Int. J. Heat Mass Transfer. Vol. 30, No. 10, p. 2211, 1987
Pergamon Journals Ltd. Printed in Great Britain

LETTER TO THE EDITORS

Radiation configuration factor between disk and segment

Reference [1] computed the factor between a segment and a coaxial parallel disk; the computing costs were reported prohibitive. This same factor can be obtained by superposing two cases. Referring to Fig. 1, it can be seen that the factor for a segment, F_{15} is equal to the difference between that for a sector, $(\phi/360)F_{12}$ and those for two right triangles, $2F_{13}$

$$F_{15} = (\phi/360)F_{12} - 2F_{13} \tag{1}$$

where [2, 3]

$$F_{12} = \tfrac{1}{2}\{X - [X^2 - 4(a/b)^2]^{1/2}\} \tag{2}$$

$$F_{13} = (1/4\pi)\{[YZ + (1+X^2)(\phi/2)] - \int_0^{\phi/2} \{[(1+X^2)+(Z\sec\psi)^2]^2 - 4(Z\sec\psi)^2\}^{1/2}\,d\psi\} \tag{3}$$

noting that equation (3) is simplified from its original version by redefining $X = d/b$, $Y = L_1/b$, and $Z = L_2/b$.

For engineering purposes, it seems plausible to assume that a, b, and d (Fig. 1) are of the same order of magnitude, i.e. both a/b and d/b range from 10 to 0.1. Furthermore, substituting into equation (2) $a/b = 0.5$ and $d/b = 5$, and $a/b = 5$ and $d/b = 0.5$ yields $F_{12} = 0.01$ and 0.99, respectively. Thus, the practical limits for a/b and d/b are from 5 to 0.5. Based upon these limits, tables of F_{15} values are produced

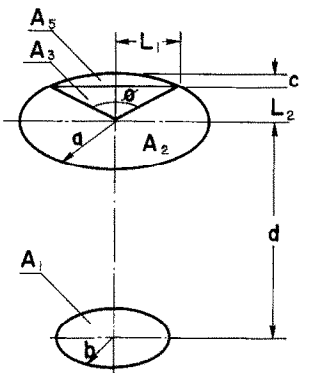

FIG. 1. Disk A_1 radiates heat toward segment A_5.

Table 1. Disk-segment radiation configuration factor

	F_{15}					
	$c/a = 0.6$					
d/b	$a/b = 0.5$	1	2	3	4	5
0.5	0.048	0.140	0.113	0.048	0.024	0.014
1	0.029	0.089	0.130	0.096	0.064	0.044
2	0.012	0.042	0.100	0.119	0.112	0.096
3	0.006	0.023	0.067	0.101	0.115	0.115
4	0.004	0.014	0.046	0.078	0.101	0.112
5	0.002	0.009	0.033	0.060	0.084	0.101

corresponding to c/a from 0.1 to 1.0, one sample table being shown here (Table 1). It can be seen that not only digital-value tables are more convenient for design uses but also the costs of the present work, being carried out on a microcomputer, are negligible.

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