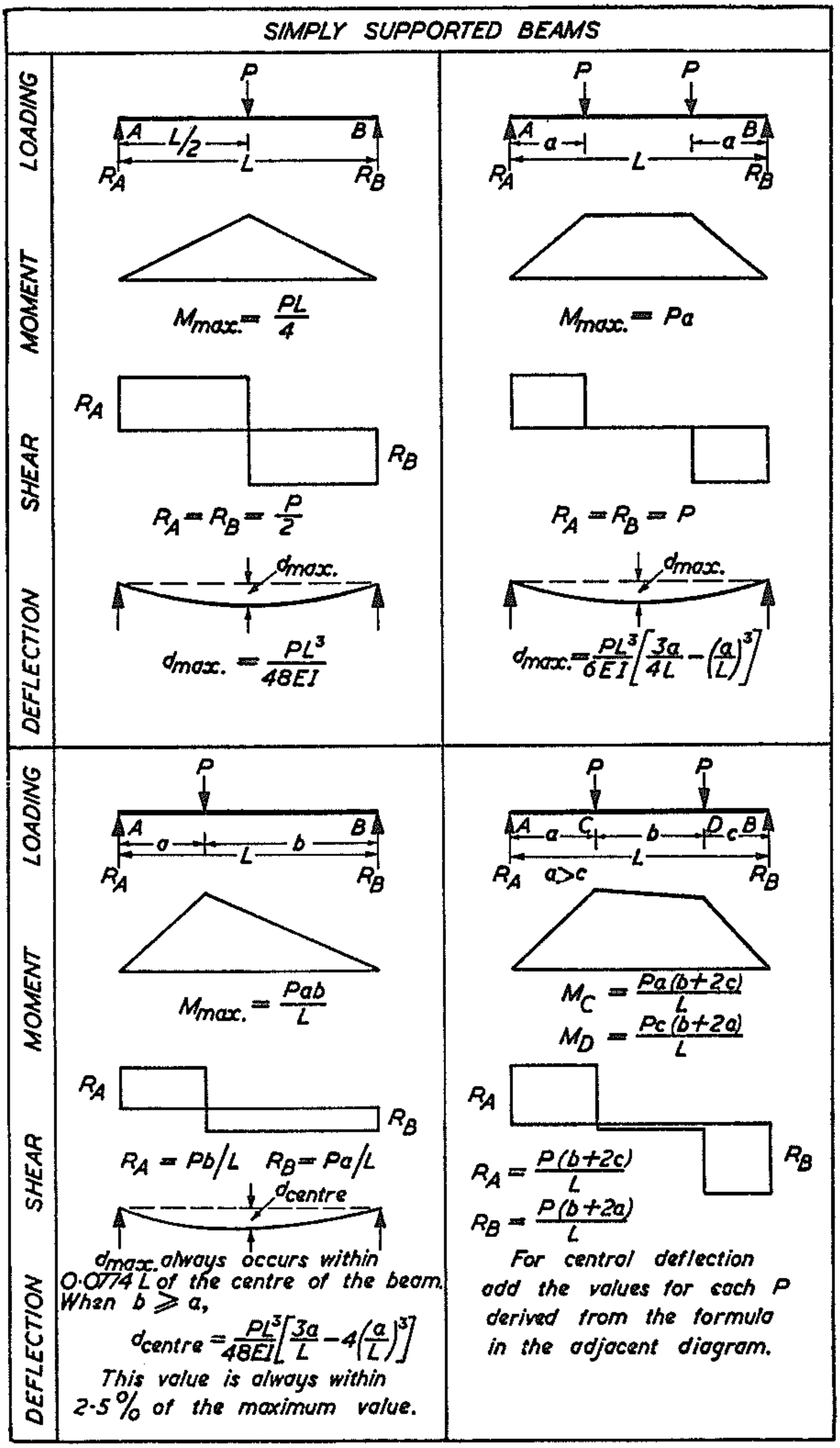
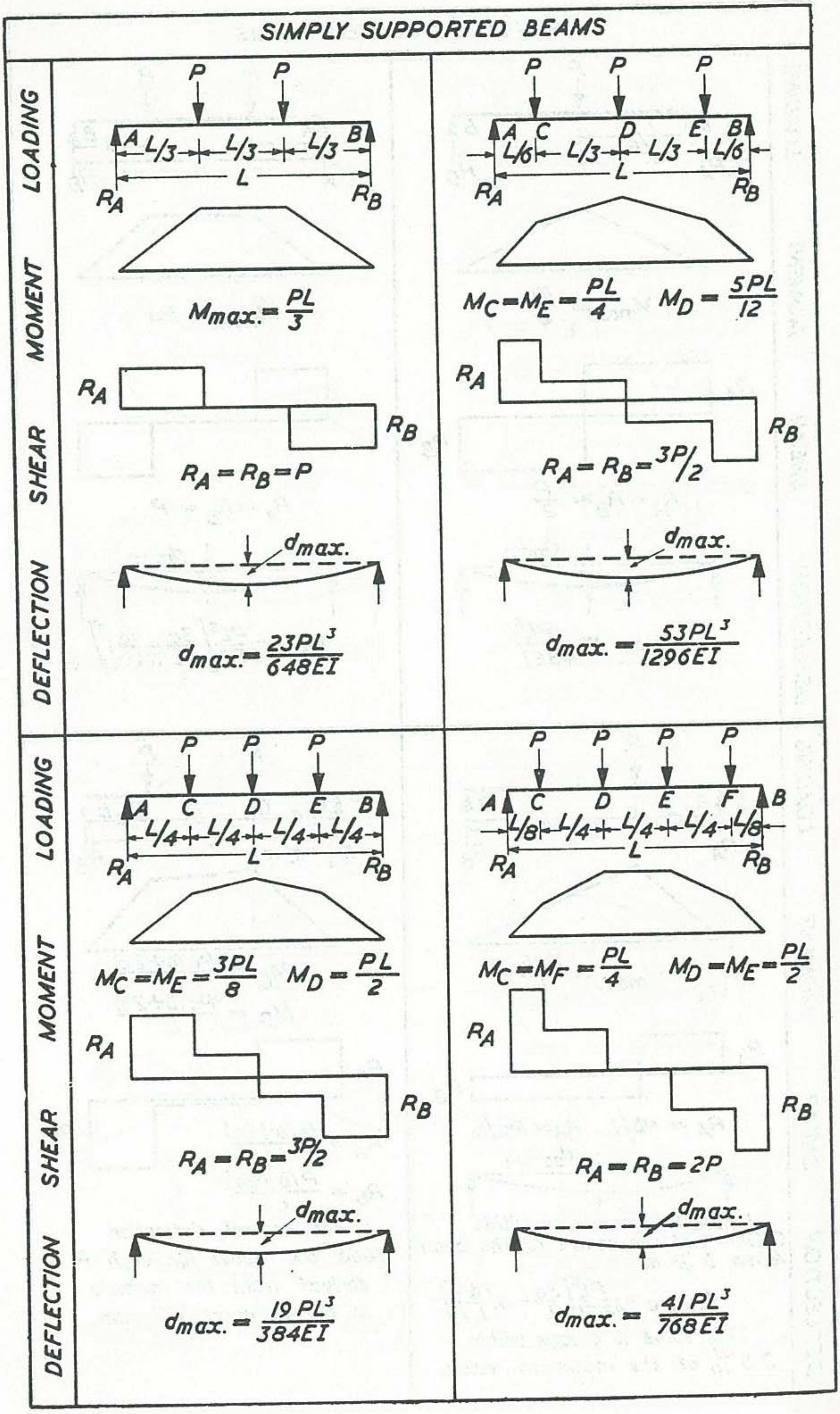
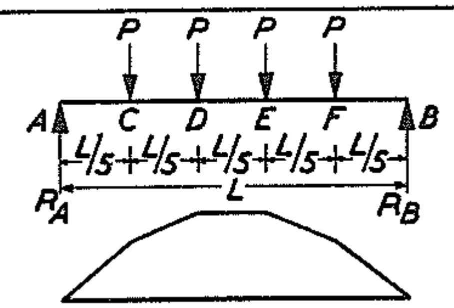

SIMPLY SUPPORTED BEAMS
LOADING
MOMENT
SHEAR
DEFLECTION
P
A L/2 L B
R_A R_B
$M_{max.} = \frac{PL}{4}$
R_A R_B
$R_A = R_B = \frac{P}{2}$
$d_{max.}$
$d_{max.} = \frac{PL^3}{48EI}$
P P
A a L a B
R_A R_B
$M_{max.} = Pa$
$R_A = R_B = P$
$d_{max.}$
$d_{max.} = \frac{PL^3}{6EI}\left[\frac{3a}{4L} - \left(\frac{a}{L}\right)^3\right]$
P
A a L b B
R_A R_B
$M_{max.} = \frac{Pab}{L}$
R_A R_B
$R_A = Pb/L$ $R_B = Pa/L$
d_{centre}
$d_{max.}$ always occurs within 0·0774 L of the centre of the beam.
When $b \geqslant a$,
$d_{centre} = \frac{PL^3}{48EI}\left[\frac{3a}{L} - 4\left(\frac{a}{L}\right)^3\right]$
This value is always within 2·5 % of the maximum value.
P P
A a C b D c B
L
R_A a>c R_B
$M_C = \frac{Pa(b+2c)}{L}$
$M_D = \frac{Pc(b+2a)}{L}$
R_A R_B
$R_A = \frac{P(b+2c)}{L}$
$R_B = \frac{P(b+2a)}{L}$
For central deflection add the values for each P derived from the formula in the adjacent diagram.


SIMPLY SUPPORTED BEAMS
LOADING
MOMENT
SHEAR
DEFLECTION
P P
A L/3 L/3 L/3 B
L
R_A R_B
M_max. = PL/3
R_A
R_B
R_A = R_B = P
d_max.
d_max. = 23PL^3/648EI
P P P
A C D E B
L/6 L/3 L/3 L/6
L
R_A R_B
M_C = M_E = PL/4 M_D = 5PL/12
R_A
R_B
R_A = R_B = 3P/2
d_max.
d_max. = 53PL^3/1296EI
LOADING
MOMENT
SHEAR
DEFLECTION
P P P
A C D E B
L/4 L/4 L/4 L/4
L
R_A R_B
M_C = M_E = 3PL/8 M_D = PL/2
R_A
R_B
R_A = R_B = 3P/2
d_max.
d_max. = 19PL^3/384EI
P P P P
A C D E F B
L/8 L/4 L/4 L/4 L/8
L
R_A R_B
M_C = M_F = PL/4 M_D = M_E = PL/2
R_A
R_B
R_A = R_B = 2P
d_max.
d_max. = 41PL^3/768EI

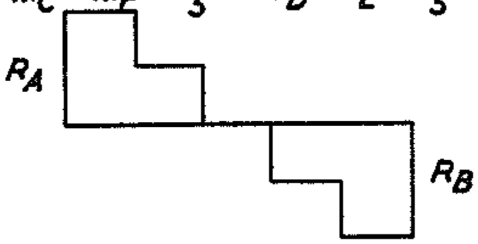
SIMPLY SUPPORTED BEAMS

LOADING / MOMENT



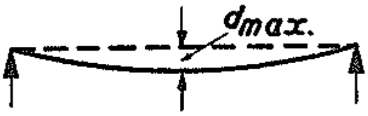
$M_C = M_F = \dfrac{2PL}{5}$ $M_D = M_E = \dfrac{3PL}{5}$

SHEAR



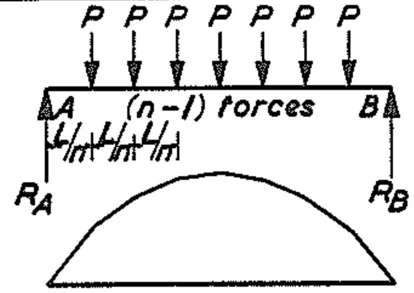
$R_A = R_B = 2P$

DEFLECTION



$d_{max.} = \dfrac{63PL^3}{1000EI}$

LOADING / MOMENT



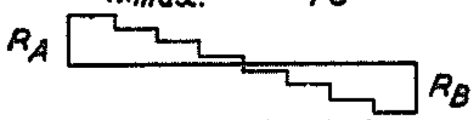
When n is odd,

$M_{max.} = \dfrac{(n^2-1)\,PL}{8n}$

When n is even,

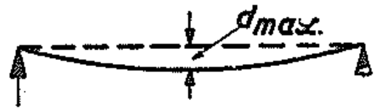
$M_{max.} = n.PL/8$

SHEAR



$R_A = R_B = (n-1)\,P/2$

DEFLECTION



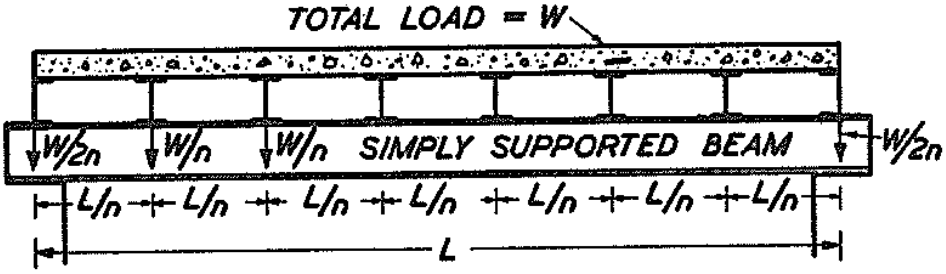
When n is odd

$d_{max.} = \dfrac{PL^3}{192EI}\left[n-\dfrac{1}{n}\right]\left[3-\dfrac{1}{2}\left(1-\dfrac{1}{n^2}\right)\right]$

When n is even

$d_{max.} = \dfrac{PL^3}{192EI}\cdot n\left[3-\dfrac{1}{2}\left(1+\dfrac{4}{n^2}\right)\right]$

TOTAL LOAD = W



When n > 10, consider the load uniformly distributed

The reaction at the supports = W/2, but the maximum S.F at the ends of the beam $= \dfrac{W(n-1)}{2n} = A.W$

The value of the maximum bending moment = C.WL

The value of the deflection at the centre of the span $= k.\dfrac{WL^3}{EI}$

Value of n	A	C	k
2	0·2500	0·1250	0·0105
3	0·3333	0·1111	0·0118
4	0·3750	0·1250	0·0124
5	0·4000	0·1200	0·0126
6	0·4167	0·1250	0·0127
7	0·4286	0·1224	0·0128
8	0·4375	0·1250	0·0128
9	0·4444	0·1236	0·0129
10	0·4500	0·1250	0·0129