SUPERSEDED BY EI 80-026 EFFECTIVE 5/23/80

ENGINEERING INSTRUCTION

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

SUBJECT: Manufacturer's Data for the Rating of Vibratory Drum Compactors for Earthwork Construction

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CONTENTS

A. Description and Usage

The basic machine data (Unsprung Drum Weight, Dynamic Force, Rated Frequency, Drum Width) for the models produced by the listed manufacturers have been authenticated and is given on the pages noted.

Machines which do not meet the specifications are so noted. Machines which have had their specifications altered without changing the model number designation have been listed with the worst acceptable parameters. The words "low," "medium" or "high" appearing after the model number indicates a machine which has the capability of changing the dynamic force by varying the amplitude and/or rated frequency. The column headed "Acceptable Frequency Range" provides limiting frequency values within which the compactor may operate (the acceptable frequency range for all vibratory compactors operated on earthwork construction is 1100 to 1500 V.P.M.). The column headed "Index Number" provides values to be used with the nomograph on Page 15 to determine the maximum loose lift thickness.

If a Contractor proposes to use a machine not listed (or to operate a compactor at an amplitude setting other than specified in the listing) the Regional Soils Engineer should be notified to assist in obtaining the necessary authenticated information to rate it. It is advisable to request such assistance promptly to allow for sufficient time to obtain the machine data to qualify the compactor. Section (E) provides criteria for obtaining the Minimum Accepted Operating Frequency and P.L.I. for an unlisted machine given the basic machine data.

Section (D) covers situations where the Contractor wishes to change the compactor traveling speed or the minimum number of passes.

BROS

DIVISION OF AMERICAN HOIST

Model	Unsprung Drum Wt. (Pounds)	Dynamic Force (Pounds)	Rated Frequency (V.P.M.)	Drum Width (Inches)	Acceptable Frequency Range (V.P.M.)	Index Number (P.L.I. @ 1500 V.P.M.)
VP-4D	2,569	10,000	1,400	60	1122-1500	234
VP-10 (Smooth Drum)	6,625	22,000	1,300	66	1128-1500	544
VP-22 (Smooth Drum)	14,690	41,000	1,300	78	1230-1500	888
SPV-7	6,000	20,000	1,500	72	1299-1500	361
SPV-627	5,500	27,000	1,700	76	1213-1500	349
SPV-627VA	6,000	27,000	2,000	76	1490-1500	279
SPV-725	6,000	25,000	1,550	84	1200-1500	350
SPV-727	6,000	27,000	1,575	84	1174-1500	363
SPV-727VA	6,200	27,000	1,700	84	1288-1500	324
-730	9,250	30,000	1,500	84	1317-1500	467
SPV-730VA	10,000	30,000	1,600	84	1460-1500	433
SPV-735	9,250	35,000	1,600	84	1300-1500	476
SPV-735VA	10,000	35,000	1,700	84	1436-1500	443
SPV-735II	10,000	35,000	1,600	84	1352-1500	485
SPV-735VAII	9,800	35,000	1,750	84	1464-1500	422
SPV-745	10,000	45,000	1,700	84	1267-1500	536
SPV-845	10,550	45,000	1,500	102	1148-1500	544
SPV-850	12,000	50,000	1,600	102	1239-1500	548

BOMAG

KOEHRING COMPACTION & GENERAL EQUIPMENT GROUP

Model	Unsprung Drum Wt. (Pounds)	Dynamic Force (Pounds)	Rated Frequency (V.P.M.)	Drum Width (Inches)	Acceptable Frequency Range (V.P.M.)	Index Number (P.L.I. @ 1500 V.P.M.)
BW-170	4,200	25,000	1,850	66	1199-1500	312
BW-170D	4,200	25,000	1,850	66	1199-1500	312
BW-200	Classified for confined areas only					
BW-210	7,900	40,000	1,850	84	1300-1500	407
BW-210A	8,300	40,500	2,000	84	1431-1500	370
BW-210D	8,000	40,000	1,850	84	1308-1500	408
BW-210DH	9,082	45,000	1,650	84	1172-1500	550
BW-215D	9,700	54,013	1,850	82.7	1240-1500	546
BW-220A	4,800	30,000	2,400	80	Does not meet specs.	

FERGUSON

SHOVEL SUPPLY COMPANY, INC.

Model	Unsprung Drum Wt. (Pounds)	Dynamic Force (Pounds)	Rated Frequency (V.P.M.)	Drum Width (Inches)	Acceptable Frequency Range (V.P.M.)	Index Number (P.L.I. @ 1500 V.P.M.)
65	6,198	25,382	1,500	72	1172-1500	438
SP-75-B	7,500	37,175	1,800	84	1278-1500	396
SP-75-B (Mod)	7,500	36,000	2,400	84	Does not meet specs.	
SP-75BA (Fixed Amplitude Range)	7,500	36,000	1,800	84	1299-1500	386
SP-75BA (Variable Amplitude Range)	Does not meet maximum 1500 V.P.M. specification					
SP-75D	7,500	45,000	2,500	84	Does not meet specs.	
SP-75* (79 Production)	7,500	31,248	1,500	84	1162-1500	461
SP-266 (Low)	3,938	17,500	2,500	66	Does not meet specs.	
SP-266 (High)	3,938	35,000	2,500	66	1326-1500	250
230	14,400	46,031	1,500	78	1326-1500	774
SP-230	14,400	46,031	1,500	78	1326-1500	774

GALION MANUFACTURING COMPANY

Model	Unsprung Drum Wt. (Pounds)	Dynamic Force (Pounds)	Rated Frequency (V.P.M.)	Drum Width (Inches)	Acceptable Frequency Range (V.P.M.)	Index Number (P.L.I. @ 1500 V.P.M.)
VOS-84	9,300	36,000	1,800	84	1446-1500	408
VOS-84A (Low)	9,300	20,000	2,300	84	Does not meet specs.	
VOS-84A (High)	9,300	40,000	2,300	84	Does not meet specs.	
VOS-2-66A (High)	4,300	30,000	2,400	66	1437-1500	242
VOS-2-66A	Low, med. low, medium and med. high - do not meet specs.					

HYSTER COMPANY

Model	Unsprung Drum Wt. (Pounds)	Dynamic Force (Pounds)	Rated Frequency (V.P.M.)	Drum Width (Inches)	Acceptable Frequency Range (V.P.M.)	Index Number (P.L.I. @ 1500 V.P.M.)
C200B	3,600	18,000	1,800	60	1272-1500	268
C250A	12,200	49,000	1,200	80	1100-1500	1109
C610A	3,900	25,000	1,800	72	1124-1500	295
C610B	4,675	25,000	1,800	72	1230-1500	306
C615A	5,100	25,000	1,800	72	1285-1500	312
*C615B (Fixed)	5,100	25,000	1,800	72	1285-1500	312
**C615B (High)	5,925	25,000	1,800	72	1385-1500	323
**C617B (High)	5,925	25,000	1,800	72	1385-1500	323
C620A	4,546	25,000	1,800	84	1213-1500	260
20B	4,625	25,000	1,800	84	1224-1500	261
C625A	5,000	25,000	1,800	84	1272-1500	266
*C625B (Fixed)	5,000	25,000	1,800	84	1272-1500	266
**C625B (High)	6,081	25,000	1,800	84	1403-1500	279
**C627B (High)	6,081	25,000	1,800	84	1403-1500	279

NOTE: * Machine data for Models C615B and C625B with fixed dynamic force settings is the same as C615A and C625A, respectively.

** Only the high setting on the variable dynamic force Models C615B, C617B, C625B and C627B meets the specification requirements.

INGERSOLL-RAND COMPANY

Model	Unsprung Drum Wt. (Pounds)	Dynamic Force (Pounds)	Rated Frequency (V.P.M.)	Drum Width (Inches)	Acceptable Frequency Range (V.P.M.)	Index Number (P.L.I. @ 1500 V.P.M.)
DA-30	4,010	1,100	4,000	40	Does not meet specs.	
SP-42	3,119	15,050	2,100	72	Does not meet specs.	
SPA-42	3,119	15,050	2,100	72	Does not meet specs.	
SP-54	6,400	25,200	1,800	85	1434-1500	281
SP-54 (NY)	10,200	25,600	1,500	85	1497-1500	421
SP-54DD	6,400	25,200	1,800	85	1434-1500	281
SPA-54	6,265	15,200	2,150	85	Does not meet specs.	
SPA-54 (NY)	11,000	19,300	2,250	85	Does not meet specs.	
SP-56	8,640	42,049	1,825	84	1308-1500	441
SP-56DD	8,777	42,049	1,825	84	1319-1500	442
SP-60	15,578	40,000	1,400	100	1381-1500	615
SP-60 (NY)	21,000	54,000	1,400	100	1380-1500	830
SP-60DD	15,720	60,160	1,500	100	1212-1500	758

RAY GO, INC.

Model	Unsprung Drum Wt. (Pounds)	Dynamic Force (Pounds)	Rated Frequency (V.P.M.)	Drum Width (Inches)	Acceptable Frequency Range (V.P.M.)	Index Number (P.L.I. @ 1500 V.P.M.
2-66 (Low)	4,160	16,000	2,300	66	Does not meet specs.	
2-66 (High)	4,160	16,000	1,700	66	1370-1500	251
2-84 (Low)	6,560	27,000	2,300	84	Does not meet specs.	
2-84 (High)	6,560	27,000	1,700	84	1325-1500	328
300-A	4,460	16,000	1,500	66	1252-1500	310
303-A (Low)	3,800	16,000	2,300	66	Does not meet specs.	
303-A (High)	3,800	16,000	1,700	66	1310-1500	246
304-A (Low)	3,800	16,000	2,300	66	Does not meet specs.	
304-A (High)	3,800	16,000	1,700	66	1310-1500	246
350	7,380	22,800	1,500	72	1349-1500	419
400	8,000	27,000	1,450	84	1248-1500	439
400-A	8,070	27,000	1,500	84	1296-1500	417
404-A	8,000	27,000	1,450	84	1248-1500	439
404-B (Low)	7,000	27,000	2,300	84	Does not meet specs.	
404-B (High)	7,000	27,000	1,700	84	1368-1500	333
410	8,330	27,000	1,450	84	1273-1500	443
420	10,130	32,000	1,450	84	1290-1500	528
500	16,350	45,000	1,450	80	1382-1500	806
510-A	16,350	45,000	1,500	80	1429-1500	767

RAY GO, INC.

Model	Unsprung Drum Wt. (Pounds)	Dynamic Force (Pounds)	Rated Frequency (V.P.M.)	Drum Width (Inches)	Acceptable Frequency Range (V.P.M.)	Number (P.L.I. @ 1500 V.P.M.)
600-A	15,276	45,000	1,450	100	1335-1500	634
700	19,500	60,000	1,450	100	1307-1500	837
6604-A (Low)	4,160	16,000	2,300	66	Does not meet specs.	
6604-A (High)	4,160	16,000	1,700	66	1371-1500	251

REXNORD, INC.

Model	Unsprung Drum Wt. (Pounds)	Dynamic Force (Pounds)	Rated Frequency (V.P.M.)	Drum Width (Inches)	Acceptable Frequency Range (V.P.M.)	Index Number (P.L.I. @ 1500 V.P.M.)
SP-600	3,600	22,000	1,800	72	1151-1500	262
SP-700 (Low)	3,600	14,800	2,000	72	Does not meet specs.	
SP-700 (High)	3,600	27,000	2,000	72	1154-1500	261
SP-848	6,400	27,000	1,800	84	1385-1500	299
SP-900	6,400	33,500	2,000	84	1382-1500	300
SP-950 (Low)	6,500	24,500	2,300	84	Does not meet specs.	
SP-950 (High)	6,500	34,000	1,800	84	1245-1500	358
SP-1100 (Low)	3,900	13,000	2,400	80	Does not meet specs.	
SP-1100 (High)	3,900	30,000	2,400	80	1369-1500	195
SP-1300	10,200	45,000	1,700	108	1279-1500	418

TAMPO MANUFACTURING CO., INC.

Model	Unsprung Drum Wt. (Pounds)	Dynamic Force (Pounds)	Rated Frequency (V.P.M.)	Drum Width (Inches)	Acceptable Frequency Range (V.P.M.)	Index Number (P.L.I. @ 1500 V.P.M.)
RS-16	3,500	16,000	1,600	60	1183-1500	292
RS-16A (Low)	3,825	7,500	1,600	60	Does not meet specs.	
RS-16A (Medium)	3,825	11,500	1,600	60	1459-1500	232
RS-16A (High)	3,825	15,000	1,600	60	1277-1500	283
RS-16D	3,580	16,000	1,600	60	1196-1500	294
RS-28	7,200	30,000	1,500	84	1161-1500	442
RS-28A (Low)	7,750	12,700	1,700	84	Does not meet specs.	
RS-28A (Medium)	7,750	28,625	1,700	84	1398-1500	357
RS-28A (High)	7,750	30,000	1,500	84	1205-1500	449
RS-28B	7,400	30,000	1,500	84	1178-1500	445
RS-28D	7,400	30,000	1,500	84	1178-1500	445
RS-166A	Low, medium and high amplitude - do not meet specs.					
RS-188A	Low, medium and high amplitude - do not meet specs.					
RS-210	14,150	45,000	1,400	104	1241-1500	632
RS-288A	Same specs. as RS-28A except that it has double drum					
RS-410	14,150	45,000	1,400	104	1241-1500	632
RH-28B	10,230	45,000	1,700	84	1281-1500	538
RH-48	13,800	43,000	1,400	80	1254-1500	789
VC-80	3,500	15,000	1,600	60	1222-1500	278
VC-125	5,900	22,000	1,500	72	1228-1500	387
VC-400	12,000	43,000	1,400	84	1169-1500	730

DYNAPAC MFG., INC.

(FORMERLY VIBRO-PLUS PRODUCTS, INC.)

Model	Unsprung Drum Wt. (Pounds)	Dynamic Force (Pounds)	Rated Frequency (V.P.M.)	Drum Width (Inches)	Acceptable Frequency Range (V.P.M.)	Index Number (P.L.I. @ 1500 V.P.M.
CA-15	4,150	22,000	1,750	66	1201-1500	307
CA-15A	4,150	24,000	2,500	66	Does not meet specs.	
CA-15D	4,150	22,000	1,750	66	1201-1500	307
CA-25 (Low)	7,200	18,000	1,700	84	Does not meet specs.	
CA-25 (High)	7,200	36,000	1,700	84	1202-1500	419
CA-25 (Super)	9,430	44,000	1,700	84	1245-1500	520
CA-25A (Low)	6,800	18,000	2,400	84	Does not meet specs.	
CA-25A (High)	6,800	36,000	2,400	84	Does not meet specs.	
CA-25D	7,200	36,000	1,700	84	1202-1500	419
CA-25T (Low)	9,450	22,000	1,700	84	Does not meet specs.	
CA-25T (High)	9,450	44,000	1,700	84	1245-1500	520
CA-30 (Low)	9,430	22,000	1,700	84	Does not meet specs.	
CA-30 (High)	9,430	44,000	1,700	84	1245-1500	520
CA-30D (Low)	9,430	22,000	1,700	84	Does not meet specs.	
CA-30D (High)	9,430	44,000	1,700	84	1245-1500	520
CC-10	900	Classified for confined areas only				
CC-21A (Low)	2,600	5,500	3,000	55	Does not meet specs.	
CC-21A (High)	2,600	11,000	3,000	55	Does not meet specs.	

DYNAPAC MFG., INC.

(FORMERLY VIBRO-PLUS PRODUCTS, INC.)

Model	Unsprung Drum Wt. (Pounds)	Dynamic Force (Pounds)	Rated Frequency (V.P.M.)	Drum Width (Inches)	Acceptable Frequency Range (V.P.M.)	Number (P.L.I. @ 1500 V.P.M.)
CC-42A (Low)	4,150	12,000	2,500	66	Does not meet specs.	
CC-42A (High)	4,150	24,000	2,500	66	Does not meet specs.	
CC-50 (Low)	7,200	18,000	1,700	84	Does not meet specs.	
CC-50 (High)	7,200	36,000	1,700	84	1202-1500	419
CC-50A (Low)	6,600	18,000	2,400	84	Does not meet specs.	
CC-50A (High)	6,600	36,000	2,400	84	Does not meet specs.	
CC-50S (Low)	9,450	22,000	1,700	84	Does not meet specs.	
CC-50S (High)	9,450	44,000	1,700	84	1245-1500	520
CG-08	Classified for confined areas only					
CG-09	Classified for confined areas only					
CG-11	Classified for confined areas only					
CH-43	4,800	23,000	1,600	75	1155-1500	333
CK-11	Classified for confined areas only					

C. Instructions for Use of the Nomograph for Determining Loose Lift Thickness

1. Given the manufacturer, model number and anticipated operating frequency, enter the column headed "Acceptable Frequency Range" in the listing to verify that the operating frequency falls within the accepted range.

2. In the listing, enter the column headed "Index Number" to obtain the index number for the model compactor.

3. On the nomograph, locate the Operating Frequency on scale (A) and the Index Number on scale (B).

4. Align the points on scales (A) & (B) to intersect scale (C). This is the P.L.I. at the operating frequency. For non-centrifugal or vertical force machines, reduce the P.L.I. obtained by 175. This adjustment is necessary when rating non-centrifugal compactors due to the cancellation of the horizontal forces and subsequent reduced compaction efficiency.

5. Project horizontally from scale (C) (adjusted for non-centrifugal compactors) to intersect the appropriate curve for soils and select granular materials or blasted or broken rock and then vertically down to locate the Loose Lift Thickness.

   Note: The curves relating loose lift thickness with P.L.I. on the nomograph are based on Figure 203-3 given on Page 112 of the 1973 Standard Specifications or Page 2-17 of the 1978 Standard Specifications. The 1973 Standard Specifications allow up to 4.0 feet loose lift thickness for blasted or broken rock. The 1978 Standard Specifications limit the loose lift thickness for this material to 2.0 feet.

EXAMPLE

GIVEN: BROS SPV-850 COMPACTOR.
ANTICIPATED OPERATING FREQUENCY = 1475 V.P.M.

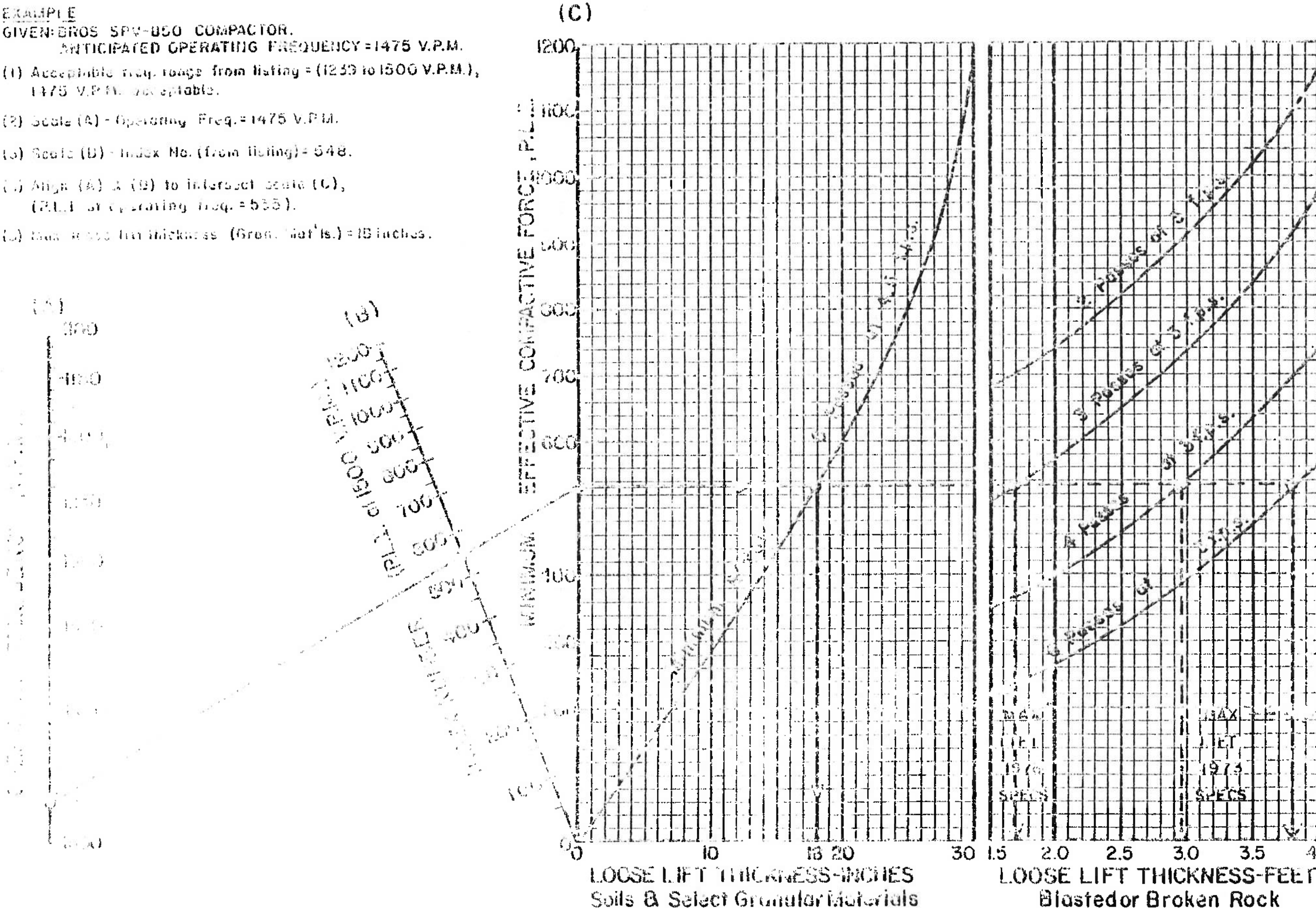
(1) Acceptable freq. range from listing = (1250 to 1500 V.P.M.), 1475 V.P.M. acceptable.

(2) Scale (A) - Operating Freq. = 1475 V.P.M.

(3) Scale (B) - Index No. (from listing) = 548.

(4) Align (A) & (B) to intersect scale (C), (P.L.I. at operating freq. = 555).

(5) Max. loose lift thickness (Gran. Mat'ls.) = 18 inches.



NOMOGRAPH FOR DETERMINING LOOSE LIFT THICKNESS

Example (shown on nomograph)

The Contractor desires to use a Bros SPV-850 compactor at an operating frequency of 1475 V.P.M. The following procedure can be used to determine the maximum loose lift thickness for soils and select granular materials or blasted or broken rock to be compacted with this machine:

1. In the listing on Page 3, the Acceptable Frequency Range is given as 1239-1500 V.P.M. The Operating Frequency (1475 V.P.M.) falls within this range and is therefore acceptable.

2. In the listing on Page 3, the Index Number is given as 548.

3. On the nomograph on Page 15, locate 1475 V.P.M. on Scale (A) and 548 on Scale (B).

4. Align the above points to intersect Scale (C) giving a P.L.I. of 535.

   Note: If this was a non-centrifugal machine, the P.L.I. would have to be reduced by 175 resulting in an effective P.L.I. of 360.

5. Projecting horizontally from 535 on Scale (C) to the curve for soils and select granular materials and vertically down yields a Loose Lift Thickness of 18 inches for 6 passes at a compactor traveling speed of 4.5 f.p.s.

   In a similar manner, for compacting blasted or broken rock with this compactor operating at 1475 V.P.M., the above procedure yields loose lift thickness values of 1.7, 2.95 and 3.8 feet for 3, 4, and 6 passes respectively, at a compactor traveling speed of 3 f.p.s.

   Note: The 1978 Standard Specifications allow a maximum two foot loose lift thickness of blasted or broken rock.

D. Varying Compactive Effort

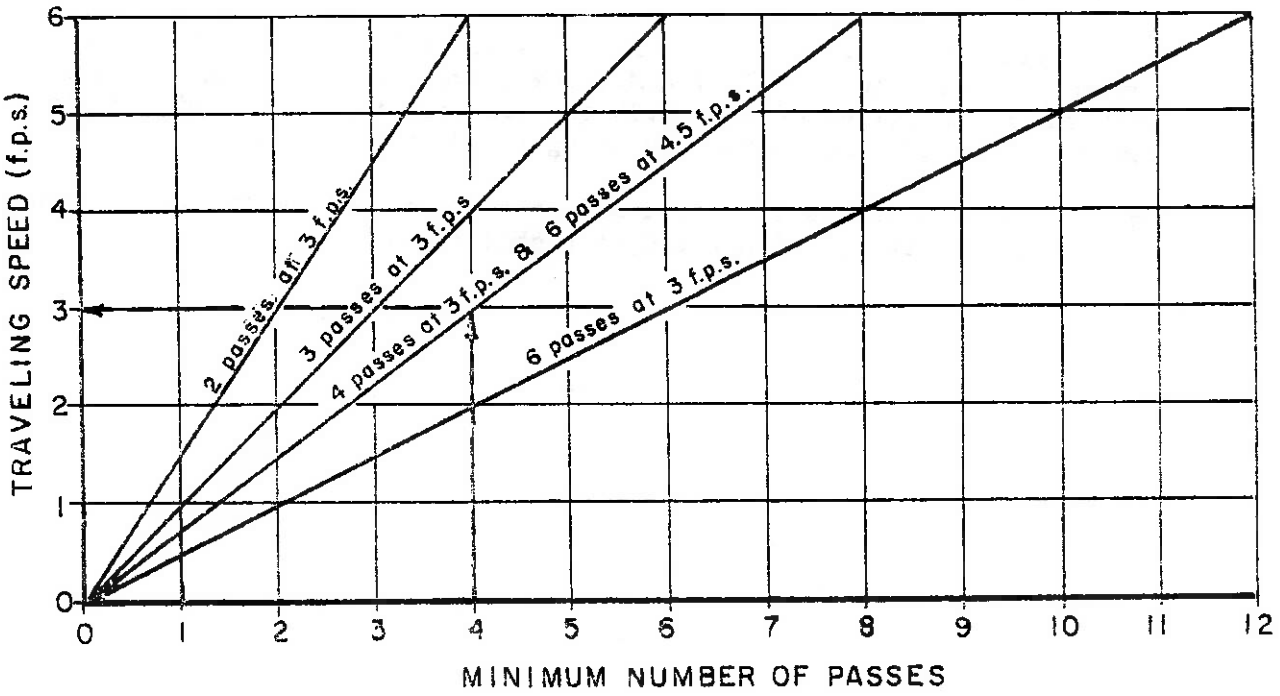
The minimum compactive efforts (minimum number of passes at a specified speed) for soils and select granular materials and blasted or broken rock are given both on the nomograph and Figure 203-3 of the 1973 and 1978 Standard Specifications. These efforts may be modified proportionately for all vibratory compactors using the formula or the chart below, provided the traveling speed does not exceed 6 f.p.s.

$$\text{speed} = \frac{(\text{specified speed})\ \ (\text{minimum passes at speed x})}{(\text{specified minimum passes})}$$

Example (shown on chart)

The Contractor desires to reduce the number of passes required to compact granular material from the specified 6 passes at 4.5 f.p.s. to 4 passes. The maximum allowable compactor traveling speed is:

$$\text{speed} = \frac{(4.5 \text{ f.p.s.})\ \ (4 \text{ passes at speed x})}{(6 \text{ passes at } 4.5 \text{ f.p.s.})} = 3 \text{ f.p.s.}$$



E. Machine Not Listed

The Contractor desires to use a machine which is not contained in the listing. Knowing the basic machine data, the minimum accepted frequency, P.L.I. at the anticipated operating frequency and the maximum loose lift thickness can be determined using the following equations and Figure 203-3 of the Standard Specifications or the curves for soils and select granular materials and blasted or broken rock on the nomograph of Page 15.

Minimum Accepted Operating Frequency ($V_{min.}$)

$$V_{min} = V_1 \sqrt{\frac{2.5\ UDW}{F}}$$

Minimum Effective Compactive Force (P.L.I.)

$$P.L.I. = \frac{UDW}{DW} + \frac{F}{DW}\left(\frac{V_2}{V_1}\right)^2$$

Where:

DW = Drum Width (inches)

F = Dynamic Force at Rated Frequency (pounds)

P.L.I. = Effective Compactive Force Per Linear Inch of Drum Width (pounds/inch)

UDW = Unsprung Drum Weight (pounds)

V_1 = Rated Frequency (V.P.M.)

V_2 = Operating Frequency (V.P.M.)

$V_{min.}$ = Minimum Operating Frequency (V.P.M.)

Example (Machine Not Listed)

The Contractor desires to use an unlisted machine. The Regional Soils Engineer provided the following authenticated machine data:

Unsprung Drum Weight (UDW)	=	6,400 pounds
Dynamic Force at Rated Frequency (F)	=	27,000 pounds
Rated Frequency (V_1)	=	1,800 V.P.M.
Drum Width (DW)	=	84 inches

In addition, the Contractor wishes to run the compactor at an Operating Frequency (V_2) equal to 1450 V.P.M.

1. Minimum Accepted Operating Frequency (V_{min})

$$V_{min} = 1800 \sqrt{\frac{(2.5 \times 6400)}{27000}} = 1385 \text{ V.P.M.}$$

The Acceptable Operating Frequency Range is 1385 - 1500 V.P.M.

2. Minimum Effective Compactive Force (P.L.I.)

$$P.L.I. = \frac{6400}{84} + \frac{27000}{84} \left(\frac{1450}{1800}\right)^2 = 285$$

3. Maximum Loose Lift Thickness

Entering Figure 203-3 (or the nomograph on Page 15) with P.L.I. equal to 285, the Maximum Loose Lift Thickness for soils and select granular material is 10 inches with 6 passes at 4.5 f.p.s. Similarly, for blasted or broken rock the Maximum Loose Lift Thickness is 2.2 feet with 6 passes at 3 f.p.s.

Note: The 1978 Standard Specifications allow a maximum two foot loose lift thickness of blasted or broken rock.