHT = 20.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 18 INCH SQUARE
AREA = 324.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 116.6						E = 6000. KSI I = 142.8					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =1.70	1000.	.056	.111	-13.8	79.5	8.5	45.2	.050	.114	-16.9	77.0	8.0	47.7
K = 40000.	2000.	.100	.144	-13.6	123.1	5.9	56.4	.086	.153	-16.6	115.7	6.0	61.0
	3000.	.143	.159	-13.4	167.2	4.8	63.1	.121	.176	-16.4	150.5	4.9	69.1
	4000.	.186	.162	-13.3	219.1	4.0	67.5	.156	.191	-16.2	185.4	4.2	74.8
	6000.	.271	.129	-13.2	408.1	3.1	74.4	.226	.199	-15.9	265.5	3.3	83.1
	8000.	(.436)	(.274)	(-423.)	(436.)	2.8	78.3	.294	.182	-15.7	383.4	2.9	88.5
H =1.70	1000.	.056	.111	-13.9	79.5	8.4	45.2	.050	.114	-17.0	77.0	8.0	47.7
K = 60000.	2000.	.100	.144	-13.7	123.3	5.8	56.4	.086	.153	-16.8	115.8	6.0	61.0
	3000.	.144	.159	-13.6	167.7	4.6	63.0	.122	.177	-16.6	150.8	4.8	69.1
	4000.	.188	.161	-13.6	220.6	4.1	67.9	.158	.191	-16.5	186.1	4.2	75.0
	6000.	.274	.127	-13.5	420.0	2.8	73.8	.228	.198	-16.3	268.3	3.3	82.7
	8000.	(.453)	(.267)	(-373.)	(387.)	2.4	78.6	.298	.179	-16.2	393.2	2.7	88.8
H =1.80	1000.	.056	.111	-13.7	79.3	8.4	45.0	.050	.113	-16.8	76.8	8.1	47.6
K = 40000.	2000.	.100	.144	-13.5	123.0	5.9	56.2	.086	.152	-16.6	115.6	6.0	60.8
	3000.	.143	.159	-13.4	167.1	4.9	62.9	.121	.176	-16.3	150.3	4.9	68.9
	4000.	.186	.161	-13.3	219.3	4.0	67.3	.156	.190	-16.1	185.2	4.2	74.5
	6000.	.272	.128	-13.2	411.7	3.2	74.2	.226	.198	-15.9	265.8	3.3	82.9
	8000.	(.440)	(.270)	(-402.)	(415.)	2.9	77.9	.294	.180	-15.7	385.3	2.9	88.2
H =1.80	1000.	.056	.111	-13.8	79.4	8.4	45.0	.050	.113	-16.9	76.8	8.0	47.6
K = 60000.	2000.	.100	.144	-13.7	123.1	6.0	56.3	.086	.152	-16.7	115.7	6.0	60.8
	3000.	.144	.158	-13.6	167.6	4.6	62.9	.122	.176	-16.6	150.6	4.8	68.9
	[illegible]	.188	.160	-13.5	220.7	4.1	67.6	.158	.190	-16.5	186.0	4.2	74.7
	6[illegible]0.	.274	.125	-13.4	423.7	2.8	73.8	.228	.197	-16.3	268.5	3.3	82.4
	8000.	(.456)	(.264)	(-359.)	(373.)	2.8	78.2	.298	.178	-16.2	395.0	2.7	88.6

RAM WEIGHT = 20.0 KIPS

PILE SIZE 20 INCH SQUARE
AREA = 400.0 SQ. IN.

TYPE I
(TYPE II)

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 144.0						E = 6000. KSI I = 176.3					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20 K = 40000.	1000.	.049	.112	-16.7	76.2	8.1	47.1	.046	.114	-20.4	74.2	8.1	49.3
	2000.	.085	.151	-16.4	114.6	6.1	60.3	.075	.156	-20.1	110.0	5.9	64.2
	4000.	.155	.188	-16.1	183.9	4.0	73.9	.132	.205	-19.6	168.2	4.3	80.7
	6000.	.225	.196	-15.9	264.4	3.4	82.3	.188	.231	-19.2	223.9	3.5	90.8
	8000.	.292	.178	-15.8	384.9	3.3	86.8	.243	.240	-19.0	284.6	3.0	97.4
	10000.	.359	.127	-15.8	668.2	2.8	90.2	.298	.238	-18.8	357.5	2.7	102.0
H =2.20 K = 60000.	1000.	.050	.112	-16.8	76.2	8.4	47.2	.046	.114	-20.5	74.2	8.0	49.3
	2000.	.085	.151	-16.6	114.7	6.1	60.2	.075	.156	-20.3	110.1	6.0	64.2
	4000.	.156	.188	-16.4	184.6	4.4	73.9	.133	.205	-20.0	168.6	4.3	80.7
	6000.	.227	.195	-16.2	266.9	3.3	81.9	.190	.231	-19.7	225.2	3.3	90.6
	8000.	.296	.175	-16.2	394.0	2.8	88.1	.247	.240	-19.5	287.8	2.9	98.0
	10000.	.365	.119	-16.2	724.8	2.6	91.8	.303	.236	-19.4	364.7	2.8	103.0
H =2.40 K = 40000.	1000.	.049	.112	-16.5	75.9	8.2	46.9	.046	.113	-20.3	73.9	8.2	49.0
	2000.	.085	.150	-16.3	114.2	6.1	59.9	.075	.156	-20.0	109.6	5.9	63.9
	4000.	.155	.187	-16.0	183.6	4.0	73.6	.132	.204	-19.5	167.8	4.2	80.3
	6000.	.225	.194	-15.8	264.9	3.4	81.8	.188	.229	-19.1	223.6	3.5	90.3
	8000.	.293	.175	-15.8	388.6	3.3	86.0	.244	.238	-18.9	284.9	3.1	96.7
	10000.	.360	.121	-15.8	695.5	2.7	89.2	.298	.235	-18.8	359.0	2.8	101.1
H =2.40 K = 60000.	1000.	.049	.112	-16.6	75.9	8.4	46.9	.046	.113	-20.4	73.9	8.1	49.0
	2000.	.085	.150	-16.5	114.3	6.1	59.8	.075	.156	-20.1	109.7	6.0	63.8
	4000.	.156	.187	-16.3	184.3	4.4	73.4	.133	.204	-19.8	168.2	4.3	80.2
	6000.	.227	.193	-16.1	267.4	3.1	81.9	.190	.229	-19.6	224.9	3.3	90.2
	8000.	.297	.172	-16.1	397.7	2.9	87.7	.247	.238	-19.4	288.0	2.9	97.5
	10000.	.365	.113	-16.1	757.7	2.8	91.0	.303	.233	-19.3	366.1	2.8	102.3

RAM WEIGHT = 20.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 22 INCH SQUARE
AREA = 484.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI, I = 174.2						E = 6000. KSI, I = 213.3					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.046	.114	-20.2	74.3	8.1	49.2	.044	.115	-24.7	72.5	7.6	51.0
K = 40000.	2000.	.075	.156	-19.9	110.3	5.9	64.0	.068	.159	-24.3	107.0	5.7	67.5
	4000.	.133	.205	-19.4	168.9	4.3	80.3	.115	.215	-23.6	159.9	4.3	86.6
	6000.	.190	.229	-19.0	225.4	3.5	90.3	.161	.250	-23.1	205.9	3.6	98.5
	8000.	.246	.238	-18.7	287.8	3.1	96.8	.207	.273	-22.6	250.6	3.1	106.7
	10000.	.301	.233	-18.6	363.9	2.8	101.3	.251	.286	-22.3	296.5	2.8	112.8
H =2.20	1000.	.046	.114	-20.3	74.3	8.1	49.2	.044	.115	-24.9	72.4	7.6	51.0
K = 60000.	2000.	.076	.156	-20.1	110.3	6.0	64.0	.068	.160	-24.6	107.0	5.7	67.4
	4000.	.134	.205	-19.7	169.3	4.4	80.3	.116	.216	-24.1	160.2	4.3	86.6
	6000.	.192	.229	-19.5	226.8	3.3	90.1	.163	.251	-23.7	206.9	3.5	98.4
	8000.	.250	.237	-19.3	291.1	2.8	97.4	.210	.273	-23.4	252.6	3.0	107.1
	10000.	.306	.231	-19.2	371.5	2.7	102.4	.256	.286	-23.1	300.4	2.7	113.6
H =2.40	1000.	.046	.113	-20.0	74.0	8.2	48.9	.044	.114	-24.5	72.2	7.8	50.8
K = 40000.	2000.	.075	.155	-19.7	109.9	5.9	63.7	.068	.159	-24.1	106.6	5.8	67.1
	4000.	.133	.203	-19.2	168.5	4.2	79.9	.115	.214	-23.5	159.4	4.4	86.1
	6000.	.190	.227	-18.9	225.2	3.5	89.8	.161	.249	-22.9	205.5	3.6	97.9
	8000.	.246	.236	-18.7	288.1	3.1	96.1	.207	.271	-22.5	250.3	3.1	106.0
	10000.	.301	.231	-18.6	365.6	2.8	100.4	.252	.284	-22.3	296.6	2.8	112.0
H =2.40	1000.	.046	.113	-20.1	74.0	8.2	48.9	.044	.114	-24.6	72.1	7.6	50.7
K = 60000.	2000.	.076	.155	-19.9	109.9	6.0	63.6	.068	.159	-24.4	106.6	5.7	67.1
	4000.	.134	.203	-19.6	168.9	4.4	79.8	.116	.214	-23.9	159.6	4.4	86.0
	6000.	.192	.227	-19.4	226.5	3.3	89.7	.163	.249	-23.6	206.3	3.5	97.8
	8000.	.250	.235	-19.2	291.4	3.0	96.9	.210	.271	-23.3	252.3	3.0	106.6
	10000.	.307	.229	-19.1	373.1	2.8	101.7	.256	.284	-23.0	300.3	2.7	112.9

RAM WEIGHT = 20.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 24 INCH SQUARE
AREA = 576.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 207.3						E = 6000. KSI I = 253.9					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.044	.115	-24.0	72.7	7.8	50.8	.044	.115	-29.5	70.7	7.2	52.4
K = 40000.	2000.	.069	.159	-23.6	107.4	5.8	67.0	.064	.161	-29.0	104.8	5.7	70.1
	4000.	.117	.214	-23.0	160.9	4.3	85.7	.103	.221	-28.1	154.9	4.2	91.4
	6000.	.165	.248	-22.4	208.0	3.5	97.3	.142	.262	-27.3	196.3	3.6	105.0
	8000.	.212	.269	-22.0	254.3	3.1	105.3	.180	.291	-26.7	234.3	3.2	114.7
	10000.	.258	.280	-21.7	302.6	2.8	111.2	.217	.313	-26.2	270.8	2.8	122.2
H =2.20	1000.	.044	.115	-24.1	72.7	7.5	50.7	.044	.115	-29.6	70.6	7.0	52.4
K = 60000.	2000.	.069	.159	-23.9	107.4	5.7	67.0	.064	.161	-29.3	104.7	5.7	70.0
	4000.	.118	.214	-23.4	161.2	4.4	85.7	.104	.222	-28.7	155.1	4.2	91.3
	6000.	.167	.248	-23.1	209.0	3.4	97.2	.144	.262	-28.1	197.1	3.5	105.0
	8000.	.215	.269	-22.8	256.4	3.0	105.8	.183	.292	-27.7	235.9	3.0	115.1
	10000.	.262	.280	-22.5	306.7	2.7	112.1	.221	.314	-27.3	273.6	2.7	122.8
H =2.40	1000.	.044	.114	-23.8	72.4	7.9	50.5	.044	.114	-29.2	70.5	7.2	52.1
K = 40000.	2000.	.069	.158	-23.5	107.0	5.8	66.7	.064	.160	-28.7	104.4	5.8	69.7
	4000.	.117	.213	-22.8	160.4	4.3	85.3	.103	.220	-27.9	154.3	4.2	90.9
	6000.	.165	.246	-22.3	207.6	3.6	96.8	.142	.260	-27.1	195.8	3.6	104.4
	8000.	.212	.267	-21.9	254.1	3.1	104.6	.180	.290	-26.6	233.8	3.2	114.0
	10000.	.258	.278	-21.7	302.8	2.8	110.4	.217	.311	-26.1	270.4	2.8	121.4
H =2.40	1000.	.044	.114	-23.9	72.4	7.6	50.5	.044	.114	-29.3	70.4	7.0	52.1
K = 60000.	2000.	.069	.158	-23.7	107.0	5.8	66.6	.064	.160	-29.0	104.3	5.8	69.7
	4000.	.118	.213	-23.3	160.7	4.4	85.2	.104	.220	-28.5	154.5	4.2	90.8
	6000.	.167	.247	-22.9	208.5	3.5	96.7	.144	.261	-28.0	196.4	3.5	104.4
	8000.	.215	.267	-22.6	256.1	3.0	105.2	.183	.290	-27.5	235.3	3.1	114.5
	1000	.263	.278	-22.4	306.7	2.7	111.3	.221	.312	-27.2	273.1	2.8	122.1

RAM WEIGHT = 20.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 20 INCH SQUARE HC
AREA = 305.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 109.8						E = 6000. KSI I = 134.4					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.058	.108	-12.7	79.7	8.4	43.7	.051	.112	-15.6	76.9	8.2	46.3
K = 40000.	2000.	.104	.138	-12.6	125.6	5.9	54.2	.089	.149	-15.4	116.6	5.9	58.8
	4000.	.197	.144	-12.4	240.2	3.9	64.6	.165	.180	-15.1	192.2	3.9	71.6
	6000.	.288	.076	-12.4	679.9	3.3	70.8	.239	.178	-14.9	290.7	3.5	79.3
	8000.	(.536)	(.219)	(-209.)	(222.)	3.1	73.3	.312	.142	-14.9	483.1	3.0	83.7
	10000.	(.733)	(.198)	(-152.)	(165.)	1.6	75.2	(.733)	(.198)	(-152.)	(165.)	1.6	75.2
H =2.20	1000.	.058	.108	-12.8	79.7	8.4	43.7	.051	.112	-15.6	76.9	8.4	46.3
K = 60000.	2000.	.105	.138	-12.7	125.8	6.3	54.1	.090	.149	-15.5	116.7	6.2	58.7
	4000.	.198	.144	-12.6	242.1	4.4	64.3	.166	.180	-15.3	193.0	4.3	71.6
	6000.	.291	.071	-12.6	737.2	2.9	71.1	.241	.177	-15.2	294.2	3.2	79.1
	8000.	(.547)	(.217)	(-202.)	(215.)	2.7	75.0	.316	.138	-15.2	502.3	2.8	84.8
	10000.	(.748)	(.197)	(-149.)	(162.)	2.9	76.2	(.748)	(.197)	(-149.)	(162.)	2.9	76.2
H =2.40	1000.	.057	.108	-12.6	79.4	8.4	43.4	.051	.111	-15.4	76.6	8.3	46.1
K = 40000.	2000.	.104	.137	-12.5	125.3	5.9	54.0	.089	.148	-15.2	116.3	5.9	58.5
	4000.	.197	.143	-12.3	241.2	4.0	64.3	.165	.179	-15.0	192.1	4.0	71.3
	6000.	.288	.070	-12.4	729.2	3.4	70.3	.239	.176	-14.9	291.9	3.5	78.9
	8000.	(.541)	(.215)	(-202.)	(215.)	3.3	72.3	.312	.138	-14.9	493.3	3.1	82.9
	10000.	(.196)	(.723)	(162.)	(-6.)	1.6	75.4	(.196)	(.723)	(162.)	(-6.)	1.6	75.4
H =2.40	1000.	.058	.108	-12.7	79.5	8.7	43.4	.051	.111	-15.5	76.6	8.5	46.1
K = 60000.	2000.	.105	.137	-12.6	125.5	6.3	53.7	.090	.148	-15.4	116.4	6.3	58.3
	4000.	.198	.142	-12.5	243.1	3.2	63.3	.166	.179	-15.2	192.9	4.4	71.0
	6000.	.291	.065	-12.5	799.0	3.0	70.9	.241	.175	-15.1	295.4	3.3	78.8
	8000.	(.551)	(.213)	(-196.)	(209.)	2.8	74.5	.316	.134	-15.1	513.1	2.9	84.3
	10000.	(.195)	(.716)	(159.)	(-6.)	2.7	76.2	(.195)	(.716)	(159.)	(-6.)	2.7	76.2

RAM WEIGHT = 20.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 22 INCH SQUARE HC
AREA = 351.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI, I = 126.3						E = 6000. KSI, I = 154.7					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.053	.111	-14.6	77.7	8.4	45.6	.048	.113	-17.9	75.4	8.0	48.0
K = 40000.	2000.	.093	.146	-14.4	118.9	5.9	57.4	.081	.153	-17.7	112.7	6.1	61.7
	4000.	.174	.171	-14.2	202.1	3.8	69.5	.146	.195	-17.3	177.1	4.1	76.4
	6000.	.253	.157	-14.1	328.4	3.4	76.8	.211	.210	-17.0	245.6	3.5	85.3
	8000.	.330	.090	-14.1	761.4	3.1	80.4	.274	.205	-16.8	333.3	3.1	90.8
	10000.	(.549)	(.265)	(-292.)	(307.)	2.7	82.6	.336	.180	-16.8	471.9	2.8	94.4
H =2.20	1000.	.053	.111	-14.7	77.7	8.4	45.6	.048	.113	-18.0	75.4	8.3	48.0
K = 60000.	2000.	.094	.146	-14.6	119.0	6.1	57.3	.081	.153	-17.8	112.8	6.1	61.7
	4000.	.175	.171	-14.4	203.1	4.4	69.4	.147	.195	-17.6	177.7	4.3	76.4
	6000.	.255	.156	-14.3	333.8	3.0	76.8	.213	.210	-17.4	247.5	3.1	85.1
	8000.	.335	.082	-14.4	847.1	2.7	81.8	.277	.204	-17.3	338.9	2.8	91.6
	10000.	(.565)	(.261)	(-275.)	(289.)	2.6	84.6	.341	.175	-17.2	490.0	2.7	95.9
H =2.40	1000.	.053	.110	-14.5	77.4	8.5	45.3	.048	.113	-17.8	75.1	8.1	47.7
K = 40000.	2000.	.093	.145	-14.3	118.5	6.0	57.1	.081	.152	-17.5	112.3	6.1	61.4
	4000.	.174	.170	-14.1	202.2	3.8	69.3	.146	.194	-17.1	176.8	4.1	76.0
	6000.	.253	.155	-14.0	331.1	3.4	76.3	.211	.209	-16.9	245.7	3.5	84.9
	8000.	.331	.083	-14.1	815.8	3.1	79.7	.274	.203	-16.8	334.9	3.1	90.0
	10000.	(.555)	(.260)	(-279.)	(293.)	2.7	81.6	.336	.176	-16.8	478.9	2.8	93.4
H =2.40	1000.	.053	.110	-14.6	77.4	8.5	45.3	.048	.113	-17.9	75.1	8.3	47.7
K = 60000.	2000.	.094	.145	-14.5	118.6	6.0	56.9	.081	.152	-17.7	112.4	6.1	61.3
	4000.	.175	.170	-14.3	203.1	4.4	68.8	.147	.194	-17.4	177.3	4.4	75.8
	6000.	.255	.153	-14.3	336.4	3.0	76.6	.213	.208	-17.3	247.6	3.1	84.8
	8000.	.335	.074	-14.3	920.2	2.8	81.3	.278	.201	-17.2	340.4	2.8	91.1
	10000.	(.571)	(.256)	(-264.)	(278.)	2.7	83.8	.342	.172	-17.2	497.1	2.7	95.1

RAM WEIGHT = 20.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 24 INCH SQUARE HC
AREA = 399.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 143.6						E = 6000. KSI I = 175.9					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.050	.112	-16.6	76.2	8.1	47.1	.046	.114	-20.4	74.2	8.1	49.3
K = 40000.	2000.	.085	.151	-16.4	114.6	6.1	60.2	.075	.156	-20.1	110.1	5.9	64.2
	4000.	.156	.188	-16.0	184.1	4.0	73.9	.132	.205	-19.5	168.4	4.2	80.6
	6000.	.225	.195	-15.8	265.1	3.4	82.2	.189	.230	-19.2	224.2	3.5	90.7
	8000.	.293	.177	-15.8	387.4	3.3	86.6	.244	.240	-18.9	285.2	3.1	97.3
	10000.	.360	.125	-15.8	681.2	2.6	90.0	.298	.237	-18.8	358.7	2.8	101.8
H =2.20	1000.	.050	.112	-16.6	76.2	8.1	47.1	.046	.114	-20.4	74.2	8.1	49.3
K = 40000.	2000.	.085	.151	-16.4	114.6	6.1	60.2	.075	.156	-20.1	110.1	5.9	64.2
	4000.	.156	.188	-16.0	184.1	4.0	73.9	.132	.205	-19.5	168.4	4.2	80.6
	6000.	.225	.195	-15.8	265.1	3.4	82.2	.189	.230	-19.2	224.2	3.5	90.7
	8000.	.293	.177	-15.8	387.4	3.3	86.6	.244	.240	-18.9	285.2	3.1	97.3
	10000.	.360	.125	-15.8	681.2	2.6	90.0	.298	.237	-18.8	358.7	2.8	101.8
H =2.40	1000.	.049	.112	-16.5	75.9	8.2	46.8	.046	.113	-20.2	73.9	8.2	49.0
K = 40000.	2000.	.085	.150	-16.3	114.3	6.1	59.9	.075	.156	-19.9	109.7	5.9	63.8
	4000.	.156	.187	-15.9	183.9	4.0	73.5	.132	.204	-19.4	167.9	4.2	80.2
	6000.	.225	.193	-15.8	265.7	3.4	81.7	.189	.229	-19.1	223.9	3.5	90.2
	8000.	.294	.174	-15.7	391.2	3.4	85.8	.244	.238	-18.9	285.5	3.1	96.5
	10000.	.361	.119	-15.8	710.4	2.7	89.1	.299	.234	-18.7	360.3	2.8	101.0
H =2.40	1000.	.050	.112	-16.6	75.9	8.4	46.8	.046	.113	-20.3	73.9	8.1	49.0
K = 60000.	2000.	.085	.150	-16.4	114.3	6.1	59.7	.075	.156	-20.1	109.7	6.0	63.8
	4000.	.157	.187	-16.2	184.6	4.4	73.3	.133	.204	-19.8	168.3	4.3	80.1
	6000.	.227	.192	-16.1	268.2	3.2	81.8	.191	.229	-19.5	225.2	3.3	90.1
	8000.	.297	.171	-16.1	400.5	2.9	87.5	.248	.237	-19.4	288.7	2.9	97.4
	10000.	.366	.110	-16.1	777.2	2.8	90.7	.304	.232	-19.3	367.5	2.8	102.2

RAM WEIGHT = 30.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 18 INCH SQUARE
AREA = 324.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI, I = 116.6						E = 6000. KSI, I = 142.8					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =1.70	1000.	.052	.088	-14.1	102.9	10.4	52.6	.046	.092	-17.3	98.4	10.2	56.3
K = 40000.	2000.	.096	.108	-13.9	168.3	7.1	64.3	.081	.120	-17.0	151.9	7.2	70.4
	3000.	.140	.109	-13.7	251.0	5.5	71.0	.117	.133	-16.8	205.3	5.8	78.7
	4000.	.183	.091	-13.6	400.9	4.8	75.4	.152	.136	-16.5	267.1	4.9	84.5
	6000.	(.366)	(.168)	(-266.)	(279.)	3.3	81.4	.221	.113	-16.2	477.3	3.9	92.3
	8000.	(.554)	(.147)	(-169.)	(182.)	3.2	85.6	(.554)	(.147)	(-169.)	(182.)	3.2	85.6
H =1.70	1000.	.052	.089	-14.2	102.9	9.9	52.6	.046	.092	-17.4	98.4	10.2	56.3
K = 60000.	2000.	.096	.108	-14.1	168.7	7.1	64.3	.082	.120	-17.2	152.2	7.2	70.4
	3000.	.140	.109	-13.9	252.7	5.8	70.9	.118	.133	-17.0	206.1	5.8	78.7
	4000.	.184	.089	-13.9	408.7	4.5	75.5	.153	.136	-16.9	269.1	4.9	84.5
	6000.	(.374)	(.167)	(-255.)	(269.)	3.7	81.2	.224	.111	-16.7	491.0	3.9	92.4
	8000.	(.565)	(.146)	(-165.)	(179.)	2.7	85.6	(.565)	(.146)	(-165.)	(179.)	2.7	85.6
H =1.80	1000.	.052	.088	-14.1	102.8	10.5	52.5	.046	.092	-17.3	98.3	10.2	56.2
K = 40000.	2000.	.096	.108	-13.9	168.2	7.1	6[illegible]1	.081	.120	-17.0	151.8	7.2	70.2
	3000.	.140	.108	-13.7	251.3	5.5	70.8	.117	.133	-16.7	205.3	5.8	78.6
	4000.	.183	.090	-13.6	403.0	4.8	75.2	.152	.135	-16.5	267.3	4.9	84.3
	6000.	(.368)	(.167)	(-262.)	(276.)	3.3	81.3	.221	.112	-16.2	479.8	3.8	92.1
	8000.	(.555)	(.146)	(-167.)	(181.)	3.2	85.5	(.555)	(.146)	(-167.)	(181.)	3.2	85.5
H =1.80	1000.	.052	.088	-14.2	102.8	9.9	52.5	.046	.092	-17.4	98.3	10.2	56.1
K = 60000.	2000.	.096	.108	-14.0	168.6	7.0	64.1	.082	.120	-17.2	152.1	7.2	70.2
	3000.	.140	.108	-13.9	252.9	5.8	70.7	.118	.132	-17.0	206.0	5.8	78.6
	4000.	.184	.089	-13.8	410.8	4.5	75.4	.153	.135	-16.9	269.2	4.8	84.3
	6000.	(.375)	(.166)	(-252.)	(266.)	4.0	80.9	.224	.110	-16.6	493.5	4.0	92.1
	8000.	(.566)	(.145)	(-164.)	(178.)	2.7	85.6	(.566)	(.145)	(-164.)	(178.)	2.7	85.6

RAM WEIGHT = 30.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 20 INCH SQUARE
AREA = 400.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI, I = 144.0						E = 6000. KSI, I = 176.3					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.045	.091	-17.2	97.6	10.3	55.8	.041	.093	-21.1	94.6	9.8	58.9
K = 40000.	2000.	.081	.119	-16.9	150.8	7.3	69.8	.070	.126	-20.7	142.0	7.3	75.4
	4000.	.151	.135	-16.5	265.4	5.0	83.8	.127	.158	-20.1	226.4	5.1	92.7
	6000.	.220	.112	-16.3	475.8	3.8	92.0	.183	.166	-19.7	321.6	4.0	102.8
	8000.	(.334)	(.241)	(-751.)	(768.)	3.5	97.1	.238	.154	-19.4	456.4	3.7	109.3
	10000.	(.512)	(.194)	(-266.)	(282.)	3.1	100.4	.291	.120	-19.3	725.5	3.3	114.3
H =2.20	1000.	.045	.091	-17.3	97.7	10.3	55.8	.041	.093	-21.2	94.6	9.7	58.9
K = 60000.	2000.	.081	.119	-17.1	151.0	7.3	69.8	.070	.126	-21.0	142.2	7.3	75.4
	4000.	.152	.134	-16.9	267.2	4.9	84.1	.128	.158	-20.5	227.4	5.1	92.8
	6000.	.222	.110	-16.7	488.6	4.0	91.4	.185	.165	-20.3	325.0	4.1	102.6
	8000.	(.351)	(.232)	(-594.)	(611.)	3.0	97.5	.241	.152	-20.0	467.8	3.3	109.7
	10000.	(.528)	(.192)	(-255.)	(272.)	2.8	101.7	.297	.114	-19.9	778.6	2.9	115.2
H =2.40	1000.	.045	.091	-17.1	97.4	10.3	55.6	.041	.093	-20.9	94.4	9.8	58.7
K = 40000.	2000.	.081	.118	-16.8	150.6	7.3	69.5	.070	.125	-20.6	141.7	7.3	75.1
	4000.	.151	.134	-16.5	265.6	5.1	83.3	.127	.157	-20.0	226.2	5.1	92.3
	6000.	.220	.110	-16.3	480.6	3.8	91.7	.183	.164	-19.7	322.0	4.0	102.4
	8000.	(.340)	(.235)	(-663.)	(680.)	3.5	96.7	.238	.153	-19.4	459.0	3.8	108.8
	10000.	(.516)	(.192)	(-260.)	(276.)	3.3	99.6	.292	.117	-19.3	739.7	3.3	113.7
H =2.40	1000.	.045	.091	-17.2	97.4	10.3	55.6	.041	.093	-21.1	94.4	9.8	58.7
K = 60000.	2000.	.081	.118	-17.0	150.8	7.1	69.6	.070	.125	-20.8	141.9	7.3	75.1
	4000.	.152	.134	-16.8	267.4	4.9	83.7	.128	.157	-20.5	227.1	5.1	92.4
	6000.	.222	.108	-16.6	493.6	3.5	90.9	.185	.164	-20.2	325.3	4.1	102.1
	8000.	(.355)	(.228)	(-549.)	(566.)	3.1	97.3	.241	.151	-20.0	470.3	3.3	109.3
	10000.	(.530)	(.190)	(-250.)	(267.)	2.9	101.3	.297	.111	-19.9	795.1	2.9	114.8

RAM WEIGHT = 30.0 KIPS

PILE SIZE 22 INCH SQUARE
AREA = 484.0 SQ. IN.

TYPE I
(TYPE II)

HELMET	CUSHION (K/IN)	E = 4000. KSI, I = 174.2						E = 6000. KSI, I = 213.3					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.041	.093	-20.8	94.8	9.8	58.8	.038	.095	-25.5	92.3	9.8	61.5
K = 40000.	2000.	.070	.125	-20.5	142.4	7.3	75.1	.062	.130	-25.0	136.9	7.1	80.1
	4000.	.128	.157	-19.9	227.9	5.1	92.2	.109	.171	-24.3	208.8	5.2	100.6
	6000.	.185	.163	-19.5	326.0	4.0	102.1	.155	.192	-23.6	277.2	4.2	112.9
	8000.	.240	.150	-19.2	469.1	3.5	108.9	.200	.201	-23.2	351.0	3.6	121.4
	10000.	.295	.112	-19.1	779.9	3.0	113.5	.244	.199	-22.9	438.3	3.2	127.7
H =2.20	1000.	.041	.093	-20.9	94.8	9.8	58.8	.038	.095	-25.6	92.3	9.7	61.4
K = 60000.	2000.	.071	.126	-20.7	142.6	7.3	75.1	.062	.130	-25.3	136.9	7.2	80.1
	4000.	.129	.157	-20.3	228.9	5.0	92.3	.110	.171	-24.8	209.5	5.1	100.7
	6000.	.187	.163	-20.0	329.6	4.1	101.9	.157	.192	-24.4	279.2	4.2	112.9
	8000.	.244	.148	-19.8	481.6	3.3	108.9	.203	.200	-24.0	355.6	3.5	121.5
	10000.	.300	.104	-19.7	847.5	3.1	114.2	.249	.197	-23.7	448.4	3.2	128.2
H =2.40	1000.	.041	.093	-20.7	94.5	9.8	58.5	.038	.094	-25.4	92.1	9.8	61.2
K = 40000.	2000.	.070	.125	-20.4	142.1	7.3	74.8	.062	.129	-24.9	136.5	7.1	79.8
	4000.	.128	.156	-19.8	227.7	5.2	91.8	.109	.170	-24.1	208.5	5.3	100.2
	6000.	.185	.162	-19.4	326.4	4.0	101.8	.155	.191	-23.6	277.0	4.2	112.4
	8000.	.241	.148	-19.2	472.1	3.6	108.4	.200	.199	-23.1	351.2	3.6	120.9
	10000.	.295	.109	-19.1	798.5	3.1	112.9	.244	.197	-22.9	439.5	3.3	127.0
H =2.40	1000.	.041	.093	-20.8	94.5	9.8	58.5	.038	.094	-25.5	92.1	9.7	61.2
K = 60000.	2000.	.071	.125	-20.6	142.3	7.3	74.8	.062	.129	-25.2	136.6	7.2	79.8
	4000.	.129	.156	-20.2	228.7	5.1	91.9	.110	.170	-24.7	209.1	5.1	100.2
	6000.	.187	.162	-20.0	329.9	4.1	101.4	.157	.191	-24.3	278.9	4.2	112.4
	8000.	.244	.146	-19.8	484.5	3.3	108.7	.203	.199	-23.9	355.8	3.4	121.0
	10000.	.301	.101	-19.7	869.9	3.1	113.7	.249	.196	-23.7	449.6	3.2	127.7

RAM WEIGHT = 30.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 24 INCH SQUARE
AREA = 576.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 207.3						E = 6000. KSI I = 253.9					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.038	.094	-24.8	92.7	9.8	61.1	.037	.095	-30.4	90.4	9.1	63.4
K = 40000.	2000.	.063	.129	-24.3	137.5	7.2	79.4	.057	.132	-29.8	133.5	6.9	83.8
	4000.	.111	.169	-23.6	210.9	5.1	99.4	.096	.178	-28.8	199.3	5.2	107.3
	6000.	.159	.189	-23.0	281.9	4.2	111.4	.135	.207	-28.0	256.8	4.3	121.7
	8000.	.205	.195	-22.6	360.5	3.6	119.7	.172	.225	-27.3	312.6	3.7	131.9
	10000.	.251	.191	-22.3	457.1	3.2	125.7	.209	.235	-26.8	370.0	3.3	139.6
H =2.20	1000.	.038	.094	-24.9	92.7	9.8	61.1	.037	.095	-30.5	90.3	9.1	63.4
K = 60000.	2000.	.063	.129	-24.6	137.6	7.2	79.4	.057	.132	-30.2	133.5	6.9	83.7
	4000.	.112	.169	-24.1	211.6	5.1	99.5	.097	.178	-29.5	199.8	5.2	107.3
	6000.	.161	.189	-23.7	284.0	4.2	111.4	.136	.207	-28.9	258.3	4.2	121.8
	8000.	.209	.195	-23.4	365.6	3.5	119.7	.175	.225	-28.4	315.7	3.6	132.2
	10000.	.256	.189	-23.1	468.8	3.0	126.2	.214	.235	-28.0	375.8	3.2	140.2
H =2.40	1000.	.038	.094	-24.6	92.4	9.8	60.9	.037	.095	-30.2	90.2	9.1	63.2
K = 40000.	2000.	.063	.129	-24.2	137.2	7.3	79.1	.057	.132	-29.6	133.1	6.9	83.5
	4000.	.111	.168	-23.5	210.5	5.2	99.0	.096	.178	-28.7	198.9	5.3	106.9
	6000.	.159	.188	-22.9	281.7	4.2	110.9	.135	.206	-27.9	256.4	4.4	121.2
	8000.	.205	.194	-22.5	360.9	3.6	119.2	.172	.224	-27.3	312.4	3.7	131.4
	10000.	.251	.189	-22.3	458.9	3.3	125.1	.209	.234	-26.8	370.1	3.3	139.1
H =2.40	1000.	.038	.094	-24.8	92.4	9.8	60.9	.037	.095	-30.4	90.1	9.1	63.1
K = 60000.	2000.	.063	.129	-24.5	137.3	7.3	79.1	.057	.132	-30.0	133.1	6.9	83.4
	4000.	.112	.168	-24.0	211.2	5.2	99.1	.097	.178	-29.3	199.4	5.3	106.9
	6000.	.161	.188	-23.6	283.8	4.2	110.8	.136	.206	-28.8	257.8	4.3	121.3
	8000.	.209	.193	-23.3	365.9	3.5	119.3	.175	.224	-28.3	315.4	3.7	131.8
	10000.	.256	.187	-23.1	470.4	3.0	125.8	.214	.234	-27.9	375.7	3.2	139.6

RAM WEIGHT = 30.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 20 INCH SQUARE HC
AREA = 305.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 109.8						E = 6000. KSI I = 134.4					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.054	.086	-13.1	104.1	10.4	50.9	.047	.090	-16.1	98.9	10.3	54.7
K = 40000.	2000.	.101	.102	-12.9	175.9	7.1	61.6	.085	.116	-15.8	155.1	7.2	67.8
	4000.	.193	.060	-12.8	597.2	4.7	71.5	.161	.123	-15.5	290.2	5.1	80.7
	6000.	(.424)	(.144)	(-183.)	(196.)	3.5	78.1	.234	.077	-15.3	688.7	3.7	88.4
	8000.	(.614)	(.131)	(-139.)	(152.)	3.3	81.1	(.614)	(.131)	(-139.)	(152.)	3.3	81.1
	10000.	(.125)	(.766)	(137.)	(-7.)	3.1	82.5	(.125)	(.766)	(137.)	(-7.)	3.1	82.5
H =2.20	1000.	.052	.086	-11.9	102.7	10.8	50.8	.045	.090	-14.6	97.9	10.4	54.5
K = 6000.	2000.	.094	.103	-11.3	166.6	7.4	61.1	.079	.114	-13.7	148.8	7.6	67.1
	4000.	.167	.086	-12.3	359.9	5.0	70.2	.138	.127	-15.4	243.6	5.3	78.6
	6000.	(.278)	(.173)	(-389.)	(404.)	3.9	74.7	.185	.114	-20.4	355.8	4.3	84.2
	8000.	(.397)	(.146)	(-190.)	(206.)	3.3	77.2	.220	.087	-26.5	537.0	3.6	87.5
	10000.	(.480)	(.137)	(-155.)	(172.)	3.1	78.7	.246	.043	-32.0	1186.1	3.2	89.6
H =2.40	1000.	.054	.086	-13.1	103.9	10.5	50.7	.047	.090	-16.0	98.7	10.4	54.4
K = 40000.	2000.	.101	.102	-12.9	175.9	6.9	61.4	.085	.115	-15.7	154.9	7.2	67.5
	4000.	.193	.058	-12.8	616.3	4.0	71.4	.161	.122	-15.4	290.9	5.1	80.2
	6000.	(.426)	(.142)	(-180.)	(193.)	3.4	77.6	.234	.075	-15.3	708.8	3.8	88.1
	8000.	(.616)	(.130)	(-137.)	(150.)	3.3	80.6	(.616)	(.130)	(-137.)	(150.)	3.3	80.6
	10000.	(.124)	(.706)	(135.)	(-7.)	3.2	81.7	(.124)	(.706)	(135.)	(-7.)	3.2	81.7
H =2.40	1000.	.054	.086	-13.1	104.0	10.0	50.6	.047	.090	-16.1	98.7	10.4	54.4
K = 60000.	2000.	.101	.102	-13.0	176.3	6.8	61.5	.086	.115	-15.9	155.1	7.1	67.6
	4000.	.195	.055	-12.9	645.0	4.8	71.9	.162	.122	-15.7	293.3	4.6	80.5
	6000.	(.432)	(.141)	(-177.)	(190.)	3.1	77.6	.237	.071	-15.6	754.8	3.3	87.4
	8000.	(.627)	(.129)	(-136.)	(149.)	3.0	81.9	(.627)	(.129)	(-136.)	(149.)	3.0	81.9
	10000.	(.124)	(.699)	(134.)	(-7.)	2.9	84.0	(.124)	(.699)	(134.)	(-7.)	2.9	84.0

RAM WEIGHT = 30.0 KIPS

TYPE I
(TYPE II)

PILE SIZE 22 INCH SQUARE HC
AREA = 351.0 SQ. IN.

HELMET	CUSHION (K/IN)	E = 4000. KSI I = 126.3						E = 6000. KSI I = 154.7					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.049	.089	-15.1	100.3	10.2	53.5	.043	.092	-18.5	96.4	10.1	57.0
K = 40000.	2000.	.090	.112	-14.9	159.9	7.2	66.0	.077	.122	-18.2	147.1	7.3	71.9
	4000.	.170	.110	-14.6	325.0	5.2	77.8	.142	.144	-17.7	247.5	5.1	87.0
	6000.	(.277)	(.220)	(-925.)	(939.)	3.9	84.9	.206	.136	-17.4	391.3	3.9	95.8
	8000.	(.485)	(.166)	(-213.)	(228.)	3.4	89.3	.268	.091	-17.3	772.6	3.5	101.6
	10000.	(.648)	(.154)	(-169.)	(184.)	3.1	91.6	(.648)	(.154)	(-169.)	(184.)	3.1	91.6
H =2.20	1000.	.047	.089	-13.7	99.1	10.6	53.5	.041	.092	-16.7	95.6	10.3	56.9
K = 6000.	2000.	.083	.111	-12.9	153.0	7.7	65.3	.071	.120	-15.7	141.8	7.6	71.0
	4000.	.146	.117	-14.4	263.3	5.3	76.0	.122	.142	-17.9	216.5	5.4	84.3
	6000.	.196	.095	-18.5	431.9	4.2	81.3	.163	.143	-25.0	282.0	4.5	91.0
	8000.	.234	.042	-23.3	1127.4	3.5	84.3	.193	.134	-33.9	343.6	3.8	95.0
	10000.	(.338)	(.187)	(-332.)	(359.)	3.2	86.2	.215	.121	-42.5	406.1	3.3	97.7
H =2.40	1000.	.049	.089	-15.0	100.0	10.3	53.3	.043	.092	-18.4	96.2	10.2	56.8
K = 40000.	2000.	.090	.112	-14.8	159.7	7.2	65.7	.077	.121	-18.1	146.9	7.4	71.6
	4000.	.170	.109	-14.6	326.5	4.8	77.4	.142	.144	-17.7	247.5	5.1	86.6
	6000.	(.284)	(.213)	(-749.)	(763.)	3.9	84.7	.206	.135	-17.4	393.1	3.9	95.5
	8000.	(.487)	(.164)	(-209.)	(224.)	3.4	88.9	.269	.008	-17.3	795.1	3.6	101.1
	10000.	(.651)	(.152)	(-167.)	(181.)	3.2	90.8	(.651)	(.152)	(-167.)	(181.)	3.2	90.8
H =2.40	1000.	.049	.089	-15.1	100.1	10.3	53.3	.044	.092	-18.5	96.2	10.2	56.8
K = 60000.	2000.	.090	.112	-14.9	160.0	7.1	65.8	.077	.121	-18.3	147.0	7.4	71.6
	4000.	.171	.108	-14.8	330.1	4.9	78.0	.143	.143	-18.0	248.8	4.8	86.8
	6000.	(.295)	(.207)	(-598.)	(613.)	3.4	84.2	.208	.133	-17.8	399.9	4.0	94.8
	8000.	(.498)	(.163)	(-204.)	(219.)	3.1	89.8	.272	.082	-17.7	863.7	3.1	101.6
	10000.	(.665)	(.151)	(-164.)	(179.)	2.8	92.8	(.665)	(.151)	(-164.)	(179.)	2.8	92.8

RAM WEIGHT = 30.0 KIPS

PILE SIZE 24 INCH SQUARE HC
AREA = 399.0 SQ. IN.

TYPE I
(TYPE II)

HEIGHT	CUSHION (K/IN)	E = 4000. KSI, I = 143.6						E = 6000. KSI, I = 175.9					
		ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)	ALPHA (S1)	OMEGA (S2)	A (P)	B (Q)	TP	(F/V)
H =2.20	1000.	.045	.091	-17.2	97.7	10.3	55.8	.041	.093	-21.0	94.7	9.8	58.9
K = 40000.	2000.	.081	.119	-16.9	151.0	7.3	69.8	.070	.126	-20.7	142.1	7.3	75.3
	4000.	.151	.134	-16.5	266.1	5.1	83.7	.127	.158	-20.1	226.7	5.1	92.8
	6000.	.220	.111	-16.3	480.1	3.8	91.8	.183	.165	-19.7	322.5	4.0	102.6
	8000.	(.338)	(.237)	(-690.)	(707.)	3.5	97.0	.238	.153	-19.4	459.0	3.8	109.1
	10000.	(.515)	(.193)	(-263.)	(279.)	3.1	100.3	.292	.119	-19.3	735.7	3.0	114.2
H =2.20	1000.	.043	.091	-15.5	96.7	10.4	55.7	.039	.093	-19.0	93.9	10.8	58.8
K = 6000.	2000.	.075	.117	-14.6	145.2	7.5	69.0	.064	.123	-17.8	137.3	7.8	74.3
	4000.	.130	.135	-16.5	228.7	5.4	81.3	.110	.152	-20.5	202.2	5.4	89.4
	6000.	.174	.129	-22.5	312.1	4.4	87.4	.146	.159	-29.3	252.0	4.5	97.2
	8000.	.207	.114	-29.9	408.6	3.7	91.0	.174	.157	-41.0	290.4	3.9	102.0
	10000.	.231	.092	-36.8	542.9	3.1	93.3	.194	.152	-52.5	320.0	3.4	105.2
H =2.40	1000.	.045	.091	-17.1	97.4	10.3	55.6	.041	.093	-20.9	94.4	9.8	58.7
K = 40000.	2000.	.081	.118	-16.8	150.7	7.3	69.4	.070	.125	-20.5	141.8	7.3	75.0
	4000.	.151	.133	-16.4	266.4	5.0	83.2	.127	.157	-20.0	226.5	5.1	92.2
	6000.	.220	.109	-16.3	485.1	3.8	91.6	.183	.164	-19.6	322.9	4.0	102.3
	8000.	(.344)	(.232)	(-620.)	(636.)	3.5	96.6	.238	.152	-19.4	461.6	3.8	108.6
	10000.	(.518)	(.191)	(-257.)	(273.)	3.3	99.4	.292	.116	-19.3	750.7	3.1	113.8
H =2.40	1000.	.045	.091	-17.1	97.5	10.3	55.5	.041	.093	-21.0	94.4	9.8	58.7
K = 60000.	2000.	.081	.118	-17.0	150.9	7.1	69.5	.070	.125	-20.8	141.9	7.3	75.0
	4000.	.152	.133	-16.7	268.2	5.0	83.6	.128	.157	-20.4	227.4	5.1	92.3
	6000.	.223	.107	-16.6	498.5	3.5	90.8	.185	.163	-20.1	326.3	4.1	101.9
	8000.	(.359)	(.226)	(-523.)	(540.)	3.1	97.2	.242	.150	-20.0	473.1	3.3	109.2
	10000.	(.533)	(.189)	(-247.)	(264.)	2.9	101.1	.298	.109	-19.9	808.8	3.0	114.6