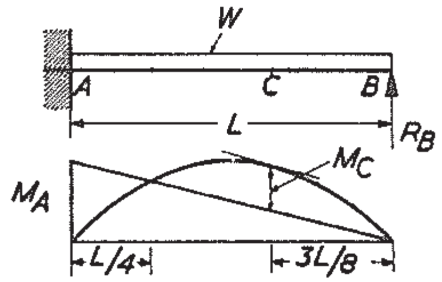
PROPPED CANTILEVERS

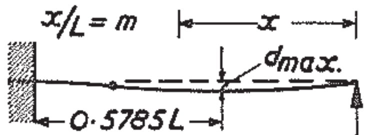
LOADING · MOMENT · SHEAR · DEFLECTION



$$M_A = -\frac{WL}{8} \qquad M_C = \frac{9WL}{128}$$

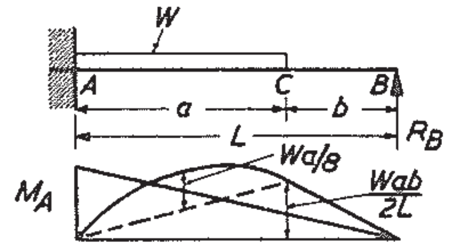
$$R_A = \frac{5W}{8} \qquad R_B = \frac{3W}{8}$$

$x/L = m$



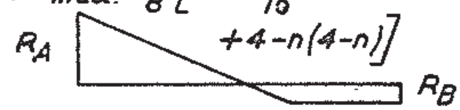
$$d = \frac{WL^3}{48EI}(m - 3m^3 + 2m^4)$$

$$d_{max.} = \frac{WL^3}{185EI}$$



$$M_A = -\frac{Wa}{8}(2-n)^2 \text{ where } a/L = n$$

$$+M_{max.} = \frac{Wa}{8}\left[-\frac{[8-n^2(4-n)]^2}{16} + 4 - n(4-n)\right]$$

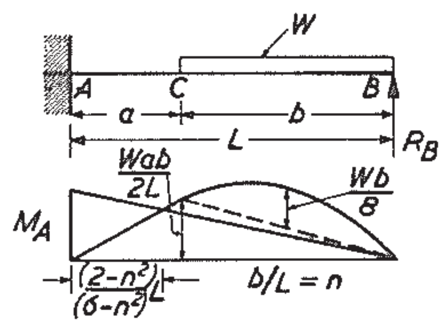


$$R_A = \frac{W}{8}[8 - n^2(4-n)]$$

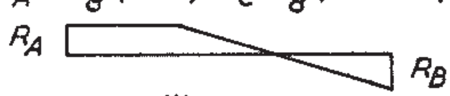
$$R_B = \frac{Wn^2}{8}(4-n)$$

$$d_C = \frac{Wa^3}{48EI}(6 - 12n + 7n^2 - n^3)$$

LOADING · MOMENT · SHEAR · DEFLECTION

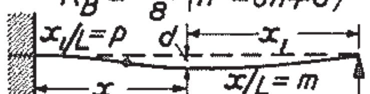


$$M_A = -\frac{Wb}{8}(2-n^2) \qquad M_C = \frac{Wb}{8}(6n - n^3 - 4)$$



$$R_A = \frac{Wn}{8}(6-n^2)$$

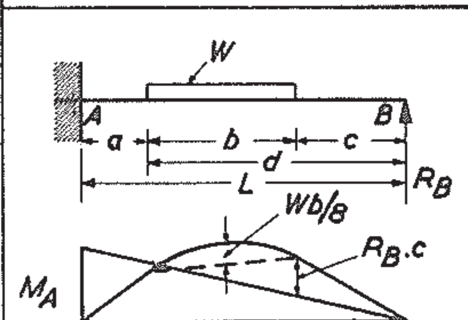
$$R_B = \frac{W}{8}(n^3 - 6n + 8)$$



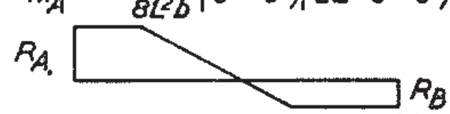
When $x \leqslant a$, $d = \frac{WbL^2}{48EI}[(n^2-6)m^3 - (3n^2-6)m^2]$

When $x \geqslant a$,

$$d = \frac{WL^4}{48bEI}\left[2p^4 - p^3 n(n^3 - 6n + 8) + pn^2(3n^2 - 8n + 6)\right]$$



$$M_A = -\frac{W}{8L^2b}(d^2 - c^2)(2L^2 - c^2 - d^2)$$



$$R_A = r_A + \frac{M_A}{L} \qquad R_B = r_B - \frac{M_A}{L}$$

Where r_A and r_B are the simple support reactions for the beam (M_A being considered positive)

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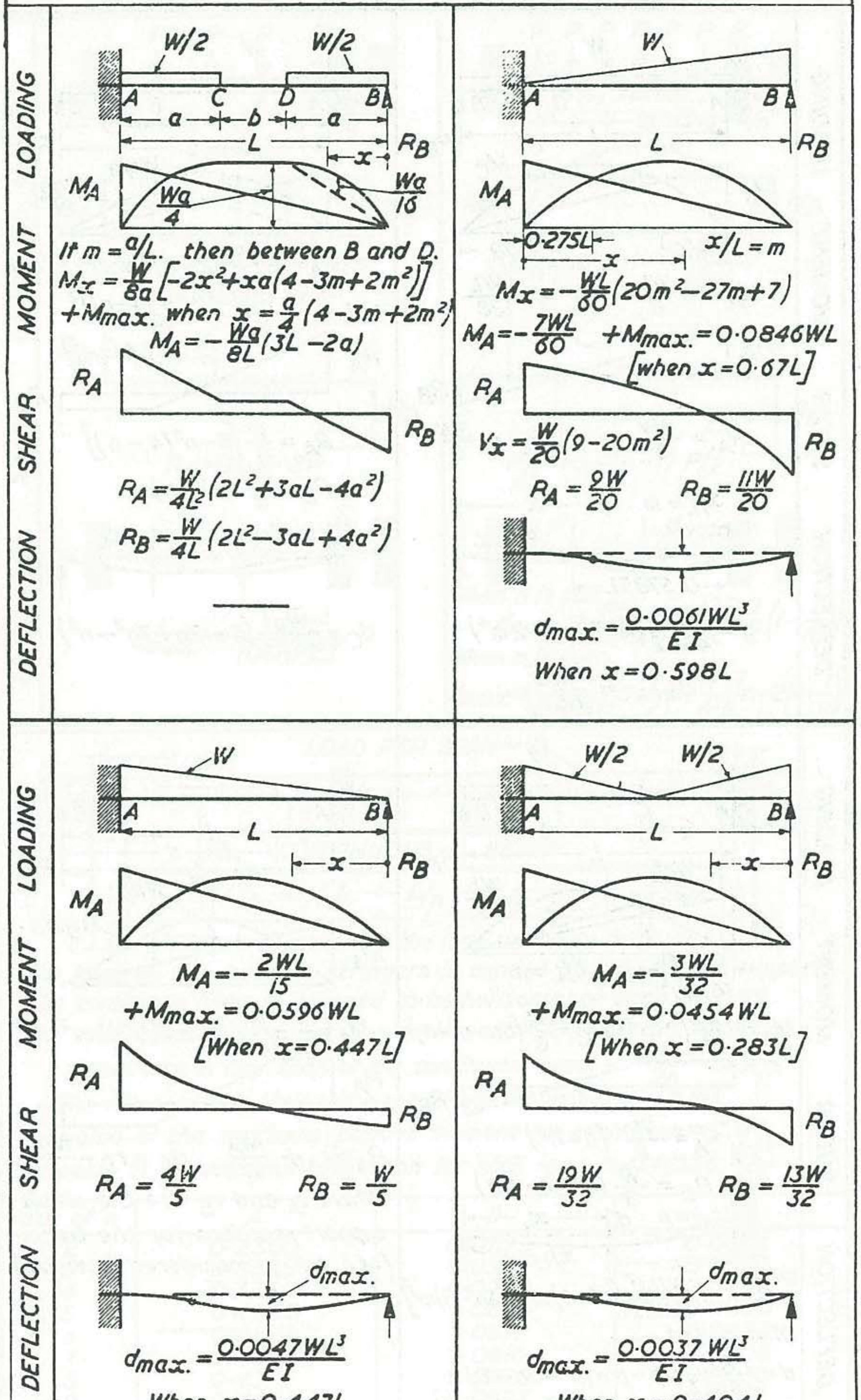
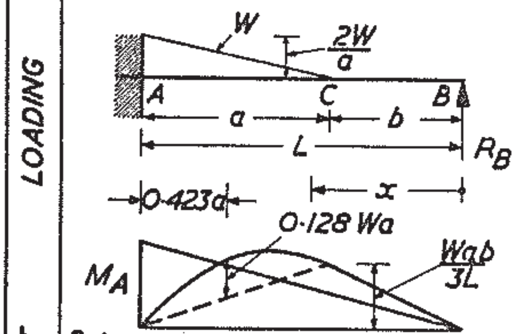


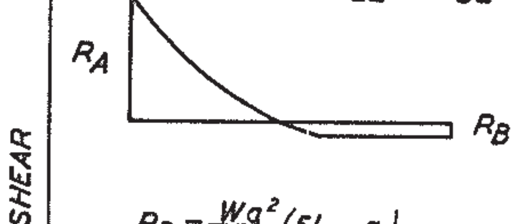
PROPPED CANTILEVERS



Between C and A, $M_x = R_B.x - \frac{W}{3a^2}(x-b)^3$

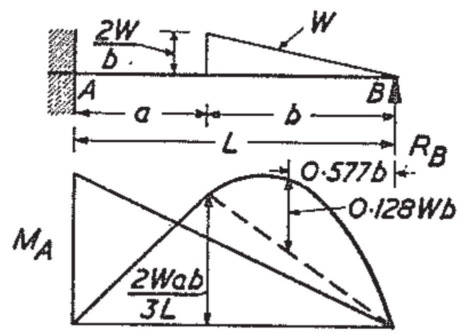
$M_A = -\frac{Wa}{60L^2}(3a^2-15aL+20L^2)$

$+M_{max.}$ when $x = b + \frac{a^2}{2L}\sqrt{1-\frac{a}{5L}}$



$R_B = \frac{Wa^2}{20L^3}(5L-a)$

$R_A = W - R_B$

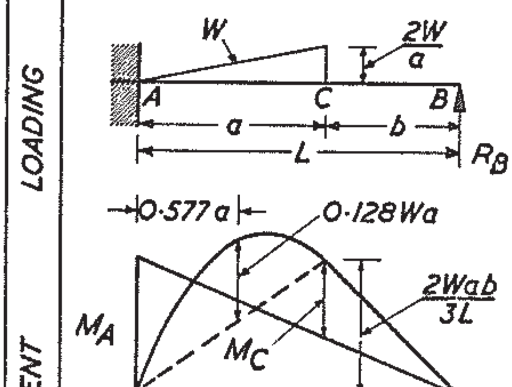


$M_x = R_B.x - \frac{Wx^3}{3b^2}$

$M_A = -\frac{Wb}{15L^2}(5L^2-3b^2)$

$R_A = \frac{Wb}{5L^3}(5L^2-b^2)$

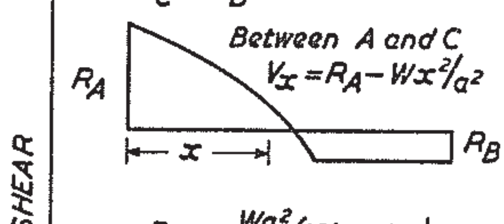
$R_B = \frac{W}{5L^3}(b^3+5aL^2)$



When $m = a/L$

$M_A = -Wa\left(\frac{m^2}{5} - \frac{3m}{4} + \frac{2}{3}\right)$

$M_C = R_B.b$

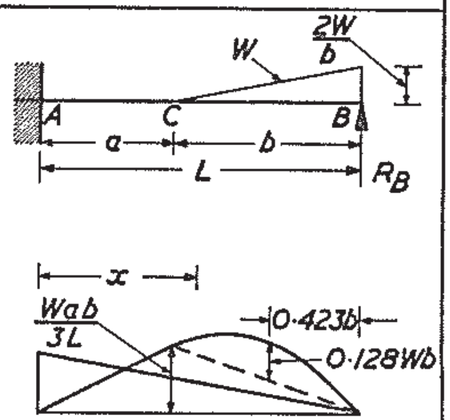


Between A and C

$V_x = R_A - Wx^2/a^2$

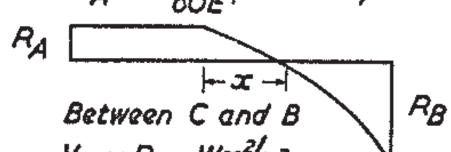
$R_B = \frac{Wa^2}{20L^3}(15L-4a)$

$R_A = W - R_B$



$M_x = R_A.x + M_A - \frac{W}{3b^2}(x-a)^3$

$M_A = -\frac{Wb}{60L^2}(10L^2-3b^2)$



Between C and B

$V_x = R_A - Wx^2/b^2$

$R_B = \frac{W}{20b^2L^3}\left[L^4(11L-15a)+a^4(5L-a)\right]$

$R_A = W - R_B$

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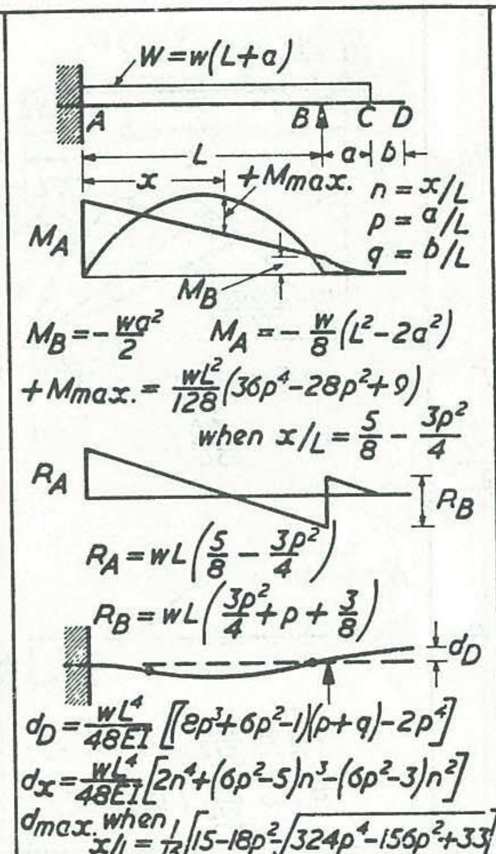
LOADING — MOMENT — SHEAR — DEFLECTION



$$M_B = -\frac{wa^2}{2} \qquad M_A = -\frac{w}{8}\left(L^2-2a^2\right)$$

$$+M_{max.} = \frac{wL^2}{128}\left(36p^4-28p^2+9\right)$$

$$\text{when } x/L = \frac{5}{8}-\frac{3p^2}{4}$$

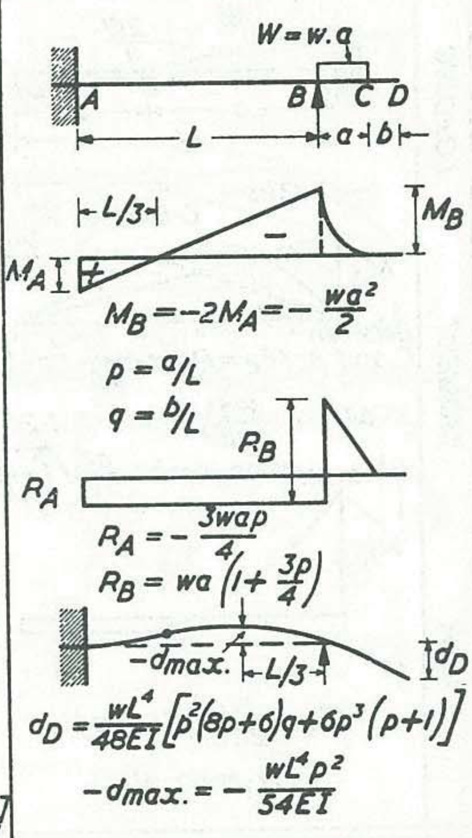
$$R_A = wL\left(\frac{5}{8}-\frac{3p^2}{4}\right)$$

$$R_B = wL\left(\frac{3p^2}{4}+p+\frac{3}{8}\right)$$

$$d_D = \frac{wL^4}{48EI}\left[\left(8p^3+6p^2-1\right)(p+q)-2p^4\right]$$

$$d_x = \frac{wL^4}{48EI}\left[2n^4+\left(6p^2-5\right)n^3-\left(6p^2-3\right)n^2\right]$$

$$d_{max.} \text{ when } x/L = \frac{1}{16}\left[15-18p^2-\sqrt{324p^4-156p^2+33}\right]$$



$$M_B = -2M_A = -\frac{wa^2}{2}$$

$$p = a/L$$

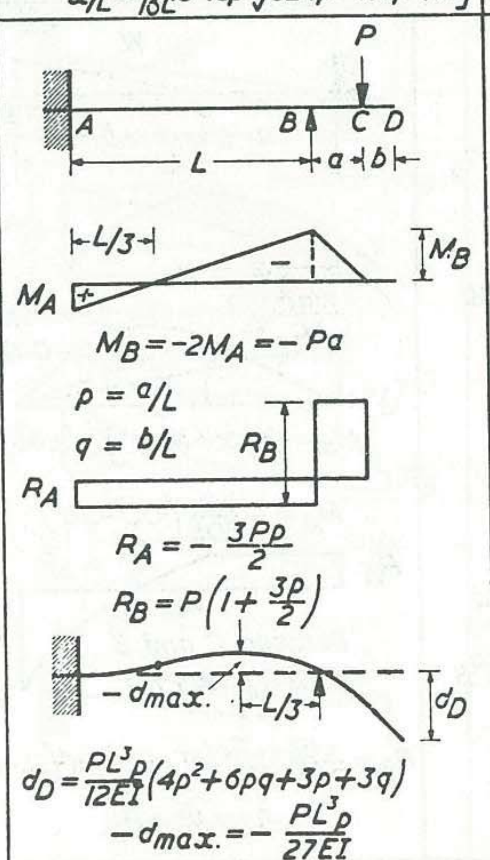
$$q = b/L$$

$$R_A = -\frac{3wap}{4}$$

$$R_B = wa\left(1+\frac{3p}{4}\right)$$

$$d_D = \frac{wL^4}{48EI}\left[p^2(8p+6)q+6p^3(p+1)\right]$$

$$-d_{max.} = -\frac{wL^4p^2}{54EI}$$



$$M_B = -2M_A = -Pa$$

$$p = a/L$$

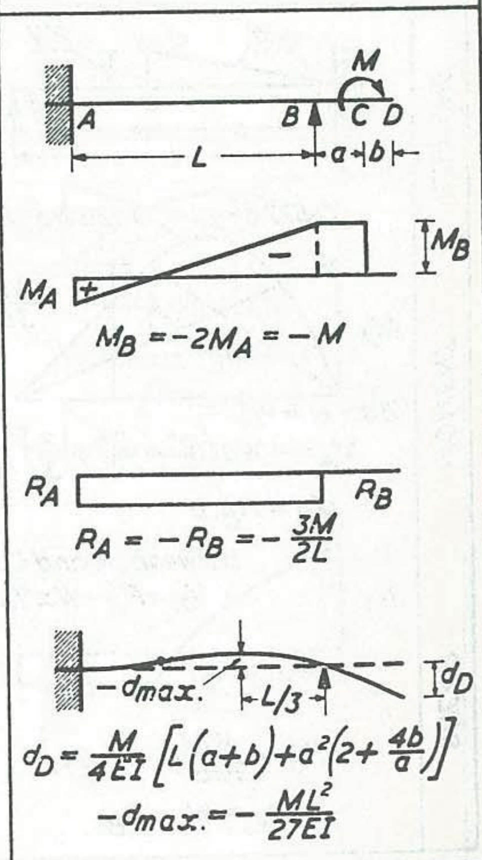
$$q = b/L$$

$$R_A = -\frac{3Pp}{2}$$

$$R_B = P\left(1+\frac{3p}{2}\right)$$

$$d_D = \frac{PL^3p}{12EI}\left(4p^2+6pq+3p+3q\right)$$

$$-d_{max.} = -\frac{PL^3p}{27EI}$$



$$M_B = -2M_A = -M$$

$$R_A = -R_B = -\frac{3M}{2L}$$

$$d_D = \frac{M}{4EI}\left[L(a+b)+a^2\left(2+\frac{4b}{a}\right)\right]$$

$$-d_{max.} = -\frac{ML^2}{27EI}$$

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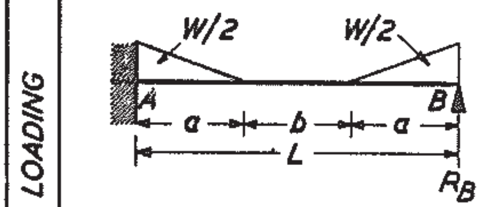
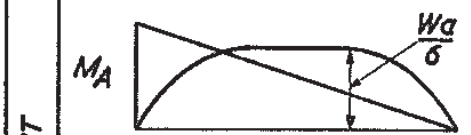
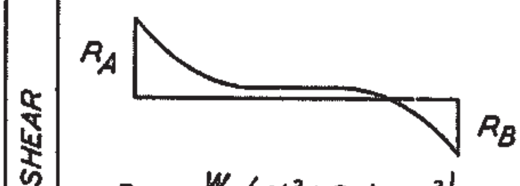


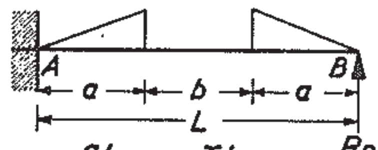


$$M_A = -\frac{Wa}{8L}(2L-a)$$

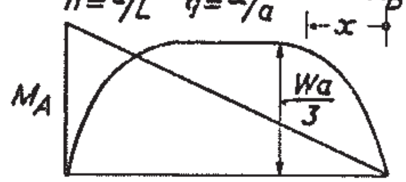


$$R_A = \frac{W}{8L^2}(4L^2+2aL-a^2)$$

$$R_B = W - R_A$$



$n = a/L \quad q = x/a$



$$M_A = -\frac{Wa}{8L}(4L-3a)$$

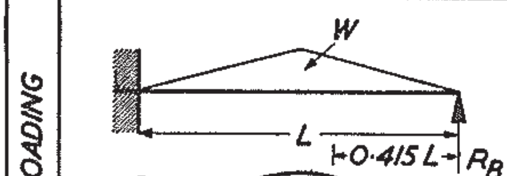
When $x < a$,

$$M_x = \frac{W}{24}(9n^2x - 12nx + 12x - 4xq^2)$$

$+M_{max.}$ occurs when $q = \sqrt{\frac{3n^2}{4} - n + 1}$

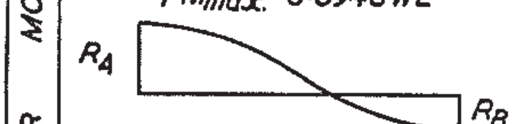
$$R_A = \frac{W}{8L^2}(4L^2+4aL-3a^2)$$

$$R_B = W - R_A$$

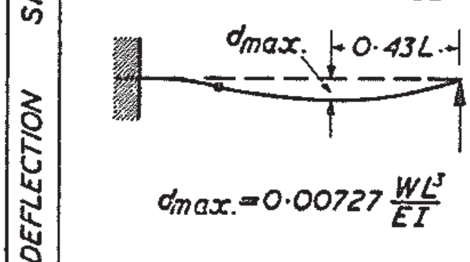


$$M_A = -\frac{5WL}{32}$$

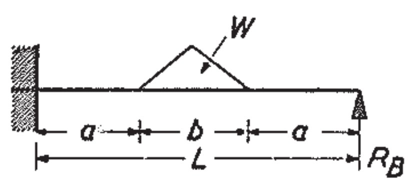
$$+M_{max.} = 0{\cdot}0948\,WL$$



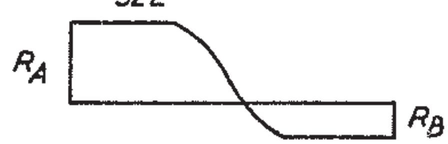
$$R_A = \frac{21W}{32} \qquad R_B = \frac{11W}{32}$$



$$d_{max.} = 0{\cdot}00727\,\frac{WL^3}{EI}$$

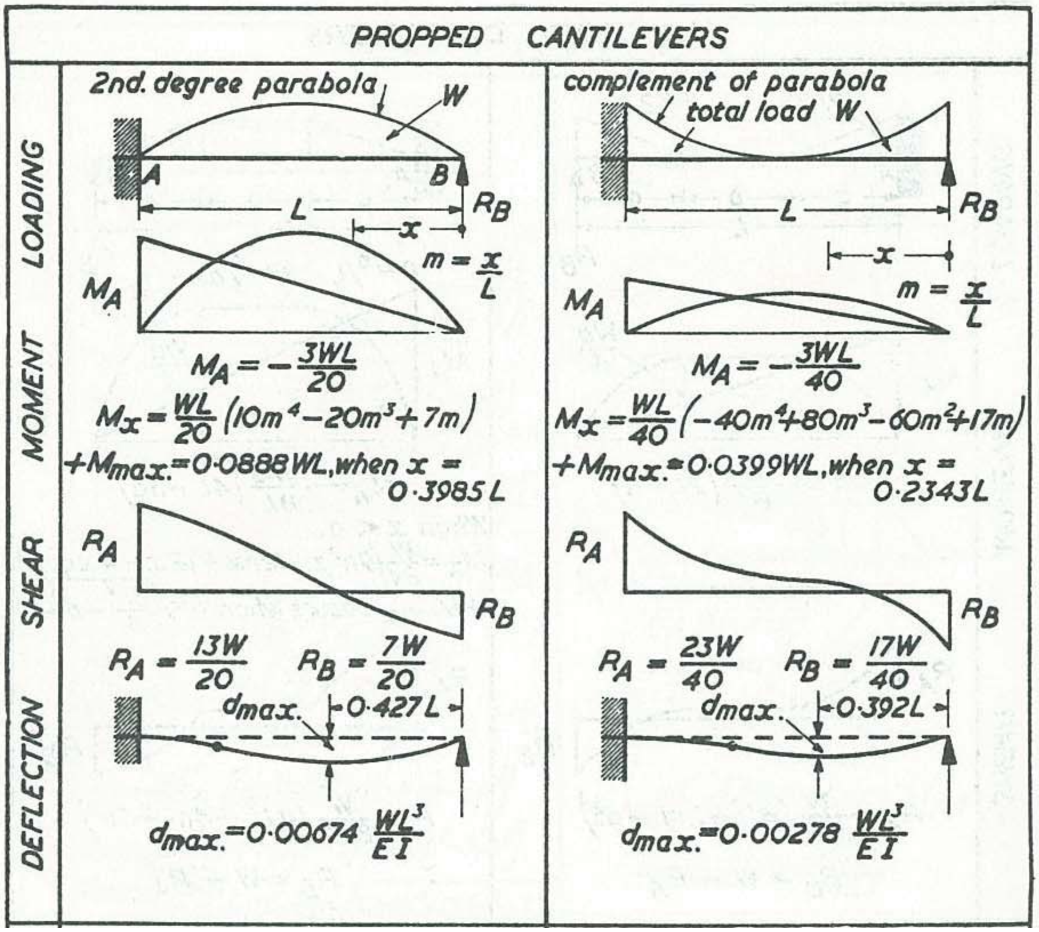


$$M_A = \frac{W}{32L}(5L^2+4aL-4a^2)$$



$$R_A = \frac{W}{32L^2}(21L^2+4aL-4a^2)$$

$$R_B = W - R_A$$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LOADING
MOMENT
SHEAR
DEFLECTION
2nd. degree parabola
W
A
B
L
x
R_B
$m = \frac{x}{L}$
M_A
$M_A = -\frac{3WL}{20}$
$M_x = \frac{WL}{20}(10m^4 - 20m^3 + 7m)$
$+M_{max.} = 0{\cdot}0888\,WL$, when $x = 0{\cdot}3985\,L$
R_A
R_B
$R_A = \frac{13W}{20}$
$R_B = \frac{7W}{20}$
$d_{max.}$
$0{\cdot}427\,L$
$d_{max.} = 0{\cdot}00674\,\frac{WL^3}{EI}$
complement of parabola
total load W
L
R_B
x
$m = \frac{x}{L}$
M_A
$M_A = -\frac{3WL}{40}$
$M_x = \frac{WL}{40}(-40m^4 + 80m^3 - 60m^2 + 17m)$
$+M_{max.} = 0{\cdot}0399\,WL$, when $x = 0{\cdot}2343\,L$
R_A
R_B
$R_A = \frac{23W}{40}$
$R_B = \frac{17W}{40}$
$d_{max.}$
$0{\cdot}392\,L$
$d_{max.} = 0{\cdot}00278\,\frac{WL^3}{EI}$