



H.B. FLEMING, INC.
CONTRACTING · ENGINEERING
89 Pleasant Ave. South Portland, ME 04106
Phone 207-799-8514 Fax 207-799-8538
www.hbfleming.com



PILE DRIVING

BRIDGES

SUBMARINE PIPELINES

SUBMITTAL

Submitted To:

Client: J.A. McDonald, Inc.
Attention: Marc Boudreau

Date: 2/12/2016
Project: Clarendon BRO 1443(48)
Location: Clarendon, VT

Subject: Pile Driving Criteria

H.B. Fleming Proposes to use the following driving criteria for the piles to be installed at the above location.

Hammer

- Either an APE D19-42 single acting open ended diesel pile hammer or an MKT DE-42 single acting open ended diesel pile hammer will be used to drive the piles. The D19 has a ram weight of 4,190 Lbs, a max stroke of 10'-3", and a rated energy of 42,800 ft-lbs. The DE-42 has a ram weight of 4,200 lbs, a max stroke of 10'-6" and a rated energy of 42,000 ft-lbs.
- The D19 will be operated on fuel setting 3
- Both hammers use Monocast MC 901 pile cushions

Pile

- HP12X63 ASTM A572 Gr. 50 steel piles
- The nominal capacity which we based our analysis on is 310 kips (155 tons)
- Piles will be fitted with cast steel driving points

Results

- Piles will be driven until a blow count of 5 for three consecutive inches is obtained at a stroke of 8.11 ft for the MKT DE-42 or 8.08 ft for the APE D19.
- If abrupt refusal is encountered, piles will be driven for 5 blows for 1/2 inch of movement or 3 blows for no movement
- These criteria are based upon the output generated from the WEAP analysis that follows.

Signed: _____

Dale Lawrence

H.B. FLEMING PILE EQUIPMENT DATA SHEET

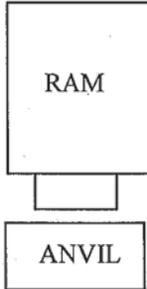
Project: Clarendon BRO 1443 (48)

Date: 2/12/2016

Location: Clarendon, VT

Client: J.A. McDonald

HAMMER



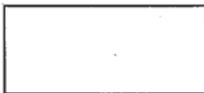
Manufacturer:	APE
Model:	D-19
Type:	Single Acting Diesel
Length of Stroke:	10' - 3"
Rated Energy at Given Stroke:	42,800 ft-lb
Modifications:	None

HAMMER CUSHION



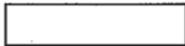
Material:	Monocast MC901
Thickness:	2"
Area:	283.5 in ²
Modulus of Elasticity:	285 ksi
Coefficient of Restitution:	0.8

DRIVE HEAD



Weight:	1200 lb
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PILE CUSHION



Cushion Material:	N/A
Thickness:	N/A
Modulus of Elasticity:	N/A
Coefficient of Restitution:	N/A

PILE



Pile Type:	HP 12x63
Length in Leads:	Up to 65'
Weight/LF:	63 lb
Wall Thickness:	.515"
Taper:	N/A
Cross Sectional Area:	18.4 in ²
Ultimate Capacity:	310 kips
Splice Description:	VAOT Web Diamond Splice
Tip Treatment Description:	Cast Steel Point

H.B. FLEMING PILE EQUIPMENT DATA SHEET

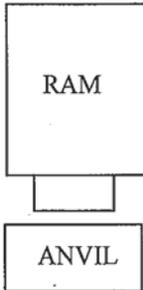
Project: Clarendon BRO 1443 (48)

Date: 2/12/2016

Location: Clarendon, VT

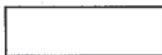
Client: J.A. McDonald

HAMMER



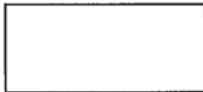
Manufacturer:	MKT
Model:	DE-42
Type:	Single Acting Diesel
Length of Stroke:	10' - 6"
Rated Energy at Given Stroke:	42,000 ft-lb
Modifications:	None

HAMMER CUSHION



Material:	Monocast MC901
Thickness:	2"
Area:	283.5 in ²
Modulus of Elasticity:	285 ksi
Coefficient of Restitution:	0.8

DRIVE HEAD



Weight:	1200 lb
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PILE CUSHION



Cushion Material:	N/A
Thickness:	N/A
Modulus of Elasticity:	N/A
Coefficient of Restitution:	N/A

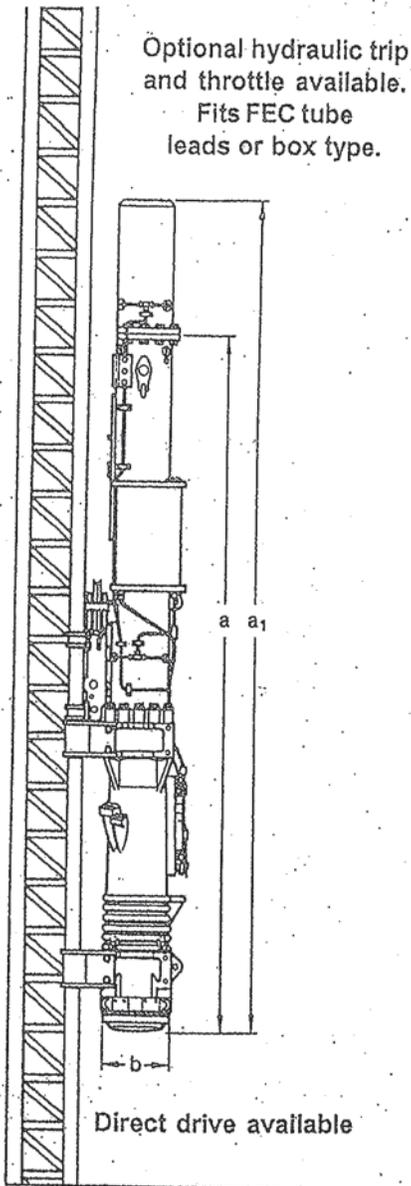
PILE



Pile Type:	HP 12x63
Length in Leads:	Up to 65'
Weight/LF:	63 lb
Wall Thickness:	.515"
Taper:	N/A
Cross Sectional Area:	18.4 in ²
Ultimate Capacity	310 kips
Splice Description:	VAOT Web Diamond Splice
Tip Treatment Description:	Cast Steel Point

APE/SEMW Model D19-42 Single Acting Impact Hammer

operates on diesel or bio-diesel for all types of impact pile driving



MODEL D19-42 (1.9 metric ton ram)

SPECIFICATIONS

Maximum Rated energy	42,800 ft-lbs
Minimum rated energy	16,000 ft-lbs
Stroke at rated energy	10 feet 2 inches
Maximum obtainable stroke	10 feet 3 inches
Speed (blows per minute)	37-53

WEIGHTS

Ram	4190 lbs
Anvil	754 lbs
Hammer weight (includes trip device)	7,800 lbs
Typical operating (weight with drive cap)	9,600 lbs

CAPACITIES

Fuel tank (runs on diesel or bio -diesel)	8.5 gal
Oil tank	2.4 gal

CONSUMPTION

Diesel or Bio-diesel fuel	1.5 gal/hr
Lubrication	2.4 gal/hr
Grease	twice per day

DIMENSIONS OF HAMMER

a ₁	Length overall	186.2 inches
a	Length over cylinder extension	219.3 inches
b	Impact block diameter	17.3 inches
c	Width over bolts	22 inches
d	Hammer width overall	19 inches
e	Width for guiding- face to face	12.5 inches
f	Hammer center to pump guard	13.5 inches
g	Hammer center to bolt center	13.6 inches
h	hammer depth overall	26.2 inches
H	Minimum clearance for leads	14.2 inches

We reserve the right to modify specifications without notice. Contact APE directly for updated literature.

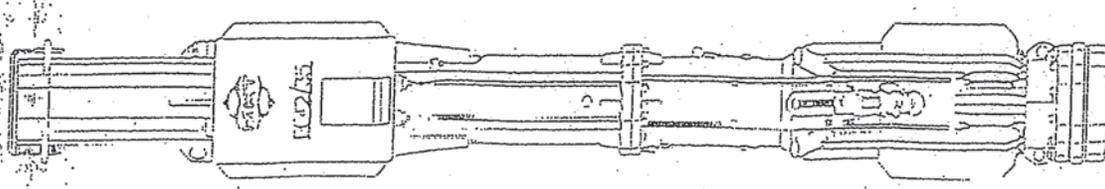
Features

- Fuel injection designed by APE engineers
- Fuel and lube pumps with 50% less parts than ICE
- Hardened piston needs no high maintenance wear rings
- Direct drive available for maximum production on steel piles
- Fuel pump mounted where heat will not harm it
- Variable mechanical cam fuel pump- no air pistons or rings
- Optional hydraulic variable fuel remote control
- Heavy duty trip system for years of fault free operation
- Chrome rings for super long life
- Low maintenance and extremely low parts pricing
- German design at a reasonable price
- Two year APE warranty



APE Corporate Offices
 7032 South 196th
 Kent, Washington 98032 USA
 (800) 248-8498 & (253) 872-0141
 (253) 872-8710 Fax 4/99

Visit our WEB site:
www.apevibro.com
 e-mail: ape@apevibro.com



INTRODUCING THE
NEW

DE42/35

MAXIMUM DIESEL HAMMER FLEXIBILITY
FITTING IN 8 X 20 LEADS WITH RAM
WEIGHTS TO 4,200 LBS.

ONE HAMMER... MULTIPLE RAM SIZES...
AND ENERGY RANGES. ANOTHER MKT
FIRST PROVIDING THE CONTRACTOR
WITH HAMMER SIZE FLEXIBILITY AND
REDUCED EQUIPMENT INVESTMENT
COSTS. MKT DIESEL HAMMERS CONTINUE
TO OFFER FEATURES WHICH INSURE
DEPENDABLE AND PRODUCTIVE
OPERATION. USING EITHER STANDARD OR
REMOTE FUEL DELIVERY SYSTEMS.

SPECIFICATIONS DE-42/35

RAM-PISTON WEIGHT (LBS.)	3,500	4,200
ENERGY RATING (FT. LBS.)	35,000	42,000
BEARING BASED ON ENGINEERING NEWS FORMULA (TONS)	230	230
MAXIMUM OBTAINABLE STROKE	10'-6"	10'-6"
OVERALL LENGTH WITH DRIVE CAP	16'-7"	16'-7"
WEIGHT, HAMMER ONLY (LBS.)	8,600	9,300
WEIGHT, HAMMER AND UNIVERSAL DRIVE CAP (LBS.)	9,550	10,250

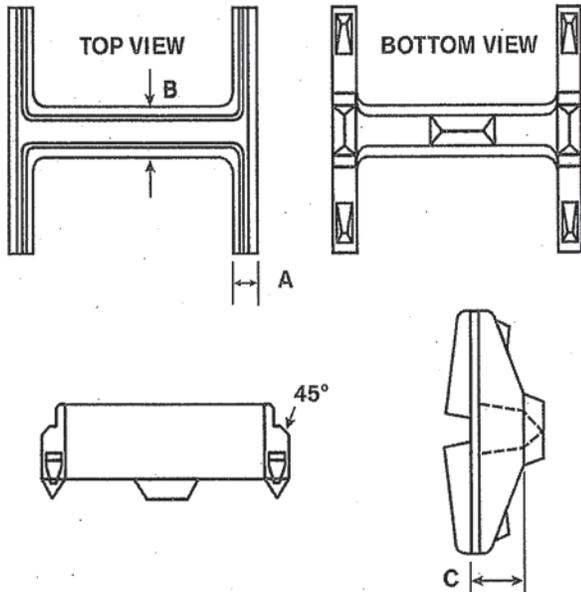
PUBLISHED ENERGY RATINGS ARE EQUAL TO RAM WEIGHT X 10.8 FT. RAM STROKE. ACTUAL ENERGY RATINGS WILL VARY AS A FUNCTION OF THE OVERALL JOB CONDITIONS. BEARING RATINGS ARE BASED UPON ENGINEERING NEWS FORMULA. PILE SET DOWNS ARE IN TONS.

PRODUCT LIST

- SINGLE ACTING DIESEL PILE HAMMERS
- AIR PILE HAMMERS
- VIBRATORY PILE DRIVERS/EXTRACTORS
- VIBRATORY HAMMER ACCESSORIES
- PILE DRIVING LEAD SYSTEMS
- CUSTOM ENGINEERED PRODUCTS
- DOUBLE ACTING DIESEL PILE HAMMERS
- DRIVE CAPS AND ACCESSORIES
- HYDRAULIC POWER UNITS
- HYDRAULIC AUGER SYSTEMS
- BOTTOM BRACES
- LEAD ACCESSORIES

HARD-BITE™ – HP-77600-B 30#

Dimensions



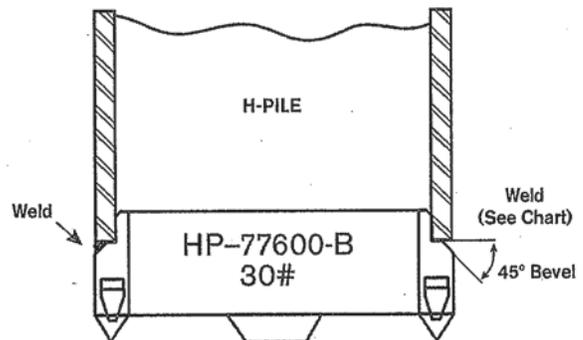
MATERIAL: CAST STEEL

ASTM A148 90/60

	12"
A	1"
B	1-5/16"
C	3"
Wt.	31#

Installation Instructions

1. Fit point onto the end of the square cut pile end.
2. Weld point to the pile in either flat or vertical position using E7018 electrodes.
3. Weld across full width of flange following chart below for minimum size weld.



Pile Size	Flange Thickness	Groove Weld
HP 12 x 84	.685	3/8
x 74	.610	3/8
x 63	.515	5/16
x 53	.435	5/16

Vermont Agency of Transportation

RECEIVED

CK'D BY RF OK'D BY RF

February 12, 2016

RESUBMIT NO Approved

BY KH DATE 02/16/2016



**ASSOCIATED PILE
& FITTING**

PO Box 5933 Parsippany, NJ 07054-5933

Tel: 973-773-8400

Fax: 973-428-5146

email: apf@associatedpile.com

www.associatedpile.com

Call Toll Free: 800-526-9047

**JOINT WELDING
PROCEDURE SPECIFICATION**

Material specification ASTM A572 Gr. 50 / REMVAL-INT
 Welding process SMAW
 Manual or machine MANUAL
 Position of welding horizontal, vertical, overhead
 Filler metal specification AWS A5.1
 Filler metal classification E7018
 Flux N/A
 Shielding gas N/A Flow rate N/A
 Single or multiple pass MULTIPLE IF REQUIRED
 Single or multiple arc SINGLE
 Welding current D/C
 Polarity REVERSE
 Welding progression N/A
 Root treatment CLEAN to bare, shiny metal free of contaminants and moisture
 Preheat and interpass temperature 50°F unless base metal is below 32°F, then 70°F
 Postheat treatment NONE

WELDING PROCEDURE

Pass no.	Electrode size	Welding current		Travel speed	Joint detail
		Amperes	Volts		
1	1/8"	120-150	12-24	1 Ft/min	
2+	5/32"	140-180	12-24	1 Ft/min	

Vermont Agency of Transportation
RECEIVED

CK'D BY RF OK'D BY RF
 February 12, 2016

RESUBMIT NO Approved
 BY KH DATE 02/16/2016

This procedure may vary due to fabrication sequence, fit-up, pass size, etc., within the limitation of variables given in Section 5.

Procedure no. VAST WRB DIAMOND SPICE Contractor H. B. FLEMING, INC.
 Revision no. φ Authorized by [Signature]
 Form E-2 Date _____

MKT DE42 Variable Capacity

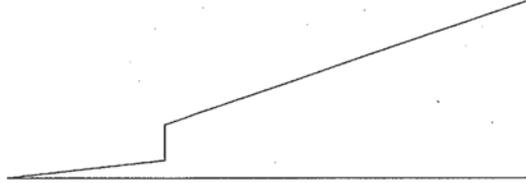
12-Feb-2016
GRLWEAP (TM) Version 2005

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Clarendon BRO 1443(48)

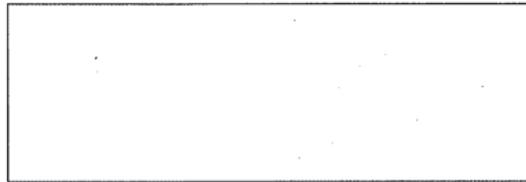
MKT DE 42/35

Efficiency 0.700
 Helmet 1.20 kips
 Hammer Cushion 40399 kips/in
 Skin Quake 0.100 in
 Toe Quake 0.040 in
 Skin Damping 0.050 sec/ft
 Toe Damping 0.150 sec/ft
 Pile Length 20.00 ft
 Pile Penetration 20.00 ft
 Pile Top Area 18.40 in²

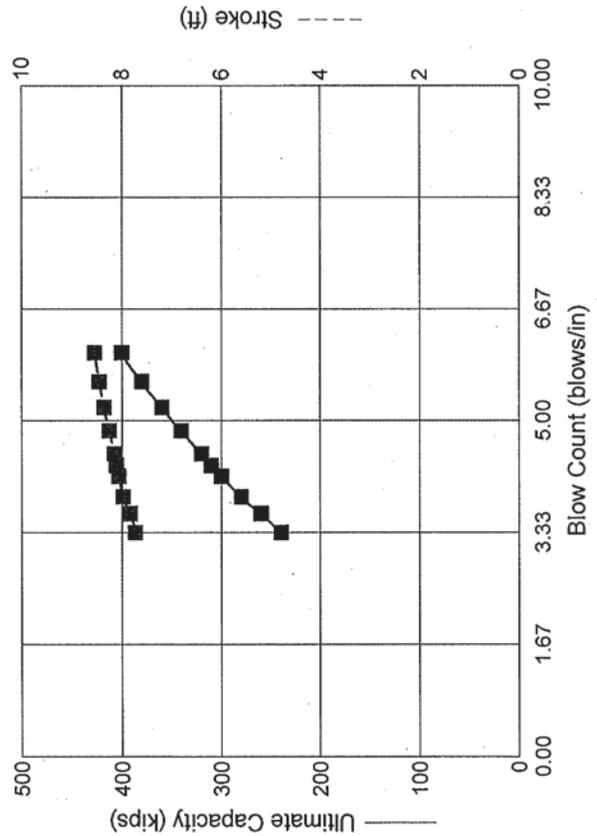
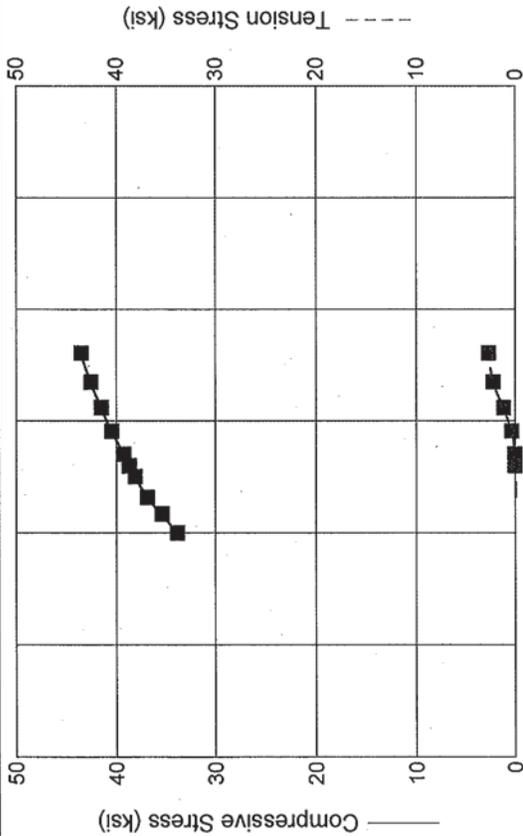
Skin Friction Distribution



Pile Model



Res. Shaft = 14 %
(Proportional)



--- Tension Stress (ksi)

--- Stroke (ft)

MKT DEL2 Variable Capacity

H.B. FLEMING
Clarendon BRO 1443(48)

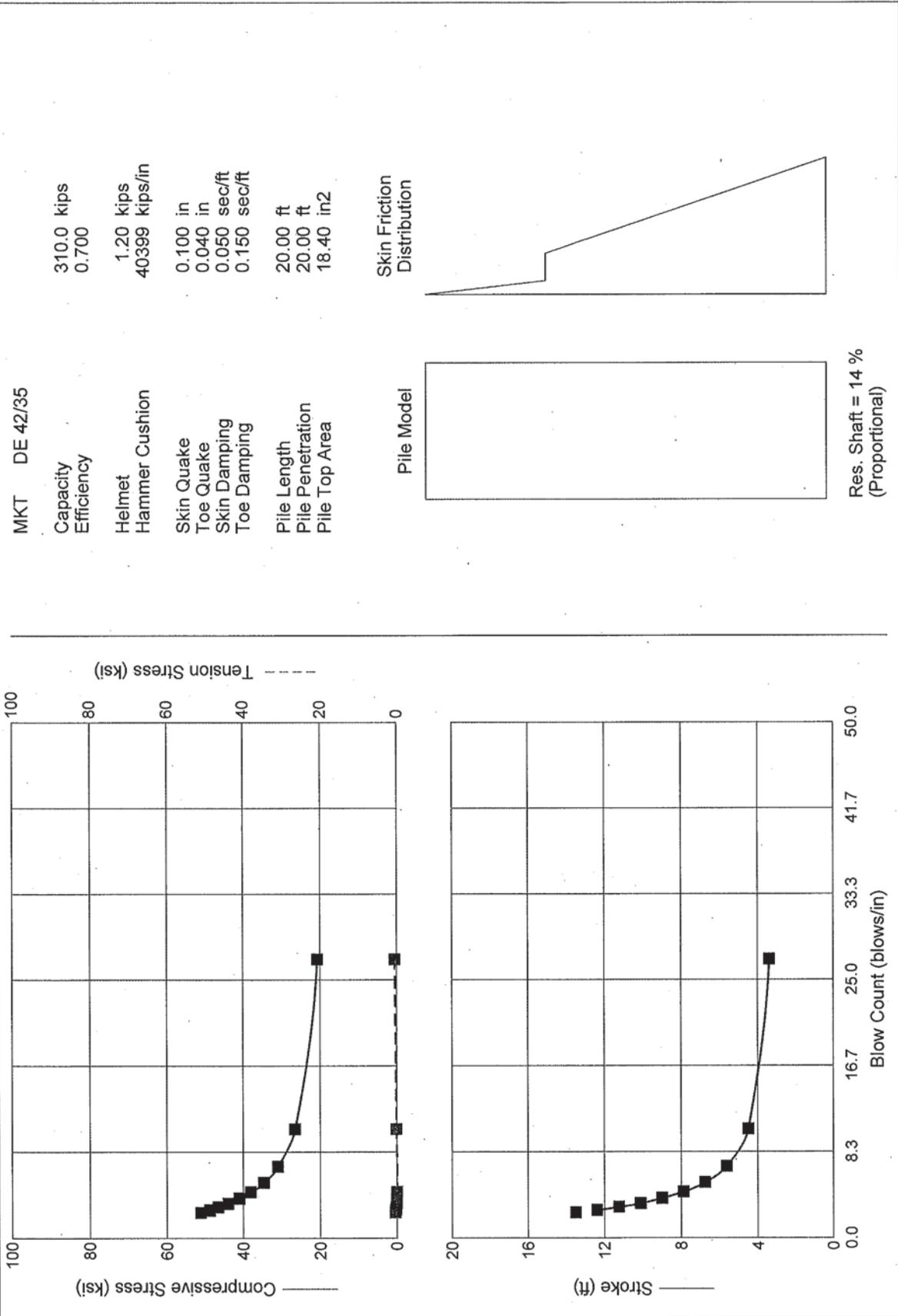
12-Feb-2016
GRLWEAP (TM) Version 2005

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
240.0	33.82	0.00	3.3	7.73	14.08
260.0	35.36	0.00	3.6	7.83	14.03
280.0	36.84	0.00	3.9	7.98	14.20
300.0	38.07	0.00	4.2	8.06	14.16
310.0	38.67	0.06	4.3	8.11	14.15
320.0	39.21	0.06	4.5	8.15	14.10
340.0	40.47	0.39	4.8	8.25	14.11
360.0	41.52	1.21	5.2	8.36	14.12
380.0	42.60	2.24	5.6	8.45	14.17
400.0	43.56	2.72	6.0	8.54	14.19

MKT DE42- Variable Stroke

12-Feb-2016
GRLWEAP (TM) Version 2005

H.B. FLEMING
Clarendon BRO 1443(48)



MKT DE42 Variable Stroke

H.B. FLEMING
Clarendon BRO 1443(48)

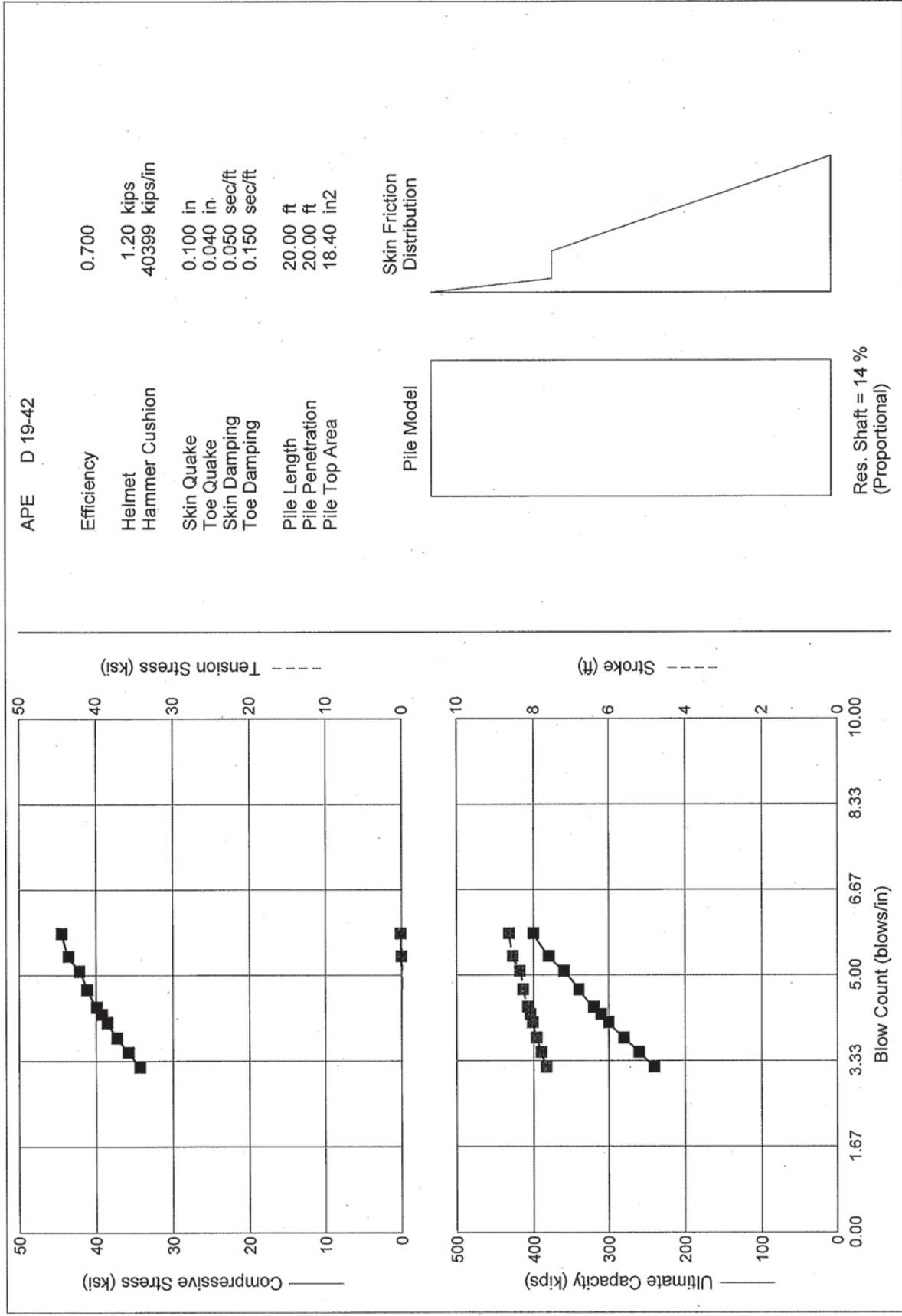
12-Feb-2016
GRLWEAP (TM) Version 2005

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
310.0	20.72	0.57	27.0	3.38	3.40
310.0	26.53	0.16	10.5	4.50	5.95
310.0	30.97	0.00	6.9	5.62	8.54
310.0	34.63	0.00	5.4	6.75	11.06
310.0	38.05	0.02	4.5	7.88	13.61
310.0	40.98	0.08	3.9	9.00	16.11
310.0	43.83	0.14	3.4	10.12	18.60
310.0	46.50	0.23	3.0	11.25	21.14
310.0	48.71	0.32	2.7	12.38	23.95
310.0	51.07	0.40	2.5	13.50	26.73

APE D19 Variable Capacity

12-Feb-2016
GRLWEAP (TM) Version 2005

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Clarendon BRO 1443(48)



APE 019

Variable Capacity

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Clarendon BRO 1443(48)

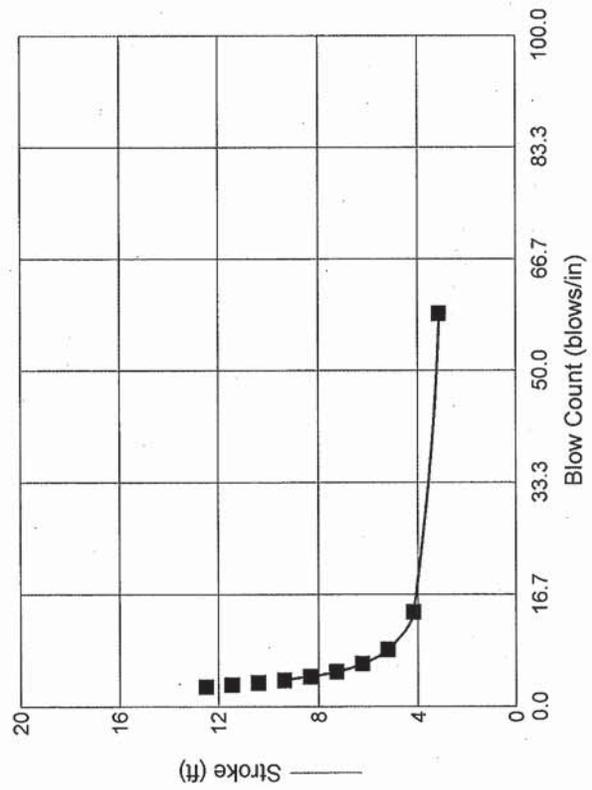
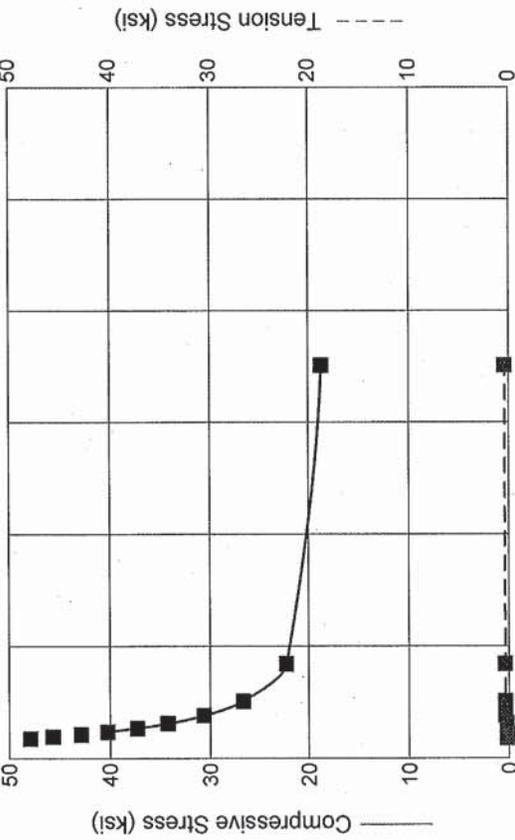
12-Feb-2016
GRLWEAP (TM) Version 2005

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
240.0	34.28	0.00	3.2	7.67	14.35
260.0	35.76	0.00	3.5	7.80	14.33
280.0	37.22	0.00	3.8	7.92	14.36
300.0	38.48	0.00	4.1	8.02	14.35
310.0	39.20	0.00	4.2	8.08	14.34
320.0	39.88	0.00	4.4	8.15	14.41
340.0	41.12	0.00	4.7	8.27	14.40
360.0	42.13	0.00	5.1	8.36	14.40
380.0	43.57	0.06	5.4	8.54	14.65
400.0	44.45	0.14	5.8	8.64	14.60

APE D19 Variable Stroke

12-Feb-2016
GRLWEAP (TM) Version 2005

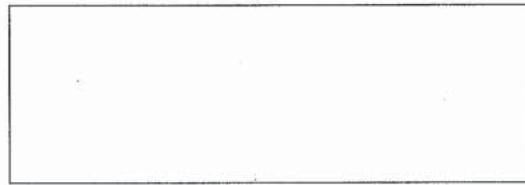
H.B. FLEMING
Clarendon BRO 1443(48)



APE D 19-42

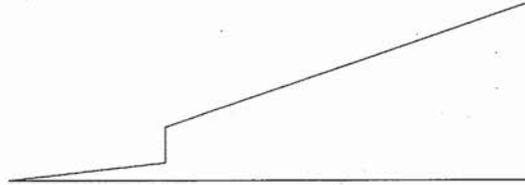
Capacity	310.0 kips
Efficiency	0.700
Helmet	1.20 kips
Hammer Cushion	40399 kips/in
Skin Quake	0.100 in
Toe Quake	0.100 in
Skin Damping	0.050 sec/ft
Toe Damping	0.150 sec/ft
Pile Length	20.00 ft
Pile Penetration	20.00 ft
Pile Top Area	18.40 in ²

Pile Model



Res. Shaft = 14 %
(Proportional)

Skin Friction
Distribution



APE D19

Variable Stroke

H.B. FLEMING
Clarendon BRO 1443(48)

12-Feb-2016
GRLWEAP (TM) Version 2005

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
310.0	18.68	0.43	58.5	3.12	3.63
310.0	22.22	0.40	14.0	4.17	5.94
310.0	26.61	0.37	8.5	5.21	8.31
310.0	30.63	0.37	6.4	6.25	10.59
310.0	34.23	0.24	5.2	7.29	12.94
310.0	37.30	0.00	4.5	8.33	15.16
310.0	40.23	0.00	3.9	9.38	17.53
310.0	42.91	0.05	3.6	10.42	19.72
310.0	45.69	0.25	3.3	11.46	21.97
310.0	47.94	0.24	3.0	12.50	24.21