1 结构计算常用基本数据

1.1 双曲线函数

(1) $\mathrm{sh}x=\dfrac{e^{x}-e^{-x}}{2}$; (2) $\mathrm{ch}x=\dfrac{e^{x}+e^{-x}}{2}$;

(3) $\mathrm{th}x=\dfrac{\mathrm{sh}x}{\mathrm{ch}x}=\dfrac{e^{x}-e^{-x}}{e^{x}+e^{-x}}$; (4) $\mathrm{sh}(-x)=-\mathrm{sh}x$;

(5) $\mathrm{ch}(-x)=\mathrm{ch}x$; (6) $\mathrm{th}(x)=-\mathrm{th}x$;

(7) $\mathrm{ch}^{2}x-\mathrm{sh}^{2}x=1$; (8) $\mathrm{sh}(x\pm y)=\mathrm{sh}x\mathrm{ch}y\pm\mathrm{ch}x\mathrm{sh}y$;

(9) $\mathrm{ch}(x\pm y)=\mathrm{ch}x\mathrm{ch}y\pm\mathrm{sh}x\mathrm{sh}y$;

(10) $\mathrm{th}(x\pm y)=\dfrac{\mathrm{th}x\pm\mathrm{th}y}{1\pm\mathrm{th}x\mathrm{th}y}$;

(11) $\mathrm{sh}x\pm\mathrm{sh}y=2\mathrm{sh}\dfrac{x\pm y}{2}\mathrm{ch}\dfrac{x\mp y}{2}$;

(12) $\mathrm{ch}x+\mathrm{ch}y=2\mathrm{ch}\dfrac{x+y}{2}\mathrm{ch}\dfrac{x-y}{2}$;

(13) $\mathrm{ch}x-\mathrm{ch}y=2\mathrm{sh}\dfrac{x+y}{2}\mathrm{sh}\dfrac{x-y}{2}$;

(14) $\mathrm{ch}x\pm\mathrm{sh}x=\dfrac{1\pm\mathrm{th}\left(\dfrac{x}{2}\right)}{1\mp\mathrm{th}\left(\dfrac{x}{2}\right)}$;

(15) $\mathrm{th}x\pm\mathrm{th}y=\dfrac{\mathrm{sh}(x\pm y)}{\mathrm{ch}x\mathrm{ch}y}$; (16) $\mathrm{sh}2x=2\mathrm{sh}x\mathrm{ch}x$;

(17) $\mathrm{ch}2x=\mathrm{ch}^{2}x+\mathrm{sh}^{2}x$; (18) $\mathrm{th}2x=\dfrac{2\mathrm{th}x}{1+\mathrm{th}^{2}x}$;

(19) $\mathrm{sh}\dfrac{x}{2}=\pm\sqrt{\dfrac{\mathrm{ch}x-1}{2}}$; (20) $\mathrm{ch}\dfrac{x}{2}=\sqrt{\dfrac{\mathrm{ch}x+1}{2}}$;

(21) $\text{th}\frac{x}{2}=\pm\sqrt{\frac{\text{ch}x-1}{\text{ch}x+1}}$；(22) $\text{sh}x=-i\sin ix$；

(23) $\text{ch}x=\cos ix$；(24) $\text{th}x=-i\text{tg}ix$；

(25) $\sin x=-i\text{sh}ix$；(26) $\cos x=\text{ch}ix$；

(27) $\text{tg}x=-i\text{th}ix$。

式中　$i=\sqrt{-1}$

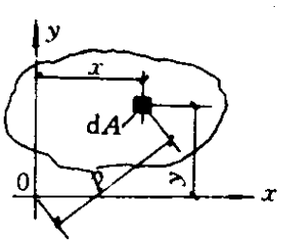
双曲线函数互换式　　表 1.1-1

	$\text{sh}x$	$\text{ch}x$	$\text{th}x$
$\text{sh}x$	—	$\sqrt{\text{ch}^2x-1}$	$\frac{\text{th}x}{\sqrt{1-\text{th}^2x}}$
$\text{ch}x$	$\sqrt{\text{sh}^2x+1}$	—	$\frac{1}{\sqrt{1-\text{th}^2x}}$
$\text{th}x$	$\frac{\text{sh}x}{\sqrt{\text{sh}^2x+1}}$	$\frac{\sqrt{\text{ch}^2x-1}}{\text{ch}x}$	—

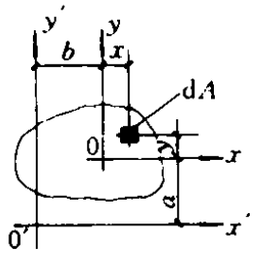
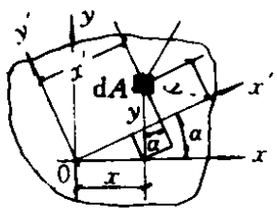
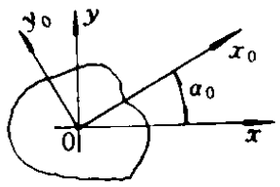
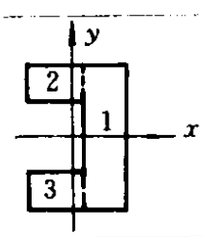
1.2　常用力学公式及数表

1.2.1　截面力学特性的计算公式

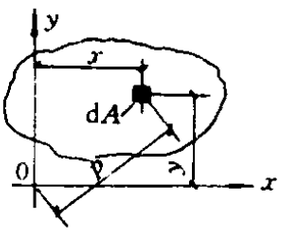
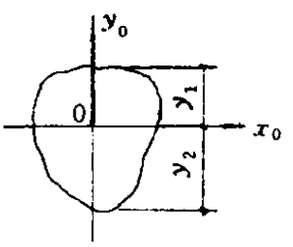
截面力学特性计算公式　　表 1.2-1

序号 名称	定义或关系	图　　例	公　　式
1 惯性矩	截面对任一轴的惯性矩：等于各微面积 dA 与它到该轴距离平方的乘积的总和		$I_x=\int_A y^2dA$ $I_y=\int_A x^2dA$
2 惯性积	截面对 x 轴及 y 轴的惯性积：等于各微面积 dA 与它到两轴距离的乘积的总和		$I_{xy}=\int_A xydA$

续表

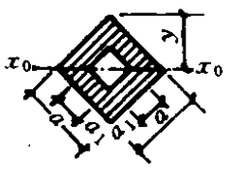
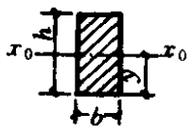
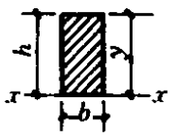
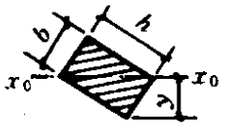
序号 名称	定义或关系	图　　例	公　　式
3 平行轴的惯性矩	截面对平行于形心轴 x 和 y 而相距 a 和 b 的 x' 和 y' 轴的惯性矩：等于本身形心轴的惯性矩与本图形面积及面积形心至 x' 和 y' 轴距离平方乘积的代数和		$I'_x = I_x + a^2A$ $I'_y = I_y + b^2A$
4 平行轴的惯性积			$I_{x'y'} = I_{xy} + abA$
5 惯性矩转轴公式	两轴（通过任一点 0）旋转 α 角（以逆时针方向为正）后惯性矩的关系		$I_{x'} = I_x\cos^2\alpha + I_y\sin^2\alpha - I_{xy}\sin 2\alpha$ $I_{y'} = I_x\sin^2\alpha + I_y\cos^2\alpha + I_{xy}\cos 2\alpha$
6 截面的主形心轴	通过截面形心并且有一定方位角 α_0 的两个互相垂直的轴 x_0 和 y_0 称为主形心轴		主形心轴的方位角 α_0 $\mathrm{tg}2\alpha_0 = \dfrac{2I_{xy}}{I_y - I_x}$
7 主形心轴的惯性矩	截面对主形心轴 x_0 和 y_0 的主形心惯性矩，一个最大，另一个最小		$I_{x0} = I_x\cos^2 2\alpha_0 + I_y\sin^2\alpha_0 - I_{xy}\sin 2\alpha_0$ $I_{y0} = I_x\sin^2 2\alpha_0 + I_y\cos^2\alpha_0 + I_{xy}\sin 2\alpha_0$
8 组合截面的惯性矩	组合截面的惯性矩等于各组成部分惯性矩的和		$I_x = I_{x_1} + I_{x_2} + \cdots\cdots I_{x_n} = \sum_{i=1}^{n} I_{x_i}$

续表

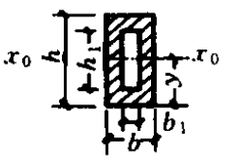
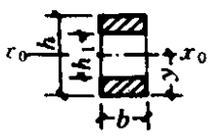
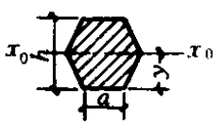
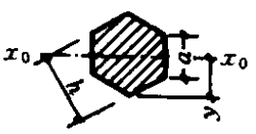
序号 名称	定义或关系	图　例	公　式
9 极惯性矩	截面对任一点0的极惯性矩：等于各微面积dA与它到0点距离的平方乘积的总和，并等于经过该点的相互垂直的任一对轴的惯性矩的总和		$I_\rho = \int_A \rho^2 dA = I_x + I_y$ 式中　$\rho = \sqrt{x^2 + y^2}$——微面积dA到0点的距离
10 截面的回转半径			$r_x = \sqrt{\frac{I_x}{A}}$；$r_y = \sqrt{\frac{I_y}{A}}$ 式中　r_x、r_y——分别为截面对x、y轴的回转半径； I_x、I_y——分别为截面对x、y轴的惯性矩； A——截面面积
11 截面弹性抵抗矩系数 (截面系数)			$W_{x_1} = \frac{I_{x_0}}{y_1}$ $W_{x_2} = \frac{I_{x_0}}{y_2}$ 式中　W_{x_1}、W_{x_2}——分别为截面上、下边缘的截面系数； I_{x_0}——截面对形心轴x_0的惯性矩； y_1、y_2——分别为形心到截面上、下边缘的距离

1.2.2 常用图形的几何及力学特征表

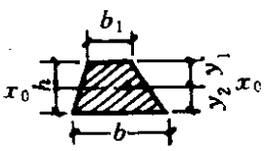
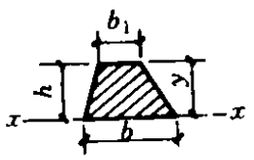
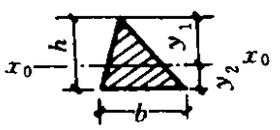
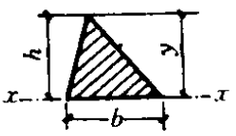
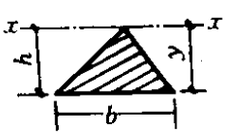
常用图形的几何及力学特征表 表 1.2-2

序号	截面简图	截面积 (A)	图示轴线到边缘距离(y;x)	对图示轴线的惯性矩、截面系数及回转半径 (I、W 及 r)
1		$a^2-a_1^2$	$y=a$	$I_x=\frac{1}{12}[4a^4-3a_1^2a^2-a_1^4]$
2		$a^2-a_1^2$	$y=\frac{a}{\sqrt{2}}$	$I_{x_0}=\frac{a^4-a_1^4}{12}$; $W_{x_0}=0.118\frac{a^4-a_1^4}{a}$; $r_{x_0}=0.289\sqrt{a^2+a_1^2}$
3		bh	$y=\frac{h}{2}$	$I_{x_0}=\frac{bh^3}{12}$; $W_{x_0}=\frac{1}{6}bh^2$; $r_{x_0}=0.289h$
4		bh	$y=h$	$I_x=\frac{bh^3}{3}$
5		bh	$y=\frac{bh}{\sqrt{b^2+h^2}}$	$I_{x_0}=\frac{b^3h^3}{6(b^2+h^2)}$; $r_{x_0}=\frac{bh}{\sqrt{6(b^2+h^2)}}$; $W_{x_0}=\frac{b^2h^2}{6\sqrt{b^2+h^2}}$
6		bh	$y=\frac{1}{2}(h\cos\alpha+b\sin\alpha)$	$I_{x_0}=\frac{bh}{12}(h^2\cos^2\alpha+b^2\sin^2\alpha)$

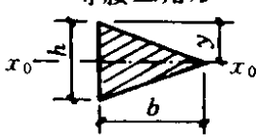
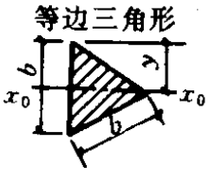
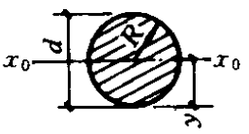
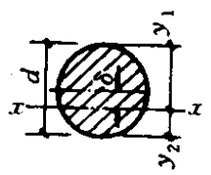
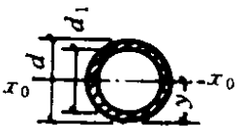
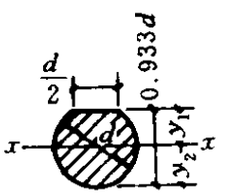
续表

序号	截面简图	截面积（A）	图示轴线到边缘距离（$y;x$）	对图示轴线的惯性矩、截面系数及回转半径（I、W及r）
7		$bh-b_1h_1$	$y=\frac{h}{2}$	$I_{x_0}=\frac{bh^3-b_1h_1^3}{12}$； $W_{x_0}=\frac{bh^3-b_1h_1^3}{6h}$； $r_{x_0}=0.289\sqrt{\frac{bh^3-b_1h_1^3}{bh-b_1h_1}}$
8		$b(h-h_1)$	$y=\frac{h}{2}$	$I_{x_0}=\frac{b(h^3-h_1^3)}{12}$； $W_{x_0}=\frac{b(h^3-h_1^3)}{6h}$； $r_{x_0}=0.289\times\sqrt{h^2+hh_1+h_1^2}$
9	正六角形 	$\frac{3\sqrt{3}}{2}a^2=2.598a$ $\frac{\sqrt{3}}{2}h^2=0.866h^2$	$y=\frac{\sqrt{3}}{2}a$ $=0.866a$ $=0.5h$	$I_{x_0}=\frac{5\sqrt{3}}{16}a^4=0.511a^4$ $=0.0601h^4$； $W_{x_0}=\frac{5}{8}a^3=0.120h^3$； $r_{x_0}=0.456a=0.261h$
10	正六角形 	$\frac{3\sqrt{3}}{2}a^2=2.598a^2$； $\frac{\sqrt{3}}{2}h^2=0.866h^2$	$y=a=\frac{h}{\sqrt{3}}$ $=0.577h$	$I_{x_0}=\frac{5\sqrt{3}}{16}a^4=0.541a^4$ $=0.0601h^4$； $W_{x_0}=0.541a^3$ $=0.104h^3$； $r_{x_0}=0.456a=0.264h$
11	正八角形 	$2\sqrt{2}R^2=2.828R^2$； $\frac{2\sqrt{2}}{2+\sqrt{2}}h^2=0.828h^2$	$y=\frac{\sqrt{2+\sqrt{2}}}{2}R$ $=0.924R$ $=0.5h$	$I_{x_0}=1+\frac{2\sqrt{2}}{6}R^4$ $=0.638R^4$ $=0.0547h^4$； $W_{x_0}=0.691R^3$ $=0.109h^3$； $r_{x_0}=0.475R=0.257h$

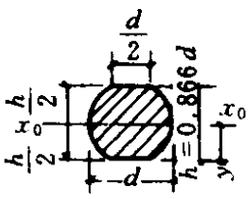
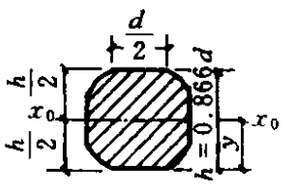
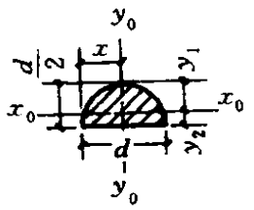
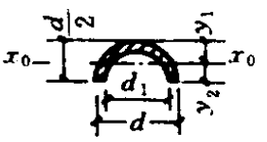
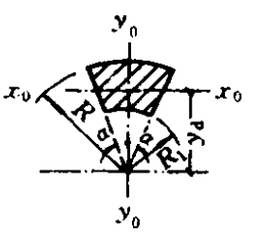
续表

序号	截面简图	截面积（A）	图示轴线到边缘距离（$y;x$）	对图示轴线的惯性矩、截面系数及回转半径（I、W及r）
12	正八角形 	$2.828R^2$ $3.314R_4^2$ $4.828a^2$	$y = R$ $= 1.082R_1$ $= 1.307a$	$I_{x_0} = 0.638R^4$ $= 0.876R_1^4$ $= 1.860a^4$; $W_{x_0} = 0.638R^3$ $= 0.809R_1^3$ $= 1.423a^3$; $r_{x_0} = 0.475R$ $= 0.514R_1 = 0.621a$
13		$\frac{h(b+b_1)}{2}$	$y_1 = \frac{h(b_1+2b)}{3(b_1+b)}$; $y_2 = \frac{h(b+2b_1)}{3(b+b_1)}$	$I_{x_0} = \frac{h^3(b^2+4bb_1+b_1^2)}{36(b+b_1)}$; $W_{x_0} = \frac{b^2+4bb_1+b_1^2}{12(2b+b_1)}h^2$; $r_{x_0} = \frac{h}{6(b+b_1)} \times \sqrt{2(b^2+4bb_1+b_1^2)}$
14		$\frac{h(b+b_1)}{2}$	$y = h$	$I_x = \frac{h^3(b+3b_1)}{12}$
15		$\frac{bh}{2}$	$y_1 = \frac{2h}{3}$ $y_2 = \frac{h}{3}$	$I_{x_0} = \frac{bh^3}{36}$; $W_{x_01} = \frac{bh^2}{24}$; $W_{x_02} = \frac{bh^2}{12}$; $r_{x_0} = 0.236h$
16		$\frac{bh}{2}$	$y = h$	$I_x = \frac{bh^3}{12}$
17		$\frac{bh}{2}$	$y = h$	$I_x = \frac{bh^3}{4}$

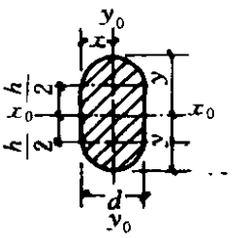
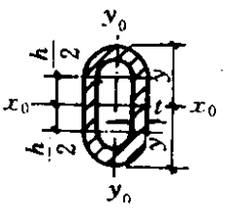
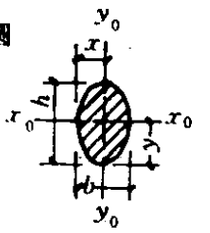
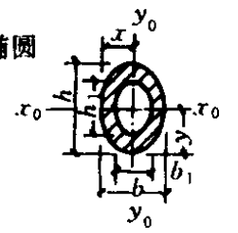
续表

序号	截面简图	截面积（A）	图示轴线到边缘距离（$y;x$）	对图示轴线的惯性矩、截面系数及回转半径（I、W及r）
18	等腰三角形 	$\frac{bh}{2}$	$y=\frac{h}{2}$	$I_{x_0}=\frac{bh^3}{48}$；$W_{x_0}=\frac{bh^2}{24}$；$r_{x_0}=0.204h$
19	等边三角形 	$\frac{\sqrt{3b^2}}{4}=0.433b^2$	$y=\frac{b}{2}$	$I_{x_0}=\frac{b^4}{32\sqrt{3}}=0.018b^4$；$W_{x_0}=0.0361b^3$；$r_{x_0}=0.204b$
20		$\frac{\pi d^2}{4}=0.785d^2$；$\pi R^2=3.142R^2$	$y=\frac{d}{2}=R$	$I_{x_0}=\frac{\pi d^4}{64}=0.0491d^4$；$W_{x_0}=0.0982d^3$；$r_{x_0}=\frac{1}{4}d$
21		$\frac{\pi d^2}{4}=0.785d^2$	$y_1=\frac{d}{2}+\delta$；$y_2=\frac{d}{2}-\delta$	$I_x=\frac{\pi d^2}{64}(d^2+16\delta^2)$
22		$\frac{\pi(d^2-d_1^2)}{4}=0.785(d^2-d_1^2)$	$y=\frac{d}{2}$	$I_{x_0}=\frac{\pi(d^4-d_1^4)}{64}=0.0491(d^4-d_1^4)$；$W_{x_0}=0.0982\frac{d^4-d_1^4}{d}$；$r_{x_0}=\frac{\sqrt{d^2+d_1^2}}{4}$
23		$0.763d^2$	$y_1=0.433d$；$y_2=\frac{d}{2}$	$I_x=0.0443d^4$

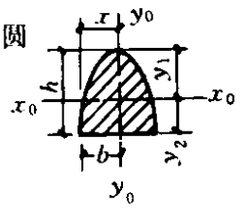
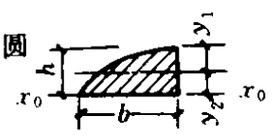
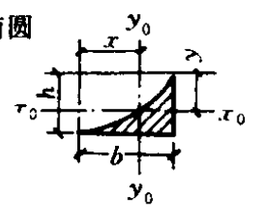
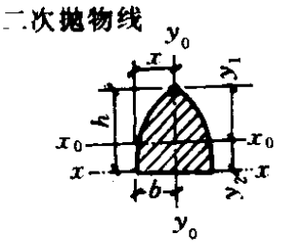
续表

序号	截面简图	截面积 (A)	图示轴线到边缘距离(y;x)	对图示轴线的惯性矩、截面系数及回转半径(I、W及r)
24		$0.740d^2$	$y=\frac{h}{2}$ $=0.433d$	$I_{x_0}=0.0395d^4$; $W_{x_0}=0.0912d^3$; $r_{x_0}=0.231d$
25		$0.695d^2$	$y=\frac{h}{2}$ $=0.433d$	$I_{x_0}=0.0389d^4$; $W_{x_0}=0.0898d^3$; $r_{x_0}=0.237d$
26		$\frac{\pi d^2}{8}=$ $0.393d^2$	$y_1=\frac{d(3\pi-4)}{6\pi}$ $=0.288d$ $y_2=\frac{2d}{3\pi}$ $=0.212d$	$I_{x_0}=\frac{d^4(9\pi^2-64)}{1152\pi}$ $=0.00686d^4$
			$x=0.5d$	$I_{y_0}=0.0245d^4$
27		$\frac{\pi}{8}(d^2-d_1^2)$ $=0.393(d^2$ $-d_1^2)$	$y_1=\frac{d}{2}-y_2$; $y_2=\frac{2}{3\pi}$ $\times\frac{(d^3-d_1^3)}{(d^2-d_1^2)}$	$I_{x_0}=$ $\frac{9\pi^2(d^4-d_1^4)(d^2-d_1^2)}{1152\pi(d^2-d_1^2)}$ $-\frac{64(d^3-d_1^3)^2}{1152\pi(d^2-d_1^2)}$
28		$\alpha(R^2-R_1^2)$	$y_d=\frac{2}{3}\times$ $\frac{R^3-R_1^3}{R^2-R_1^2}\times\frac{\sin\alpha}{\alpha}$	$I_{x_0}=\frac{1}{4}\left(\alpha+\sin\alpha\cos\alpha\right.$ $\left.-\frac{16\sin^2\alpha}{9\alpha}\right)\times(R^4-R_1^4)$ $-\frac{4\sin^2\alpha R^2R_1^2(R-R_1)}{9\alpha(R+R_1)}$ $I_{y_0}=\frac{1}{4}(\alpha-\sin\alpha\cos\alpha)$ $\times(R^4-R_1^4)$

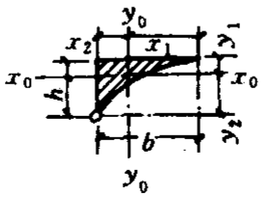
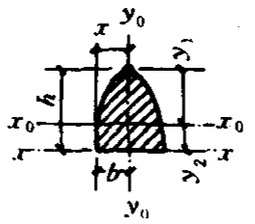
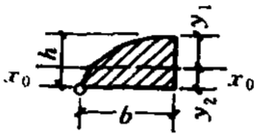
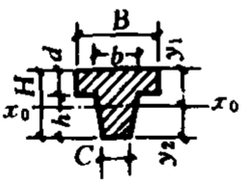
续表

序号	截面简图	截面积 (A)	图示轴线到边缘距离(y;x)	对图示轴线的惯性矩、截面系数及回转半径(I、W及r)
29		$\frac{\pi}{4}d^2 + hd$	$y = \frac{1}{2}(h + d)$ $x = \frac{1}{2}d$	$I_{x_0} = \frac{\pi d^4}{64} + \frac{hd^3}{6} + \frac{\pi h^2 d^2}{16} + \frac{dh^3}{12}$; $I_{y_0} = \frac{\pi d^4}{64} + \frac{hd^3}{12}$
30		$2(\pi R + h)t$	$y = R + \frac{h + t}{2}$	$I_{x_0} = \pi R^3 t + 4R^2 th + \frac{\pi}{2}Rth^2 + \frac{1}{6}th^3 + \left(\frac{\pi R}{4} + \frac{h}{3}\right)t^3$
31	椭圆 	$\frac{\pi bh}{4} = 0.785bh$	$y = \frac{1}{2}h$	$I_{x_0} = \frac{\pi bh^3}{64} = 0.0491bh^3$; $W_{x_0} = 0.0982bh^2$; $r_{x_0} = \frac{1}{4}h$
			$x = \frac{1}{2}b$	$I_{y_0} = \frac{\pi hb^3}{64} = 0.0491hb^3$; $W_{y_0} = 0.0982hb^2$; $r_{y_0} = \frac{1}{4}b$
32	椭圆 	$\frac{\pi(bh - b_1h_1)}{4} = 0.785(bh - b_1h_1)$	$y = \frac{1}{2}h$	$I_{x_0} = \frac{\pi(bh^3 - b_1h_1^3)}{64} = 0.0491(bh^3 - b_1h_1^3)$
			$x = \frac{1}{2}b$	$I_{y_0} = \frac{\pi(bh^3 - b_1h_1^3)}{64} = 0.0491(bh^3 - b_1h_1^3)$

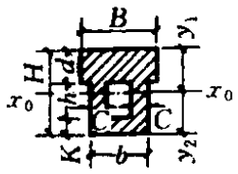
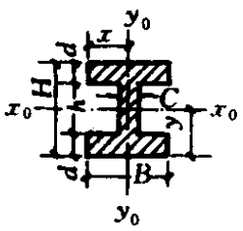
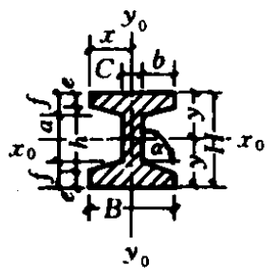
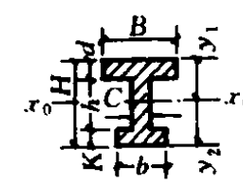
续表

序号	截面简图	截面积 (A)	图示轴线到边缘距离(y;x)	对图示轴线的惯性矩、截面系数及回转半径(I、W及r)
33	椭圆 	$\frac{\pi bh}{2}=1.571$ bh	$y_1=h\left(1-\frac{4}{3\pi}\right)$ $=0.576h$; $y_2=\frac{4}{3\pi}h$ $=0.424h$	$I_{x_0}=\frac{9\pi^2-64}{72\pi}bh^3$ $=0.11bh^3$
			$x=b$	$I_{y_0}=\frac{1}{8}\pi hb^3$ $=0.393hb^3$
34	椭圆 	$\frac{\pi bh}{4}=0.785$ bh	$y_1=h\left(1-\frac{4}{3\pi}\right)$ $=0.576h$; $y_2=\frac{4}{3\pi}h$ $=0.424h$	$I_{x_0}=\frac{9\pi^2-64}{144\pi}bh^3$ $=0.0549bh^3$
35	椭圆 	$bh\left(1-\frac{\pi}{4}\right)$ $=0.215bh$	$y=\frac{h}{6\left(1-\frac{\pi}{4}\right)}$ $=0.777h$	$I_{x_0}=\left(\frac{1}{3}-\frac{\pi}{16}-\frac{1}{36-9\pi}\right)bh^3$ $=0.00755bh^3$
			$x=\frac{b}{6\left(1-\frac{\pi}{4}\right)}$ $=0.777b$	$I_{y_0}=\left(\frac{1}{3}-\frac{\pi}{16}-\frac{1}{36-9\pi}\right)hb^3$ $=0.00755hb^3$
36	二次抛物线 	$\frac{4}{3}bh$	$y_1=\frac{3}{5}h$; $y_2=\frac{2}{5}h$	$I_{x_0}=\frac{16}{175}bh^3$; $I_x=\frac{32}{105}bh^3$
			$x=b$	$I_{y_0}=\frac{4}{15}hb^3$

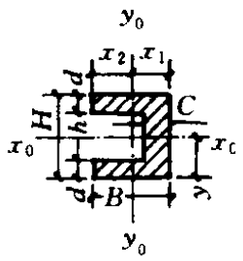
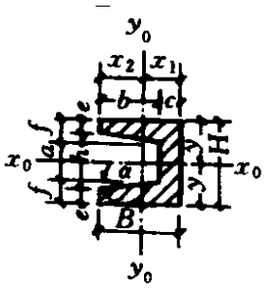
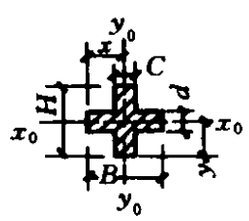
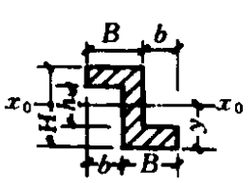
续表

序号	截面简图	截面积（A）	图示轴线到边缘距离（y；x）	对图示轴线的惯性矩、截面系数及回转半径（I、W 及 r）
37	二次抛物线 	$\frac{2}{3}bh$	$y_1=\frac{5}{8}h$； $y_2=\frac{3}{8}h$	$I_{x_0}=\frac{19}{480}bh^3$
38	二次抛物线 	$\frac{1}{3}bh$	$y_1=\frac{1}{4}h$； $y_2=\frac{3}{4}h$	$I_{x_0}=\frac{1}{80}bh^3$
			$x_1=\frac{7}{10}b$； $x_2=\frac{3}{10}b$	$I_{y_0}=\frac{37}{2100}hb^3$
39	n 次抛物线 	$\frac{2n}{n+1}bh$	$y_1=\frac{n+1}{2n+1}h$； $y_2=\frac{n}{2n+1}h$	$I_{x_0}=\frac{2n^3bh^3}{(3n+1)(2n+1)^2}$； $I_x=\frac{4n^3bh^3}{(n+1)(2n+1)(3n+1)}$
			$x=b$	$I_{y_0}=\frac{2n}{3(n+3)}hb^3$
40	n 次抛物线 	$\frac{n}{n+1}bh$	$y_1=\frac{n+3}{2(n+2)}h$； $y_2=\frac{n+1}{2(n+2)}h$	$I_{x_0}=\frac{n(n^2+4n+7)bh^3}{12(n+3)(n+2)^2}$
41		$Bd+\frac{h}{2}(b+C)$	$y_1=\frac{3d(Bd+bh+Ch)}{6Bd+3h(b+C)}+\frac{h^2(b+2C)}{6Bd+3h(b+C)}$； $y_2=H-y_1$	$I_{x_0}=\frac{1}{12}[4Bd^3+(b+3C)h^3]-\left[Bd+\frac{h}{2}(b+C)\right](y_1-d)^2$

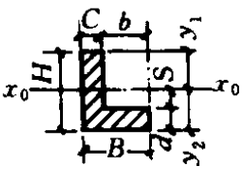
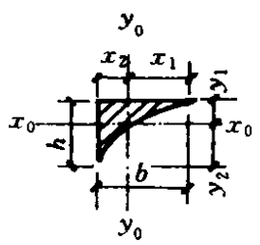
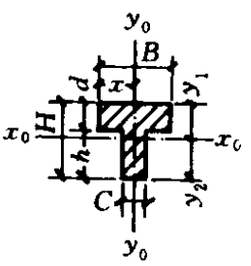
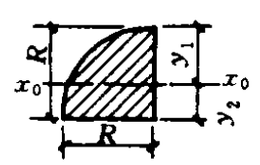
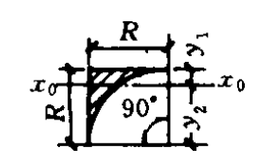
续表

序号	截面简图	截面积 (A)	图示轴线到边缘距离(y;x)	对图示轴线的惯性矩、截面系数及回转半径(I、W及r)
42		$Bd+2Ch+bK$	$y_1=H-y_2$; $y_2=\frac{1}{2}\left[\frac{2CH^2+(b-2C)K^2}{Bd+2Ch+bK}+\frac{(B-2C)(2H-d)d}{Bd+2Ch+bK}\right]$	$I_{x_0}=\frac{1}{3}[by_2^3+By_1^3-(b-2C)(y_2-K)^3-(B-2C)(y_1-d)^3]$
43		$Ch+2Bd$	$y=\frac{1}{2}H$	$I_{x_0}=\frac{1}{12}[BH^3-(B-C)h^3]$; $W_{x_0}=\frac{BH^3-h^3(B-C)}{6h}$
			$x=\frac{1}{2}B$	$I_{y_0}=\frac{1}{12}(hC^3+2dB^3)$
44		$CH+2b(e+f)$	$y=\frac{1}{2}H$	$I_{x_0}=\frac{1}{12}\left[BH^3-\frac{h^4-a^4}{4\mathrm{tg}\alpha}\right]$ 式中 $\mathrm{tg}\alpha=\frac{h-a}{B-C}$
			$x=\frac{1}{2}B$	$I_{y_0}=\frac{1}{12}\left[B^3(H-h)+aC^3+\frac{\mathrm{tg}\alpha}{4}(B^4-C^4)\right]$ 式中 $\mathrm{tg}\alpha=\frac{h-a}{B-C}$
45		$Bd+Ch+bK$	$y_1=H-y_2$; $y_2=\frac{1}{2}\left[\frac{CH^2+(b-C)K^2}{Bd+Ch+bK}+\frac{(B-C)(2H-d)d}{Bd+Ch+bK}\right]$	$I_{x_0}=\frac{1}{3}[by_2^3+By_1^3-(b-C)(y_2-K)^3-(B-C)(y_1-d)^3]$

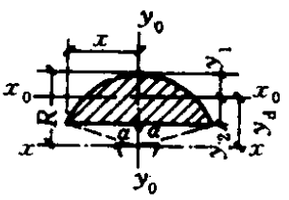
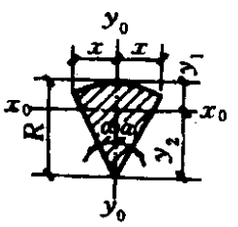
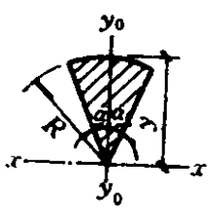
续表

序号	截面简图	截面积 (A)	图示轴线到边缘距离($y;x$)	对图示轴线的惯性矩、截面系数及回转半径 (I、W 及 r)
46		$BH-h$ $(B-C)$	$y=\frac{1}{2}H$	$I_{x_0}=\frac{1}{12}[BH^3-(B-C)h^3]$
			$x_1=B-x_2$; $x_2=\frac{1}{2}\left[\frac{B^2H-h(B-C)^2}{BH-h(B-C)}\right]$	$I_{y_0}=\frac{1}{3}(2B^3d+hC^3)-[BH-h(B-C)]x_1^2$
47		$CH+b(e+f)$	$y=\frac{1}{2}H$	$I_{x_0}=\frac{1}{12}\left(BH^3-\frac{h^4-a^4}{8\mathrm{tg}\alpha}\right)$ 式中 $\mathrm{tg}\alpha=\frac{h-a}{2b}$
			$x_1=\frac{6B^2e+3hC^2}{6[CH+b(e+f)]}+\frac{2b(b+3C)(f-e)}{6[CH+b(e+f)]}$; $x_2=B-x_1$	$I_{y_0}=\frac{1}{3}\left[2eB^3+aC^3+\frac{\mathrm{tg}\alpha}{2}(B^4-C^4)\right]-[CH+b(e+f)]x_1^2$ 式中 $\mathrm{tg}\alpha=\frac{h-a}{2b}$
48		$CH+d$ $(B-C)$	$y=\frac{1}{2}H$	$I_{x_0}=\frac{1}{12}[CH^3+d^3(B-C)]$
			$x=\frac{1}{2}B$	$I_{y_0}=\frac{1}{12}[dB^3+C^3(H-d)]$
49		$BH-bh$	$y=\frac{1}{2}H$	$I_{x_0}=\frac{1}{12}(BH^3-bh^3)$

续表

序号	截面简图	截面积 (A)	图示轴线到边缘距离(y;x)	对图示轴线的惯性矩、截面系数及回转半径(I、W及r)
50		$CH + bd$	$y_1 = H - y_2$; $y_2 = \frac{1}{2} \times \frac{CH^2 + bd^2}{CH + bd}$	$I_{x_0} = \frac{1}{3}(By_2^3 - bS^3 + Cy_1^3)$
51	n 次抛物线 	$\frac{1}{n+1}bh$	$y_1 = \frac{1}{n+2}h$; $y_2 = \frac{n+1}{n+2}h$	$I_{x_0} = \frac{bh^3}{(n+3)(n+2)^2}$
			$x_1 = \frac{3n+1}{2(2n+1)}b$; $x_2 = \frac{n+1}{2(2n+1)}b$	$I_{y_0} = \frac{(7n^2+4n+1)}{12(3n+1)(2n+1)^2}hb^3$
52		$Bd + hC$	$y_1 = \frac{1}{2} \times \frac{CH^2 + d^2(B-C)}{Bd + hC}$ $y_2 = H - y_1$	$I_{x_0} = \frac{1}{3}[Cy_2^3 + By_1^3 - (B-C)(y_1 - d)^3]$
			$x = \frac{1}{2}B$	$I_{y_0} = \frac{1}{12}(dB^3 + hC^3)$
53		$\frac{\pi}{4}R^2 = 0.785R^2$	$y_1 = \left(1 - \frac{4}{3\pi}\right)R = 0.576R$; $y_2 = \frac{4}{3\pi}R = 0.424R$	$I_{x_0} = \frac{9\pi^2 - 64}{144\pi}R^4 = 0.0549R^4$
54		$R^2\left(1 - \frac{\pi}{4}\right) = 0.215R^2$	$y_1 = 0.223R$; $y_2 = \frac{R}{6\left(1 - \frac{\pi}{4}\right)} = 0.777R$	$I_{x_0} = R^4\left(\frac{1}{3} - \frac{\pi}{16} - \frac{1}{36 - 9\pi}\right) = 0.00755R^4$

续表

序号	截面简图	截面积 (A)	图示轴线到边缘距离(y;x)	对图示轴线的惯性矩、截面系数及回转半径 (I、W 及 r)
55		$\frac{R^2}{2}(2\alpha - \sin 2\alpha)$	$y_d = \frac{4R}{3} \times \frac{\sin^3\alpha}{2\alpha - \sin 2\alpha}$; $y_1 = R - y_d$; $y_2 = R(1 - \cos\alpha) - y_1$	$I_{x_0} = \frac{R^4}{72}\left[18\alpha - 9\sin 2\alpha\cos 2\alpha - \frac{64\sin^6\alpha}{2\alpha - \sin 2\alpha}\right]$ $I_x = \frac{R^4}{8}(2\alpha - \sin 2\alpha\cos 2\alpha)$
			$x = R\sin\alpha$	$I_{y_0} = \frac{R^4}{24}[6\alpha - \sin 2\alpha(3 + 2\sin^2\alpha)]$
56		αR^2	$y_1 = R - y_2$; $y_2 = \frac{2}{3} \times \frac{R\sin\alpha}{\alpha}$	$I_{x_0} = \frac{R^4}{4}\left(\alpha + \sin\alpha\cos\alpha - \frac{16\sin^2\alpha}{9\alpha}\right)$
			$x = R\sin\alpha$	$I_{y_0} = \frac{R^4}{4}(\alpha - \sin\alpha\cos\alpha)$
57		αR^2	$y = R$	$I_x = \frac{R^4}{4}(\alpha + \sin\alpha\cos\alpha)$; $I_{y_0} = \frac{R^4}{4}(\alpha - \sin\alpha\cos\alpha)$

1.2.3　几种常用截面的几何及力学特征表

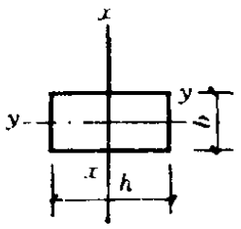
(1) 矩形截面特征表（表 1.2-3）

(2) T 形、十形、工形截面特征表（表 1.2-4～表 1.2-7）

(3) 管柱截面特征表（表 1.2-8）

(4) 双肢柱截面特征表（表 1.2-9、表 1.2-10）

矩形柱截面几何特征表 表 1.2-3



A ——截面积；

I_x——对 $x—x$ 轴的惯性矩；

I_y——对 $y—y$ 轴的惯性矩；

r_x——对 $x—x$ 轴的回转半径；

r_y——对 $y—y$ 轴的回转半径；

g ——每米长标准自重(按钢筋混凝土表观密度为 2500kg/m^3 计算)

b	h	A	I_x	I_y	r_x	r_y	g
(mm)	(mm)	$\times 10^2$ (mm^2)	$\times 10^8$ (mm^4)	$\times 10^8$ (mm^4)	(mm)	(mm)	(kN/m)
300	150	450	0.84	3.38	43.40	86.70	1.13
	200	600	2.00	4.50	57.80		1.50
	250	750	3.91	5.63	72.30		1.88
	300	900	6.75	6.75	86.60		2.25
	350	1050	10.70	7.87	101.00		2.63
	400	1200	16.00	9.00	115.50		3.00
	450	1350	22.78	10.13	129.90		3.38
	500	1500	31.25	11.25	144.30		3.75
	550	1650	41.59	12.38	158.80		4.13
	600	1800	54.00	13.50	173.20		4.50
350	350	1225	12.5	12.5	101.00	101.00	3.06
	400	1400	18.7	14.3	115.50		3.50
	450	1575	26.6	16.1	129.90		3.94
	500	1750	36.4	17.9	144.30		4.38
	550	1925	48.5	19.6	158.80		4.81
	600	2100	63.0	21.4	173.20		5.25
	650	2275	80.2	23.2	187.60		5.69
	700	2450	100.1	25.0	202.10		6.13
400	400	1600	21.3	21.3	115.50	115.50	4.00
	450	1800	30.4	24.0	129.90		4.50
	500	2000	41.6	26.6	144.30		5.00
	550	2200	55.5	29.3	158.80		5.50
	600	2400	72.0	32.0	173.20		6.00
	650	2600	91.5	34.6	187.60		6.50
	700	2800	114.2	37.4	202.10		7.00
	750	3000	140.5	40.0	216.50		7.50
	800	3200	170.6	42.7	231.00		8.00
	850	3400	204.4	45.4	245.40		8.50