

结构静力计算图表

建筑工程部设计总局彙編

建筑工程出版社

B220

結 构 靜 力 計 算 图 表

建筑工程部設計总局 編

建 筑 工 程 出 版 社 出 版

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內 容 提 要

本冊图表系綜合国内外一部分有关的計算图表加以編排整理而成。

本冊图表主要内容是为計算連續梁、框架、單层厂房排架以及一些異型梁板的計算图表公式。其中某些图表在使用时应注意其使用条件，以免发生錯誤，图表內也編入了一些常用构件截面的几何特征表，供計算人員选用。

本图表可供一般建筑結構設計人員使用。

結 构 靜 力 計 算 图 表

建筑工程部設計总局 編

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前 言

在社会主义建設总路綫的光輝照耀下，全国建設事业正在飞跃发展，建筑設計的任务亦在日益增加，因此，加快設計速度已是設計部門当前急需解决的問題。

在結構設計中采用計算图表来代替繁瑣的公式計算，是加快設計速度的有效办法。为此，我們將目前收集到的国内外各設計單位已編制的图表，进行加工整理，按鋼筋混凝土結構、磚石結構、木結構、天然地基及靜力計算；分別編制成冊，以供有关設計人員使用。

由于本冊图表包括范围很广，不可能一一罗列，故主要内容系以連續梁及框架，厂房排架的应力分析为主。在这一部分内容当中，又仅按目前习用的計算方法为根据加以編排。其中关于單层厂房排架应力分析部分由于变化条件过多，短時間尚不可能編制成完整的一套图表，故仅將現有的少数計算公式、图表列入。后面附有几种常見排架形式的計算表格，將其应用公式及分析步驟列出，以供計算人員参考。此外，在本冊图表內也列入了少量的有关連續梁，双向板，井字梁，曲梁等等的計算公式及計算系数，在一定条件下可以采用。

本冊图表系由建筑工程部設計总局、北京第一工业建筑設計院、北京市城市規劃管理局設計院及天津工业建筑設計院等單位共同編制。各單位在使用中如有意見或有更好的图表，希能通知上述編制單位，以备在今后修訂时予以考虑采用。

1. 各种截面几何特征表

表 1

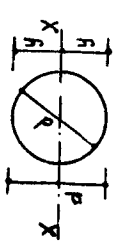
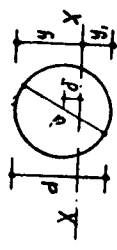
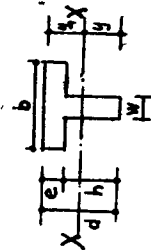
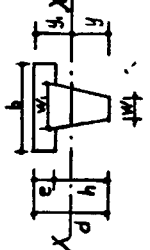
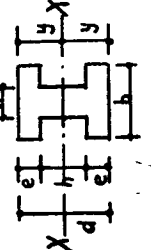
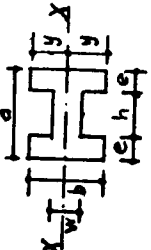
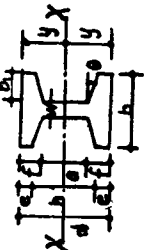
截面特征	面积 F	重心位置	惯性矩 I_x	截面系数 W_x	扭转半径 r_x
	$\frac{\pi d^2}{4} = 0.785d^2$	$y = \frac{d}{2}$	$\frac{\pi d^4}{64} = 0.049d^4$	$\frac{\pi d^3}{32} = 0.098d^3$	$\frac{d}{4}$
	$\frac{\pi d^2}{4} = 0.785d^2$	$y = \frac{d}{2}$	$\frac{\pi d^4}{64}$	$W_x = \frac{I_x}{y} = \frac{\pi}{32} \cdot \frac{d^2(d^2+16\delta^2)}{d+2\delta}$ $W_{x_1} = \frac{I_x}{y_1} = \frac{\pi}{32} \cdot \frac{d^2(d^2+16\delta^2)}{d-2\delta}$	$\frac{1}{4} \sqrt{d^2+16\delta^2}$
	$be+hW$	$y_1 = \frac{Wd^2+e^2(b-W)}{2(be+hW)}$ $y = d-y_1$	$\frac{Wy^3+by_1^3-(b-W)(y_1-e)^3}{3}$	$\frac{I_x}{y}$	$\sqrt{\frac{I_x}{F}}$
	$be + \frac{h}{2}(W+W_1)$	$y_1 = \frac{[3be^2+3Wh(d+e)+h(W_1-W)(h+3e)]}{6F}$ $y = d-y_1$	$\frac{4be^3+h^3(3W+W_1)}{12} - F(y_1-e)^2$	$\frac{I_x}{y}$	$\sqrt{\frac{I_x}{F}}$
	$bd-h(b-W)$	$y = \frac{d}{2}$	$\frac{bd^3-h^3(b-W)}{12}$	$\frac{bd^3-h^3(b-W)}{6d}$	$\sqrt{\frac{bd^3-h^3(b-W)}{12[bd-h(b-W)]}}$
	$bd-h(b-W)$	$y = \frac{b}{2}$	$\frac{2eb^3+hW^3}{12}$	$\frac{2eb^3+hW^3}{6b}$	$\sqrt{\frac{2eb^3+hW^3}{12[bd-h(b-W)]}}$
	$Wd+2b_1(e+f)$	$y = \frac{d}{2}$	$\frac{bd^3-\frac{1}{4}\tan\theta(h^4-a^4)}{12}$ $\left(\tan\theta = \frac{h-a}{b-W}\right)$	$\frac{I_x}{y}$	$\sqrt{\frac{I_x}{F}}$

表 2

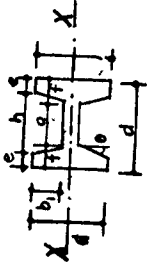
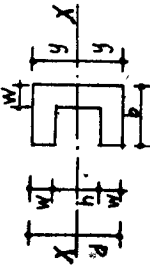
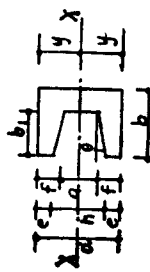
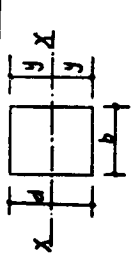
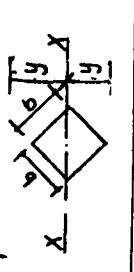
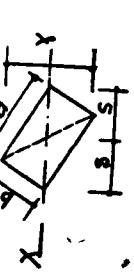
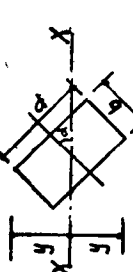
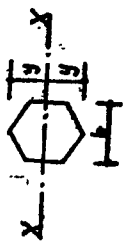
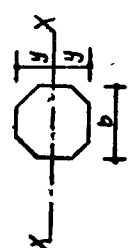
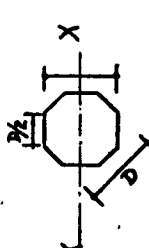
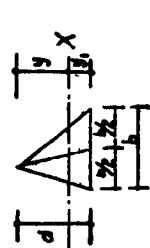
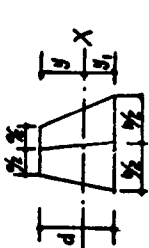
截面特征	面积 F	重心位置	慣性矩 I_x	截面系数 W_x	廻轉半徑 r_x
	$Wd + 2b_1(e + f)$	$y = \frac{b}{2}$	$\frac{b^3(d-h) + aW^3 + \frac{\tan\theta}{4}(b^4 - W^4)}{12}$ $\left(\tan\theta = \frac{h-a}{b-W}\right)$	$\frac{I_x}{y}$	$\sqrt{\frac{I_x}{F}}$
	$bd - h(b - W)$	$y = \frac{d}{2}$	$\frac{bd^3 - h^3(b - W)}{12}$	$\frac{bd^3 - h^3(b - W)}{6d}$	$\sqrt{\frac{bd^3 - h^3(b - W)}{12[bd - h(b - W)]}}$
	$Wd + b_1(e + f)$	$y = \frac{d}{2}$	$\frac{bd^3 - \frac{1}{8}\tan\theta(h^4 - a^4)}{12}$ $\left(\tan\theta = \frac{h-a}{2(b-W)}\right)$	$\frac{I_x}{y}$	$\sqrt{\frac{I_x}{F}}$
	bd	$y = \frac{d}{2}$	$\frac{bd^3}{12}$	$\frac{bd^2}{6}$	$\frac{d}{\sqrt{12}} = 0.289d$
	b^2	$y = \frac{b}{\sqrt{2}} = 0.707b$	$\frac{b^4}{12}$	$\frac{b^3}{6\sqrt{2}} = 0.118b^3$	$\frac{b}{\sqrt{12}} = 0.289b$
	bd	$y = \frac{db}{\sqrt{b^2 + d^2}}$ $S = \frac{1}{2}\sqrt{b^2 + d^2}$	$\frac{b^3d^3}{6(b^2 + d^2)}$	$\frac{b^2d^2}{6\sqrt{b^2 + d^2}}$	$\frac{bd}{\sqrt{6(b^2 + d^2)}}$
	bd	$y = \frac{1}{2}(b\sin\alpha + d\cos\alpha)$	$\frac{b^4}{12}(b^2\sin^2\alpha + d^2\cos^2\alpha)$	$\frac{bd}{6} \cdot \frac{(b^2\sin^2\alpha + d^2\cos^2\alpha)}{(b\sin\alpha + d\cos\alpha)}$	$\sqrt{\frac{b^2\sin^2\alpha + d^2\cos^2\alpha}{12}}$

表 3

截面特征	面积 F	重心位置	惯性矩 I_x	截面系数 W_x	迴轉半徑 r_x
	$\frac{\sqrt{3}}{2} b^2 = 0.866 b^2$	$y = \frac{b}{\sqrt{3}} = 0.577 b$	$\frac{5\sqrt{3}}{144} b^4 = 0.0602 b^4$	$\frac{5}{48} b^3 = 0.104 b^3$	$\sqrt{\frac{5}{72}} b = 0.264 b$
	$\frac{\sqrt{3}}{2} b^2 = 0.866 b^2$	$y = \frac{b}{2}$	$\frac{5\sqrt{3}}{144} b^4 = 0.0602 b^4$	$\frac{5\sqrt{3}}{72} b^3 = 0.1204 b^3$	$\sqrt{\frac{5}{72}} b = 0.264 b$
	$2b^2 \tan 22^\circ 30' = 0.828 b^2$	$y = \frac{b}{2}$	$0.1054 b^4$	$0.109 b^3$	$0.257 b$
	$0.693 D^2$	$y = 0.433 D$	$0.038 D^4$	$0.087 D^3$	
	$\frac{bd}{2}$	$y = \frac{2}{3} d$ $y_1 = \frac{1}{3} d$	$\frac{bd^3}{36}$	$W_x = \frac{I_x}{y} = \frac{bd^2}{24}$ $W_{x_1} = \frac{I_x}{y_1} = \frac{bd^2}{12}$	$\frac{d}{\sqrt{18}} = 0.236 d$
	$\frac{1}{2} (a+b) d$	$y = \frac{a+2b}{a+b} \cdot \frac{d}{3}$ $y_1 = \frac{2a+b}{a+b} \cdot \frac{d}{3}$	$\frac{a^2+4ab+b^2}{36(a+b)} \cdot d^3$	$W_x = \frac{I_x}{y} = \frac{(a^2+4ab+b^2)d^2}{12(a+2b)}$ $W_{x_1} = \frac{I_x}{y_1} = \frac{(a^2+4ab+b^2)d^2}{12(2a+b)}$	$\sqrt{\frac{2(a^2+4ab+b^2)}{6(a+b)}} \cdot \frac{d}{6(a+b)}$

$$I = \frac{1}{12}bh^3$$

2. 矩形截面惯性矩数值表

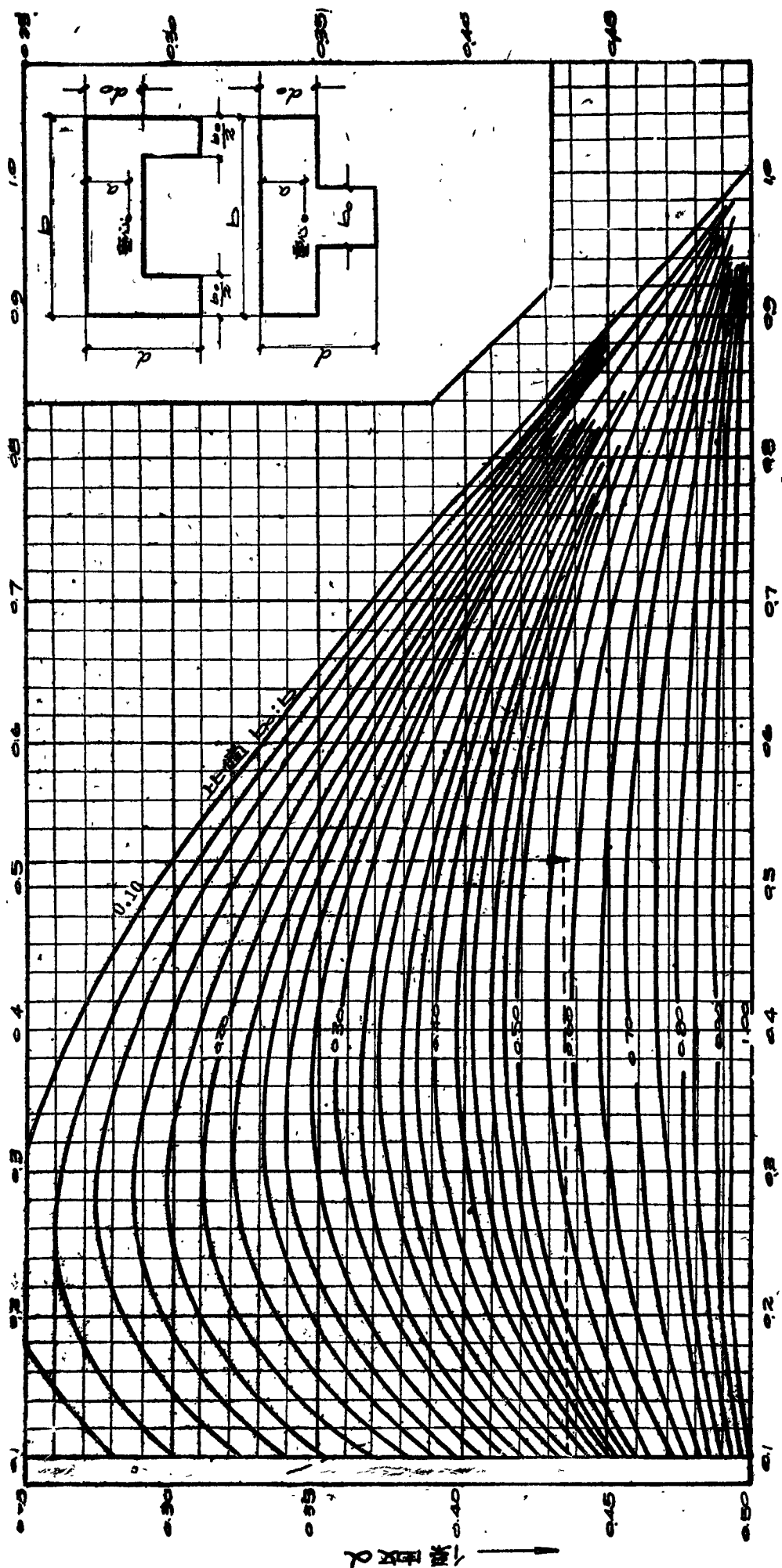
表 4

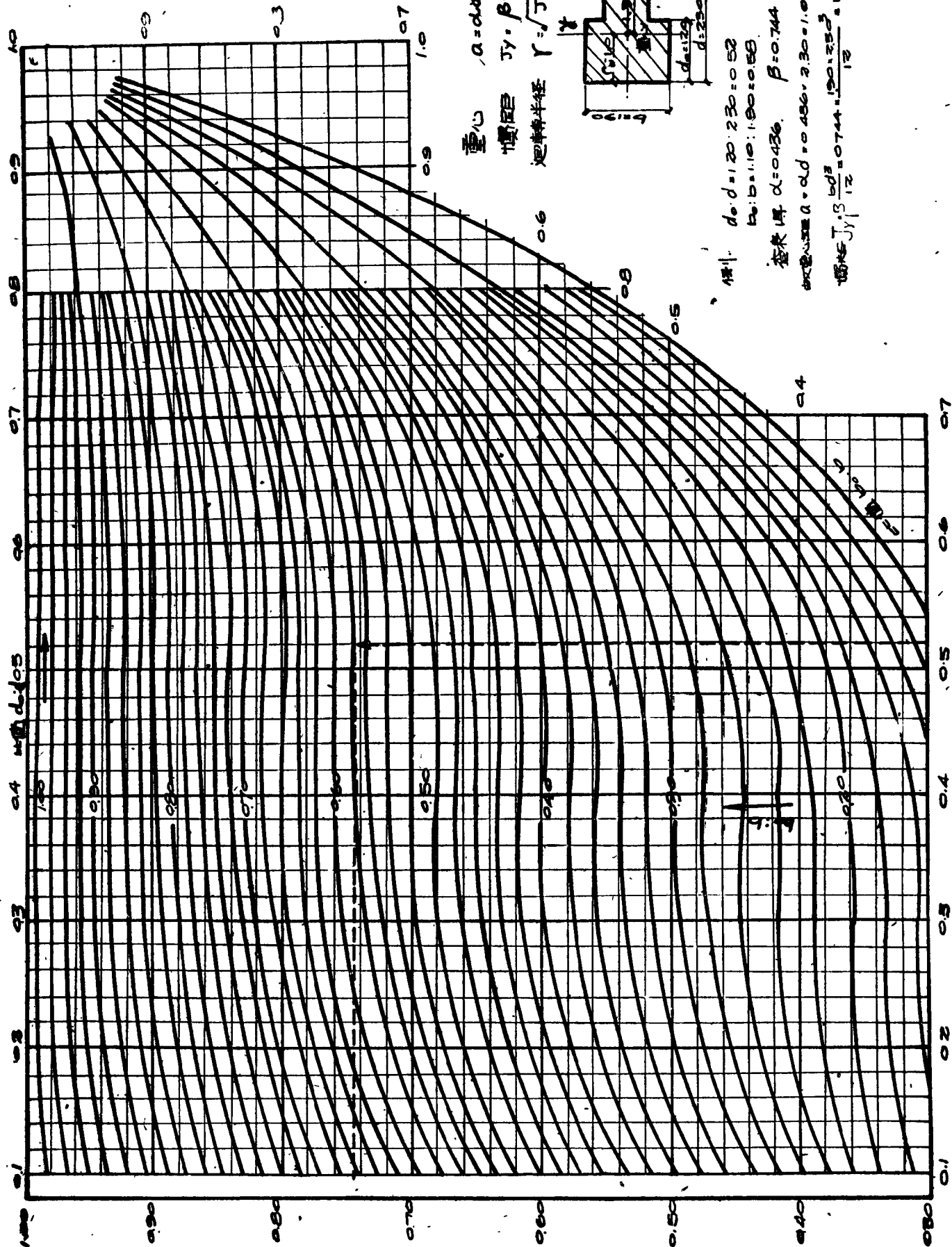
$\frac{h}{b}$	1	2	3	4	5	6	7	8	9	10	11.5	13	24	36.5	49	61.5	74	86.5
11.5	127	253	380	507	634	760	887	1014	1140	1267	1457	2280	3041	4624	6208	7791	9375	10960
15	281	562	844	1125	1406	1687	1969	2250	2531	2812	3233	5061	6747	10260	13780	17290	20800	24320
18	486	972	1458	1944	2430	2916	3402	3888	4374	4860	5589	8748	11660	17740	23810	29890	35960	42040
20	667	1333	2000	2666	3333	4000	4666	5333	6000	6667	7667	12000	16000	24330	32670	41000	49330	57670
24	1152	2304	3456	4608	5760	6912	8064	9216	10370	11520	13250	20740	27650	42050	56450	70850	85250	99650
25	1302	2604	3906	5208	6510	7812	9114	10420	11720	13020	14970	23440	31250	47520	63800	80070	96350	112600
30	2250	4500	6750	9000	11250	13500	15750	18000	20250	22500	25880	40500	54000	82130	110250	138400	166500	194600
35	3573	7146	10720	14290	17860	21440	25010	28580	32160	35730	41090	64310	85750	130400	175100	219700	264400	309000
36.5	4052	8104	12160	16210	20260	24310	28360	32420	36470	40520	46600	72940	97250	147900	198600	249200	299900	350500
40	5333	10670	16000	21330	26670	32000	37330	42660	48000	53330	61330	96000	128000	194700	261300	328000	394600	461300
45	7593	15190	22780	30370	37970	45560	53150	60750	68320	75930	87320	136700	182200	429000	572100	715000	858000	1001000
49	9804	19610	29410	39210	49020	58820	68630	78430	88230	98040	112700	176500	235300	546800	732100	917400	1102700	1288000
50	10460	20920	31250	41670	52080	62500	72910	83330	93750	104200	119800	187500	250000	580200	793000	1006000	1219000	1432000
55	13860	27730	41590	55460	69320	83180	97050	110900	124800	138600	159400	249600	332700	760000	1043000	1326000	1609000	1892000
60	18000	36000	54000	72000	90000	108000	126000	144000	162000	180000	207000	324000	432000	1000000	1360000	1720000	2080000	2440000
61.5	19380	38770	58150	77530	96920	116300	135700	155100	174400	193800	222900	348900	465200	1120000	1512000	1904000	2296000	2688000
65	22890	45780	68655	91540	114400	137300	160200	183100	206000	228900	263200	411900	549200	1333000	1811000	2290000	2769000	3248000
70	28580	57160	85750	114300	142900	171500	200100	228700	257200	285800	328700	514500	686000	1643000	2228000	2813000	3398000	3983000
74	33770	67530	101300	135100	168800	202600	236400	270100	303900	337700	388300	607800	810400	1932000	2645000	3358000	4071000	4784000
75	35160	70320	104800	139600	175800	210000	246100	281300	316400	351600	404400	632900	843800	2033000	2763000	3493000	4223000	4953000
80	42670	85330	128000	170700	213300	256000	299000	341300	384000	426700	490600	768000	1024000	2457000	3311000	4172000	5033000	5894000
85	51180	102400	153500	204700	255900	307100	358200	409400	460600	511800	588500	921200	1228000	2988000	4038000	5125000	6212000	7299000
86.5	53930	107900	161800	215700	269700	323600	377500	431500	485400	539300	620200	970800	1294000	3169000	4283000	5393000	6504000	7615000
90	60750	121500	182300	243000	303800	364500	425300	486000	546800	607500	698600	1094000	1458000	3517000	4757000	5996000	7235000	8474000
95	71450	142900	214300	285800	357200	428700	500100	571600	643000	714500	821600	1286000	1715000	4169000	5562000	6955000	8348000	9741000
99	80860	161700	242600	323400	404300	485100	566000	646800	727700	808600	929800	1455000	1941000	4651000	6162000	7673000	9184000	10695000
100	83330	166700	250000	333300	416700	500000	583300	666700	750000	833300	958300	1500000	2000000	4834000	6345000	7856000	9367000	10878000
105	96470	192900	289400	385900	482300	578800	675300	771700	868200	964700	1109000	1736000	2315000	5521000	7327000	9133000	10939000	12745000
110	110900	221800	332700	443600	554600	665500	776400	887300	998200	1109000	1275000	1996000	2662000	6408000	8435000	10462000	12489000	14516000
115	126700	253500	380200	506900	633700	760400	887100	1014000	1141000	1267000	1457000	2281000	3041000	7426000	9811000	12196000	14581000	16966000
120	144000	288000	432000	576000	720000	864000	1008000	1152000	1296000	1440000	1656000	2592000	3456000	8525000	11200000	14060000	16920000	19780000
125	162800	325500	488300	651000	813800	976500	1139000	1302000	1465000	1628000	1872000	2930000	3906000	9541000	12550000	15620000	18690000	21760000
130	183100	366200	549200	732300	915400	1098000	1282000	1465000	1648000	1831000	2105000	3295000	4394000	10820000	14360000	17910000	21400000	24890000
135	205000	410000	615100	820100	1025000	1230000	1435000	1640000	1845000	2050000	2358000	3690000	4921000	12180000	16050000	19920000	23790000	27660000
140	228700	457300	686000	914600	1143000	1372000	1601000	1829000	2058000	2287000	2630000	4116000	5488000	13460000	17800000	22160000	26520000	30880000
145	254000	508100	762100	1016000	1270000	1524000	1778000	2032000	2286000	2540000	2921000	4563000	6097000	15270000	20000000	24730000	29460000	34190000
150	281300	562500	843750	1125000	1406000	1688000	1969000	2250000	2531000	2813000	3234000	5063000	6750000	17070000	22480000	27990000	33500000	39010000
160	341300	682600	1024000	1365000	1707000	2048000	2389000	2730000	3072000	3413000	3925000	6144000	8192000	21260000	28120000	35080000	42040000	49000000
170	409400	818800	1228000	1638000	2047000	2456000	2866000	3275000	3684000	4094000	4708000	7369000	9826000	25400000	33600000	42800000	51990000	61180000
180	486000	972000	1458000	1944000	2430000	2916000	3402000	3888000	4374000	4860000	5598000	8748000	11660000	29400000	38500000	48600000	58700000	68800000
190	571600	1143000	1715000	2286000	2858000	3429000	4001000	4572000	5144000	5716000	6573000	10290000	13720000	34200000	44200000	55200000	66200000	77200000
200	666700	1333000	2000000	2667000	3333000	4000000	4667000	5333000	6000000	6667000	7667000	12000000	16000000	40000000	52000000	64000000	76000000	88000000

表 5

3. 确定 T 形和 I 形截面重心距及惯性矩图表

比值 $d_0:d$





4. 各种荷载下简支梁的计算公式

表 7

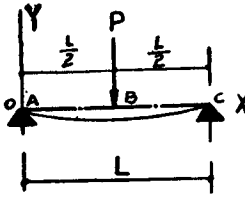
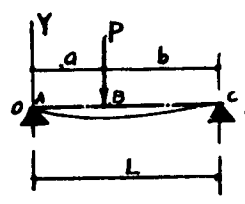
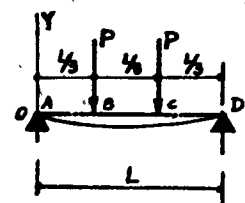
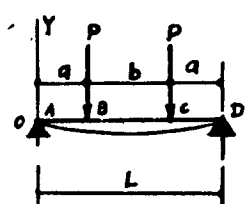
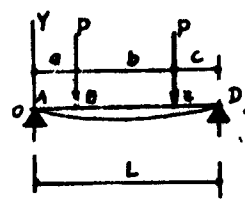
荷载情况	支座反力及剪力	弯 曲 力 矩	挠 度
	$A = +\frac{P}{2} \quad C = +\frac{P}{2}$ $(A-B) \quad Q = +\frac{P}{2}$ $(B-C) \quad Q = -\frac{P}{2}$	$(A-B) \quad M = \frac{Px}{2}$ $(B-C) \quad M = -\frac{P(L-x)}{2}$ $M_{\max} = \frac{PL}{4} \quad x = \frac{L}{2}$	$(A-B) \quad y = \frac{Px^3}{48EI} (3L^2 - 4x^2)$ $y_{\max} = \frac{PL^3}{48EI} \quad x = L/2$
	$A = +\frac{b}{L}P \quad C = +\frac{a}{L}P$ $(A-B) \quad Q = +\frac{b}{L}P$ $(B-C) \quad Q = -\frac{a}{L}P$	$(A-B) \quad M = \frac{b}{L}Px$ $(B-C) \quad M = -\frac{a}{L}P(L-x)$ $M_{\max} = +\frac{ab}{L}P \quad x = a$	$(A-B) \quad y = \frac{Pbx}{6EIL} [2L(L-x) - b^2 - (L-x)^2]$ $(B-C) \quad y = \frac{Pa(L-x)}{6EIL} [2Lb - b^2 - (L-x)^2]$ $y_{\max} = \frac{Pab}{27EIL} (a+2b) \sqrt{3a(a+2b)}$ $x = \sqrt{\frac{a}{3}} (a+2b) \quad \text{当 } a > b \text{ 时}$
	$A = +P \quad D = +P$ $(A-B) \quad Q = +P$ $(B-C) \quad Q = 0$ $(C-D) \quad Q = -P$	$(A-B) \quad M = Px$ $(B-C) \quad M = \frac{PL}{3}$ $(C-D) \quad M = P(L-x)$ $M_{\max} = \frac{PL}{3} \quad x = \frac{L}{3} \rightarrow \frac{2L}{3}$	$y_{\max} = \frac{23PL^3}{648EI} \quad x = L/2$ $(A-B) \quad y = \frac{PL^3}{18EI} \left(2 - 3\frac{x^2}{L^2} \right) \frac{x}{L}$ $(B-C)$ $y = \frac{PL^3}{162EI} \left[27\frac{x}{L} \left(1 - \frac{x}{L} \right) - 1 \right]$ $y_{\frac{L}{3}} = \frac{5PL^3}{102EI}$
	$A = +P \quad D = +P$ $(A-B) \quad Q = +P$ $(B-C) \quad Q = 0$ $(C-D) \quad Q = -P$	$(A-B) \quad M = Px$ $(B-C) \quad M = -Pa$ $(C-D) \quad M = -P(L-x)$ $M_{\max} = +Pa \quad x = a \rightarrow (a+b)$	$(A-B) \quad y = \frac{Px^3}{6EI} (3La - 3a^2 - x^2)$ $(B-C) \quad y = \frac{Pa}{6EI} (3Lx - 3x^2 - a^2)$ $y_{\max} = \frac{Pa}{24EI} (3L^2 - 4a^2) \quad x = L/2$ $y_a = \frac{Pa^2}{6EI} (3L - 4a)$
	$A = \frac{2P}{L} \left(c + \frac{b}{2} \right)$ $D = \frac{2P}{L} \left(a + \frac{b}{2} \right)$ $(A-B) \quad Q = +\frac{2P}{L} \left(c + \frac{b}{2} \right)$ $(B-C) \quad Q = \frac{P}{L} (c - a)$	$(A-B) \quad M = \frac{2P}{L} \left(c + \frac{b}{2} \right) x$ $(B-C) \quad M = \frac{P}{L} [(c-a)x + aL]$ $M_{\max} = \frac{2Pa}{L} \left(c + \frac{b}{2} \right)$ $\text{当 } a > \frac{L-b}{2} \text{ 时}$ $x = a$	

表 8

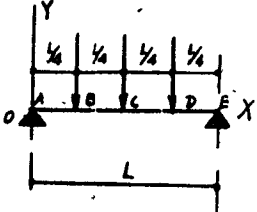
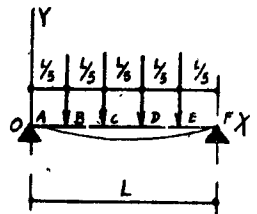
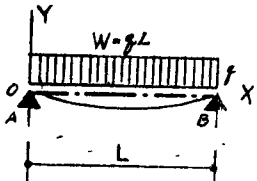
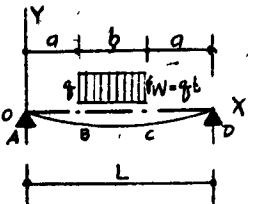
荷 載 情 况	支 座 反 力 及 剪 力	弯 曲 力 矩	挠 度
	$A = E = +\frac{3}{2}P$ $(A-B) Q = +\frac{3}{2}P$ $(B-C) Q = +\frac{1}{2}P$ $(C-D) Q = -\frac{1}{2}P$ $(D-E) Q = -\frac{3}{2}P$	$M_{\max} = \frac{1}{2}PL$	$y_{\max} = \frac{19 PL^3}{384 EI}$
	$A = +2P \quad F = +2P$ $(A-B) Q = +2P$ $(B-C) Q = +P$ $(C-D) Q = 0$ $(D-E) Q = -P$ $(E-F) Q = -2P$	$M_{\max} = \frac{3 PL}{5}$	$y_{\max} = \frac{63 PL^3}{1000 EI}$
	$A = B = +\frac{1}{2}W$ $Q = \frac{1}{2}W \left(1 - \frac{2x}{L}\right)$	$M = \frac{1}{2}W \left(x - \frac{x^2}{L}\right)$ $M_{\max} = \frac{1}{8}WL \quad x = \frac{L}{2}$	$y = \frac{Wx}{24EI} (L^3 - 2Lx^2 + x^3)$ $y_{\max} = \frac{5WL^3}{384 EI} \quad x = \frac{L}{2}$
	$A = D = +\frac{W}{2}$ $(A-B) Q = +\frac{W}{2}$ $(B-C) Q = \frac{W}{2} - q(x-a)$ $(C-D) Q = -\frac{W}{2}$	$(A-B) M = -\frac{W}{2}x$ $(B-C) M = -\frac{W}{2} \left[x - \frac{1}{b}(x-a)^2 \right]$ $M_{\max} = -\frac{W}{8}(2L-b) \quad x = L/2$	$(A-B) y = \frac{WL^3}{48EI} \left[\left(3 - \frac{b^2}{L^2}\right) \times \frac{x}{L} - 4 \frac{x^3}{L^3} \right]$ $(B-C) y = -\frac{W}{48EI} \left[\frac{2}{b}(x-a)^4 - 4x^3 + L^2x \left(3 - \frac{b^2}{L^2}\right) \right]$ $y_a = \frac{WaL^2}{24EI} \left(1 + \frac{b}{L} - \frac{b^2}{L^2}\right)$ $y_{\max} \text{ 当 } x = L/2$

表 9

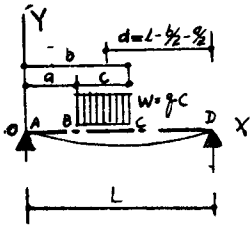
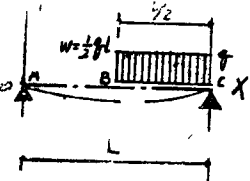
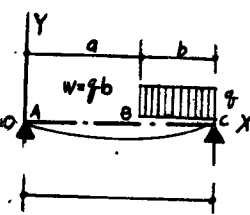
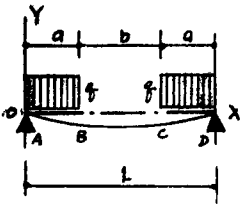
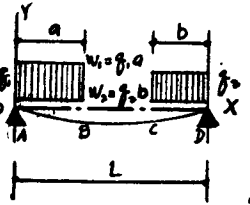
荷 載 情 况	支 座 反 力 及 剪 力	弯 曲 力 矩	挠 度
	$A = W \frac{d}{L}$ $D = \frac{W}{L} \left(a + \frac{c}{2} \right)$ $(A-B) \quad Q = W \frac{d}{L}$ $(B-C) \quad Q = W \frac{d}{L} - W \frac{x-a}{c}$ $(C-D) \quad Q = W \left(\frac{d}{L} - 1 \right)$	$(A-B) \quad M = \frac{Wdx}{L}$ $(B-C) \quad M = \frac{Wdx}{L} - \frac{W(x-a)^2}{2c}$ $(C-D) \quad M = \frac{Wdx}{L} - W \left(x - \frac{a}{2} - \frac{b}{2} \right)$ $M_{\max} = W \frac{d}{L} \left(a + \frac{cd}{2L} \right)$ $x = a + \frac{cd}{L}$	$(A-B) \quad y = \frac{1}{48EI} \left\{ 8W \frac{d}{L} (x^3 - L^2 x) + Wx \left[\frac{8d^3}{L} - \frac{2bc^2}{L} + \frac{c^3}{L} + 2c^2 \right] \right\}$ $(B-C) \quad y = \frac{1}{48EI} \left\{ 8W \frac{d}{L} (x^3 - L^2 x) + Wx \left[\frac{8d^3}{L} - \frac{2bc^2}{L} + \frac{c^3}{L} + 2c^2 \right] - 2W \frac{(x-a)^4}{c} \right\}$ $(C-D) \quad y = \frac{1}{48EI} \left\{ 8W \frac{d}{L} (x^3 - L^2 x) + Wx \left[\frac{8d^3}{L} - \frac{2bc^2}{L} + \frac{c^3}{L} \right] - 8W \left(x - \frac{a}{2} - \frac{b}{2} \right)^3 + W(2bc^2 - c^3) \right\}$
	$A = \frac{1}{4} W \quad C = \frac{3}{4} W$ $(A-B) \quad Q = \frac{1}{4} W$ $(B-C) \quad Q = \frac{1}{4} W - q \left(x - \frac{L}{2} \right)$	$(A-B) \quad M = \frac{1}{4} Wx$ $(B-C) \quad M = \frac{1}{4} Wx - \frac{q \left(x - \frac{L}{2} \right)^2}{2}$ $M_{\max} = \frac{9}{128} qL^2 \quad x = \frac{5}{8} L$	$(A-B) \quad y = \frac{qL^4}{384EI} \left(7 \frac{x}{L} - 8 \frac{x^3}{L^3} \right)$ $(B-C) \quad y = \frac{qL^4}{384EI} \left[7 \frac{x}{L} - 8 \frac{x^3}{L^3} + \left(2 \frac{x}{L} - 1 \right)^4 \right]$ $y_{\max} = 0.006565 \frac{qL^4}{EI} \quad \text{当 } x_0 \approx 0.54L$ $y_{L/2} = \frac{5}{768} \frac{qL^4}{EI}$
	$A = \frac{Wb}{2L}$ $C = \frac{W}{2L} (2L - b)$ $(A-B) \quad Q = + \frac{Wb}{2L}$ $(B-C) \quad Q = \frac{Wb}{2L} - q(x-a)$	$(A-B) \quad M = \frac{Wbx}{2L}$ $(B-C) \quad M = \frac{Wbx}{2L} - \frac{q(x-a)^2}{2}$ $M_{\max} = \frac{Wb}{8L^2} (2L-b)^2$ $x_0 = L - b \left(1 - \frac{b}{2L} \right)$	$(A-B) \quad y = \frac{WbL}{24EI} \cdot x \left(2 - \frac{b^2}{L^2} - 2 \frac{x^2}{L^2} \right)$ $(B-C) \quad y = \frac{WbL^2}{24EI} \left[\frac{(x-a)^4}{b^2 L^2} - 2 \frac{x^3}{L^3} - \frac{b^2 x}{L^3} + 2 \frac{x}{L} \right]$ $y_{\max} = \frac{qab^3}{24EI} \left(1 - 3 \frac{b}{L} \right), \text{当 } x = a$
	$A = qa \quad D = qa$ $(A-B) \quad Q = q(a-x)$ $(B-C) \quad Q = 0$	$(A-B) \quad M = \frac{qx}{2} (2a-x)$ $(B-C) \quad M = \frac{qa^2}{2}$ $M_{\max} = \frac{qa^2}{2} \quad x = a \rightarrow (L-a)$	
	$A = \frac{W_1(2L-a) + W_2b}{2L}$ $D = \frac{W_2(2L-b) + W_1a}{2L}$	$\text{当 } A < W_1$ $M = -\frac{A^2 a}{2W_1}$ $\text{当 } D < W_2$ $M = -\frac{B^2 b}{2W_2}$	

表10

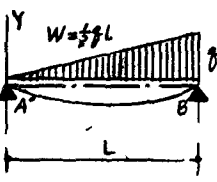
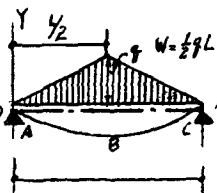
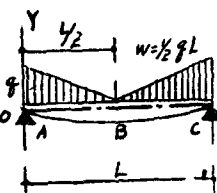
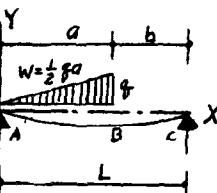
荷 載 情 况	支 座 反 力 及 剪 力	弯 曲 力 矩	挠 度
	$A = \frac{1}{3}W \quad B = \frac{2}{3}W$ $Q = W \left(\frac{x}{3} - \frac{x^2}{L^2} \right)$	$M = \frac{W}{3} \left(x - \frac{x^3}{L^2} \right)$ $M_{\max} = 0.128WL$ $x = 0.5774L$	$y = \frac{Wx}{180EI L^2} (3x^4 - 10L^2x^2 + 7L^4)$ $y_{\max} = 0.01304 \frac{WL^3}{EI} \quad x = 0.519L$
	$A = C = \frac{1}{2}W$ $(A-B) \quad Q = -\frac{1}{2}W \left(1 - 4\frac{x^2}{L^2} \right)$ $(B-C) \quad Q = -\frac{1}{2}W \left(1 - 4\frac{(L-x)^2}{L^2} \right)$	$(A-B) \quad M = \frac{W}{6} \left(3x - 4\frac{x^3}{L^2} \right)$ $(B-C) \quad M = \frac{1}{6}W \left[3L - x - 4\frac{(L-x)^3}{L^2} \right]$ $M_{\max} = \frac{1}{6}WL \quad x = L/2$	$(A-B) \quad y = \frac{Wx}{6EI L^2} \left(\frac{1}{2}L^2x^2 - \frac{1}{5}x^4 - \frac{5}{16}L^4 \right)$ $y_{\max} = \frac{WL^3}{60EI} \quad x = L/2$
	$A = C = \frac{1}{2}W$ $(A-B) \quad Q = \frac{1}{2}W \left(\frac{L-2x}{L} \right)^2$ $(B-C) \quad Q = -\frac{1}{2}W \left(\frac{2x-L}{L} \right)^2$	$(A-B) \quad M = \frac{1}{2}W \left(x - 2\frac{x^2}{L} + \frac{4}{3}\frac{x^3}{L^2} \right)$ $(B-C) \quad M = \frac{1}{2}W \left[(L-x) - 2\frac{(L-x)^2}{L} + \frac{4}{3}\frac{(L-x)^3}{L^2} \right]$ $M = \frac{WL}{12} \quad x = L/2$	$(A-B) \quad y = \frac{W}{12EI} \left(x^3 - \frac{x^4}{L} + \frac{2}{5}\frac{x^5}{L^2} - \frac{3}{8}L^2x \right)$ $y_{\max} = -\frac{3WL^3}{320EI} \quad x = L/2$
	$A = W \left(1 - \frac{2}{3} \cdot \frac{a}{L} \right)$ $C = \frac{qa^2}{2L}$ $(A-B) \quad Q = A - \frac{qx^2}{2a}$ $(B-C) \quad Q = -\frac{qa^2}{3L}$	$(A-B) \quad M = Ax - \frac{qx^3}{6a}$ $(B-C) \quad M = \frac{qa^2}{3L} (L-x)$ $M_{\max} \text{ 当 } x = a \sqrt{1 - \frac{2a}{3L}}$	$(A-B) \quad y = \frac{qa^3x}{360EI} \left[3\frac{x^4}{a^4} + 10 \left(2\frac{a}{L} - 3 \right) \frac{x^2}{a^2} - 3 \left(15 - 4\frac{a}{L} \right) + 40\frac{a}{L} \right]$ $(B-C) \quad y = \frac{qa^2L^2}{90EI} \left[5\frac{x^3}{L^3} - 15\frac{x^2}{L^2} + \left(3\frac{a^2}{L^2} + 10 \right) \frac{x}{L} - 3\frac{a^2}{L^2} \right]$ $y_{\max} = \frac{qa^3L}{45EI} \left(5 - 9\frac{a}{L} + 4\frac{a^2}{L^2} \right) \quad x = a$

表11

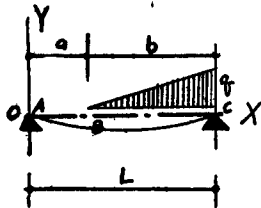
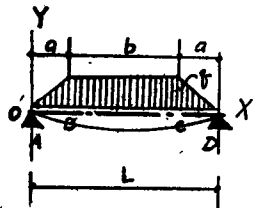
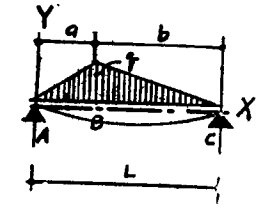
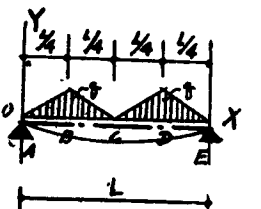
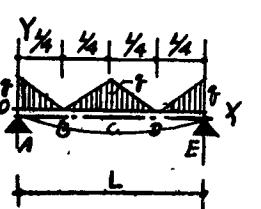
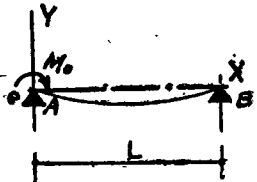
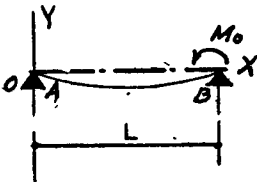
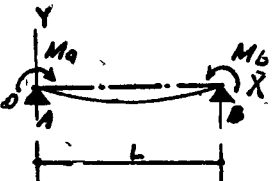
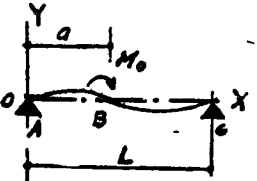
荷 載 情 况	支 座 反 力 及 剪 力	弯 曲 力 矩	挠 度
	$A = \frac{qb^2}{6L}$ $C = \frac{qb}{2} \left(1 - \frac{b}{3L} \right)$ $(A-B) \quad Q = \frac{qb^2}{6L}$ $(B-C)$ $Q = A - \frac{q}{2b}(x-a)^2$	$(A-B) \quad M = \frac{qb^2}{6L} x$ $(B-C) \quad M = \frac{qb^2}{6L} x - \frac{q}{6b}(x-a)^3$ $M_{\max} \text{ 当 } x = a + b\sqrt{\frac{b}{3L}}$	$(A-B)$ $y = \frac{qb^2L}{360EI} \cdot x \left(10\frac{x^2}{L^2} + 3\frac{b^2}{L^2} - 10 \right)$ $(B-C)$ $y = \frac{qb^2L^2}{360EI} \left[10\frac{x^3}{L^3} + 3\frac{b^2}{L^2} \cdot \frac{x}{L} - 10\frac{x}{L} - 3\frac{(x-a)^5}{L^2b^3} \right]$ $y_{\max} = \frac{qab^2L}{360EI} \left(20\frac{b}{L} - 13\frac{b^2}{L^2} \right) \quad x = a$
	$A = D = \frac{q}{2}(a+b)$ $(A-B)$ $Q = \frac{q}{2} \left(a + b - \frac{x^2}{a} \right)$ $(B-C) \quad Q = \frac{q}{2}(L-2x)$	$(A-B) \quad M = -\frac{qx}{2} \left(a + b - \frac{x^2}{3a} \right)$ $(B-C)$ $M = \frac{qLx}{2} - \frac{qa^2}{6} \left(1 + \frac{3x^2}{a^2} \right)$ $M_{\max} = \frac{qL^2}{8} - \frac{qa^2}{6} \quad x = L/2$	
	$A = \frac{q}{6}(L+b)$ $C = \frac{q}{6}(L+a)$ $(A-B) \quad Q = A - \frac{qx^2}{2a}$ $(B-C)$ $Q = - \left[B - \frac{q}{2b}(L-x)^2 \right]$	$(A-B) \quad M = Ax - \frac{qx^3}{6a}$ $(B-C)$ $M = B(L-x) - \frac{q}{6b}(L-x)^3$ $M_{\max} \text{ 在 } a < b \text{ 时}$ $x = L - \sqrt{\frac{b(L+a)}{3}}$	
	$A = E = \frac{qL}{4}$ $(A-B)$ $Q = \frac{qL}{4} \left(1 - \frac{8x^2}{L^2} \right)$ $(B-C)$ $Q = \frac{qL}{2} \left(1 - \frac{2x}{L} \right)^2$	$(A-B) \quad M = \frac{qLx}{12} \left(3 - 8\frac{x^2}{L^2} \right)$ $(B-C)$ $M = \frac{qL^2}{48} \left(-1 + 24\frac{x}{L} - 48\frac{x^2}{L^2} + 32\frac{x^3}{L^3} \right)$ $M_{\max} = \frac{qL^2}{16} \quad x = L/2$	
	$A = E = \frac{qL}{4}$ $(A-B)$ $Q = \frac{qL}{4} \left(1 - \frac{x}{L} + \frac{8x^2}{L^2} \right)$ $(B-C)$ $Q = qx \left(1 - 2\frac{x}{L} \right)$	$(A-B)$ $M = \frac{qLx}{12} \left(3 - 6\frac{x}{L} + \frac{8x^2}{L^2} \right)$ $(B-C)$ $M = \frac{qL^2}{48} \left(1 + 24\frac{x^2}{L^2} - 32\frac{x^3}{L^3} \right)$ $M_{\max} = \frac{qL^2}{16} \quad x = L/2$	

表12

荷 載 情 况	支 座 反 力 及 剪 力	弯 曲 力 矩	挠 度
	$A = -\frac{M_0}{L}$ $B = +\frac{M_0}{L}$ $Q = A$	$M = M_0 + Ax$ $M_{\max} = M_0 \quad x = 0$	$y = \frac{M_0}{6EI} \left(3x^2 - \frac{x^3}{L} - 2Lx \right)$ $y_{\max} = 0.0642 \frac{M_0 L^2}{EI} \quad x = 0.422 L$
	$A = +\frac{M_0}{L}$ $B = -\frac{M_0}{L}$ $Q = A$	$M = Ax$ $M_{\max} = M_0 \quad x = L$	$y = \frac{M_0 L x}{6EI} \left(1 - \frac{x^2}{L^2} \right) \quad y_{L,2} = \frac{M_0 L^2}{16EI}$ $y_{\max} = 0.0642 \frac{M_0 L^2}{EI}$ $x = 0.578 L$
	$A = -\frac{M_a - M_b}{L}$ $B = +\frac{M_a - M_b}{L}$ $Q = A$	$M = M_a \cdot \frac{L-x}{L} + M_b \cdot \frac{x}{L}$ $M_{\max} = +M_a \quad x = 0$ 当 $M_a > M_b$	$y = \frac{MaLx}{6EI} \left[2 + \frac{M_b}{M_a} - 3 \frac{x}{L} - \left(\frac{M_b}{M_a} - 1 \right) \frac{x^2}{L^2} \right]$ $y_{L,2} = \frac{MaL^2}{16EI} \left(1 + \frac{M_b}{M_a} \right)$ $y_{\max} \text{ 当 } x = L \left[1 - \sqrt{\frac{1}{3} \left(\frac{M_b^2}{M_a^2} + \frac{M_b}{M_a} \right)} \right] \cdot \left(1 - \frac{M_b}{M_a} \right)$
	$A = -\frac{M_0}{L} \quad C = +\frac{M_0}{L}$ $Q = A$	$(A-B) M = Ax$ $(B-C) M = Ax + M_0$ $+M_{\max} = Aa + M_0 \quad x = a$ $M_{\min} = Aa \quad x = a$	$(A-B)$ $y = \frac{M_0}{6EI} \left[\left(6a - 3 \frac{a^2}{L} - 2L \right) x - \frac{x^3}{L} \right]$ $(B-C)$ $y = \frac{M_0}{6EI} \left[3a^2 + 3x^2 - \frac{x^3}{L} - \left(2L + 3 \frac{a^2}{L} \right) x \right]$ $y_{\max} \text{ 当 } x = L \sqrt{2 \frac{a}{L} - \frac{2}{3} - \frac{a^2}{L^2}}$