The development and evaluation of an experimental technique to determine stress distribution in uniformly loaded flat plates

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THE DEVELOPMENT AND EVALUATION OF AN EXPERIMENTAL TECHNIQUE TO DETERMINE STRESS DISTRIBUTION IN UNIFORMLY LOADED FLAT PLATES

BY

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A

THESIS

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ABSTRACT

This thesis reports and evaluates an experimental technique that was developed to determine and monitor the stresses in a simply supported, uniformly loaded circular plate. Deflections are less than half the thickness of the plate. The application of the developed technique to plates whose integrity has been compromised with holes in various locations is discussed.

Resistance strain gages were used to determine experimentally the stresses in a simply supported, uniformly loaded circular plate with and without a concentric hole. The accuracy of the experimental results was established to be within approximately six percent of theoretical.

Proper application of the experimental technique to simply supported, uniformly loaded circular plates with non-concentric holes, or other perforations, can be expected to produce similar accuracy.

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TABLE OF CONTENTS

Page

LIST OF TABLES

Table | Page

LIST OF FIGURES

Figure | Page

Figure | Page

Figure Page

Figure Page

Figure Page

Figure | Page

LIST OF SYMBOLS

Symbol	Name	Units
A	Outside Radius of Plate	In.
B	Radius of Concentric Hole	In.
C	Distance from Centroid to Extreme Fiber	In.
D	Flexural Rigidity of Plate	Lb.-In.
E	Young's Modulus	$Lb./In.^2$
I	Area Moment of Inertia	$In.^4$
M	Moment	In.-Lb.
M_r	Radial Bending Moment	In.-Lb./In. of Section
M_t	Tangential Bending Moment	In.-Lb./In. of Section
P	Uniform Pressure Loading	$Lb./In.^2$
r	Radial Distance from Center	In.
S	Stress	$Lb./In.^2$
S_r	Radial Bending Stress	$Lb./In.^2$
S_t	Tangential Bending Stress	$Lb./In.^2$
t	Thickness of Plate	In.
u	Poisson's Ratio	
V_r	Radial Shear Force	Lb./In. of Section
V_t	Tangential Shear Force	Lb./In. of Section
W	Deflection of Centroidal Plane	In.
Θ	Angular Position	Rad.

BASIC DEFINITIONS

$D = Et^3/12(1 - u^2)$

$\nabla^2 = ((1/r)(d/dr) + d^2/dr^2)$

$\nabla^4 = ((1/r)(d/dr) + d^2/dr^2)((1/r)(dW/dr) + (d^2W/dr^2))$

W' = First derivative of W with respect to r

W'' = Second derivative of W with respect to r

W''' = Third derivative of W with respect to r

W'''' = Fourth derivative of W with respect to r

I. INTRODUCTION

The subject of this thesis was suggested by Professor Gordon L. Scofield. During the design of a deep sea probe at the Naval Ordnance Test Station at China Lake, California, the problem of determining the stresses and deflections for a uniformly loaded, simply supported circular plate containing a non-concentric hole was encountered. The lack of published design information for a problem of this type was instrumental in initiating this study which is to be the first of a series on this subject.

Considerable work has been done in establishing the stresses and deflections in plates containing multiple perforations in a symmetrical pattern about the center of a circular plate. H. Kraus, in his article on flexure of a plate containing holes, derives the analytical expressions for the deflections and stresses for a simply supported, uniformly loaded circular plate containing a ring of equally spaced circular holes with and without a central hole (1)*. The defining differential equation was transformed into complex variable notation and solved by means of a highly complicated series type solution. Mansfield writes the differential equation in the regular notation and uses

*Numbers in parentheses are references listed in Bibliography.

a numerical method approach to give an approximate solution (2). Salero and Mahoney, in their article on flat perforated plates, approximated the plate with a series of hexagonal beam structures around the holes (3). The load carrying ability of the hexagonal beam structures was computed. Using this information an equivalent set of values of Young's modulus and Poisson's ratio were computed to use in the equations for a solid plate. Several variations of this method have been used to give approximate solutions for the plate deflections.

By using Prandtl's membrane analogy, the differential equation of deflection can be described by the deflection of a membrane (4). Knowledge of the boundary conditions and the deflection of the membrane will yield values of deflection for the simulated plate. For a simply supported plate, the boundary conditions are known. For a plate containing a hole, the deflection at the edge of the hole is not known and the analogy cannot be used.

Lemcoe has reviewed several methods of experimentally determining the stresses in ligaments (5). These methods are applicable to the problem of a circular plate with or without holes. The methods include stresscoat, photoelastic methods, photostress, resistance strain gages, and combinations of the individual methods.

The brittle coating or stresscoat technique depends on

the cracking of a brittle coating after a certain strain level has been reached (6). This method gives an excellent picture of the overall strain distribution. The directions of the principal strains are easily determined but the accuracy of the measured strain may be in error by as much as 20 percent. The value of strain that will crack the coating is high, approximately 800 micro-inches per inch strain. This strain level may be beyond the elastic limit of certain materials, and the deflections would not be small compared to the thickness of the plate.

The photoelastic techniques are based on the fact that polarized light transmitted through certain materials will produce fringes, which are due to the imposed stresses (4). A model, constructed of these materials, can be used to determine the strain distribution and its magnitude. A flat plate model must be made in two layers with a reflective medium between. One layer would be in compression while the other layer would be in tension. Fringes would appear in each layer due to the imposed stresses. If the variation of the stresses through the thickness are needed, then the three-dimensional photoelastic method must be used.

Photostress is a similar technique, except a surface of the actual test item is made reflective and a thin sheet of photoelastic material is bonded to this surface. With the use of proper equipment, fringes will be produced due to the stresses in the extreme fiber of the test item. The

directions and magnitudes of stress can be determined with this method. A few resistance strain gages should be used to verify the photostress readings. Day, Koboyoshi, and Larson discuss some of the problems and propose a method of increasing the accuracy of the photostress method (7).

Bynum and Lemcoe, in their article on the deflection of perforated plates, discuss the experimental setup for determining the stresses and deflections in a simply supported, uniformly loaded circular plate containing many circular perforations (8). A thin aluminum diaphragm was placed over the test plate and the plate was loaded with a hydraulic pressure on this diaphragm. Experimental results were obtained by using resistance strain gages and photostress. The results of the two methods were compared.

Resistance strain gages are the best method if the peak stress locations are known. Uniaxial strain gages will require that the location and direction of principal strains be known. Model studies employing photoelastic, photostress, or brittle coating methods could be used to establish such information. Such strain gages are relatively inexpensive. The associated equipment is also simple and inexpensive when compared to the photoelastic method. With the direction and location of principal strains known, strain gages can be applied to either a model study, or to a full scale study of the problem in question.

One of the primary advantages of the strain gage is its ability to be placed on the full scale structure and monitored at some remote location. Underwater environments as well as space type environments make such remote reading of the stress-sensing instrument a requirement. In addition, transient stress distribution as well as time-dependent loading situations can be monitored with strain gage equipment. Brittle coatings and photoelastic methods do not have this capability for many applications.

For the purpose of this thesis, it is assumed that model studies could be employed in order to establish the direction and location of principal strains. This information coupled with the proper application of uniaxial strain gages will develop quantitative design criteria of a useful quality.

The ability of the uniaxial strain gage to function properly in this situation must be tested. By applying these gages to flat circular plates, uniformly loaded and simply supported, for which analytical solutions are known, the accuracy of these sensing elements can be evaluated. The simplest examples of such circular plates are those without any holes or those with a concentric hole. In either case principal strain location and direction are known and numerical values for strain can be calculated by the application of existing theory (4), (7), and (9).

The accuracy of the experimental application can be evaluated by comparing experimental results, from uniaxial strain gages, to the values obtained by theoretical analysis. This evaluation of instrument accuracy is the objective of the study reported here.

The knowledge gained in this study will be capable of extension to a broad range of problems involving plates with geometry for which no theoretical solution is available. Plates containing non-concentric holes are only one example of such geometry. The actual application of the technique developed here to such situations is left for future investigation.

II. DISCUSSION

This discussion will cover the equipment and method used in providing a simple support and uniform load on a flat plate with a hole. In addition, the application procedure for the strain gages as well as a discussion of errors in strain gage readings brought about by partial bonds, uniform loading normal to the strain gage, and transverse sensitivity is included. The theoretical solution to a simply supported, uniformly loaded circular plate, with and without a concentric hole, will be developed for comparison with experimental results.

DESCRIPTION OF APPARATUS

Test Specimen - In order to facilitate the comparison of experimental and theoretical results, a circular plate was chosen as the test specimen. Initial tests were performed on a circular plate without a hole, and later tests were made on this same plate after a concentric hole was added. In either instance, the locations and numerical values of the principal stresses are known. The plate was 24S aluminum, 0.081 inches in thickness, and 10.84 inches in diameter. The flatness of the plate is of importance to the accuracy of the experimental results. The plate should be stress relieved in a fixture that holds the plate flat. In addition to making the plate flat, this treatment should prevent warpage of the plate when the concentric hole is cut.

Loading Fixture - The requirements established for the circular plate containing a hole were that the shear force at the edge of the hole be zero and that the plate could rotate but not deflect at the support. This requirement is somewhat more severe than that imposed by the plate without a center hole. The simple support could be provided by a cylinder with its end beveled to a knife edge. This will provide line contact with the plate and allow the plate to rotate but not deflect at this point.

Bynum and Lemcoe, in their experiments, provided uniform loading for a simply supported plate containing many perforations by laying a thin diaphragm over the plate and loading directly on this diaphragm with hydraulic pressure (8). This does not provide zero shear force at the edge of the hole.

The uniform loading could be provided by the static weight of some medium resting on the plate. A method would be required to keep this medium on the plate, but off the area over the hole. Such a situation would result in zero shear force at the edge of the hole. Kraus, in his work, used lead shot to simulate the uniform load (1). Sand, ball bearings, semi-liquids, and liquids could also be used. A supporting container could be used to keep the loading medium on the plate. This container could also support a rod to be passed through the hole in the plate. This rod would serve to keep the loading medium off the area over

the hole. The diameter of the rod should be slightly smaller than the diameter of the hole to insure that the rod does not give support at the hole.

Liquids and semi-liquids would present leakage problems with a fixture of the type just described. For this reason a thin plastic boot or bladder, conforming to the inside surface of the container and to the surface of the plate was designed. This bladder would not affect the loading but would prevent leakage of the liquid.

The support fixture is shown in Figure I. This

Figure I

SUPPORT FIXTURE

fixture provides the line contact for simple support and was machined from a section of steel pipe, 10-7/8 inches in diameter. The internal diameter and the external diameter at the upper end were beveled at 45° to provide line contact. The diameter of the line contact was 10.413 inches.

The container, in this instance a cylinder, that holds the loading medium on the plate was made from a section of

Figure II

CYLINDER

steel pipe. The inside diameter of the cylinder was 10.41 inches and the outside diameter was beveled at 60° on the

end adjacent to the plate. Three lugs were welded to the cylinder and screw jacks were placed at these lugs in order to raise the cylinder off the plate a small distance. This will insure that the plate is free to rotate at the support. This cylinder also provides the support for the rod that passes through the hole in the plate during experiments with plates containing concentric holes.

The support fixture was placed on a leveling platform. Three leveling screws on this platform could be used to

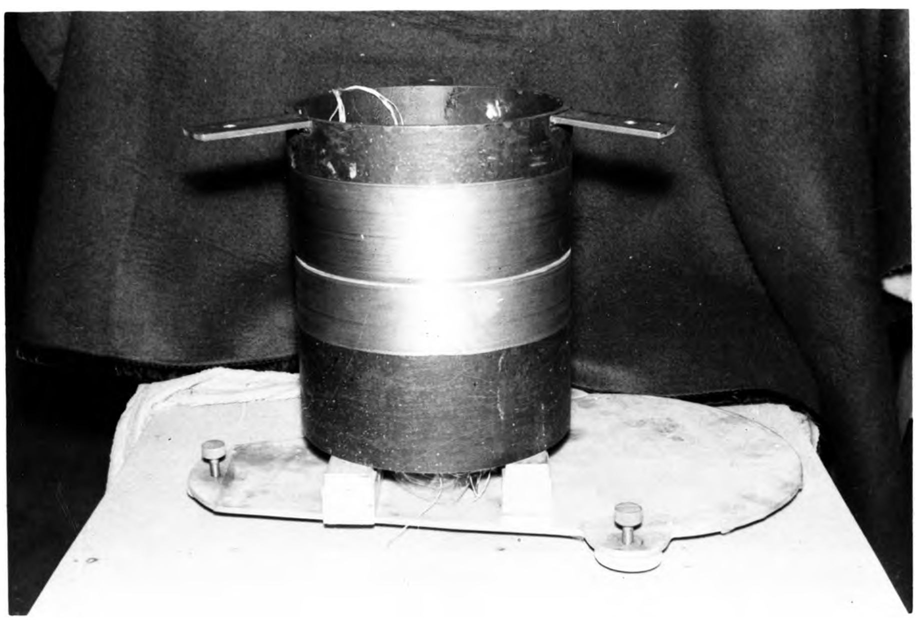

Figure III

SUPPORT FIXTURE, CYLINDER, AND TEST PLATE
ON LEVELING PLATFORM

insure that the liquid level in the bladder-cylinder imposed

a uniform load on the plate.

STRAIN GAGE APPLICATION

Surface Preparation - The surface preparation was the same for both types of strain gages used during the experimental phase of this study. The plate was sanded lightly to roughen the surface in order to provide better adhesion. The next step was to thoroughly clean the surface with a mixture of xylene and methyl ethyl ketone. The surface had to be completely clean for the strain gage to bond properly. After cleaning, a small amount of Budd GA-1B Neutralizer was placed on the clean surface. After about a minute it was wiped off with a clean tissue, and the strain gage was applied immediately.

Metal Foil Strain Gage Application - A piece of scotch tape was applied directly to the metal foil strain gage, on the grid side of the strain gage (11). The tape extended about an inch over each end of the gage. In this way the gage could be handled without damage. The plastic backing was removed, and the gage was placed over the plate and aligned using the scribe marks on the plate and the alignment marks on the strain gage. When the gage was aligned properly, one end of the tape was stuck to the plate, while the other end of the tape was folded back so that the bonding surface of the strain gage was facing up. A thin coating of Budd GA-1A, an accelerator, was applied to the bond-

ing surface of the strain gage. About five minutes was required for drying the accelerator. A contact cement, Eastman 910 (cyanoacrylate monomer), was used. When pressure was applied to the liquid cement, instant polymerization and hardening took place. Care should be used because getting a small amount of cement between the finger and thumb, and pressing, will make a bond that will require surgery to part. A generous bead of the contact cement was placed between the plate and the strain gage. The loose end of the tape was pulled taut with one hand while the strain gage was wiped down on the plate with the other thumb. A protective tissue should be used on the thumb employed to wipe the strain gage on the plate. Uniform pressure should be applied over the entire area of the strain gage. After about a minute the tape was removed. This was done by taking the loose end of the tape and pulling back parallel to the surface of the gage.

A wiring terminal was placed adjacent to each wiring tab of the gage. The wiring terminal is a sheet of copper on a piece of plastic. It was bonded to the plate in the same way as the strain gage. Care should be used so that no cement gets on the surface of the strain gage.

This technique for applying metal foil strain gages was acquired by the author during summer employment at the General Motors Proving Grounds.

Application of SR-4 Strain Gages - An ample amount of nitrocellulose cement was applied to the bonding surface of the strain gage and to the mating area of the plate. The strain gage was placed on the plate and aligned, then the excess cement was squeezed out by rolling the finger over the gage. This removes air bubbles that might be present. The gage was clamped with special clamps or by placing a one pound weight on the strain gage. Eighteen to twenty four hours was required for the cement to cure in air at room temperature.

Lead Wire Installation - For metal foil strain gages a single strand of 20-gauge stranded wire was soldered to the tab on the strain gage and the wiring terminal. A 300°, .015 inch diameter resin core solder and a small low power soldering iron was used. Care must be exercised so the strain gage does not get too hot, also solder splashes must be kept off the grid of the strain gage. By using a single strand of wire and the wiring terminal, the strain gage tab was protected from damage due to handling of the lead wires. 20-gauge lead wire of the proper length was taped and glued to the plate with one end soldered to the wiring terminal.

For SR-4 gages the 20-gauge lead wire was taped to the plate and the lead wire was soldered to the lead wires extending from the SR-4 strain gages.

Strain Gage Testing - The resistance of the bonded

strain gage was checked. If the resistance was too high, it indicated poor solder joints or a broken grid. If the reading was too low, it indicated that a portion of the grid had shorted out. The resistance between the strain gage and the plate was checked with a vacuum tube ohmmeter. The resistance should be at least 1000 megohms.

The final check was to connect the strain gage to a strain indicator and zero the indicator. Light pressure was applied to the strain gage with an eraser on the end of a pencil, then the pressure was removed. If the indicator did not return to zero, or if the meter on the indicator drifted with no change in load, the bond was not complete and the strain gage had to be replaced.

Prior to soldering, a metal foil strain gage with a partial bond can be found by the use of a microscope. A piece of scotch tape is stuck to the bonded strain gage. As the tape is peeled from the strain gage, any portion that is not bonded will lift slightly as the tape is removed. By observing the strain gage through a microscope as the tape is removed, the lifting of the unbonded area is easily seen.

Effect of Partial Bonds - If a strain gage is not bonded at the ends, the indicated strain when the gage is in tension or compression can be as much as 29 percent less than the true value of strain (10). The indicated strain

from a strain gage in compression that is not bonded at the center may be 5 percent less than the true value of the strain. For the same strain gage in tension, the indicated strain may be 5 percent greater than the true value of strain.

Effect of Load Normal to Strain Gage - Tests were run at the University of Illinois to determine the effect of hydrostatic pressure on a strain gage (6). If the surface under the strain gage is free of pits, holes, and depressions, the effect of the hydrostatic pressure was 2 to 5 micro-inches per inch compressive strain with a hydrostatic pressure of 1,000 psi. Since the maximum pressure for the tests performed during this thesis study was less than 0.2 psi, the effect of the load resting directly on the gages should be negligible. Tests performed to check this are discussed later.

Transverse Sensitivity - The transverse sensitivity is much less for the metal foil strain gages than for the SR-4 strain gages (6), (10). A metal foil strain gage in a biaxial stress field, where both stresses are equal, will have an error due to the transverse sensitivity of about 0.6 percent. A SR-4 A-18 strain gage in the same stress field would have an error of 2.5 percent. A SR-4 A-5 strain gage in the same stress field would have an error of 4.3 percent. For the metal foil strain gages this error can be neglected, but this would not be true for the SR-4 strain gages.

Strain Gage Protection - A coating of Budd GW-1 waterproofing was applied to the metal foil strain gages to afford protection against damage to the grid of the strain gage during the testing.

DERIVATION OF THEORETICAL SOLUTION

The experimental values of stress obtained must be compared to the theoretically correct values in order to evaluate the accuracy of the experimental technique. The following derivation provides the equations by which the theoretically correct values of stress were calculated. This derivation was made for a simply supported, uniformly loaded circular plate with and without a concentric hole. The conditions and assumptions required for this derivation are given.

1. The deflection of the plate must be less than one-half the thickness of the plate.
2. The material must be homogeneous, isotropic, and perfectly elastic in the range of the loadings that produce the small deflections.
3. There must be no deformation in the middle plane of the plate. The middle plane has zero stress during bending.
4. Points in the plate lying initially on a normal-to-the-middle plane of the plate must remain on the normal-to-the-middle plane after bending.

Circular Plate Without a Concentric Hole - Figure IV

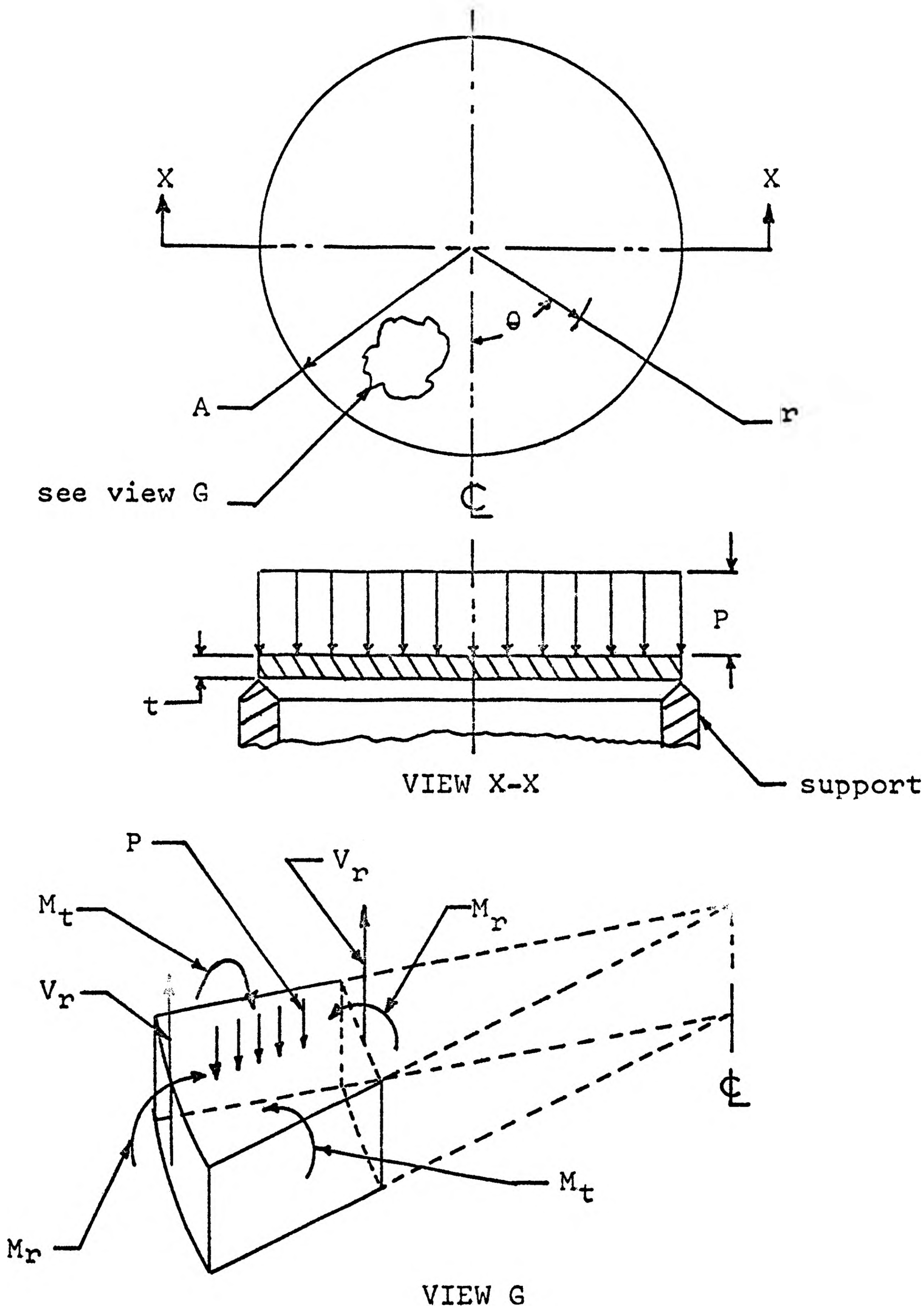

FIGURE IV

SIMPLY SUPPORTED UNIFORMLY LOADED CIRCULAR
PLATE WITHOUT A CONCENTRIC HOLE

shows that the plate was laterally loaded in a symmetrical manner about an axis that was perpendicular to the plane of the plate and passed through the center of the plate. The deflections and stresses are a function of the loading and the radial position, but are not a function of θ. This was because of the symmetrical loading. The differential equation for small deflections of the plate is (9),

$$\nabla^4 W = P/D.$$

$$(P/D) = (1/r)(W''/r - W'/r^2 + W''') + W'''/r - 2W''/r^2 + 2W'/r^3 + W''''.$$

Rearranging the equation,

$$r^4W'''' + 2r^2W''' - r^2W'' + rW' = Pr^4/D.$$

This equation is a fourth order differential equation, which is linear and has variable coefficients. This is the same form as the Cauchy linear differential equation. Therefore, the following substitutions were made to reduce the equation to a fourth order linear differential equation with constant coefficients:

$$r = e^t,$$

$$dW/dr = e^{-t}(dW/dt),$$

$$d^2W/dr^2 = e^{-2t}(d^2W/dt^2 - dW/dt),$$

$$d^3W/dr^3 = e^{-3t}(d^3W/dt^3 - 3d^2W/dt^2 + 2dW/dt), \text{ and}$$

$$d^4W/dr^4 = e^{-4t}(d^4W/dt^4 - 6d^3W/dt^3 + 11d^2W/dt^2 - 6dW/dt).$$

The above substitutions are made and the differential equation is,

$$d^4W/dt^4 + 2d^3W/dt^3 - d^2W/dt^2 + dW/dt = Pe^{4t}/D.$$

This differential equation has a complementary solution of the form, $W_c = t^m$. Substitution of this solution into the differential equation and solving for the value of m gave the complementary solution,

$$m(m - 1)(m - 2)(m - 3) + 2m(m - 1)(m - 2) -$$
$$m(m - 1) + m = 0.$$

The roots for this equation are:

$m_1 = 0$,

$m_2 = 0$,

$m_3 = 2$, and

$m_4 = 2$.

The complementary solution had this form after the substitution of the original variables.

$$W_c = C_1 + C_2Ln(r) + C_3r^2 + C_4r^2Ln(r).$$

A particular solution of the form,

$W_p = r^4R$, is assumed.

Substitution of the assumed particular solution into the original differential equation gives the value of R.

$$r^4R(24 + 48 - 12 + 4) = Pr^4/D.$$

$$R = P/64D.$$

The particular solution in terms of the original variables is,

$$W_p = pr^4/64D.$$

The general solution for the circular plate deflection expression for a uniform loading P is,

$$W = C_1 + C_2Ln(r) + C_3r^2 + C_4r^2Ln(r) + Pr^4/64D. \text{---1.}$$

The equations for the tangential and radial moments and shear forces are (4):

$$M_r = D(W'' + uW'/r), \text{------------------------------2.}$$

$$M_t = D(W'/r + uW''), \text{------------------------------3.}$$

$$V_t = (D/r)(d(\nabla^2W)/d\theta) = 0, \text{ and}$$

$$V_r = D(d(\nabla^2W)/dr) = D(d(W'/r + W'')/dr). \text{---------4.}$$

The first and second derivatives of the deflection equation with respect to r, are substituted into equations 2., 3., and 4. to give the following equations:

$$M_r = D(C_2(u - 1)/r^2 + 2C_3(1 + u) + C_4(3 + u) +$$
$$2C_4(1 + u)Ln(r) + Pr^2(3 + u)/16D), \text{---------------5.}$$

$$M_t = D(C_2(1 - u)/r^2 + 2(1 + u)C_3 + C_4(1 + 3u) +$$
$$2C_4(1 + u)Ln(r) + Pr^2(1 + 3u)/16D), \text{ and----------6.}$$

$$V_r = D(Pr/2D + 4C_4/r). \text{---------------------------7.}$$

From Figure IV, the boundary conditions are:

1. the deflection at $r = 0$ is finite,
2. the deflection is zero at $r = A$, because the support is rigid at that point, and
3. the radial moment is zero at $r = A$, because of the simple support at that point.

From the first boundary condition, the constants C_2 and C_4 must be zero if the deflection is to be finite at $r = 0$.

The expression for the deflection becomes,

$$W = C_1 + C_3 r^2 + Pr^4/64D.$$

From the third boundary condition, the value of C_3 is found.

$$0 = D(2C_3(1 + u) + PA^2(3 + u)/16D), \text{ and}$$

$$C_3 = - PA^2(3 + u)/32D(1 + u).$$

From the second boundary condition, the value of C_1 is,

$$C_1 = (PA^4/32D)((3 + u)/(1 + u) - 0.5).$$

These values for the constants are substituted into the original equations to give the following expressions for the deflection, tangential and radial moments, and the tangential shear force:

$$W = (PA^4/64D)((5 + u)/(1 + u) + (r/A)^4 -$$
$$2r^2(3 + u)/A^2(1 + u)), \text{------------------------} 8.$$
$$M_r = P(3 + u)(r^2 - A^2)/16, \text{--------------------} 9.$$
$$M_t = (PA^2/16)((1 + 3u)(r/A)^2 - (3 + u)), \text{ and } -10.$$
$$V_r = Pr/2. \text{-------------------------------------} 11.$$

The maximum bending stress is at the outer fiber of the plate. The maximum bending stress at any point r is,

$$S = MC/I = M(t/2)/(t^3/12) = 6M/t^2.$$

The maximum tangential bending stress at any point r is,

$$S_t = (6PA^2/16t^2)((1 + 3u)(r/A)^2 - (3 + u)). \text{---} 12.$$

The maximum radial bending stress at any point r is,

$$S_r = 6P(3 + u)(r^2 - A^2)/16t^2. \text{----------------} 13.$$

<u>Circular Plate With a Concentric Hole</u> - The derivation of the solution for this problem used the same conditions and assumptions as in the previous section, however, the boundary conditions are different. The same differential equation will describe the deflection of the circular plate containing a concentric hole. The complementary and particular solutions are of the same form. Only the value of the constants will be different. The general solution for the deflection, radial moment, tangential moment, and the tangential shear force are:

$W = C_1 + C_2Ln(r) + C_3r^2 + C_4r^2Ln(r) + Pr^4/64D,$

$M_r = D(C_2(u - 1)/r^2 + 2C_4(1 + u)Ln(r) +$

$2C_3(1 + u) + C_4(3 + u) + Pr^2(3 + u)/16D),$

$M_t = D(C_2(1 - u)/r^2 + 2C_3(1 + u) + C_4(1 + 3u) +$

$2C_4(1 + u)Ln(r) + Pr^2(1 + 3u)/16D)$, and

$V_r = D(Pr/2D + 4C_4/r).$

From Figure V, the following boundary conditions are determined:

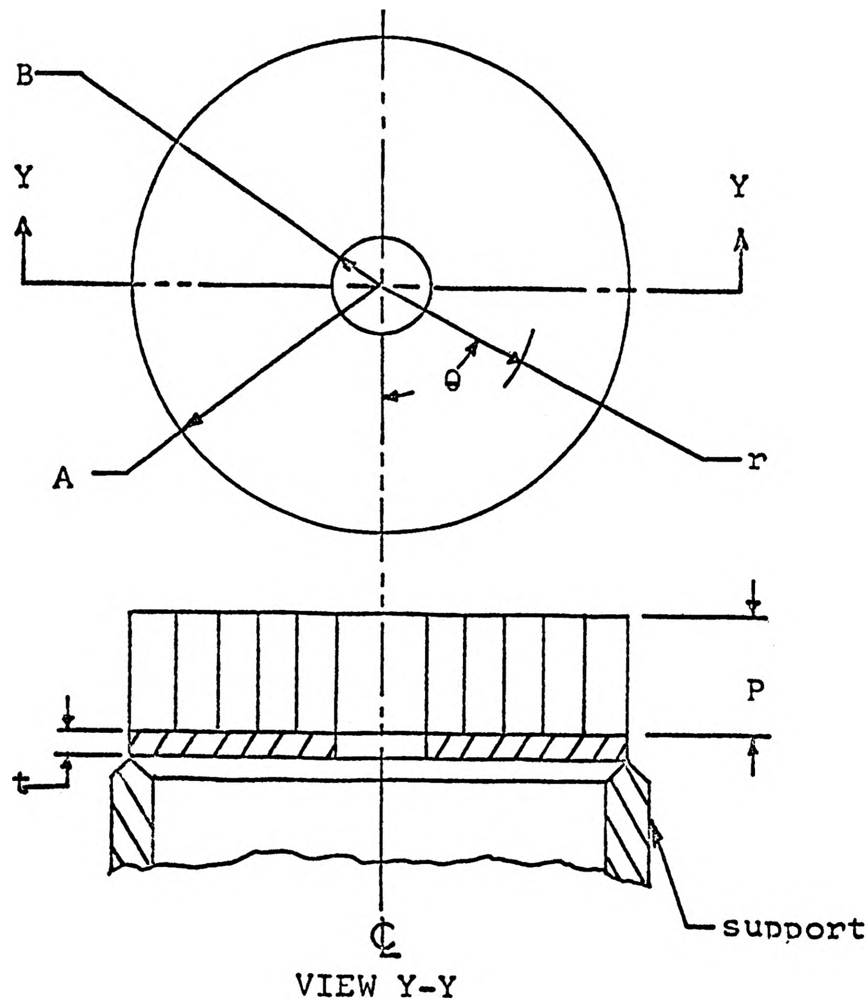

Figure V

SIMPLY SUPPORTED UNIFORMLY LOADED CIRCULAR PLATE
WITH A CONCENTRIC HOLE

1. the radial shear force is zero at $r = B$,

2. the radial moment is zero at $r = B$,

3. the radial moment is zero at $r = A$, because of the simple support at that point, and

4. the deflection is zero at $r = A$, because the support is rigid.

Using the first boundary condition, the value of C_4 is determined.

$$0 = D(PB/2D + 4C_4/B).$$

$$C_4 = -PB^2/8D.$$

From the second and third boundary condition, the values of C_2 and C_3 are:

$$C_2 = (PA^2B^2/16D)((3 + u)/(u - 1) +$$
$$4B^2(1 + u)Ln(A/B)/(u - 1)(B^2 - A^2)), \text{ and}$$
$$C_3 = (PA^2B^2/16D)(-(3 + u)/2B^2(1 + u) -$$
$$2Ln(A/B)/(B^2 - A^2) + (3 + u)/2A^2(1 + u) +$$
$$2Ln(B)/A^2).$$

From the fourth boundary condition, the value of C_1 can be determined as,

$$C_1 = (PA^2B^2/16D)(-(3 + u)/(u - 1) + 2Ln(A/B) -$$
$$4B^2(1 + u)Ln(A/B)Ln(A)/(u - 1)(B^2 - A^2) +$$
$$(3 + u)(A/B)^2/2(1 + u) + 2A^2Ln(A/B)/(B^2 - A^2) -$$
$$(3 + u)/2(1 + u) - (A/B)^2/4).$$

The values of C_1, C_2, C_3, and C_4 are substituted into the expressions for the deflection, moments, and the shear force to give the following:

$$W = (PA^2B^2/16D)((3 + u)Ln(r/A)/(u - 1) +$$
$$4B^2(1 + u)Ln(r/A)Ln(A/B)/(u - 1)(B^2 - A^2) +$$
$$2Ln(A/B)(A^2 - r^2)/(B^2 - A^2) + 2Ln(A/B) +$$
$$((3 + u)/2(1 + u))((A/B)^2 - 1 - (r/B)^2 + (r/A)^2) +$$
$$2r^2Ln(B/r)/A^2 + (1/4B^2)(r^4/A^2 - A^2)), \text{----------}14.$$
$$M_t = (PA^2B^2/16)(-(3 + u)/r^2 -$$
$$4(1 + u)B^2Ln(A/B)/r^2(B^2 - A^2) +$$
$$((1 + 3u)/A^2)((r/B)^2 - 2) -$$
$$4(1 + u)Ln(A/B)/(B^2 - A^2) +$$
$$4(1 + u)Ln(B/r)/A^2 + (3 + u)(B^2 - A^2)/A^2B^2), \text{---}15.$$
$$M_r = (PA^2B^2/16)((3 + u)/r^2 +$$
$$4(1 + u)B^2Ln(A/B)/r^2(B^2 - A^2) +$$
$$4(1 + u)Ln(B/r)/A^2 + (3 + u)(B^2 - A^2)/A^2B^2 +$$
$$((3 + u)/A^2)((r/B)^2 - 2) -$$
$$4(1 + u)Ln(A/B)/(B^2 - A^2)), \text{ and----------------}16.$$
$$V_r = (PB^2/2)(r/B^2 - 1/r). \text{---------------------}17.$$

The maximum radial and tangential bending stress at any point r is shown below.

$$S_r = 6M_r/t^2. \text{------------------------------------}18.$$
$$S_t = 6M_t/t^2. \text{------------------------------------}19.$$

EXPERIMENTAL RESULTS

The following discussion is presented in the chronological order of the experimental investigations. A principal objective of this investigation was to verify the experimental results for a simply supported, uniformly loaded circular plate without a concentric hole. In addition, the experimental results for this plate with a concentric hole were to be verified. Also, any problem areas that became apparent during the tests were to be investigated.

<u>First Test Plate</u> - Resistance strain gages were applied at radial and tangential positions at radii of 0, 1, 2, and 3 inches. Baldwin-Lima-Hamilton SR-4 type strain gages and Budd metal foil strain gages were used. A great deal of trouble was encountered during the application of the metal foil strain gages. This was mainly due to a lack of know-how and lack of proper supplies. After the first plate had been gaged, the correct procedure for application of the metal foil strain gages was acquired by the author during a summer job at the General Motors Proving Grounds.

The strain gage hookup was with an active strain gage and a dummy strain gage in the half bridge hookup. This hookup is temperature compensated. A Budd model HW-1 strain indicator was used. This instrument could be read to the nearest 5 micro-inches per inch strain.

Test Procedure - The support fixture was leveled, and then the plate was placed and aligned on top of the support fixture. The load containing cylinder was placed on top of the plate and raised off the plate about 0.03 inches. The strain gage to be monitored was connected to the strain indicator in conformity with the hookup for a half bridge. The gage factor of the strain gage was set on the gage factor setting of the strain indicator.

The strain gages were cycled a few times to make certain that the bond would not creep. A balance was used to weigh the lead shot that was to be used as an incremental loading medium. The lead shot was 0.173 inches in diameter.

The zero reading of the strain gage was recorded and the first increment of load was placed on the plate. The lead shot was leveled, then the reading on the strain indicator was recorded. The next increment of load was added, the lead shot was leveled, and the strain reading was recorded. This procedure was repeated until the maximum selected value of loading was reached. The loading was removed and the zero reading on the strain indicator was checked against the initial zero reading. If the two readings did not check to within 5 micro-inches per inch strain, the test was repeated.

This procedure was repeated for each strain gage. From Hooke's equation, the biaxial strain can be used to calculate the value of the biaxial stress (tangential and radial

directions). From previously derived expressions for the biaxial stresses, the percent deviation was calculated.

Tests were made using a cork and then a plastic sponge pad between the lead shot and the plate. Tests were run with the cylinder raised off the plate and, also, with the cylinder resting on the plate. All of these test results gave poor readings. After the first two increments of load, the experimental readings were consistently low. The experimental values obtained when a pad was used between the lead shot and the plate were better than without the pad. The experimental values when the cylinder was raised off the plate were better than those for the cylinder resting on the plate.

Conclusions of the First Tests - The test results were very poor. It was felt that the error in locating the strain gages was causing some of the problems. The SR-4 type strain gages were very difficult to align because of the lack of alignment marks on the gage. The error from the strain indicator, because of a readability of only 5 micro-inches per inch strain, contributed measurably to the error. The maximum readings were only about 70 micro-inches per inch strain.

Based on the experience gained from the first plate, a second test plate was made. This test plate was to have two active gages. One strain gage would be on one side of the plate and the second strain gage would be in a similar

location on the opposite side of the plate. With this type hookup the output signal will be twice that for a single active gage hookup. This combination reduces the error due to the limited readability of the strain indicator.

Metal foil strain gages were selected for future testing because the error due to the transverse sensitivity is very small. Also, the metal foil strain gages usually have more axial sensitivity. The metal foil strain gages used had a resistance of 350 ohms. The axial sensitivity of this strain gage is usually greater than that of a 120 ohm strain gage. The method of locating the strain gages was changed to increase the locational accuracy of the strain gages.

Second Test Plate - This plate was 24S aluminum, 0.081 inches thick and with an outside diameter of 10.63 inches. A coordinate system was scribed on both sides of the plate to aid in gage location. This coordinate system was one inch by one inch and was located from the center of the plate. The lines of this coordinate system on one side of the plate were coincident with the lines on the other side of the plate. Adjustable parallel bars, micrometers, and a center head were used to insure accuracy. By using this grid system and the alignment marks on the strain gages, the location of the strain gages was accurate to at least 0.015 inches or better. The angular location was believed to be accurate to at least 0.5° or better.

Budd C12-141-B-350 resistance metal foil strain gages were bonded in the radial and tangential positions at radii of 0, 1, 2, and 3 inches. The strain gages have a grid length of 0.25 inches and are 0.125 inches wide. The gage factor was 2.13 and the gage resistance was 350 ohms. These strain gages were self-temperature compensated for aluminum.

First Test With Second Plate - The sides of the test plate were identified as side 1 and as side 2. Figure VI and VII show side 1 and side 2. With a strain gage on each side of the plate, one strain gage is in tension and the other strain gage is in compression. These two strain

Figure VI

TEST PLATE - SIDE 1

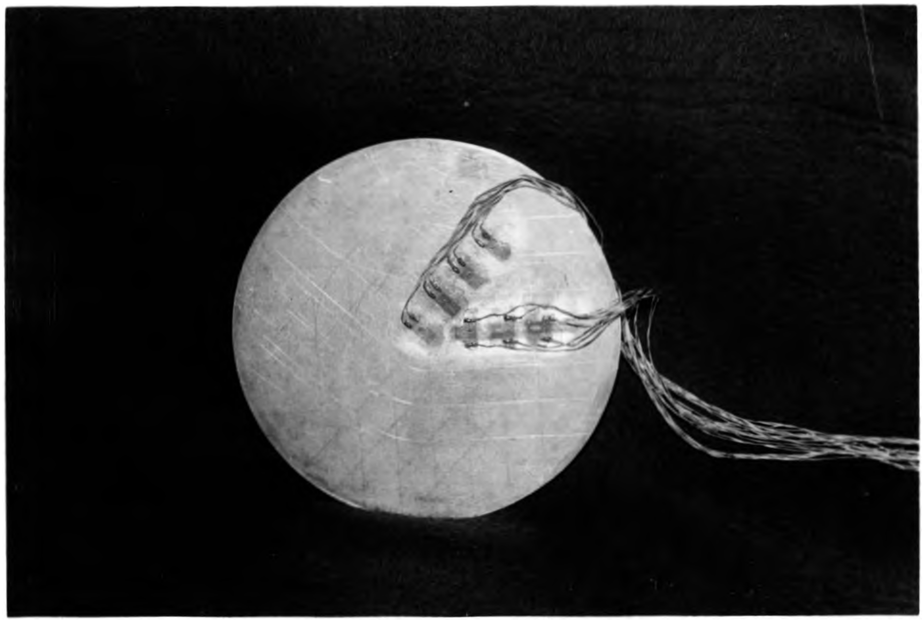

Figure VII

TEST PLATE - SIDE 2

gages were connected in adjacent arms of the half bridge and gave an output signal that was twice that of a single active gage. The gage factor setting on the strain indicator was 2.13, therefore, the indicated strain was twice the true strain. A Budd model SB-1 switching and balancing unit and a Budd model P-350 strain indicator were used. This allowed up to ten different strain gage bridges to be monitored for each loading. This strain indicator could be read to the nearest 1 micro-inch per inch strain. With the two active gages and the improved strain indicator, the

error in the experimental results due to the strain indicator was greatly reduced.

The same test procedure was used except all eight strain gage bridges were monitored at each loading with the use of the switching unit. Figure VIII shows the complete test setup. The results from these tests were poor. Careful investigation revealed that the plate was warped

Figure VIII

TEST SETUP

and was not contacting the support fixture uniformly. In a few places the gap was greater than 0.003 inches. Shim stock was placed in these gaps to give a more uniform

support. With this gap the plate initially twisted instead of bending symmetrically. The twisting would cause the strain to be a function of Θ. The shims prevented the twisting. The results were much better than before, but the results were erratic at light loads.

Water as the Uniform Load - If water were used as the loading medium, then the loading would be more uniform.

Figure IX

PLASTIC BLADDER IN CYLINDER

The cylinder was raised off the plate approximately 0.03 inches. A boot or bladder of thin plastic was placed inside the cylinder to form a water tight container. See Figure IX.

The plastic was thin enough that it would conform to the surface of the plate and the surface of the cylinder, yet the clearance between the plate and the cylinder was small enough that the plastic was not forced out due to the pressure of the water.

A series of four tests were implemented. There were two active gages, and the load was on side 1. The plate was shimmed, and the first test was run. The plate was rotated 90° with respect to the support fixture, and the plate was reshimmed, and the next test was run. This was repeated two more times. This gave test results at four locations. Locations 1 and 4 are the same. These test results are presented in Tables I and II and Figures 1-14 in the Appendix. The results were very good. The variation from one location to another is very small. One trend that was apparent was that the tangential and radial strain gages at the one and two inch radii positions were consistently giving low readings. This could have been due to the fact that even with the shims there was not a uniform support.

<u>Load Directly on the Strain Gage</u> - The next series of tests were performed to show that uniform load normal to the strain gage had little or no effect on the strain readings. For these tests one active strain gage was used and was connected to the strain indicator in a quarter bridge hookup. This type hookup does not have circuit temperature compensa-

tion, but the individual strain gages are self-temperature compensated when used on aluminum. This should account for any effects due to temperature changes. Also, the temperature changes should be very small because the test time was short and the water used as the load was at room temperature.

The indicated strain readings from the strain gages on side 1 were obtained with the load on side 1, and then with the load on side 2. Next, the indicated strain readings from the strain gages on side 2 were obtained with the load on side 1, and then with the load on side 2. These four sets of tests are presented in Tables III and IV and Figures 15-28, in the Appendix.

The test results were good although the results using two active gages gave less variation. This variation was due to the increased effect of the error of the strain indicator. This was because the output from a single active gage was less than from two active gages.

The strain readings from the tangential strain gages on side 1 are closer to the theoretical values with the exception of the tangential strain gage at the 2 inch radius. The results from this strain gage indicated a partial failure of the bond at the ends of the strain gage. With this type bond failure the indicated strain readings are low, both in tension and compression.

The strain readings from the radial strain gages on side 1 are closer to the theoretical values than the radial strain gages on side 2.

These test results show that the indicated strain levels on side 2 were consistently lower than those on side 1. The possibility of this being due to a partial failure of the bonds is unlikely because all the strain gages on side 2 would have to have a partial failure at the ends of the strain gages, while all the strain gage bonds on side 1 would be good except as previously noted. The other explain-ation is that the strains on side 2 were less than on side 1. This could be due to the warp in the plate. Even with the shims, the support was not uniform and twisting of the plate was possible.

The test results from the strain gages on side 1, first with the load on side 1, and then with the load on side 2, were checked. There was no trend for the differences be-tween the two sets of test results. This indicated that the load directly on the strain gages had little or no effect on the indicated strain. The same was true for the strain gages on side 2.

Plate With Concentric Hole - A 0.29 inch diameter hole was drilled in the test plate. This hole eliminated one set of strain gages. Additional strain gages were applied in radial and tangential positions at radii of 0.5 and 1.5

inches on both sides of the plate. The addition of these gages augmented the data for comparison with theoretical values. A rod slightly smaller in diameter than the con-

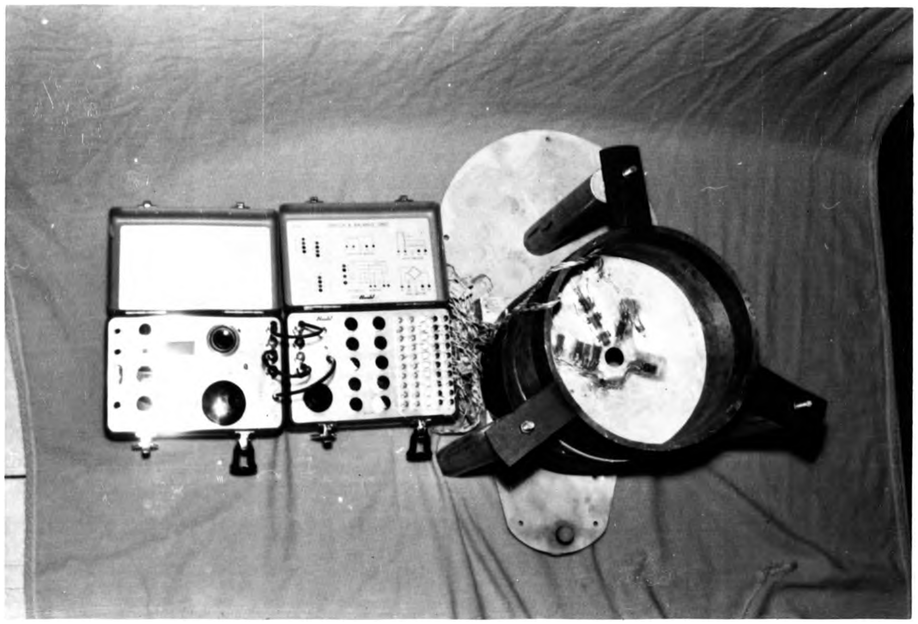

Figure X

CONCENTRIC HOLE TEST SETUP WITHOUT PLASTIC BLADDER

centric hole was adjusted to pass through the 0.29 inch diameter concentric hole. A plastic bladder was made from thin plastic so it would conform to the surface of the cylinder, plate, and rod. This bladder contained the loading medium. With this setup there was no load over the concentric hole. Figure X shows this arrangement. Figure XI shows the complete setup for this test.

After the concentric hole was drilled the warp in the plate was observed to be much worse. The gap between the plate and the support fixture in places was as much as 0.015 inches. Attempts to shim this gap and obtain good

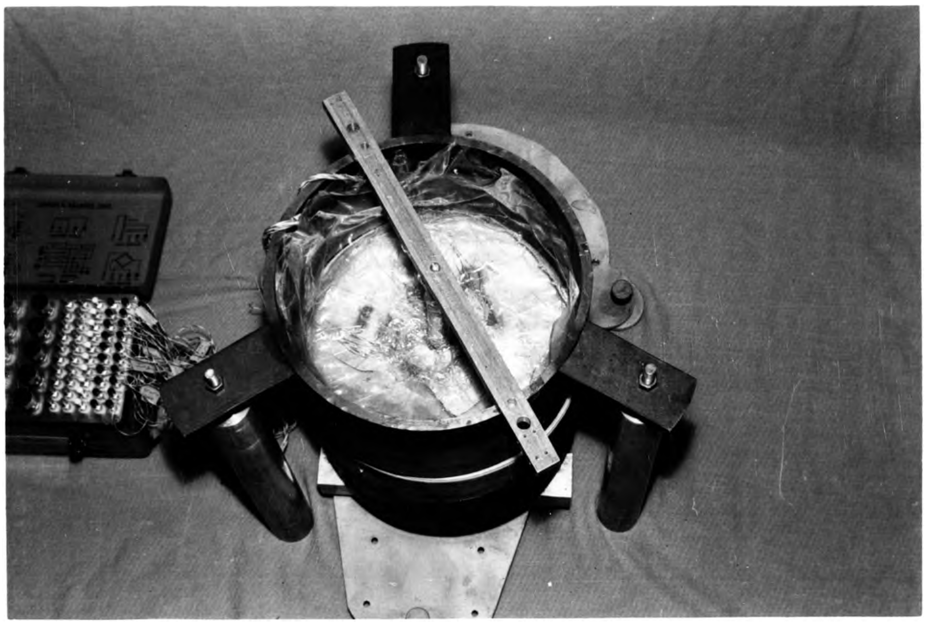

Figure XI

COMPLETE CONCENTRIC HOLE TEST SETUP

test results were unsuccessful. Attempts to pull the plate down flat by clamping the support fixture and cylinder together proved unsuccessful. The clamping added additional restraints to the support which lowered the strain readings. The experimental results confirmed this.

Previously the shims were used in an attempt to bring

the support fixture up to the surface of the plate. Another way was to build up the support fixture to the surface of the plate with water putty in order to provide a uniform support.

The plate was supported, and the support fixture was turned upside down and supported above the plate. There was a minimum gap between the plate and support fixture of 0.01 to 0.02 inches. A form made of masking tape was used to keep the liquid water putty between the plate and support fixture until the water putty set. After the putty had set, the location of the plate was marked, and the plate was removed. The putty was trimmed to insure that the plate could rotate at the support but not deflect at the support.

For this series of tests, two active strain gages were used with the strain gages in adjacent arms of the half bridge. The gage factor setting on the strain indicator was 2.13. The indicated strain was twice the true value of strain. Four sets of tests were run, two with the load on side 1 and two with the load on side 2. The results of these tests are presented in Tables V, VI, VII, and VIII and Figures 29-42 in the Appendix.

The results from these tests were not nearly as good as the previous set of tests. One observed trend was that the strain readings were low at the higher loads. There seemed to be quite a variation of strain readings when the load was

on side 2. If the strain readings from the strain gages on side 2 were giving low readings, this would account for the poor results. There is a good possibility that the warp in the plate contributed to the poor results.

0.70 Diameter Concentric Hole - The 0.29 inch diameter hole was enlarged to 0.70 inches diameter. Tests were run, but it was noticed that the strain readings from the tangential strain gage at the 2 inch radius on side 1 were giving very low strain readings. It was possible that a partial failure of the bond had occurred. Instead of removing this gage, a new location at a 2 inch radius was selected, and strain gages were applied in the tangential and radial positions on side 1. Comparison of the readings from the new strain gages proved that the old tangential strain gage on side 1 was giving low readings.

Additional tests were run using only the strain gages on side 1. For these tests, one active strain gage was used in the quarter bridge hookup on the strain indicator. The gage factor setting on the strain indicator was set at 1.065. This gave indicated strain values that were twice the true value of strain. This decreased the sensitivity of the strain indicator, but the instrument still had ample sensitivity. The four sets of tests were run on the plate using the strain gages on side 1. Two of the tests were with the load on side 1, and the other two tests were with the load on side 2. The results of these tests are pre-

sented in Tables IX and X and Figures 43-56 in the Appendix.

The results were very good. One trend was that, at the larger loads, the strain readings were low. This probably was due to the warp in the plate.

The same tests were run again except the strain gages on side 2 were used. The results of these tests are presented in Tables XI and XII and Figures 57-70 in the Appendix.

The readings from the strain gages on side 2 were not as good as the results from the gages on side 1. The readings from the radial strain gages at the larger loads, with the exception of the strain gage at the 3 inch radius position, were affected by the load being on the strain gage. The same is true for the tangential gages. During later tests the bond failed on one of the strain gages on side 2. Since the one gage failed, the strain gages on side 2 were not used for any further tests. Since the load resting directly on side 2 affected these gages this is a good indication that the bonds were not good.

<u>1.00 Diameter Concentric Hole</u> - The 0.70 inch diameter hole was enlarged to 1.00 inch diameter. Tests were run using the strain gages on side 1. The tests were run in exactly the same manner as the ones for the plate with 0.70 inch diameter hole. The results of these tests are presented in Tables XIII and XIV and Figures 71-84 in the Appendix.

III. CONCLUSIONS

The purpose of this investigation was to evaluate the accuracy that can be expected from the experimental technique developed. This accuracy has been established, at a satisfactory level, provided certain conditions are met. The metal foil strain gage application procedure must be followed to produce consistently good results. If the bonds are not good, the results will be unsatisfactory. The plate must be flat if the results are to correlate well with the theoretical values.

The test results from the circular plate without a concentric hole are shown in Tables I, II, III, and IV. These test results gave values of stress with an average deviation of 5.3 percent from theoretical.

The test results from the strain gages on side 1 with a 0.70 inch diameter concentric hole are shown in Tables IX and X. These test results gave values of stress with an average deviation of 5.4 percent from theoretical.

Test results from the strain gages on side 1 with a 1.00 inch diameter concentric hole are shown in Tables XIII and XIV. These test results gave values of stress with an average deviation of 6.7 percent from theoretical.

The test results from the strain gages on side 1 and side 2 with a 0.29 inch diameter concentric hole were not as

good, Tables V, VI, VII, and VIII. These test results gave values of stress with an average deviation of 11.4 percent from theoretical.

The test results from the strain gages on side 2 with a 0.70 inch diameter concentric hole were not as good as those from the strain gages on side 1, Tables XI.and XII. These test results gave values of stress with an average deviation of 11.9 percent from theoretical.

Before the concentric hole was placed in the plate, the warp was small and the test results from the strain gages on side 1 and side 2 were good. After the concentric hole was cut in the plate, the warp increased and the test results were poorer, especially from the strain gages on side 2.

With a 0.70 inch diameter concentric hole, the test results from the strain gages on side 2 indicated a partial bond for these gages. This was because the test results with the load on side 1 were consistently different from the test results with the load on side 2.

This experimental technique can be used for the determination of the strains in a simply supported, uniformly loaded circular plate containing a single hole or many holes in any location. The location and the direction of the principal strains can be determined from the use of the photostress method. The proper application of the strain

gages in these locations, plus keeping the plate flat, will give experimental values with a satisfactory accuracy for engineering applications.

IV. RECOMMENDATIONS

The importance of the flatness of the test plate cannot be overemphasized. In addition to being flat, it should be thoroughly stress relieved while clamped flat in a fixture. After this treatment the plate should be flat, and since the internal stresses have been relieved, it should not warp when a hole is cut in it. Care should be used in handling the plate to insure that it remains flat.

The correct application of the metal foil strain gages is a requirement that must be met if the results are to be consistantly good. Care should be exercised in locating the strain gages accurately.

For the plate with a non-concentric hole, the photo-stress technique can be used to determine the directions and locations of the principal strains. Next, the strain gages can be placed in these locations so the value of the principal strains can be determined. The metal foil strain gages should be the type with two grids per gage. These grids are perpendicular to each other and can be used to determine both values of the principal strains at a point. Strain gages on one side of the test plate will be adequate. The test procedure that was used for the tests with a single active gage and a concentric hole should be used.

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VI. VITA

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He was employed by the Westinghouse Electric Corporation during the period between June 1961 and September 1963. His position at the end of this period was Associate Engineer in the Mechanical Design and Development Section at the Air Arm Division.

He entered the Graduate School of the Missouri School of Mines and Metallurgy in September 1963. He was employed as a Graduate Assistant in the Mechanical Engineering Department during the academic year 1963-64 and during the fall semester of the academic year 1964-65.

VII. APPENDIX

The following Tables and Figures contain the experimentally determined values of strain. These values of strain are used to calculate the values of the stresses. The values of these stresses and strains are the absolute magnitudes of these quantities.

If one active strain gage hookup was used, the readings from the strain gages on side 1 would be, compressive if the load was on side 1, tensile if the load was on side 2. The readings from the strain gages on side 2 would be, compressive if the load was on side 2, tensile if the load was on side 1. The hookup with an active strain gage on each side of the plate gave a reading that was the average of the absolute magnitude of the compressive stress on one side and the tensile stress on the other side.

TABLE I

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE

(10.413 IN. DIA., 0.081 IN. THICK)

TABLE I

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE' (10.415 IN. DIA., 0.081 IN. THICK)

DEVIATION IS CALCULATED FROM THEORETICAL VALUES OF PRINCIPAL STRESSES

THE SQUARES ON FIGURES 1-14 REPRESENT THE FIRST SET OF DATA
THE DIAMONDS ON FIGURES 1-14 REPRESENT THE SECOND SET OF DATA

POSITION (RADIUS) (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)	TANG-ENTIAL STRESS (PSI)	TANG-ENTIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)
			FIRST SET OF DATA				
0.0	.0258	126.8	8.5	5.2	126.8	8.5	5.2
0.0	.0517	261.1	17.5	2.2	261.1	17.5	2.2
0.0	.0776	388.0	26.0	3.2	388.0	26.0	3.2
0.0	.1035	522.3	35.0	2.2	522.3	35.0	2.2
0.0	.1294	634.3	42.5	5.2	634.3	42.5	5.2
0.0	.1553	791.0	53.0	1.3	791.0	53.0	1.3
0.0	.1812	917.9	61.5	1.8	917.9	61.5	1.8
1.0	.0258	115.6	7.5	11.2	123.1	8.5	6.0
1.0	.0517	255.5	17.0	.6	259.3	17.5	.7
1.0	.0776	358.1	23.5	7.7	373.1	25.5	4.9
1.0	.1035	483.1	32.0	6.4	494.4	33.5	5.6
1.0	.1294	606.2	40.0	6.0	625.0	42.5	4.4
1.0	.1553	740.6	49.0	4.2	759.3	51.5	3.1
1.0	.1812	861.8	57.0	4.4	884.4	60.0	3.3
2.0	.0258	104.4	7.0	8.9	104.4	7.0	16.5
2.0	.0517	218.2	14.0	4.3	237.0	16.5	2.7
2.0	.0776	313.3	20.5	8.9	328.4	22.5	11.2
2.0	.1035	432.7	28.5	5.2	447.8	30.5	8.7
2.0	.1294	535.3	35.0	6.3	561.6	38.5	8.4
2.0	.1553	649.1	42.5	5.2	679.2	46.5	7.5
2.0	.1812	764.7	50.0	4.2	802.3	55.0	6.2
3.0	.0258	89.4	5.5	-.3	104.5	7.5	2.4
3.0	.0517	169.6	10.0	5.1	210.9	15.5	1.4
3.0	.0776	255.2	15.0	4.8	319.2	23.5	.5
3.0	.1035	344.8	20.5	3.4	423.6	31.0	1.0
3.0	.1294	424.9	25.0	4.9	530.2	39.0	.9
3.0	.1553	521.9	31.0	2.5	642.2	47.0	0.0
3.0	.1812	616.9	36.5	1.2	763.6	56.0	-1.8
			SECOND SET OF DATA				
0.0	.0258	141.7	9.5	-5.8	141.7	9.5	-5.8
0.0	.0517	276.1	18.5	-3.2	276.1	18.5	-3.2
0.0	.0776	335.8	22.5	19.3	335.8	22.5	19.3
0.0	.1035	529.8	35.5	.8	529.8	35.5	.8
0.0	.1294	671.6	45.0	-.5	671.6	45.0	-.5
0.0	.1553	805.9	54.0	-.5	805.9	54.0	-.5
0.0	.1812	955.2	64.0	-2.1	955.2	64.0	-2.1
1.0	.0258	143.6	9.5	-10.4	147.4	10.0	-11.3
1.0	.0517	257.4	17.0	0.0	264.9	18.0	-1.4
1.0	.0776	365.6	24.0	5.5	380.6	26.0	2.9
1.0	.1035	486.8	32.0	5.6	505.6	34.5	3.3
1.0	.1294	604.3	39.5	6.4	634.4	43.5	2.9
1.0	.1553	725.6	47.5	6.3	759.4	52.0	3.1
1.0	.1812	850.6	56.0	5.8	880.7	60.0	3.8
2.0	.0258	121.2	8.0	-6.1	125.0	8.5	-2.5
2.0	.0517	221.9	14.5	2.5	233.2	16.0	4.4
2.0	.0776	324.5	21.0	5.2	347.0	24.0	5.2
2.0	.1035	429.0	28.0	6.1	451.5	31.0	7.8
2.0	.1294	537.2	35.0	5.9	567.2	39.0	7.3
2.0	.1553	639.7	41.5	6.7	681.1	47.0	7.2
2.0	.1812	746.1	48.5	6.8	791.2	54.5	7.7
3.0	.0258	98.8	6.0	-9.7	117.6	8.5	-8.9
3.0	.0517	184.5	11.0	-3.3	225.9	16.5	-5.2
3.0	.0776	260.9	15.5	2.5	321.1	23.5	0.0
3.0	.1035	354.1	21.0	.7	436.8	32.0	-1.9
3.0	.1294	436.2	26.0	2.2	533.9	39.0	.2
3.0	.1553	535.0	32.0	0.0	651.5	47.5	-1.4
3.0	.1812	611.4	36.5	2.1	746.7	54.5	.3

TABLE II

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE

(10.413 IN. DIA., 0.081 IN. THICK)

TABLE II

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE
(10.413 IN. DIA., 0.081 IN. THICK)

DEVIATION IS CALCULATED FROM THEORETICAL VALUES OF PRINCIPAL STRESSES

TWO CONCENTRIC SQUARES ON FIGURES 1-14 REPRESENT THE THIRD SET OF DATA
AN X WITHIN A SQUARE ON FIGURES 1-14 REPRESENTS THE FOURTH SET OF DATA

POSITION (RADIUS) (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (µIN./IN.)	DEVIATION (PER CENT)	TANG-ENTIAL STRESS (PSI)	TANG-ENTIAL STRAIN (µIN./IN.)	DEVIATION (PER CENT)
				THIRD SET OF DATA			
0.0	.0258	134.3	9.0	-.5	134.3	9.0	-.5
0.0	.0517	268.6	18.0	-.5	268.6	18.0	-.5
0.0	.0776	395.5	26.5	1.3	395.5	26.5	1.3
0.0	.1035	514.9	34.5	3.7	514.9	34.5	3.7
0.0	.1294	656.7	44.0	1.6	656.7	44.0	1.6
0.0	.1553	768.6	51.5	4.2	768.6	51.5	4.2
0.0	.1812	925.3	62.0	1.0	925.3	62.0	1.0
1.0	.0258	138.0	9.5	-6.8	130.5	8.5	0.0
1.0	.0517	255.5	17.0	.6	259.3	17.5	.7
1.0	.0776	376.8	25.0	2.4	384.3	26.0	1.9
1.0	.1035	486.8	32.0	5.6	505.6	34.5	3.3
1.0	.1294	606.2	40.0	6.0	625.0	42.5	4.4
1.0	.1553	733.1	48.5	5.2	751.9	51.0	4.2
1.0	.1812	859.9	56.5	4.7	893.7	61.0	2.2
2.0	.0258	110.0	7.0	3.4	121.3	8.5	.3
2.0	.0517	231.2	14.5	-1.5	261.3	18.5	-6.7
2.0	.0776	332.0	21.5	2.8	354.5	24.5	3.0
2.0	.1035	427.1	27.5	6.6	460.9	32.0	5.6
2.0	.1294	540.9	35.0	5.2	578.4	40.0	5.2
2.0	.1553	632.3	41.0	8.0	673.6	46.5	8.4
2.0	.1812	753.5	49.0	5.7	798.6	55.0	6.7
3.0	.0258	96.9	6.0	-7.9	111.9	8.0	-4.4
3.0	.0517	178.9	10.5	-.2	224.0	16.5	-4.4
3.0	.0776	231.0	13.0	15.6	306.2	23.0	4.8
3.0	.1035	341.0	20.0	4.6	427.5	31.5	.1
3.0	.1294	415.6	24.5	7.3	517.1	38.0	3.5
3.0	.1553	497.6	29.0	7.5	629.2	46.5	2.0
3.0	.1812	590.8	34.5	5.6	744.9	55.0	.5
				FOURTH SET OF DATA			
0.0	.0258	134.3	9.0	-.5	134.3	9.0	-.5
0.0	.0517	276.1	18.5	-3.2	276.1	18.5	-3.2
0.0	.0776	388.0	26.0	3.2	388.0	26.0	3.2
0.0	.1035	537.3	36.0	-.5	537.3	36.0	-.5
0.0	.1294	656.7	44.0	1.6	656.7	44.0	1.6
0.0	.1553	798.5	53.5	.3	798.5	53.5	.3
0.0	.1812	925.3	62.0	1.0	925.3	62.0	1.0
1.0	.0258	117.4	7.5	9.4	126.7	9.0	1.4
1.0	.0517	240.6	15.5	6.9	259.3	18.0	.7
1.0	.0776	363.7	24.0	6.0	375.0	25.5	4.4
1.0	.1035	479.4	31.5	7.3	498.2	34.0	4.8
1.0	.1294	608.1	40.0	5.7	630.6	43.0	3.5
1.0	.1553	734.9	48.5	5.0	757.5	51.5	3.4
1.0	.1812	858.0	56.5	4.9	888.1	60.5	2.9
2.0	.0258	115.6	7.5	-1.5	123.1	8.5	-1.1
2.0	.0517	227.5	15.0	0.0	235.1	16.0	3.5
2.0	.0776	322.6	21.0	5.8	341.4	23.5	6.9
2.0	.1035	430.8	28.0	5.6	457.1	31.5	6.5
2.0	.1294	531.5	34.5	7.0	565.4	39.0	7.6
2.0	.1553	643.4	41.5	6.1	692.3	48.0	5.5
2.0	.1812	753.5	49.0	5.7	798.6	55.0	6.7
3.0	.0258	93.1	5.5	-4.2	115.7	8.5	-7.5
3.0	.0517	182.6	11.0	-2.3	220.2	16.0	-2.8
3.0	.0776	262.8	15.5	1.8	326.7	24.0	-1.6
3.0	.1035	344.8	20.5	3.4	423.8	31.0	1.0
3.0	.1294	439.9	26.0	1.4	545.1	40.0	-1.8
3.0	.1553	516.3	30.5	3.6	640.3	47.0	.3
3.0	.1812	609.5	36.0	2.4	756.1	55.5	-.8

FIGURE 1

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0258 PSI UNIFORM LOAD
AVERAGE STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

□ RADIAL STRESS FOR PLATE LOCATION 1.

◇ RADIAL STRESS FOR PLATE LOCATION 2.

⊡ RADIAL STRESS FOR PLATE LOCATION 3.

⊠ RADIAL STRESS FOR PLATE LOCATION 4.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

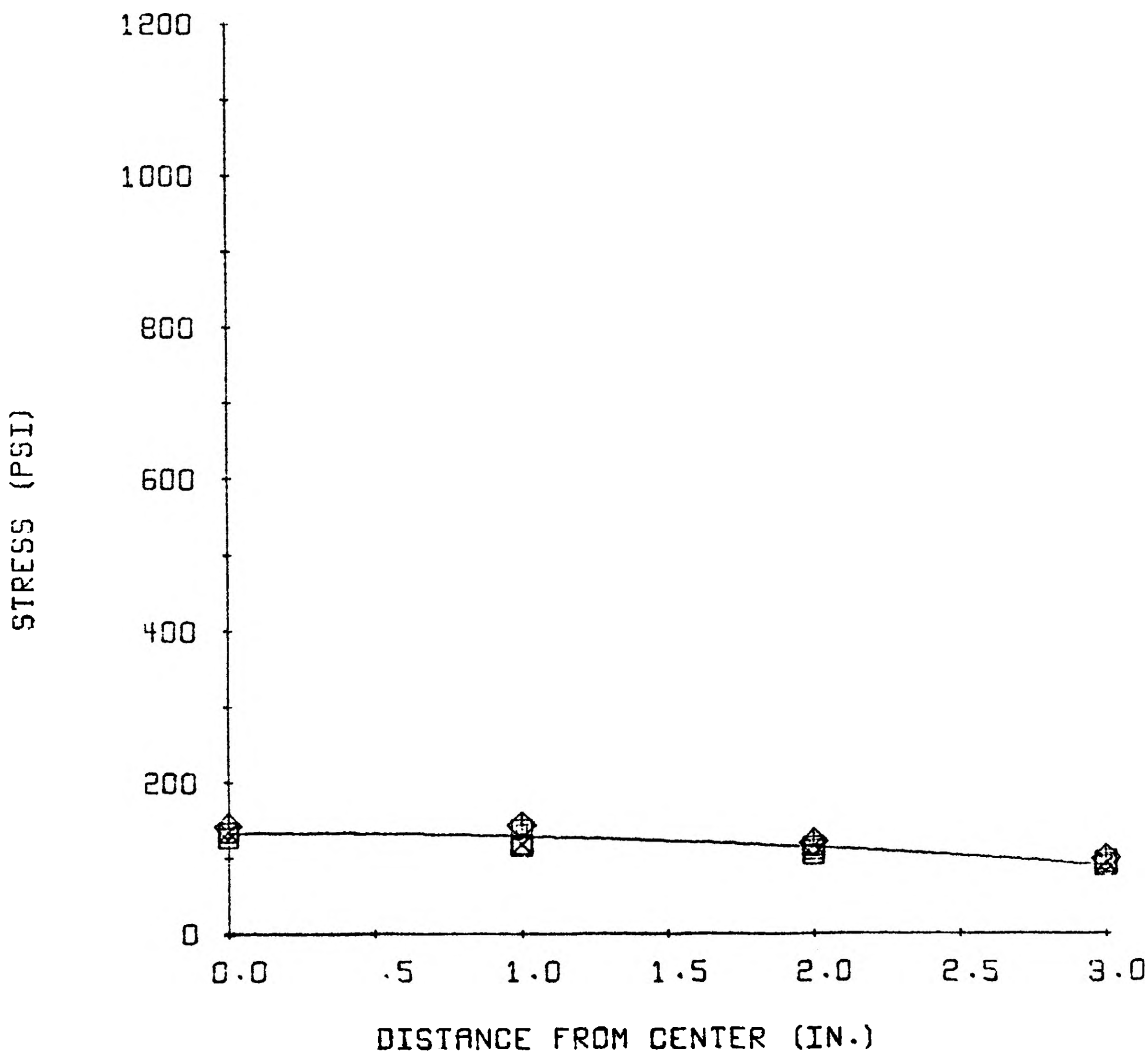

FIGURE 2

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0258 PSI UNIFORM LOAD
AVERAGE STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

□ TANGENTIAL STRESS FOR PLATE LOCATION 1.

◇ TANGENTIAL STRESS FOR PLATE LOCATION 2.

▣ TANGENTIAL STRESS FOR PLATE LOCATION 3.

⊠ TANGENTIAL STRESS FOR PLATE LOCATION 4.

\- THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2

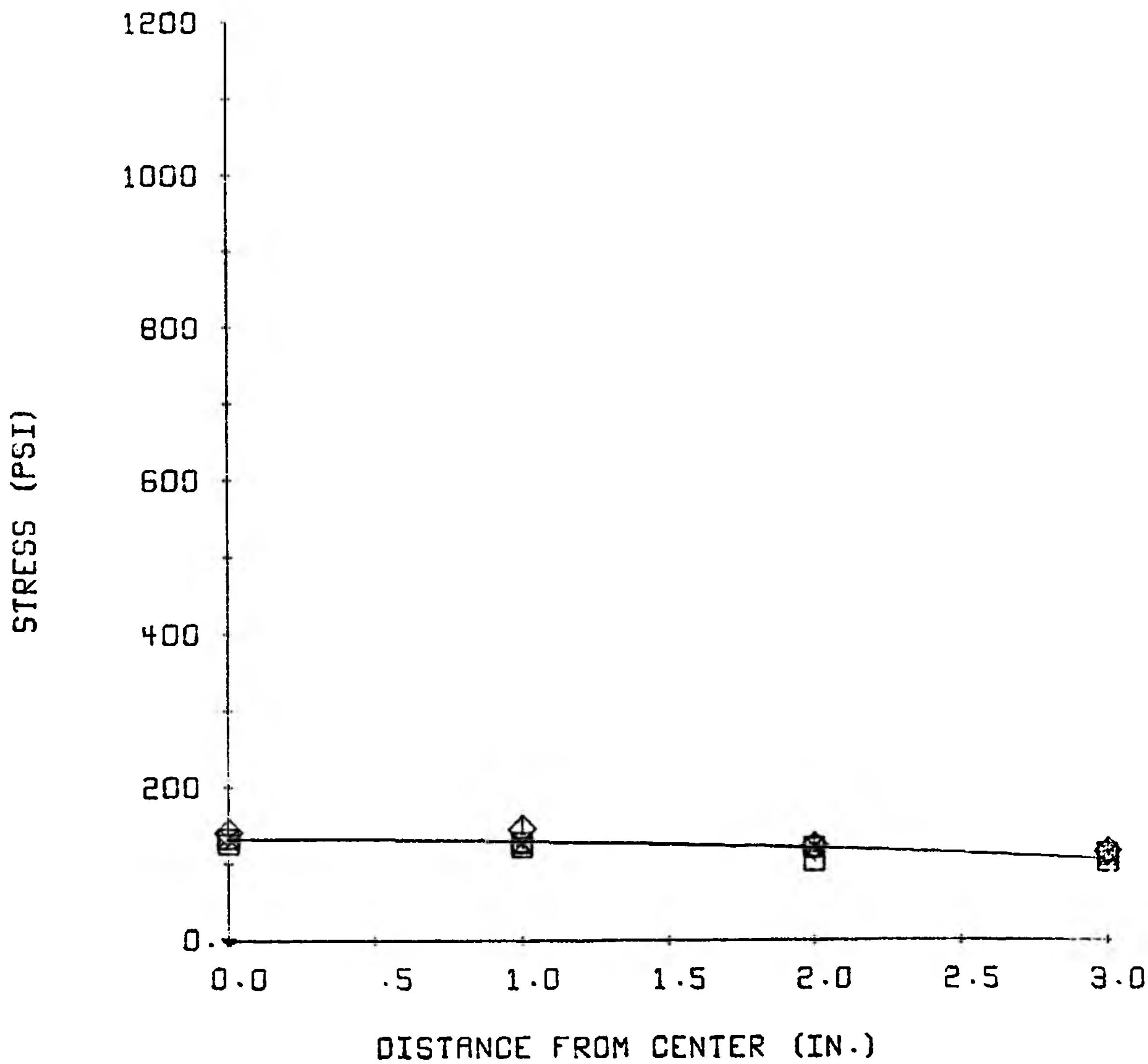

FIGURE 3

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0517 PSI UNIFORM LOAD
AVERAGE STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

□ RADIAL STRESS FOR PLATE LOCATION 1.

◇ RADIAL STRESS FOR PLATE LOCATION 2.

▣ RADIAL STRESS FOR PLATE LOCATION 3.

⊠ RADIAL STRESS FOR PLATE LOCATION 4.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

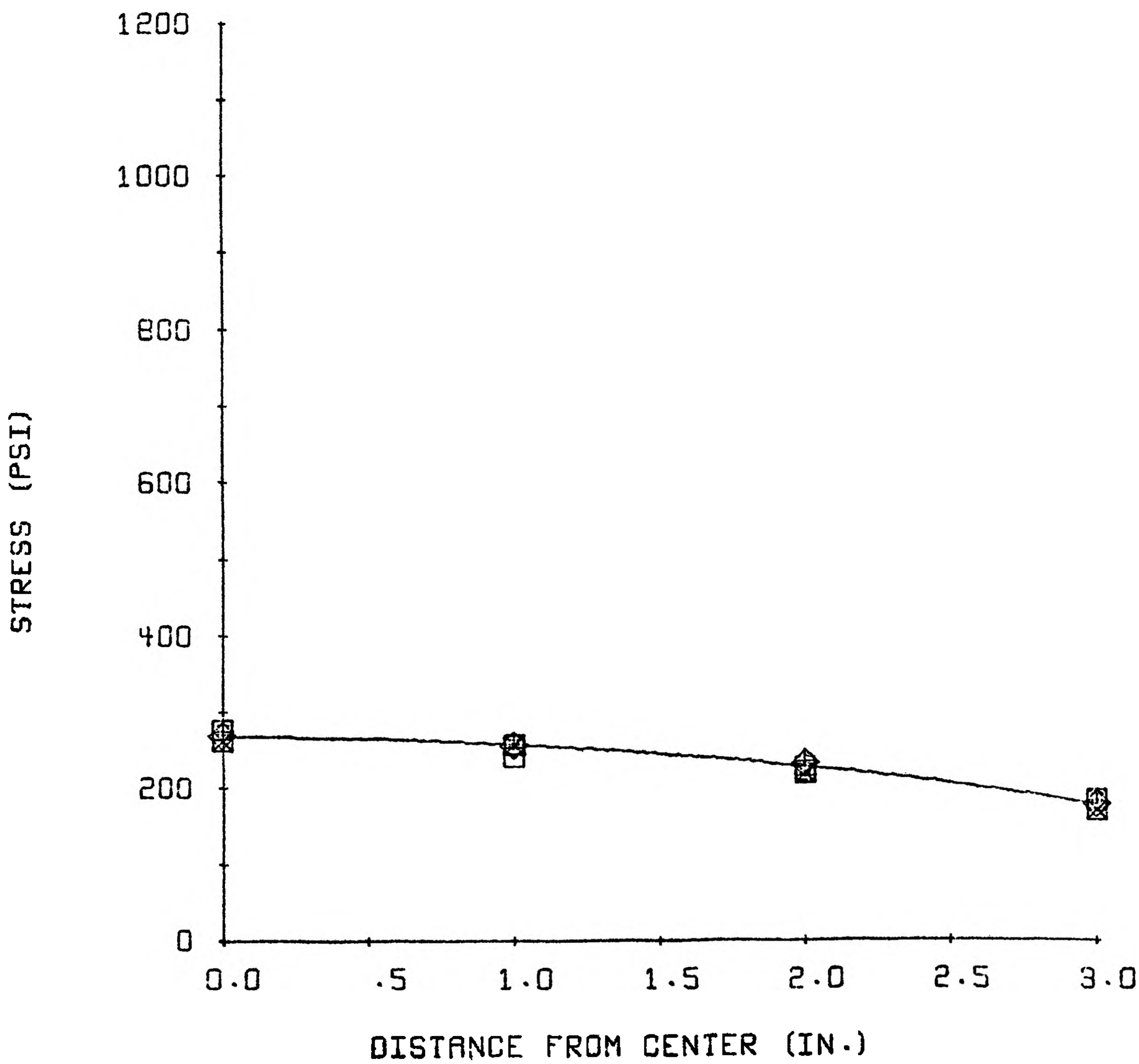

FIGURE 4

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0517 PSI UNIFORM LOAD
AVERAGE STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

□ TANGENTIAL STRESS FOR PLATE LOCATION 1.

◇ TANGENTIAL STRESS FOR PLATE LOCATION 2.

▣ TANGENTIAL STRESS FOR PLATE LOCATION 3.

⊠ TANGENTIAL STRESS FOR PLATE LOCATION 4.

\- THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

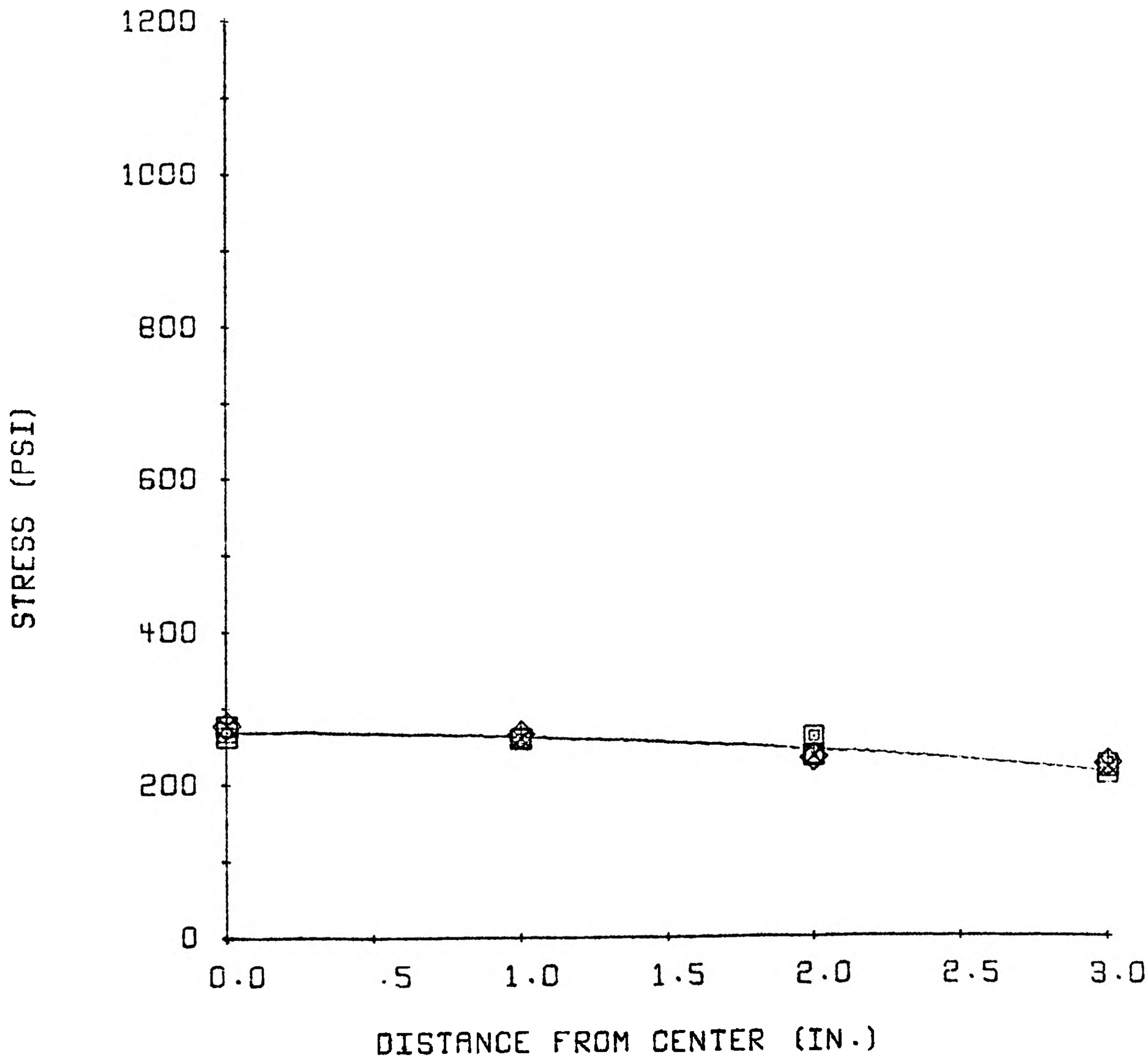

FIGURE 5

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0776 PSI UNIFORM LOAD
AVERAGE STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

□ RADIAL STRESS FOR PLATE LOCATION 1.

◇ RADIAL STRESS FOR PLATE LOCATION 2.

▣ RADIAL STRESS FOR PLATE LOCATION 3.

⊠ RADIAL STRESS FOR PLATE LOCATION 4.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

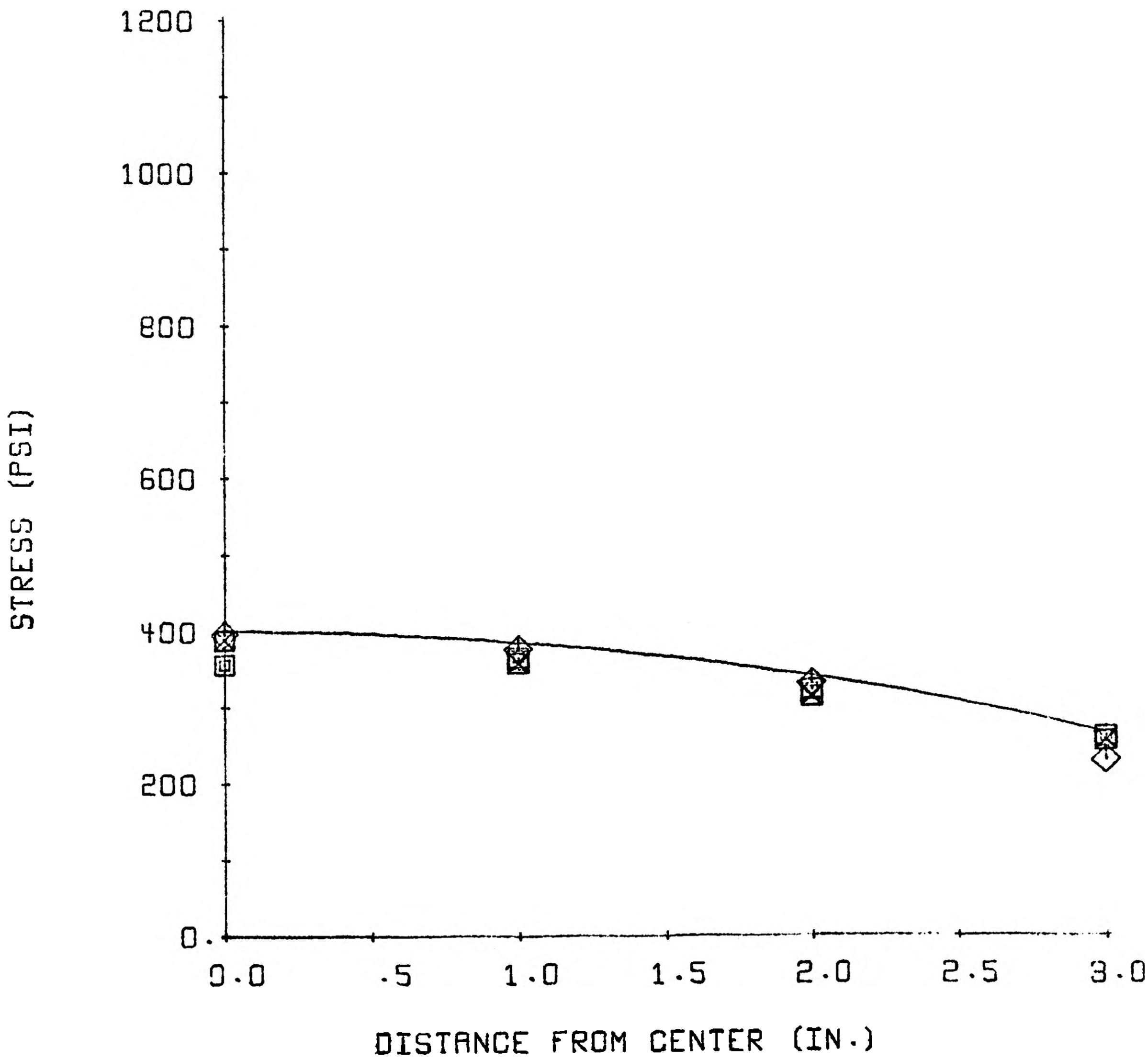

FIGURE 6

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0776 PSI UNIFORM LOAD
AVERAGE STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

□ TANGENTIAL STRESS FOR PLATE LOCATION 1.

◇ TANGENTIAL STRESS FOR PLATE LOCATION 2.

▣ TANGENTIAL STRESS FOR PLATE LOCATION 3.

⊠ TANGENTIAL STRESS FOR PLATE LOCATION 4.

\- THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

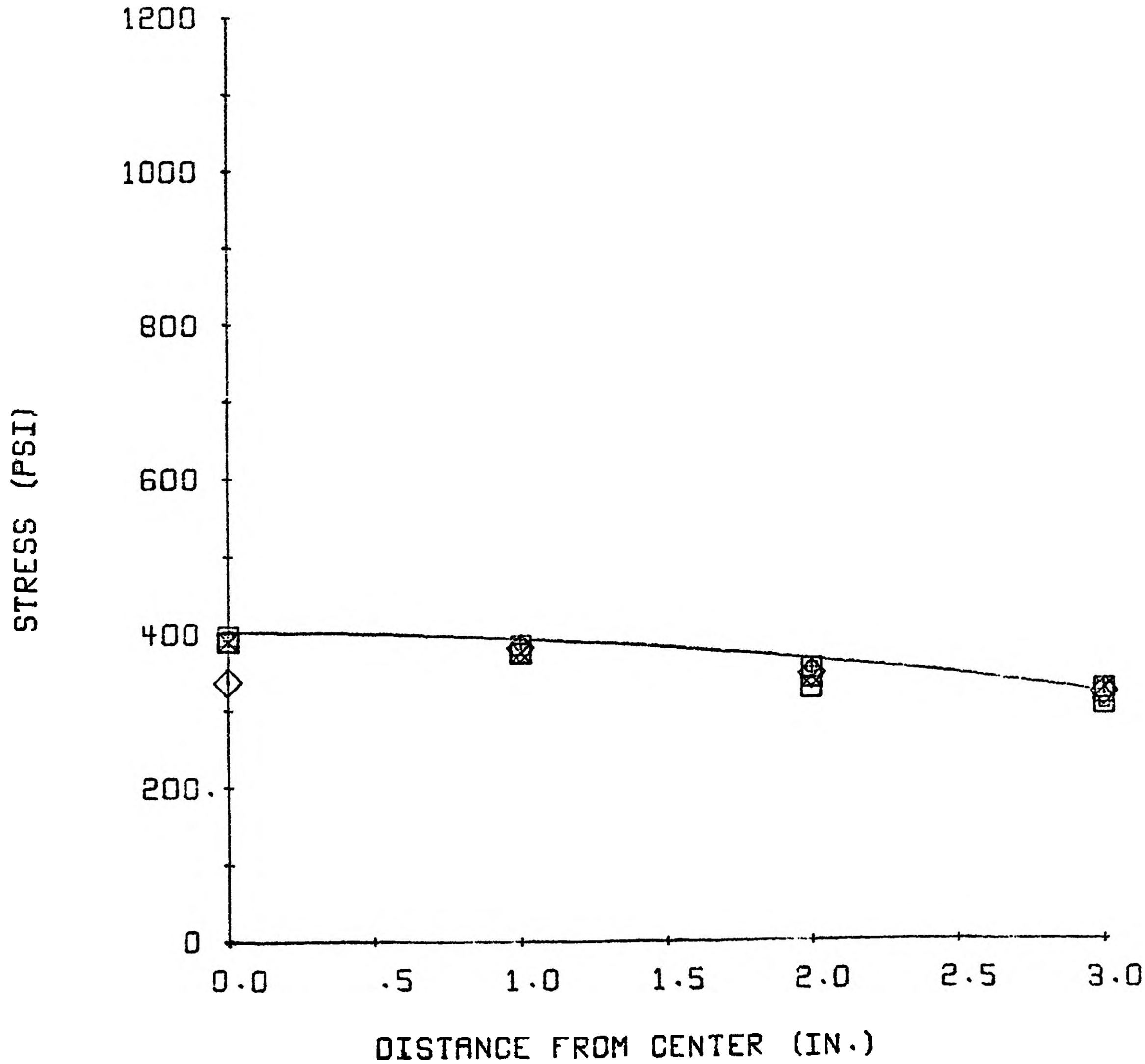

FIGURE 7

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1035 PSI UNIFORM LOAD
AVERAGE STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

□ RADIAL STRESS FOR PLATE LOCATION 1.

◇ RADIAL STRESS FOR PLATE LOCATION 2.

▣ RADIAL STRESS FOR PLATE LOCATION 3.

⊠ RADIAL STRESS FOR PLATE LOCATION 4.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

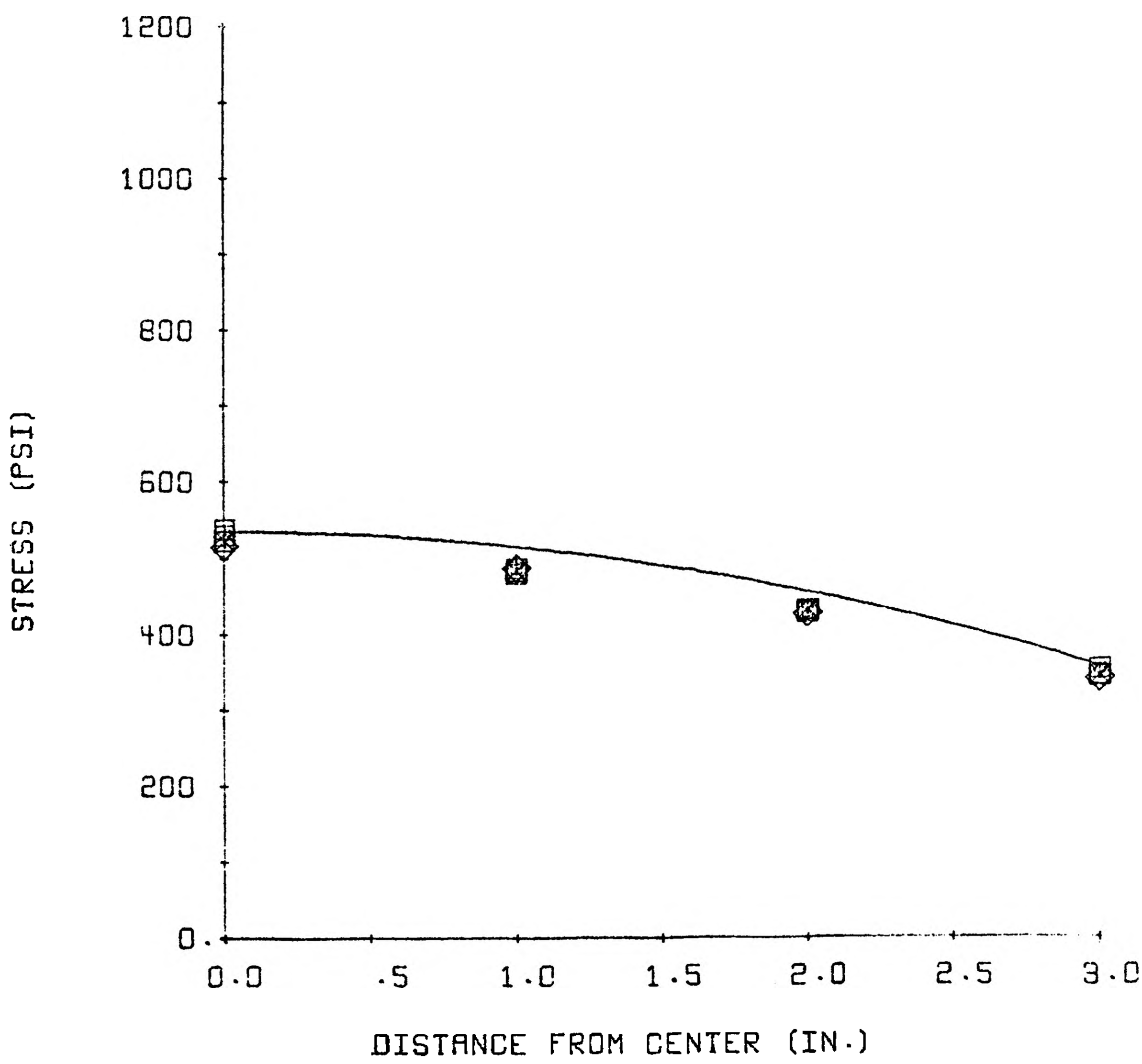

FIGURE 6

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1035 PSI UNIFORM LOAD
AVERAGE STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

□ TANGENTIAL STRESS FOR PLATE LOCATION 1.

◇ TANGENTIAL STRESS FOR PLATE LOCATION 2.

▣ TANGENTIAL STRESS FOR PLATE LOCATION 3.

⊠ TANGENTIAL STRESS FOR PLATE LOCATION 4.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

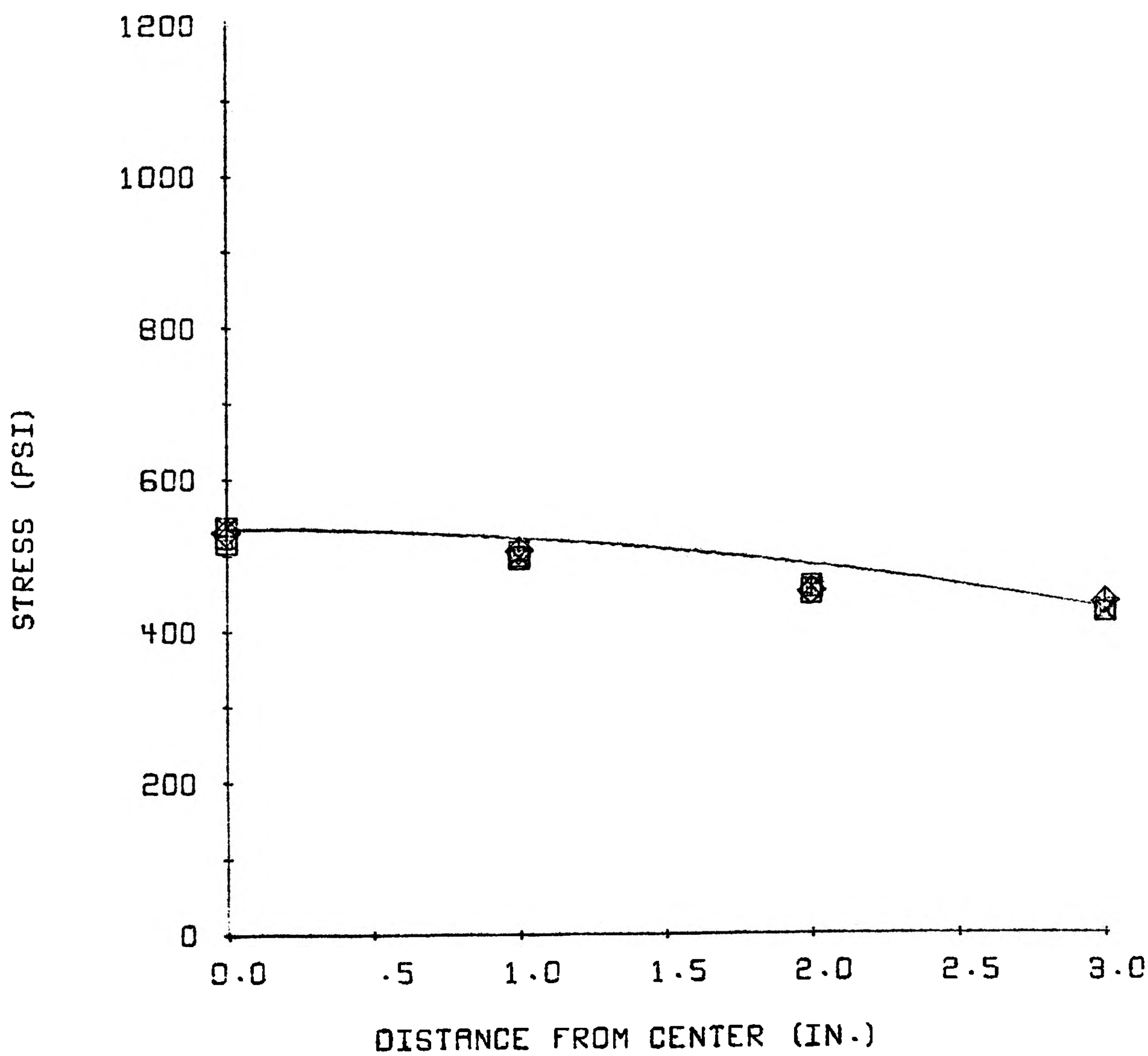

FIGURE 9

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1294 PSI UNIFORM LOAD
AVERAGE STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

□ RADIAL STRESS FOR PLATE LOCATION 1.

◇ RADIAL STRESS FOR PLATE LOCATION 2.

▣ RADIAL STRESS FOR PLATE LOCATION 3.

⊠ RADIAL STRESS FOR PLATE LOCATION 4.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

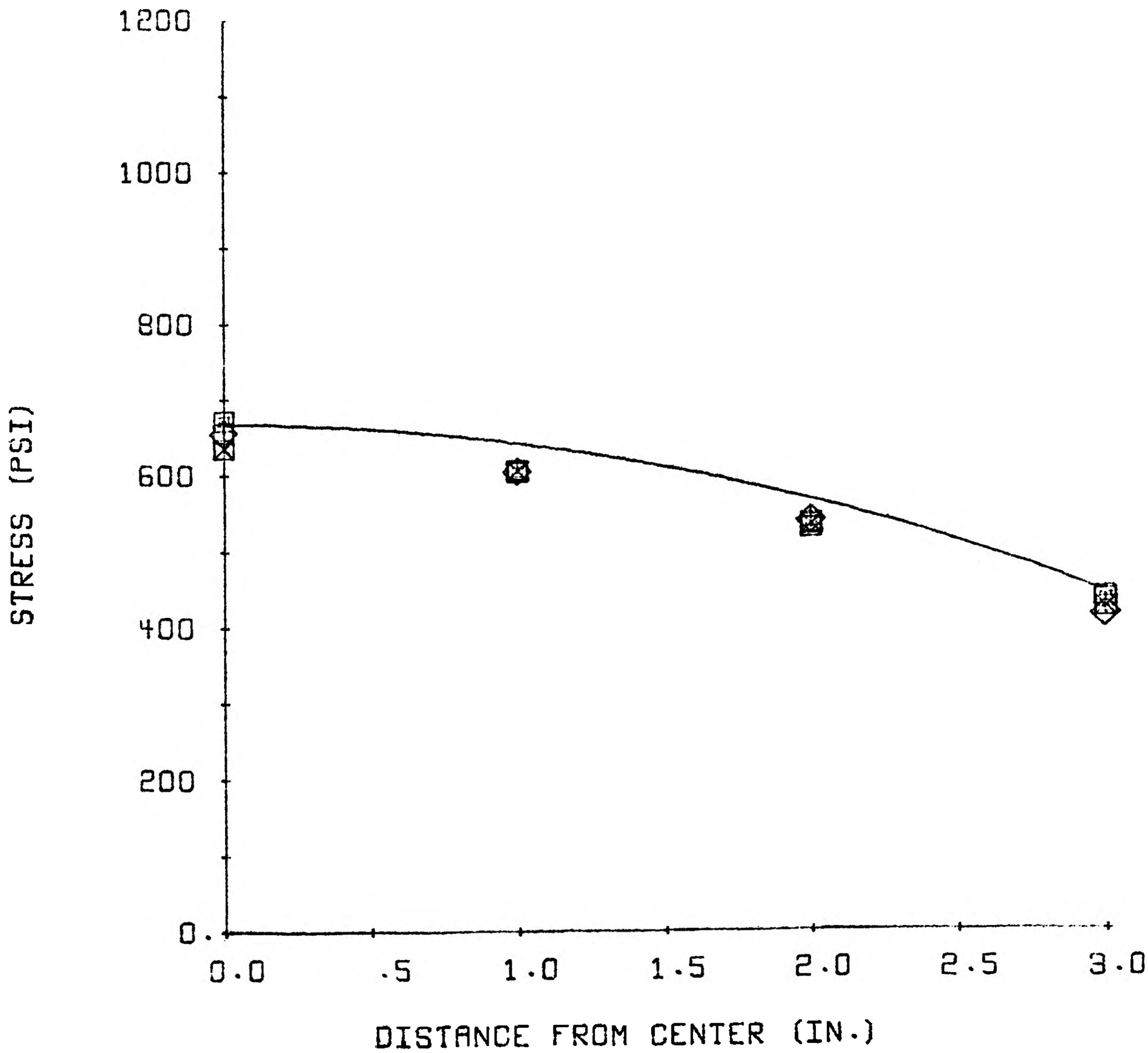

FIGURE 10

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1294 PSI UNIFORM LOAD
AVERAGE STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

□ TANGENTIAL STRESS FOR PLATE LOCATION 1.

◇ TANGENTIAL STRESS FOR PLATE LOCATION 2.

▣ TANGENTIAL STRESS FOR PLATE LOCATION 3.

⊠ TANGENTIAL STRESS FOR PLATE LOCATION 4.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

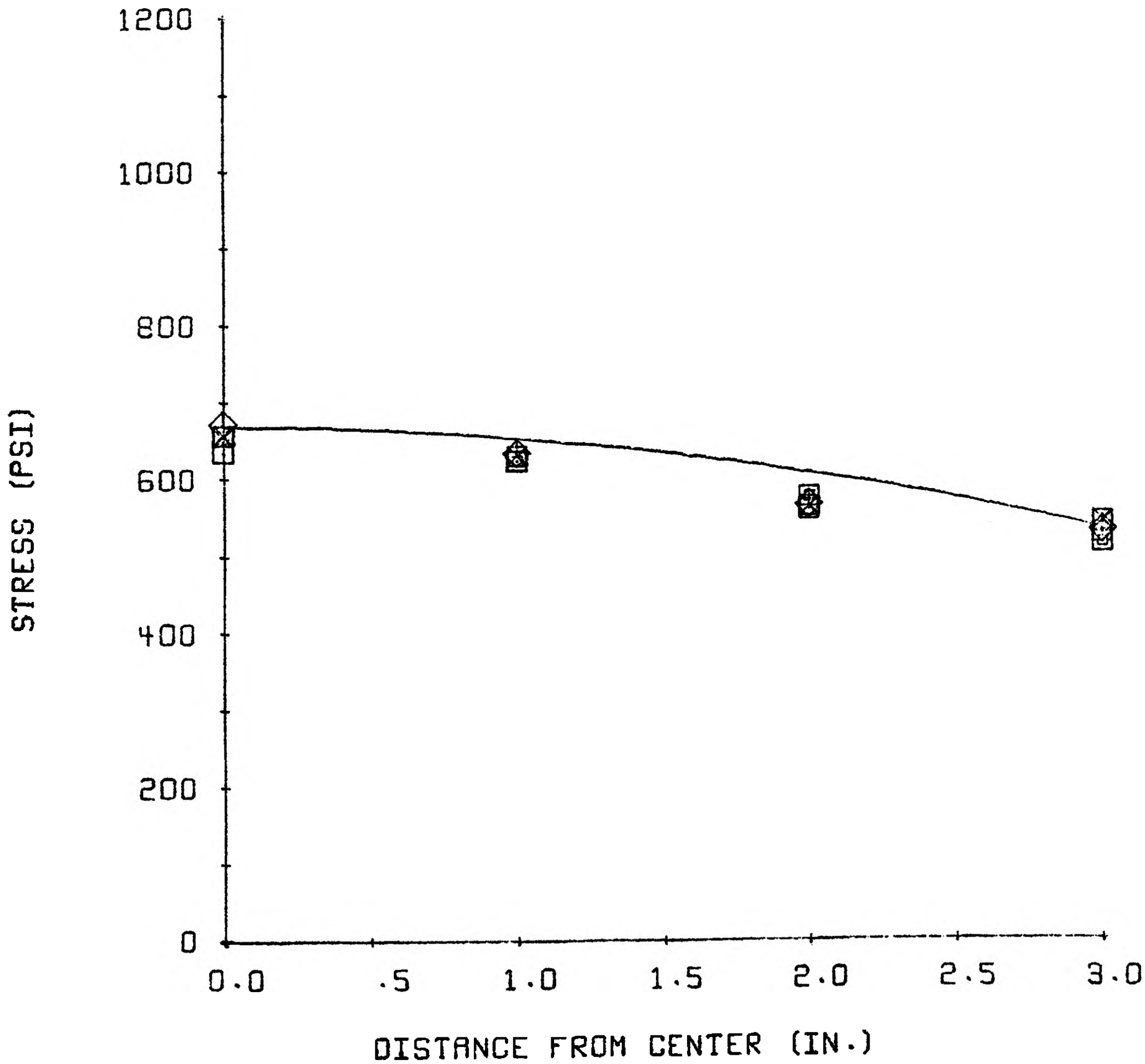

FIGURE 11

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1553 PSI UNIFORM LOAD
AVERAGE STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

□ RADIAL STRESS FOR PLATE LOCATION 1.

◇ RADIAL STRESS FOR PLATE LOCATION 2.

▣ RADIAL STRESS FOR PLATE LOCATION 3.

⊠ RADIAL STRESS FOR PLATE LOCATION 4.

- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

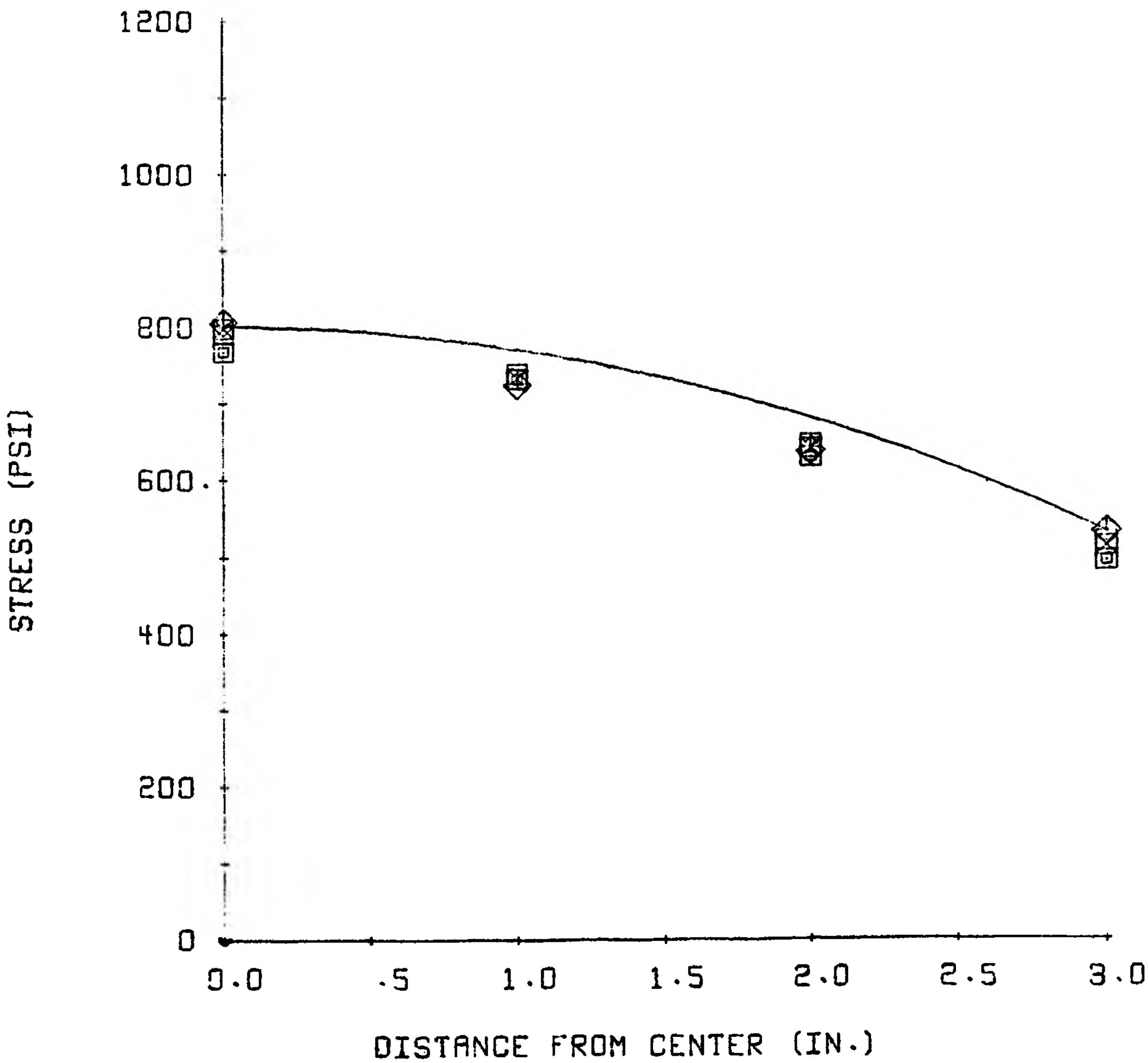

FIGURE 12

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1553 PSI UNIFORM LOAD
AVERAGE STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

□ TANGENTIAL STRESS FOR PLATE LOCATION 1.

◇ TANGENTIAL STRESS FOR PLATE LOCATION 2.

▣ TANGENTIAL STRESS FOR PLATE LOCATION 3.

⊠ TANGENTIAL STRESS FOR PLATE LOCATION 4.

\- THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

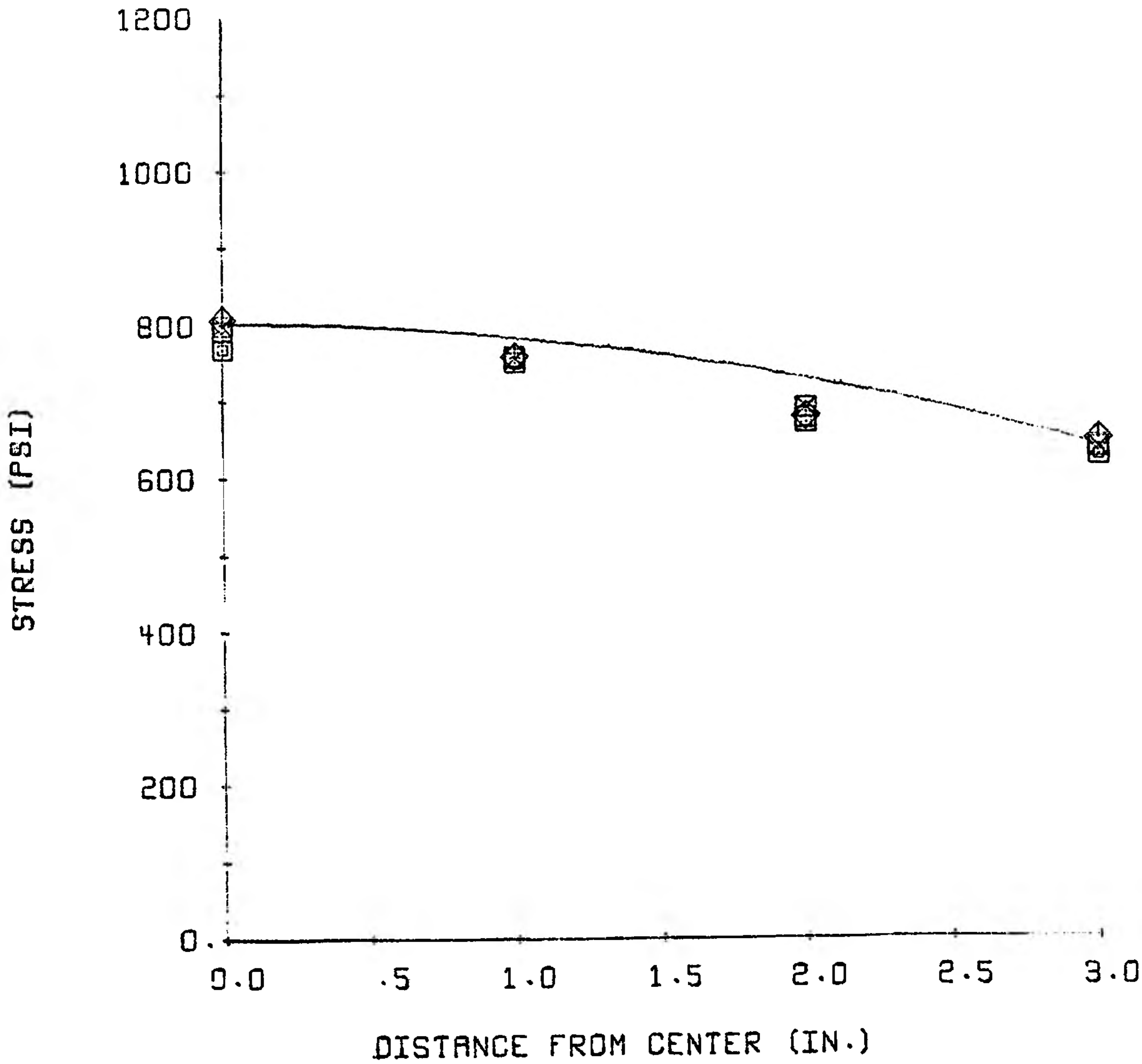

FIGURE 13

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1812 PSI UNIFORM LOAD
AVERAGE STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

□ RADIAL STRESS FOR PLATE LOCATION 1.

◇ RADIAL STRESS FOR PLATE LOCATION 2.

⊡ RADIAL STRESS FOR PLATE LOCATION 3.

⊠ RADIAL STRESS FOR PLATE LOCATION 4.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

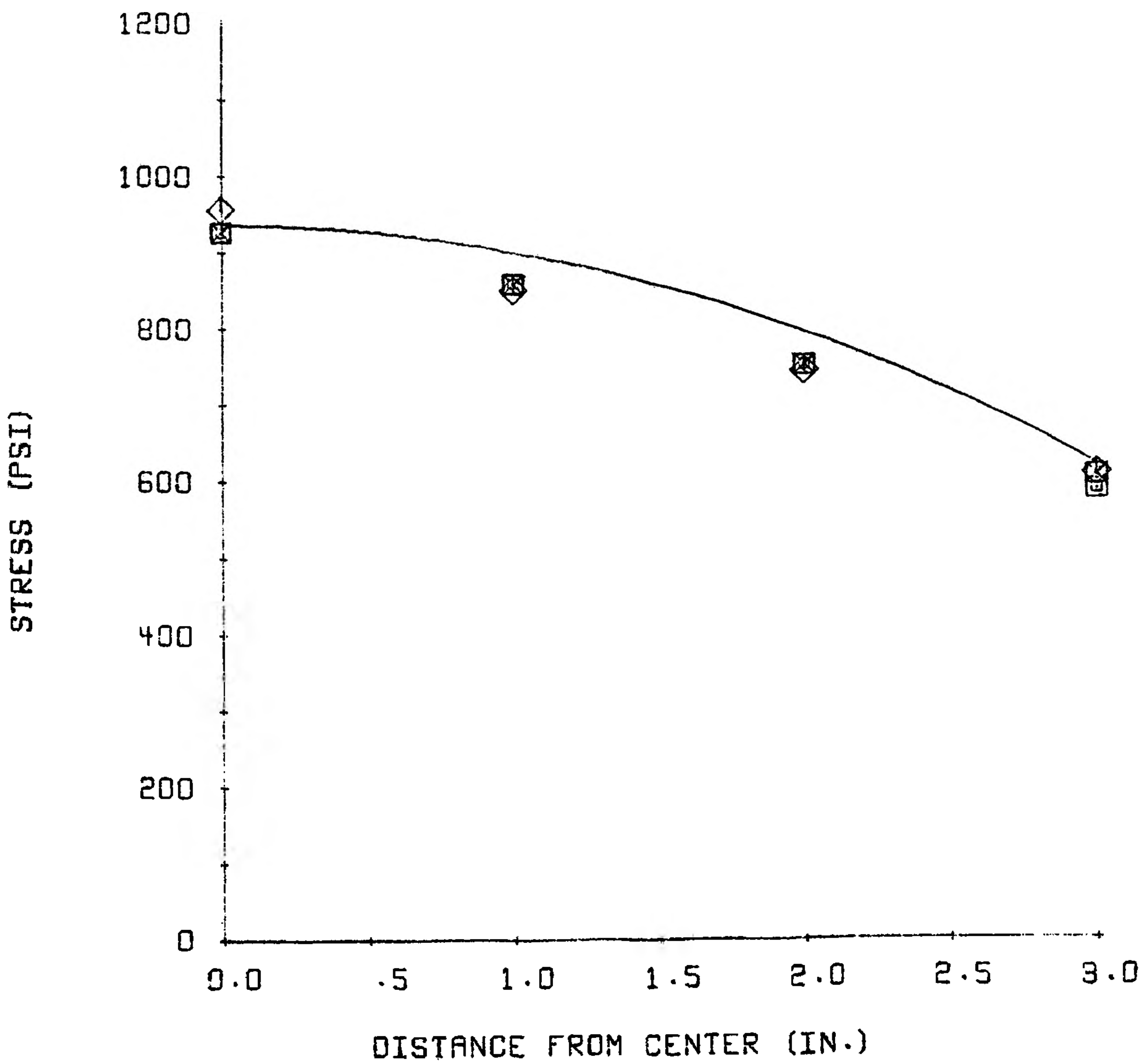

FIGURE 14

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1812 PSI UNIFORM LOAD
AVERAGE STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

□ TANGENTIAL STRESS FOR PLATE LOCATION 1.

◇ TANGENTIAL STRESS FOR PLATE LOCATION 2.

▣ TANGENTIAL STRESS FOR PLATE LOCATION 3.

⊠ TANGENTIAL STRESS FOR PLATE LOCATION 4.

\- THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

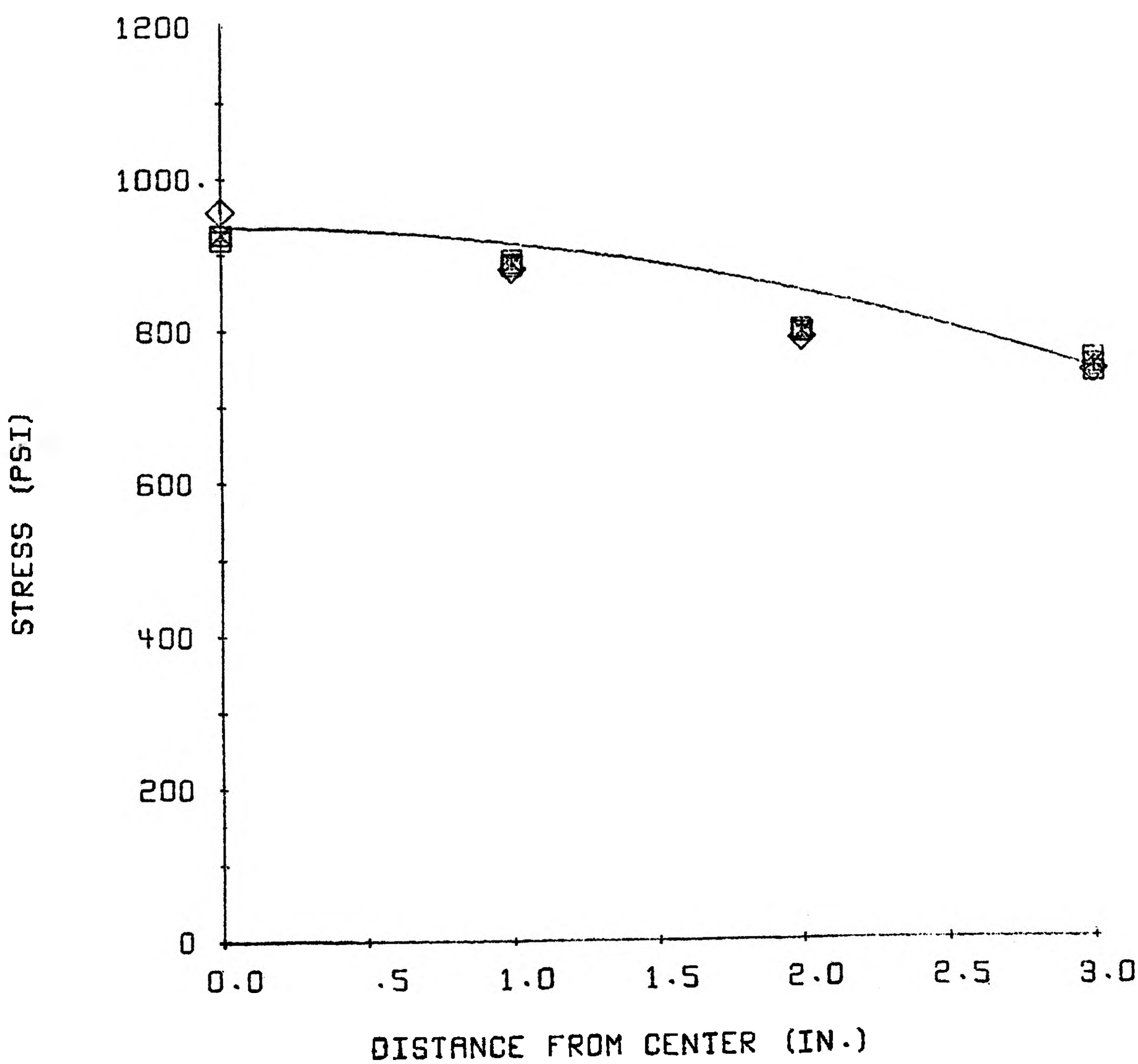

TABLE III

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE

(10.413 IN. DIA., 0.081 IN. THICK)

TABLE III

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK)

DEVIATION IS CALCULATED FROM THEORETICAL VALUES OF PRINCIPAL STRESSES

THE SQUARES ON FIGURES 15-28 REPRESENT THE FIRST SET OF DATA
THE DIAMONDS ON FIGURES 15-28 REPRESENT THE SECOND SET OF DATA

POSITION (RADIUS) (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (µIN./IN.)	DEVIATION (PER CENT)	TANG-ENTIAL STRESS (PSI)	TANG-ENTIAL STRAIN (µIN./IN.)	DEVIATION (PER CENT)
			FIRST SET OF DATA				
0.0	.0258	149.2	10.0	-10.5	149.2	10.0	-10.5
0.0	.0517	268.6	18.0	-.5	268.6	18.0	-.5
0.0	.0776	388.0	26.0	3.2	388.0	26.0	3.2
0.0	.1035	537.3	36.0	-.5	537.3	36.0	-.5
0.0	.1294	686.5	46.0	-2.7	686.5	46.0	-2.7
0.0	.1553	791.0	53.0	1.3	791.0	53.0	1.3
0.0	.1812	955.2	64.0	-2.1	955.2	64.0	-2.1
1.0	.0258	149.2	10.0	-13.8	149.2	10.0	-12.4
1.0	.0517	253.7	17.0	1.3	253.7	17.0	2.9
1.0	.0776	395.4	26.0	-2.4	410.5	28.0	-4.5
1.0	.1035	526.0	35.0	-2.1	533.6	36.0	-2.0
1.0	.1294	637.9	42.0	.8	660.5	45.0	-1.1
1.0	.1553	768.6	51.0	.4	783.6	53.0	0.0
1.0	.1812	899.2	60.0	.1	906.7	61.0	.8
2.0	.0258	138.0	9.0	-17.5	145.5	10.0	-16.3
2.0	.0517	227.5	15.0	0.0	235.1	16.0	3.5
2.0	.0776	332.0	22.0	2.6	339.5	23.0	7.5
2.0	.1035	447.7	30.0	1.7	447.7	30.0	8.7
2.0	.1294	555.9	37.0	2.3	563.4	38.0	8.0
2.0	.1553	656.7	44.0	4.0	656.7	44.0	11.2
2.0	.1812	764.8	51.0	4.1	772.4	52.0	10.3
3.0	.0258	111.8	7.0	-20.2	126.9	9.0	-15.6
3.0	.0517	186.3	11.0	-4.2	231.5	17.0	-7.5
3.0	.0776	272.1	16.0	-1.6	339.8	25.0	-5.4
3.0	.1035	372.7	22.0	-4.2	463.0	34.0	-7.5
3.0	.1294	462.3	28.0	-3.5	552.5	40.0	-3.1
3.0	.1553	533.0	31.0	.4	675.9	50.0	-4.9
3.0	.1812	626.3	37.0	-.2	776.6	57.0	-3.5
			SECOND SET OF DATA				
0.0	.0258	119.4	8.0	11.8	119.4	6.0	11.8
0.0	.0517	253.7	17.0	5.2	253.7	17.0	5.2
0.0	.0776	388.0	26.0	3.2	388.0	26.0	3.2
0.0	.1035	522.3	35.0	2.2	522.3	35.0	2.2
0.0	.1294	641.7	43.0	4.0	641.7	43.0	4.0
0.0	.1553	791.0	53.0	1.3	791.0	53.0	1.3
0.0	.1812	925.3	62.0	1.0	925.3	62.0	1.0
1.0	.0258	123.1	8.0	4.4	130.6	9.0	0.0
1.0	.0517	257.4	17.0	0.0	264.9	18.0	-1.4
1.0	.0776	361.9	24.0	6.6	369.4	25.0	6.0
1.0	.1035	492.5	33.0	4.4	492.5	33.0	6.0
1.0	.1294	619.3	41.0	3.6	634.3	43.0	2.9
1.0	.1553	753.6	50.0	2.4	768.7	52.0	1.9
1.0	.1812	891.7	59.0	.9	914.2	62.0	0.0
2.0	.0258	145.6	11.0	-21.8	108.0	6.0	12.6
2.0	.0517	250.1	18.0	-8.9	212.5	13.0	14.5
2.0	.0776	350.9	25.0	-2.6	305.8	19.0	19.4
2.0	.1035	462.7	32.0	-1.5	432.7	28.0	12.5
2.0	.1294	563.5	39.0	1.0	525.9	34.0	15.7
2.0	.1553	668.0	46.0	2.2	630.4	41.0	15.8
2.0	.1812	783.7	54.0	1.6	738.6	48.0	15.4
3.0	.0258	70.8	4.0	25.9	93.3	7.0	14.6
3.0	.0517	145.3	8.0	22.7	197.9	15.0	8.1
3.0	.0776	227.3	13.0	17.7	295.0	22.0	8.8
3.0	.1035	328.0	19.0	8.7	418.2	31.0	2.3
3.0	.1294	428.6	25.0	4.0	541.4	40.0	-1.1
3.0	.1553	521.9	31.0	2.5	642.2	47.0	0.0
3.0	.1812	633.8	38.0	-1.4	769.1	56.0	-2.5

TABLE IV

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK)

TABLE IV

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK)

DEVIATION IS CALCULATED FROM THEORETICAL VALUES OF PRINCIPAL STRESSES

TWO CONCENTRIC SQUARES ON FIGURES 15-28 REPRESENT THE THIRD SET OF DATA
AN X WITHIN A SQUARE ON FIGURES 15-28 REPRESENTS THE FOURTH SET OF DATA

POSITION (RADIUS) (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)	TANGENTIAL STRESS (PSI)	TANGENTIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)
				THIRD SET OF DATA			
0.0	.0258	134.3	9.0	-.5	134.3	9.0	-.5
0.0	.0517	268.6	18.0	-.5	268.6	18.0	-.5
0.0	.0776	417.9	28.0	-4.1	417.9	28.0	-4.1
0.0	.1035	522.3	35.0	2.2	522.3	35.0	2.2
0.0	.1294	656.7	44.0	1.6	656.7	44.0	1.6
0.0	.1553	761.1	51.0	5.2	761.1	51.0	5.2
0.0	.1812	910.4	61.0	2.6	910.4	61.0	2.6
1.0	.0258	111.8	7.0	14.9	126.9	9.0	2.9
1.0	.0517	238.6	15.0	7.7	268.7	19.0	-2.8
1.0	.0776	354.3	23.0	8.8	376.9	26.0	3.9
1.0	.1035	458.8	30.0	12.1	481.4	33.0	6.5
1.0	.1294	581.9	38.0	10.5	612.0	42.0	6.7
1.0	.1553	705.0	46.0	9.4	742.6	51.0	5.5
1.0	.1812	824.4	54.0	9.2	862.0	59.0	6.0
2.0	.0258	111.8	7.0	1.7	126.9	9.0	-4.0
2.0	.0517	216.3	14.0	5.2	231.3	16.0	5.2
2.0	.0776	309.6	20.0	10.3	332.1	23.0	9.9
2.0	.1035	417.7	27.0	8.9	447.8	31.0	6.7
2.0	.1294	529.6	34.0	7.4	574.7	40.0	5.9
2.0	.1553	652.7	42.0	4.6	705.4	49.0	3.5
2.0	.1812	764.6	49.0	4.2	832.3	58.0	2.4
3.0	.0258	82.0	5.0	8.7	97.0	7.0	10.2
3.0	.0517	160.3	10.0	11.2	182.9	13.0	17.0
3.0	.0776	231.1	14.0	15.7	276.2	20.0	16.2
3.0	.1035	320.6	19.0	11.3	395.6	29.0	8.1
3.0	.1294	417.5	25.0	6.8	507.7	37.0	5.4
3.0	.1553	518.2	31.0	3.2	631.0	46.0	1.7
3.0	.1812	596.5	36.0	4.6	716.8	52.0	4.5
				FOURTH SET OF DATA			
0.0	.0258	134.3	9.0	-.5	134.3	9.0	-.5
0.0	.0517	253.7	17.0	5.2	253.7	17.0	5.2
0.0	.0776	373.1	25.0	7.3	373.1	25.0	7.3
0.0	.1035	492.5	33.0	8.4	492.5	33.0	8.4
0.0	.1294	611.9	41.0	9.1	611.9	41.0	9.1
0.0	.1553	731.3	49.0	9.5	731.3	49.0	9.5
0.0	.1812	865.6	58.0	7.9	865.6	58.0	7.9
1.0	.0258	156.5	9.0	-17.8	201.6	15.0	-35.2
1.0	.0517	242.3	15.0	6.1	279.9	20.0	-6.7
1.0	.0776	365.6	24.0	5.5	380.6	26.0	2.9
1.0	.1035	485.0	32.0	6.0	500.0	34.0	4.4
1.0	.1294	581.9	38.0	10.5	612.0	42.0	6.7
1.0	.1553	690.1	45.0	11.8	727.7	50.0	7.6
1.0	.1812	809.5	53.0	11.2	847.1	58.0	7.9
2.0	.0258	141.7	9.0	-19.6	156.7	11.0	-22.3
2.0	.0517	227.4	14.0	.1	265.0	19.0	-8.1
2.0	.0776	331.9	21.0	2.8	369.5	26.0	-1.1
2.0	.1035	413.9	26.0	10.0	466.6	33.0	4.3
2.0	.1294	518.4	33.0	9.7	571.0	40.0	6.6
2.0	.1553	626.6	40.0	9.0	686.7	48.0	6.3
2.0	.1812	712.3	45.0	11.8	795.0	56.0	7.2
3.0	.0258	96.9	6.0	-7.9	111.9	8.0	-4.4
3.0	.0517	186.3	11.0	-4.2	231.5	17.0	-7.5
3.0	.0776	260.9	15.0	2.5	336.1	25.0	-4.4
3.0	.1035	335.4	19.0	6.3	440.6	33.0	-2.8
3.0	.1294	409.9	23.0	8.8	545.2	41.0	-1.8
3.0	.1553	495.6	28.0	7.9	653.5	49.0	-1.7
3.0	.1812	544.1	31.0	14.7	709.5	53.0	5.6

FIGURE 15

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0258 PSI UNIFORM LOAD

□ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊡ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⊠ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

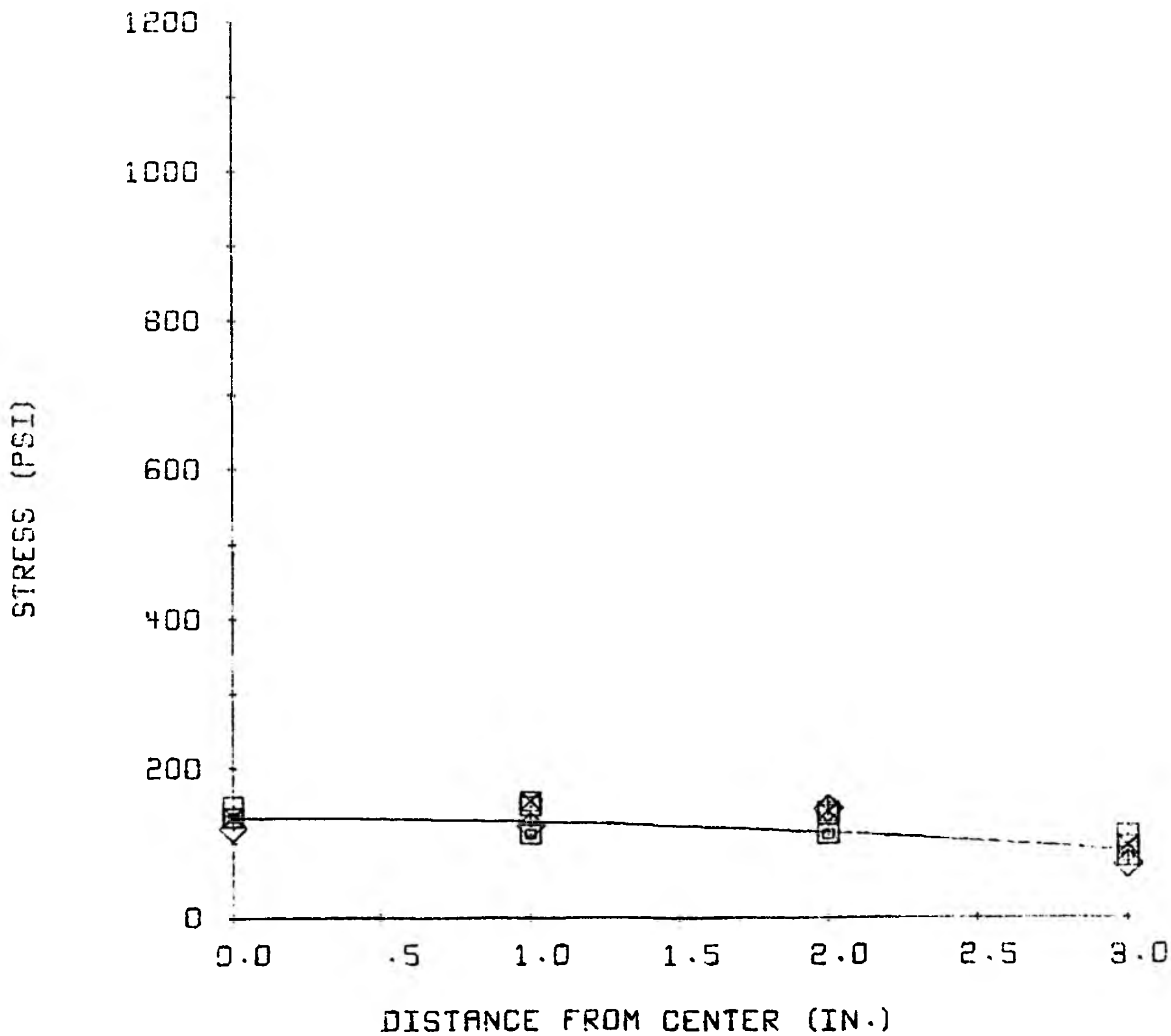

FIGURE 16

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0258 PSI UNIFORM LOAD

□ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

▣ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⊠ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

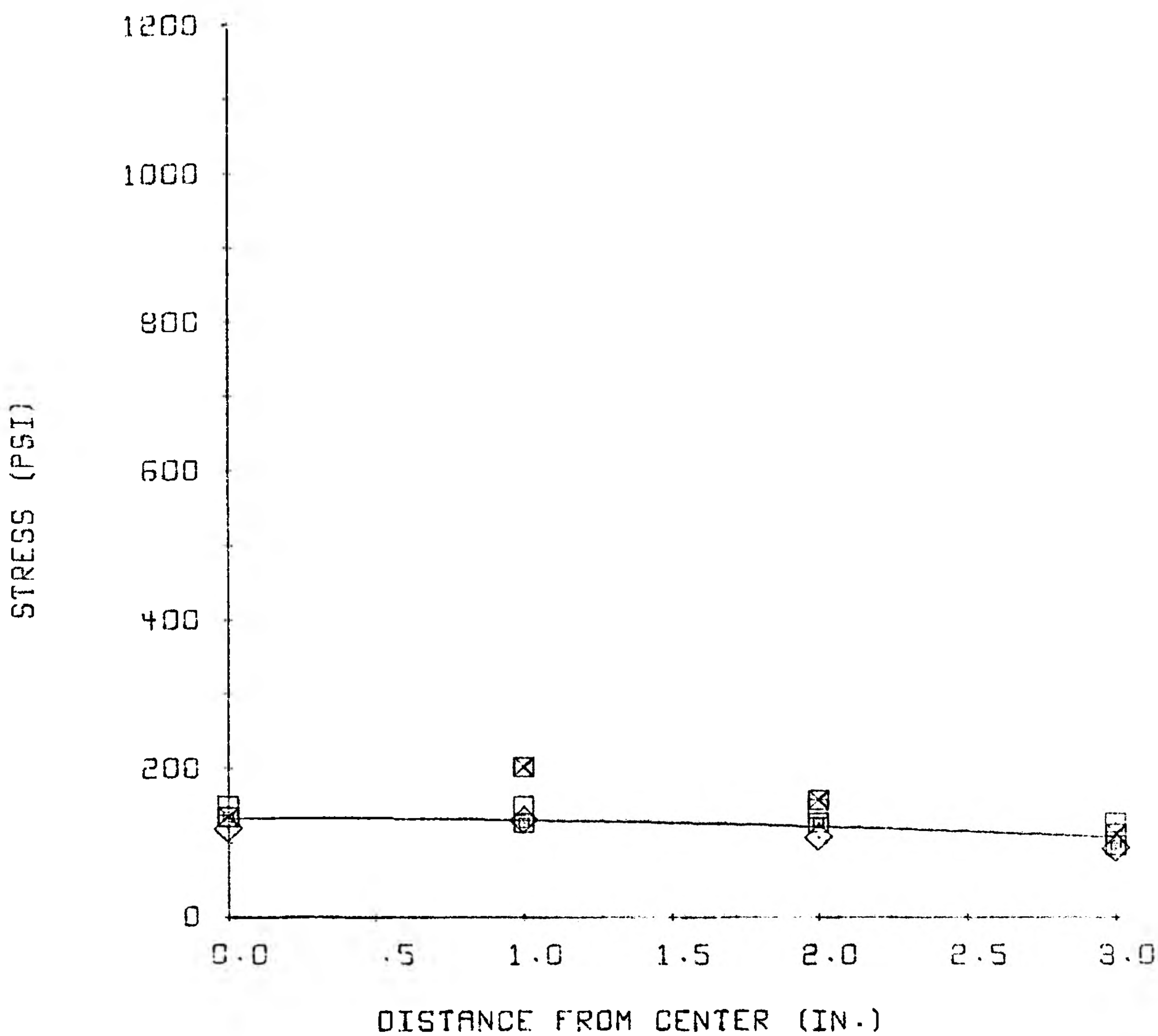

FIGURE 17

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0517 PSI UNIFORM LOAD

□ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

▣ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⊠ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

– THEORETICAL RADIAL STRESS ON SIDE 1 AND 2

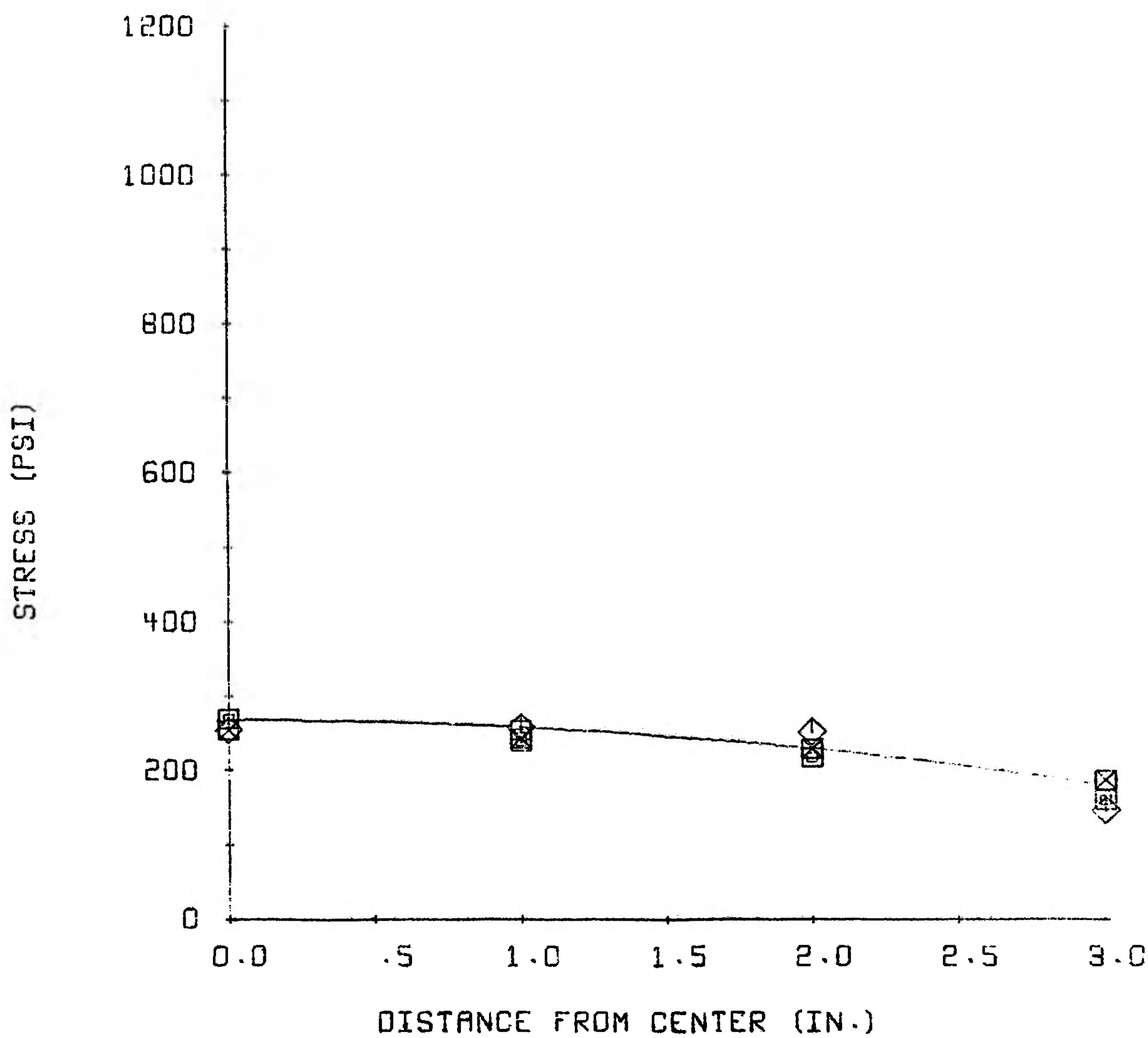

FIGURE 18

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0517 PSI UNIFORM LOAD

□ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.
◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.
⊞ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.
⊠ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.
- THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2

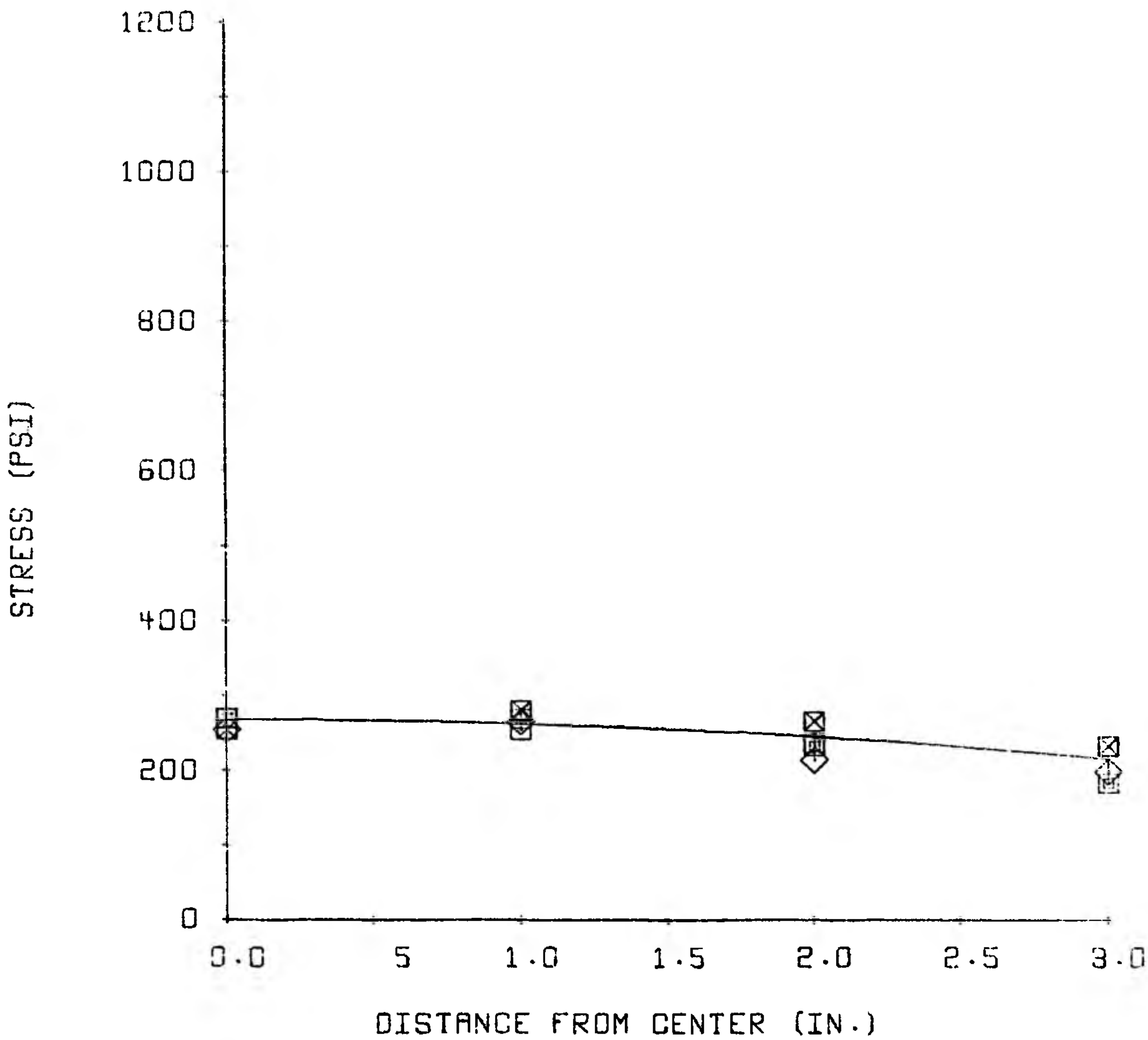

FIGURE 19

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.061 IN. THICK
SIMPLY SUPPORTED-- .0776 PSI UNIFORM LOAD

□ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊡ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⊠ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

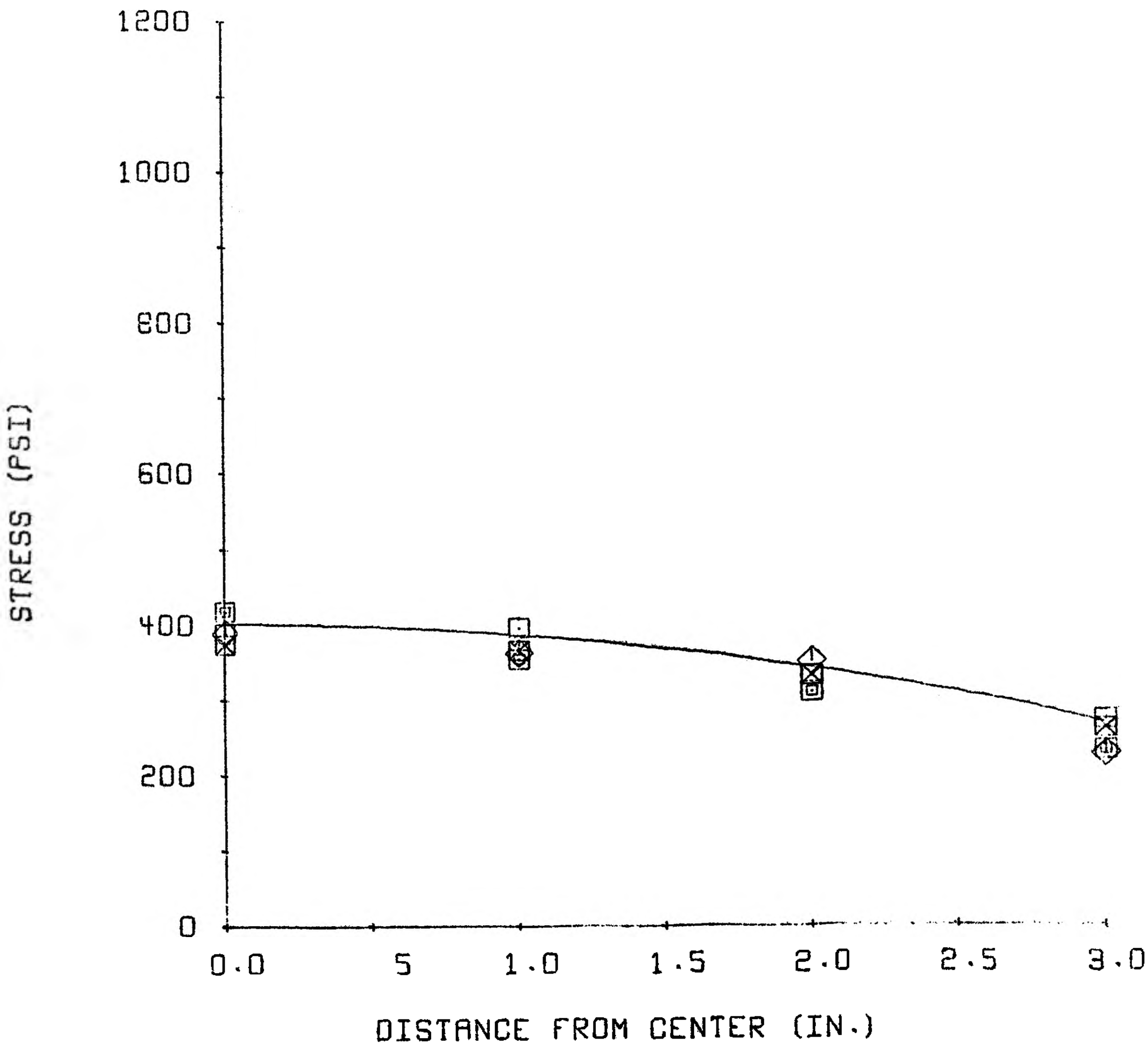

FIGURE 20

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0776 PSI UNIFORM LOAD

⊡ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊞ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⊠ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

\- THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

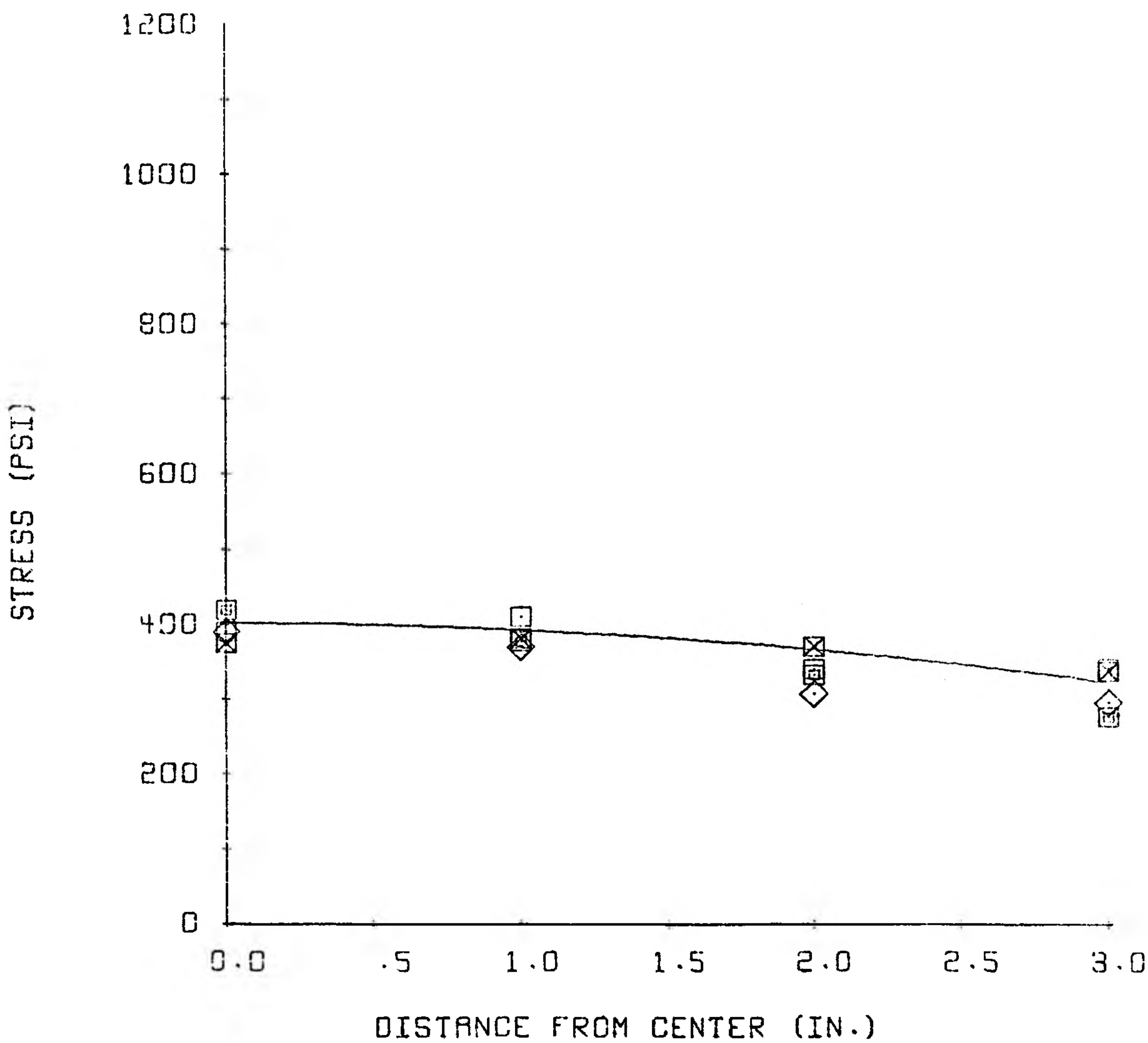

FIGURE 21

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1035 PSI UNIFORM LOAD

⊡ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

▣ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⊠ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

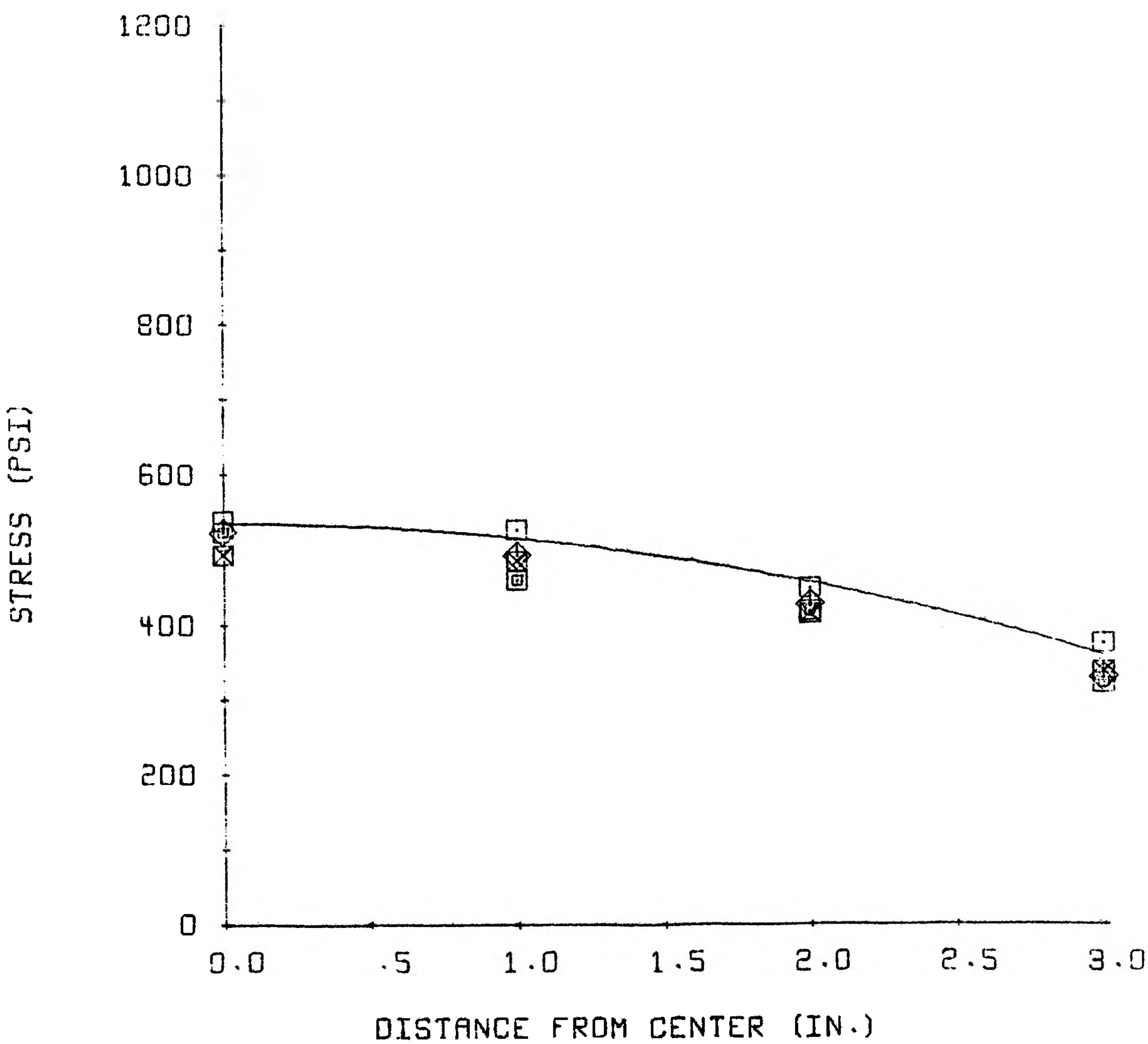

FIGURE 22

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1035 PSI UNIFORM LOAD

⊡ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

▣ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⊠ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

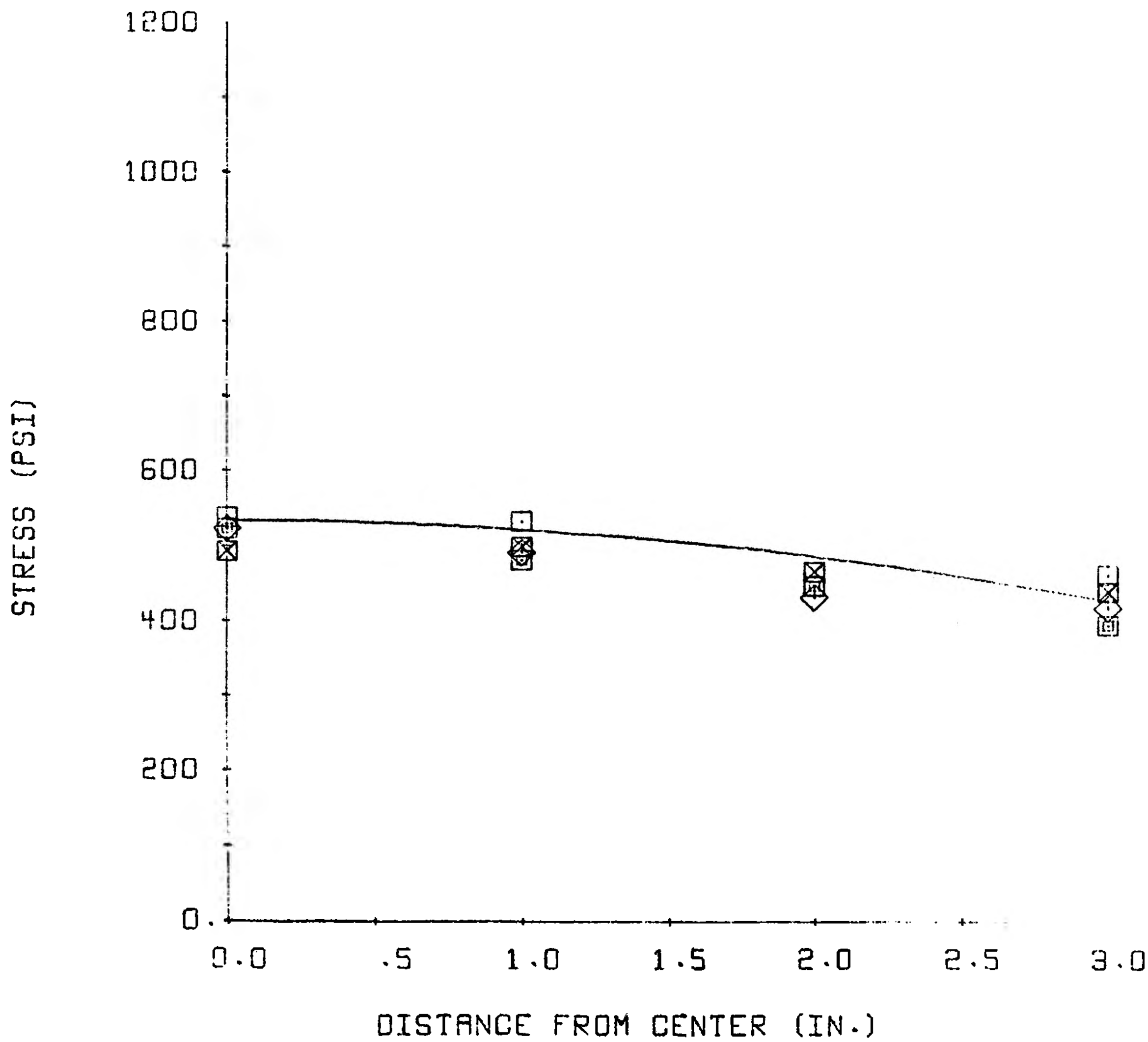

FIGURE 23

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1294 PSI UNIFORM LOAD

□ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

▣ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⊠ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

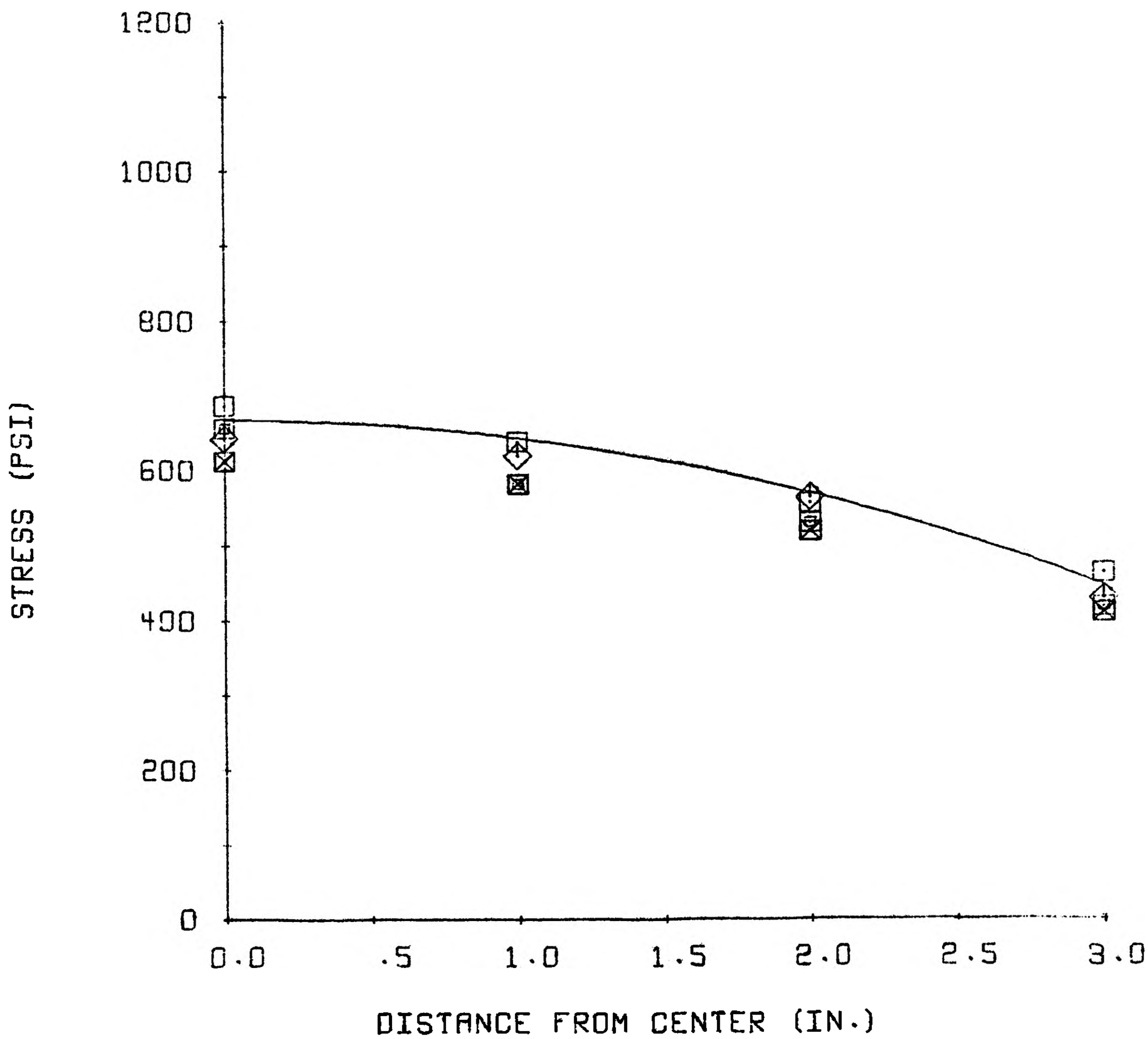

FIGURE 24

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1294 PSI UNIFORM LOAD

□ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊡ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⊠ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

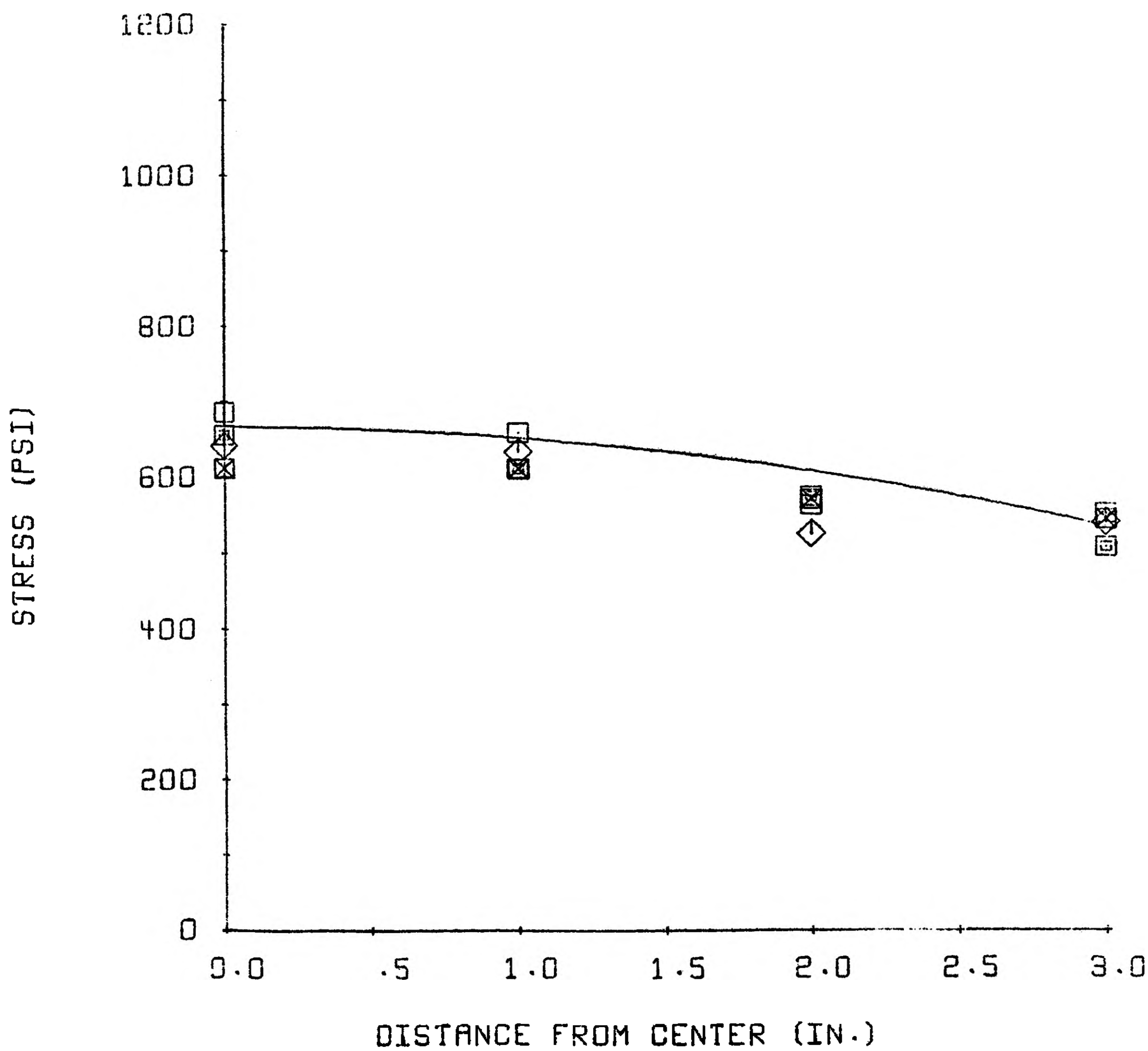

FIGURE 25

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1553 PSI UNIFORM LOAD

□ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊡ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⊠ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

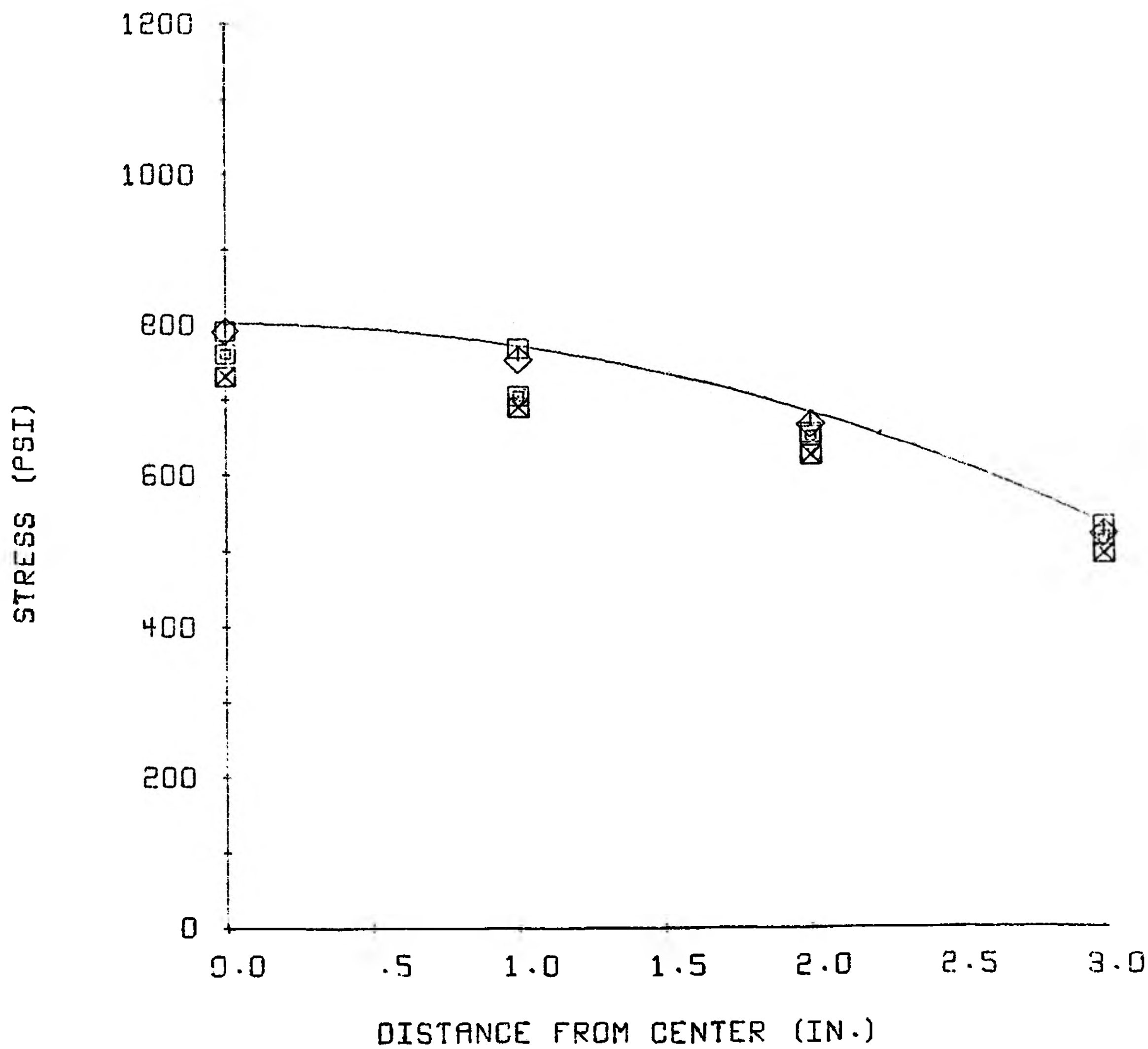

FIGURE 26

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1553 PSI UNIFORM LOAD

□ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

▣ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⊠ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

— THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

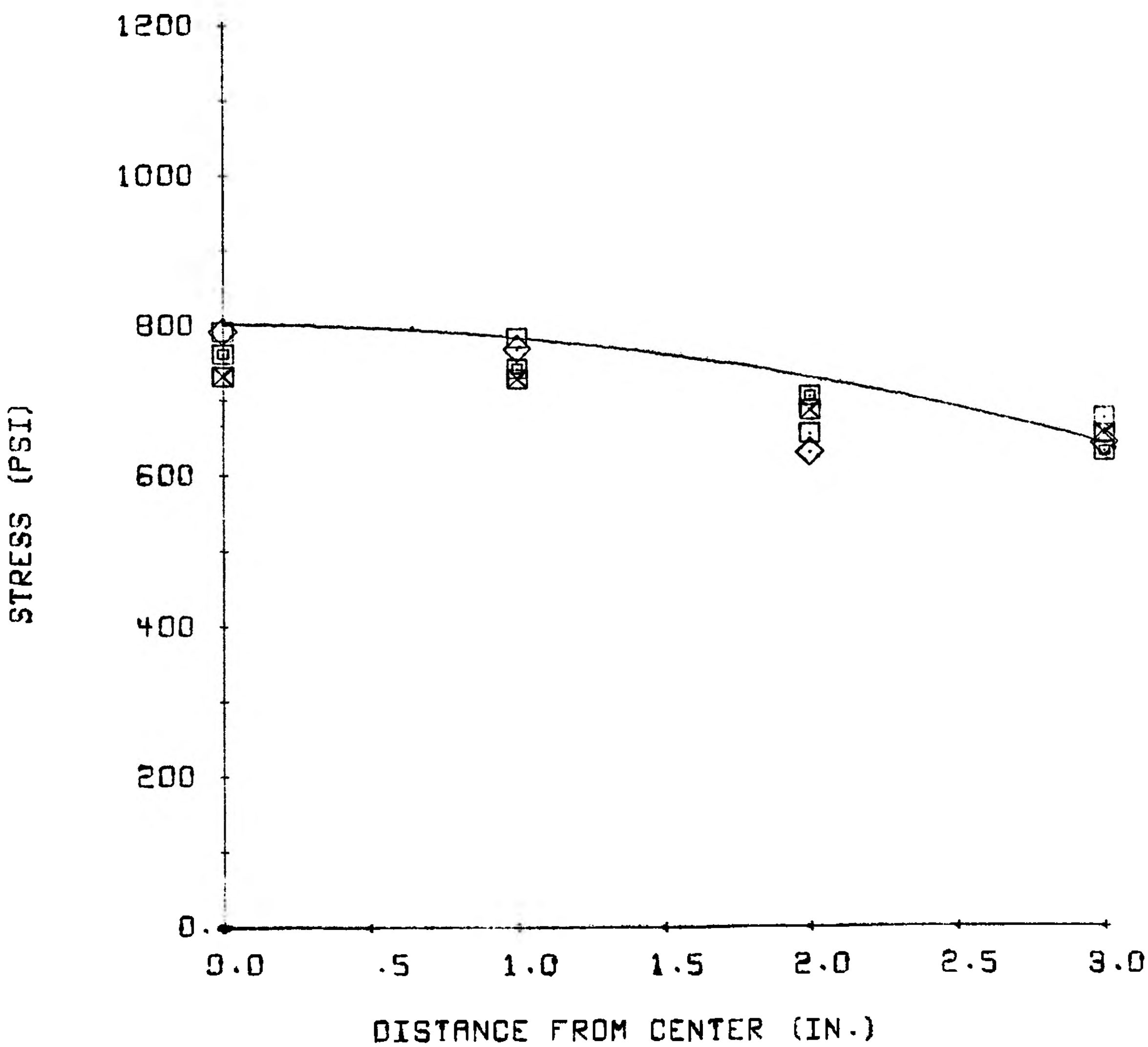

FIGURE 27

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1812 PSI UNIFORM LOAD

□ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

▣ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⊠ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

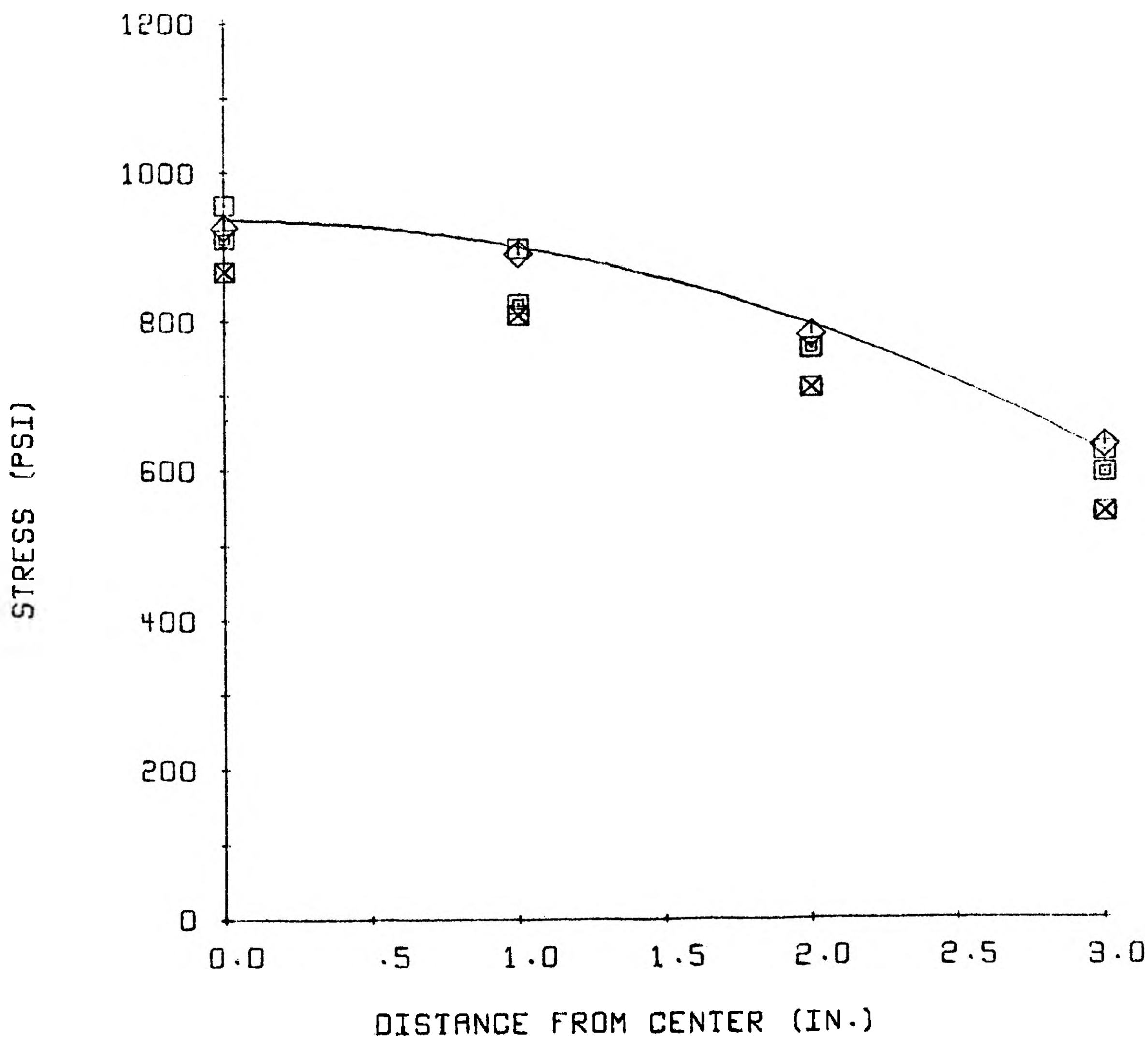

FIGURE 28

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1812 PSI UNIFORM LOAD

□ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊡ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⊠ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

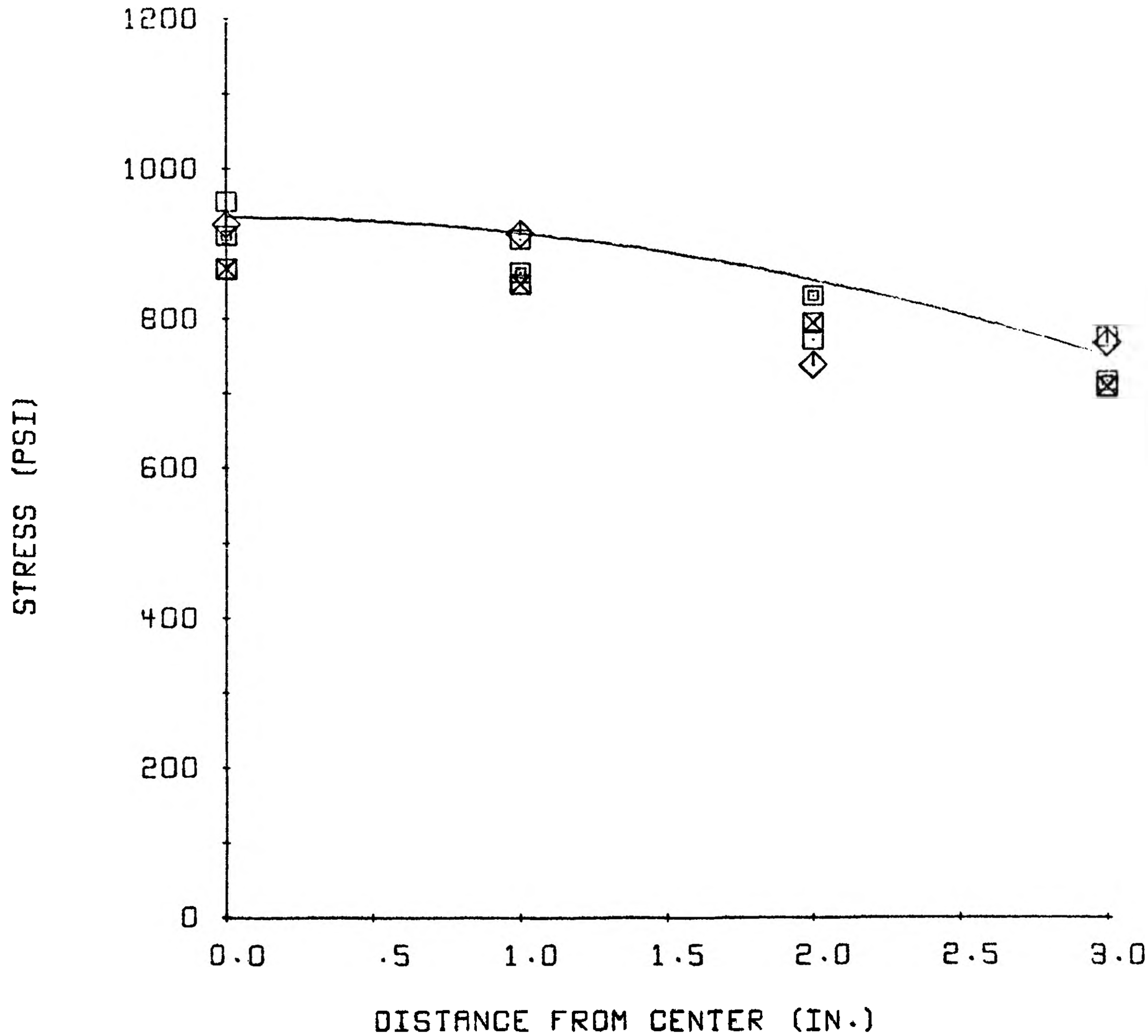

TABLE V

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK, 0.29 IN. DIA. CONCENTRIC HOLE)

TABLE V

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE
(10.413 IN. DIA., 0.081 IN. THICK, 0.29 IN. DIA. CONCENTRIC HOLE)

DEVIATION IS CALCULATED FROM THEORETICAL VALUES OF PRINCIPAL STRESSES

THE SQUARES ON FIGURES 29-42 REPRESENT THE FIRST SET OF DATA

POSITION (RADIUS) (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)	TANGENTIAL STRESS (PSI)	TANGENTIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)
FIRST SET OF DATA							
.5	.0259	98.8	6.0	22.7	117.6	8.5	21.9
.5	.0518	208.7	12.5	16.2	253.8	18.5	12.9
.5	.0777	315.0	19.0	15.5	378.9	27.5	13.4
.5	.1036	419.4	25.5	15.7	498.4	36.0	15.0
.5	.1295	533.2	32.5	13.7	630.9	45.5	13.6
.5	.1554	641.3	39.0	13.5	761.6	55.0	12.9
.5	.1813	749.4	45.5	13.3	892.3	64.5	12.4
1.0	.0259	115.6	7.5	8.8	123.1	8.5	8.1
1.0	.0518	231.2	15.0	8.8	246.3	17.0	8.1
1.0	.0777	337.6	22.0	11.8	356.4	24.5	12.0
1.0	.1036	443.9	29.0	13.3	466.5	32.0	14.1
1.0	.1295	572.6	37.5	9.8	598.9	41.0	11.1
1.0	.1554	673.3	43.5	12.1	722.1	50.0	10.6
1.0	.1813	787.1	51.0	11.9	839.7	58.0	11.0
1.5	.0259	108.1	7.0	12.1	115.6	8.0	10.7
1.5	.0518	225.6	14.5	7.4	244.4	17.0	4.7
1.5	.0777	328.3	21.5	10.8	343.3	23.5	11.9
1.5	.1036	436.4	28.5	11.1	459.0	31.5	11.5
1.5	.1295	546.5	35.5	10.9	580.3	40.0	10.3
1.5	.1554	654.6	42.5	11.1	696.0	48.0	10.3
1.5	.1813	781.5	51.0	8.6	822.9	56.5	8.9
2.0	.0259	111.9	7.5	1.1	111.9	7.5	9.3
2.0	.0518	218.2	14.0	3.7	237.0	16.5	3.2
2.0	.0777	307.7	20.0	10.3	326.5	22.5	12.4
2.0	.1036	399.1	26.0	13.4	421.7	29.0	16.1
2.0	.1295	496.1	32.0	14.0	533.7	37.0	14.6
2.0	.1554	604.3	39.0	12.3	649.4	45.0	13.1
2.0	.1813	706.8	45.5	12.0	763.2	53.0	12.2
3.0	.0259	87.6	5.5	1.5	98.9	7.0	8.5
3.0	.0518	180.8	11.0	-1.5	214.6	15.5	0.0
3.0	.0777	249.8	15.0	6.8	302.4	22.0	6.5
3.0	.1036	333.6	20.0	6.6	405.1	29.5	6.0
3.0	.1295	410.1	24.5	8.5	500.3	36.5	7.3
3.0	.1554	488.3	29.0	9.3	601.1	44.0	7.1
3.0	.1813	561.0	33.0	11.0	700.1	51.5	7.3

TABLE VI

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK, 0.29 IN. DIA. CONCENTRIC HOLE)

TABLE VI

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE
(10.413 IN. DIA., 0.081 IN. THICK, 0.29 IN. DIA. CONCENTRIC HOLE)

DEVIATION IS CALCULATED FROM THEORETICAL VALUES OF PRINCIPAL STRESSES

THE DIAMONDS ON FIGURES 29-42 REPRESENT THE SECOND SET OF DATA

POSITION (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)	TANG-ENTIAL STRESS (PSI)	TANG-ENTIAL STRAIN (IN./IN.)	DEVIATION (PER CENT)
			SECOND SET OF DATA				
.5	.0259	126.8	8.0	-4.3	141.8	10.0	1.0
.5	.0518	236.8	15.0	2.4	263.1	18.5	8.9
.5	.0777	341.1	20.5	6.6	412.5	30.0	4.2
.5	.1036	477.1	28.0	1.7	597.4	44.0	-4.0
.5	.1295	568.7	35.5	6.6	647.6	46.0	10.6
.5	.1554	667.4	40.5	9.0	795.2	57.5	8.1
.5	.1813	775.5	47.0	9.5	925.9	67.0	8.3
1.0	.0259	117.4	7.5	7.1	128.7	9.0	3.4
1.0	.0518	199.5	12.5	26.1	225.8	16.0	17.9
1.0	.0777	346.9	22.5	8.8	369.4	25.5	8.1
1.0	.1036	451.3	29.0	11.5	488.9	34.0	8.9
1.0	.1295	537.1	34.5	17.1	582.2	40.5	14.3
1.0	.1554	677.0	43.5	11.5	733.4	51.0	8.9
1.0	.1813	783.3	50.5	12.4	843.5	58.5	10.5
1.5	.0259	121.2	8.0	0.0	125.0	8.5	2.4
1.5	.0518	203.2	13.0	19.2	222.0	15.5	15.3
1.5	.0777	352.5	23.0	3.1	371.3	25.5	3.4
1.5	.1036	451.3	29.0	7.4	488.9	34.0	4.7
1.5	.1295	529.7	34.5	14.4	559.8	38.5	14.3
1.5	.1554	615.3	38.5	18.2	698.0	49.5	10.0
1.5	.1813	783.4	51.0	8.3	828.5	57.0	8.1
2.0	.0259	102.5	6.5	10.3	113.8	8.0	7.5
2.0	.0518	184.6	12.0	22.6	195.9	13.5	24.9
2.0	.0777	315.2	21.0	7.7	319.0	21.5	15.0
2.0	.1036	402.9	26.5	12.3	417.9	28.5	17.1
2.0	.1295	473.7	31.0	19.4	496.3	34.0	23.3
2.0	.1554	585.6	38.0	15.9	623.2	43.0	17.8
2.0	.1813	697.6	45.5	13.5	735.2	50.5	16.5
3.0	.0259	93.1	5.5	-4.5	115.7	8.5	-7.2
3.0	.0518	145.3	8.5	22.4	182.9	13.5	17.3
3.0	.0777	246.0	14.5	8.5	306.1	22.5	5.1
3.0	.1036	318.7	18.5	11.7	405.1	30.0	6.0
3.0	.1295	372.7	21.5	19.3	478.0	35.5	12.3
3.0	.1554	484.5	28.0	10.2	619.9	46.0	3.9
3.0	.1813	568.4	33.0	9.5	722.5	53.5	4.0

TABLE VII

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK, 0.29 IN. DIA. CONCENTRIC HOLE)

TABLE VII

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE
(10.413 IN. DIA., 0.081 IN. THICK, 0.29 IN. DIA. CONCENTRIC HOLE)

DEVIATION IS CALCULATED FROM THEORETICAL VALUES OF PRINCIPAL STRESSES

TWO CONCENTRIC SQUARES ON FIGURES 29-42 REPRESENT THE THIRD SET OF DATA

POSITION (RADIUS) (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (µIN./IN.)	DEVIATION (PER CENT)	TANG-ENTIAL STRESS (PSI)	TANG-ENTIAL STRAIN (µIN./IN.)	DEVIATION (PER CENT)
			THIRD SET OF DATA				
.5	.0259	123.0	7.5	-1.4	145.6	10.5	-1.5
.5	.0518	210.6	13.0	15.1	244.5	17.5	17.2
.5	.0777	309.5	19.0	17.6	362.1	26.0	18.7
.5	.1036	410.1	25.0	18.3	485.3	35.0	18.1
.5	.1295	522.0	32.0	16.2	612.2	44.0	17.0
.5	.1554	628.3	38.5	15.6	737.3	53.0	16.6
.5	.1813	742.0	45.5	14.4	869.8	62.5	15.3
1.0	.0259	130.5	8.5	-3.5	138.0	9.5	-3.5
1.0	.0518	236.8	15.5	6.2	248.1	17.0	7.3
1.0	.0777	335.7	22.0	12.4	350.8	24.0	13.8
1.0	.1036	438.3	28.5	14.8	464.6	32.0	14.6
1.0	.1295	553.9	36.0	13.5	587.8	40.5	13.2
1.0	.1554	664.0	43.0	13.7	709.1	49.0	12.6
1.0	.1813	777.8	50.5	13.2	826.6	57.0	12.7
1.5	.0259	106.2	6.5	14.1	125.0	9.0	2.4
1.5	.0518	206.9	13.0	17.1	235.3	16.5	9.7
1.5	.0777	317.0	20.5	14.7	339.6	23.5	13.1
1.5	.1036	429.0	28.0	13.0	451.5	31.0	13.4
1.5	.1295	542.8	35.5	11.6	569.1	39.0	12.4
1.5	.1554	662.2	43.5	9.8	688.5	47.0	11.5
1.5	.1813	777.8	51.0	9.1	811.6	55.5	10.4
2.0	.0259	113.7	7.5	-.5	117.5	8.0	4.1
2.0	.0518	205.1	13.5	10.3	212.7	14.5	15.0
2.0	.0777	302.2	20.0	12.3	309.7	21.0	18.5
2.0	.1036	393.6	26.0	15.0	404.6	27.5	20.9
2.0	.1295	488.7	32.0	15.8	511.2	35.0	19.7
2.0	.1554	583.8	38.0	16.3	617.6	42.5	18.9
2.0	.1813	697.6	45.5	13.5	735.2	50.5	16.5
3.0	.0259	91.3	5.5	-2.5	110.1	8.0	-2.4
3.0	.0518	171.5	10.5	3.7	201.6	14.5	6.4
3.0	.0777	242.3	14.5	10.1	294.9	21.5	9.1
3.0	.1036	320.6	19.0	11.0	395.8	29.0	8.5
3.0	.1295	395.1	23.5	12.6	485.4	35.5	10.6
3.0	.1554	482.7	28.5	10.6	599.3	44.0	7.4
3.0	.1813	551.7	32.5	12.9	687.0	50.5	9.3

TABLE VIII

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK, 0.29 IN. DIA. CONCENTRIC HOLE)

TABLE VIII

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE
(10.413 IN. DIA., 0.081 IN. THICK, 0.29 IN. DIA. CONCENTRIC HOLE)

DEVIATION IS CALCULATED FROM THEORETICAL VALUES OF PRINCIPAL STRESSES

AN X WITHIN A SQUARE ON FIGURES 29-42 REPRESENTS THE FOURTH SET OF DATA

POSITION (RADIUS) (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)	TANGENTIAL STRESS (PSI)	TANGENTIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)
			FOURTH SET OF DATA				
.5	.0259	102.5	6.0	18.3	128.8	9.5	11.3
.5	.0518	205.0	12.5	18.3	242.6	17.5	18.1
.5	.0777	421.3	26.0	-13.6	489.0	35.0	-12.0
.5	.1036	439.9	26.5	10.3	530.1	38.5	8.1
.5	.1295	546.2	33.0	11.0	655.2	47.5	9.4
.5	.1554	663.6	40.0	9.6	799.0	58.0	7.6
.5	.1813	713.9	42.5	18.9	875.6	64.0	14.6
1.0	.0259	96.9	6.0	29.8	111.9	8.0	18.9
1.0	.0518	221.9	14.5	13.3	233.2	16.0	14.1
1.0	.0777	421.6	28.0	-10.4	429.1	29.0	-6.9
1.0	.1036	455.1	30.0	10.5	470.2	32.0	13.2
1.0	.1295	553.9	36.0	13.5	587.8	40.5	13.2
1.0	.1554	690.1	45.0	9.4	727.7	50.0	9.7
1.0	.1813	734.8	47.5	19.8	787.5	54.5	18.3
1.5	.0259	111.9	7.5	8.3	111.9	7.5	14.4
1.5	.0518	231.3	15.5	4.8	231.3	15.5	10.7
1.5	.0777	406.6	26.5	-10.5	429.1	29.5	-10.4
1.5	.1036	447.6	29.0	8.3	477.7	33.0	7.2
1.5	.1295	546.5	35.5	10.9	580.3	40.0	10.3
1.5	.1554	678.9	44.0	7.1	724.0	50.0	6.1
1.5	.1813	731.1	47.5	16.0	776.2	53.5	15.4
2.0	.0259	95.1	6.5	18.9	91.4	6.0	33.9
2.0	.0518	201.4	13.5	12.3	201.4	13.5	21.4
2.0	.0777	374.9	24.5	-9.4	393.7	27.0	-6.7
2.0	.1036	410.3	27.0	10.3	425.4	29.0	15.1
2.0	.1295	496.1	32.5	14.0	518.7	35.5	17.9
2.0	.1554	617.4	40.5	10.0	643.7	44.0	14.0
2.0	.1813	654.7	43.0	21.0	681.0	46.5	25.8
3.0	.0259	76.4	4.5	16.4	95.2	7.0	12.7
3.0	.0518	162.1	9.5	9.7	203.5	15.0	5.4
3.0	.0777	294.6	19.0	-9.3	317.2	22.0	1.5
3.0	.1036	326.1	19.0	9.1	412.6	30.5	4.0
3.0	.1295	411.8	23.5	8.0	535.9	40.0	.1
3.0	.1554	497.6	29.5	7.2	614.2	45.0	4.8
3.0	.1813	544.1	30.5	14.5	724.5	54.5	3.7

FIGURE 23

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0259 PSI UNIFORM LOAD
0.23 IN. DIAMETER CONCENTRIC HOLE

□ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

⊡ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

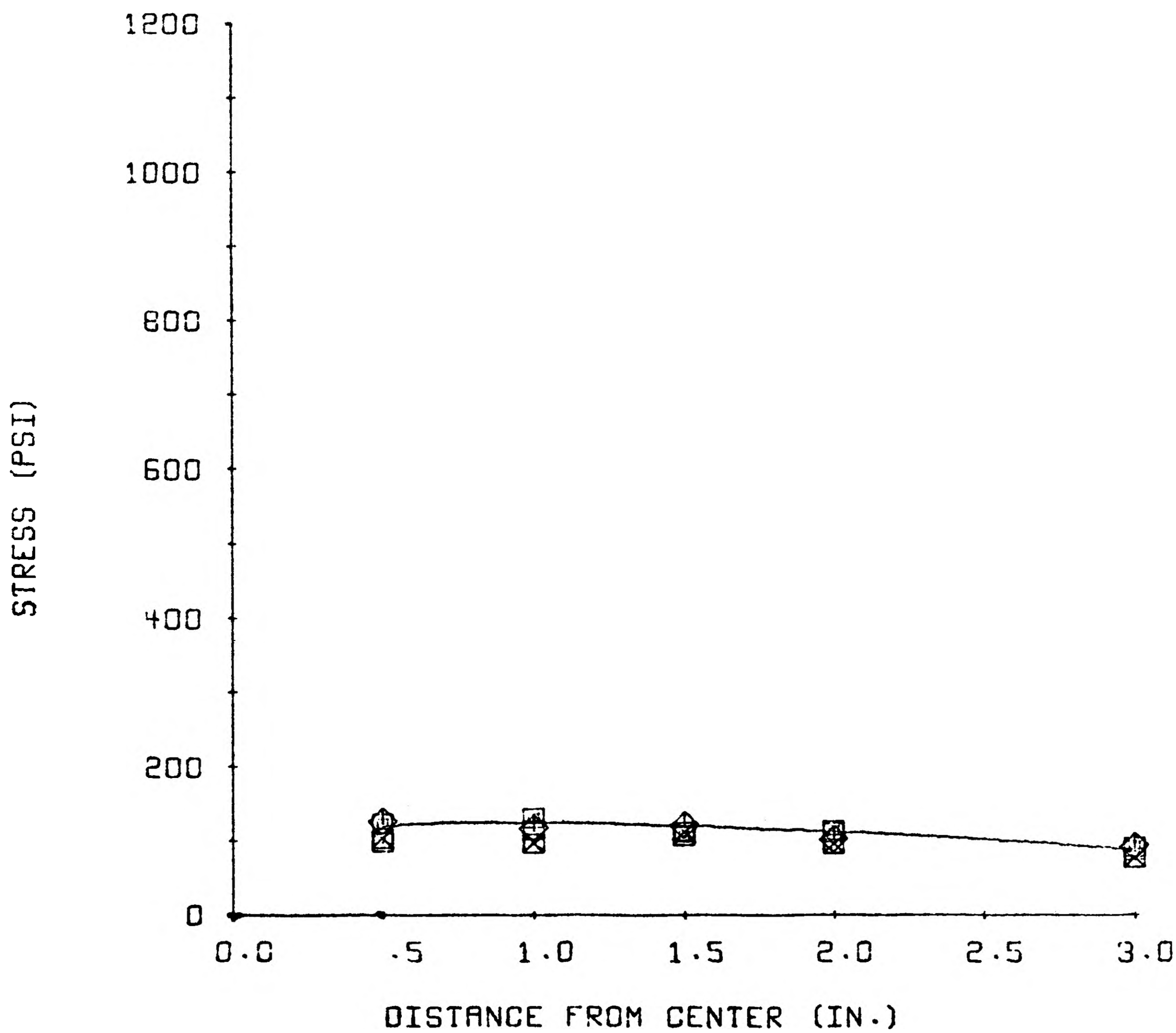

FIGURE 30

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0259 PSI UNIFORM LOAD
0.29 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE

◇ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE

⊡ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE

⊠ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

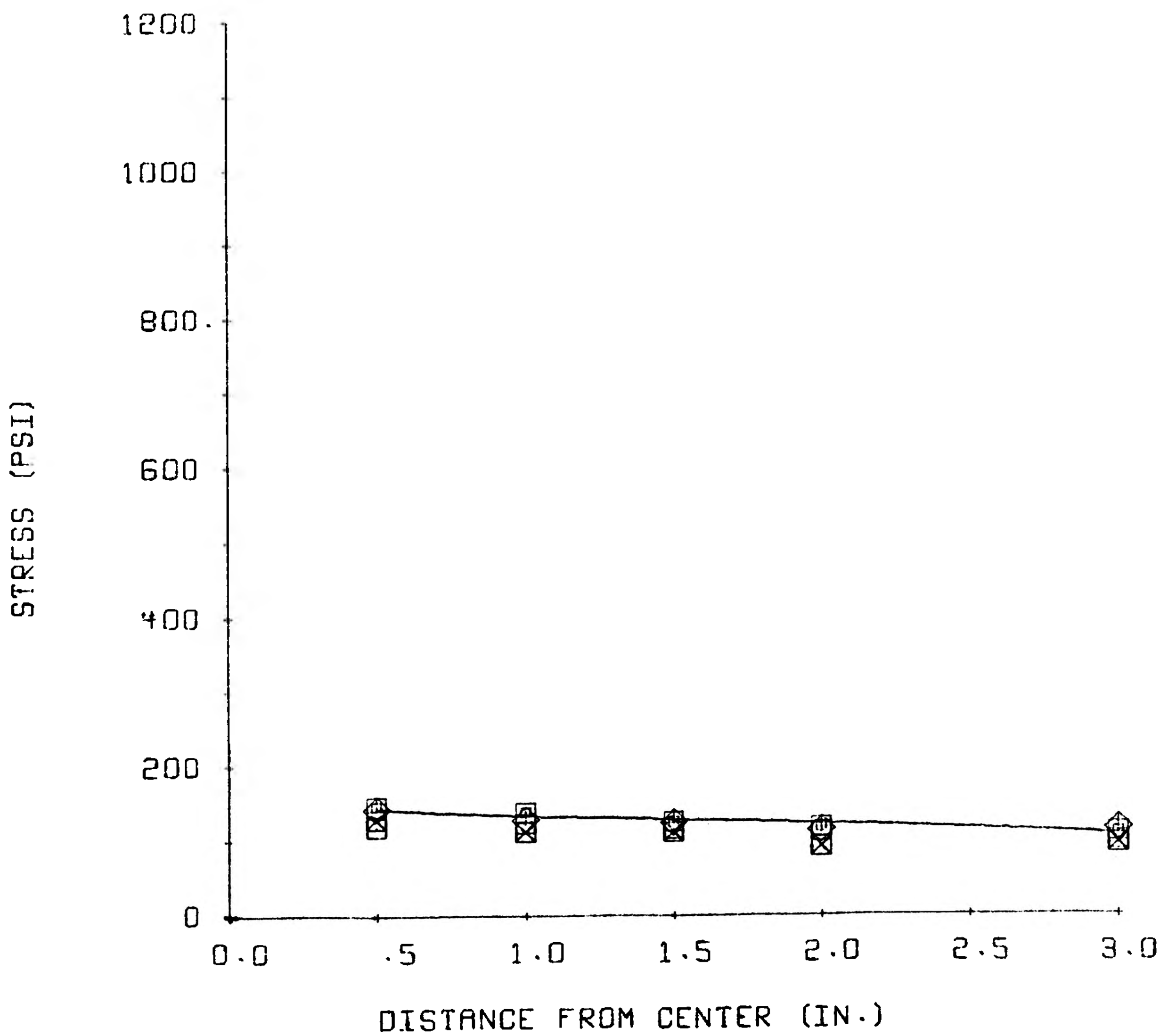

FIGURE 31

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0518 PSI UNIFORM LOAD
0.29 IN. DIAMETER CONCENTRIC HOLE

□ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

▣ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

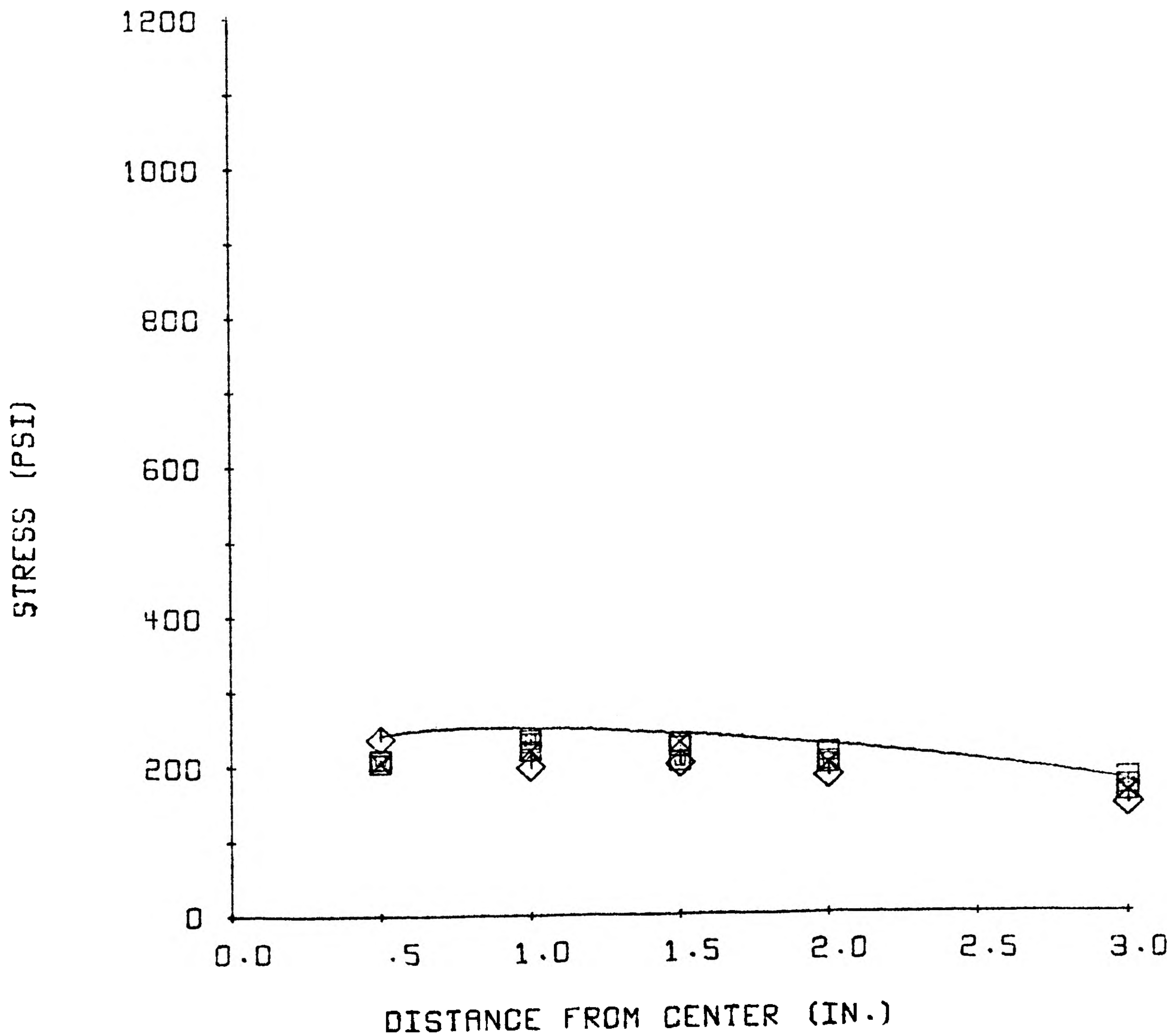

FIGURE 32

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0518 PSI UNIFORM LOAD
0.29 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

\- THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

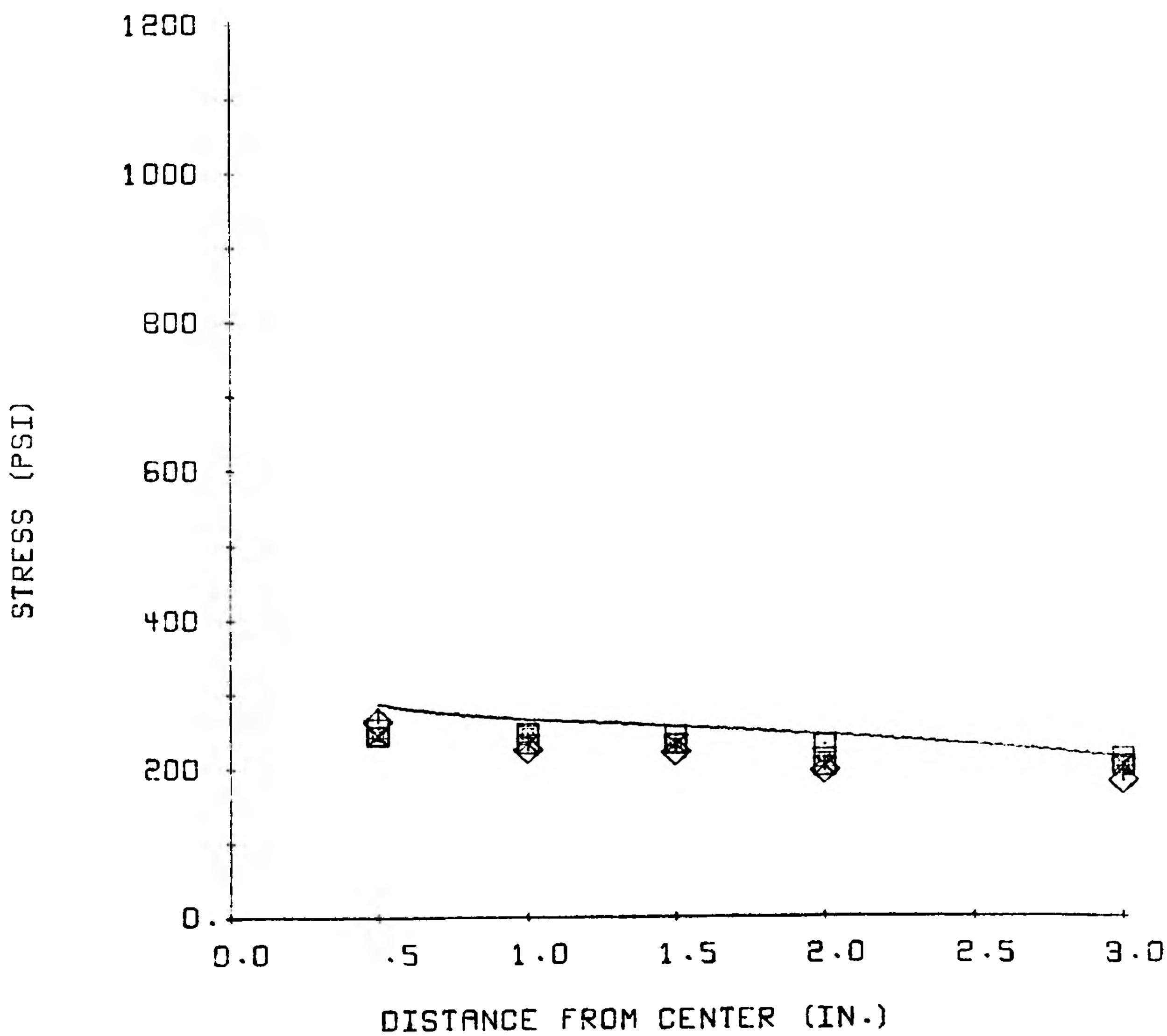

FIGURE 33

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0777 PSI UNIFORM LOAD
0.23 IN. DIAMETER CONCENTRIC HOLE

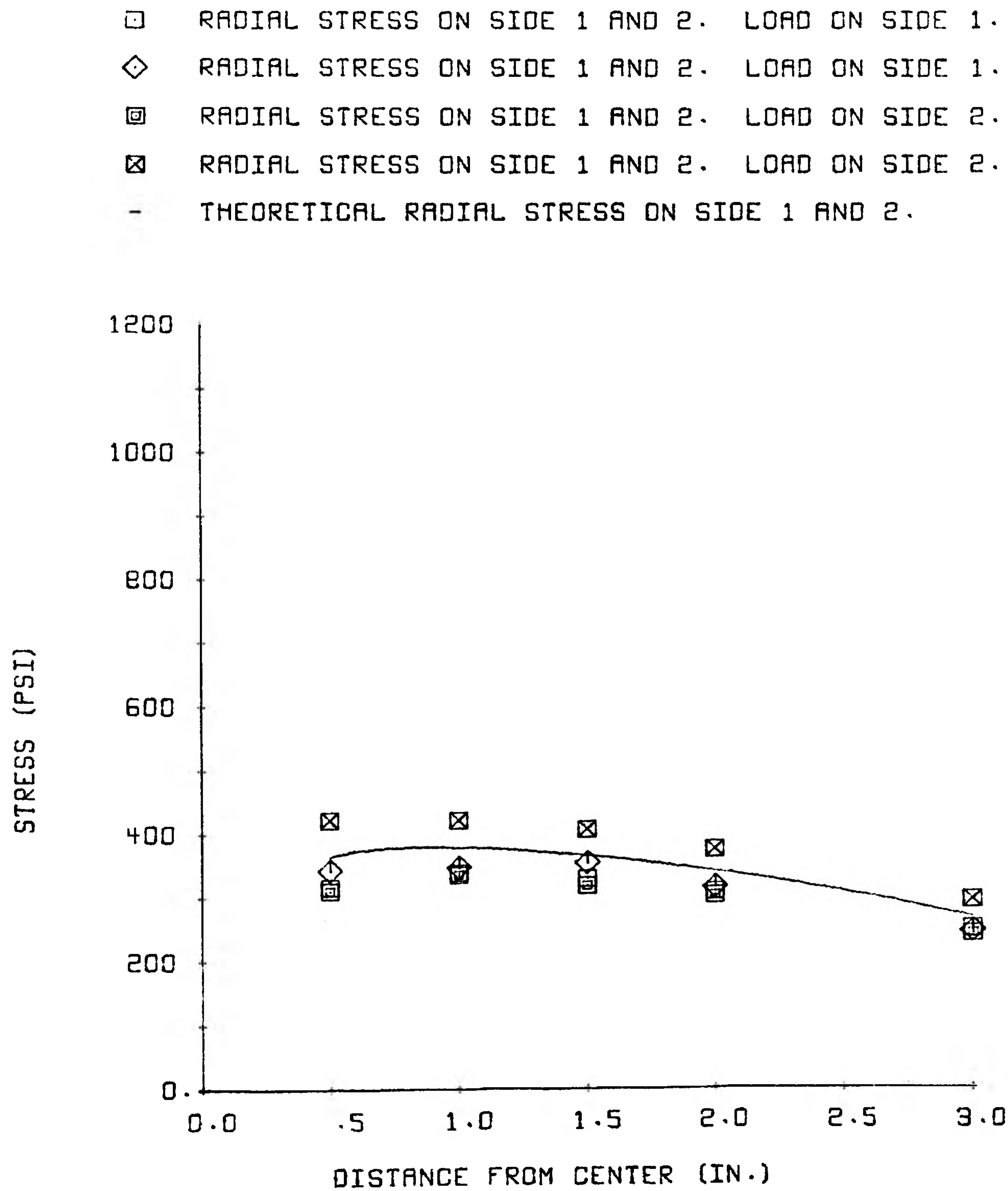

FIGURE 34

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0777 PSI UNIFORM LOAD
0.29 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

⊡ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

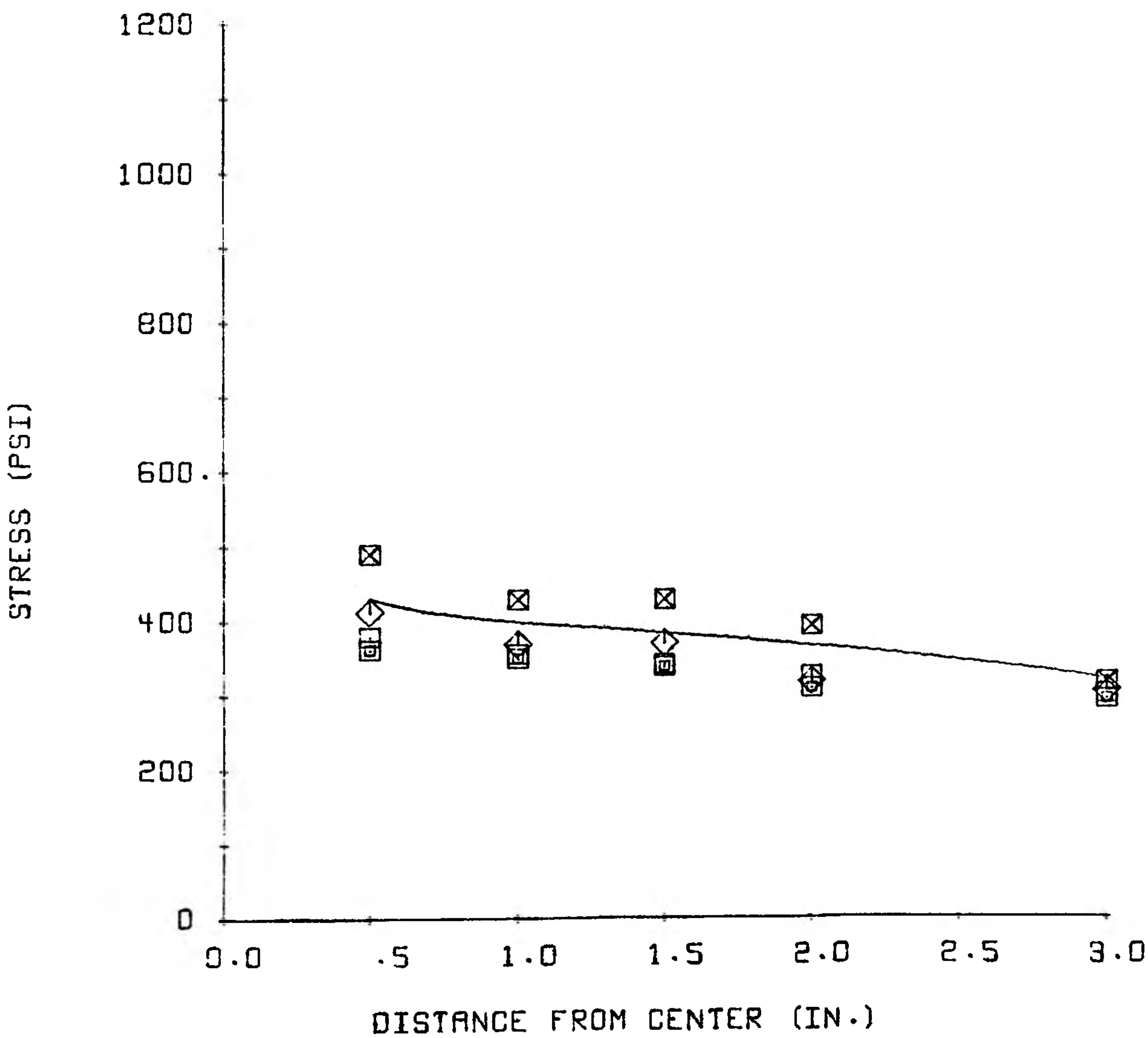

FIGURE 35

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1036 PSI UNIFORM LOAD
0.23 IN. DIAMETER CONCENTRIC HOLE

□ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

▣ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

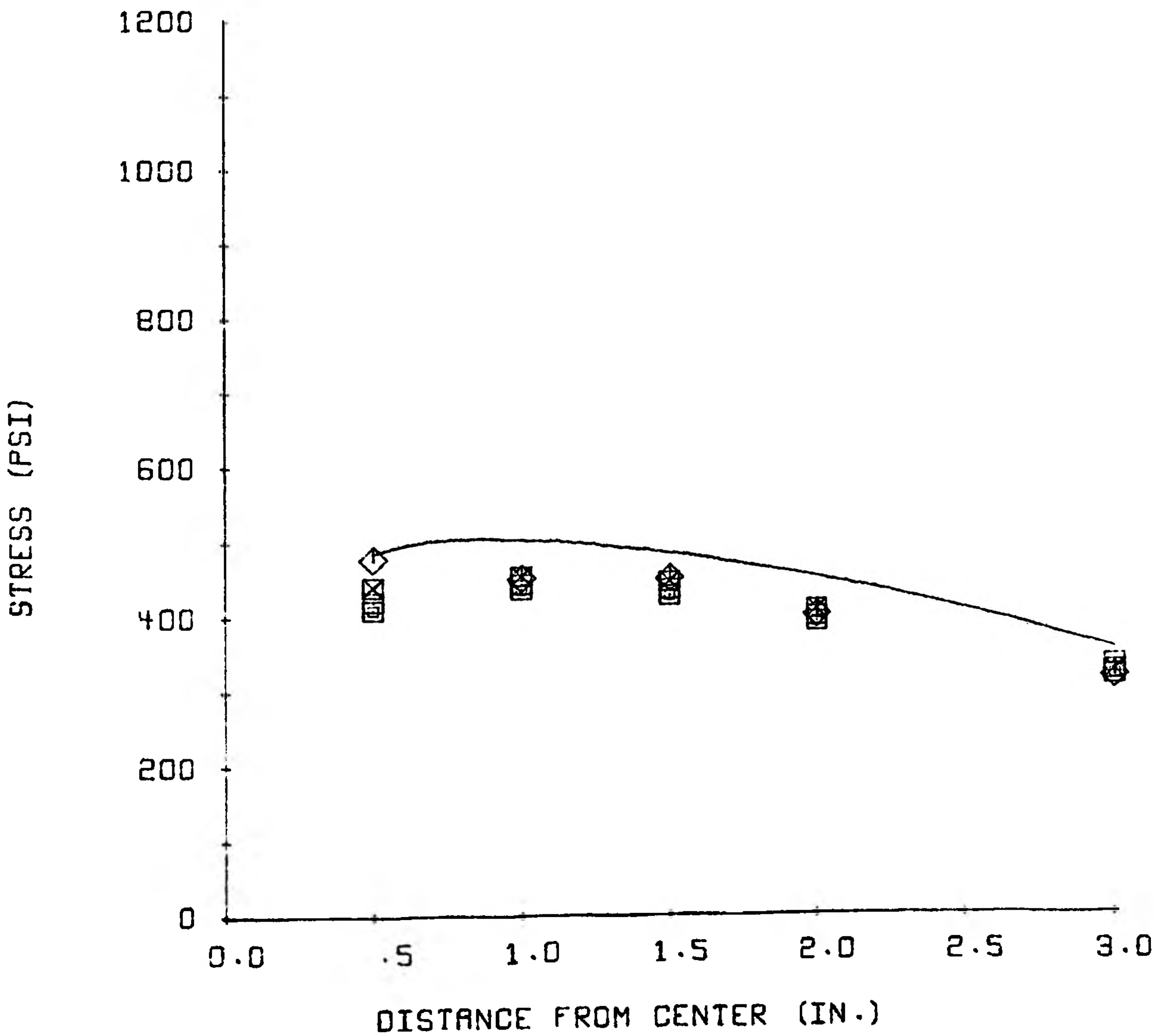

FIGURE 36

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1036 PSI UNIFORM LOAD
0.29 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.
◇ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.
▣ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.
⊠ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.
– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

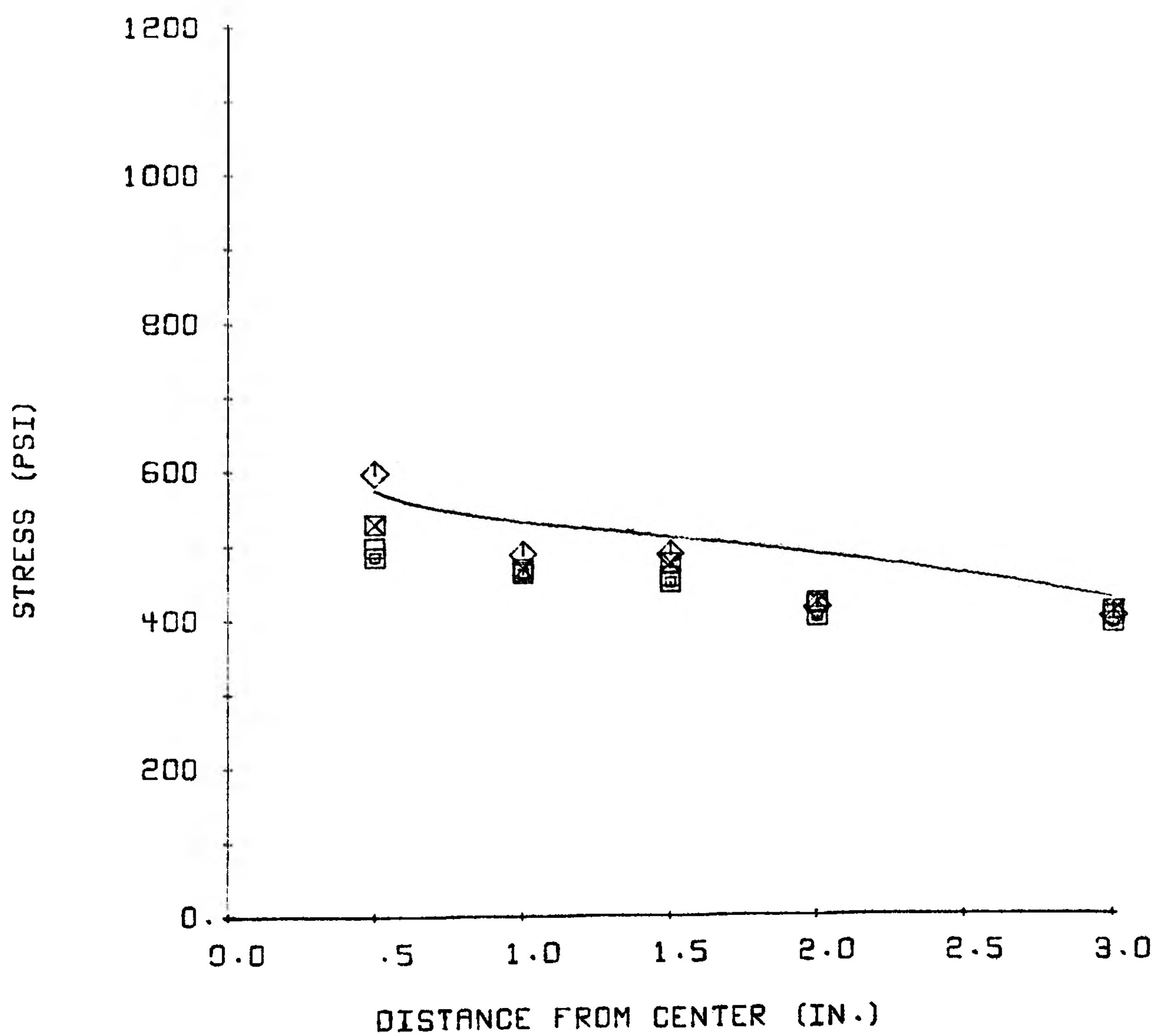

FIGURE 37

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1235 PSI UNIFORM LOAD
0.23 IN. DIAMETER CONCENTRIC HOLE

□ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

⊡ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

– THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

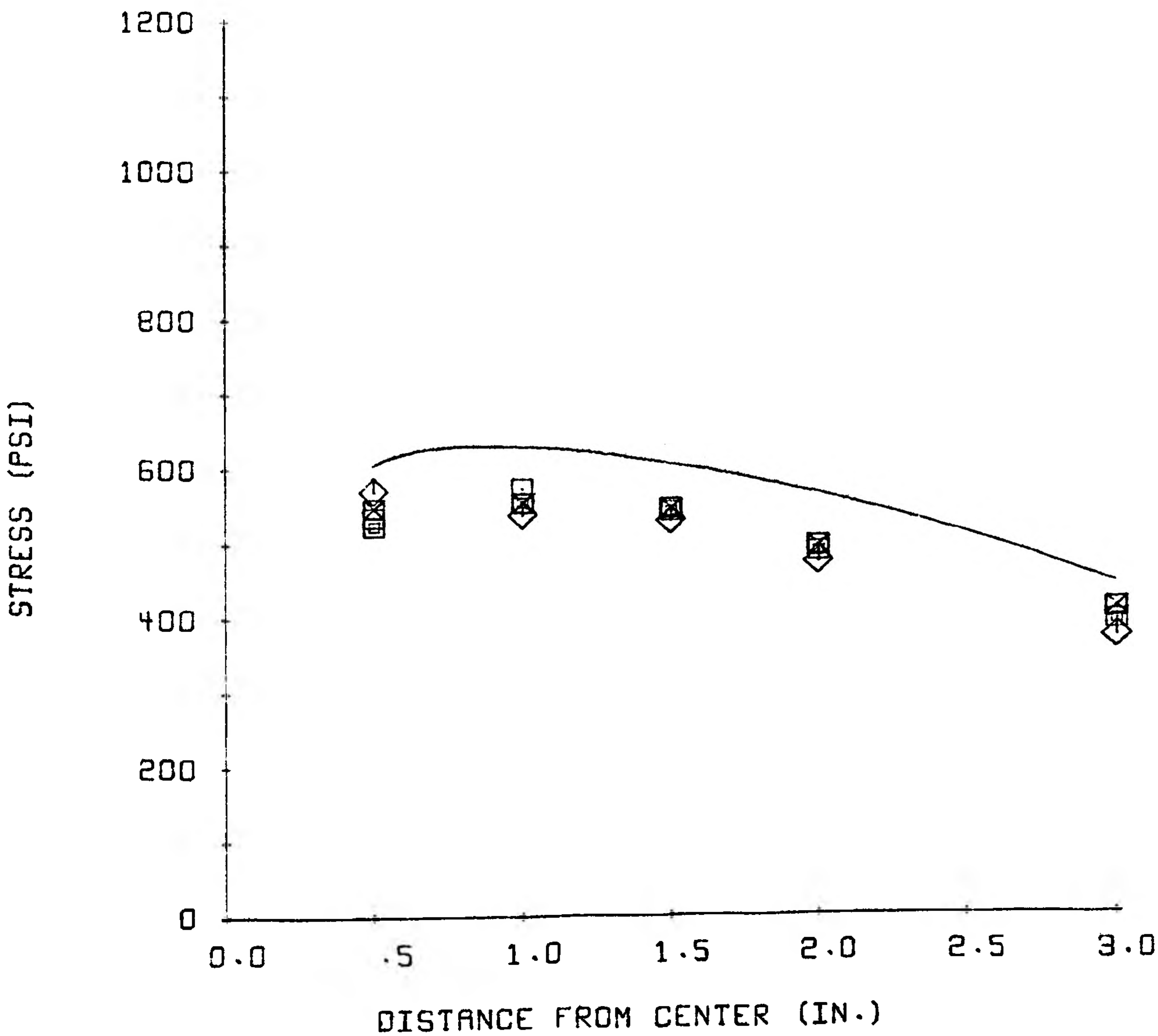

FIGURE 38

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1295 PSI UNIFORM LOAD
0.29 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

\- THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

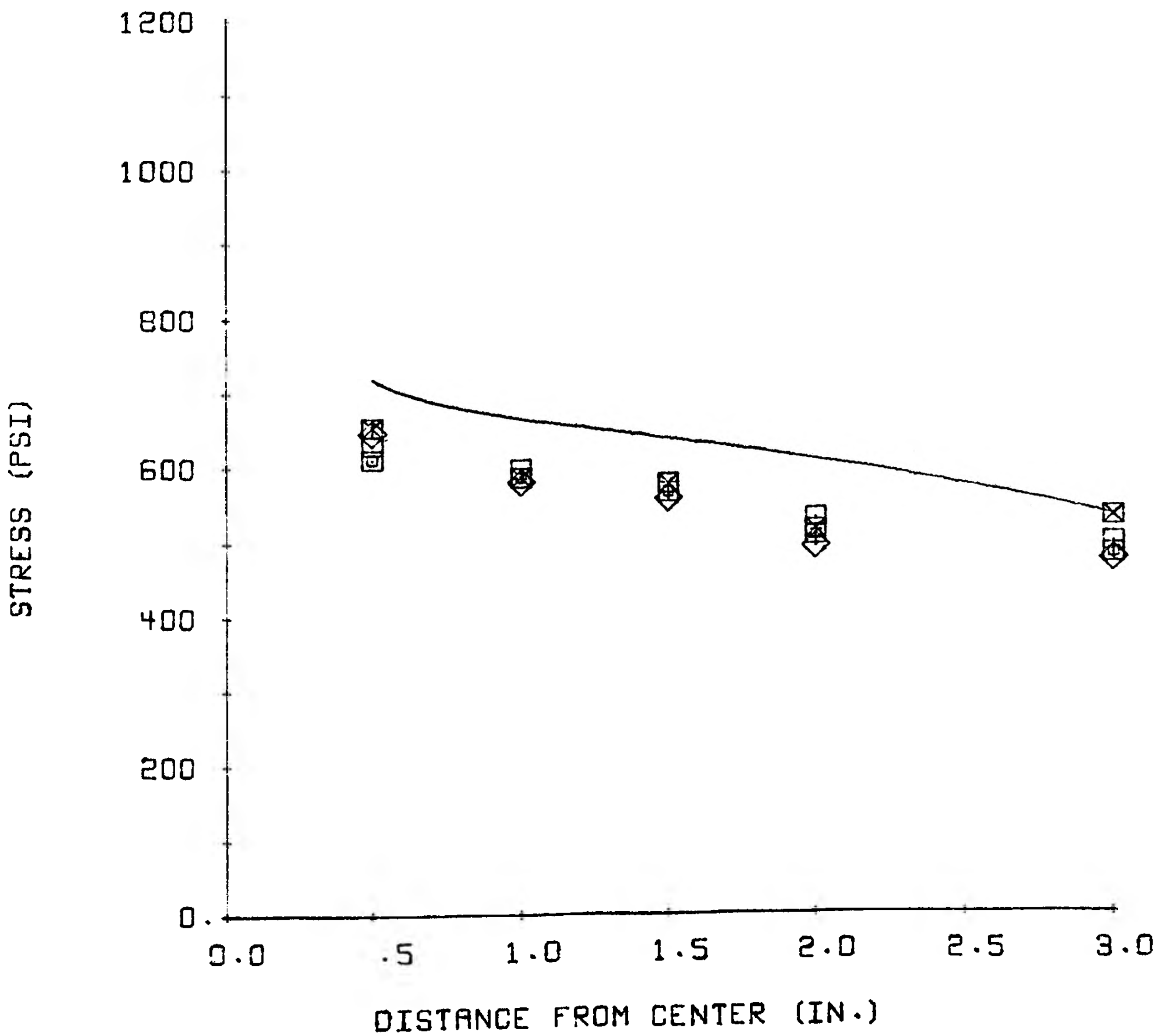

FIGURE 39

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1554 PSI UNIFORM LOAD
0.29 IN. DIAMETER CONCENTRIC HOLE

□ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.

⊡ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.

– THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

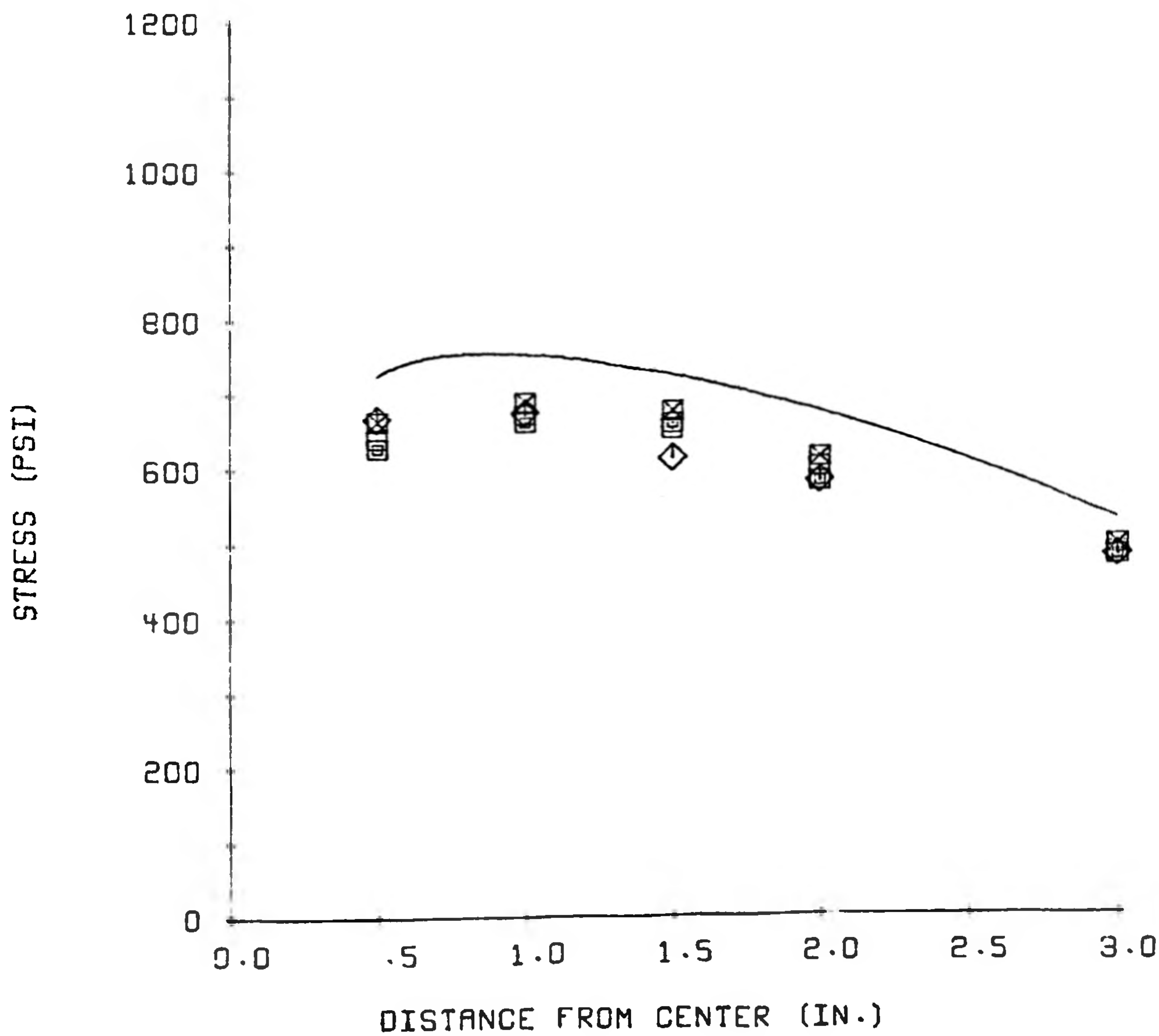

FIGURE 40

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1554 PSI UNIFORM LOAD
0.29 IN. DIAMETER CONCENTRIC HOLE

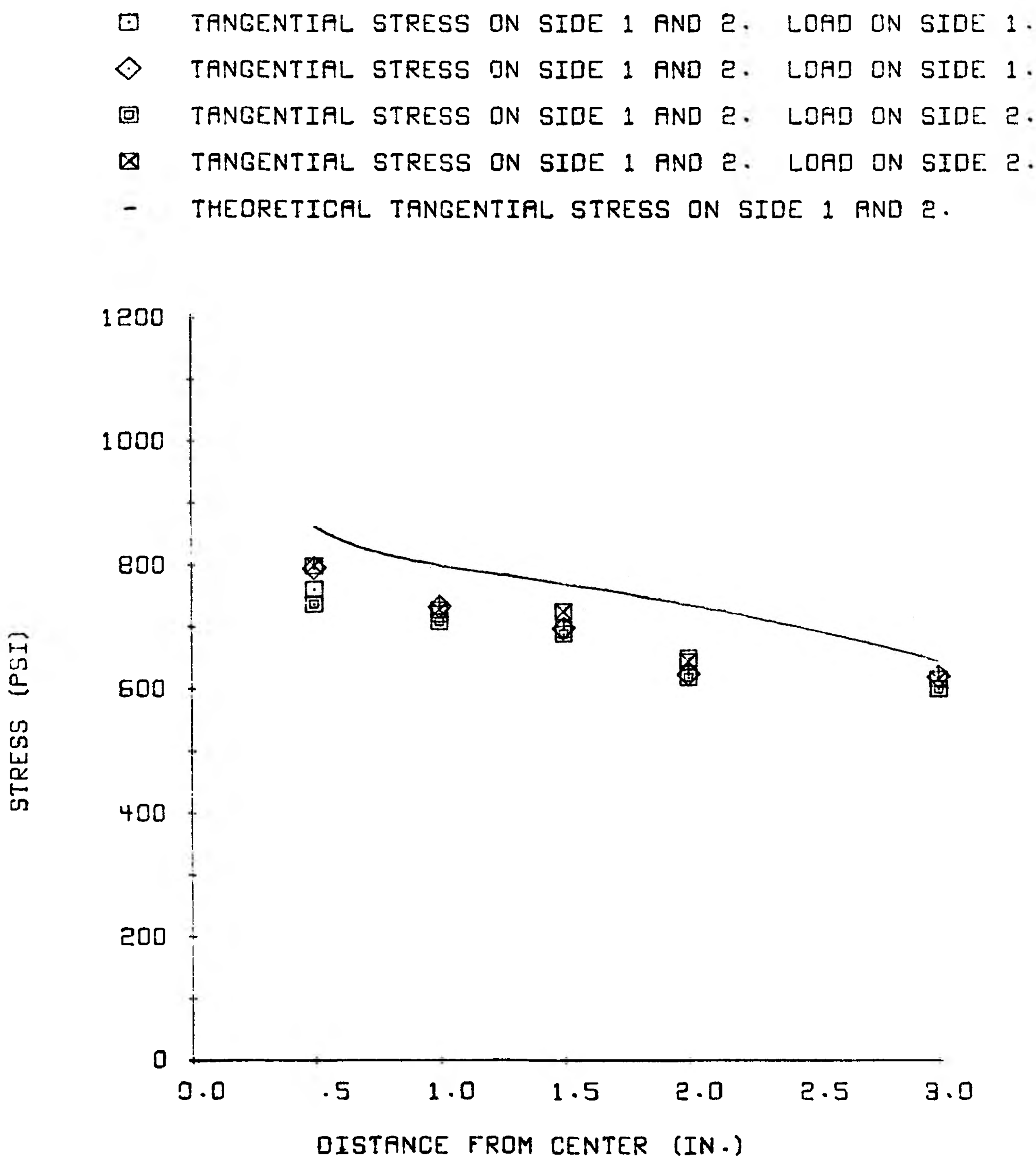

FIGURE 41

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1813 PSI UNIFORM LOAD
0.23 IN. DIAMETER CONCENTRIC HOLE

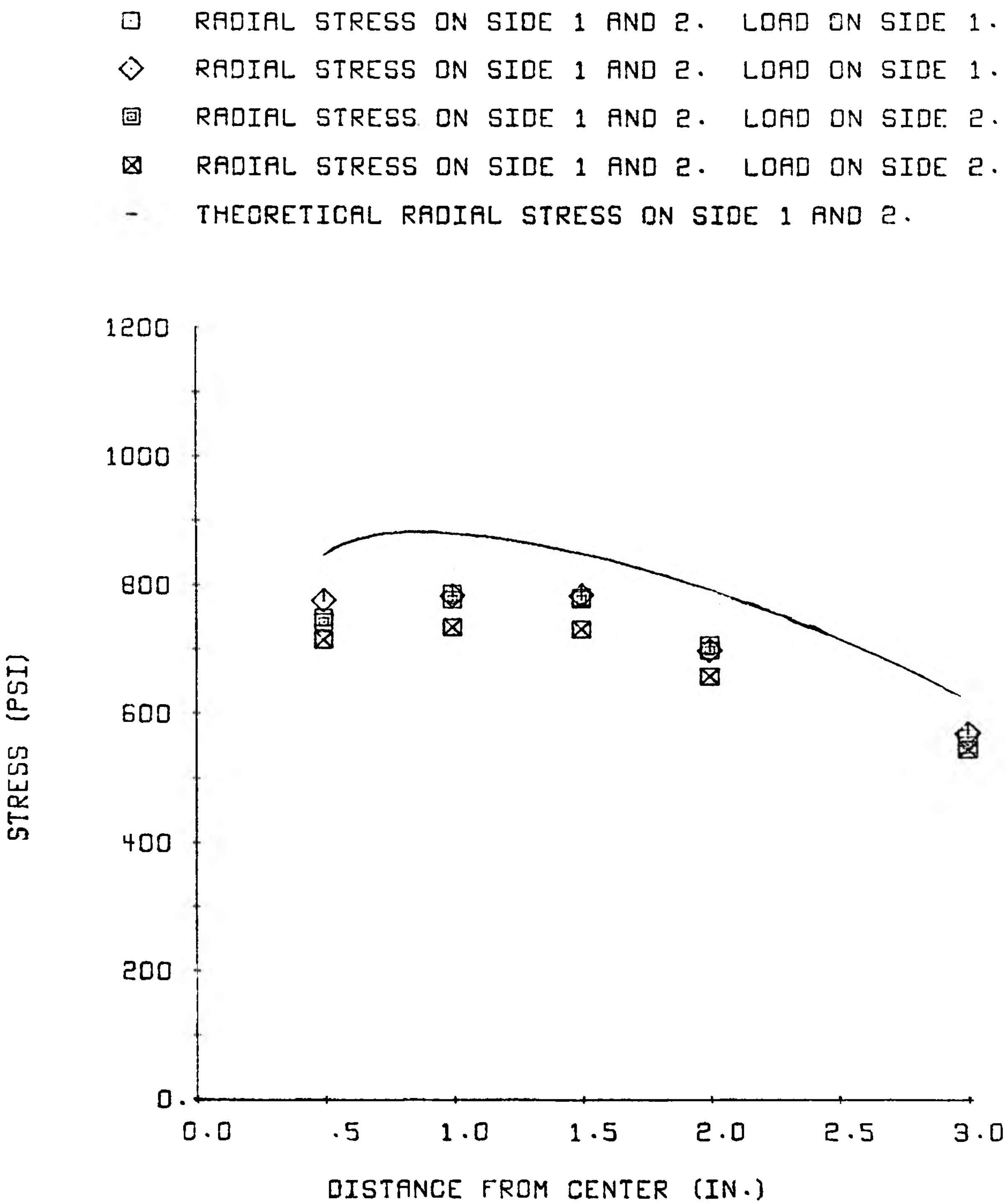

FIGURE 42

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1813 PSI UNIFORM LOAD
0.29 IN. DIAMETER CONCENTRIC HOLE

- □ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.
- ◇ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 1.
- ▣ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.
- ⊠ TANGENTIAL STRESS ON SIDE 1 AND 2. LOAD ON SIDE 2.
- \- THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

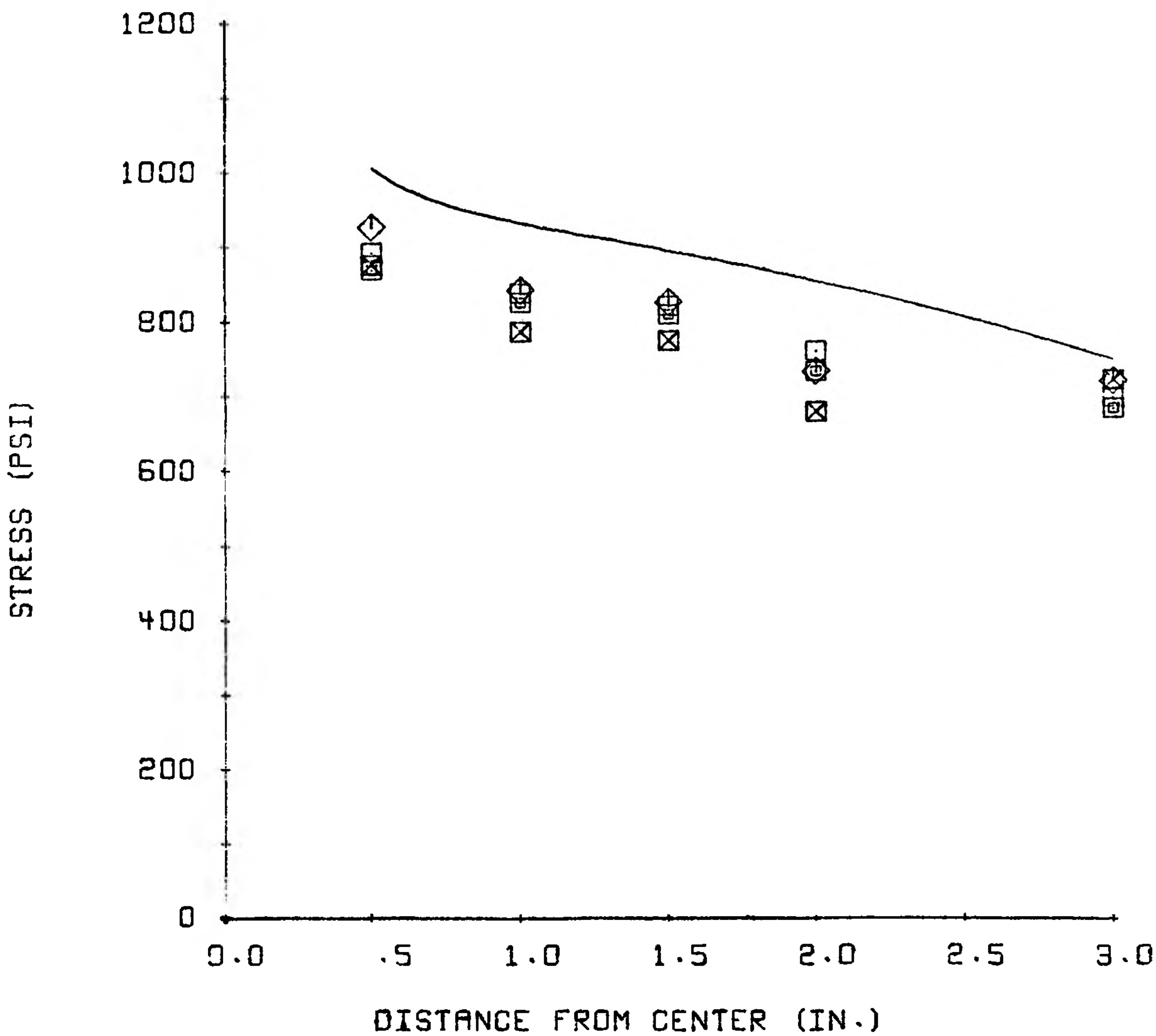

TABLE IX

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK, 0.70 IN. DIA. CONCENTRIC HOLE)

TABLE IX

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK, 0.70 IN. DIA. CONCENTRIC HOLE)

DEVIATION IS CALCULATED FROM THEORETICAL VALUES OF PRINCIPAL STRESSES

THE SQUARES ON FIGURES 43-56 REPRESENT THE FIRST SET OF DATA
THE DIAMONDS ON FIGURES 43-56 REPRESENT THE SECOND SET OF DATA

FIRST SET OF DATA

POSITION (RADIUS) (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)	TANG-ENTIAL STRESS (PSI)	TANG-ENTIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)
1.0	.0260	96.8	5.0	15.7	141.9	11.0	2.7
1.0	.0520	203.0	11.0	10.4	282.0	21.5	3.4
1.0	.0780	316.7	17.5	6.1	429.5	32.5	1.8
1.0	.1040	428.5	24.0	4.6	571.4	43.0	2.0
1.0	.1300	529.1	29.5	5.9	709.6	53.5	2.7
1.0	.1560	642.8	35.5	4.6	872.1	66.0	.3
1.0	.1820	737.9	41.5	6.3	978.5	73.5	4.3
1.5	.0260	126.8	8.0	-9.0	141.8	10.0	-5.8
1.5	.0520	246.1	15.5	-6.3	276.2	19.5	-3.2
1.5	.0780	358.0	22.5	-3.4	403.1	28.5	-.6
1.5	.1040	469.9	29.5	-1.8	530.0	37.5	.7
1.5	.1300	574.3	36.0	.3	649.5	46.0	2.8
1.5	.1560	673.1	42.0	2.7	767.1	54.5	4.4
1.5	.1820	788.8	49.5	2.2	890.3	63.0	5.0
2.0	.0260	111.8	7.0	-1.6	126.9	9.0	-1.1
2.0	.0520	216.3	13.5	1.7	246.3	17.5	1.9
2.0	.0780	324.4	20.0	1.7	377.0	27.0	-.1
2.0	.1040	427.0	26.5	3.0	490.9	35.0	2.2
2.0	.1300	535.1	33.5	2.7	606.6	43.0	3.4
2.0	.1560	637.7	40.0	3.5	720.4	51.0	4.5
2.0	.1820	749.6	47.0	2.7	847.3	60.0	3.7
3.0	.0260	67.0	3.5	31.0	97.1	7.5	12.1
3.0	.0520	158.3	8.5	11.0	222.2	17.0	-2.0
3.0	.0780	244.0	13.5	8.0	330.5	25.0	-1.1
3.0	.1040	326.0	18.0	7.8	442.5	33.5	-1.5
3.0	.1300	398.7	22.0	10.2	541.5	41.0	.5
3.0	.1560	486.3	27.0	8.4	655.4	49.5	-.3
3.0	.1820	564.5	31.5	8.9	756.3	57.0	.8

SECOND SET OF DATA

POSITION (RADIUS) (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)	TANG-ENTIAL STRESS (PSI)	TANG-ENTIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)
1.0	.0260	122.9	7.0	-8.8	160.5	12.0	-9.2
1.0	.0520	212.3	11.5	5.5	295.0	22.5	-1.1
1.0	.0780	324.2	18.0	3.7	436.9	33.0	.1
1.0	.1040	424.8	23.5	5.5	575.1	43.5	1.4
1.0	.1300	521.7	29.0	7.4	702.1	53.0	3.8
1.0	.1560	627.9	35.0	7.1	842.2	63.5	3.8
1.0	.1820	737.9	41.5	6.3	978.5	73.5	4.3
1.5	.0260	132.4	8.5	-12.9	143.6	10.0	-7.0
1.5	.0520	244.3	15.5	-5.6	270.6	19.0	-1.2
1.5	.0780	363.6	23.0	-4.9	405.0	28.5	-1.0
1.5	.1040	469.9	29.5	-1.8	530.0	37.5	.7
1.5	.1300	576.1	36.0	0.0	655.1	46.5	1.9
1.5	.1560	686.2	43.0	.7	776.4	55.0	3.2
1.5	.1820	794.3	49.5	1.5	907.1	64.5	3.0
2.0	.0260	104.4	6.5	5.3	119.4	8.5	5.0
2.0	.0520	221.9	14.0	-.8	248.2	17.5	1.1
2.0	.0780	328.1	20.5	.5	373.3	26.5	.8
2.0	.1040	430.7	27.0	2.1	487.1	34.5	3.0
2.0	.1300	540.7	34.0	1.7	608.4	43.0	3.1
2.0	.1560	650.8	41.0	1.4	729.7	51.5	3.2
2.0	.1820	747.7	47.0	2.9	841.7	59.5	4.3
3.0	.0260	74.5	4.0	17.9	104.5	8.0	4.1
3.0	.0520	149.0	8.0	17.9	209.1	16.0	4.1
3.0	.0780	253.3	14.0	4.0	343.6	26.0	-4.9
3.0	.1040	320.4	17.5	9.7	440.7	33.5	-1.1
3.0	.1300	408.0	22.5	7.7	554.6	42.0	-1.8
3.0	.1560	482.5	26.5	9.2	659.2	50.0	-.8
3.0	.1820	570.1	31.5	7.9	773.1	58.5	-1.3

TABLE X

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK, 0.70 IN. DIA. CONCENTRIC HOLE)

TABLE X

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK, 0.70 IN. DIA. CONCENTRIC HOLE)

DEVIATION IS CALCULATED FROM THEORETICAL VALUES OF PRINCIPAL STRESSES

TWO CONCENTRIC SQUARES ON FIGURES 43-56 REPRESENT THE THIRD SET OF DATA
AN X WITHIN A SQUARE ON FIGURES 43-56 REPRESENTS THE FOURTH SET OF DATA

POSITION (RADIUS) (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)	TANGENTIAL STRESS (PSI)	TANGENTIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)
			THIRD SET OF DATA				
1.0	.0260	108.1	6.5	3.6	130.6	9.5	11.5
1.0	.0520	208.7	12.0	7.4	268.8	20.0	8.4
1.0	.0780	307.4	17.5	9.3	401.4	30.0	8.9
1.0	.1040	409.9	23.5	9.3	530.2	39.5	9.9
1.0	.1300	516.2	29.5	8.5	670.3	50.0	8.7
1.0	.1560	620.5	35.5	8.3	804.7	60.0	8.7
1.0	.1820	738.0	42.5	6.3	948.5	70.5	7.6
1.5	.0260	123.1	8.0	-6.3	130.6	9.0	2.2
1.5	.0520	231.2	15.0	-.3	246.3	17.0	8.4
1.5	.0780	337.5	21.5	2.4	371.3	26.0	7.8
1.5	.1040	445.7	28.5	3.4	467.0	34.0	9.6
1.5	.1300	559.4	35.5	3.0	619.6	43.5	7.7
1.5	.1560	671.3	42.5	3.0	746.5	52.5	7.3
1.5	.1820	787.0	50.0	2.5	869.7	61.0	7.5
2.0	.0260	93.1	5.5	18.0	115.7	8.5	8.4
2.0	.0520	184.5	11.0	19.2	225.9	16.5	11.1
2.0	.0780	292.7	18.0	12.7	341.6	24.5	10.2
2.0	.1040	395.2	24.5	11.3	455.4	32.5	10.2
2.0	.1300	501.6	31.5	9.6	565.5	40.0	10.9
2.0	.1560	606.0	38.0	8.9	684.9	48.5	9.9
2.0	.1820	721.6	45.5	6.7	808.1	57.0	8.7
3.0	.0260	80.1	4.5	9.7	106.4	8.0	2.3
3.0	.0520	177.0	10.5	-.7	218.4	16.0	-.2
3.0	.0780	264.6	15.5	-.3	332.3	24.5	-1.6
3.0	.1040	342.9	20.0	2.5	433.1	32.0	.5
3.0	.1300	439.9	26.0	0.0	545.1	40.0	-.1
3.0	.1560	538.7	32.0	-2.1	662.7	48.5	-1.3
3.0	.1820	635.6	38.0	-3.2	774.7	56.5	-1.5
			FOURTH SET OF DATA				
1.0	.0260	109.9	6.5	1.9	136.2	10.0	6.9
1.0	.0520	216.1	12.5	3.7	276.3	20.5	5.5
1.0	.0780	318.7	18.5	5.5	405.1	30.0	7.9
1.0	.1040	423.0	24.5	5.9	539.6	40.0	8.0
1.0	.1300	521.8	30.0	7.4	672.2	50.0	8.4
1.0	.1560	624.3	36.0	7.7	801.0	59.5	9.2
1.0	.1820	736.1	42.5	6.5	942.9	70.0	8.2
1.5	.0260	121.2	8.0	-4.9	125.0	8.5	6.8
1.5	.0520	238.7	15.5	-3.4	253.7	17.5	5.2
1.5	.0780	343.1	22.0	.7	373.2	26.0	7.3
1.5	.1040	456.9	29.0	.8	505.7	35.5	5.6
1.5	.1300	553.8	35.0	4.0	617.7	43.5	8.1
1.5	.1560	676.9	43.0	2.1	748.4	52.5	7.0
1.5	.1820	781.3	49.5	3.2	867.8	61.0	7.7
2.0	.0260	87.5	5.0	25.5	113.9	8.5	10.1
2.0	.0520	195.7	12.0	12.3	229.6	16.5	9.3
2.0	.0780	298.3	18.5	10.6	343.4	24.5	9.6
2.0	.1040	400.9	25.0	9.7	457.2	32.5	9.8
2.0	.1300	503.4	31.5	9.2	571.1	40.5	9.9
2.0	.1560	604.1	38.0	9.2	679.3	48.0	10.8
2.0	.1820	719.8	45.5	6.9	802.5	56.5	9.5
3.0	.0260	80.1	4.5	9.7	106.4	8.0	2.3
3.0	.0520	178.9	10.5	-1.7	224.0	16.5	-2.7
3.0	.0780	259.0	15.0	1.7	330.4	24.5	-1.1
3.0	.1040	356.0	21.0	-1.2	442.4	32.5	-1.5
3.0	.1300	441.7	26.0	-.5	550.7	40.5	-1.1
3.0	.1560	527.4	31.0	0.0	659.0	48.5	-.8
3.0	.1820	624.4	37.0	-1.4	771.0	56.5	-1.1

FIGURE 43

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0260 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

▣ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

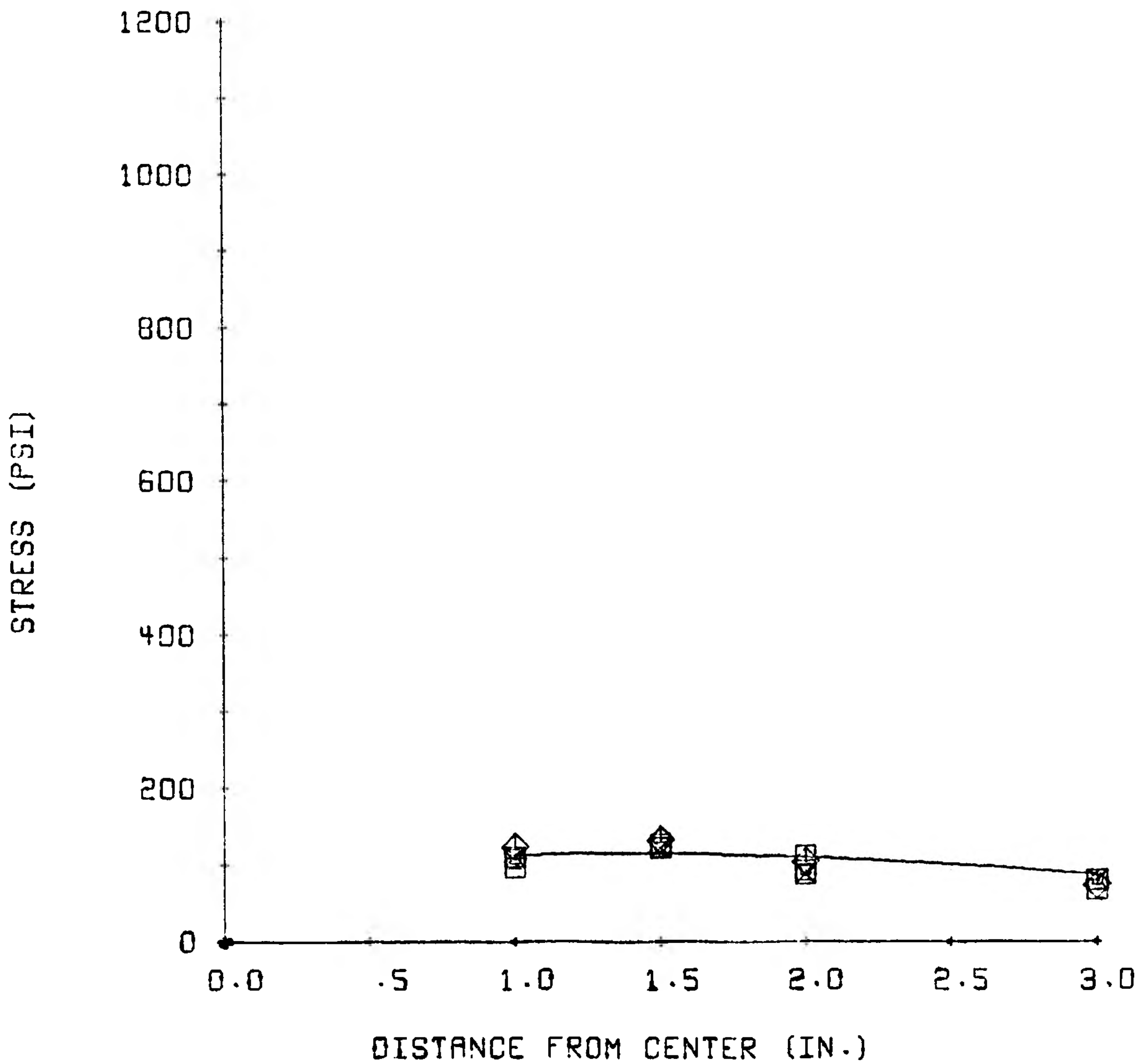

FIGURE 44

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0260 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

⊡ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

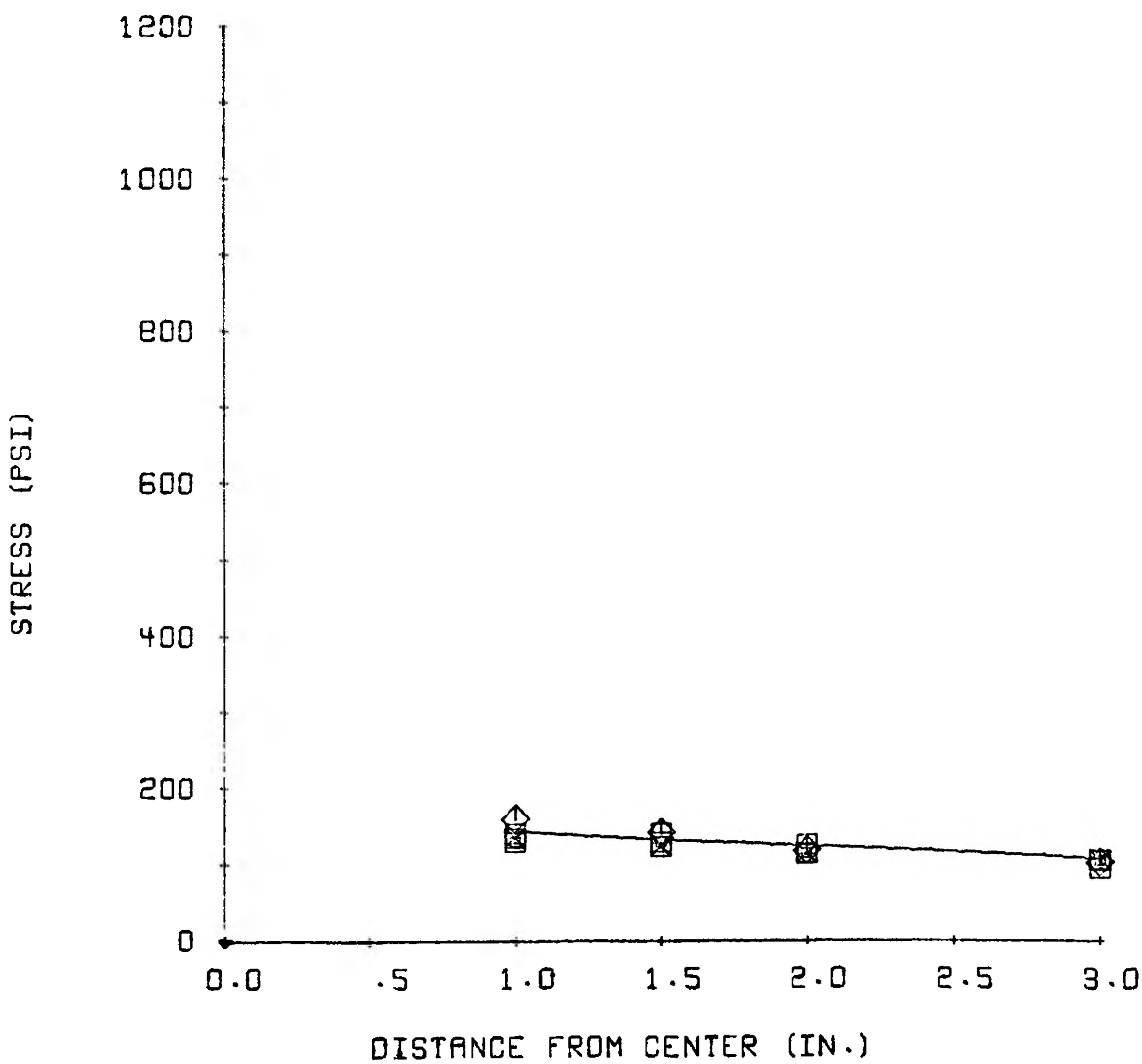

FIGURE 45

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0520 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

- □ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.
- ◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.
- ⊡ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.
- ⊠ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.
- \- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

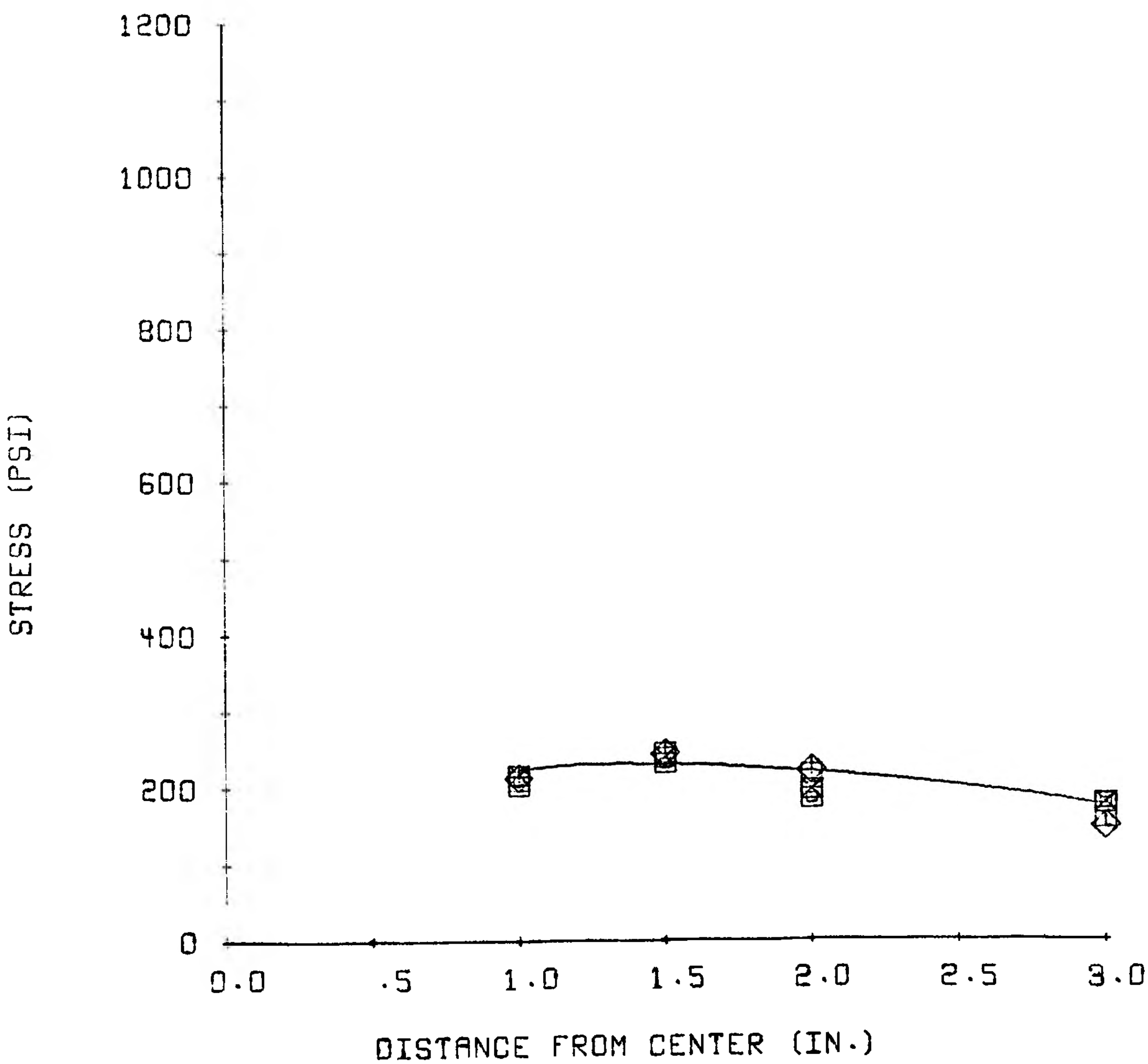

FIGURE 46

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0520 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

⊡ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

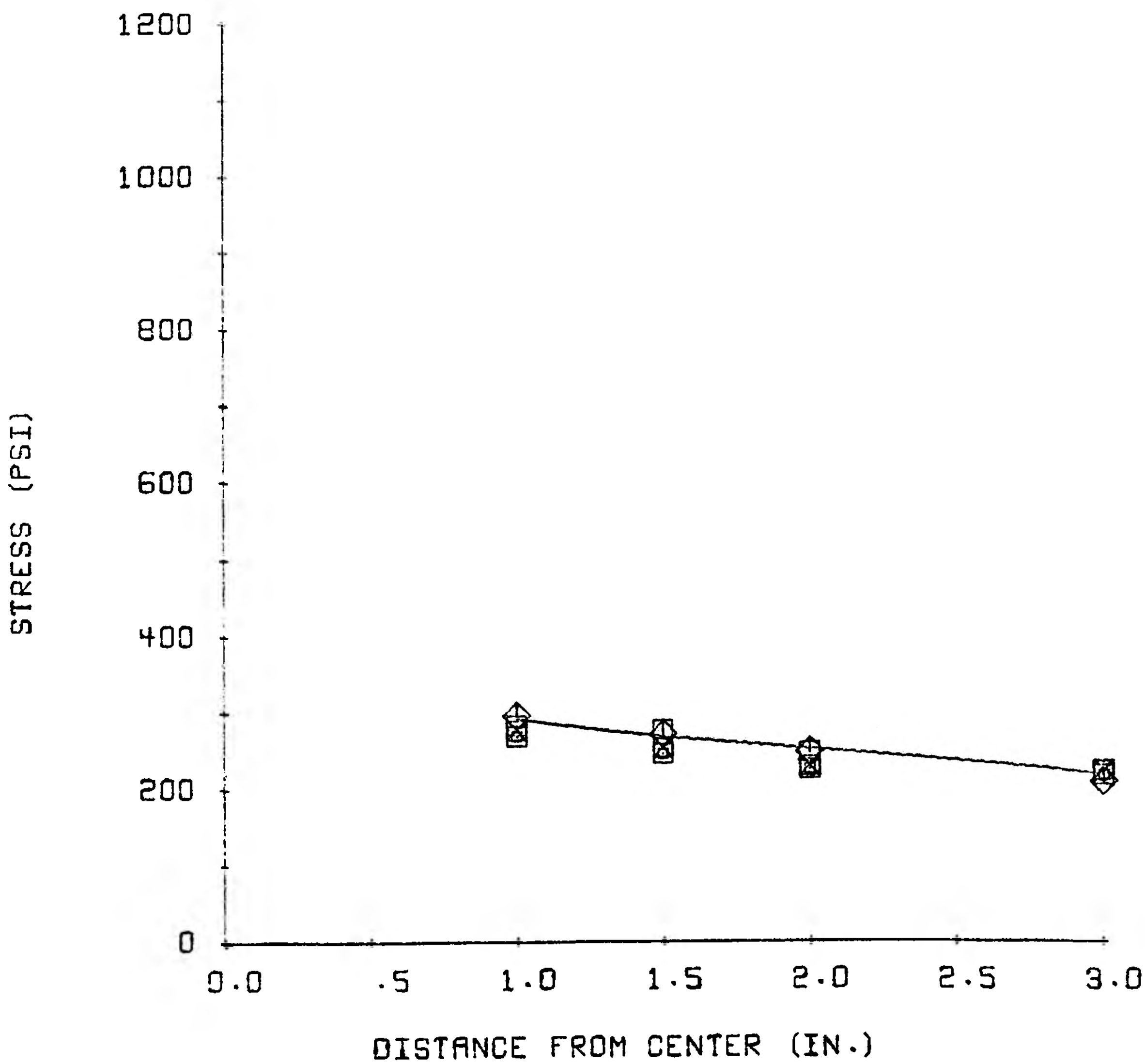

FIGURE 47

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0780 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

⊡ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

▣ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

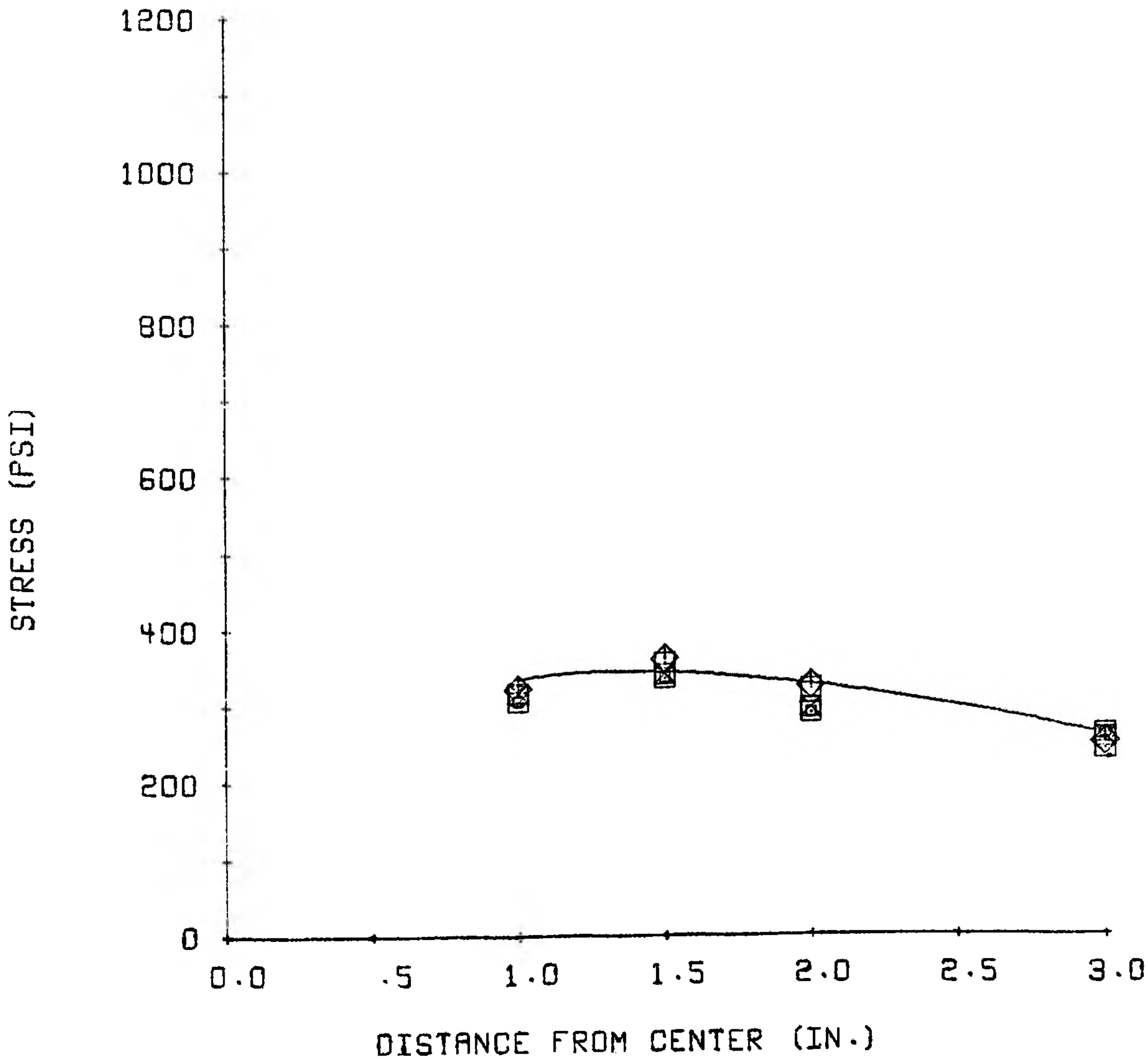

FIGURE 48

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0720 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

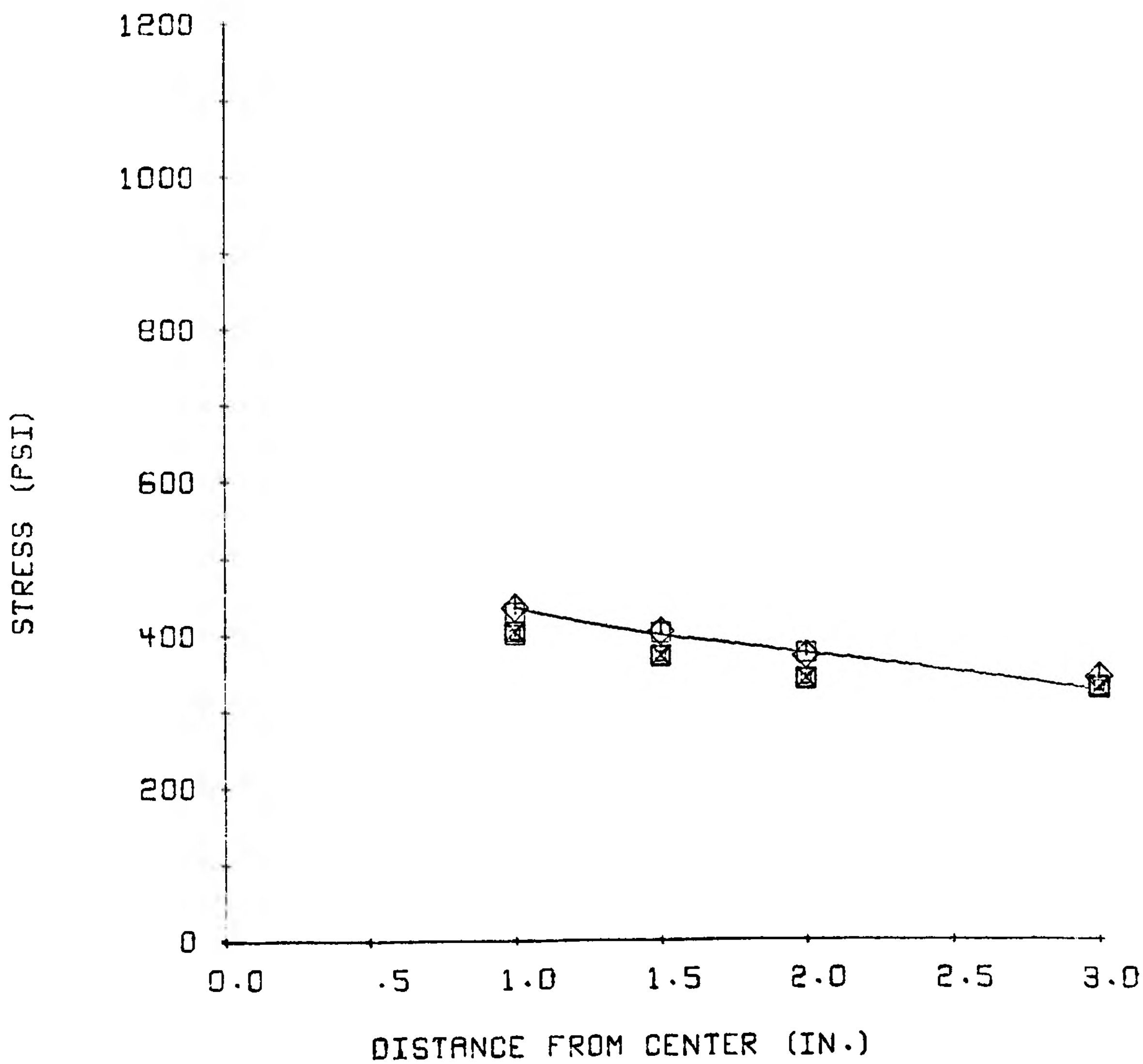

FIGURE 49

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.061 IN. THICK
SIMPLY SUPPORTED-- .1040 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

▣ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

☒ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

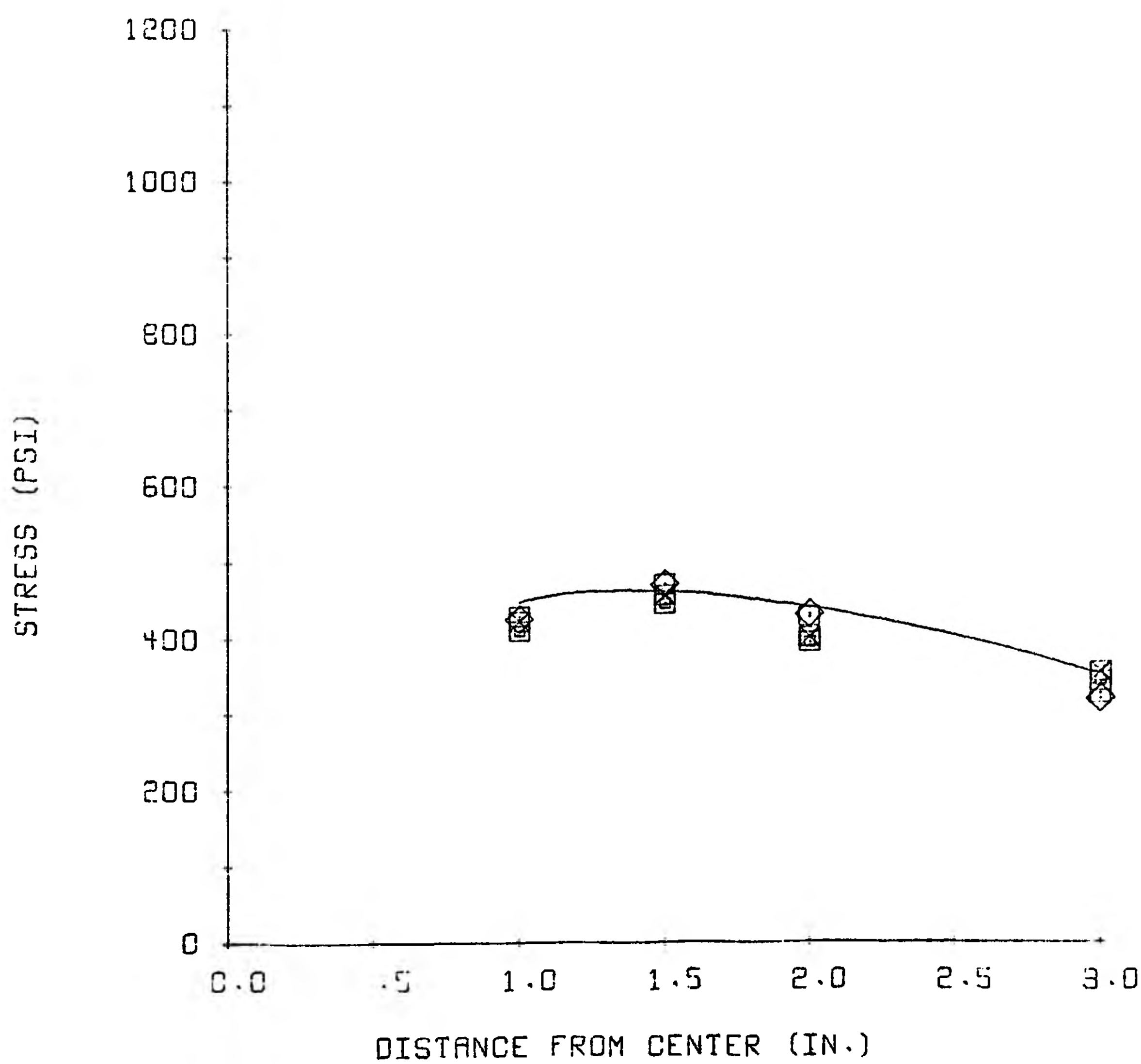

FIGURE 50

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1040 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

⊡ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

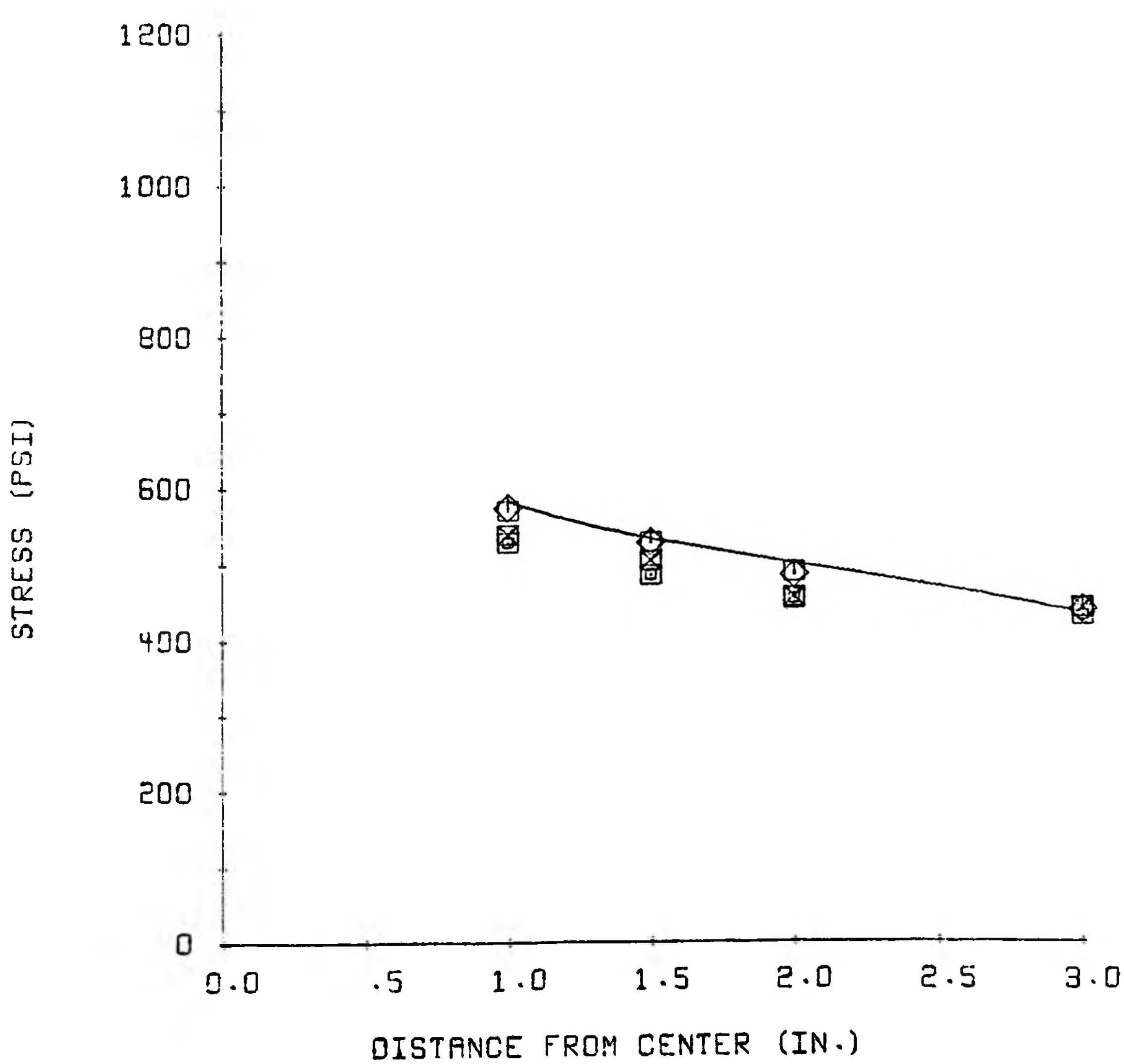

FIGURE 51

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1300 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

⊡ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

⊞ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

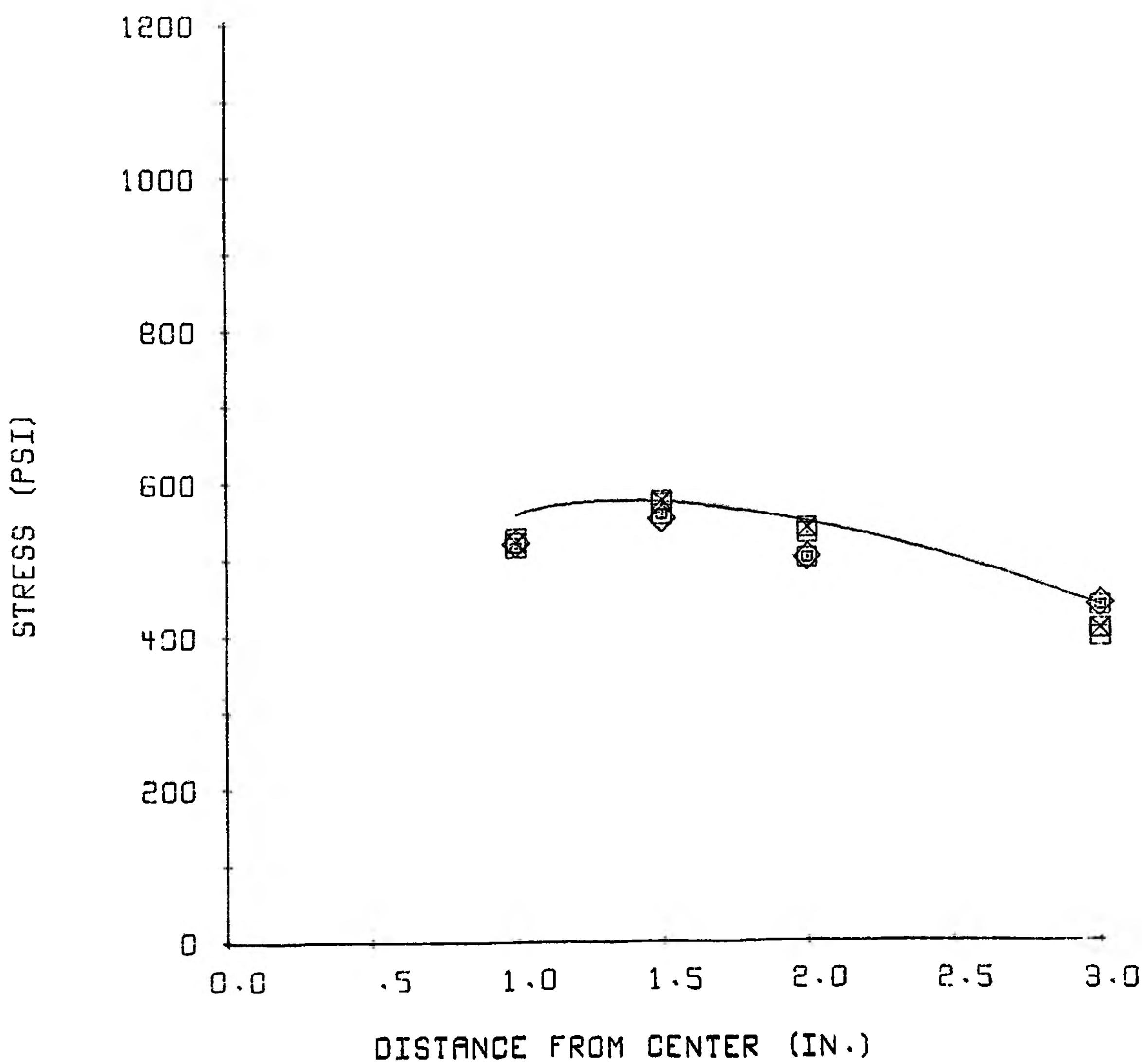

FIGURE 52

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1300 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

⊡ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

\- THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

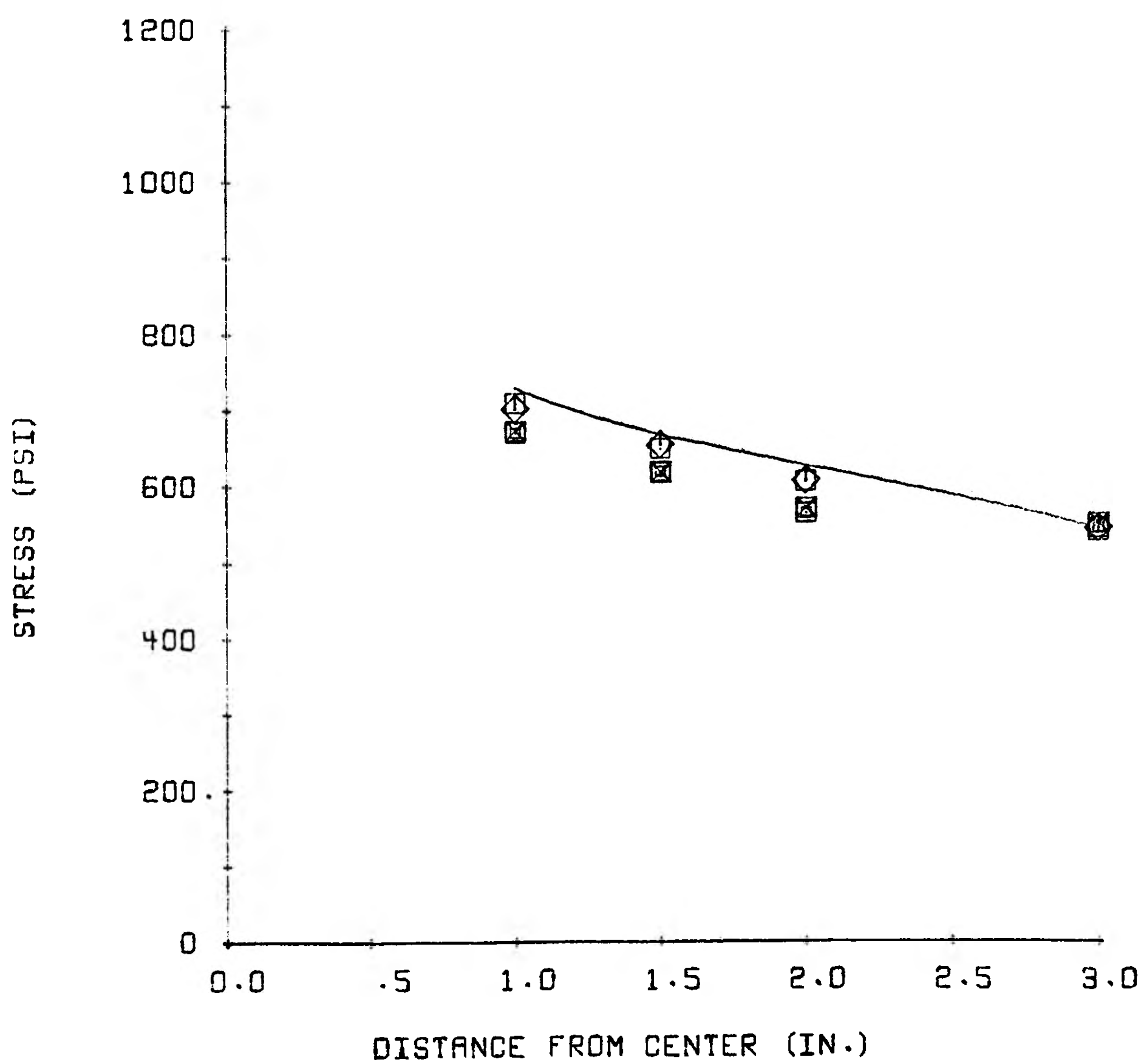

FIGURE 53

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1560 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

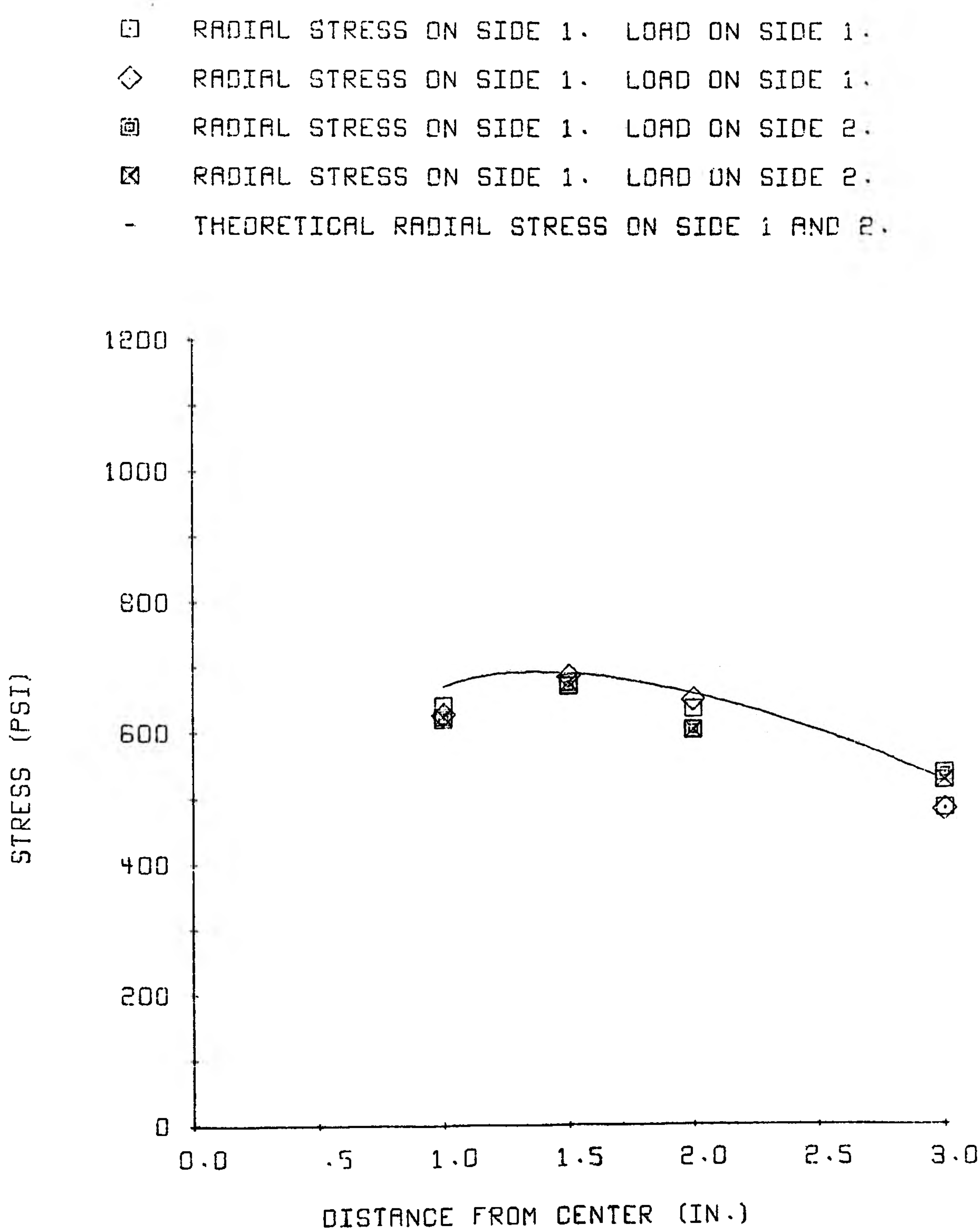

FIGURE 54

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1560 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

⊡ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

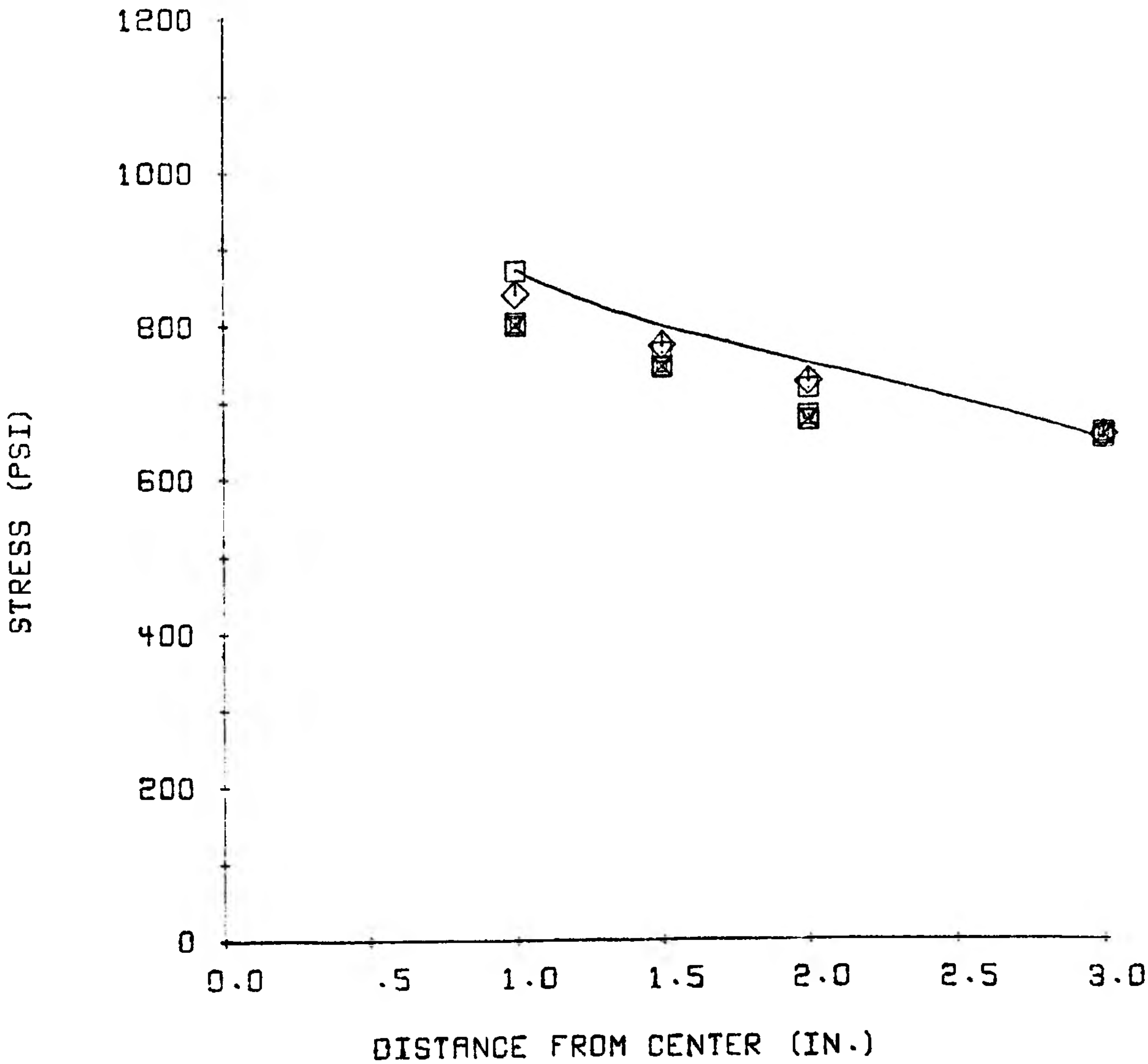

FIGURE 55

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1820 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

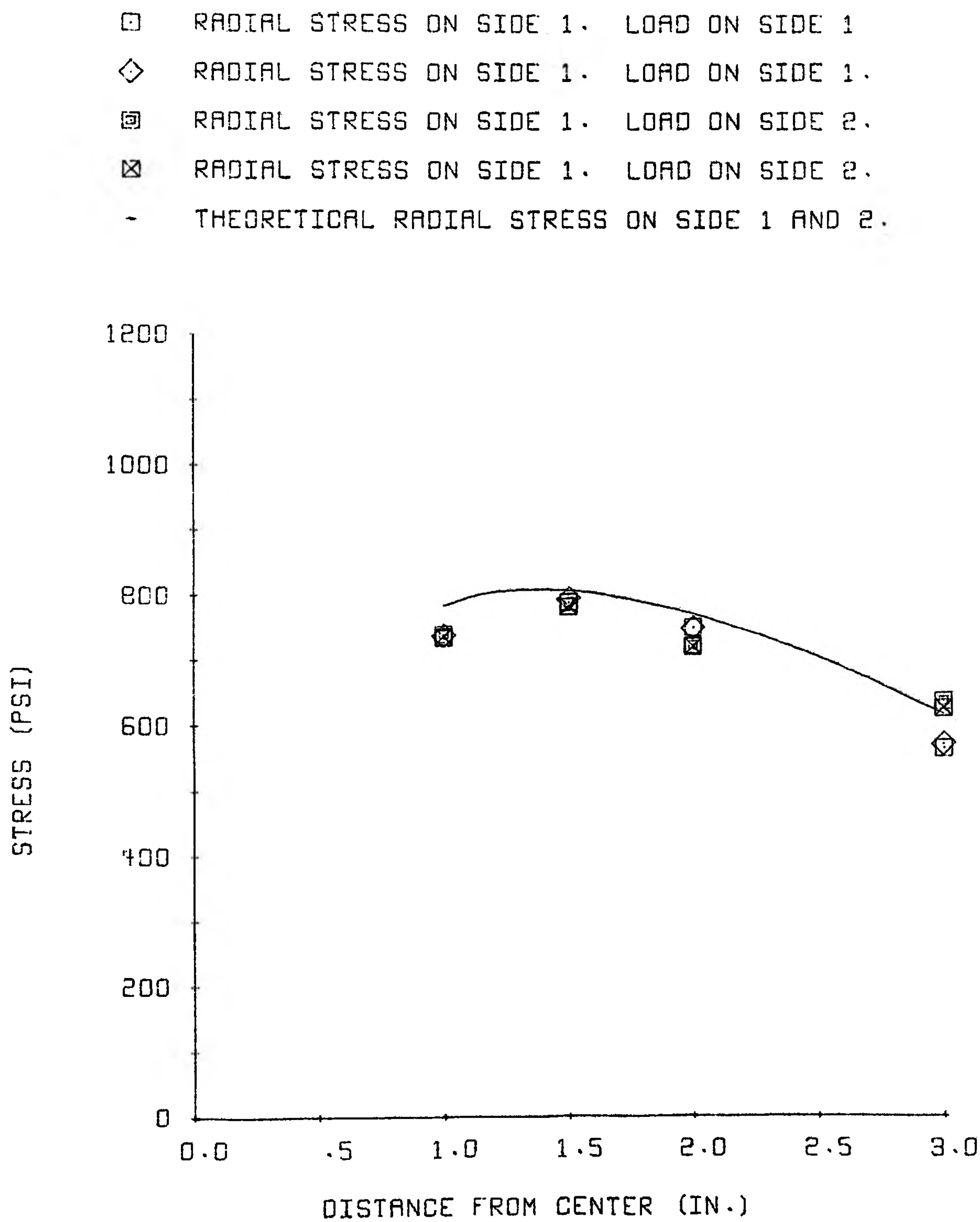

FIGURE 56

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1820 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

\- THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

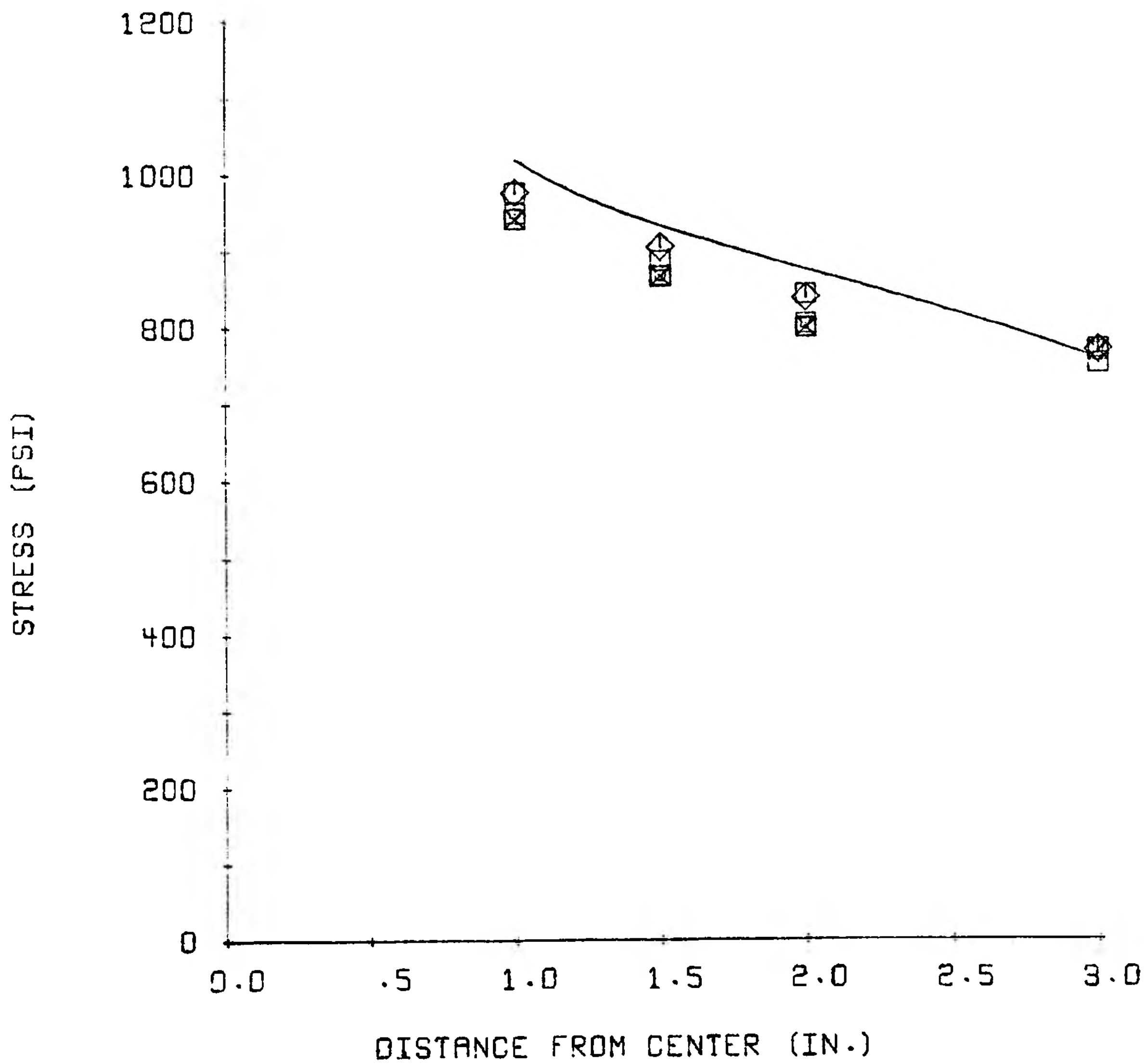

TABLE XI

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK, 0.70 IN. DIA. CONCENTRIC HOLE)

TABLE XI

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE
(10.413 IN. DIA., 0.081 IN. THICK, 0.70 IN. DIA. CONCENTRIC HOLE)

DEVIATION IS CALCULATED FROM THEORETICAL VALUES OF PRINCIPAL STRESSES

THE SQUARES ON FIGURES 57-70 REPRESENT THE FIRST SET OF DATA
THE DIAMONDS ON FIGURES 57-70 REPRESENT THE SECOND SET OF DATA

POSITION (RADIUS) (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (µIN./IN.)	DEVIATION (PER CENT)	TANG-ENTIAL STRESS (PSI)	TANG-ENTIAL STRAIN (µIN./IN.)	DEVIATION (PER CENT)
			FIRST SET OF DATA				
1.0	.0260	94.9	5.0	18.0	136.3	10.5	6.9
1.0	.0520	154.4	7.0	45.1	255.9	20.5	13.9
1.0	.0780	313.0	17.5	7.4	418.3	31.5	4.5
1.0	.1040	411.7	23.0	8.8	550.6	41.5	5.8
1.0	.1300	495.5	27.0	13.1	683.5	52.0	6.6
1.0	.1560	620.4	34.5	8.4	834.7	63.0	4.8
1.0	.1820	724.8	40.5	8.2	969.1	73.0	5.3
1.5	.0260	121.2	8.0	-4.9	125.0	8.5	6.8
1.5	.0520	227.5	14.5	1.3	250.0	17.5	6.8
1.5	.0780	337.5	21.5	2.4	371.3	26.0	7.8
1.5	.1040	434.4	27.0	6.1	498.3	35.5	7.2
1.5	.1300	568.7	36.0	1.3	632.7	44.5	5.5
1.5	.1560	680.6	43.0	1.6	759.6	53.5	5.5
1.5	.1820	786.9	49.5	2.5	884.6	62.5	5.6
2.0	.0260	87.5	5.0	25.5	113.9	8.5	10.1
2.0	.0520	184.5	11.0	19.2	225.9	16.5	11.1
2.0	.0780	281.5	17.0	17.2	337.8	24.5	11.4
2.0	.1040	385.9	23.5	14.0	457.3	33.0	9.8
2.0	.1300	484.7	29.5	13.4	574.9	41.5	9.1
2.0	.1560	581.6	35.5	13.4	686.9	49.5	9.6
2.0	.1820	684.2	42.0	12.5	800.8	57.5	9.7
3.0	.0260	70.8	4.0	24.1	93.3	7.0	16.6
3.0	.0520	145.3	8.0	20.9	197.9	15.0	10.0
3.0	.0780	214.2	12.0	23.0	285.7	21.5	14.3
3.0	.1040	285.0	16.0	23.3	379.0	28.5	14.9
3.0	.1300	363.4	21.0	20.9	464.9	34.5	17.1
3.0	.1560	434.2	25.0	21.4	558.2	41.5	17.0
3.0	.1820	521.8	30.5	17.8	657.2	48.5	16.0
			SECOND SET OF DATA				
1.0	.0260	93.1	5.0	20.3	130.7	10.0	11.5
1.0	.0520	204.9	11.5	9.3	272.6	20.5	6.9
1.0	.0780	303.7	17.0	10.7	405.2	30.5	7.9
1.0	.1040	406.1	22.5	10.3	549.0	41.5	6.2
1.0	.1300	506.7	28.0	10.5	687.2	52.0	6.1
1.0	.1560	613.0	34.0	9.7	827.2	62.5	5.7
1.0	.1820	711.7	39.5	10.2	959.8	72.5	6.3
1.5	.0260	110.0	7.0	4.7	121.3	8.5	10.1
1.5	.0520	227.5	14.5	1.3	250.0	17.5	6.8
1.5	.0780	339.4	21.5	1.6	377.0	26.5	6.2
1.5	.1040	445.6	28.0	3.4	502.0	35.5	6.4
1.5	.1300	561.3	35.5	2.6	625.2	44.0	6.8
1.5	.1560	678.8	43.0	1.8	754.0	53.0	6.2
1.5	.1820	786.9	49.5	2.5	884.6	62.5	5.6
2.0	.0260	85.7	5.0	28.2	108.2	8.0	15.8
2.0	.0520	184.5	11.0	19.2	225.9	16.5	11.1
2.0	.0780	288.9	17.5	14.1	345.3	25.0	9.0
2.0	.1040	385.9	24.0	13.9	442.3	31.5	13.5
2.0	.1300	484.7	29.5	13.4	574.9	41.5	9.1
2.0	.1560	589.1	36.0	12.0	694.4	50.0	8.4
2.0	.1820	691.7	42.5	11.3	808.2	58.0	8.7
3.0	.0260	67.0	3.5	31.0	97.1	7.5	12.1
3.0	.0520	132.2	7.0	32.9	188.6	14.5	15.4
3.0	.0780	208.6	11.5	26.3	283.8	21.5	15.0
3.0	.1040	286.9	16.0	22.5	384.6	29.0	13.2
3.0	.1300	355.9	20.0	23.4	472.4	35.5	15.2
3.0	.1560	436.0	25.0	20.9	563.9	42.0	15.8
3.0	.1820	518.1	30.0	18.7	660.9	49.0	15.3

TABLE XII

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE

(10.413 IN. DIA., 0.081 IN. THICK, 0.70 IN. DIA. CONCENTRIC HOLE)

TABLE XII

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE
(10.413 IN. DIA., 0.081 IN. THICK, 0.70 IN. DIA. CONCENTRIC HOLE)

DEVIATION IS CALCULATED FROM THEORETICAL VALUES OF PRINCIPAL STRESSES

TWO CONCENTRIC SQUARES ON FIGURES 57-70 REPRESENT THE THIRD SET OF DATA
AN X WITHIN A SQUARE ON FIGURES 57-70 REPRESENTS THE FOURTH SET OF DATA

POSITION (RADIUS) (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (µIN./IN.)	DEVIATION (PER CENT)	TANG-ENTIAL STRESS (PSI)	TANG-ENTIAL STRAIN (µIN./IN.)	DEVIATION (PER CENT)
			THIRD SET OF DATA				
1.0	.0260	104.3	6.0	7.4	134.4	10.0	8.4
1.0	.0520	195.6	11.0	14.5	259.5	19.5	12.3
1.0	.0780	292.5	16.5	14.9	386.5	29.0	13.1
1.0	.1040	374.5	21.0	19.7	498.5	37.5	16.9
1.0	.1300	473.2	26.5	18.4	631.1	47.5	15.5
1.0	.1560	549.7	31.0	22.3	726.4	54.5	20.4
1.0	.1820	644.7	36.5	21.7	847.7	63.5	20.4
1.5	.0260	113.7	7.5	1.3	117.5	8.0	13.6
1.5	.0520	223.8	14.5	2.9	238.8	16.5	11.8
1.5	.0780	317.0	20.0	9.0	354.6	25.0	12.9
1.5	.1040	421.4	26.5	9.3	474.0	33.5	12.7
1.5	.1300	510.9	32.0	12.7	578.6	41.0	15.4
1.5	.1560	604.1	37.5	14.4	694.3	49.5	15.4
1.5	.1820	697.3	43.5	15.6	795.1	56.5	17.5
2.0	.0260	100.7	6.5	9.2	108.2	7.5	15.9
2.0	.0520	193.9	12.0	13.4	223.9	16.0	12.1
2.0	.0780	296.4	18.5	11.3	337.8	24.0	11.4
2.0	.1040	387.8	24.0	13.4	447.9	32.0	12.1
2.0	.1300	477.3	29.5	15.2	552.5	39.5	13.6
2.0	.1560	568.6	35.0	16.0	662.6	47.5	13.6
2.0	.1820	654.4	40.0	17.6	770.9	55.5	13.9
3.0	.0260	78.2	4.5	12.2	100.8	7.5	8.0
3.0	.0520	162.1	9.5	6.4	203.5	15.0	7.0
3.0	.0780	264.7	16.0	-.3	317.3	23.0	2.9
3.0	.1040	346.7	21.0	1.3	414.4	30.0	5.1
3.0	.1300	430.6	26.0	2.0	517.1	37.5	5.3
3.0	.1560	507.0	30.5	4.0	612.3	44.5	6.7
3.0	.1820	570.3	33.5	7.8	713.2	52.5	6.8
			FOURTH SET OF DATA				
1.0	.0260	102.5	6.0	9.3	128.8	9.5	13.1
1.0	.0520	201.2	11.5	11.3	261.4	19.5	11.5
1.0	.0780	290.7	16.5	15.6	360.9	28.5	14.8
1.0	.1040	378.2	21.5	18.5	494.8	37.0	17.8
1.0	.1300	465.8	26.5	20.3	608.7	45.5	19.7
1.0	.1560	542.2	30.5	24.0	718.9	54.0	21.7
1.0	.1820	629.8	35.5	24.5	832.8	62.5	22.5
1.5	.0260	115.6	7.5	-.2	123.1	8.5	8.4
1.5	.0520	225.6	14.5	2.1	244.4	17.0	9.2
1.5	.0780	317.0	20.0	9.0	354.6	25.0	12.9
1.5	.1040	417.6	26.0	10.3	477.8	34.0	11.8
1.5	.1300	510.9	32.0	12.7	578.6	41.0	15.4
1.5	.1560	596.6	37.0	15.9	686.9	49.0	16.6
1.5	.1820	689.9	43.0	16.9	787.6	56.0	18.7
2.0	.0260	111.8	6.5	-1.6	141.9	10.5	-11.5
2.0	.0520	201.3	12.5	9.2	231.4	16.5	8.4
2.0	.0780	309.4	18.5	6.6	377.1	27.5	-.1
2.0	.1040	384.0	23.5	14.5	451.7	32.5	11.1
2.0	.1300	469.8	29.0	17.0	545.0	39.0	15.1
2.0	.1560	561.2	34.5	17.6	655.2	47.0	14.9
2.0	.1820	652.5	40.0	18.0	765.3	55.0	14.8
3.0	.0260	89.4	5.5	-1.7	104.5	7.5	4.1
3.0	.0520	171.5	10.5	2.4	201.6	14.5	8.0
3.0	.0780	240.4	14.0	9.6	304.3	22.5	7.3
3.0	.1040	307.4	17.5	14.3	401.4	30.0	8.5
3.0	.1300	395.1	23.0	11.2	500.3	37.0	8.8
3.0	.1560	477.1	28.0	10.5	597.4	44.0	9.3
3.0	.1820	549.8	32.0	11.9	696.4	51.5	9.4

FIGURE 57

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0260 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

▣ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

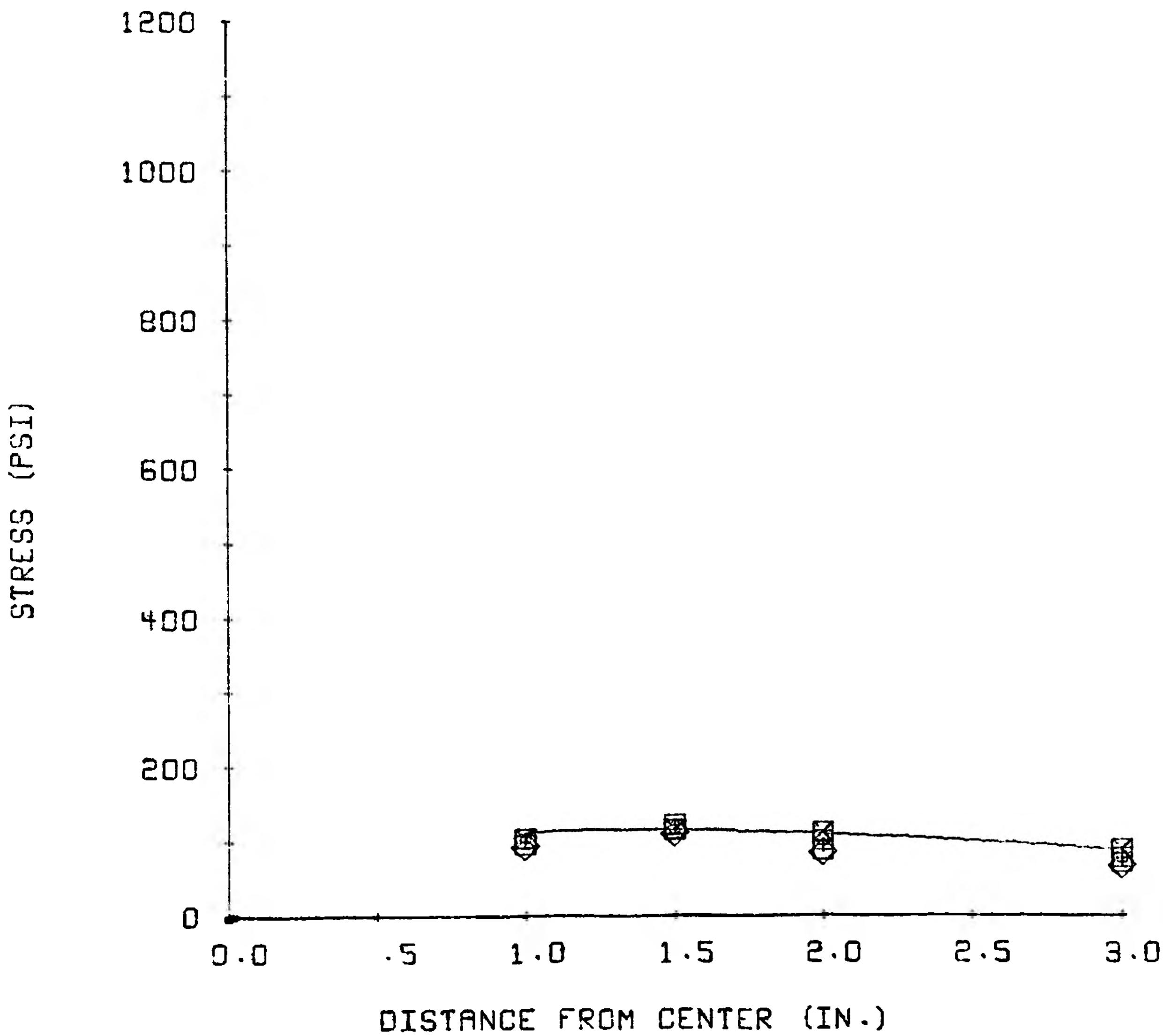

FIGURE 58

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0260 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

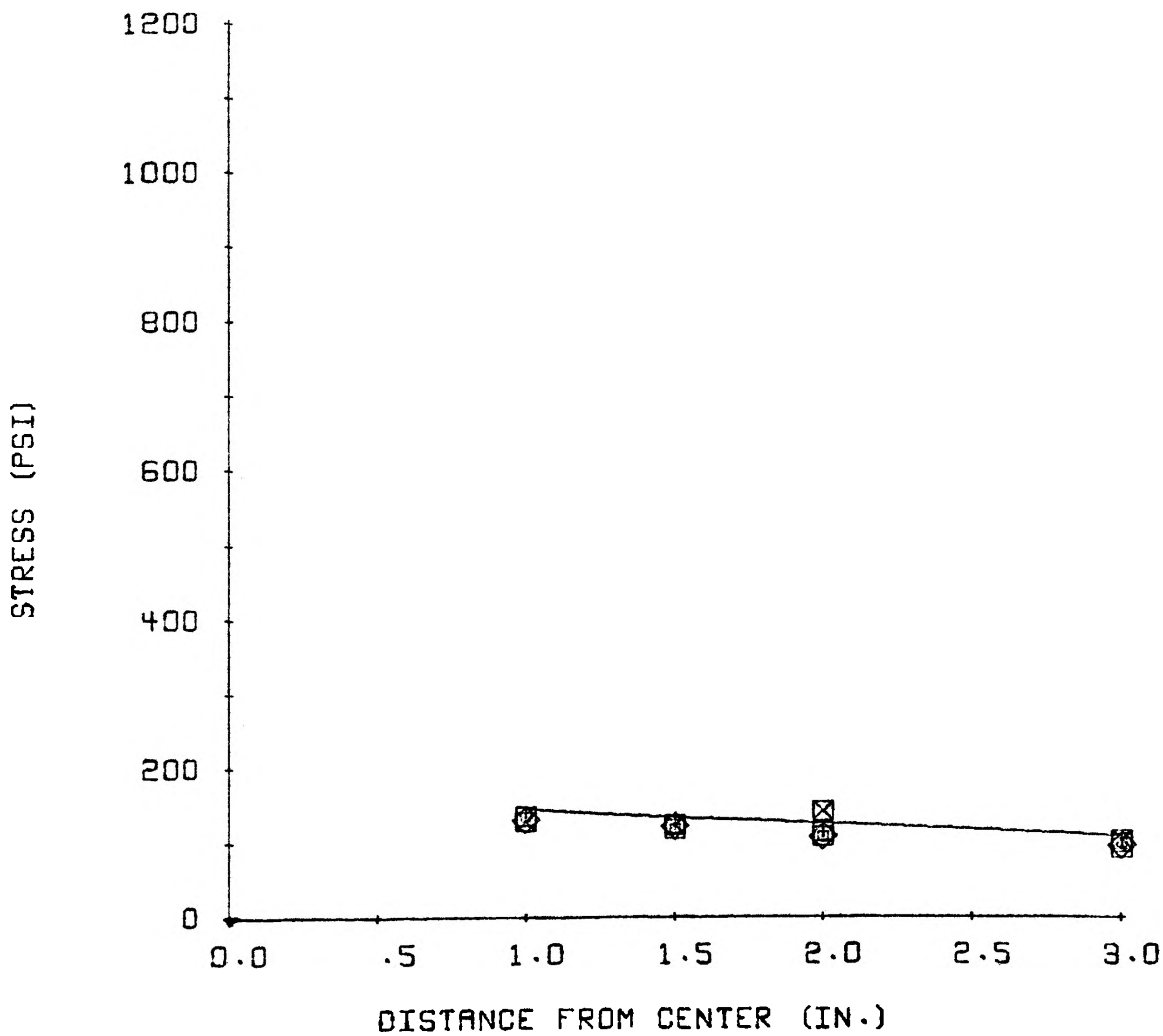

FIGURE 59

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0520 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

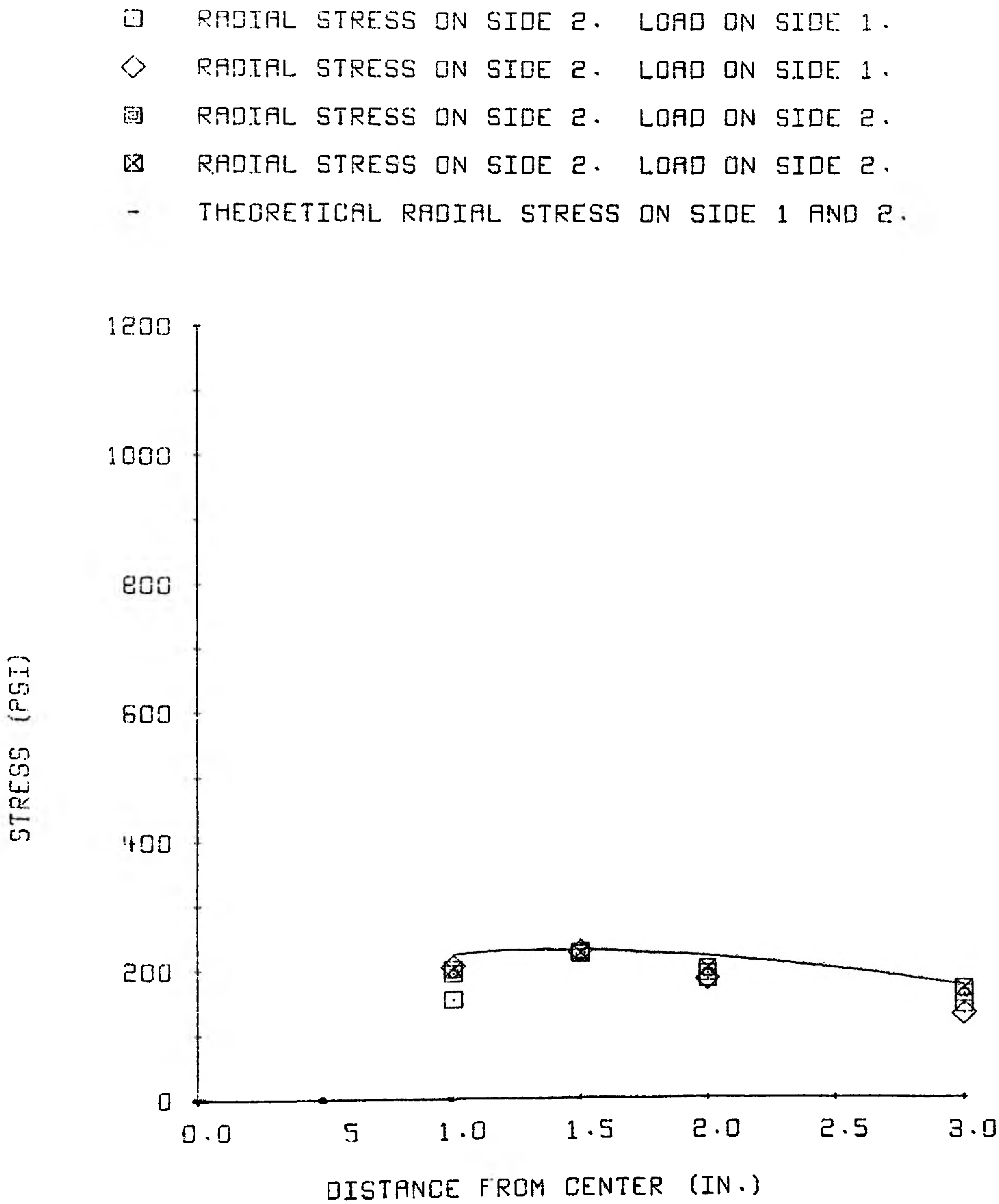

FIGURE 60

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.091 IN. THICK
SIMPLY SUPPORTED-- .0520 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

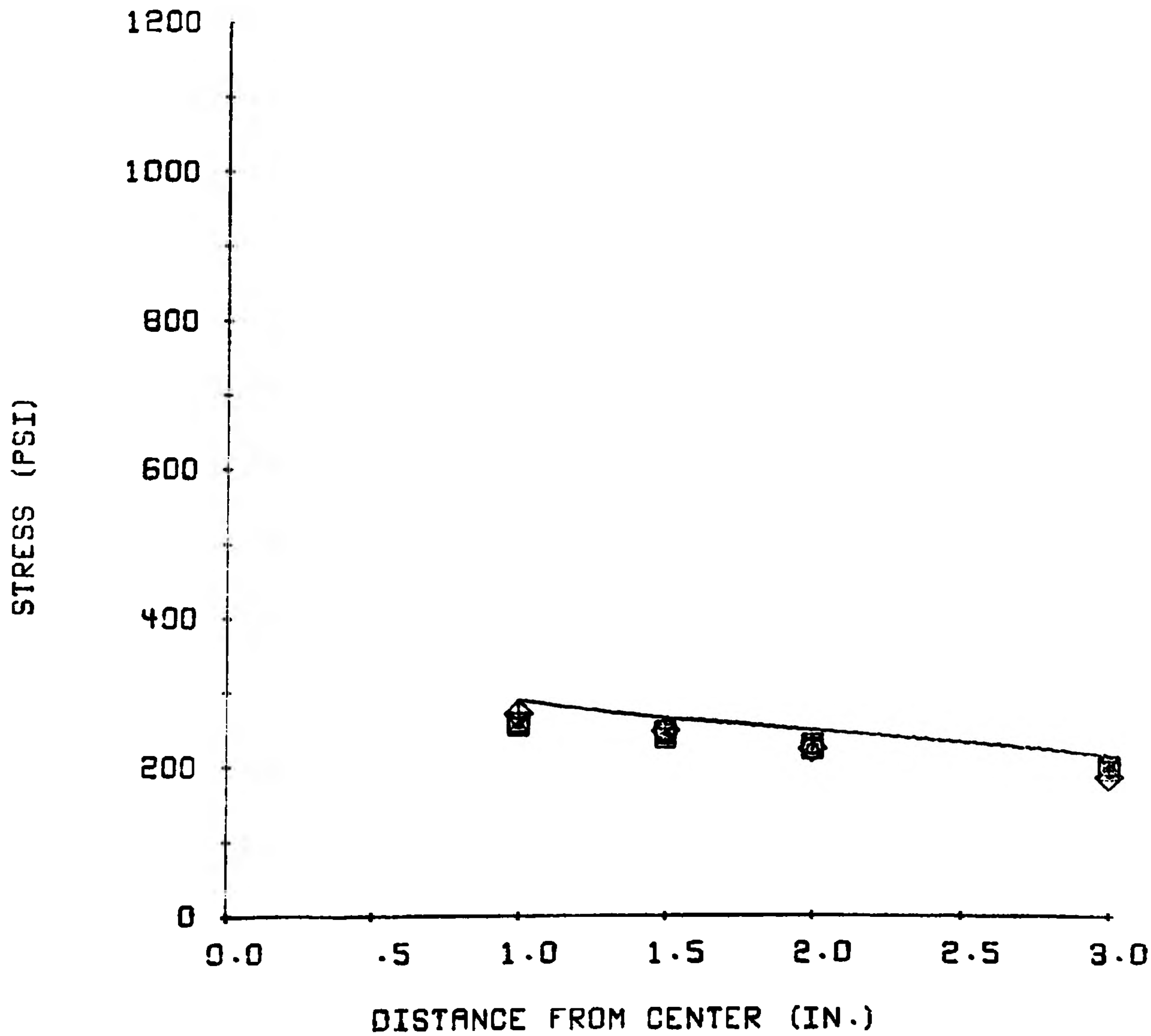

FIGURE G1

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0780 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

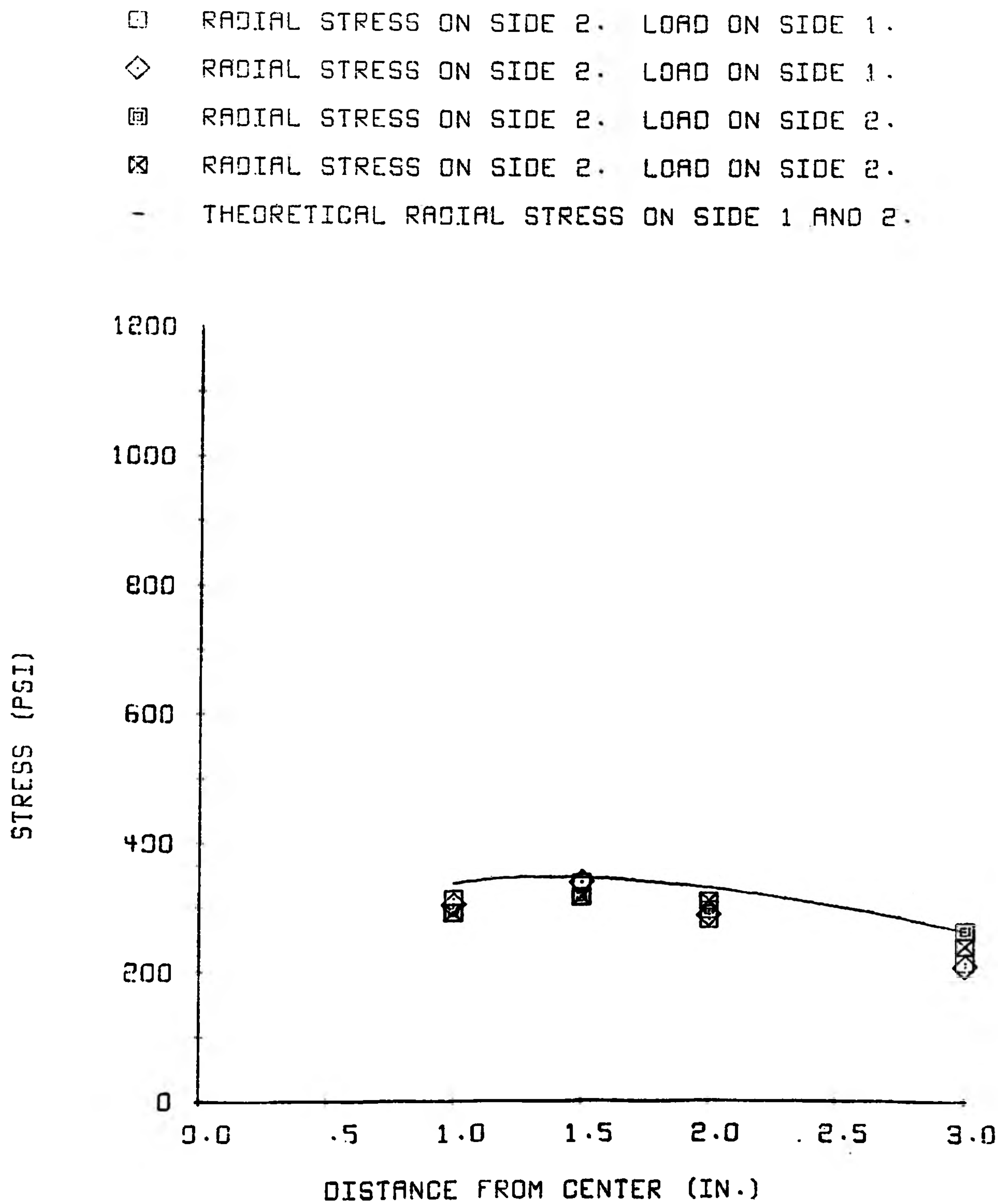

FIGURE 62

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0780 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

⊡ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

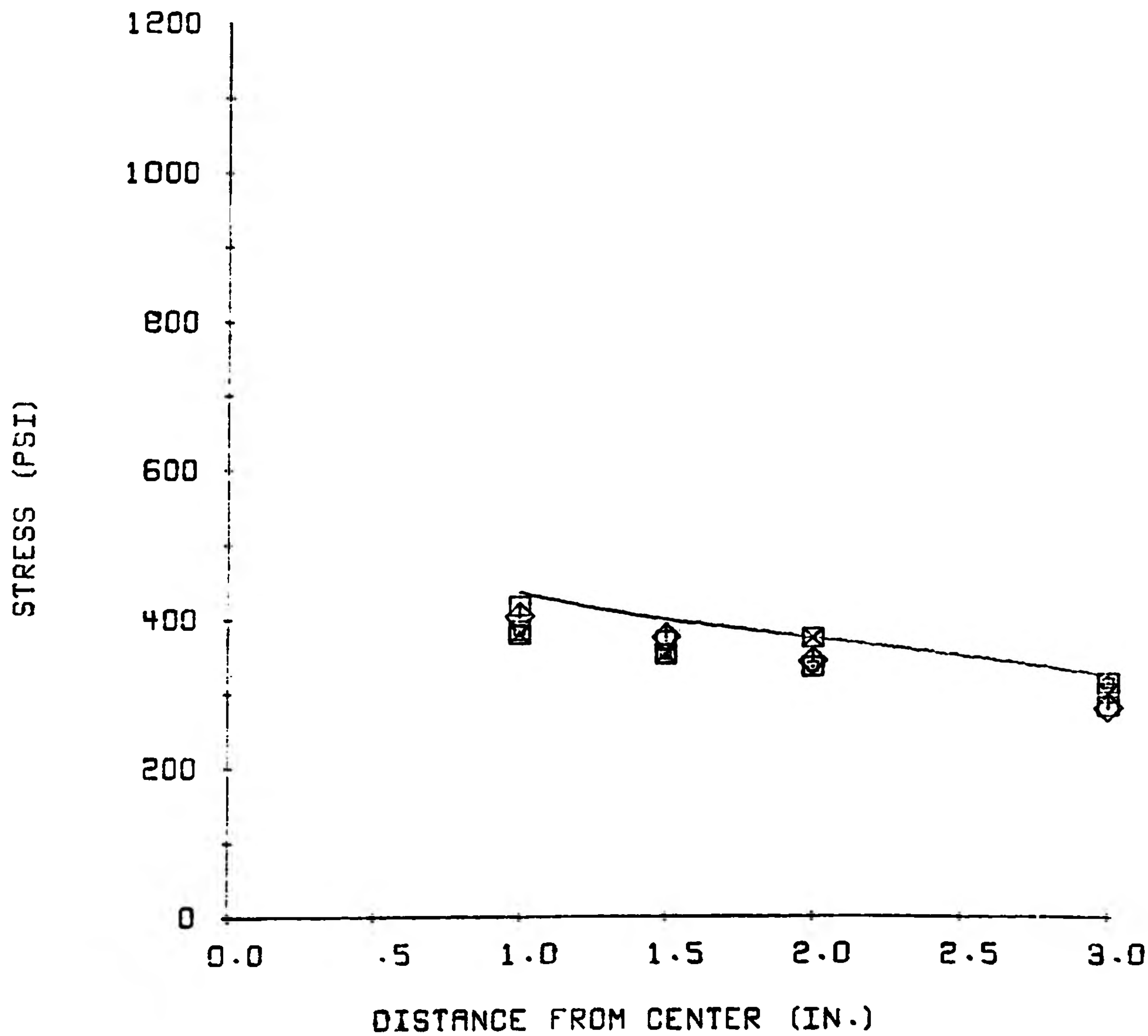

FIGURE 64

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED--.1040 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

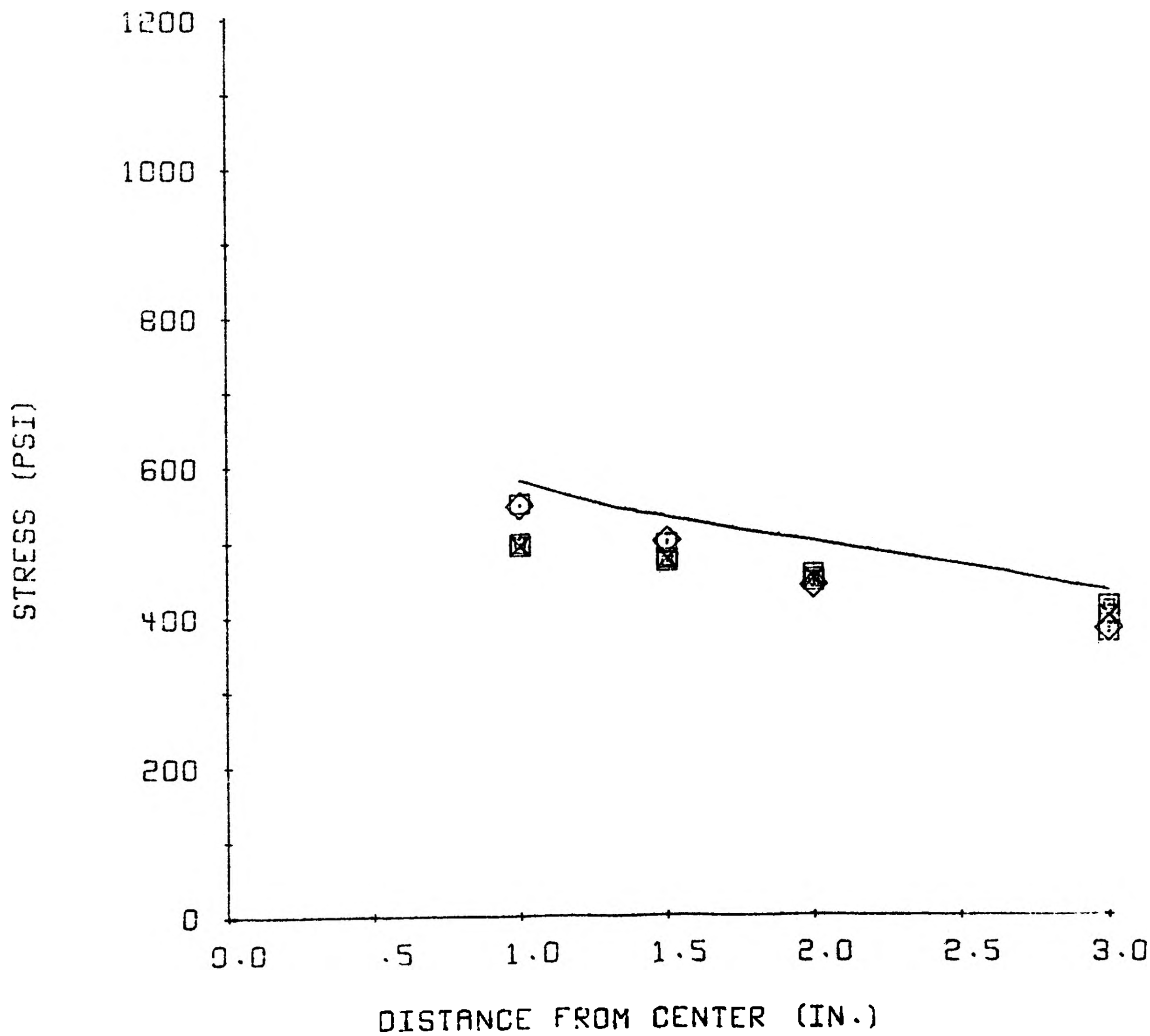

FIGURE 65

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1300 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 1.
◇ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 1.
▣ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 2.
⊠ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 2.
– THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

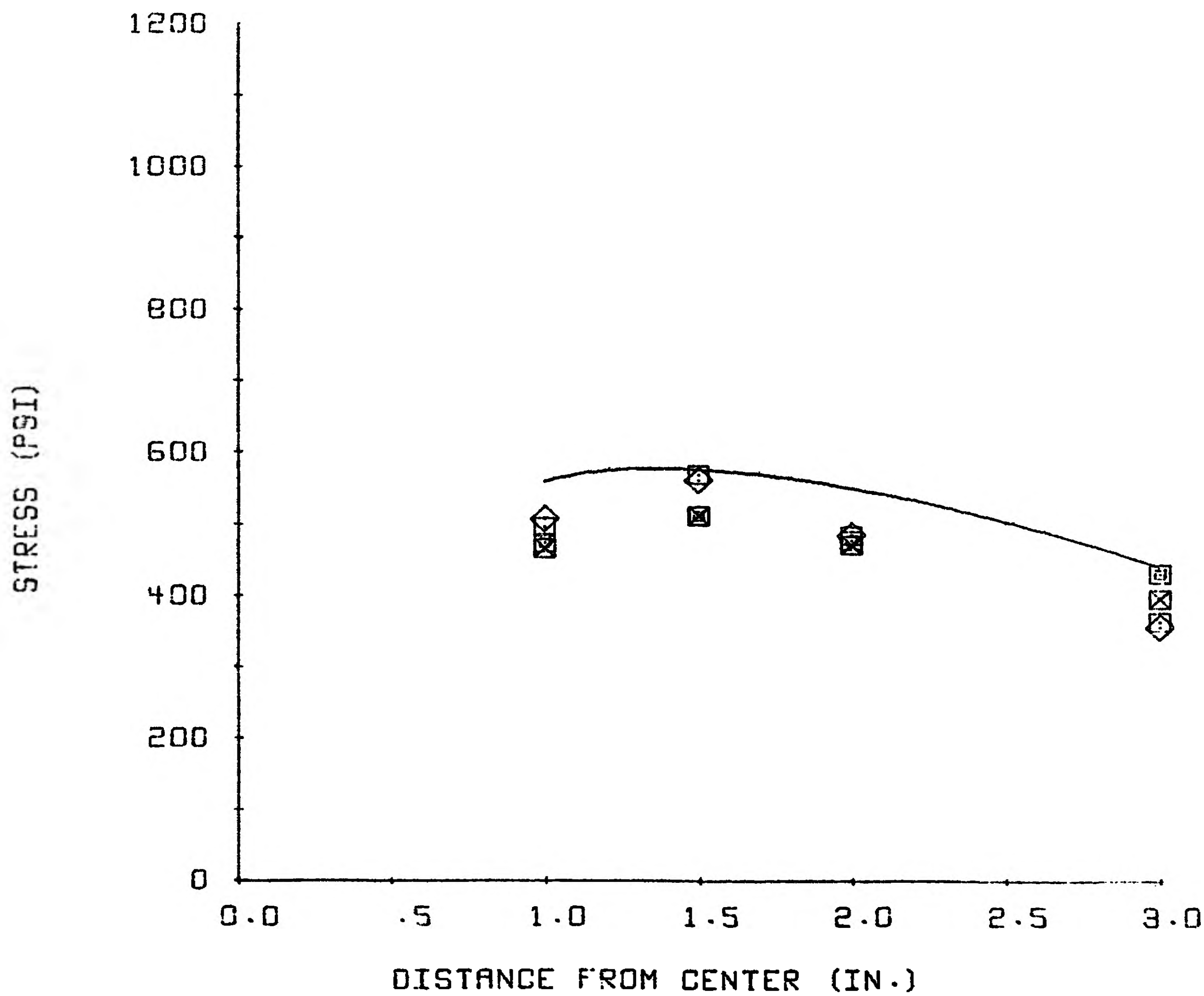

FIGURE 66

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1300 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

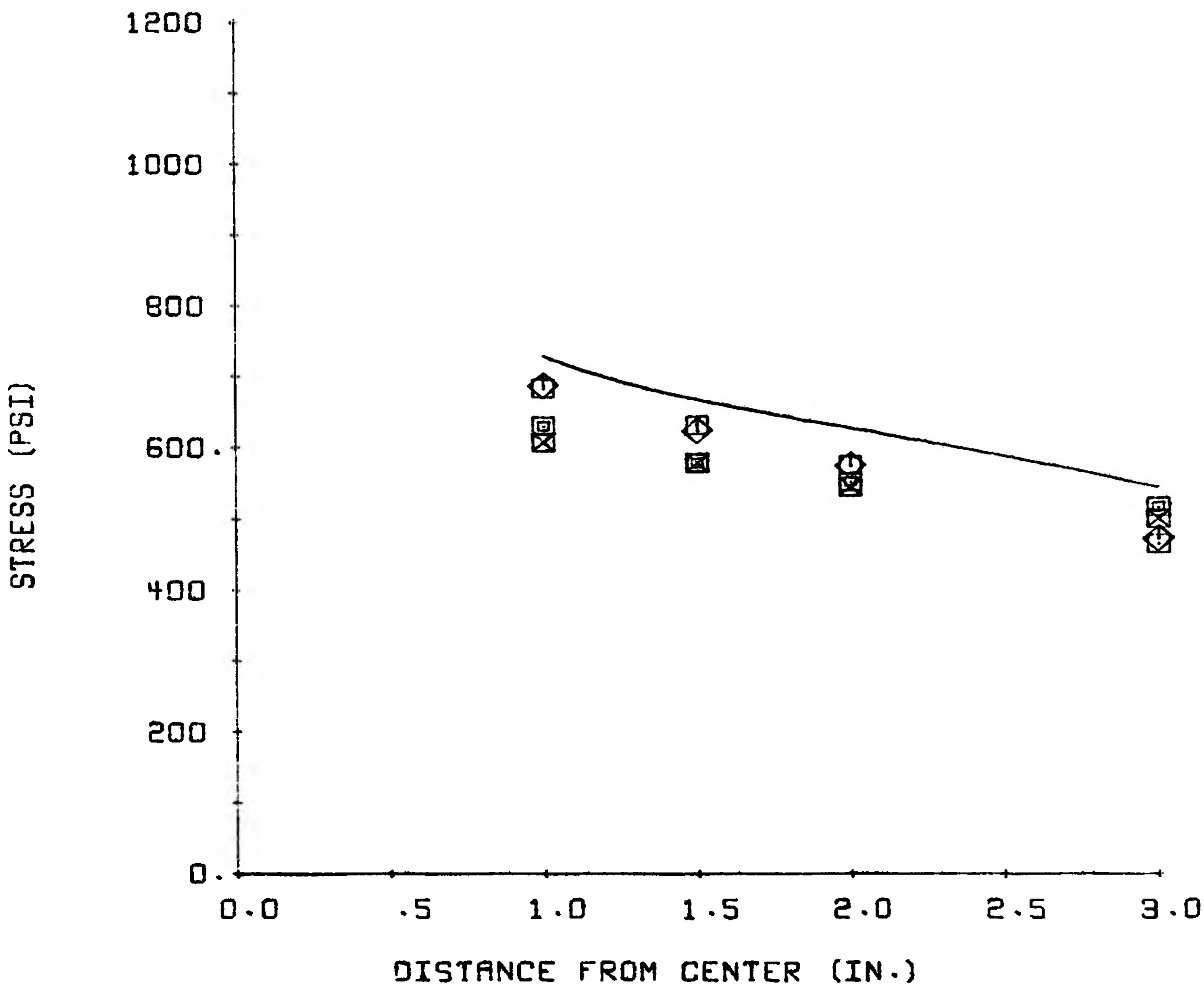

FIGURE 67

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1560 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

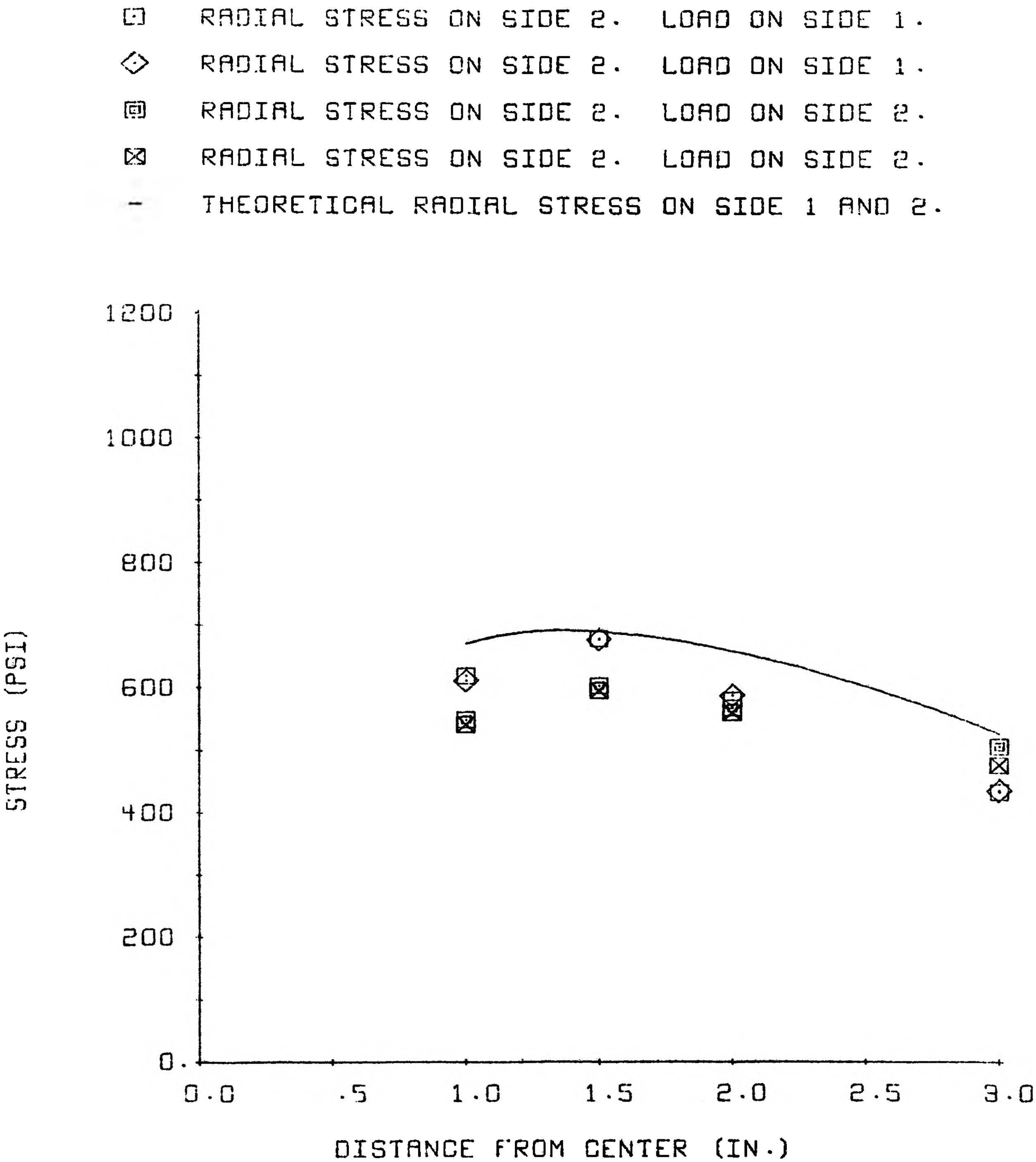

FIGURE 68

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1560 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

⊡ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

\- THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

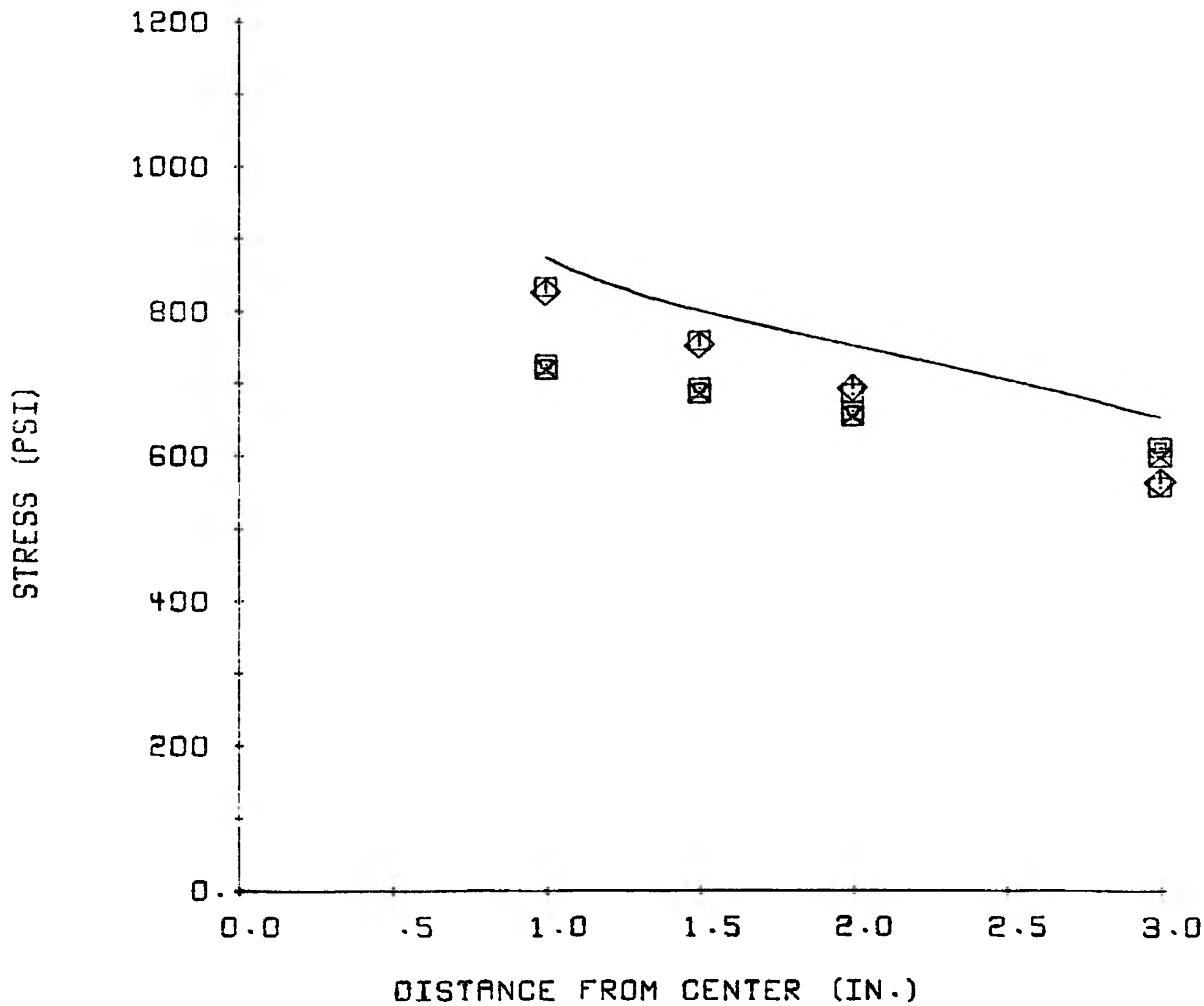

FIGURE 69

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1820 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

⊡ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⧈ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

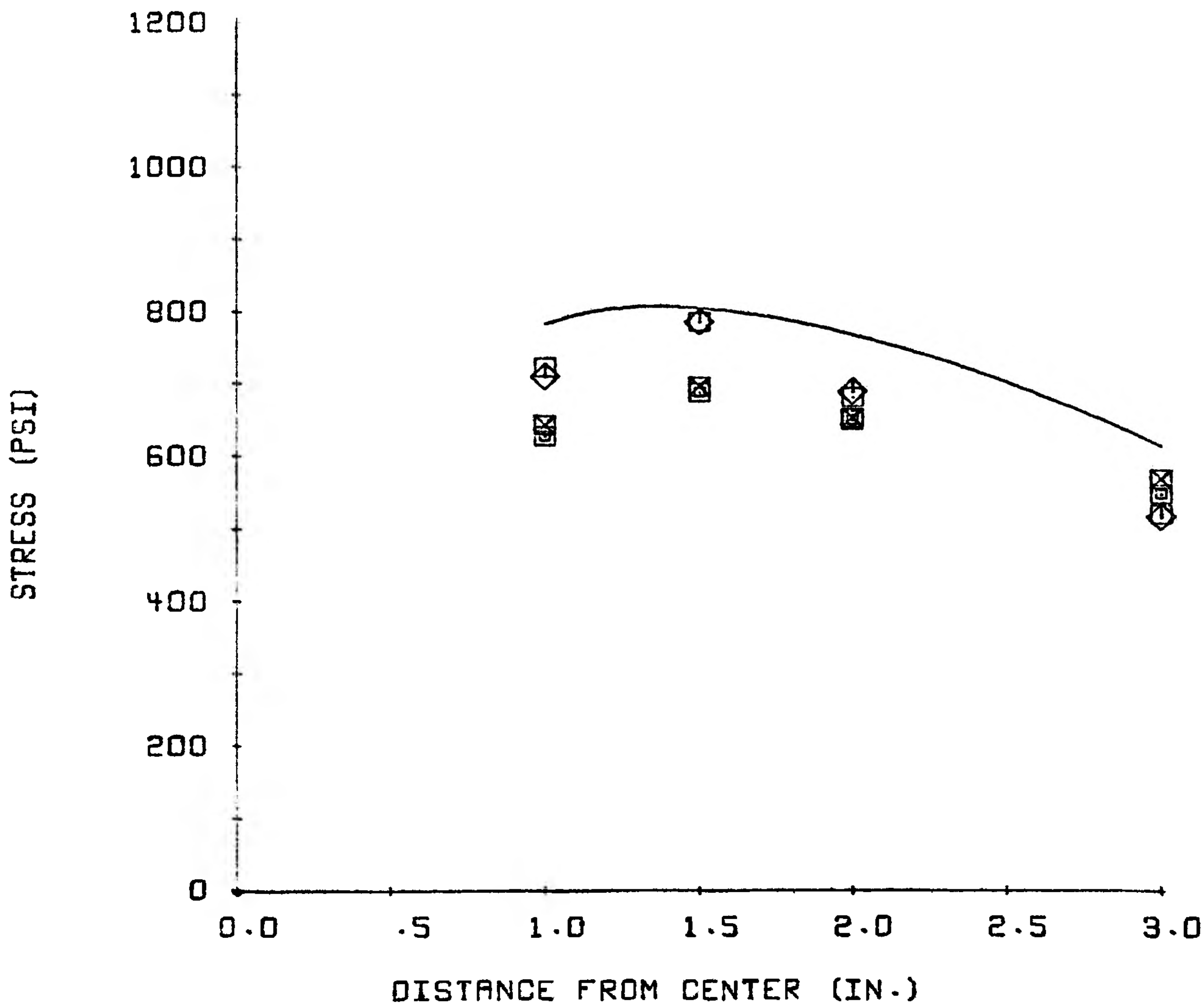

FIGURE 70

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1820 PSI UNIFORM LOAD
0.70 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 1.

⊡ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 2. LOAD ON SIDE 2.

— THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

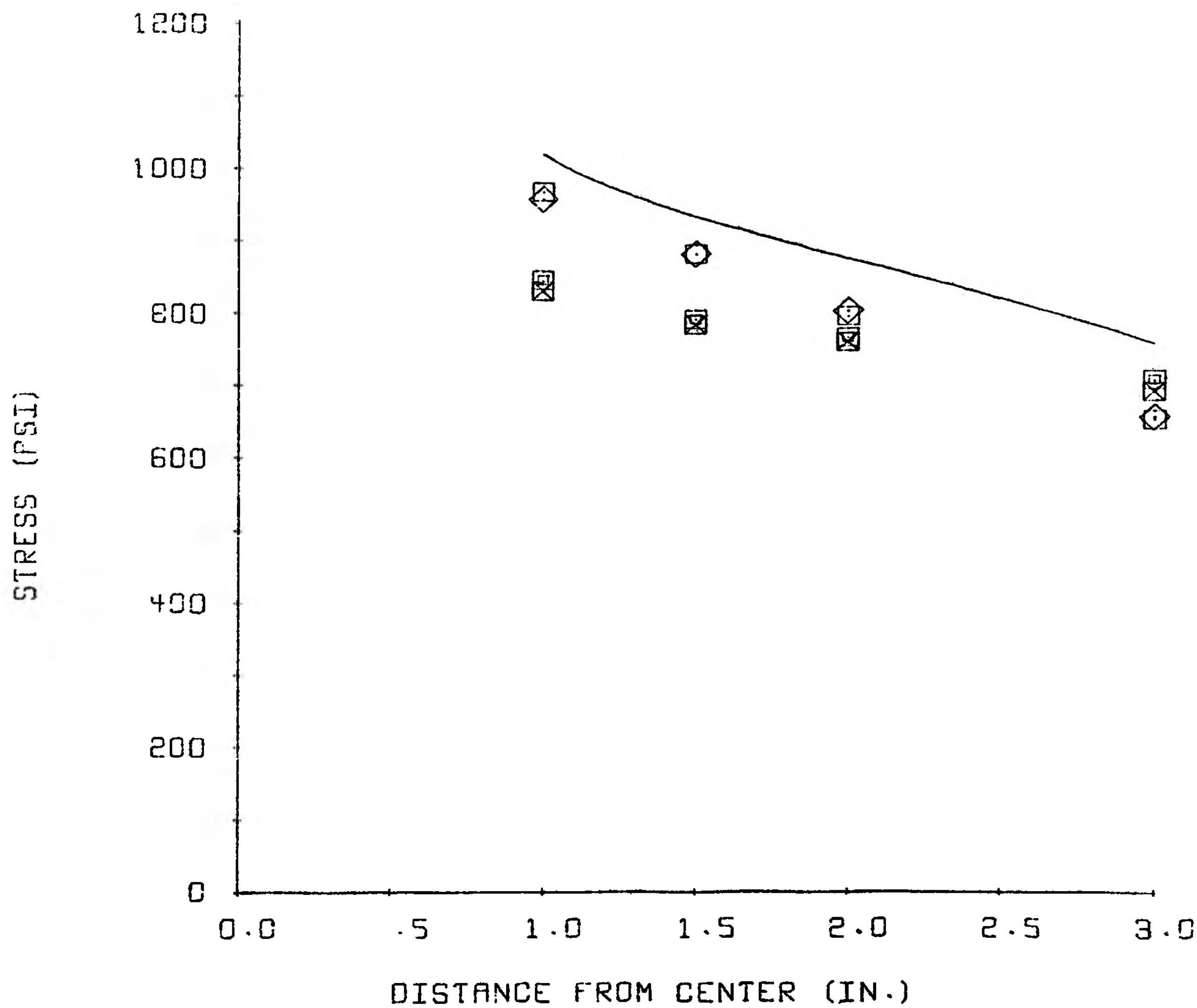

TABLE XIII

EXPERIMENTAL VALUES OF PRINCIPLE STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK, 1.00 IN. DIA. CONCENTRIC HOLE)

TABLE XIII

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK, 1.00 IN. DIA. CONCENTRIC HOLE)

DEVIATION IS CALCULATED FROM THEORETICAL VALUES OF PRINCIPAL STRESSES

THE SQUARES ON FIGURES 71-84 REPRESENT THE FIRST SET OF DATA
THE DIAMONDS ON FIGURES 71-84 REPRESENT THE SECOND SET OF DATA

POSITION (RADIUS) (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)	TANG-ENTIAL STRESS (PSI)	TANG-ENTIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)
			FIRST SET OF DATA				
1.0	.0261	94.8	4.0	.3	166.3	13.5	-3.0
1.0	.0522	184.1	7.5	3.4	330.7	27.0	-2.4
1.0	.0783	267.8	10.5	6.6	493.3	40.5	-1.9
1.0	.1045	360.8	14.5	5.5	654.0	53.5	-1.3
1.0	.1306	437.1	17.5	8.9	794.2	65.0	1.5
1.0	.1567	520.8	21.0	9.7	941.8	77.0	2.7
1.0	.1828	604.5	24.5	10.2	1089.4	89.0	3.6
1.5	.0261	121.1	7.5	-10.9	139.9	10.0	.2
1.5	.0522	234.8	14.0	-8.1	287.5	21.0	-2.4
1.5	.0783	348.5	20.5	-7.1	435.0	32.0	-3.2
1.5	.1045	452.9	26.5	-4.7	569.4	42.0	-1.4
1.5	.1306	557.2	32.5	-3.2	703.9	52.0	-.3
1.5	.1567	657.8	38.0	-1.6	842.1	62.5	0.0
1.5	.1828	756.6	43.5	-.1	974.6	72.5	.7
2.0	.0261	100.6	5.5	5.4	138.1	10.5	-6.3
2.0	.0522	205.0	12.0	3.4	257.6	19.0	.4
2.0	.0783	300.0	17.5	6.0	379.0	28.0	2.3
2.0	.1045	411.9	24.5	2.9	505.9	37.0	2.2
2.0	.1306	497.6	29.5	6.5	614.2	45.0	5.2
2.0	.1567	603.9	36.0	5.3	739.3	54.0	4.9
2.0	.1828	699.0	41.5	6.2	860.6	63.0	5.1
3.0	.0261	83.8	4.5	3.1	117.6	9.0	-5.8
3.0	.0522	167.6	9.0	3.2	235.3	18.0	-5.8
3.0	.0783	268.2	14.5	-3.2	373.5	28.5	-11.0
3.0	.1045	350.2	19.0	-1.1	485.5	37.0	-8.7
3.0	.1306	443.3	24.0	-2.4	616.3	47.0	-10.1
3.0	.1567	519.7	28.0	-.1	726.5	55.5	-8.5
3.0	.1828	611.0	33.0	-.8	851.6	65.0	-8.9
			SECOND SET OF DATA				
1.0	.0261	96.7	4.0	-1.5	171.9	14.0	-6.1
1.0	.0522	187.9	8.0	1.3	327.0	26.5	-1.3
1.0	.0783	282.7	12.0	1.0	493.3	40.0	-1.9
1.0	.1045	375.8	16.0	1.3	654.0	53.0	-1.3
1.0	.1306	470.7	20.0	1.1	820.3	66.5	-1.6
1.0	.1567	550.6	23.0	3.7	971.7	79.0	-.4
1.0	.1828	641.8	27.0	3.8	1126.8	91.5	.1
1.5	.0261	147.3	9.5	-26.7	158.6	11.0	-11.5
1.5	.0522	249.8	15.0	-13.6	302.4	22.0	-7.2
1.5	.0783	370.9	22.0	-12.7	457.4	33.5	-7.9
1.5	.1045	469.7	27.5	-8.1	590.0	43.5	-4.8
1.5	.1306	585.2	34.0	-7.8	743.1	55.0	-5.6
1.5	.1567	683.9	39.5	-5.3	875.7	65.0	-3.8
1.5	.1828	793.9	46.0	-4.8	1012.0	75.0	-2.9
2.0	.0261	141.6	8.5	-25.1	171.7	12.5	-24.6
2.0	.0522	270.2	16.0	-21.4	334.1	24.5	-22.5
2.0	.0783	370.8	21.5	-14.2	472.3	35.0	-17.8
2.0	.1045	475.3	28.0	-10.7	591.8	43.5	-12.5
2.0	.1306	579.6	34.0	-8.5	726.2	53.5	-10.9
2.0	.1567	676.5	39.5	-5.9	853.2	63.0	-9.0
2.0	.1828	760.4	44.0	-2.3	970.9	72.0	-6.7
3.0	.0261	80.0	4.0	8.0	121.4	9.5	-8.7
3.0	.0522	171.3	9.0	1.0	246.5	19.0	-10.1
3.0	.0783	260.7	13.5	-.4	381.0	29.5	-12.7
3.0	.1045	340.8	17.5	1.5	502.4	39.0	-11.8
3.0	.1306	432.0	22.0	.1	642.5	50.0	-13.8
3.0	.1567	500.9	25.5	3.6	745.3	58.0	-10.8
3.0	.1828	594.0	30.5	1.9	876.0	68.0	-11.4

TABLE XIV

EXPERIMENTAL VALUES OF PRINCIPLE STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK, 1.00 IN. DIA. CONCENTRIC HOLE)

TABLE XIV

EXPERIMENTAL VALUES OF PRINCIPAL STRESSES FOR A SIMPLY SUPPORTED CIRCULAR PLATE (10.413 IN. DIA., 0.081 IN. THICK, 1.00 IN. DIA. CONCENTRIC HOLE)

DEVIATION IS CALCULATED FROM THEORETICAL VALUES OF PRINCIPAL STRESSES

TWO CONCENTRIC SQUARES ON FIGURES 71-84 REPRESENT THE THIRD SET OF DATA
AN X WITHIN A SQUARE ON FIGURES 71-84 REPRESENTS THE FOURTH SET OF DATA

POSITION (RADIUS) (IN.)	LOAD (PSI)	RADIAL STRESS (PSI)	RADIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)	TANGENTIAL STRESS (PSI)	TANGENTIAL STRAIN (μIN./IN.)	DEVIATION (PER CENT)
				THIRD SET OF DATA			
1.0	.0261	113.5	5.5	-16.1	177.4	14.0	-9.1
1.0	.0522	199.1	9.0	-4.3	330.7	26.5	-2.4
1.0	.0783	292.1	13.0	-2.2	491.4	39.5	-1.5
1.0	.1045	383.3	17.0	-.6	646.5	52.0	-.2
1.0	.1306	476.3	21.0	0.0	807.2	65.0	0.0
1.0	.1567	575.0	25.5	-.6	969.7	78.0	-.2
1.0	.1828	671.8	30.0	-.7	1126.6	90.5	.2
1.5	.0261	119.2	7.0	-9.5	149.3	11.0	-6.0
1.5	.0522	225.5	13.0	-4.3	289.4	21.5	-3.0
1.5	.0783	342.9	20.0	-5.6	433.1	32.0	-2.8
1.5	.1045	437.9	25.0	-1.4	569.5	42.5	-1.4
1.5	.1306	559.1	32.5	-3.5	709.5	52.5	-1.1
1.5	.1567	663.5	38.5	-2.4	843.9	62.5	-.2
1.5	.1828	780.9	45.5	-3.2	987.7	73.0	-.5
2.0	.0261	100.6	5.5	5.4	138.1	10.5	-6.3
2.0	.0522	210.6	12.5	.7	259.5	19.0	-.3
2.0	.0783	313.1	18.5	1.6	388.3	28.5	0.0
2.0	.1045	421.3	25.5	.7	504.0	36.5	2.6
2.0	.1306	527.6	32.0	.5	629.1	45.5	2.7
2.0	.1567	633.8	38.5	.4	754.1	54.5	2.9
2.0	.1828	745.7	45.5	-.4	881.1	63.5	2.7
3.0	.0261	104.3	6.0	-17.1	134.4	10.0	-17.5
3.0	.0522	201.2	11.5	-13.9	261.4	19.5	-15.2
3.0	.0783	301.9	17.5	-14.0	384.6	28.5	-13.6
3.0	.1045	396.9	23.0	-12.7	506.0	37.5	-12.4
3.0	.1306	505.1	29.5	-14.3	636.6	47.0	-13.0
3.0	.1567	602.0	35.0	-13.7	763.6	56.5	-12.9
3.0	.1828	715.7	42.0	-15.3	896.1	66.0	-13.4
				FOURTH SET OF DATA			
1.0	.0261	83.6	3.0	13.7	162.6	13.5	-.8
1.0	.0522	202.8	9.0	-6.0	341.9	27.5	-5.6
1.0	.0783	294.0	13.0	-2.8	497.0	40.0	-2.6
1.0	.1045	375.8	16.0	1.3	654.0	53.0	-1.3
1.0	.1306	463.2	19.5	2.7	812.8	66.0	-.7
1.0	.1567	565.6	24.5	1.0	971.6	78.5	-.4
1.0	.1828	651.2	28.0	2.3	1124.9	91.0	.3
1.5	.0261	113.6	6.5	-5.0	147.5	11.0	-4.8
1.5	.0522	229.2	13.0	-5.8	300.6	22.5	-6.6
1.5	.0783	344.7	20.0	-6.1	438.7	32.5	-4.0
1.5	.1045	451.0	26.0	-4.3	578.8	43.0	-3.0
1.5	.1306	560.9	32.0	-3.8	730.1	54.5	-3.9
1.5	.1567	672.8	39.0	-3.7	857.0	63.5	-1.7
1.5	.1828	782.7	45.5	-3.5	993.3	73.5	-1.1
2.0	.0261	111.8	6.5	-5.1	141.9	10.5	-8.8
2.0	.0522	231.1	14.0	-8.2	276.2	20.0	-6.3
2.0	.0783	326.2	19.5	-2.4	397.6	29.0	-2.4
2.0	.1045	438.1	26.5	-3.1	524.5	38.0	-1.3
2.0	.1306	536.9	32.5	-1.2	642.1	46.5	.7
2.0	.1567	645.1	39.5	-1.3	757.8	54.5	2.4
2.0	.1828	742.0	45.5	0.0	869.8	62.5	4.0
3.0	.0261	104.3	6.0	-17.1	134.4	10.0	-17.5
3.0	.0522	208.7	12.0	-17.0	268.8	20.0	-17.5
3.0	.0783	305.6	17.5	-15.0	395.8	29.5	-16.0
3.0	.1045	396.9	22.5	-12.7	520.9	39.0	-14.9
3.0	.1306	499.4	28.5	-13.3	649.8	48.5	-14.7
3.0	.1567	596.3	34.0	-12.9	776.7	58.0	-14.4
3.0	.1828	682.0	39.0	-11.1	885.0	66.0	-12.3

FIGURE 71

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0261 PSI UNIFORM LOAD
1.00 IN. DIAMETER CONCENTRIC HOLE

□ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

⊡ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

— THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

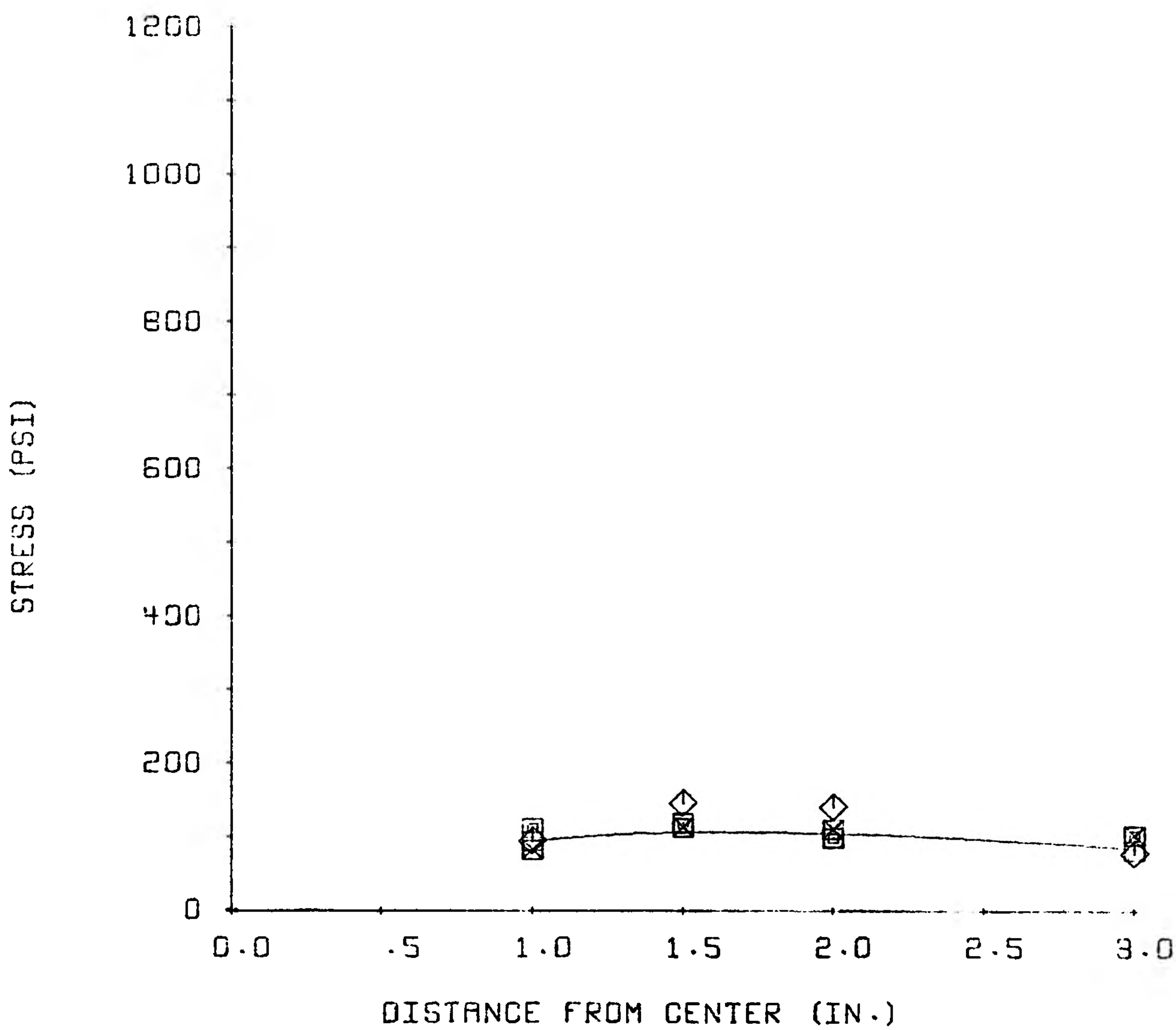

FIGURE 72

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0261 PSI UNIFORM LOAD
1.00 IN. DIAMETER CONCENTRIC HOLE

⊡ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

⊡ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

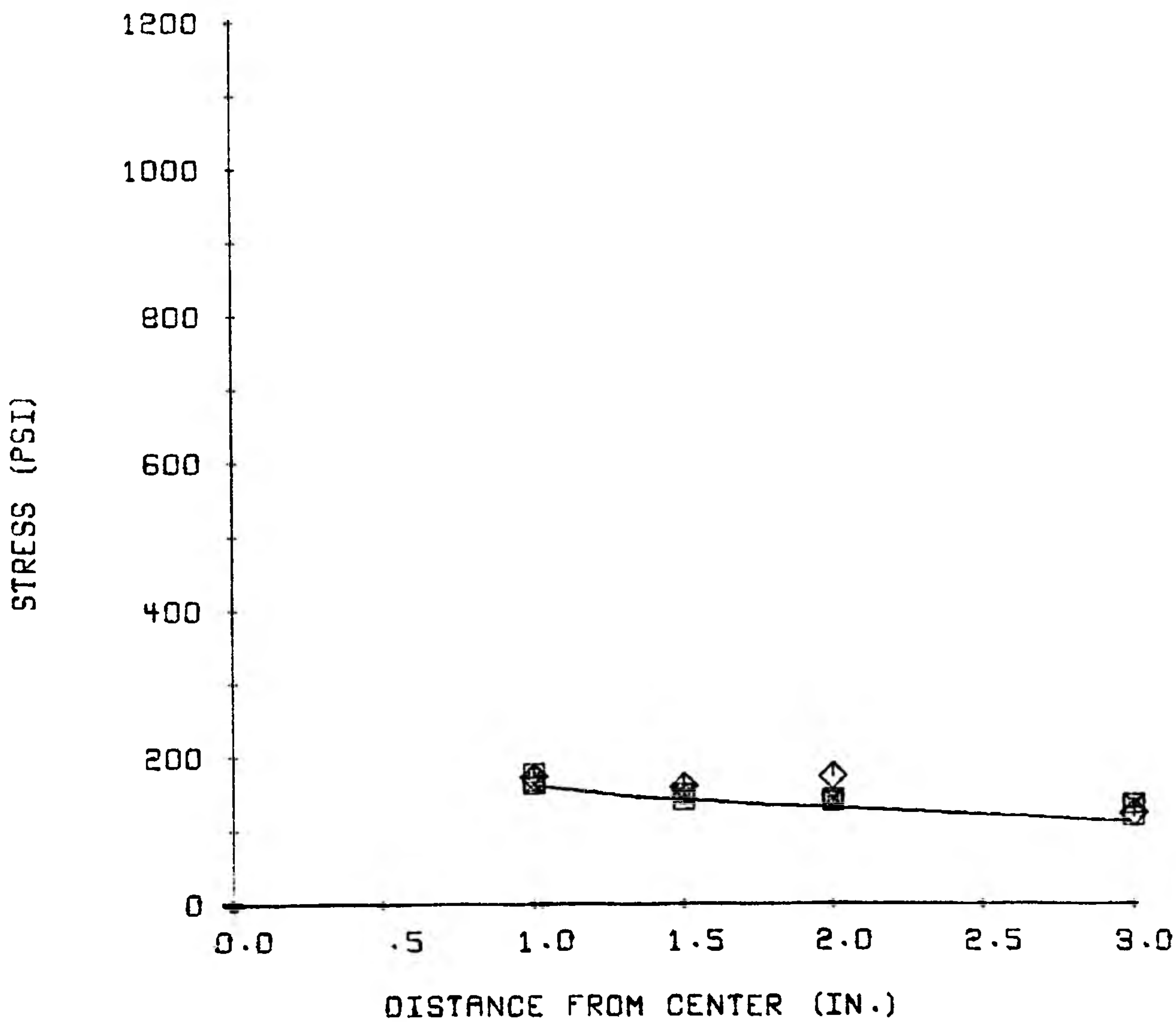

FIGURE 73

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0522 PSI UNIFORM LOAD
1.00 IN. DIAMETER CONCENTRIC HOLE

◻ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

▣ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

– THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

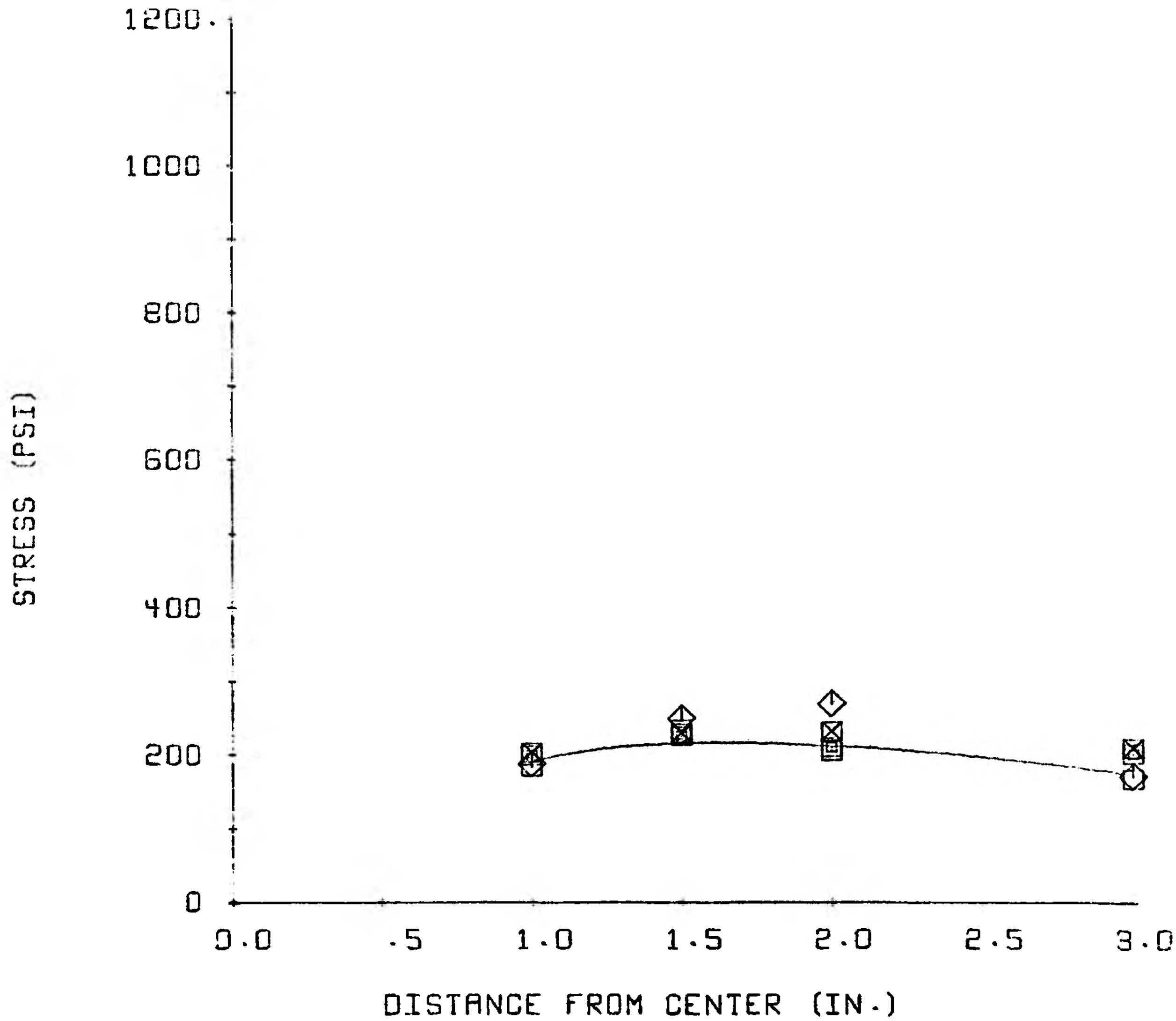

FIGURE 74

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0522 PSI UNIFORM LOAD
1.00 IN. DIAMETER CONCENTRIC HOLE

⊡ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

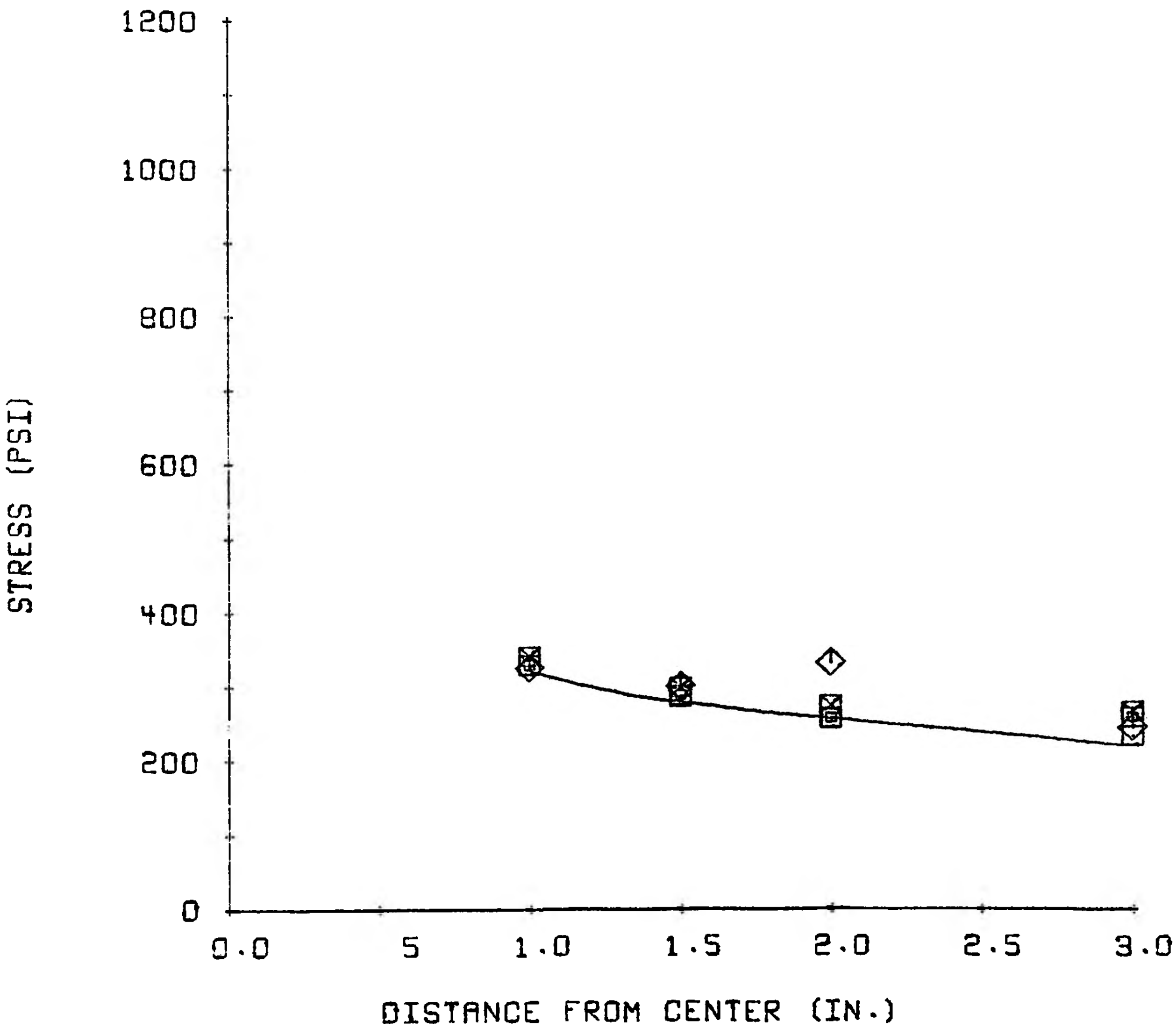

FIGURE 75

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0783 PSI UNIFORM LOAD
1.00 IN. DIAMETER CONCENTRIC HOLE

□ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

▣ RADIAL STRESS ON SIDE 1 LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

\- THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

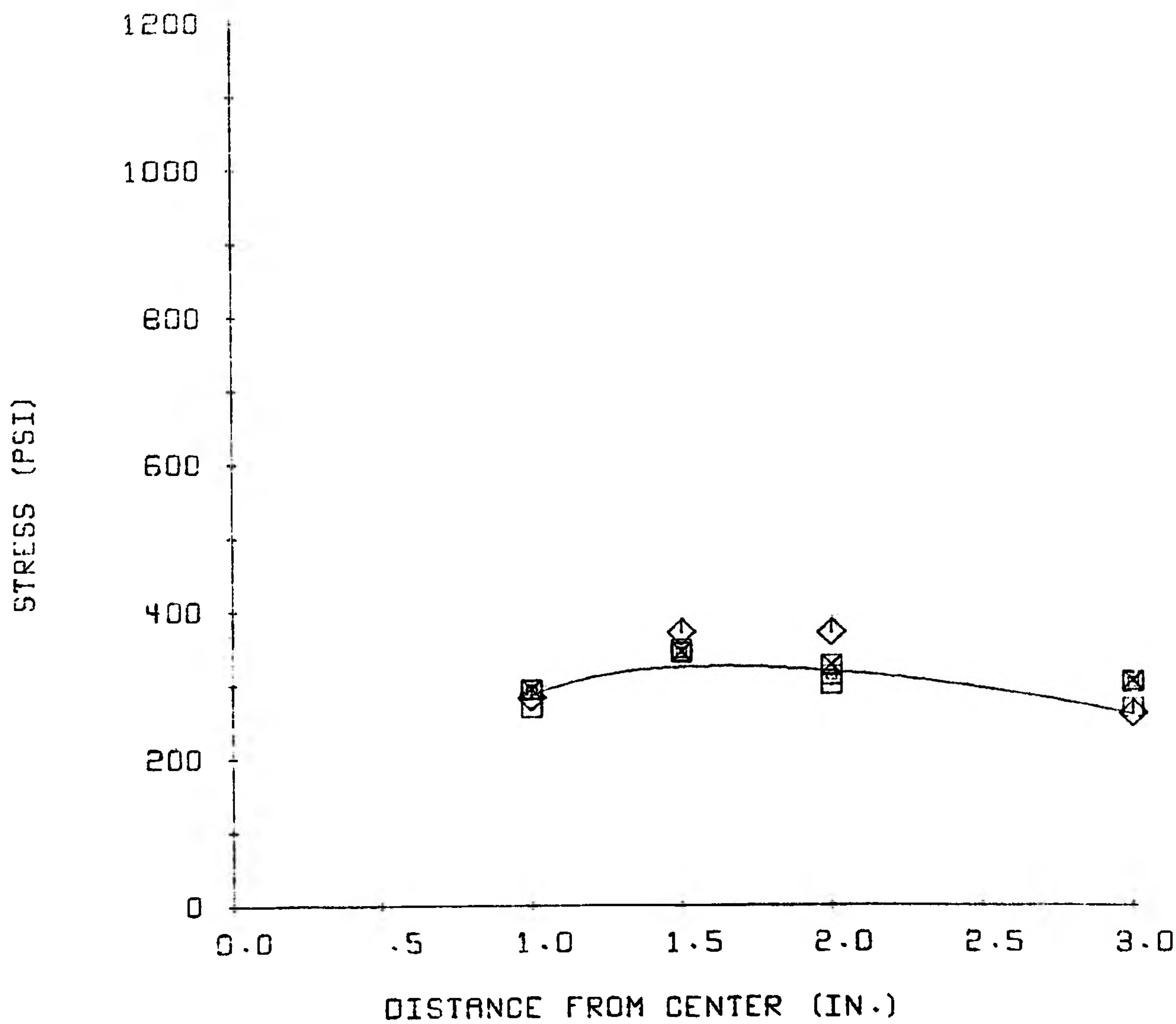

FIGURE 76

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .0783 PSI UNIFORM LOAD
1.00 IN. DIAMETER CONCENTRIC HOLE

⊡ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

⧉ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

\- THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

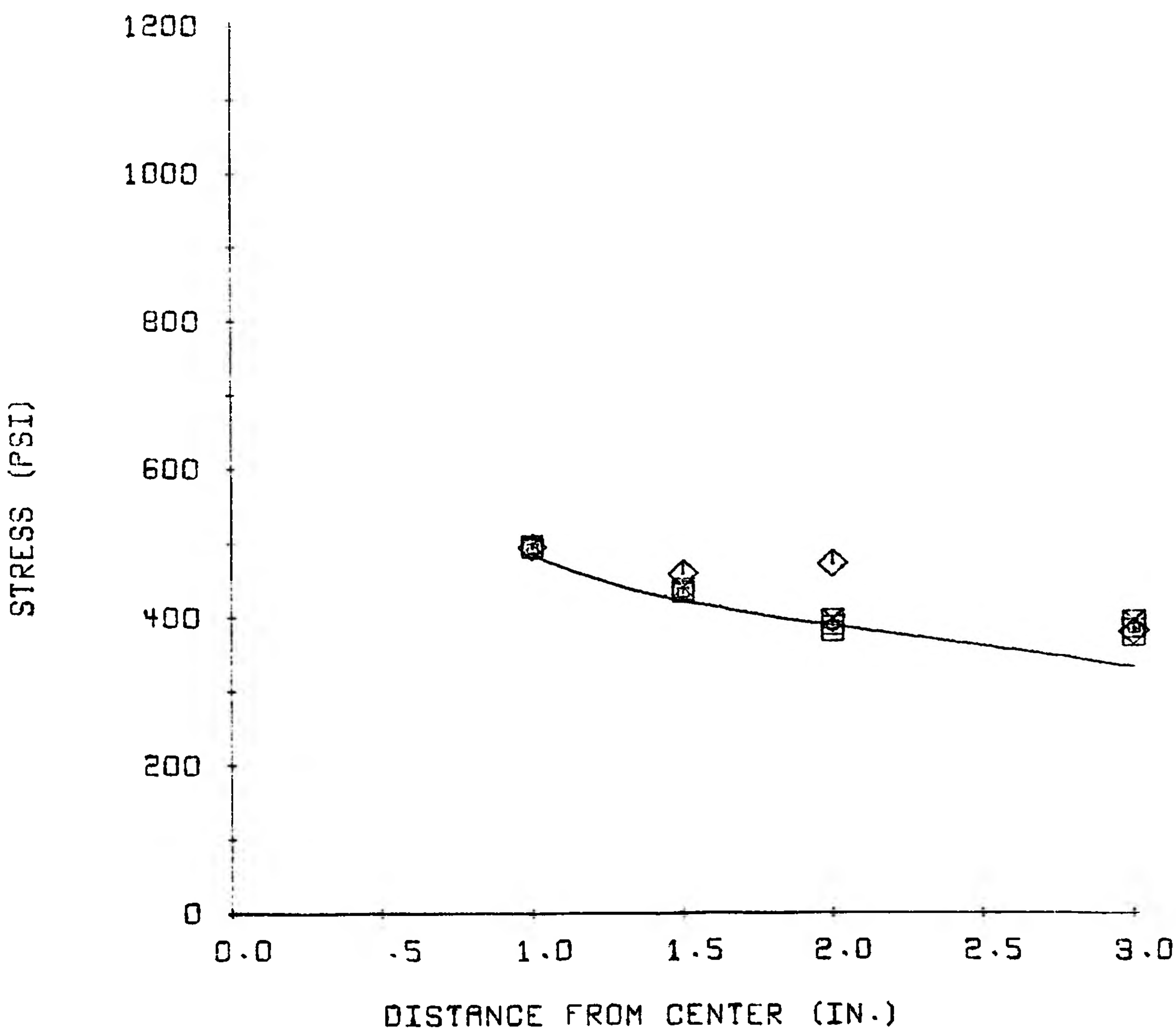

FIGURE 77

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1045 PSI UNIFORM LOAD
1.00 IN. DIAMETER CONCENTRIC HOLE

□ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

⊡ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

– THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

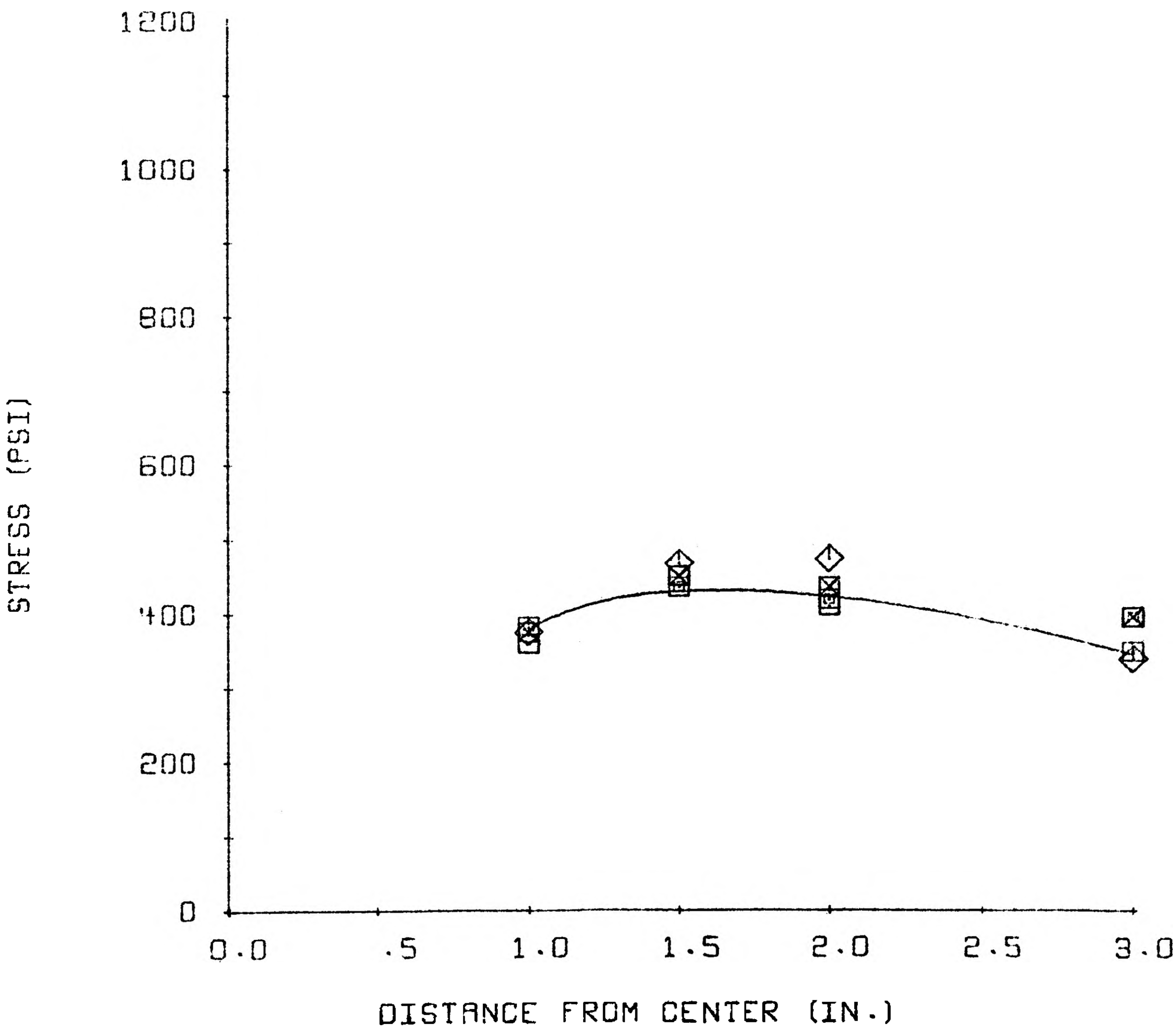

FIGURE 78

STRESS DISTRIBUTTON IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1045 PSI UNIFORM LOAD
1.00 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON STDE 1 AND 2.

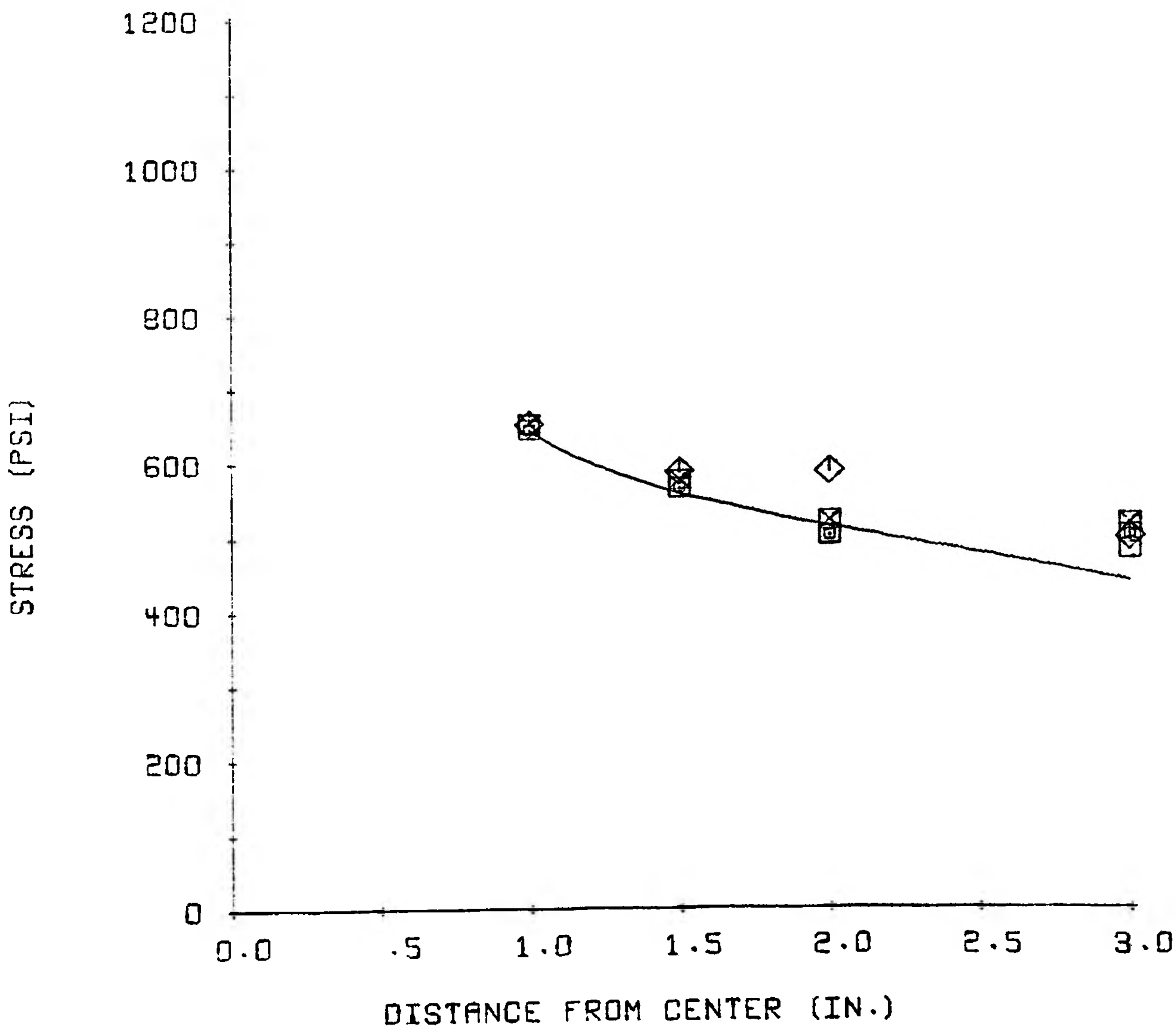

FIGURE 79

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1306 PSI UNIFORM LOAD
1.00 IN. DIAMETER CONCENTRIC HOLE

□ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

▣ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

– THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

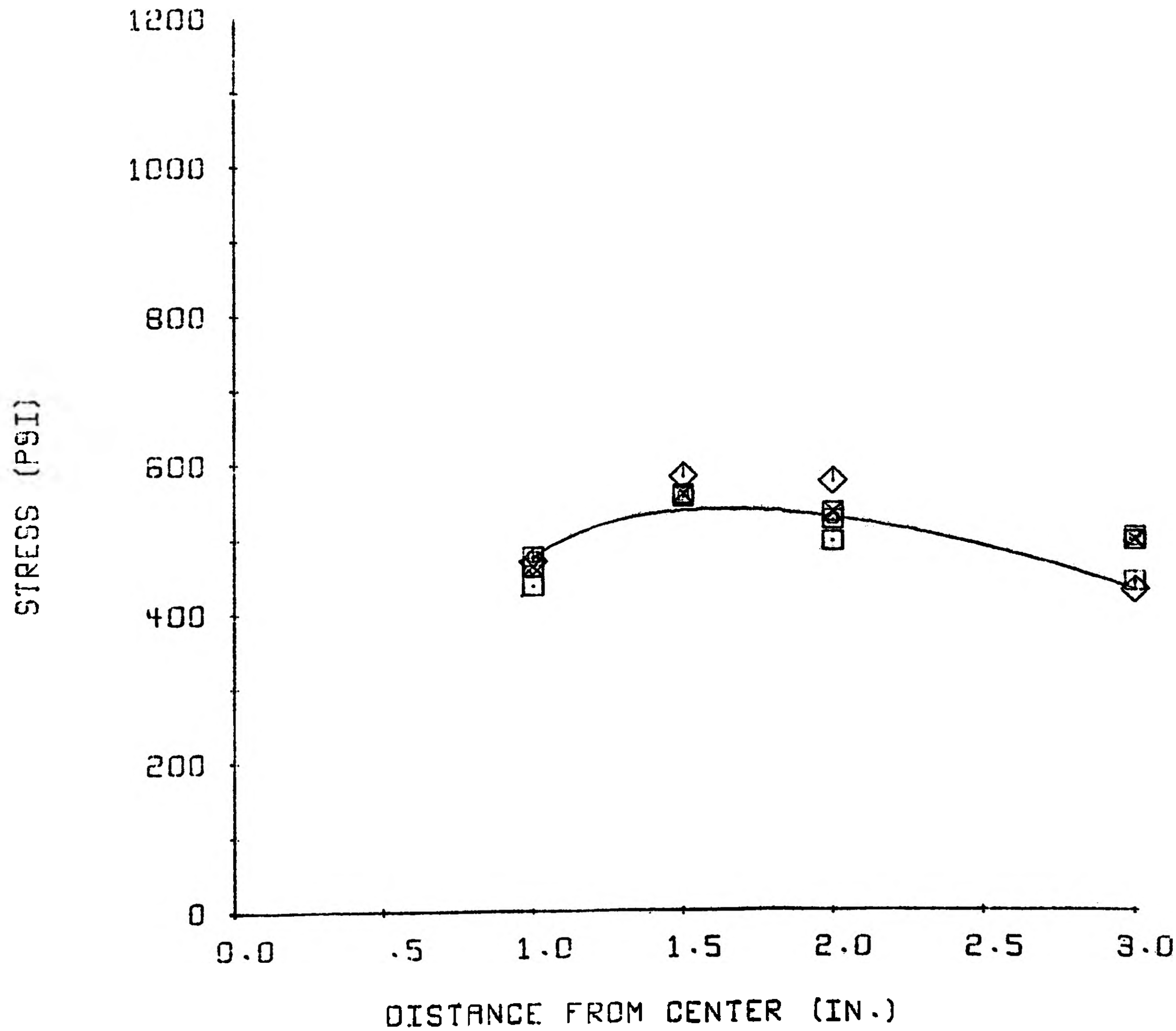

FIGURE 80

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1306 PSI UNIFORM LOAD
1.00 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

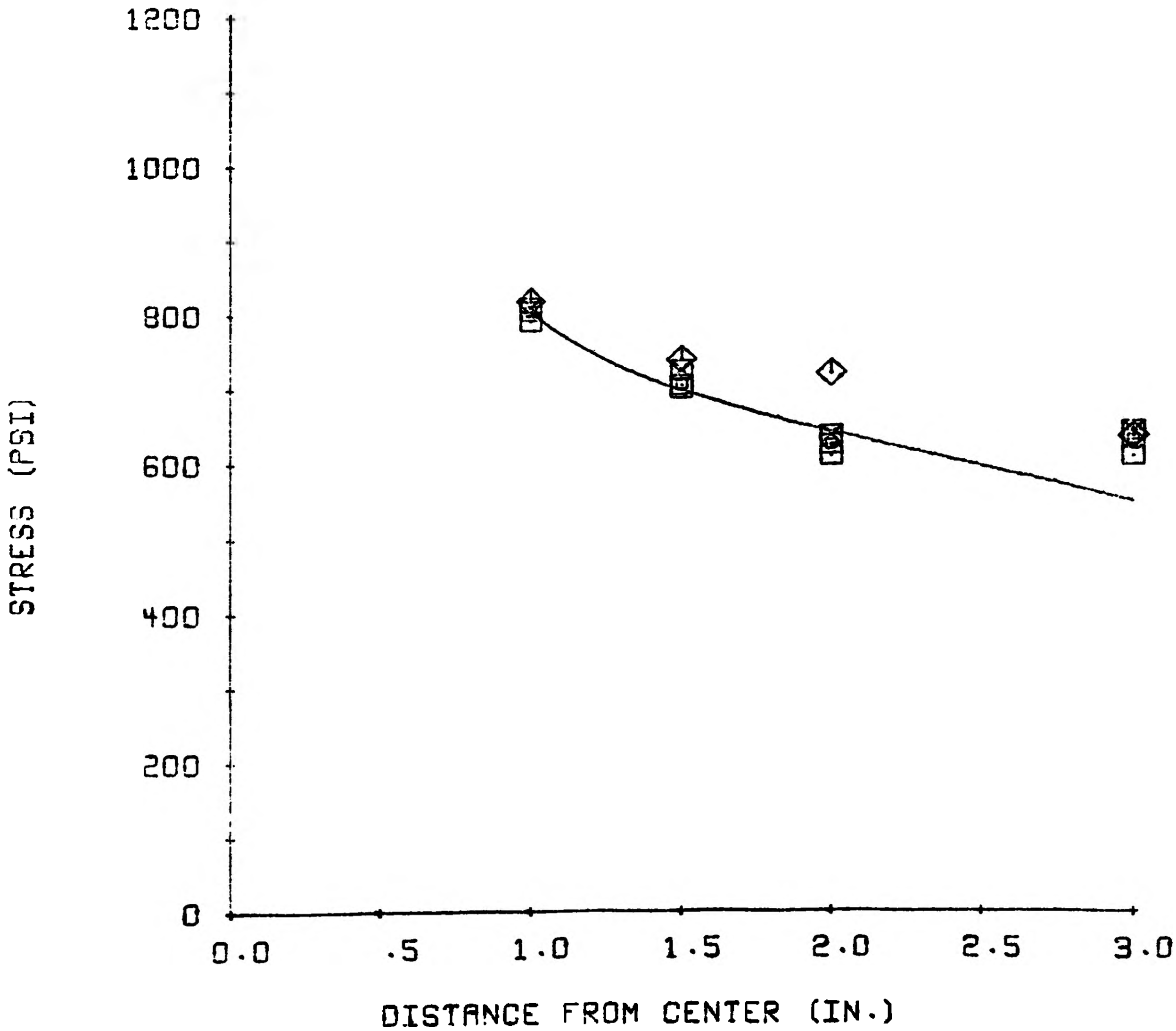

FIGURE 61

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1567 PSI UNIFORM LOAD
1.00 IN. DIAMETER CONCENTRIC HOLE

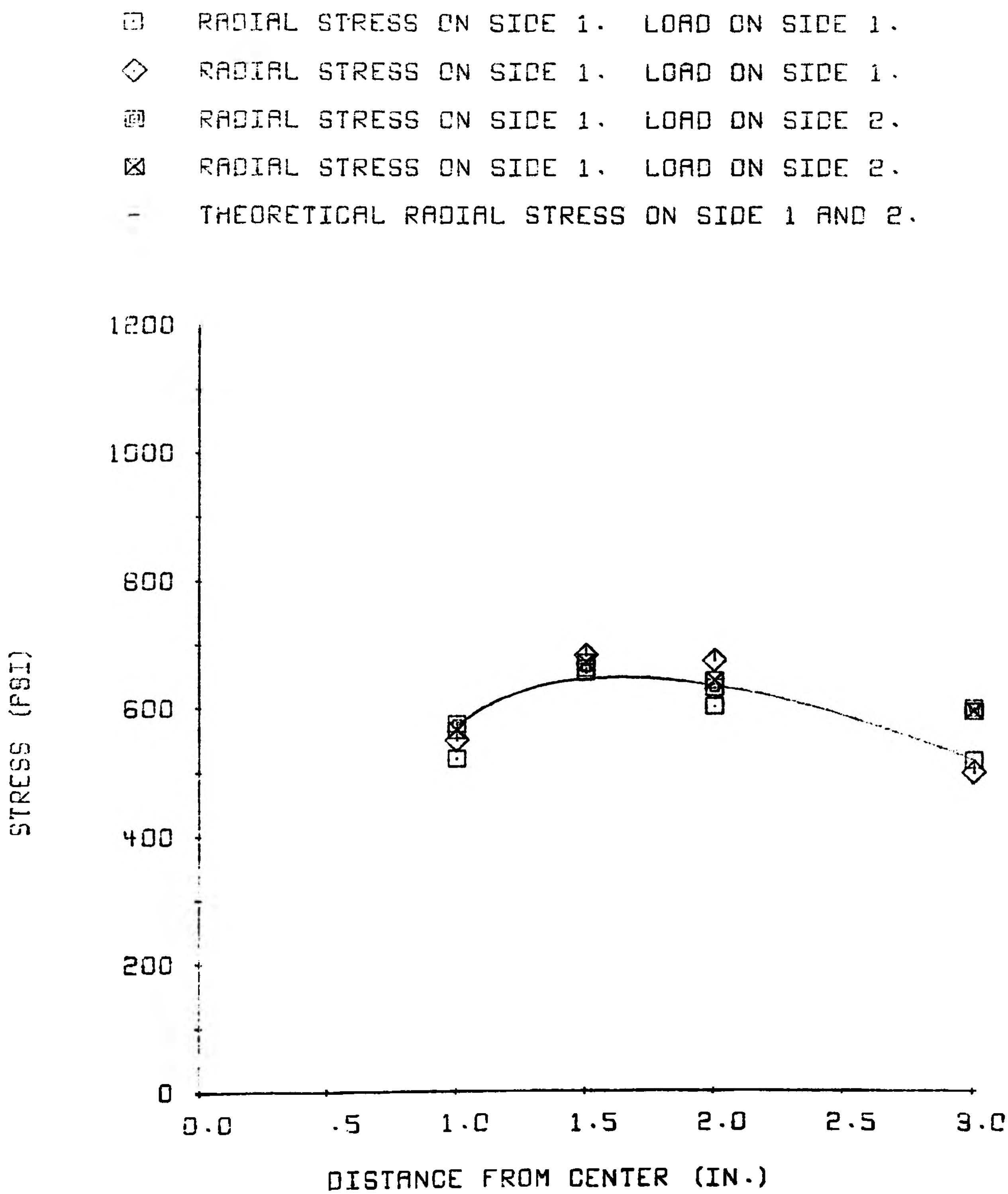

FIGURE 82

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1567 PSI UNIFORM LOAD
1.00 IN. DIAMETER CONCENTRIC HOLE

- ⊡ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.
- ◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.
- ▣ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.
- ⊠ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.
- — THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.

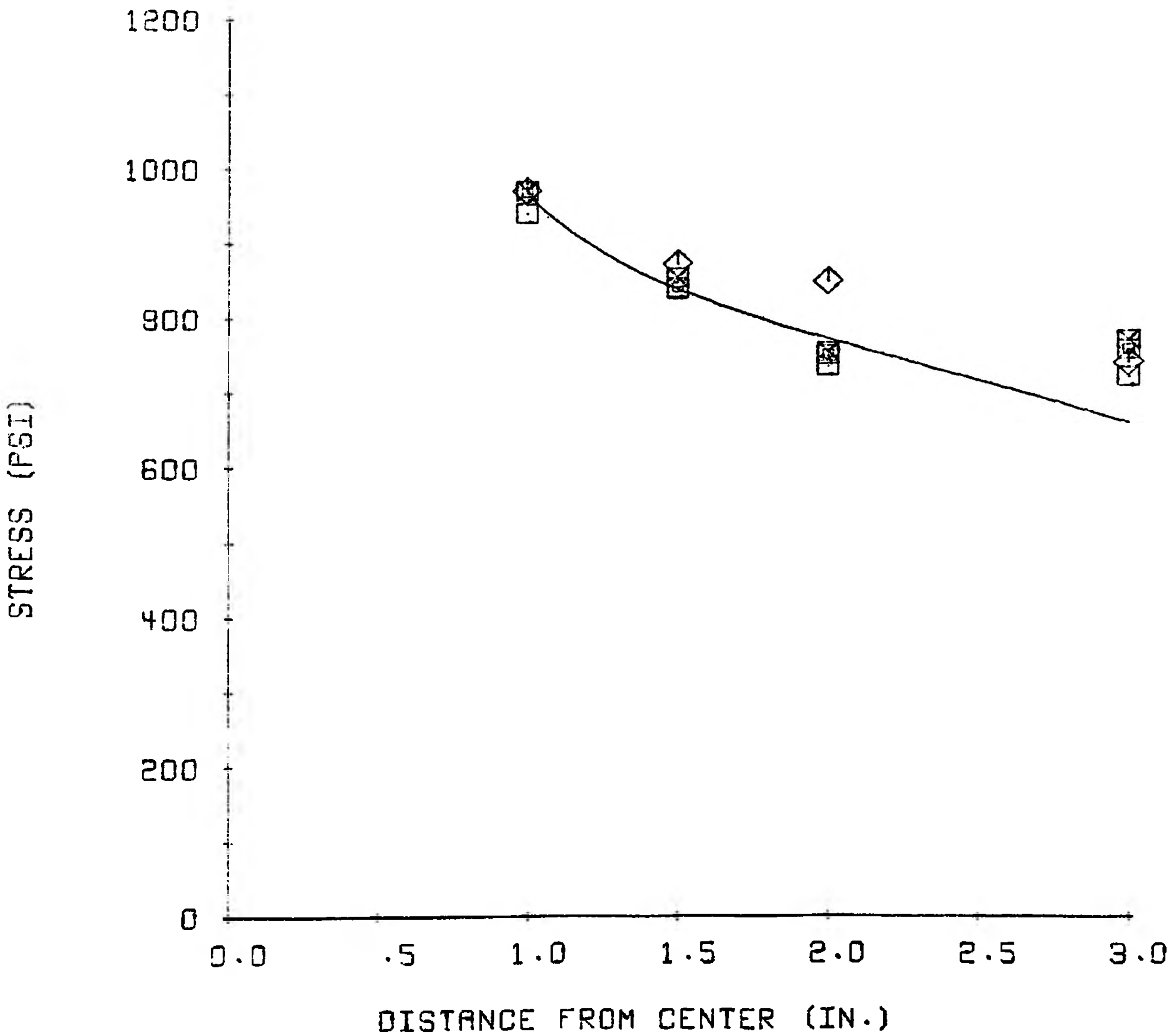

FIGURE 83

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1828 PSI. UNIFORM LOAD
1.00 IN. DIAMETER CONCENTRIC HOLE

⊡ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1

◇ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

▣ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ RADIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

— THEORETICAL RADIAL STRESS ON SIDE 1 AND 2.

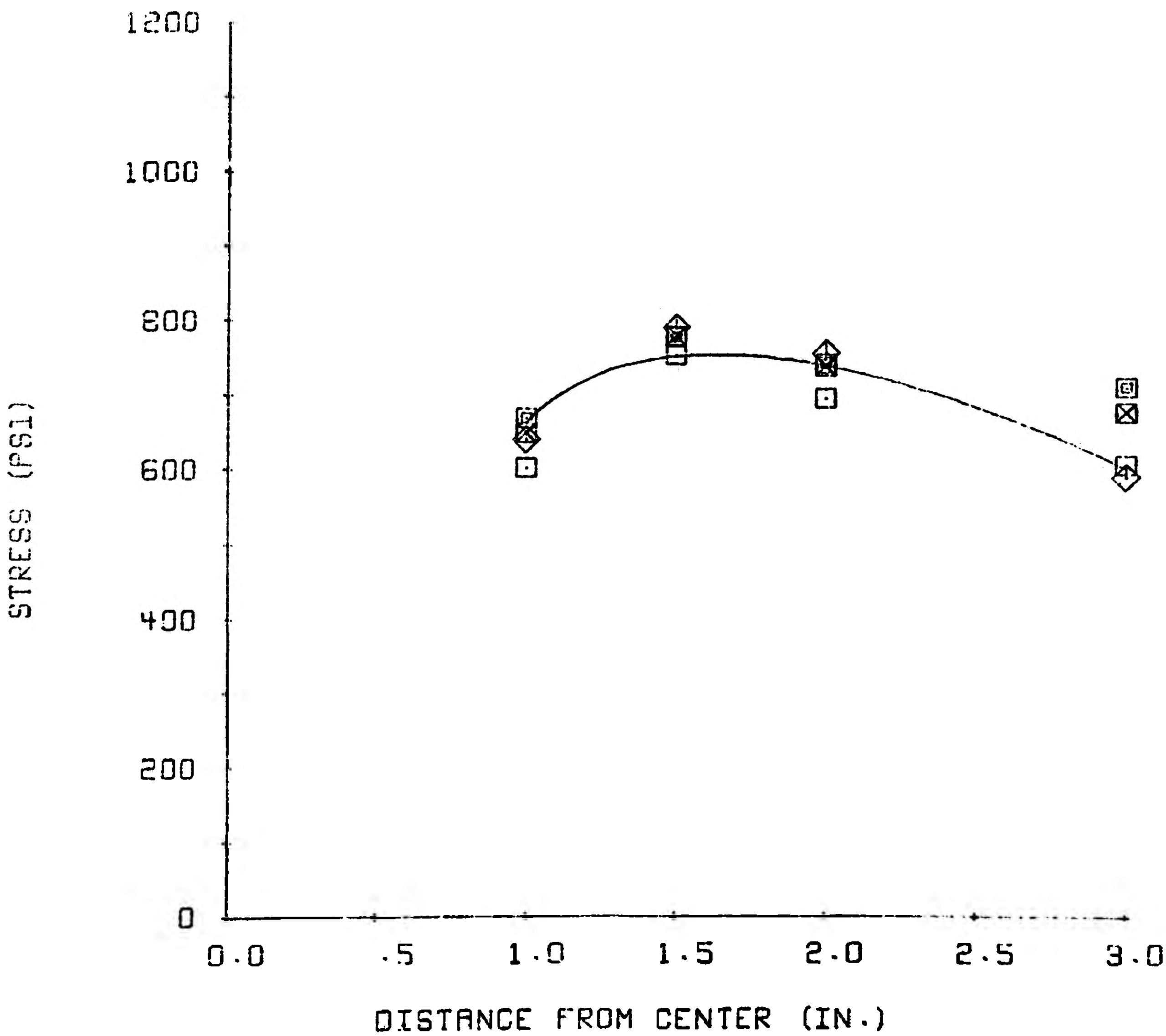

FIGURE 84

STRESS DISTRIBUTION IN A THIN CIRCULAR PLATE

10.413 IN. DIAMETER--0.081 IN. THICK
SIMPLY SUPPORTED-- .1828 PSI UNIFORM LOAD
1.00 IN. DIAMETER CONCENTRIC HOLE

□ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

◇ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 1.

▣ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

⊠ TANGENTIAL STRESS ON SIDE 1. LOAD ON SIDE 2.

– THEORETICAL TANGENTIAL STRESS ON SIDE 1 AND 2.