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Deflection of a Thick Ring with Multipole-Magnet-Like Loads

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Author

Meuser, R

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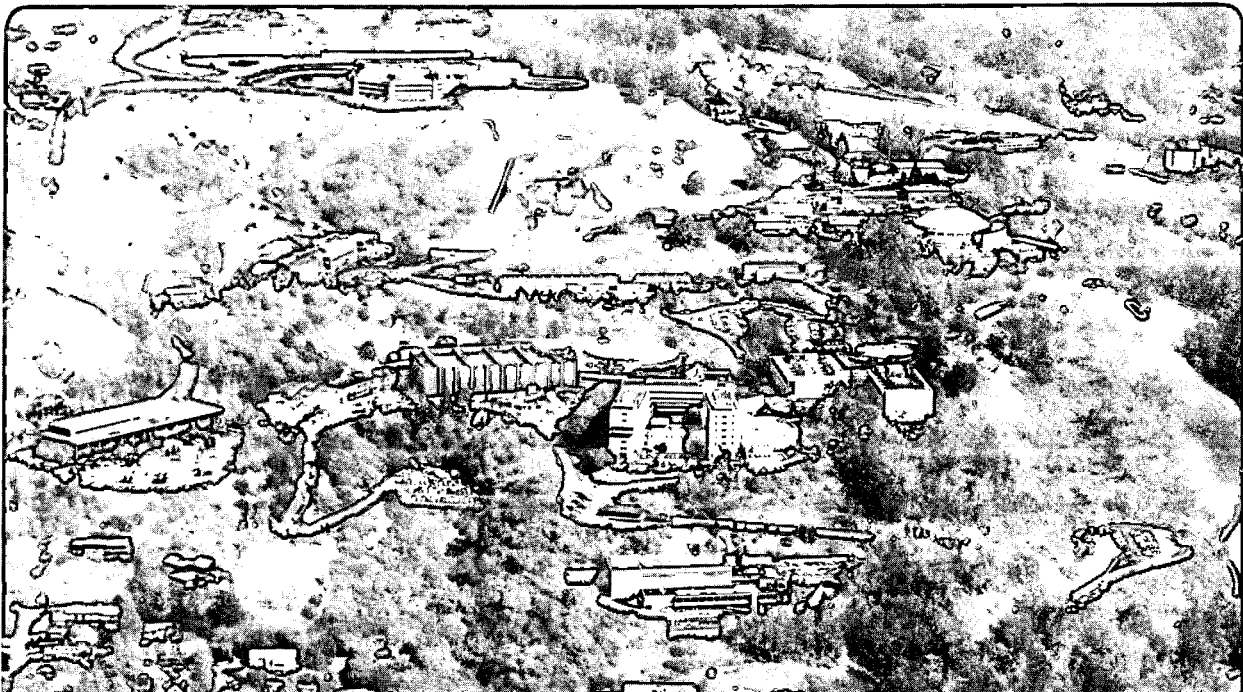
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PROGRAM - PROJECT - JOB

High-Field Magnet Development

Structural Analysis

TITLE

Deflections of a Thick Ring with Multipole-Magnet-Like Loads.

A revision, 11-3-80. Exponents changed

In a previous note (Ref 1), formulas for stresses were presented for surface normal and shear forces varying as $\cos n\theta$ and $\sin n\theta$. With the stresses known, the deflections can be calculated from the formulas given in (Ref 2), namely:

$$u = \frac{r}{E} \left\{ [(-n+2)A, r^n - nB, r^{n-2} + (n+2)C, r^{-n} + nD, r^{-n-2}] \right. \\ \left. + v [(-n-2)A, r^n - nB, r^{n-2} + (n-2)C, r^{-n} + nD, r^{-n-2}] \right\} \cos n\theta$$

$$v = \frac{r}{E} \left\{ [(n+4)A, r^n + nB, r^{n-2} + (n-4)C, r^{-n} + nD, r^{-n-2}] \right. \\ \left. + v [nA, r^n + nB, r^{n-2} + nC, r^{-n} + nD, r^{-n-2}] \right\} \sin n\theta$$

(Note: These have been translated from the nomenclature used in Ref. 2 into that of Ref. 1 and rearranged. Apparently there is an error in formulas as presented in Ref 2; the stresses, Hook's Law equations, and deflections are not compatible. The above equations are correct.)

The constants A_1, \dots, D_1 are evaluated from the loads using the formulas in Ref. 1

Ref 1 Eng. Note. M5255, Meuser, Oct 23 1978

Ref 2 Handbook of Engineering Mechanics, W. Flügge, 1st. Ed. (1962) pp. 37-17, 18.

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