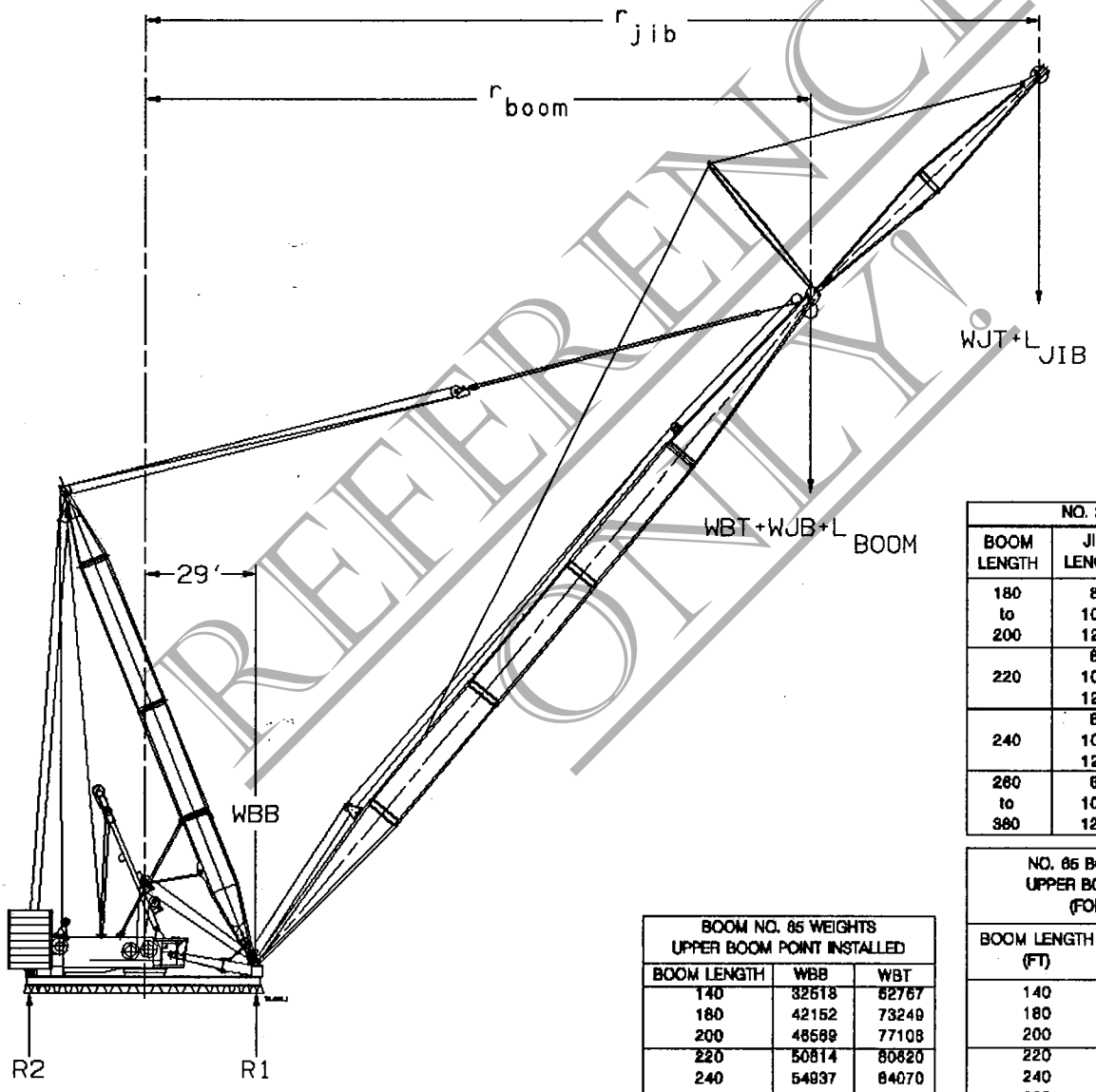
TECHNICAL DATA

FOUNDATION REACTION ESTIMATE
4600 Series 4 RINGER® Series 3 No. 65 Boom

This ground reaction estimation method applies only to a 4600 Series 4 RINGER® Series 3 operating on firm, level, uniformly supporting surface and static operating conditions. The dynamic load effects of hoisting, booming, swinging, wind conditions or any adverse operating conditions are not included in these calculations. For these reasons, sufficient design tolerances should be used by a competent foundation engineer to ensure adequate foundation design. Not to be used for crane rating purposes.



NO. 27AB JIB WEIGHTS			
BOOM LENGTH	JIB LENGTH	WJB	WJT
180	80	33920	9320
to	100	36180	13830
200	120	38280	17140
	80	37550	6750
220	100	39300	11570
	120	41060	15520
	80	39520	5230
240	100	40980	10350
	120	42530	14410
260	80	43680	2130
to	100	44520	7870
380	120	45680	12340

BOOM NO. 65 WEIGHTS UPPER BOOM POINT INSTALLED		
BOOM LENGTH	WBB	WBT
140	32518	52767
160	42152	73249
200	46569	77108
220	50814	80820
240	54937	84070
260	59105	87663
280	62657	91376
300	66917	95510
320	70633	98752
340	74918	102969
360	78584	106283
380	82757	110486
400	86362	113844

NO. 65 BOOM POINT WEIGHTS UPPER BOOM POINT REMOVED (FOR USE WITH JIB)		
BOOM LENGTH (FT)	WBB (LBS)	WBT (LBS)
140	32698	59150
160	42296	69876
200	46698	73549
220	50931	77074
240	55045	80534
260	59204	84186
280	62749	57858
300	67003	91997
320	70714	95244
340	74992	98466
360	78635	102785
380	82825	106991
400	86426	110363

60 Ft. Diameter Ring Support Requirement

The support load distribution is a summation of the loads due to R_1, R_2, the dead weight of the 60 foot diameter ring and the dead weight of the ring support pedestals. Load distribution on the ring supports from R_1 and R_2 is calculated as follows:

Boom Carrier Reaction: (R_1)

The boom carrier reaction on the 60 ft. diameter ring can be estimated for a given boom and jib combination with loads up to and including rated loads by the following method:

$$R_1 = 46{,}200 + WBB + \left[\frac{r_{boom}}{58} + .5\right]\left(WBT + WJB + L_{boom}\right) + \left[\frac{r_{jib}}{58} + .5\right]\left(WJT + L_{jib}\right)$$

When any of the above terms are not required for a particular lifting condition, they become equal to 0.

Note - To find r_{boom} when lifting on the jib, assume jib to be in-line with boom rather than offset 6 degrees to simplify calculations.

R_1 - Reaction under centerline of boom carrier on 60 ft. diameter ring in pounds.

WBB & WBT - Equivalent weight of boom and rigging in pounds at boom hinge pin and boom top respectively.

BL - Length of boom in feet.

WJB & WJT - Equivalent weight of jib and rigging in pounds at jib hinge pin and jib top respectively.

r_{Boom} & r_{Jib} - Horizontal distance in feet from centerline of rotation to boom point and jib point respectively.

L_{Boom} & L_{Jib} - Lifted load in pounds at boom point and jib point respectively. (to include weight of load blocks, slings, rope, etc.)

ϕ - Angle between horizontal and centerline of main boom (Boom Angle).

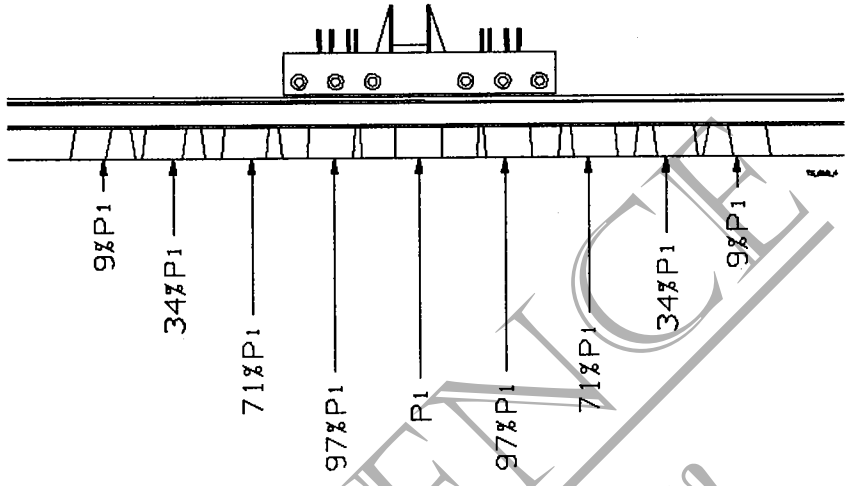
R_2 - Reaction in pounds under centerline of counterweight carrier on 60 foot diameter ring. R_2 is maximum when the machine is not lifting a load.

RING SUPPORT LOAD DISTRIBUTION

RING PEDESTAL SUPPORT LOAD DISTRIBUTION DUE TO R_1

36 SUPPORT PEDESTALS (5' 1-1/4" pedestal spacing, center to center)

$$P_1 = 15{,}000 + 0.193\ R_1$$

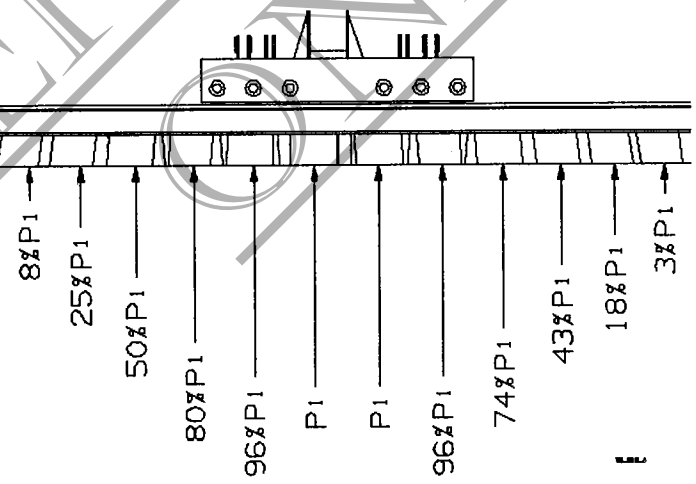


BOOM CARRIER W/RING ON 36 PADS

RING PEDESTAL SUPPORT LOAD DISTRIBUTION DUE TO R_1

48 SUPPORT PEDESTALS (3' 10" pedestal spacing, center to center)

$$P_1 = 20{,}000 + 0.147\ R_1$$



BOOM CARRIER W/RING ON 48 PADS

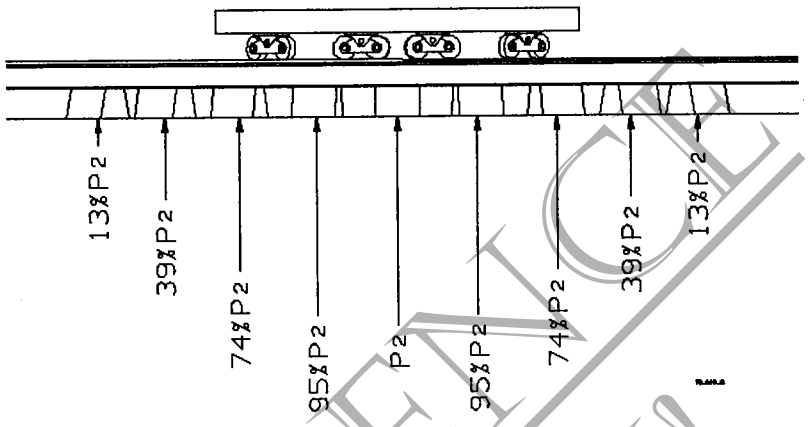
Load distribution is identical whether R_1 is between pedestals or centered over a pedestal due to close spacing of pedestals when 48 are used.

RING SUPPORT LOAD DISTRIBUTION DUE TO R_2

Ctwt (Lbs)	174,100	442,300	889,300	978,700
R2 (Lbs)	214,500	482,700	929,700	1,019,100

36 SUPPORT PEDESTALS (5' 1-1/4" pedestal spacing, center to center)

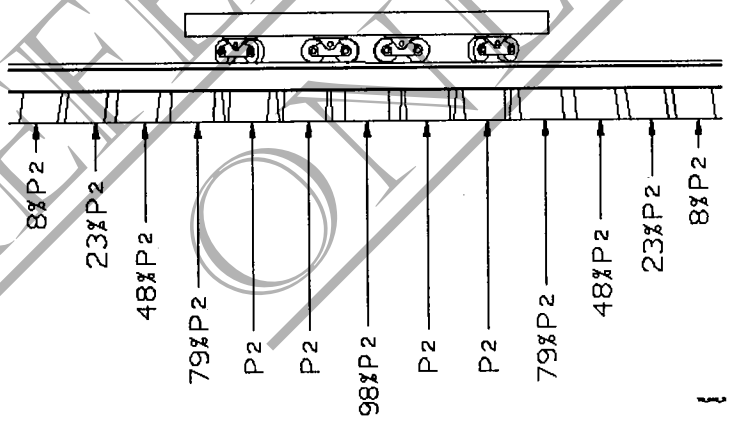
$$P_2 = 20{,}000 + 0.17\ R_2$$



COUNTERWEIGHT CARRIER W/RING ON 36 PADS

48 SUPPORT PEDESTALS (3' 10" pedestal spacing, center to center)

$$P_2 = 15{,}000 + 0.129\ R_2$$



COUNTERWEIGHT CARRIER W/RING ON 48 PADS

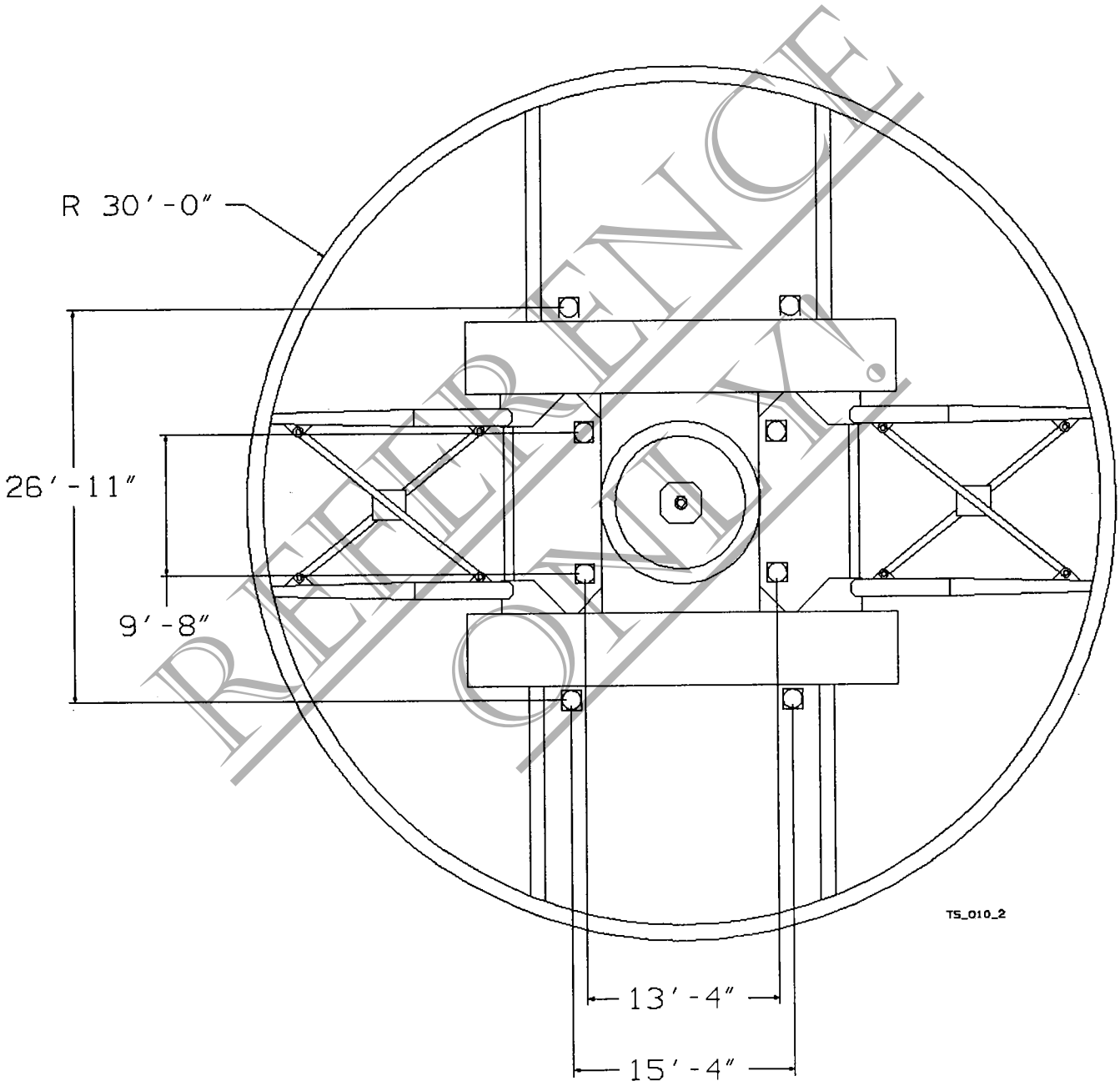
60 Foot diameter roller ring supported by 36 or 48 equally spaced ring pedestal supports each having a base dimension of 36" x 36" (1,296 sq. in.).

Machine Support Requirement During Assembly

The 4600 Series 4 RINGER® Series 3 is supported during assembly/leveling at 4 locations under lugs on the sides of the crawler frames where the 4 side beams are attached. The optional Manitowoc pedestals for this purpose have a 8-1/4" x 11" base dimension (91 sq. in.). The working load on each of these 4 supports is 300,000-lbs.

Hydraulic Jack Support Requirement

Maximum jacking load = 330,000-lbs



FOUNDATION RECOMMENDATIONS

Foundations may be prepared in a number of different ways. Several common forms are concrete pads and crushed stone foundations.

A competent engineer should design the foundations.

Operating Criteria:

1. 60 foot diameter ring must remain level within 1-1/4" (front to back and side to side), unless more stringent requirements are required on the machine's capacity chart. Please consult crane capacity chart for operating criteria.

2. Top surface of machine roller path should be set 24 inches higher than top surface of 60 foot diameter ring, and should not be allowed to become more then 25 inches due to ring settlement. (NOTE - this is measured from top of 60 foot diameter ring wear plate). Make sure hydraulic jacks have been fully retracted.

3. Minimize any gaps between boom carrier rollers and 60 foot diameter ring. Re-shim pedestals when space is present with load or no load conditions.

4. Rotate RINGER 360 degrees a number of times equipped with full RINGER® counterweight and boom to check foundation adequacy and to get an idea of the magnitude of pedestal settlement to expect.

5. Pedestal Settlement Guidelines
   a. 1/4" settlement over 8 pedestals
   b. 1/2" settlement over 10 pedestals
   c. 3/4" settlement over 12 pedestals

NOTE: The foundation should be checked with a test lift or with the RINGER® counterweight (which ever is greater) to determine whether settlement will be within the capacity chart limits. If not within these limits, a better foundation or more support area under the pedestals is needed.

Manitowoc Engineering Company designs and manufactures cranes. We are not experts in soil mechanics or foundation design. The preceding estimating method has been highly simplified and will provide good estimates for the 4600 Series 4 with RINGER® Series 3 lift attachment's specific lift conditions for most soil conditions (calculations based on soil stiffness factor of 400 psi per inch of soil deflection). The calculations will provide higher than actual values for very soft foundations and lower than actual values for very stiff foundations.

FOUNDATION REACTION ESTIMATE SUMMARY SHEET
4600 Series 4 RINGER® Series 3 No. 65 Boom

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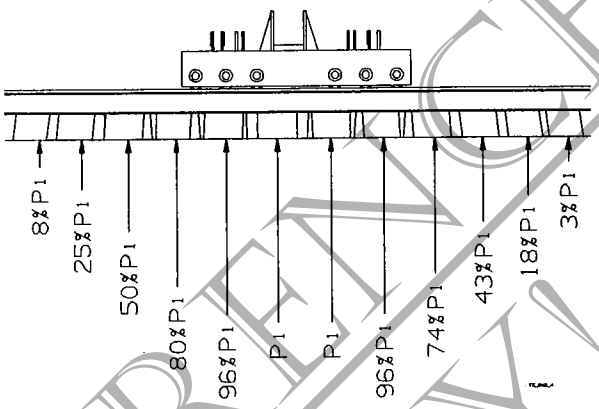
RING PEDESTAL SUPPORT LOAD DISTRIBUTION DUE TO R_1

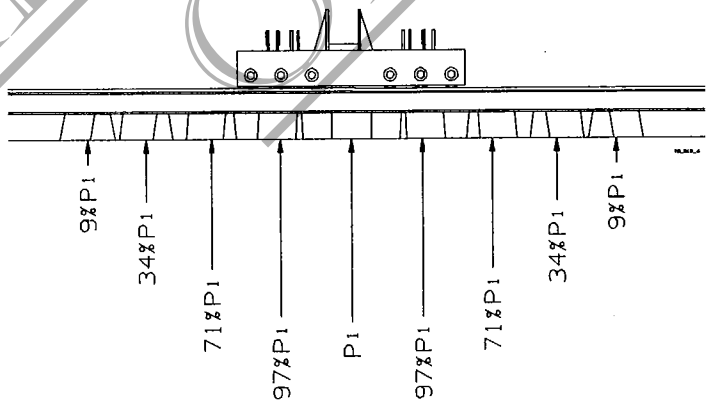
Boom:_____
Jib:_____
Load:_____
Radius:_____
R1:_____



BOOM CARRIER W/RING ON 48 PADS

Load	8%P1	25%P1	50%P1	80%P1	96%P1	P1
Pounds						
PSI						

Boom:_____
Jib:_____
Load:_____
Radius:_____
R1:_____

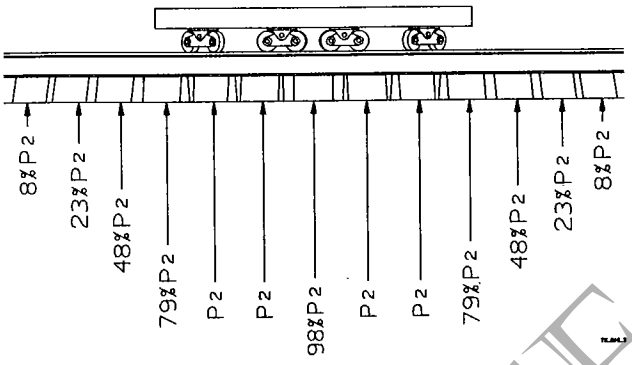


BOOM CARRIER W/RING ON 36 PADS

Load	9%P1	34%P1	71%P1	97%P1	P1
Pounds					
PSI					

RING SUPPORT LOAD DISTRIBUTION DUE TO R_2

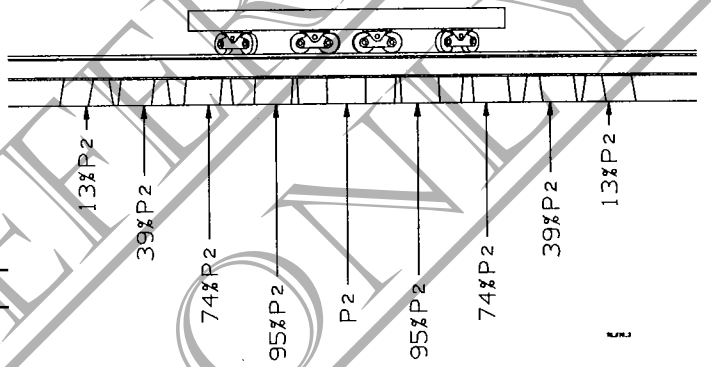
Counterweight:_____
R2:_____



COUNTERWEIGHT CARRIER W/RING ON 48 PADS

Load	8%P2	23%P2	48%P2	79%P2	98%P2	P2
Pounds						
PSI						

Counterweight:_____
R2:_____



COUNTERWEIGHT CARRIER W/RING ON 36 PADS

Load	13%P2	39%P2	74%P2	95%P2	P2
Pounds					
PSI					