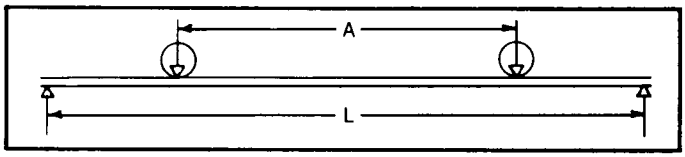
AMERICAN CRANE & HOIST

RUNWAY BEAM

EQUIVALENT CENTER LOAD & MAXIMUM SUPPORT LOAD FOR TWO MOVING LOADS

The purpose of this procedure is to outline the steps and calculations involved in determining the equivalent center load and the maximum support load for runway beams subjected to two equal moving loads (2-wheel top running end truck or 4-wheel underhung end truck).



The figure above represents a runway beam span length between supports on which is operating two *equal* moving loads separated by a distance equal to a crane end truck wheel base. Each moving load is *equal* to M.W.L. and can be calculated by procedures outlined on information sheets for the product under investigation.

EQUIVALENT CENTER LOAD (E.C.L.)

E.C.L. is the load that, when applied in a concentrated loading condition at the center of the span length specified, causes a bending stress in the beam equivalent to the bending stress that occurs in the beam when two *equal* moving loads separated by a specified wheel base distance operates on it.

MAXIMUM SUPPORT LOAD (M.S.L.)

Loading at the runway span supports will vary as the two *equal* moving loads change position during operation on the runway. The maximum loading condition must be known for design of the support and is called M.S.L. caused by the moving crane loads.

The following information for calculating E.C.L. and M.S.L. is based on the standard A.I.S.C. equations for a simple beam having two *equal* concentrated moving loads.

STEP 1—CALCULATE RATIO A/L

Calculate the ratio A/L, where A = truck wheel base, and L = runway span length between supports. Values of A and L must be in the same units, both in inches, or both in feet.

STEP 2—SELECT MULTIPLICATION FACTORS

From the following table, select the multiplication factors K_1 and K_2 based on the calculated A/L ratio. When the calculated value of A/L falls between the A/L values shown in the table, use the next lower tabulated A/L value.

	Less Than						
A/L	.05	.05	.10	.15	.20	.25	.30
K_1	2.000	1.902	1.805	1.712	1.620	1.532	1.445
K_2	2.000	1.950	1.900	1.850	1.800	1.750	1.700
A/L	.35	.40	.45	.50	.55	.60	.65
K_1	1.362	1.280	1.202	1.125	1.052	1.000	1.000
K_2	1.650	1.600	1.550	1.500	1.450	1.400	1.350
A/L	.70	.75	.80	.85	.90	.95	1.00 or greater
K_1	1.000	1.000	1.000	1.000	1.000	1.000	1.000
K_2	1.300	1.250	1.200	1.150	1.100	1.050	1.000

STEP 3—CALCULATE EQUIVALENT CENTER LOAD (E.C.L.)

E.C.L. is calculated by multiplying M.W.L. by multiplication factor K_1 or

$$E.C.L. = (K_1)(M.W.L.)$$

STEP 4—CALCULATE MAXIMUM SUPPORT LOAD (M.S.L.)

M.S.L. is calculated by multiplying M.W.L. by multiplication factor K_2 or

$$M.S.L. = (K_2)(M.W.L.)$$

The above calculated M.S.L. is based on loading caused by the crane only and the total load on the support to use in the support design must also include the runway beam weight, lateral and longitudinal loads caused by crane trolley and bridge movement, and weight of any attachments and equipment mounted on the runway.

EXAMPLE:

Find the E.C.L. and M.S.L. for a runway span of 30′ on which an end truck having a 6′-9″ wheel base operates. M.W.L. = 8000#

$$\text{Wheel base} = 6'\text{-}9'' = 6.75'$$

$$\frac{A}{L} = \frac{6.75}{30} = .225$$

Table does not have an A/L value of .225, therefore, use the next lower value. A/L = .20

From table, under A/L value of .20,

$$K_1 = 1.620$$
$$K_2 = 1.800$$

$$E.C.L. = (K_1)(M.W.L.) = (1.620)(8000) = 12960\#$$

$$M.S.L. = (K_2)(M.W.L.) = (1.800)(8000) = 14400\#$$

SUPPLEMENTARY INFORMATION—TWO UNEQUAL MOVING LOADS

For conditions where two *unequal* moving loads are encountered, the E.C.L. and M.S.L. can be calculated by the standard A.I.S.C. equations for a simple beam having two *unequal* concentrated moving loads. Procedures and equations are as follows, where:

P_1 = Heavier load
P_2 = Lighter load
M = Maximum bending moment

Calculate M by the following two methods:

$$M = \frac{P_1 + P_2}{4L}\left(L - \frac{P_2 A}{P_1 + P_2}\right)^2$$

$$M = \frac{P_1 L}{4}$$

Use the largest value of M and calculate E.C.L. as follows:

$$E.C.L. = \frac{4M}{L}$$

Calculate M.S.L. as follows:

Where A is less than L:

$$M.S.L. = P_1 + (P_2)\left(\frac{L - A}{L}\right)$$

Where A is equal to or greater than L:

$$M.S.L. = P_1$$