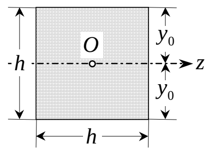
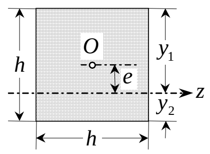
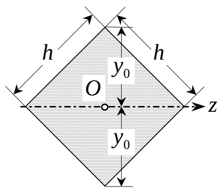
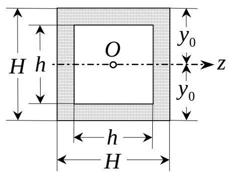
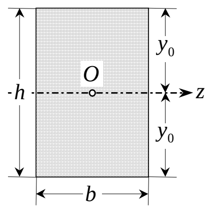
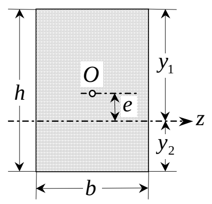
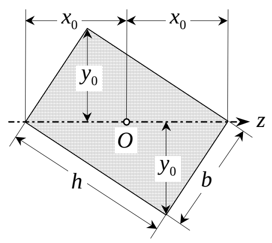
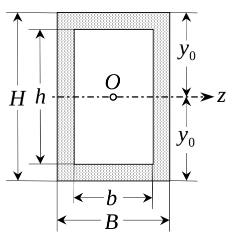
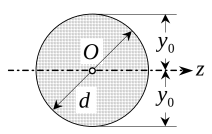
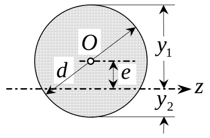
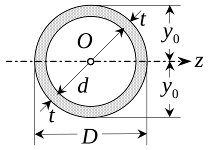
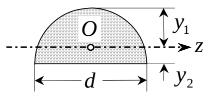
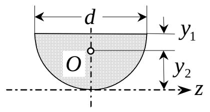
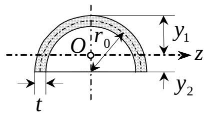
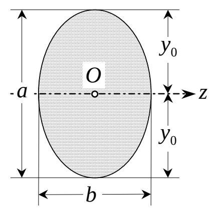
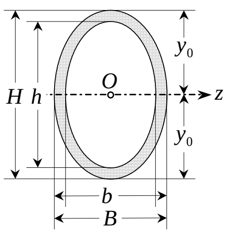
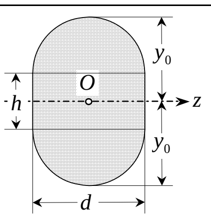
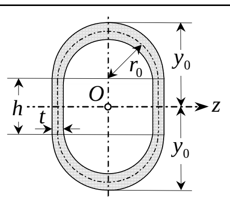
代表的図形の断面諸量（その１）

	図　　形	断面積 A	図示の軸より縁に至る距離 y	図示の軸に関する断面慣性モーメント I_z	図示の軸に関する断面係数 W_z	図示の軸に関する回転半径 r_z
正方形		h^2	$y_0=\dfrac{h}{2}$	$\dfrac{h^4}{12}$	$\dfrac{h^3}{6}$	$\dfrac{h}{\sqrt{12}}\cong 0.289h$
正方形		h^2	$y_1=\dfrac{h}{2}+e$ $y_2=\dfrac{h}{2}-e$	$\dfrac{h^4}{12}+h^2e^2$	$W_1=\dfrac{I_z}{y_1}=\dfrac{h^2(h^2+12e^2)}{6(h+2e)}$ $W_2=\dfrac{I_z}{y_2}=\dfrac{h^2(h^2+12e^2)}{6(h-2e)}$	$\sqrt{\dfrac{h^2+12e^2}{12}}$ $\cong 0.289\sqrt{h^2+12e^2}$
正方形		h^2	$y_0=\dfrac{h}{\sqrt{2}}$ $\cong 0.707h$	$\dfrac{h^4}{12}$	$\dfrac{h^3}{6\sqrt{2}}\cong 0.118h^3$	$\dfrac{h}{\sqrt{12}}\cong 0.289h$
中空正方形		H^2-h^2	$y_0=\dfrac{H}{2}$	$\dfrac{H^4-h^4}{12}$	$\dfrac{H^4-h^4}{6H}$	$\sqrt{\dfrac{H^2+h^2}{12}}$ $\cong 0.289\sqrt{H^2+h^2}$
長方形		bh	$y_0=\dfrac{h}{2}$	$\dfrac{bh^3}{12}$	$\dfrac{bh^2}{6}$	$\dfrac{h}{\sqrt{12}}\cong 0.289h$
長方形		bh	$y_1=\dfrac{h}{2}+e$ $y_2=\dfrac{h}{2}-e$	$\dfrac{bh^3}{12}+bhe^2$	$W_1=\dfrac{I_z}{y_1}=\dfrac{bh\cdot(h^2+12e^2)}{6(h+2e)}$ $W_2=\dfrac{I_z}{y_2}=\dfrac{bh\cdot(h^2+12e^2)}{6(h-2e)}$	$\sqrt{\dfrac{h^2+12e^2}{12}}$ $\cong 0.289\sqrt{h^2+12e^2}$
長方形		bh	$y_0=\dfrac{bh}{\sqrt{b^2+h^2}}$ $x_0=\dfrac{\sqrt{b^2+h^2}}{2}$	$\dfrac{b^2h^2}{6(b^2+h^2)}$	$\dfrac{b^2h^2}{6\sqrt{b^2+h^2}}$	$\dfrac{bh}{\sqrt{6(b^2+h^2)}}$
中空長方形		$BH-bh$	$y_0=\dfrac{H}{2}$	$\dfrac{BH^3-bh^3}{12}$	$\dfrac{BH^3-bh^3}{6H}$	$\sqrt{\dfrac{BH^3-bh^3}{12(BH-bh)}}$
円		$\dfrac{\pi}{4}d^2$ $\cong 0.785d^2$	$y_0=\dfrac{d}{2}$	$\dfrac{\pi}{64}d^4\cong 0.0491d^4$	$\dfrac{\pi}{32}d^3\cong 0.0982d^3$	$\dfrac{d}{4}$

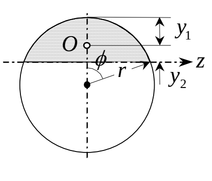
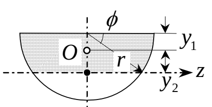
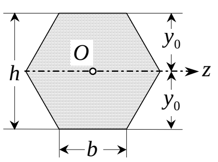
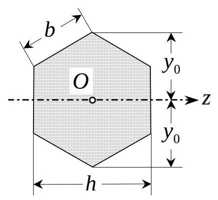
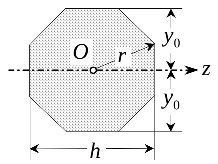
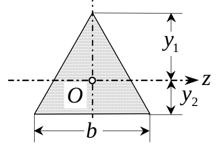
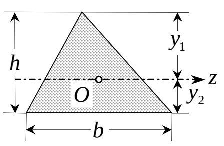
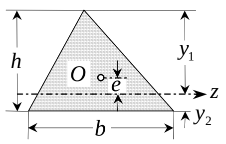
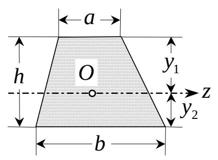
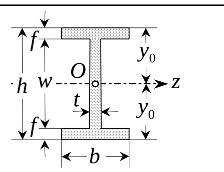
※改訂３版　土木設計便覧，丸善(1974)，pp.1136~1143 に準拠

代表的図形の断面諸量（その２）

	図　　形	断面積 A	図示の軸より縁に至る距離 y	図示の軸に関する断面慣性モーメント I_z	図示の軸に関する断面係数 W_z	図示の軸に関する回転半径 r_z
円		$\frac{\pi}{4}d^2$ $\cong 0.785d^2$	$y_1=\frac{d}{2}+e$ $y_2=\frac{d}{2}-e$	$\frac{\pi}{64}d^4+\frac{\pi}{4}d^2e^2$	$W_1=\frac{\pi}{32}\cdot\frac{d^2(d^2+16e^2)}{d+2e}$ $W_2=\frac{\pi}{32}\cdot\frac{d^2(d^2+16e^2)}{d-2e}$	$\frac{\sqrt{d^2+16e^2}}{4}$
中空円		$\frac{\pi}{4}(D^4-d^2)$	$y_0=\frac{D}{2}$	$\frac{\pi}{64}(D^4-d^4)$ $\cong 0.0491(D^4-d^4)$	$\frac{\pi}{32}\cdot\frac{D^4-d^4}{D}$ $\cong 0.0982\frac{D^4-d^4}{D}$ $\cong 0.8D^2t$ t/Dが小さいとき	$\sqrt{\frac{D^2+d^2}{4}}$
半円		$\frac{\pi}{8}d^2$ $\cong 0.393d^2$	$y_1=\frac{3\pi-4}{6\pi}d$ $\cong 0.288d$ $y_2=\frac{2}{3\pi}d$ $\cong 0.212d$	$\frac{9\pi^2-64}{1152\pi}d^4$ $\cong 0.00686d^4$	$W_1=\frac{9\pi^2-64}{192(3\pi-4)}d^3$ $\cong 0.0239d^3$ $W_2=\frac{9\pi^2-64}{768}d^3$ $\cong 0.0325d^3$	$\frac{\sqrt{9\pi^2-64}}{12\pi}d$ $\cong 0.132d$
半円		$\frac{\pi}{8}d^2$ $\cong 0.393d^2$	$y_1=\frac{2}{3\pi}d$ $\cong 0.212d$ $y_2=\frac{3\pi-4}{6\pi}d$ $\cong 0.288d$	$\frac{1}{16}\cdot\left(\frac{5}{8}\pi-\frac{4}{3}\right)\cdot d^4$ $\cong 0.0394d^4$	$W_1=\frac{I_z}{y_1}$，　$W_2=\frac{I_z}{y_2}$	$\sqrt{\frac{5}{16}-\frac{2}{3\pi}}d$ $\cong 0.317d$
中空半円		$\pi r_0 t$	$y_1=\left(1-\frac{2}{\pi}\right)\cdot r_0+\frac{t}{2}$ $y_2=\frac{2}{\pi}r_0$	$\left(\frac{\pi}{2}-\frac{4}{\pi}\right)\cdot r_0^3t$ $\cong 0.298r_0^3t$	$W_1=\frac{I_z}{y_1}$，　$W_2=\frac{I_z}{y_2}$	$\sqrt{\frac{1}{2}-\frac{4}{\pi^2}}r_0$ $\cong 0.308r_0$
楕円		$\frac{\pi ab}{4}$ $\cong 0.785ab$	$y_0=\frac{a}{2}$	$\frac{\pi}{64}a^3b\cong 0.0491a^3b$	$\frac{\pi}{32}a^2b\cong 0.0982a^2b$	$\frac{a}{4}$
中空楕円		$\frac{\pi}{4}(HB-hb)$ $\cong 0.785$ $\times(HB-hb)$	$y_0=\frac{H}{2}$	$\frac{\pi}{64}(H^3B-h^3b)$ $\cong 0.0491$ $\times(H^3B-h^3b)$	$\frac{\pi}{32}\cdot\frac{H^3B-h^3b}{H}$ $\cong 0.0982\cdot\frac{H^3B-h^3b}{H}$	$\frac{1}{4}\sqrt{\frac{H^3B-h^3b}{HB-hb}}$
小判型		$\frac{\pi}{4}d^2+hd$	$y_0=\frac{h+d}{2}$	$\frac{\pi d^4}{64}+\frac{hd^3}{6}$ $+\frac{\pi h^2d^2}{16}+\frac{h^3d}{12}$	$W=\frac{I_z}{y_0}$	$r_z=\sqrt{\frac{I_z}{A}}$
中空小判型		$2(\pi r_0+h)t$	$y_0=r_0+\frac{h+t}{2}$	$\pi t r_0^3+4t r_0^2h$ $+\frac{\pi}{2}t r_0h^2+\frac{1}{6}t h^3$	$W=\frac{I_z}{y_0}$	$r_z=\sqrt{\frac{I_z}{A}}$

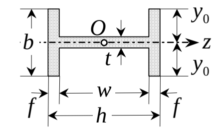
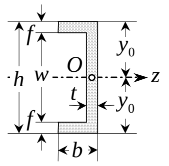
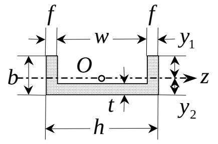
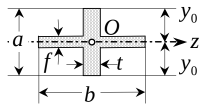
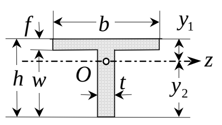
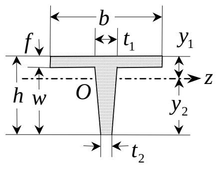
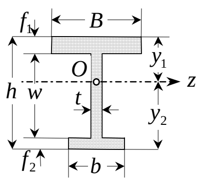
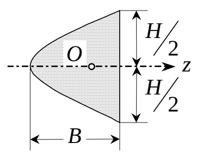
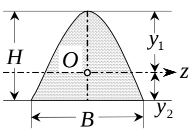
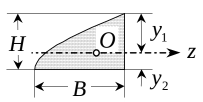
※改訂３版　土木設計便覧，丸善(1974)，pp.1136~1143 に準拠

代表的図形の断面諸量（その３）

	図　　形	断面積 A	図示の軸より縁に至る距離 y	図示の軸に関する断面慣性モーメント I_z	図示の軸に関する断面係数 W_z	図示の軸に関する回転半径 r_z
欠円		$\frac{r^2}{2}(2\phi-\sin 2\phi)$	$y_1 = r(1-\cos\phi)-y_2$ $y_2 = \frac{2\left[\frac{1}{3}\sin\phi(2+\cos^2\phi)-\phi\cos\phi\right]}{2\phi-\sin 2\phi}r$	$r^4\left[\phi\left(\frac{1}{4}+\cos^2\phi\right)-\sin\phi\cos\phi\left(\frac{5}{4}-\frac{1}{6}\sin^2\phi\right)\right]$		$r_z=\sqrt{\frac{I_z}{A}}$
円帯		$\frac{r^2}{2}(2\phi+\sin 2\phi)$	$y_1 = r\sin\phi-y_2$ $y_2 = \frac{2\left[\frac{1}{3}\sin\phi(2+\cos^2\phi)+\left(\frac{\pi}{2}-\phi\right)\cos\phi-\frac{2}{3}\right]}{2\phi+\sin 2\phi}r$	$r^4\left[\left(\frac{\pi}{2}-\phi\right)\left(\frac{1}{4}+\cos^2\phi\right)+\sin\phi\cos\phi\left(\frac{5}{4}-\frac{1}{6}\sin^2\phi\right)\right]$		$r_z=\sqrt{\frac{I_z}{A}}$
正六角形		$\frac{\sqrt{3}}{2}h^2$ $\cong 0.866h^2$ $\frac{3\sqrt{3}}{2}b^2$ $\cong 2.598b^2$	$y_0=\frac{h}{2}$	$\frac{5\sqrt{3}}{144}h^4 \cong 0.0602h^4$ $\frac{5\sqrt{3}}{16}b^4 \cong 0.541b^4$	$\frac{5\sqrt{3}}{72}h^3 \cong 0.120h^3$ $\frac{5}{8}b^3 = 0.625b^3$	$\sqrt{\frac{5}{72}}h \cong 0.264h$ $\sqrt{\frac{5}{24}}b \cong 0.456b$
正六角形		$\frac{\sqrt{3}}{2}h^2$ $\cong 0.866h^2$ $\frac{3\sqrt{3}}{2}b^2$ $\cong 2.598b^2$	$y_0=\frac{h}{\sqrt{3}} \cong 0.577h$	$\frac{5\sqrt{3}}{144}h^4 \cong 0.0602h^4$ $\frac{5\sqrt{3}}{16}b^4 \cong 0.541b^4$	$\frac{5}{48}h^3 \cong 0.104h^3$ $\frac{5\sqrt{3}}{16}b^3 \cong 0.541b^3$	$\sqrt{\frac{5}{72}}h \cong 0.264h$ $\sqrt{\frac{5}{24}}b \cong 0.456b$
正八角形		$2h^2\tan 22.5°$ $\cong 0.828h^2$ $4r^2\sin 45°$ $\cong 2.828r^2$	$r\cos 22.5°$ $\cong 0.924r$	$0.0547h^4$ $0.638r^4$	$0.109h^3$ $0.691r^3$	$0.257h$ $0.475r$
正三角形		$\frac{\sqrt{3}}{4}b^2$ $\cong 0.433b^2$	$y_1=\frac{\sqrt{3}}{3}b \cong 0.577b$ $y_2=\frac{\sqrt{3}}{6}b \cong 0.289b$	$\frac{b^4}{32\sqrt{3}} \cong 0.0180b^4$	$W_1=\frac{I_z}{y_1}=\frac{b^3}{32}$ $W_2=\frac{I_z}{y_2}=\frac{b^3}{16}$	$\frac{b}{\sqrt{24}} \cong 0.204b$
三角形		$\frac{bh}{2}$	$y_1=\frac{2}{3}h$ $y_2=\frac{1}{3}h$	$\frac{bh^3}{36}$	$W_1=\frac{I_z}{y_1}=\frac{bh^2}{24}$ $W_2=\frac{I_z}{y_2}=\frac{bh^2}{12}$	$\frac{h}{\sqrt{18}} \cong 0.236h$
三角形		$\frac{bh}{2}$	$y_1=\frac{2}{3}h+e$ $y_2=\frac{1}{3}h-e$	$\frac{bh}{36}(h^2+18e^2)$	$W_1=\frac{I_z}{y_1}$ $W_2=\frac{I_z}{y_2}$	$\sqrt{\frac{h^2+18e^2}{18}}$
台形		$\frac{(a+b)h}{2}$	$y_1=\frac{a+2b}{a+b}\times\frac{h}{3}$ $y_2=\frac{2a+b}{a+b}\times\frac{h}{3}$	$\frac{a^2+4ab+b^2}{36(a+b)}h^3$	$W_1=\frac{a^2+4ab+b^2}{12(a+2b)}h^2$ $W_2=\frac{a^2+4ab+b^2}{12(2a+b)}h^2$	$\frac{\sqrt{2(a^2+4ab+b^2)}}{6(a+b)}h$
I形		$bh-w(b-t)$	$y_0=\frac{h}{2}$	$\frac{bh^3-w^3(b-t)}{12}$	$\frac{bh^3-w^3(b-t)}{6h}$	$\sqrt{\frac{bh^3-w^3(b-t)}{12\left[bh-w(b-t)\right]}}$

※改訂３版　土木設計便覧，丸善(1974)，pp.1136~1143 に準拠

代表的図形の断面諸量（その４）

	図　　形	断面積 A	図示の軸より縁に至る距離 y	図示の軸に関する断面慣性モーメント I_z	図示の軸に関する断面係数 W_z	図示の軸に関する回転半径 r_z
I形		$bh-w(b-t)$	$y_0=\frac{b}{2}$	$\frac{2fb^3+wt^3}{12}$	$\frac{2fb^3+wt^3}{6b}$	$\sqrt{\frac{2fb^3+wt^3}{12[bh-w(b-t)]}}$
溝形		$bh-w(b-t)$	$y_0=\frac{h}{2}$	$\frac{bh^3-w^3(b-t)}{12}$	$\frac{bh^3-w^3(b-t)}{6h}$	$\sqrt{\frac{bh^3-w^3(b-t)}{12[bh-w(b-t)]}}$
溝形		$bh-w(b-t)$	$y_1=\frac{b^2h-w(b-t)^2}{2[bh-w(b-t)]}$ $y_2=b-y_1$	$\frac{2fb^3+wt^3}{12}-Ay_2^2$	$W_1=\frac{I_z}{y_1}$ $W_2=\frac{I_z}{y_2}$	$r_z=\sqrt{\frac{I_z}{A}}$
十字形		$at+f(b-t)$	$y_0=\frac{a}{2}$	$\frac{ta^3+f^3(b-t)}{12}$	$\frac{ta^3+f^3(b-t)}{6a}$	$\sqrt{\frac{ta^3+f^3(b-t)}{12[at+f(b-t)]}}$
T形		$bf+wt$	$y_1=\frac{th^2+f^2(b-f)}{2(bf+wt)}$ $y_2=h-y_1$	$\frac{th^3+(b-t)f^3}{3}-Ay_1^2$	$W_1=\frac{I_z}{y_1}$ $W_2=\frac{I_z}{y_2}$	$r_z=\sqrt{\frac{I_z}{A}}$
T形		$bf+\frac{w}{2}(t_1+t_2)$	$y_1=\frac{3bf^2+3t_2w(b+f)+w(t_1-t_2)(3f+w)}{6A}$		$W_1=\frac{I_z}{y_1}$ $W_2=\frac{I_z}{y_2}$	$r_z=\sqrt{\frac{I_z}{A}}$
			$y_2=h-y_1$	$\frac{4bf^3+w^3(t_1+3t_2)}{12}-A(y_1-f)^2$		
T形（変形）		$Bf_1+wt+bf_2$	$y_1=\frac{h^2t+(b-t)f_1^2+(b-t)(2h-f_2)f_2}{2A}$		$W_1=\frac{I_z}{y_1}$ $W_2=\frac{I_z}{y_2}$	$r_z=\sqrt{\frac{I_z}{A}}$
			$y_2=h-y_1$	$\frac{1}{3}\left[\begin{array}{l}By_1^3+by_2^3\\-(B-t)(y_1-f_1)^3\\-(b-t)(y_2-f_2)^3\end{array}\right]$		
放物線形		$\frac{2}{3}BH$	$\frac{H}{2}$	$\frac{BH^3}{30}$	$\frac{BH^2}{15}$	$\frac{H}{2\sqrt{5}}$
放物線形		$\frac{2}{3}BH$	$y_1=\frac{2}{5}H$ $y_2=\frac{3}{5}H$	$\frac{8}{175}BH^3$	$W_1=\frac{I_z}{y_1}=\frac{4}{35}BH^2$ $W_2=\frac{I_z}{y_2}=\frac{8}{105}BH^2$	$\sqrt{\frac{12}{175}}H$
放物線形		$\frac{2}{3}BH$	$y_1=\frac{3}{8}H$ $y_2=\frac{5}{8}H$	$\frac{19}{480}BH^3$	$W_1=\frac{I_z}{y_1}=\frac{19}{180}BH^2$ $W_2=\frac{I_z}{y_2}=\frac{19}{300}BH^2$	$\frac{\sqrt{95}}{40}H$

※改訂３版　土木設計便覧，丸善(1974)，pp.1136~1143 に準拠