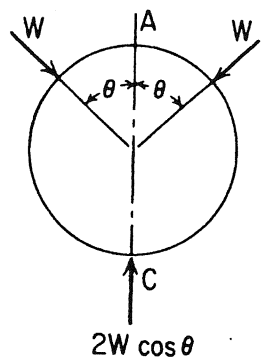


ABLE 17 Formulas for circular rings (Continued)

Reference no., loading, and load terms	Formulas for moments, loads, and deformations and some selected numerical values																																																																							
5.  $LT_M = -WR \sin (x - \theta) \langle x - \theta \rangle^0$ $LT_N = -W \sin (x - \theta) \langle x - \theta \rangle^0$ $LT_V = -W \cos (x - \theta) \langle x - \theta \rangle^0$	$M_A = \frac{-WR}{\pi} [s(\pi - \theta) - k_2(1 + c)]$ $M_C = \frac{-WR}{\pi} [s\theta - k_2(1 + c)]$ $N_A = \frac{-W}{\pi} s(\pi - \theta)$ $V_A = 0$ $D_H = \begin{cases} \frac{-WR^3}{EI} \left[k_1 \left(\frac{\theta_s}{2} - c \right) + 2k_2c - \frac{2k_2^2(1 + c)}{\pi} \right] & \text{if } \theta \leq \frac{\pi}{2} \\ \frac{-WR^3}{EI} \left[\frac{k_1s(\pi - \theta)}{2} - \frac{2k_2^2(1 + c)}{\pi} \right] & \text{if } \theta \geq \frac{\pi}{2} \end{cases}$ $D_V = \frac{WR^3}{EI} \left[\frac{k_1(s - \pi c + \theta c)}{2} - k_2s + \frac{2k_2^2(1 + c)}{\pi} \right]$ $\Delta L = \begin{cases} \frac{WR^3}{2EI} \left[k_1 \left(\frac{\theta_s}{\pi} - \frac{\pi c}{2} \right) - k_2(1 - c) + \frac{2k_2^2(1 + c)}{\pi} \right] & \text{if } \theta \leq \frac{\pi}{2} \\ \frac{WR^3}{2EI} \left[k_1 \left(\frac{\theta_s}{\pi} - \pi c + \theta c \right) + k_2(1 + c - 2s) + \frac{2k_2^2(1 + c)}{\pi} \right] & \text{if } \theta \geq \frac{\pi}{2} \end{cases}$ $\Delta L_w = \frac{WR^3}{EI} \left\{ k_1 \frac{s - s^3(1 - \theta/\pi) - c(\pi - \theta)}{2} + k_2 \left[\frac{\theta_s(1 + c)}{\pi} - s + \frac{k_2^2(1 + c)^2}{\pi} \right] \right\}$ $D_{WH} = \frac{-WR^3}{EI\pi} [k_1s(\pi - \theta)(\theta - sc) + 2\theta ck_2(1 + c) - 2sk_2^2(1 + c)]$ $\Delta\psi = \frac{WR^2}{EI\pi} [\pi s^2 - \theta(1 + c + s^2)]k_2$																																																																							
<p>Max + $M = M_C$ if $\theta \leq 60^\circ$ Max + M occurs at the load if $\theta > 60^\circ$ where $M_\theta = \frac{WR}{\pi} [k_2(1 + c) - sc(\pi - \theta)]$ Max - $M = \begin{cases} M_C & \text{if } \theta \geq 90^\circ \\ M_A & \text{if } 60^\circ \leq \theta \leq 90^\circ \end{cases}$ Max - M occurs at an angular position $x_1 = \arctan \frac{-\pi c}{\theta_s}$ if $\theta \leq 60^\circ$ If $\alpha = \beta = 0$, $M = K_M WR$, $N = K_N W$, $D = K_D WR^3/EI$, $\Delta\psi = K_{\Delta\psi} WR^2/EI$, etc.</p>																																																																								
<table><tr><th>θ</th><th>30°</th><th>60°</th><th>90°</th><th>120°</th><th>150°</th></tr><tr><td>K_{MA}</td><td>0.1773</td><td>-0.0999</td><td>-0.1817</td><td>-0.1295</td><td>-0.0407</td></tr><tr><td>K_{NA}</td><td>-0.4167</td><td>-0.5774</td><td>-0.5000</td><td>-0.2887</td><td>-0.0833</td></tr><tr><td>K_{MC}</td><td>0.5106</td><td>0.1888</td><td>-0.1817</td><td>-0.4182</td><td>-0.3740</td></tr><tr><td>$K_{M\theta}$</td><td>0.2331</td><td>0.1888</td><td>0.3183</td><td>0.3035</td><td>0.1148</td></tr><tr><td>K_{DH}</td><td>0.1910</td><td>0.0015</td><td>-0.1488</td><td>-0.1351</td><td>-0.0456</td></tr><tr><td>K_{DV}</td><td>-0.1957</td><td>-0.0017</td><td>0.1366</td><td>0.1471</td><td>0.0620</td></tr><tr><td>$K_{\Delta L}$</td><td>-0.1115</td><td>-0.0209</td><td>0.0683</td><td>0.0936</td><td>0.0447</td></tr><tr><td>$K_{\Delta L_w}$</td><td>-0.1718</td><td>-0.0239</td><td>0.0683</td><td>0.0888</td><td>0.0278</td></tr><tr><td>K_{DWH}</td><td>0.0176</td><td>-0.0276</td><td>-0.1488</td><td>-0.1206</td><td>-0.0182</td></tr><tr><td>$K_{\Delta\psi}$</td><td>-0.1027</td><td>0.0000</td><td>0.0000</td><td>0.0833</td><td>-0.0700</td></tr></table>							θ	30°	60°	90°	120°	150°	K_{MA}	0.1773	-0.0999	-0.1817	-0.1295	-0.0407	K_{NA}	-0.4167	-0.5774	-0.5000	-0.2887	-0.0833	K_{MC}	0.5106	0.1888	-0.1817	-0.4182	-0.3740	$K_{M\theta}$	0.2331	0.1888	0.3183	0.3035	0.1148	K_{DH}	0.1910	0.0015	-0.1488	-0.1351	-0.0456	K_{DV}	-0.1957	-0.0017	0.1366	0.1471	0.0620	$K_{\Delta L}$	-0.1115	-0.0209	0.0683	0.0936	0.0447	$K_{\Delta L_w}$	-0.1718	-0.0239	0.0683	0.0888	0.0278	K_{DWH}	0.0176	-0.0276	-0.1488	-0.1206	-0.0182	$K_{\Delta\psi}$	-0.1027	0.0000	0.0000	0.0833	-0.0700
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