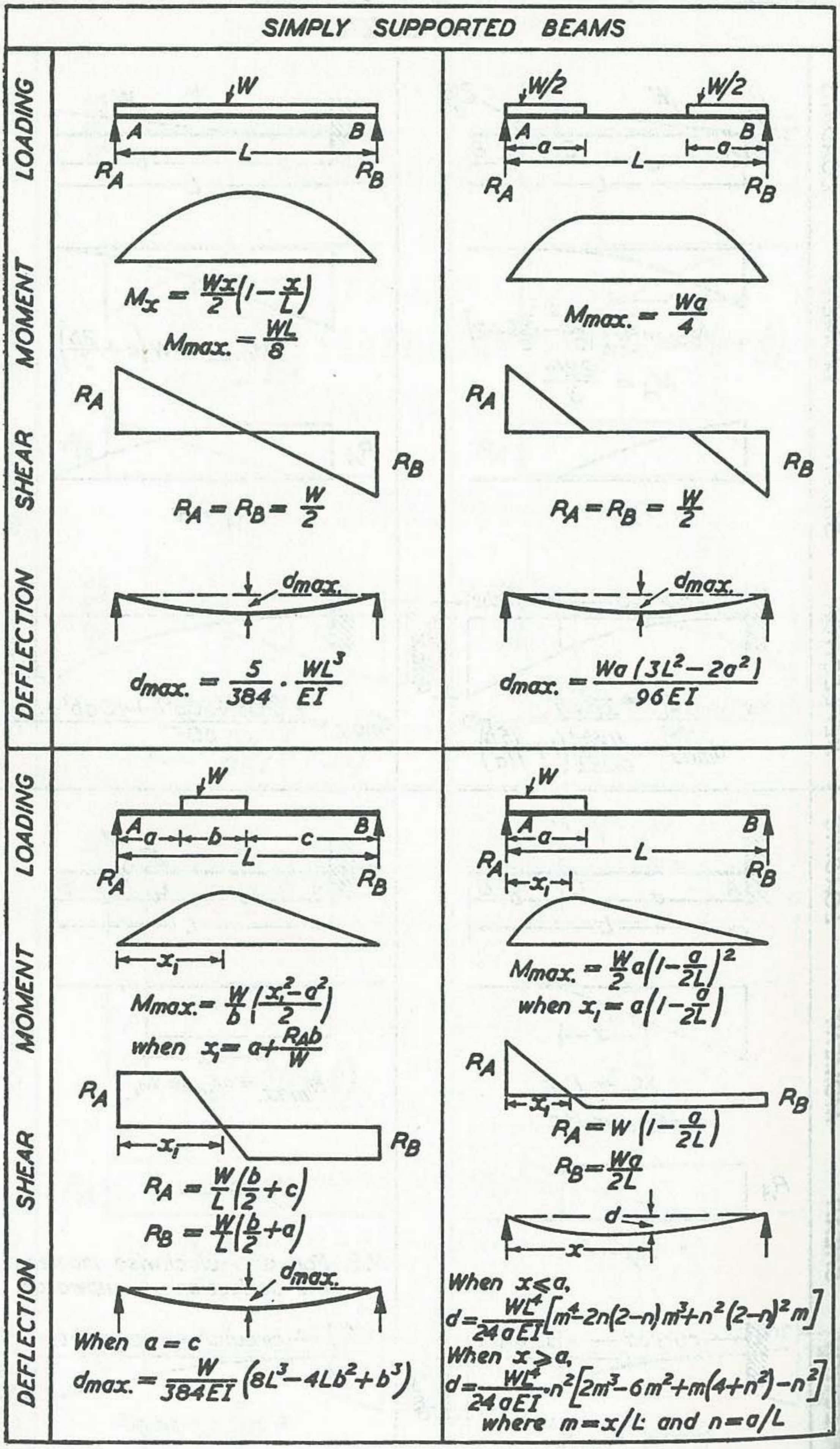
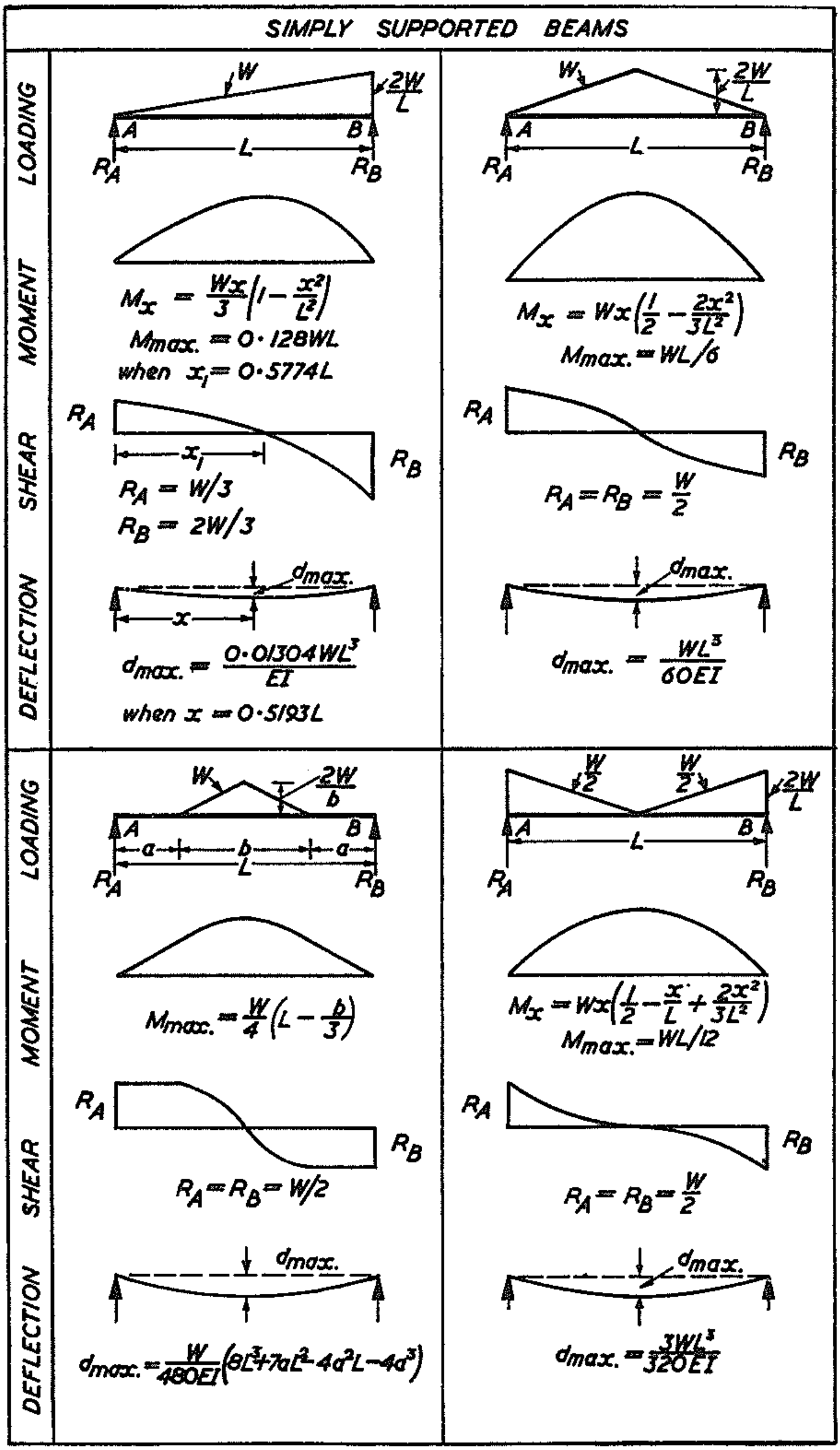
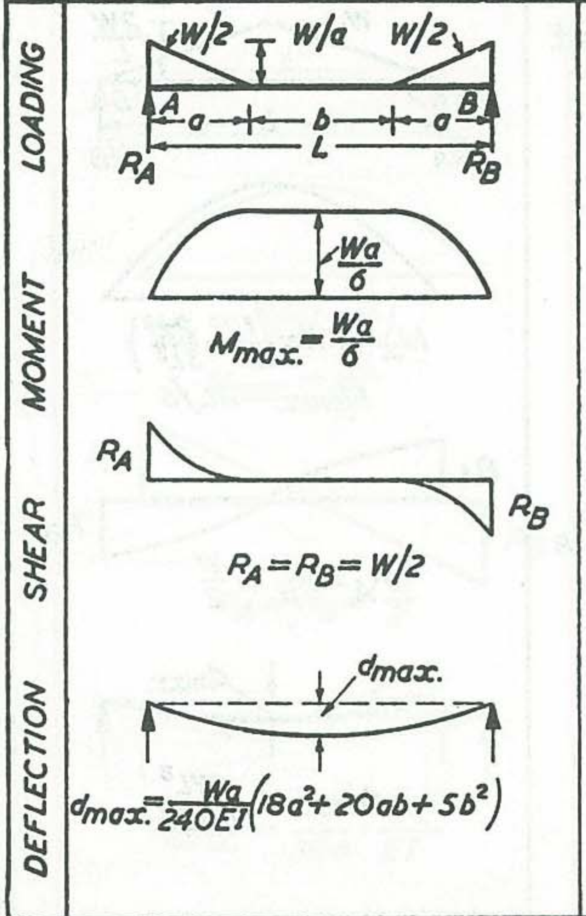

SIMPLY SUPPORTED BEAMS
LOADING
MOMENT
SHEAR
DEFLECTION
W
A
B
L
R_A
R_B
$M_x = \frac{Wx}{2}\left(1-\frac{x}{L}\right)$
$M_{max.} = \frac{WL}{8}$
$R_A = R_B = \frac{W}{2}$
$d_{max.}$
$d_{max.} = \frac{5}{384} \cdot \frac{WL^3}{EI}$
W/2
W/2
a
a
$M_{max.} = \frac{Wa}{4}$
$R_A = R_B = \frac{W}{2}$
$d_{max.} = \frac{Wa\,(3L^2-2a^2)}{96EI}$
a
b
c
x_1
$M_{max.} = \frac{W}{b}\left(\frac{x_1^2-a^2}{2}\right)$
when $x_1 = a + \frac{R_A b}{W}$
$R_A = \frac{W}{L}\left(\frac{b}{2}+c\right)$
$R_B = \frac{W}{L}\left(\frac{b}{2}+a\right)$
When $a = c$
$d_{max.} = \frac{W}{384EI}\left(8L^3-4Lb^2+b^3\right)$
$M_{max.} = \frac{W}{2}a\left(1-\frac{a}{2L}\right)^2$
when $x_1 = a\left(1-\frac{a}{2L}\right)$
$R_A = W\left(1-\frac{a}{2L}\right)$
$R_B = \frac{Wa}{2L}$
d
x
When $x \leq a$,
$d = \frac{WL^4}{24aEI}\left[m^4-2n(2-n)m^3+n^2(2-n)^2 m\right]$
When $x \geq a$,
$d = \frac{WL^4}{24aEI} \cdot n^2\left[2m^3-6m^2+m(4+n^2)-n^2\right]$
where $m = x/L$ and $n = a/L$


SIMPLY SUPPORTED BEAMS
LOADING
MOMENT
SHEAR
DEFLECTION
W
2W/L
A
B
L
R_A
R_B
$M_x = \frac{Wx}{3}\left(1-\frac{x^2}{L^2}\right)$
$M_{max.} = 0\cdot 128WL$
when $x_1 = 0\cdot 5774L$
x_1
$R_A = W/3$
$R_B = 2W/3$
$d_{max.}$
x
$d_{max.} = \frac{0\cdot 01304WL^3}{EI}$
when $x = 0\cdot 5193L$
W
2W/L
A
B
L
R_A
R_B
$M_x = Wx\left(\frac{1}{2}-\frac{2x^2}{3L^2}\right)$
$M_{max.} = WL/6$
$R_A = R_B = \frac{W}{2}$
$d_{max.}$
$d_{max.} = \frac{WL^3}{60EI}$
W
2W/b
A
B
a
b
a
L
R_A
R_B
$M_{max.} = \frac{W}{4}\left(L-\frac{b}{3}\right)$
$R_A = R_B = W/2$
$d_{max.}$
$d_{max.} = \frac{W}{480EI}(8L^3+7aL^2-4a^2L-4a^3)$
W/2
W/2
2W/L
A
B
L
R_A
R_B
$M_x = Wx\left(\frac{1}{2}-\frac{x}{L}+\frac{2x^2}{3L^2}\right)$
$M_{max.} = WL/12$
$R_A = R_B = \frac{W}{2}$
$d_{max.}$
$d_{max.} = \frac{3WL^3}{320EI}$

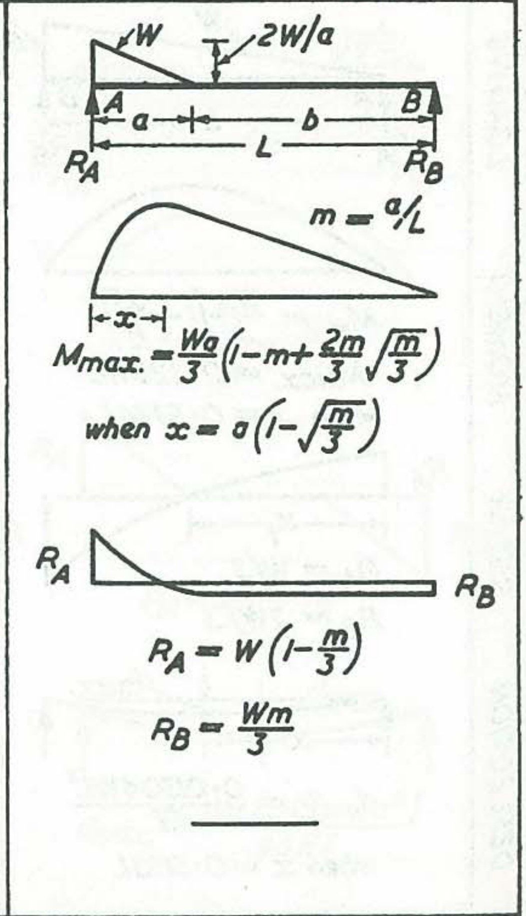
SIMPLY SUPPORTED BEAMS



$M_{max.} = \frac{Wa}{6}$

$R_A = R_B = W/2$

$d_{max.} = \frac{Wa}{240EI}(18a^2 + 20ab + 5b^2)$

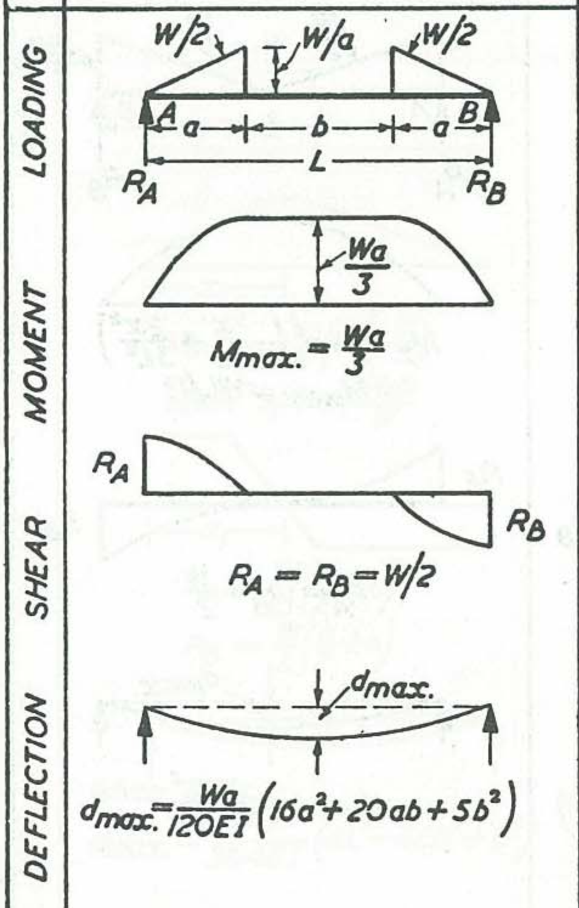


$M_{max.} = \frac{Wa}{3}\left(1 - m + \frac{2m}{3}\sqrt{\frac{m}{3}}\right)$

when $x = a\left(1 - \sqrt{\frac{m}{3}}\right)$

$R_A = W\left(1 - \frac{m}{3}\right)$

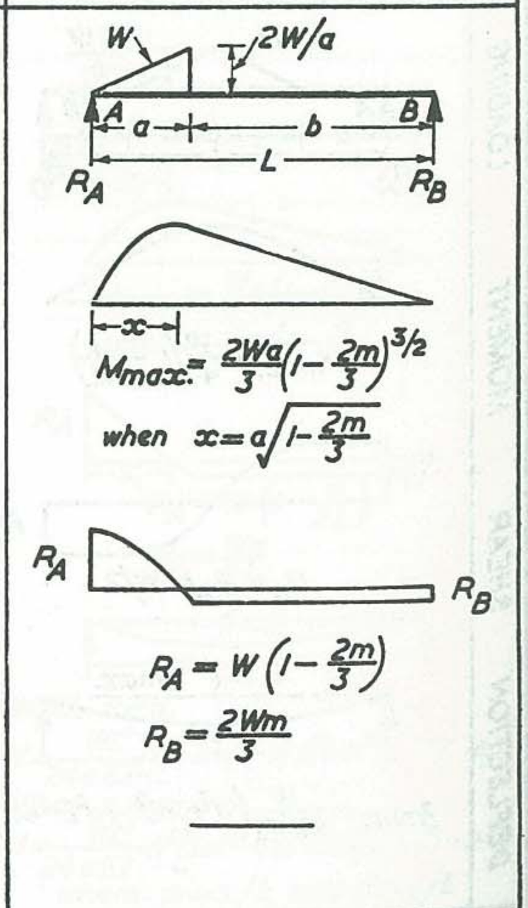
$R_B = \frac{Wm}{3}$



$M_{max.} = \frac{Wa}{3}$

$R_A = R_B = W/2$

$d_{max.} = \frac{Wa}{120EI}(16a^2 + 20ab + 5b^2)$

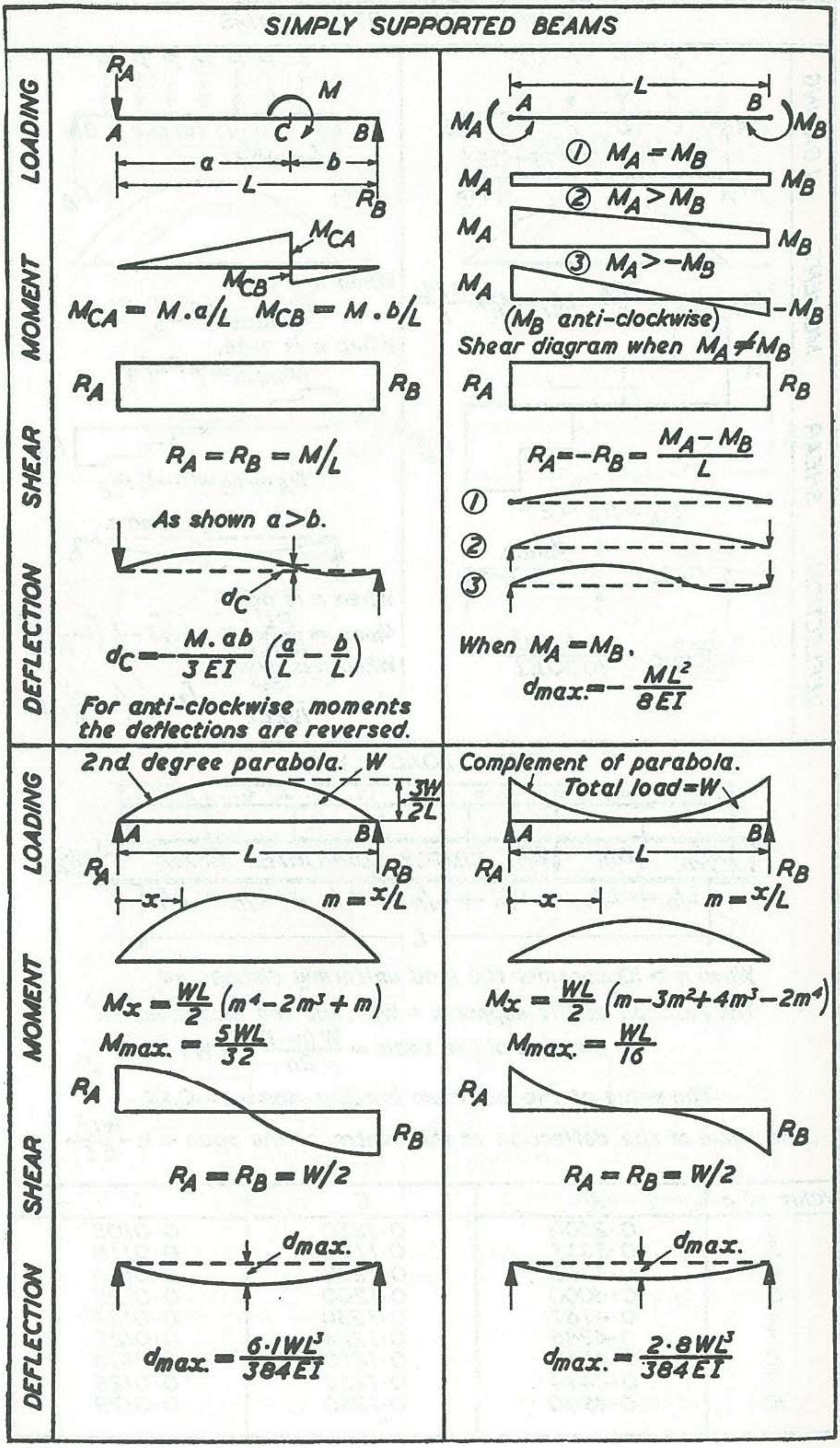


$M_{max.} = \frac{2Wa}{3}\left(1 - \frac{2m}{3}\right)^{3/2}$

when $x = a\sqrt{1 - \frac{2m}{3}}$

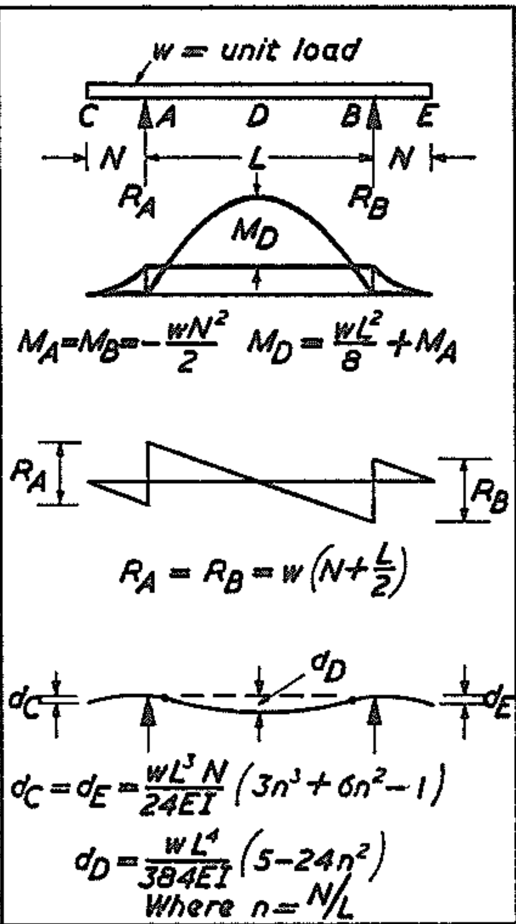
$R_A = W\left(1 - \frac{2m}{3}\right)$

$R_B = \frac{2Wm}{3}$


SIMPLY SUPPORTED BEAMS
LOADING
MOMENT
SHEAR
DEFLECTION
R_A
M
A
C
B
a
b
L
R_B
M_{CA}
M_{CB}
$M_{CA} = M.a/L$ $M_{CB} = M.b/L$
R_A
R_B
$R_A = R_B = M/L$
As shown a>b.
d_C
$d_C = -\frac{M.ab}{3EI}\left(\frac{a}{L} - \frac{b}{L}\right)$
For anti-clockwise moments
the deflections are reversed.
L
M_A
A
B
M_B
① $M_A = M_B$
M_A
M_B
② $M_A > M_B$
M_A
M_B
③ $M_A > -M_B$
M_A
$-M_B$
(M_B anti-clockwise)
Shear diagram when $M_A \neq M_B$
R_A
R_B
$R_A = -R_B = \frac{M_A - M_B}{L}$
①
②
③
When $M_A = M_B$.
$d_{max.} = -\frac{ML^2}{8EI}$
LOADING
MOMENT
SHEAR
DEFLECTION
2nd degree parabola.
W
$\frac{3W}{2L}$
A
B
L
R_A
R_B
x
$m = x/L$
$M_x = \frac{WL}{2}(m^4 - 2m^3 + m)$
$M_{max.} = \frac{5WL}{32}$
R_A
R_B
$R_A = R_B = W/2$
$d_{max.}$
$d_{max.} = \frac{6 \cdot 1WL^3}{384EI}$
Complement of parabola.
Total load = W
A
B
L
R_A
R_B
x
$m = x/L$
$M_x = \frac{WL}{2}(m - 3m^2 + 4m^3 - 2m^4)$
$M_{max.} = \frac{WL}{16}$
R_A
R_B
$R_A = R_B = W/2$
$d_{max.}$
$d_{max.} = \frac{2 \cdot 8WL^3}{384EI}$

SIMPLY SUPPORTED BEAMS

LOADING / MOMENT / SHEAR / DEFLECTION



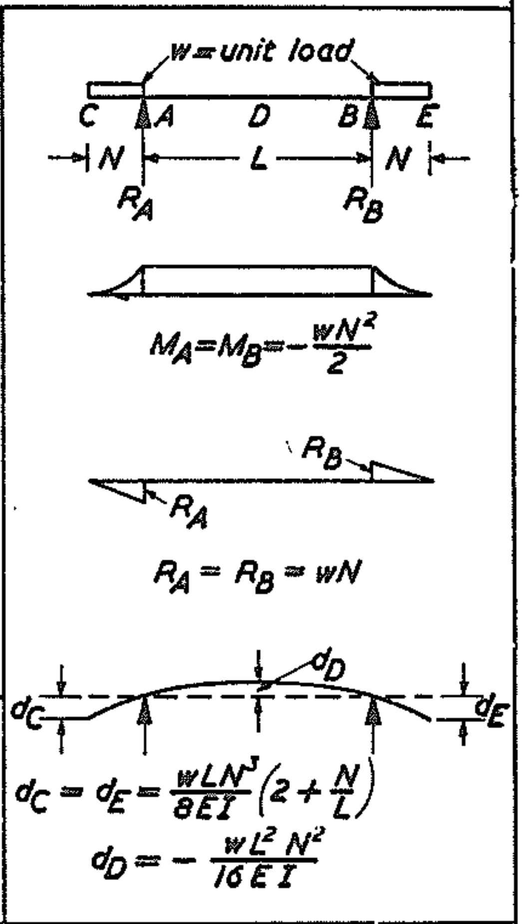
$M_A = M_B = -\frac{wN^2}{2}$ $M_D = \frac{wL^2}{8} + M_A$

$R_A = R_B = w\left(N+\frac{L}{2}\right)$

$d_C = d_E = \frac{wL^3N}{24EI}\left(3n^3+6n^2-1\right)$

$d_D = \frac{wL^4}{384EI}\left(5-24n^2\right)$

Where $n = N/L$

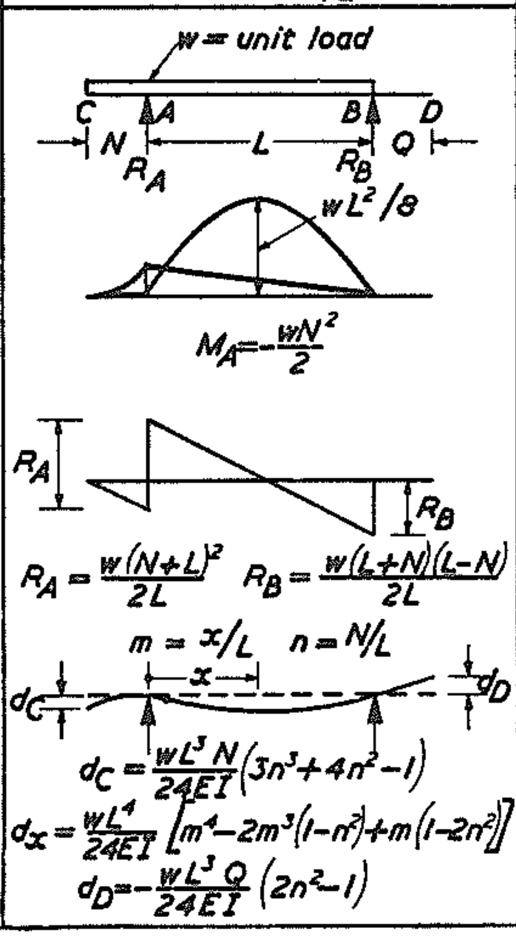


$M_A = M_B = -\frac{wN^2}{2}$

$R_A = R_B = wN$

$d_C = d_E = \frac{wLN^3}{8EI}\left(2+\frac{N}{L}\right)$

$d_D = -\frac{wL^2N^2}{16EI}$



$M_A = -\frac{wN^2}{2}$

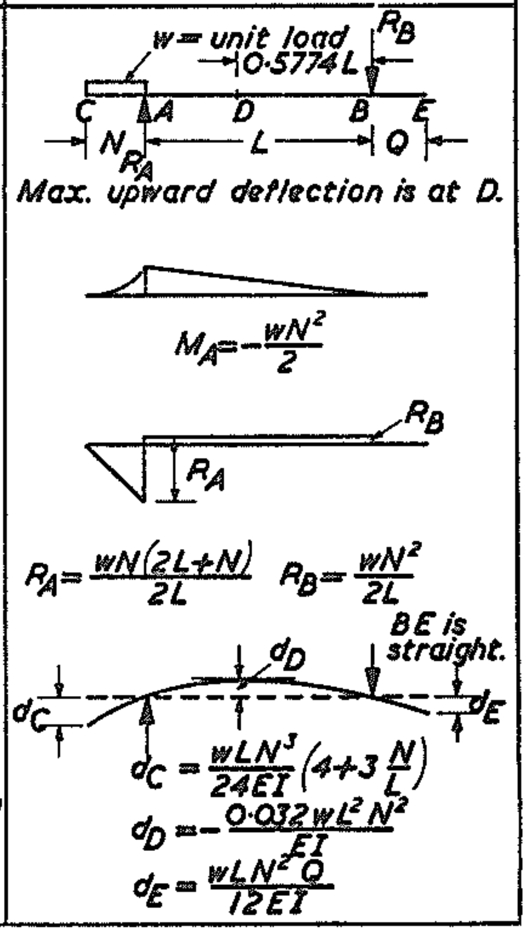
$R_A = \frac{w(N+L)^2}{2L}$ $R_B = \frac{w(L+N)(L-N)}{2L}$

$m = x/L$ $n = N/L$

$d_C = \frac{wL^3N}{24EI}\left(3n^3+4n^2-1\right)$

$d_x = \frac{wL^4}{24EI}\left[m^4-2m^3(1-n^2)+m(1-2n^2)\right]$

$d_D = -\frac{wL^3Q}{24EI}\left(2n^2-1\right)$



Max. upward deflection is at D.

$M_A = -\frac{wN^2}{2}$

$R_A = \frac{wN(2L+N)}{2L}$ $R_B = \frac{wN^2}{2L}$

BE is straight.

$d_C = \frac{wLN^3}{24EI}\left(4+3\frac{N}{L}\right)$

$d_D = -\frac{0{\cdot}032\,wL^2N^2}{EI}$

$d_E = \frac{wLN^2Q}{12EI}$