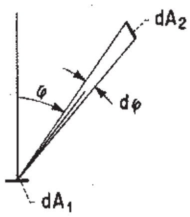
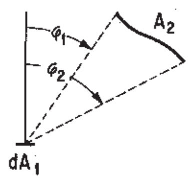
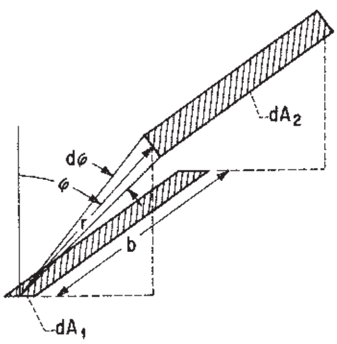
APPENDIX C

CATALOG OF SELECTED CONFIGURATION FACTORS

1		Area dA_1 of differential width and any length, to infinitely long strip dA_2 of differential width and with parallel generating line to dA_1. $dF_{d1-d2} = \frac{\cos \varphi}{2} d\varphi = \frac{1}{2} d(\sin \varphi)$
2		Area dA_1 of differential width and any length to any cylindrical surface A_2 generated by a line of infinite length moving parallel to itself and parallel to the plane of dA_1. $F_{d1-2} = \frac{1}{2}(\sin \varphi_2 - \sin \varphi_1)$

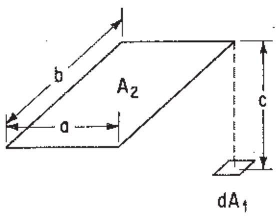
3



Strip of finite length b and of differential width, to differential strip of same length on parallel generating line.

$$dF_{d1-d2} = \frac{\cos\varphi}{\pi}\, d\varphi \tan^{-1}\frac{b}{r}$$

4

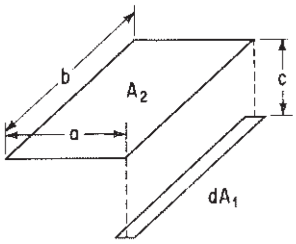


Plane element dA_1 to plane parallel rectangle; normal to element passes through corner of rectangle.

$$X = \frac{a}{c} \qquad Y = \frac{b}{c}$$

$$F_{d1-2} = \frac{1}{2\pi}\left(\frac{X}{\sqrt{1+X^2}}\tan^{-1}\frac{Y}{\sqrt{1+X^2}} + \frac{Y}{\sqrt{1+Y^2}}\tan^{-1}\frac{X}{\sqrt{1+Y^2}}\right)$$

5

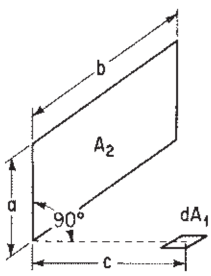


Strip element to rectangle in plane parallel to strip; strip is opposite one edge of rectangle.

$$X = \frac{a}{c} \qquad Y = \frac{b}{c}$$

$$F_{d1-2} = \frac{1}{\pi Y}\left[\sqrt{1+Y^2}\tan^{-1}\frac{X}{\sqrt{1+Y^2}} - \tan^{-1}X + \frac{XY}{\sqrt{1+X^2}}\tan^{-1}\frac{Y}{\sqrt{1+X^2}}\right]$$

6

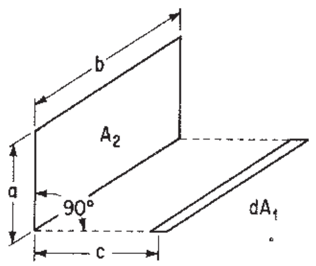


Plane element dA_1 to rectangle in plane 90° to plane of element.

$$X = \frac{a}{b} \qquad Y = \frac{c}{b}$$

$$F_{d1-2} = \frac{1}{2\pi}\left[\tan^{-1}\frac{1}{Y} - \frac{Y}{\sqrt{X^2+Y^2}}\tan^{-1}\frac{1}{\sqrt{X^2+Y^2}}\right]$$

7

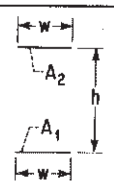


Strip element dA_1 to rectangle in plane 90° to plane of strip.

$X = \frac{a}{b} \qquad Y = \frac{c}{b}$

$$F_{d1-2} = \frac{1}{\pi}\left\{\tan^{-1}\frac{1}{Y} + \frac{Y}{2}\ln\left[\frac{Y^2(X^2+Y^2+1)}{(Y^2+1)(X^2+Y^2)}\right] - \frac{Y}{\sqrt{X^2+Y^2}}\tan^{-1}\frac{1}{\sqrt{X^2+Y^2}}\right\}$$

8

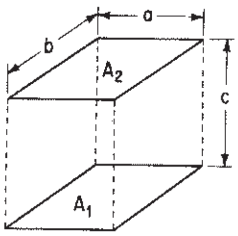


Two infinitely long, directly opposed parallel plates of the same finite width.

$H = \frac{h}{w}$

$F_{1-2} = F_{2-1} = \sqrt{1 + H^2} - H$

9

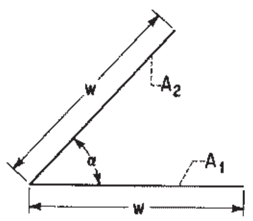


Identical, parallel, directly opposed rectangles.

$X = \frac{a}{c} \qquad Y = \frac{b}{c}$

$$F_{1-2} = \frac{2}{\pi XY}\left\{\ln\left[\frac{(1+X^2)(1+Y^2)}{1+X^2+Y^2}\right]^{\frac{1}{2}} + X\sqrt{1+Y^2}\tan^{-1}\frac{X}{\sqrt{1+Y^2}} + Y\sqrt{1+X^2}\tan^{-1}\frac{Y}{\sqrt{1+X^2}} - X\tan^{-1}X - Y\tan^{-1}Y\right\}$$

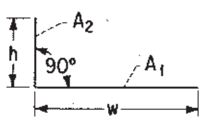
10



Two infinitely long plates of equal finite width w, having one common edge, and at an included angle α to each other

$F_{1-2} = F_{2-1} = 1 - \sin\frac{\alpha}{2}$

11

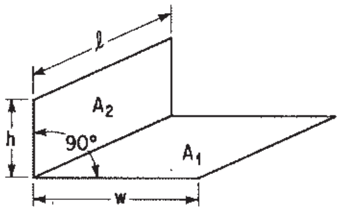


Two infinitely long plates of unequal widths h and w, having one common edge, and at an angle of 90° to each other.

$H = \frac{h}{w}$

$F_{1-2} = \frac{1}{2}[1 + H - \sqrt{1 + H^2}]$

12

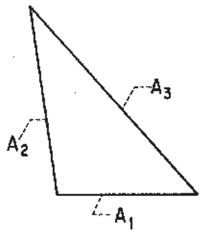


Two finite rectangles of same length, having one common edge, and at an angle of 90° to each other.

$$H = \frac{h}{l} \qquad W = \frac{w}{l}$$

$$F_{1-2} = \frac{1}{\pi W}\left(W\tan^{-1}\frac{1}{W} + H\tan^{-1}\frac{1}{H} - \sqrt{H^2+W^2}\,\tan^{-1}\frac{1}{\sqrt{H^2+W^2}} + \frac{1}{4}\ln\left\{\left[\frac{(1+W^2)(1+H^2)}{(1+W^2+H^2)}\right]\left[\frac{W^2(1+W^2+H^2)}{(1+W^2)(W^2+H^2)}\right]^{W^2}\left[\frac{H^2(1+H^2+W^2)}{(1+H^2)(H^2+W^2)}\right]^{H^2}\right\}\right)$$

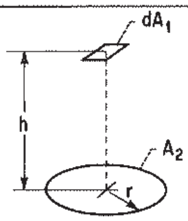
13



Infinitely long enclosure formed by three plane areas.

$$F_{1-2} = \frac{A_1 + A_2 - A_3}{2A_1}$$

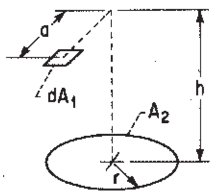
14



Plane element dA_1 to circular disk in plane parallel to element; normal to element passes through center of disk.

$$F_{d1-2} = \frac{r^2}{h^2 + r^2}$$

15



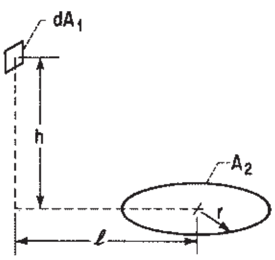
Plane element dA_1 to circular disk in plane parallel to element.

$$H = \frac{h}{a} \qquad R = \frac{r}{a}$$

$$Z = 1 + H^2 + R^2$$

$$F_{d1-2} = \frac{1}{2}\left(1 - \frac{1 + H^2 - R^2}{\sqrt{Z^2 - 4R^2}}\right)$$

16



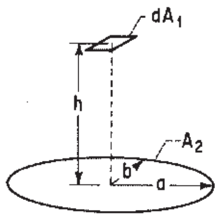
Plane element dA_1 to circular disk; planes containing element and disk intersect at 90°.

$$H = \frac{h}{l} \qquad R = \frac{r}{l}$$

$$Z = 1 + H^2 + R^2$$

$$F_{d1-2} = \frac{H}{2}\left(\frac{Z}{\sqrt{Z^2 - 4R^2}} - 1\right)$$

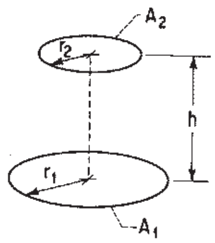
17



Plane element dA_1 to elliptical plate in plane parallel to element; normal to element passes through center of plate.

$$F_{d1-2} = \frac{ab}{\sqrt{(h^2 + a^2)(h^2 + b^2)}}$$

18



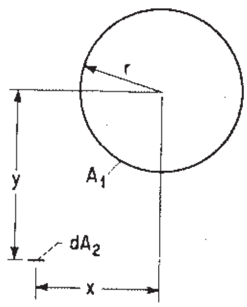
Parallel circular disks with centers along the same normal.

$$R_1 = \frac{r_1}{h} \qquad R_2 = \frac{r_2}{h}$$

$$X = 1 + \frac{1 + R_2^2}{R_1^2}$$

$$F_{1-2} = \frac{1}{2}\left[X - \sqrt{X^2 - 4\left(\frac{R_2}{R_1}\right)^2}\right]$$

19

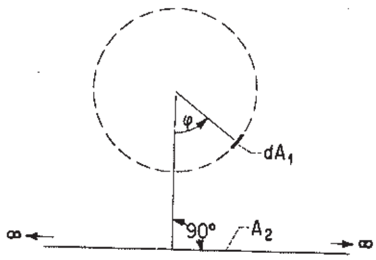


Strip element dA_2 of any length to infinitely long cylinder.

$$X = \frac{x}{r} \qquad Y = \frac{y}{r}$$

$$F_{d2-1} = \frac{Y}{X^2 + Y^2}$$

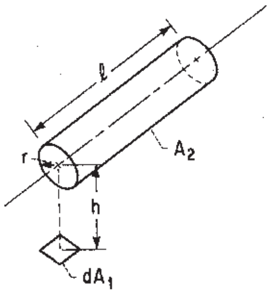
20



Element of any length on cylinder to plane of infinite length and width.

$$F_{d1-2} = \tfrac{1}{2}(1 + \cos\varphi)$$

21



Plane element dA_1 to right circular cylinder of finite length l and radius r; normal to element passes through one end of cylinder and is perpendicular to cylinder axis.

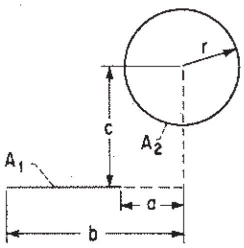
$L = \frac{l}{r} \qquad H = \frac{h}{r}$

$X = (1 + H)^2 + L^2$

$Y = (1 - H)^2 + L^2$

$$F_{d1-2} = \frac{1}{\pi H} \tan^{-1} \frac{L}{\sqrt{H^2 - 1}} + \frac{L}{\pi}\left[\frac{(X - 2H)}{H\sqrt{XY}} \tan^{-1} \sqrt{\frac{X(H - 1)}{Y(H + 1)}} - \frac{1}{H} \tan^{-1} \sqrt{\frac{H - 1}{H + 1}}\right]$$

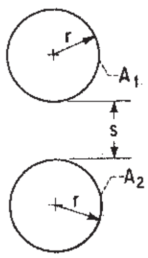
22



Infinitely long plane of finite width to parallel infinitely long cylinder.

$$F_{1-2} = \frac{r}{b - a}\left[\tan^{-1}\frac{b}{c} - \tan^{-1}\frac{a}{c}\right]$$

23

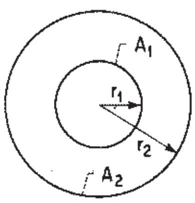


Infinitely long parallel cylinders of the same diameter.

$$X = 1 + \frac{s}{2r}$$

$$F_{1-2} = F_{2-1} = \frac{1}{\pi}\left[\sqrt{X^2 - 1} + \sin^{-1}\left(\frac{1}{X}\right) - X\right]$$

24



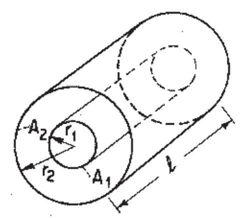
Concentric cylinders of infinite length.

$F_{1-2} = 1$

$F_{2-1} = \frac{r_1}{r_2}$

$F_{2-2} = 1 - \frac{r_1}{r_2}$

25



Two concentric cylinders of same finite length.

$R = \frac{r_2}{r_1} \qquad L = \frac{l}{r_1}$

$A = L^2 + R^2 - 1$

$B = L^2 - R^2 + 1$

$$F_{2-1} = \frac{1}{R} - \frac{1}{\pi R}\left\{\cos^{-1}\left(\frac{B}{A}\right) - \frac{1}{2L}\left[\sqrt{(A+2)^2 - (2R)^2}\cos^{-1}\left(\frac{B}{RA}\right) + B\sin^{-1}\left(\frac{1}{R}\right) - \frac{\pi A}{2}\right]\right\}$$

$$F_{2-2} = 1 - \frac{1}{R} + \frac{2}{\pi R}\tan^{-1}\left(\frac{2\sqrt{R^2-1}}{L}\right)$$

$$- \frac{L}{2\pi R}\left\{\frac{\sqrt{4R^2+L^2}}{L}\sin^{-1}\left[\frac{4(R^2-1) + (L^2/R^2)(R^2-2)}{L^2 + 4(R^2-1)}\right]\right.$$

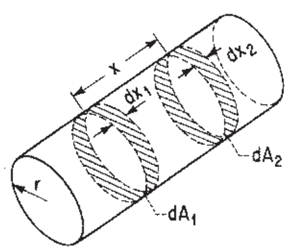
$$\left. - \sin^{-1}\left(\frac{R^2-2}{R^2}\right) + \frac{\pi}{2}\left(\frac{\sqrt{4R^2+L^2}}{L} - 1\right)\right\}$$

where for any argument ξ:

$-\frac{\pi}{2} \leq \sin^{-1}\xi \leq \frac{\pi}{2}$

$0 \leq \cos^{-1}\xi \leq \pi$

26

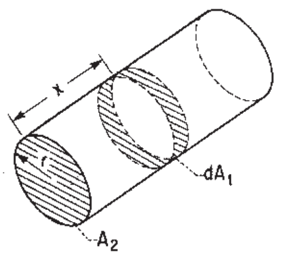


Two ring elements on the interior of a right circular cylinder.

$X = \frac{x}{2r}$

$$dF_{d1-d2} = \left[1 - \frac{2X^3 + 3X}{2(X^2+1)^{3/2}}\right] dX_2$$

27

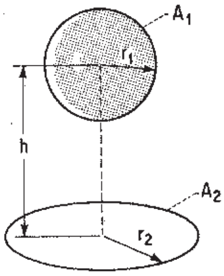


Ring element dA_1 on interior of right circular cylinder to circular disk A_2 at end of cylinder.

$X = \frac{x}{2r}$

$$F_{d1-2} = \frac{X^2 + \frac{1}{2}}{\sqrt{X^2+1}} - X$$

28

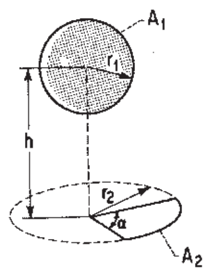


Sphere of radius r_1 to disk of radius r_2; normal to center of disk passes through center of sphere.

$$R_2 = \frac{r_2}{h}$$

$$F_{1-2} = \frac{1}{2}\left(1 - \frac{1}{\sqrt{1 + R_2^2}}\right)$$

29

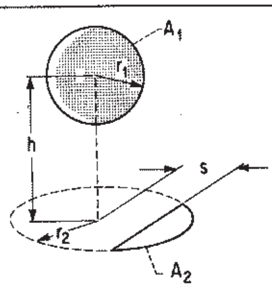


Sphere to sector of disk; normal to center of disk passes through center of sphere.

$$R_2 = \frac{r_2}{h}$$

$$F_{1-2} = \frac{\alpha}{4\pi}\left(1 - \frac{1}{\sqrt{1 + R_2^2}}\right)$$

30

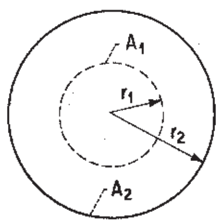


Sphere to segment of disk.

$$R_2 = \frac{r_2}{h} \qquad S = \frac{s}{h}$$

$$F_{1-2} = \frac{1}{8} - \frac{\cos^{-1}(S/R_2)}{2\pi\sqrt{1 + R_2^2}} + \frac{1}{4\pi}\sin^{-1}\frac{(1 - S^2)R_2^2 - 2S^2}{(1 + S^2)R_2^2}$$

31



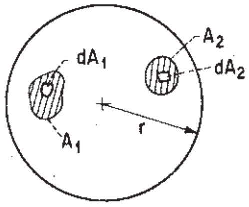
Concentric spheres.

$$F_{1-2} = 1$$

$$F_{2-1} = \left(\frac{r_1}{r_2}\right)^2$$

$$F_{2-2} = 1 - \left(\frac{r_1}{r_2}\right)^2$$

32



Differential or finite areas on the inside of a spherical cavity,

$$dF_{d1-d2} = dF_{1-d2} = \frac{dA_2}{4\pi r^2}$$

$$F_{d1-2} = F_{1-2} = \frac{A_2}{4\pi r^2}$$