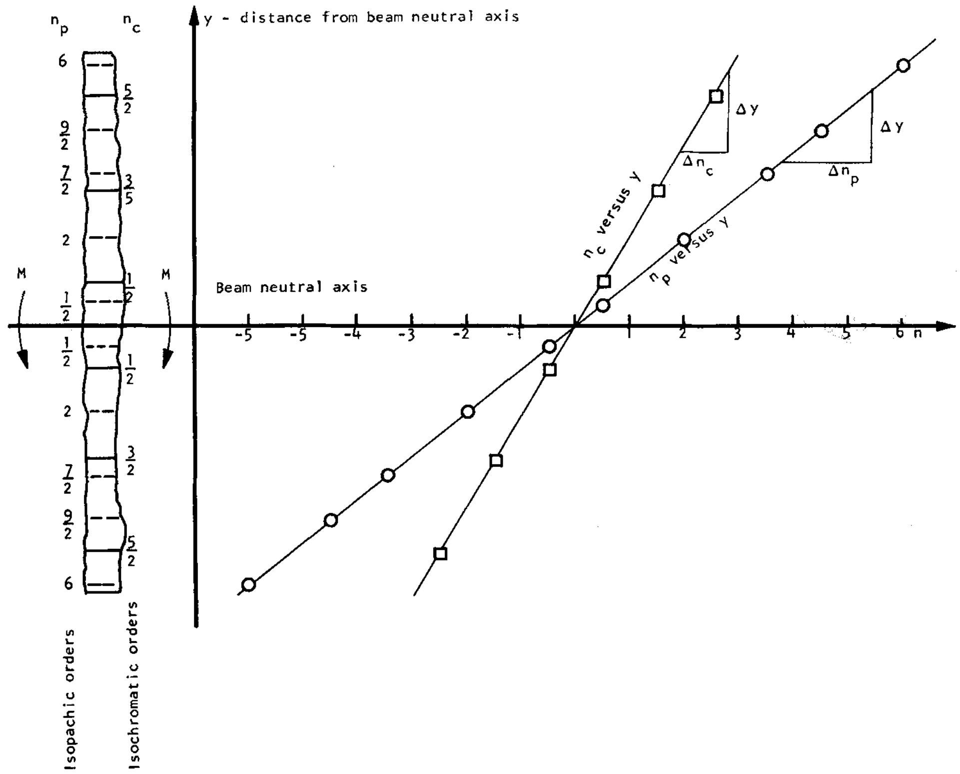

Fig. 5—Simultaneous calibration curves for isochromatics and isopachics from a beam in bending

and isopachic-stress-fringe material values are determined as:

$$f_c = \frac{6M}{h^3} \frac{\Delta y}{\Delta n_c} \quad (26a)$$

$$f_p = \frac{6M}{h^3} \frac{\Delta y}{\Delta n_p} \quad (26b)$$

where

M = moment applied to beam
h = height of beam
$\Delta y/\Delta n_c$ = slope of isochromatic order vs. beam position
$\Delta y/\Delta n_p$ = slope of isopachic order vs. beam position.

The general two-dimensional method of this paper lends itself to the analysis by photoelastic coatings as well as to models. In this case, the hologram apparatus is simply rearranged so that object beam can be reflected from the coating-prototype interface and directed to the hologram. The obliquity of incidence can be minimized to the same degree, or less, as that which is possible by standard reflection polariscopes. It should be noted here that coated surfaces of flat and curves surfaces may be studied.

Extensions are possible for study of the general three-dimensional problem and will be reported in another paper.

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References

1. *Favre, H., "Sur une Nouvelle Methode Optique de Determination de Tensions Interieurs," Revue d'Optique,* **8**, *193–213, 241–261, 289–307 (1929).*
2. *Coker and Filon, Photoelasticity (A Treatise On), Cambridge, 204–243 (1957).*
3. *Stetson, K. A., and Powell, R. L., "Hologram Interferometry," Jnl. Opt. Soc. Am.,* **56**, *(9) (September 1966).*
4. *Gabor, D., Nature,* 161, *777 (1948); Proc. Roy. Soc. (London),* A197, *454 (1949).*
5. *Nisida, M., and Saito, H., "A New Interferometric Method of Two-dimensional Stress Analysis,"* EXPERIMENTAL MECHANICS, **4** *(12), 366–376 (Dec. 1964).*
6. *Hovanesian, J. D., "Isochromatic and Isopachic Intensification in Stress-Holo-Interferometry," Wayne State University Research Report, (1967).*

ADDENDUM

After completion of this manuscript, the authors became aware of some related work being conducted at the University of Washington by M. E. Fourney. The above mentioned work entitled "Application of Holography to Photoelasticity," Report 67-2, University of Washington, College of Engineering, reports on various experimental observations in applying some holographic methods to photoelasticity. The authors of this paper do not agree with the Fourney conclusions which deal with the interpretation of isopachics. Based on his experimental work, Fourney asserts that isopachic interference families are continuous and do not undergo a half order change upon intersection with isochromatics. The authors of this paper have experimentally noted that discontinuity of isopachics occur at intersections with isochromatics and have further predicted the phenomena mathematically [see eqs (19)–(24)].