# THE EFFECTS OF NEARPOINT STRESS ON HORIZONTAL FIXATION DISPARITY UNDER OPEN LOOP CONDITIONS

By

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Presented To

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## ABSTRACT

Fixation disparity measurements at near continue to become increasingly useful for prescribing near point lenses, visual therapy, and prism, as well as identifying binocular anomalies. The intent of this study was to evaluate the effects of nearpoint reading stress on one's fixation disparity curve under conditions where accommodation or convergence were virtually eliminated.

Visually the curves tended to be steeper with increased exo fixation disparity toward the base out side following reading monocularly to open the vergence loop. The poststress curves following reading through multiple pinholes binocularly were not as significant, but tended to become more eso with base out prism and the central portion of the curve generally flattened with a decrease in measured fixation disparity.

## INTRODUCTION

Fixation disparity is a small misalignment of the two eyes that occurs during binocular fusion. The fusional vergence system is under control of a fast neural integrator which aligns the eyes and a slow neural integrator which maintains binocular alignment. A control systems approach proposed by Saladin [1] presents the vergence mechanism as a dual interactive negative feedback model with provisions for some separation of the divergent and convergent disparity vergence controllers. A summary of the control model follows.

The control model is best understood by first viewing it as having two parts, one for the accommodation mechanism and one for the fusional or disparity vergence mechanism. The accommodation mechanism is a continuously sampling negative feedback system with blur detectors which keep sending innervation to the ciliary muscle for more lens change until no blur is recognized.

The disparity vergence system is more complicated, but works in essentially the same way as a negative feedback system. Disparity detectors in the cortex send innervation to the controller which, in turn, sends innervation to the extraocular muscles to begin a vergence movement. The disparity detectors not only recognize the magnitude of the disparity but also if it is crossed (exo) or uncrossed (eso) disparity. These eso and exo disparity detectors have a short time constant but a relatively low gain. To prevent the feedback mechanism from ever reaching a null position, which would cause loss of necessary innervation and the eyes would drift, Krishnam and Stark [2] hypothesized that the forward controller "leaks" innervation. This innervation leaks to the slow vergence adaption (SVA) mechanism, located between the forward controller and the extraocular muscles, which has a long time constant and high amplifier to take the load off the forward controller. Evidence exists from Vaegan[3] that the SVA has an eso and an exo disparity side also.

It should also be noted that the accommodation controller sends innervation down to the vergence mechanism and the accommodative convergence innervation enters the disparity vergence loop after the SVA mechanism; therefore, the SVA cannot be excersized directly through stimulation of the accommodation controller. Figure 1 summarizes the above described control model.

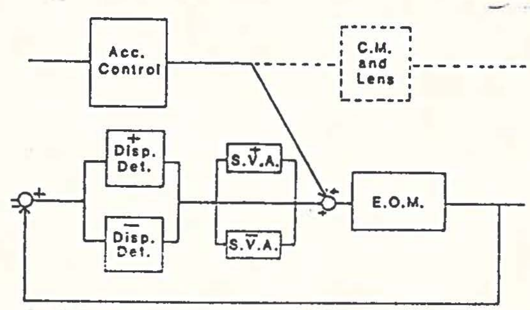



FIGURE 1

Fixation disparity was first studied by Ogle over thirty years ago and was originally believed to be equal to the phoria measurement.[4] It is common for the phoria and fixation disparity to be in the same direction, but this is not always the case. In addition, there is a large difference in amplitudes of associated and dissociated measures of heterophoria and this seems to result from slow fusional vergence that is activated only during binocular fusion.

Prolonged nearpoint fixation coupled with information processing demands produces stress that results in changes of accommodation and convergence functions. Clinically, fixation disparity analysis has been found to be a relatively good indicator of binocular visual function and will be the basis of this investigation.

There is growing evidence that strenuous visual tasks induce change of oculomotor tonus. In a more recent investigation by Owens and Wolf-Kelly[5] they conclude that current data provides new evidence that near reading induces significant changes in the resting posture after reading. Schor and Tsuetaki[6] suggest individuals who have strong adaption of one system (accommodation or vergence) with moderate to low adaption of the other system, have fatigue of their more adaptable system following either a vergence tracking or an accommodative tracting task. This fatigue is likely to occur centrally at sites where adaptable tonic accommodation and tonic vergence are controlled and perhaps at sites where phasic responses of optical reflex accommodation and disparity vergence are controlled. This fatigue of adaptable tonic mechanism is produced by both direct stimulation as well as cross-linked interactions between accommodation and vergence. Furthermore, they found ramp tracking exercises of either accommodation or vergence resulted in fatigue associated with an increase of accommodative vergence and vergence accommodation.

Prior investigation of the effect of nearpoint stress on the horizontal fixation disparity curve was carried out by Garzia and Dyer[7]. However, their research looked at the effects after reading 25 minutes under normal binocular vision with the vergence and accommodation loops intact. Their data concluded that prior nearpoint stress did not effect the fixation disparity curve of asymptomatic patients with normal binocular vision, but had a significant effect on symptomatic patients with large fixation disparities or steep curves prior to reading. Their further investigation of a 15- and 30-minute poststress recovery curve indicated a clear trend for the fixation disparity measurement to return to baseline however.

METHOD

Data was gathered on 30 subjects selected from the faculty, staff and student body at Ferris State University. Subjects were without subjective complaints and objective signs indicating a binocular anomaly. Phoria measurements using Risley prisms were obtained at 6m and 40cm to insure no large dissociated phorias. All subjects were correctable to 20/20 and measurements throughout this study were taken through the subject's normal near refractive correction. Furthermore, none of the subjects had engaged in sustained nearpoint activity for several hours before each experimental session.

A fixation disparity curve was generated using a disparometer.[8] Each subject was instructed to hold the disparometer at approximately 40 cm. Their attention was directed to the aperature containing the vernier lines used to test for lateral fixation disparity. The subjects were instructed to "align the two lines such that they are one above the other while keeping the letters on either side of the circle clear". All subjects were encouraged to bracket around the point where they thought the vernier lines were properly positioned. After polaroid glasses were inserted over the subject's habitual near prescription, the test was performed with repeated instructions to align the lines one above the other and to do it as quickly as possible. Fixation disparity was first measured with no prism in place. Then fixation disparity measurements were determined using loose prisms held in front of one of the subject's eyes by the examiner. Fixation disparity was measured using $3^{\Delta}$ BI, $3^{\Delta}$ BO, $6^{\Delta}$ BI, $6^{\Delta}$ BO, $9^{\Delta}$ BI, and $9^{\Delta}$ BO in that order, and results were plotted to determine the prestress fixation disparity curve. A rest period of 30 seconds was allowed between each measurement.

Next the subjects read visually stimulating reading material of their choice in quiet surroundings for 20 minutes under one of two altered conditions. One condition involved reading monocularly with their unoccluded eye refractively corrected for near work. The other condition involved reading binocularly through multiple pinhole glasses without their spectacle correction. The order in which testing was carried out between these two conditions was not controlled.

Immediately after reading under one of these conditions (within 30 seconds), a fixation disparity curve was generated in a manner identical to the prestress curve.

On another day, varying from one day to two months later, the above procedure was repeated while reading under the other altered condition. Both a prestress and a poststress fixation disparity curve was generated.

## DISCUSSION

Let us first look at the effect of nearpoint reading stress on fixation disparity under conditions in which the vergence loop is opened by reading monocularly for 20 minutes. Because slow vergence effects fixation disparity primarily, elimination of convergence was anticipated to have a greater effect on slow vergence than elimination of accommodation, and therefore would have a greater effect on the fixation disparity curve. Research by Schor[9] indicates a rapid relaxation of accommodative vergence after long-term monocular stimulation of accommodation and the lack of adaption to the phoria. They concluded that accommodative convergence does not provide an input to the slow fusional vergence system when the disparity vergence system loop is open. Furthermore, the lack of adaption to the phoria would not be likely to reduce fixation disparity.

Our data indicates a general increase in exo fixation disparity following monocular nearpoint stress in most subjects which increases toward the base out side of the curve. This can be explained if we assume that during monocular viewing the eyes assume a more divergent tonic position. When prism is induced that requires greater convergence than the new tonic state, an increase in exo fixation disparity is generated. Furthermore, when divergence is stimulated with larger amounts of base in prism beyond the tonic state induced with the monocular nearpoint stress, the fixation disparity may show an increase in eso fixation disparity in comparison to the prestress fixation disparity curve. This is evident in twelve of the thirty poststress curves and would be predicted had larger amounts of base in prism been induced.

Data involving nearpoint stress when the accommodation loop was opened by reading through pinholes binocularly for 20 minutes indicates a smaller magnitude of change in fixation disparity after nearpoint stress. In fifteen of the thirty subjects the amount of fixation disparity measured without prism before the eye, the y-intercept, decreased following reading and remained essentially the same in eleven of the remaining fifteen. Also, there was a general tendency for the slope of the curve to flatten centrally after the nearpoint stress. Whereas opening the vergence loop caused an increase in exo fixation disparity toward the base out side, fourteen of the thirty subjects showed a change toward increased eso fixation disparity toward the base out side following reading with the accommodation loop open.

It appears that opening the accommodation loop with pinholes eliminated the correction of focus error caused by convergence accommodation and as a result reduced the amount of exo fixation disparity caused by prism stimuli for convergence. This apparent incomplete relaxation of convergence after long-term stimulation of convergence is indicative of slow fusional vergence.

Semmlow and Hung[10] compared force duction fixation disparity curves measured with a pinhole pupil (accommodation loop open) and with a normal pupil (accommodation loop closed). They observed that fixation disparity was reduced by one-half when the accommodation loop was opened using the pinhole pupil. They conclude that during closed-loop conditions forced convergence produced change in accommodation by way of convergence accommodation. This change resulted in blur that when corrected for by optical reflex accommodation altered accommodative convergence in a way that increased the demand on fusional vergence and resulting fixation disparity magnitude.

Subjective analysis of the prestress curve slopes indicates several steep curves for this asymptomatic population. However, research by Teitelbaum[11] concluded that slope analysis itself seems unreliable for identifying patients with oculomotor problems. Therefore, we may assume these asymptomatic subjects have normal binocular systems despite their steep fixation disparity curves. More important is the change that occurs with nearpoint stress. According to research by Jones[12], under the supervision of Saladin, with stable binocular systems the fixation disparity curves are sufficiently reliable to serve as indicators of change in oculomotor balance.

An equation developed by Saladin was used to calculate the shape factor of each curve. The equation is as follows:

$$\text{Shape Factor} = |0 - 4BO| + |4BI - 0| + |4BO - 8BO|/2 + |4BI - 6BI|/2$$

The number of minutes of fixation disparity corresponding to zero prism (0), $4^{\Delta}$ BI, $6^{\Delta}$ BI, $4^{\Delta}$ BO, and $8^{\Delta}$ BO are entered into the formula. The points on the exo side are assigned a negative value, while those on the eso side are given a positive value.

The higher the shape factor, the greater the curve slope. The shape factors for each subject have been calculated and are listed in Table 1.

In comparing the curves before and after reading through multiple pinholes, twenty of the thirty subjects had curve shape factors that remained the same or decreased. The average change for all the curves was from 15.17 to 15.67. Considering only those twenty curves that remained the same or whose shape factor decreased, the average change was -3.38.

Following nearpoint reading monocularly, twenty-five of the thirty subject's shape factors increased. Of these twenty-five subjects their average increase in shape factor was +5.44. When the changes in shape factor of all thirty subjects were utilized, the average change in shape factor following reading with the vergence loop open increased from 13.75 to 17.63.

Whether the changes in these shape factors is significant is uncertain. Also one should consider the human error incorporated to interpret the values for the formula, since most measurements were not made exactly and had to be estimated from the curve. However, a note should be made that opening the vergence loop tends to have a greater effect on steepening the slope than opening the accommodation loop.

## CONCLUSION

One of the striking aspects of fixation disparity is the smallness of the quantities being measured and the precision within which they are obtained. The subject may feel their judgements are very uncertain, but the actual objective accuracy proves to be surprisingly great, especially if visual acuity is high and the muscle balance is fairly normal. Fixation disparity certainly varies somewhat from day to day, depending upon rather intangible factors associated with the individual. For some subjects the precision of measurements may vary from one day to the next for no obvious reason, except that fatigue, previous excessive use of the eyes, and even disinterest may have been specific factors. However, in spite of this variation, the prestress curve generally found for a given subject after a variable lapse of time agreed relatively well with that previously obtained in most subjects. The small normal involuntary eye movements that are always present, and which may increase with the stress, could account for occasional spurious responses.

It can be concluded from the data in this research that nearpoint stress has a greater and more predictable effect on fixation disparity under conditions when the vergence loop is open rather than the accommodation loop. This change in fixation disparity curve generated by reading monocularly generally corresponds to an increase in exo fixation disparity toward the base out side and possibly to a steepening of the curve slope. This can be explained by the fact that by occluding one eye, there is minimal fusional vergence and SVA. There is accommodative convergence innervation, but this has little effect on SVA, as illustrated by Figure 1. Therefore, following occlusion the SVA is winding down from it's previous tonic state created during monocular reading for 20 minutes. When the eyes are associated, the (+) disparity detectors must bring the (+) SVA up to normal tonicity and the actual difference with the phoria. Therefore, a large output from the (+) disparity detectors is needed and a large amount of exo fixation is measured immediately after the monocular reading task. Furthermore, because the vergence adaptation system adapts poorly to prism, the curve tends to have a steeper slope.

An increase in eso fixation disparity centrally or on the base out side of the curve along with a decrease in fixation disparity and flattening of the curve may occur from reading through binocular pinholes to open the accommodation loop. With pinholes eliminating accommodative convergence, the (+) SVA must undergo high adaptation. Therefore, when the pinholes are removed the extraocular muscles will receive extra innervation from accommodative convergence as well as the large amount of innervation coming through the SVA and the fusional vergence loop. This would add up to too much convergence innervation and therefore result in an increased eso or decreased exo fixation disparity. Also because the disparity detectors and SVA have been actively functioning, one would expect the system to have a high general ability to respond to change in prism resulting in a flatter slope.

In conclusion, this study shows strong support that prior near-point stress does effect fixation disparity measurements. The findings of this study that indicate the vergence loop has a greater effect on fixation disparity then accommodation is conclusive with our initial expectations. However, one cannot ignore the possibility that accommodation may have some indirect influence on fixation disparity. In particular, we cannot be sure voluntary accommodation was not involved when the accommodation loop was open so this must be kept in mind.

## TABLE 1

SHAPE FACTOR RESULTS

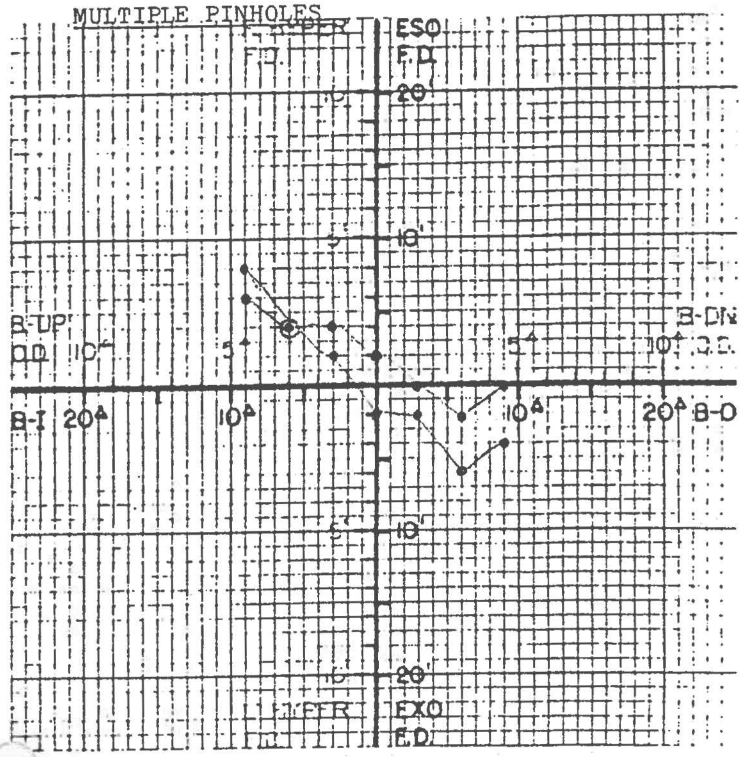
| Patient | Pinholes Prestress | Pinholes Poststress | Monocular Prestress | Monocular Poststress |
|---|---|---|---|---|
| M.M. | 8½ | 5½ | 11 | 12 |
| G.F. | 12½ | 5½ | 9½ | 12½ |
| T.H. | 4 | 7 | 6 | 12½ |
| R.C. | 7 | 10½ | 6½ | 8 |
| B.C. | 19½ | 37 | 27 | 30 |
| M.M. | 5½ | 5½ | 7½ | 8 |
| D.W. | 11½ | 11 | 12½ | 13 |
| J.C. | 16½ | 12 | 7½ | 4½ |
| R.W. | 12 | 11 | 17 | 19 |
| T.H. | 26 | 19 | 10½ | 13 |
| D.D. | 18½ | 16 | 15 | 18½ |
| R.W. | 15 | 15 | 11½ | 14 |
| J.M. | 18 | 13 | 15 | 14½ |
| C.E. | 29½ | 36 | 16½ | 31 |
| P.T. | 15½ | 24 | 12½ | 16½ |
| M.K. | 10 | 8½ | 16 | 40 |
| J.H. | 8 | 7 | 13 | 12 |
| C.L. | 24 | 19½ | 15½ | 21½ |
| J.C. | 23½ | 20½ | 25 | 27 |
| S.H. | 13 | 14½ | 15½ | 9 |
| C.K. | 8 | 11½ | 5½ | 12½ |
| J.M. | 21 | 19½ | 23 | 33 |
| J.M. | 8½ | 23 | 13½ | 15 |
| T.G. | 26½ | 24½ | 30 | 33 |
| E.M. | 21½ | 36 | 24½ | 39½ |
| R.G. | 11 | 22 | 16½ | 15 |
| C.B. | 6 | 4½ | 7 | 12½ |
| L.C. | 28 | 8½ | 4 | 7 |
| J.M. | 25 | 21½ | 18 | 25 |

# FIXATION DISPARITY CURVE

NAME M.M.
DATE
DISTANCE
□ LATERAL □ VERTICAL

COMMENTS: phoria: ∅ @6m
2 exo @40cm

MULTIPLE PINHOLES

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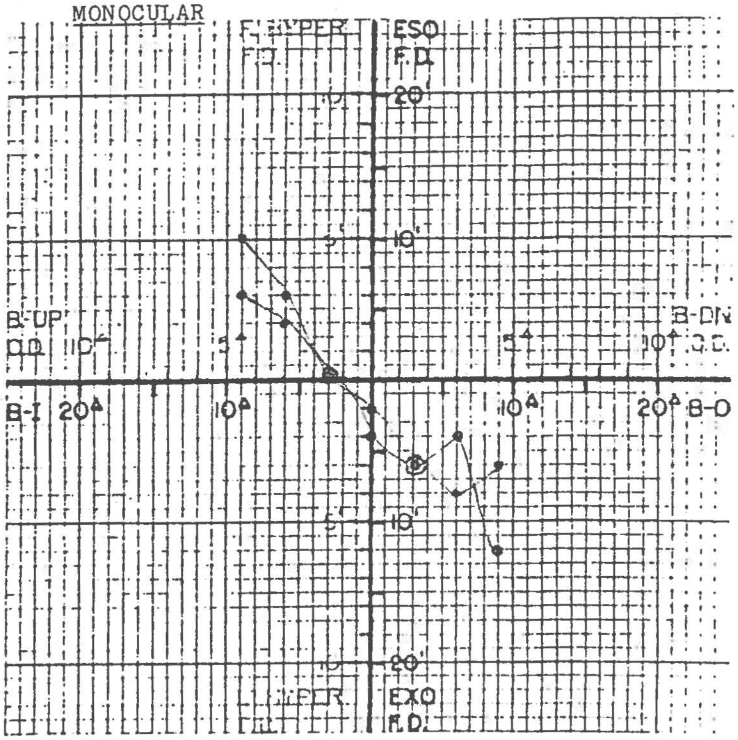


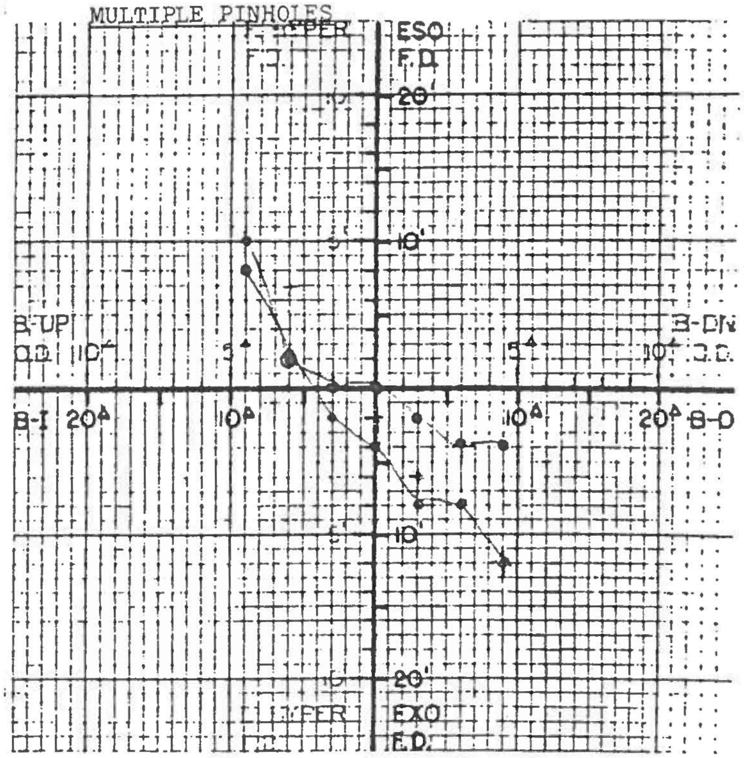



# FIXATION DISPARITY CURVE

NAME G.F.
DATE
DISTANCE
□ LATERAL □ VERTICAL

COMMENTS: phoria: 3 exo @6m
5 exo @40

MULTIPLE PINHOLES

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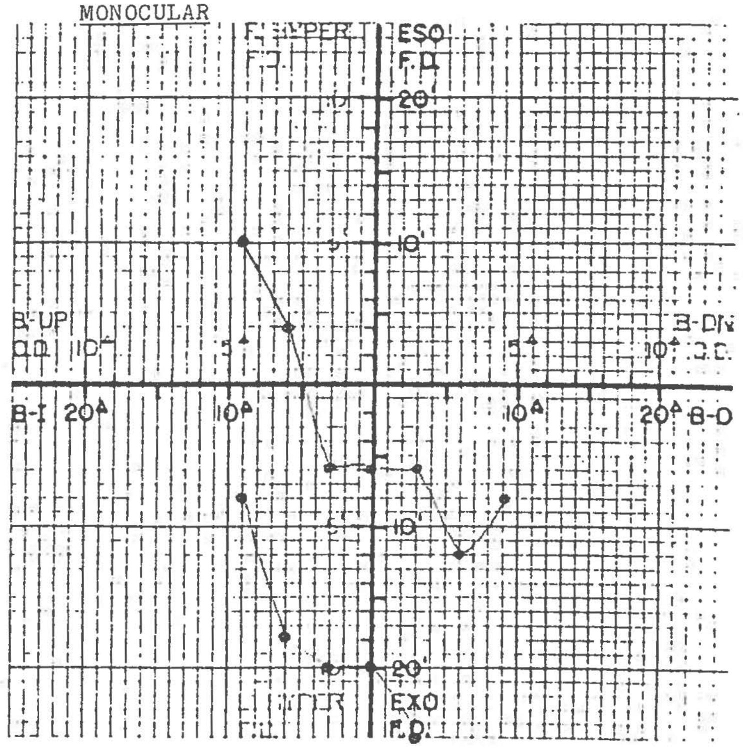




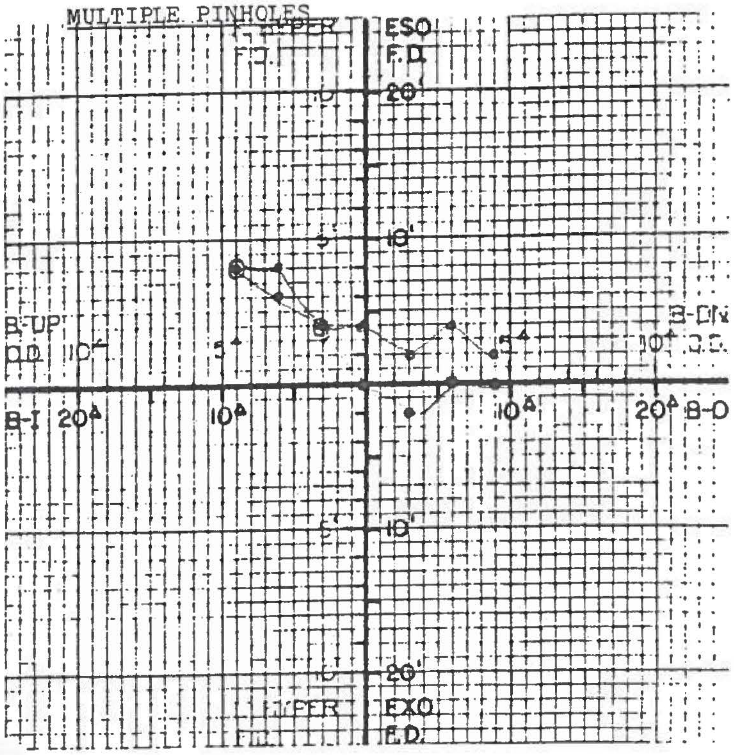

(•) - Prestress
(•) - Poststress

## FIXATION DISPARITY CURVE

NAME T.H
DATE
DISTANCE
LATERAL ☐ VERTICAL

COMMENTS:
phoria: ø @6m
3 eso @40cm

MULTIPLE PINHOLES

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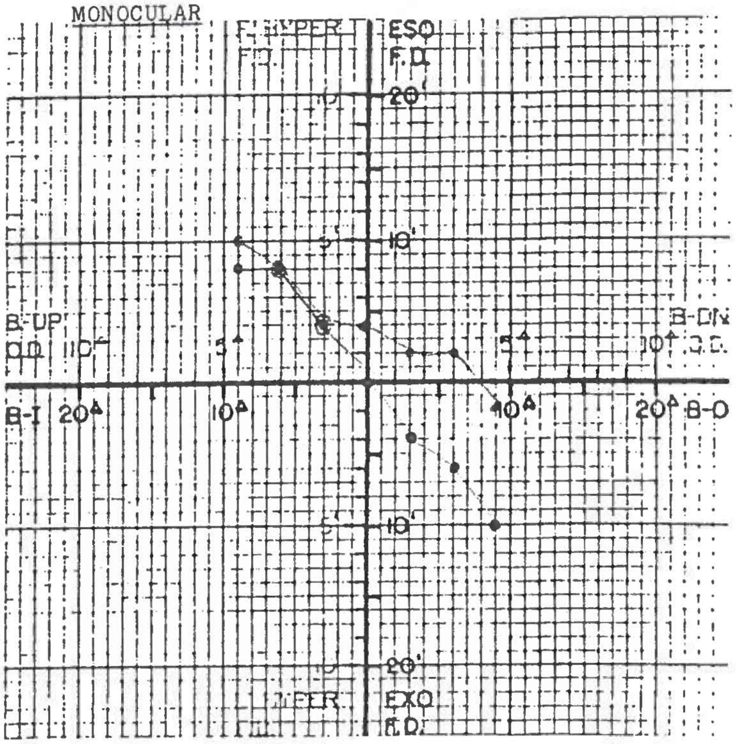


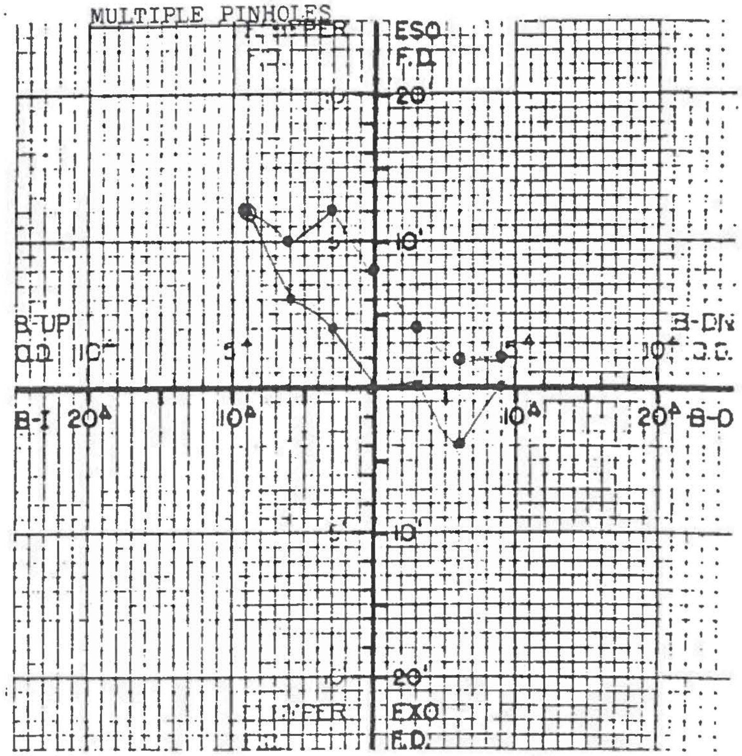



## FIXATION DISPARITY CURVE

NAME R.C.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS:
phoria: ø @6m
2 exo @40cm

MULTIPLE PINHOLES

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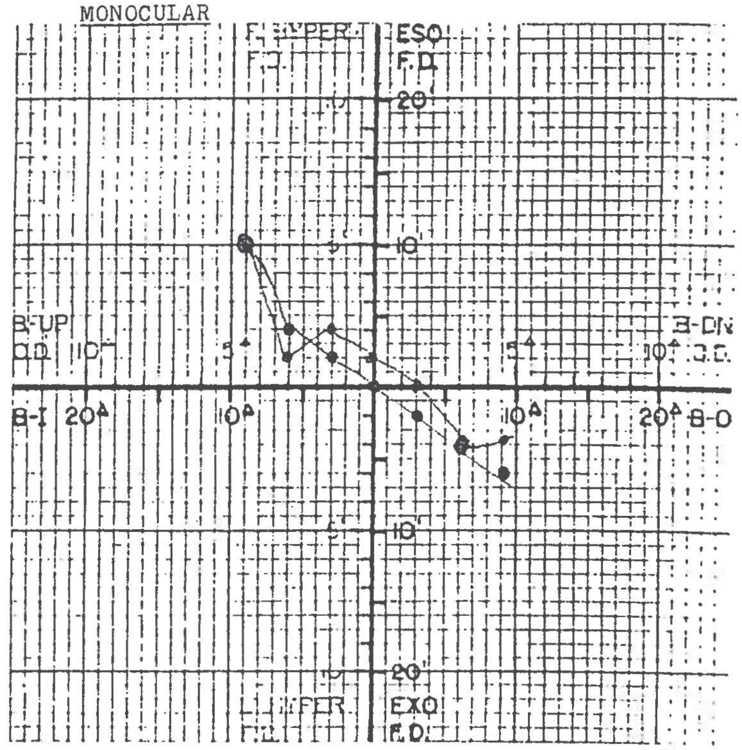


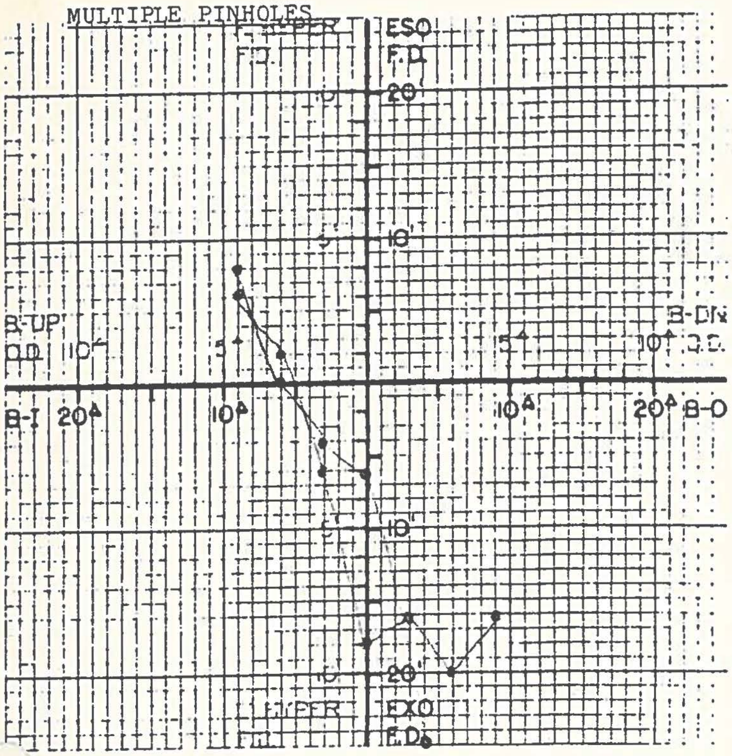


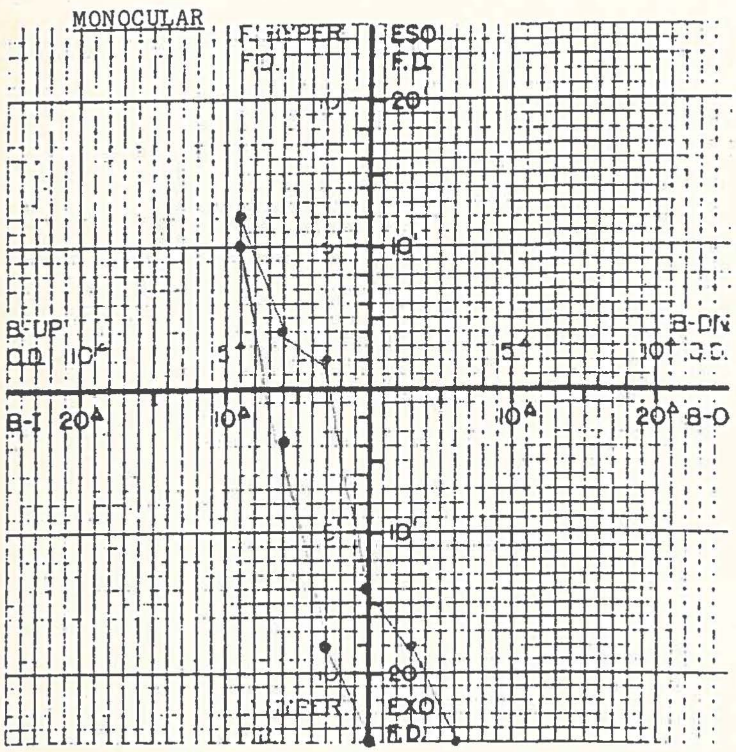

(•) - Prestress
(•) - Poststress

# FIXATION DISPARITY CURVE

NAME B.C.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS:
phoria: 2 exo @6m
4 exo @40cm



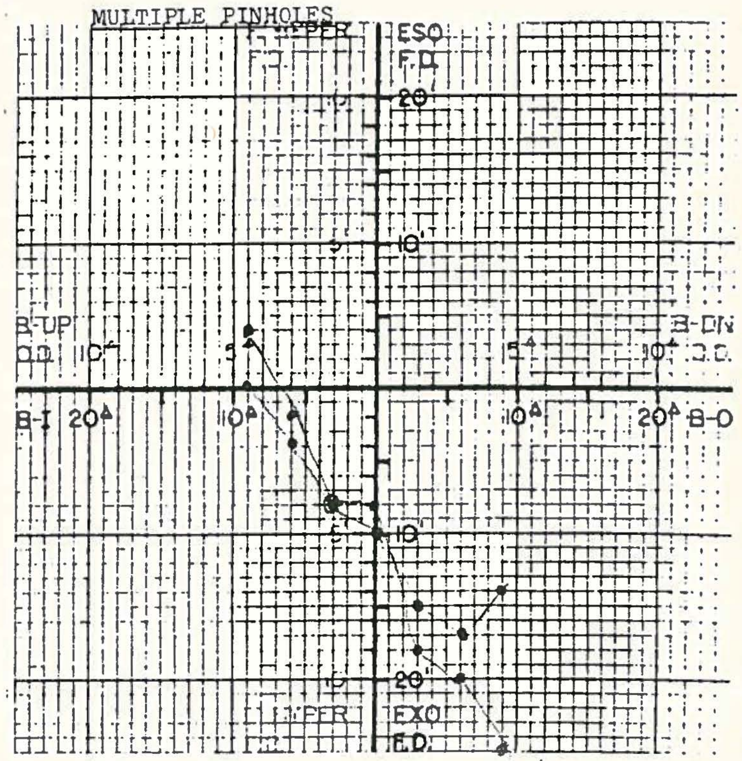



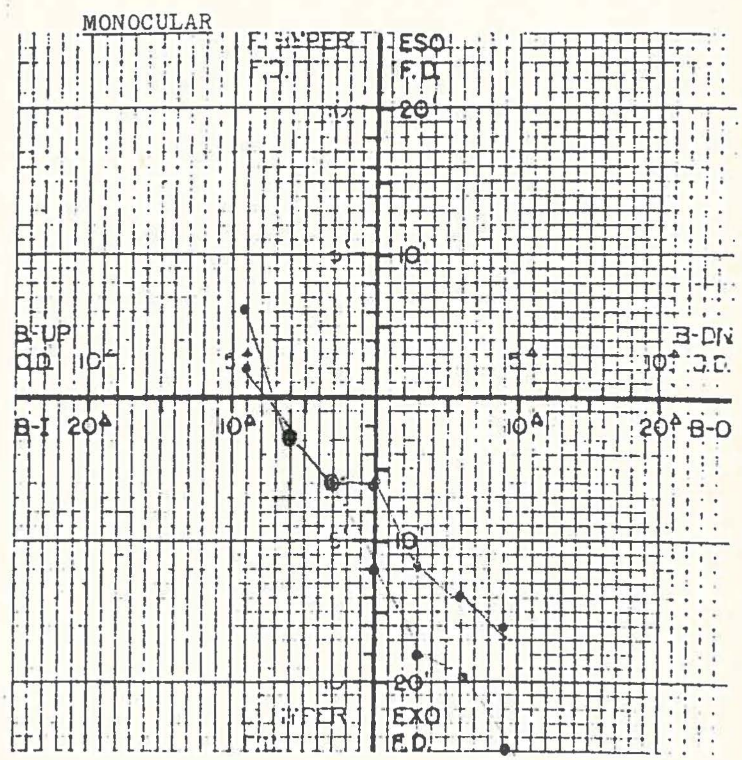



# FIXATION DISPARITY CURVE

NAME T.L.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS:
phoria: 2 eso @6m
6 exo @40cm



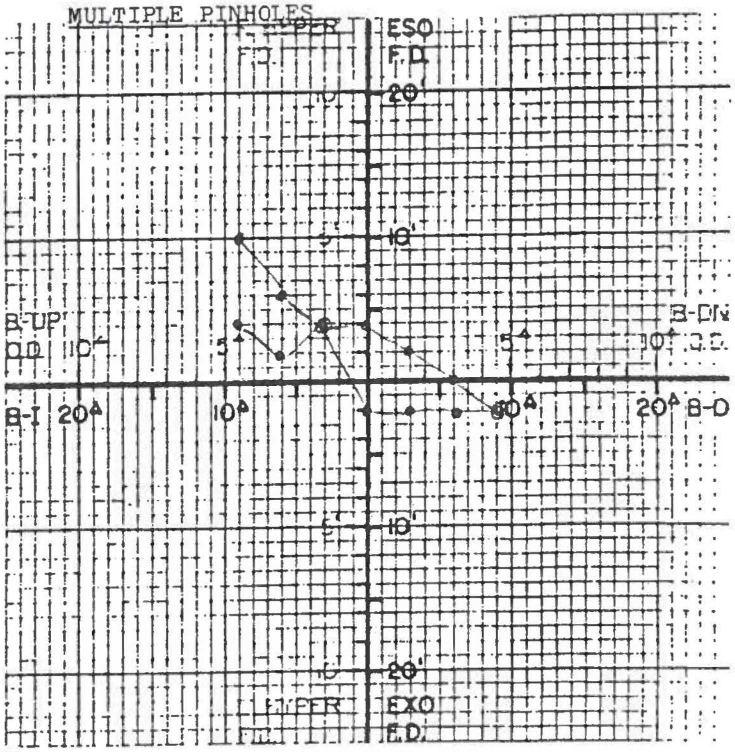


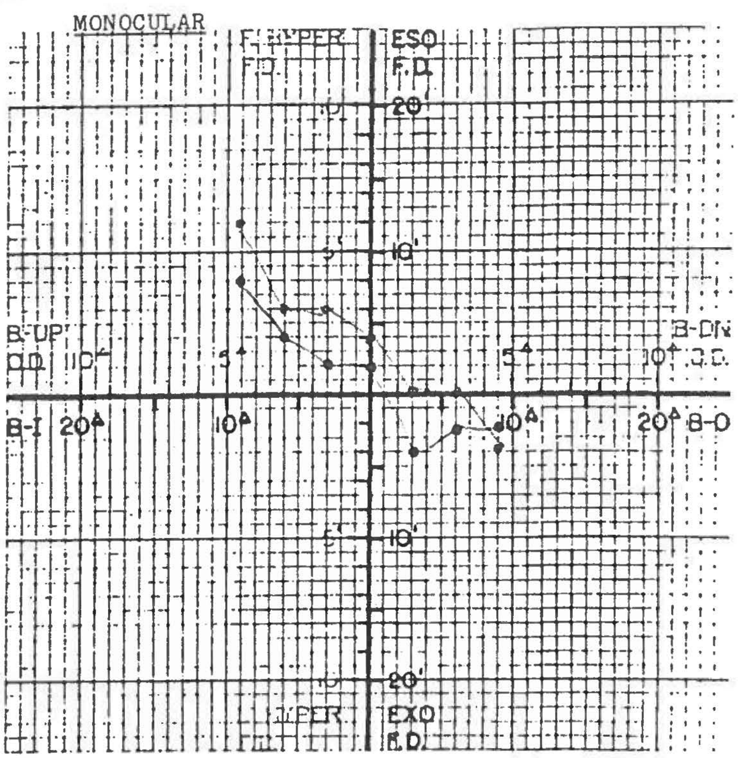

(•) - Prestress
(•) - Poststress

## FIXATION DISPARITY CURVE

NAME M.M.
DATE
DISTANCE
LATERAL  ☐ VERTICAL

COMMENTS:
phoria: 3 exo @6m
12 exo @40cm



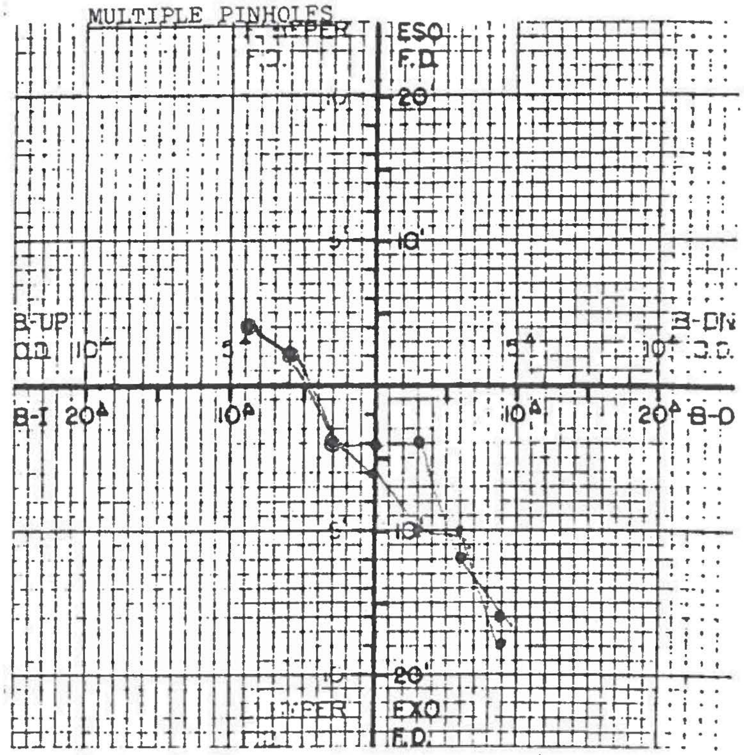



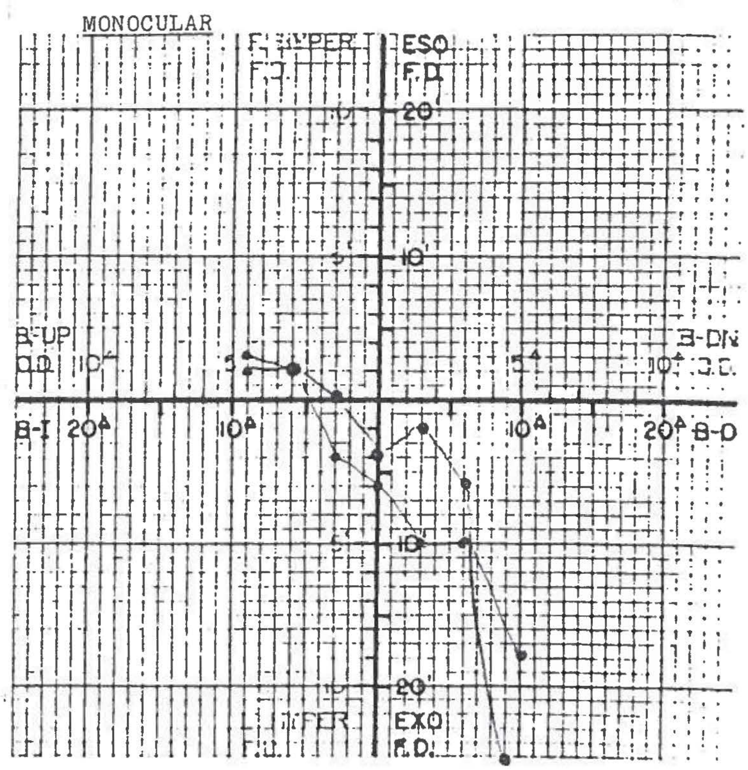

RIGHT 1979
VISION ANALYSIS

## FIXATION DISPARITY CURVE

NAME D.W.
DATE
DISTANCE
☐ LATERAL  ☐ VERTICAL

COMMENTS:
phoria: ∅ @6m
6 exo @40cm





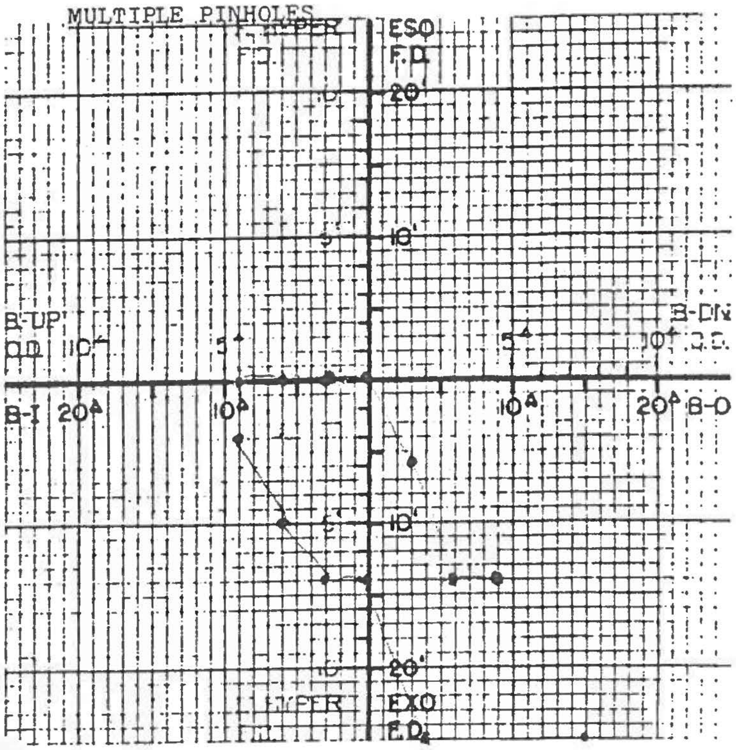

(•) - Prestress
(•) - Poststress

## FIXATION DISPARITY CURVE

NAME J.C.
DATE
DISTANCE
□ LATERAL □ VERTICAL

COMMENTS:
phoria: 6 exo @6m
12 exo @40cm

MULTIPLE PINHOLES

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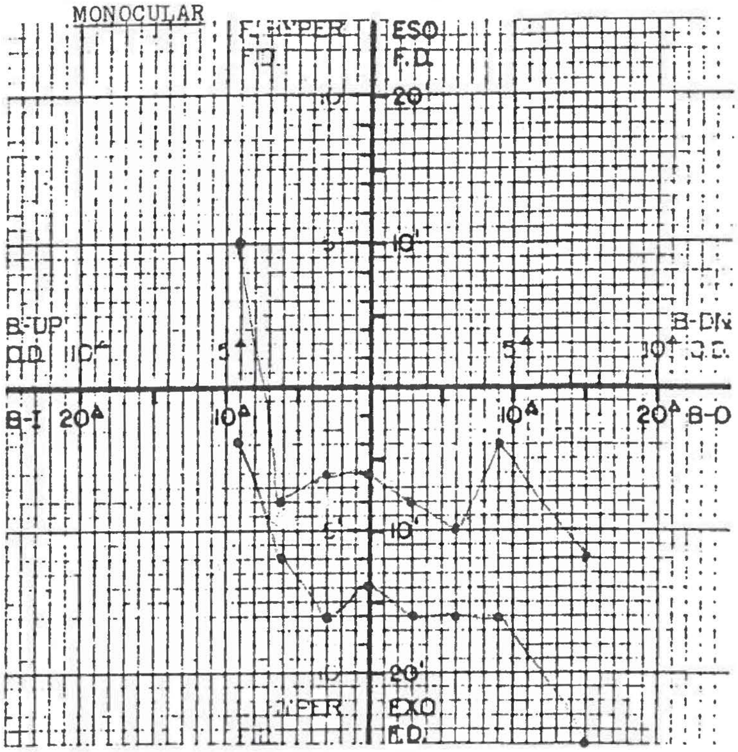


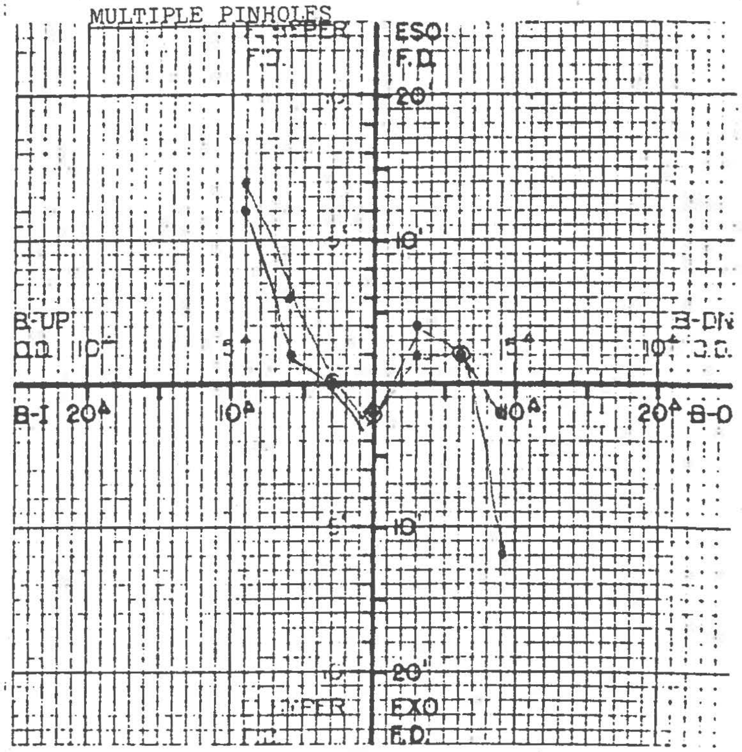



## FIXATION DISPARITY CURVE

NAME R.W.
DATE
DISTANCE
□ LATERAL □ VERTICAL

COMMENTS:
phoria: 3 eso @6m
3 exo @40cm

MULTIPLE PINHOLES

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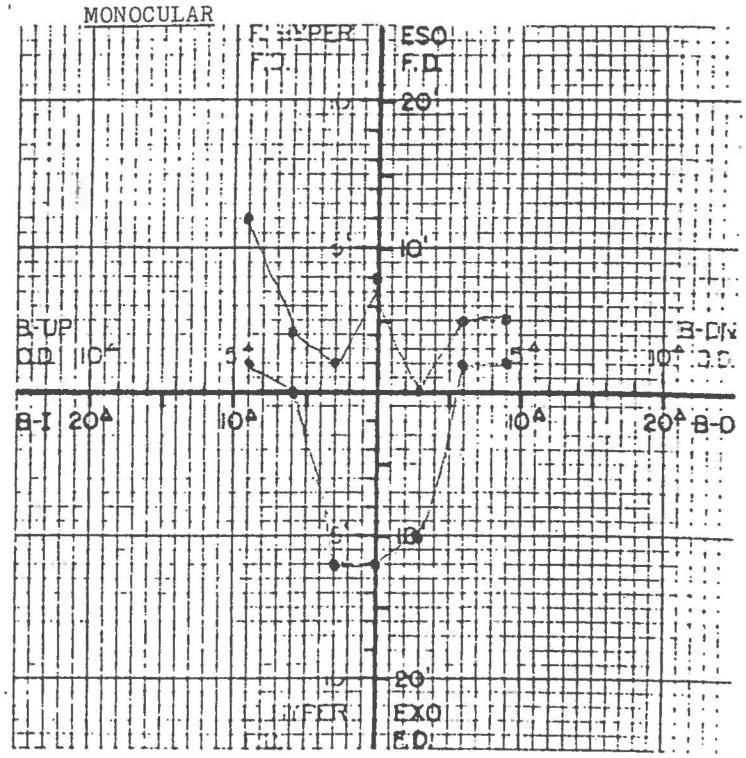




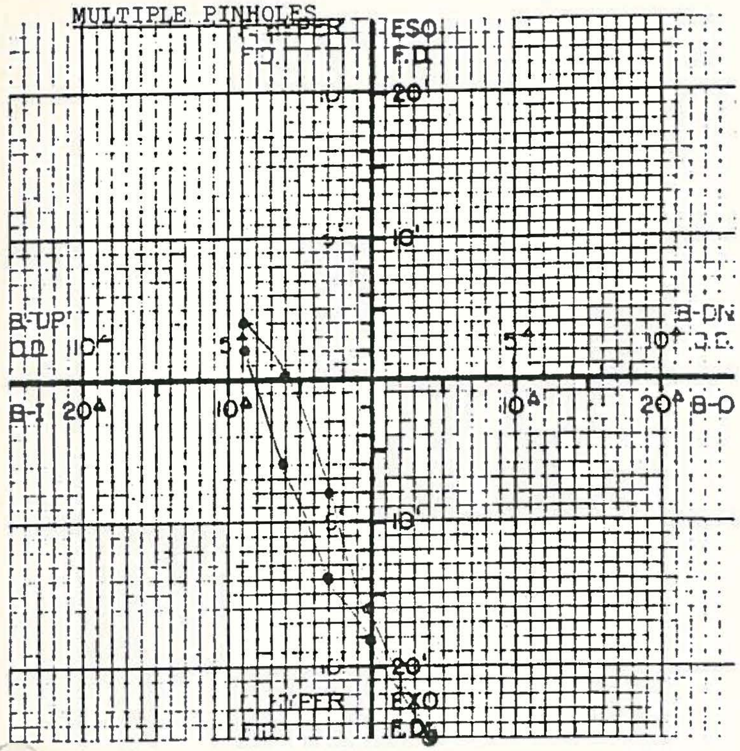

(•) - Prestress
(•) - Poststress

# FIXATION DISPARITY CURVE

NAME T.H.
DATE
DISTANCE
LATERAL ☐ VERTICAL

COMMENTS:
phoria: Ø @6m
5 exo @ 40cm

MULTIPLE PINHOLES

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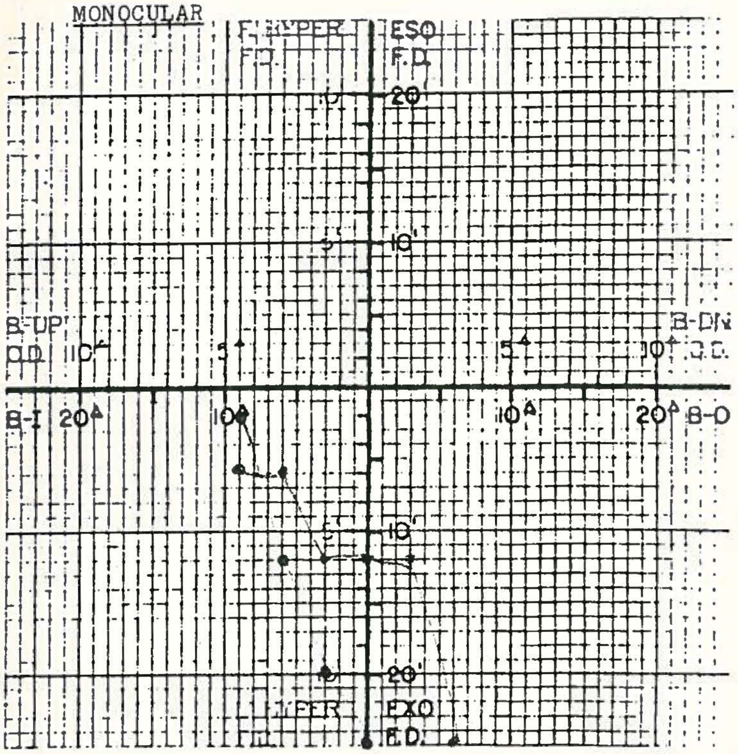


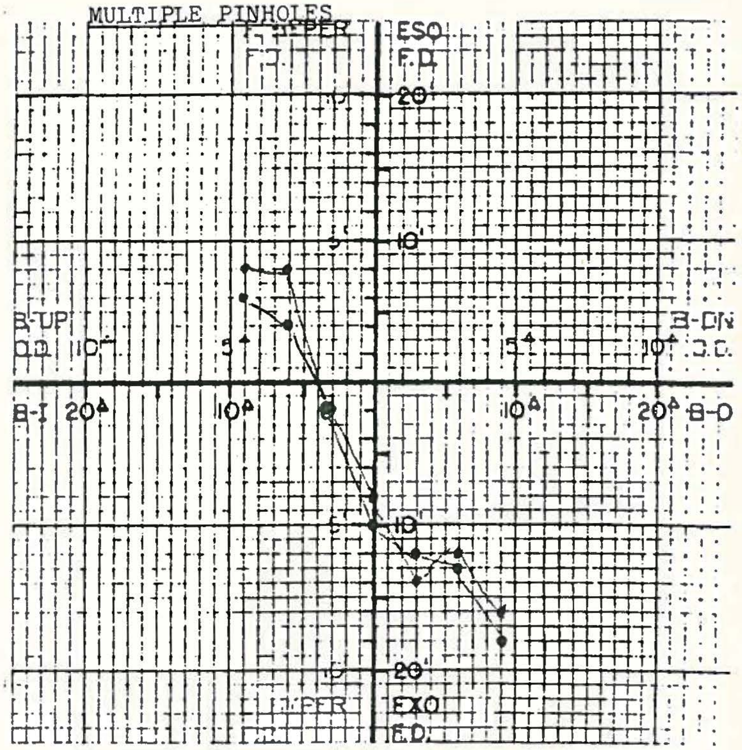



# FIXATION DISPARITY CURVE

NAME D.D.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS:
phoria: Ø @6m
3 exo @40cm

MULTIPLE PINHOLES

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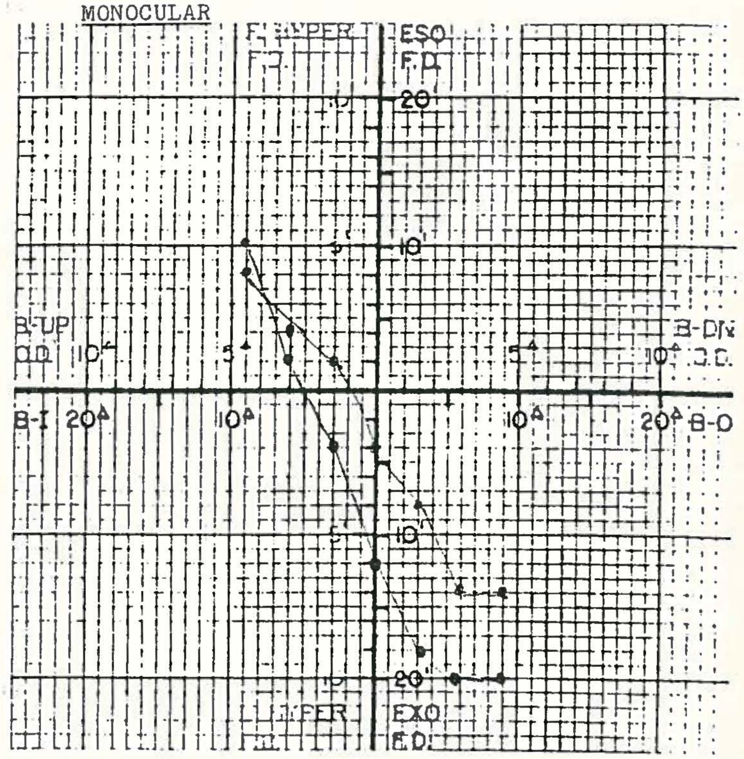




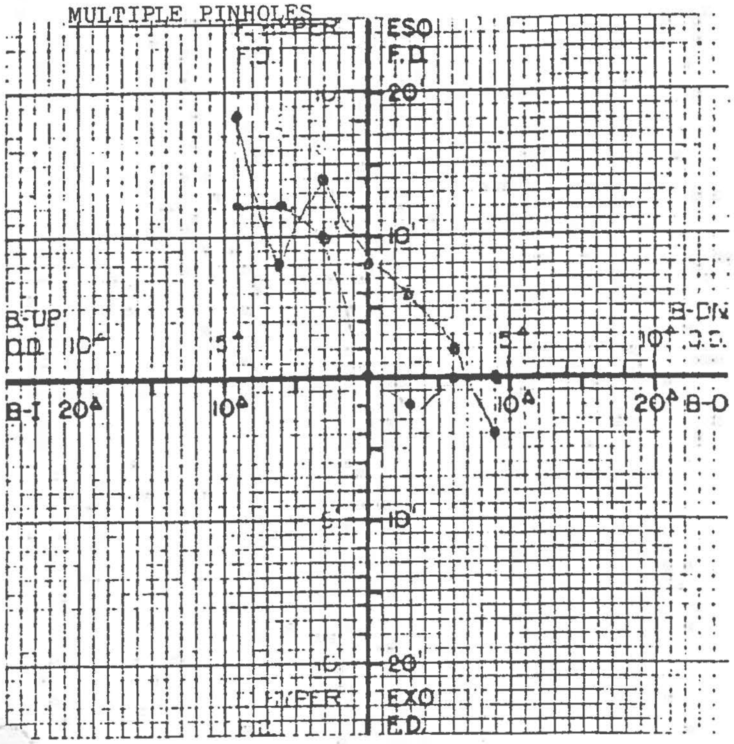

(•) - Prestress
(•) - Poststress

## FIXATION DISPARITY CURVE

NAME R.W.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS:
phoria: 3 eso @6m
3 eso @40cm

MULTIPLE PINHOLES

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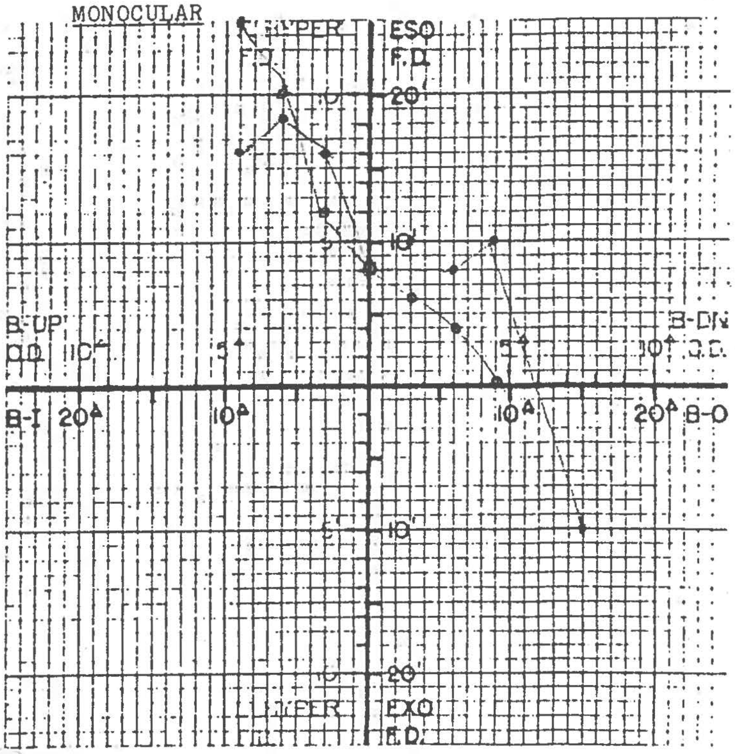




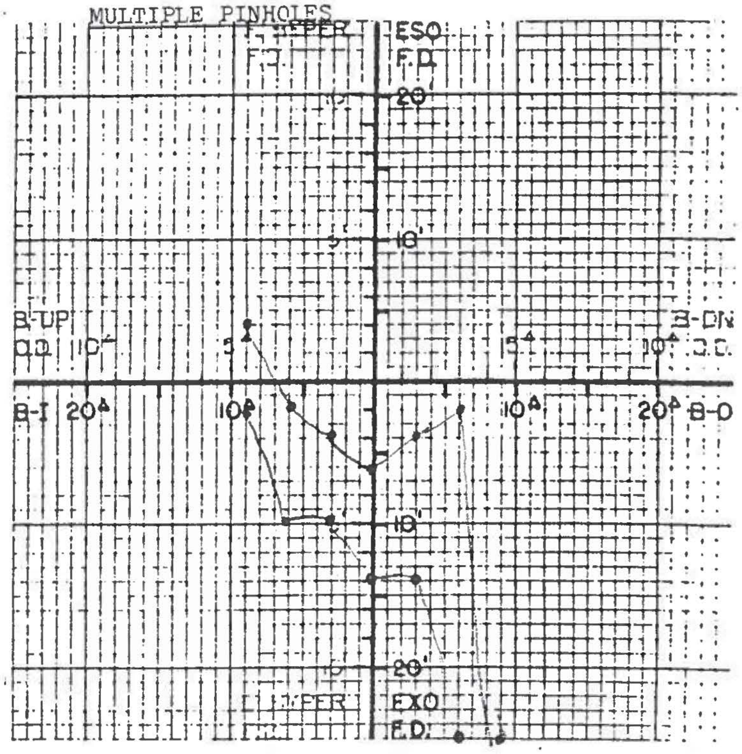

(•)- Prestress
(∘)- Poststress

## FIXATION DISPARITY CURVE

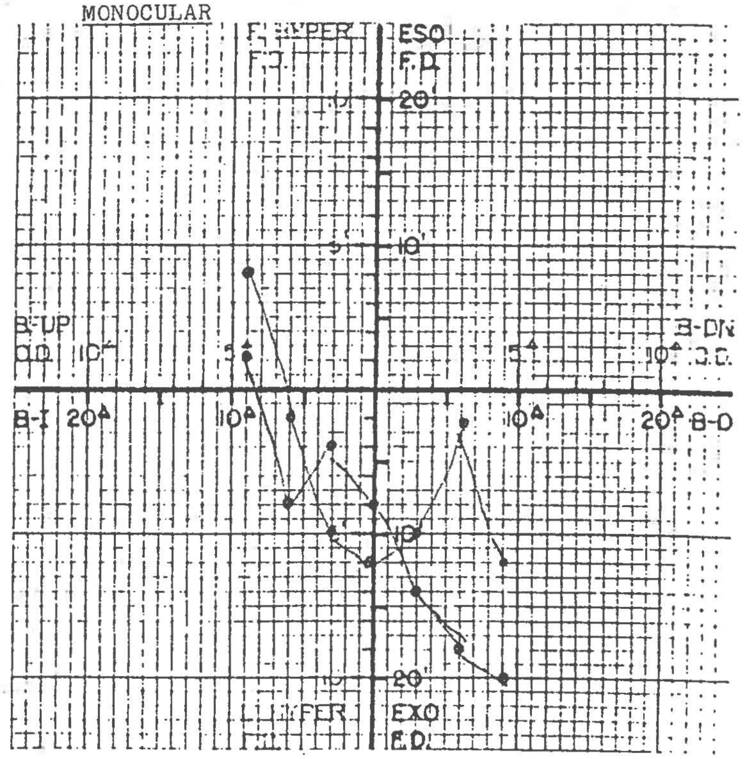
NAME J.M.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS:
phoria: 2 exo @6m
5 exo @40cm

MULTIPLE PINHOLES



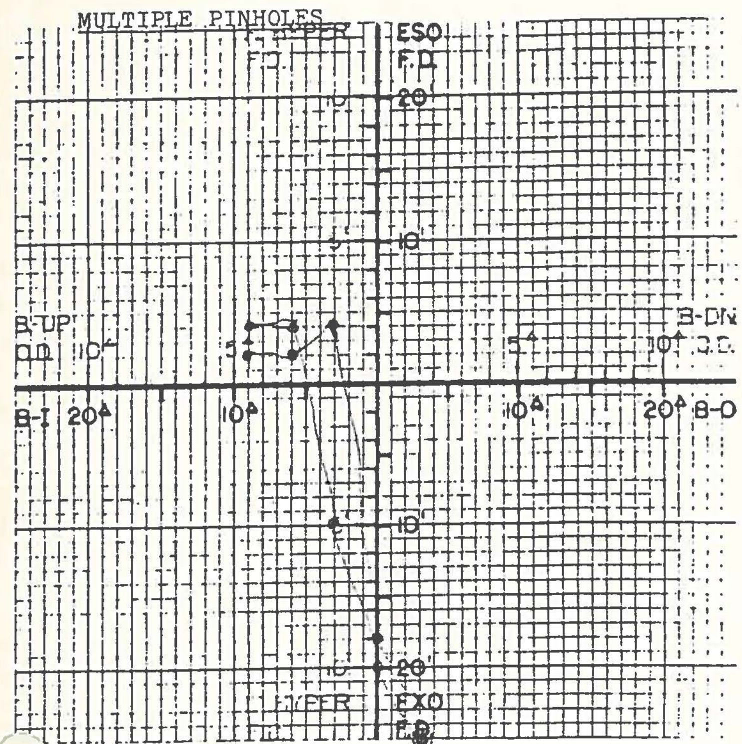

MONOCULAR

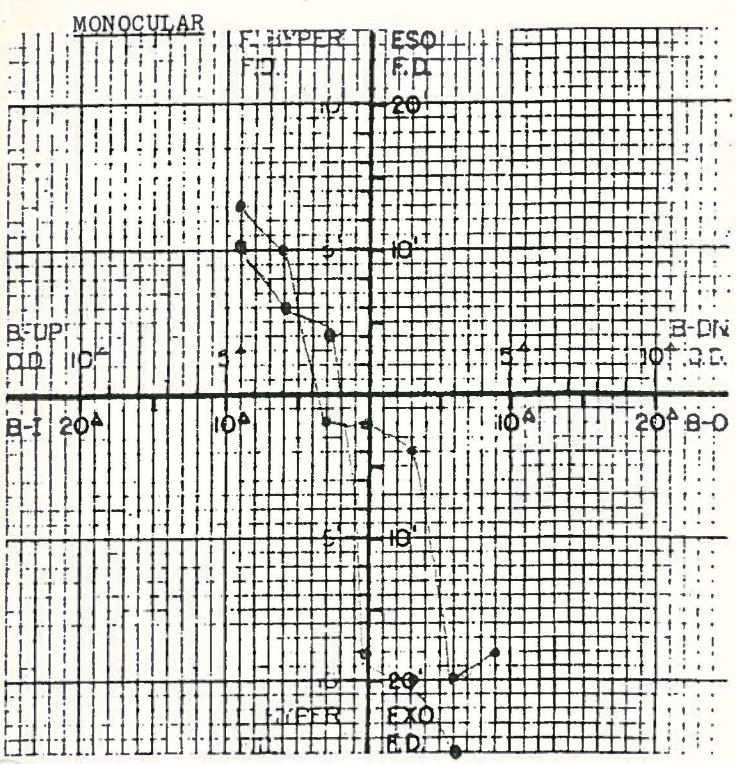


## FIXATION DISPARITY CURVE

NAME C.E.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS: phoria: Ø @6m
Ø @40cm



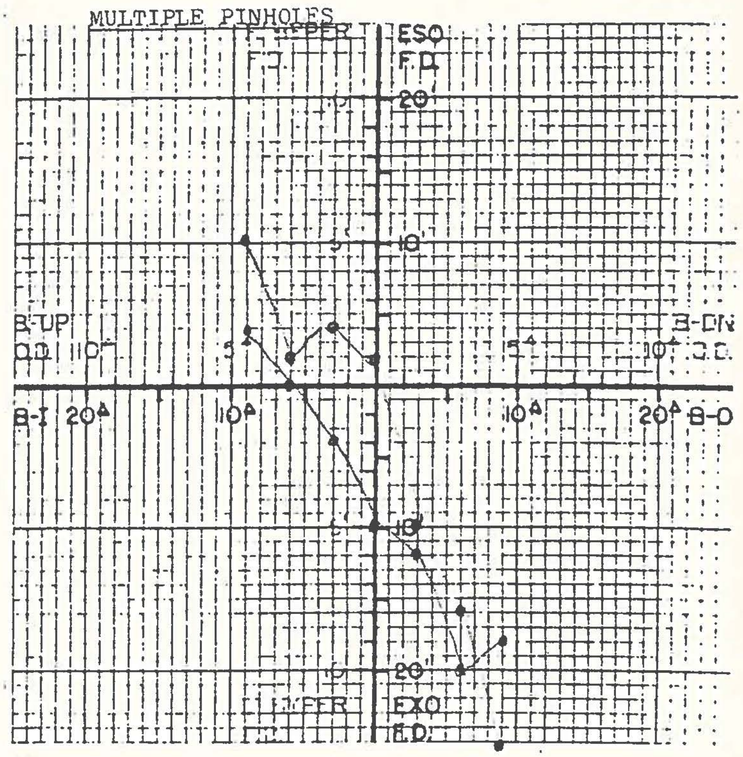


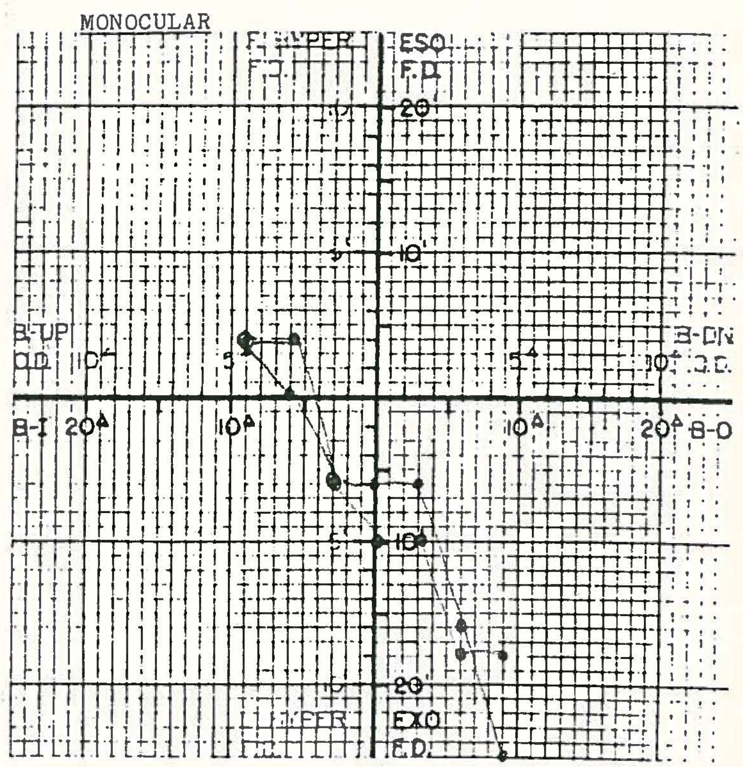

(•) - Prestress
(•) - Poststress

## FIXATION DISPARITY CURVE

NAME P.T.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS: phoria: 1 exo @6m
6 exo @40cm

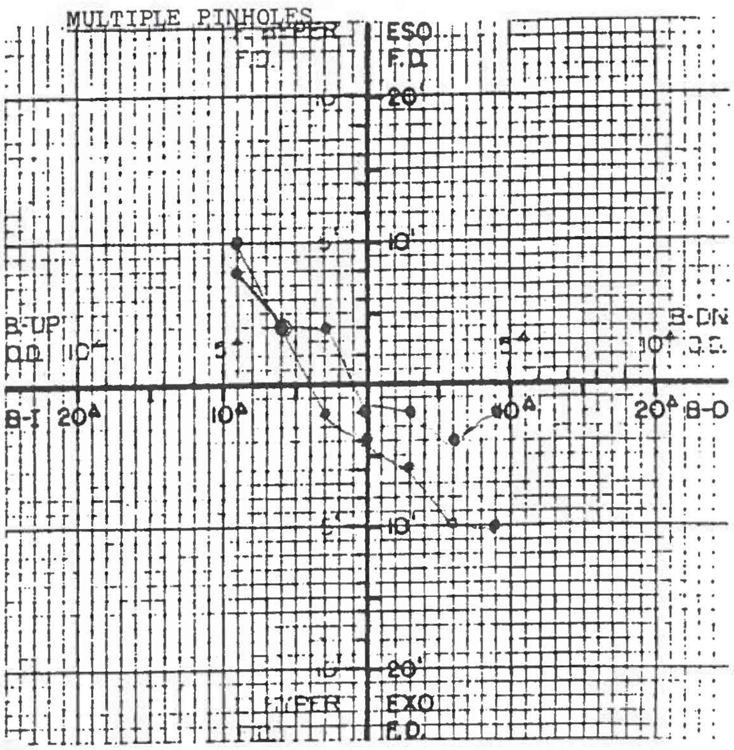


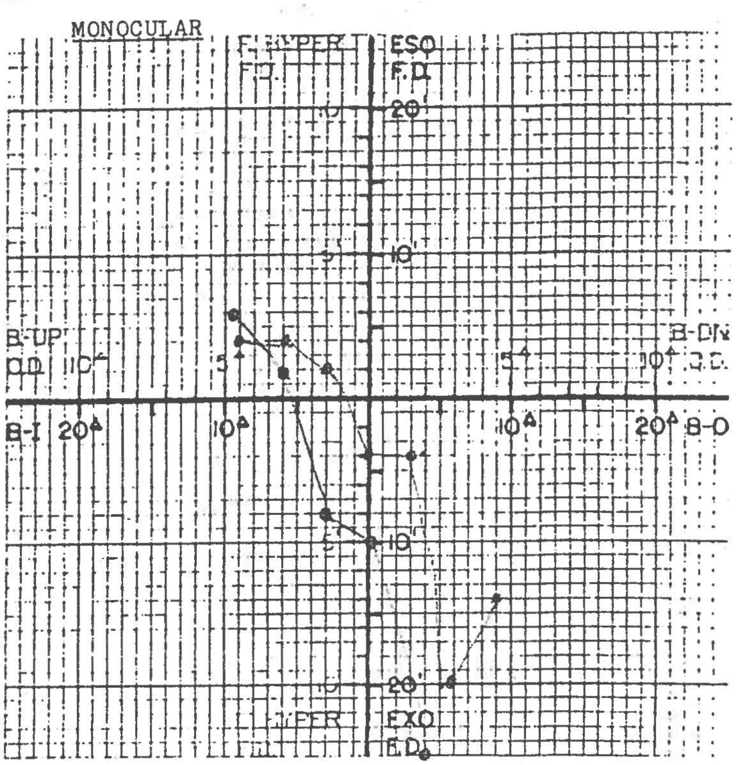



# FIXATION DISPARITY CURVE

NAME M.K.
DATE
DISTANCE
LATERAL  VERTICAL

COMMENTS:
phoria: 2 exo @6m
10 exo @40cm



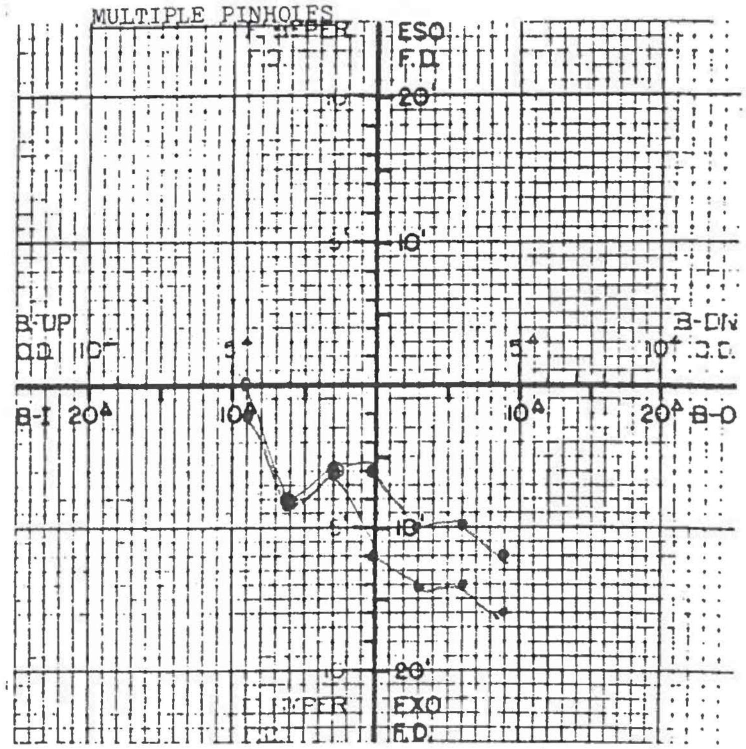



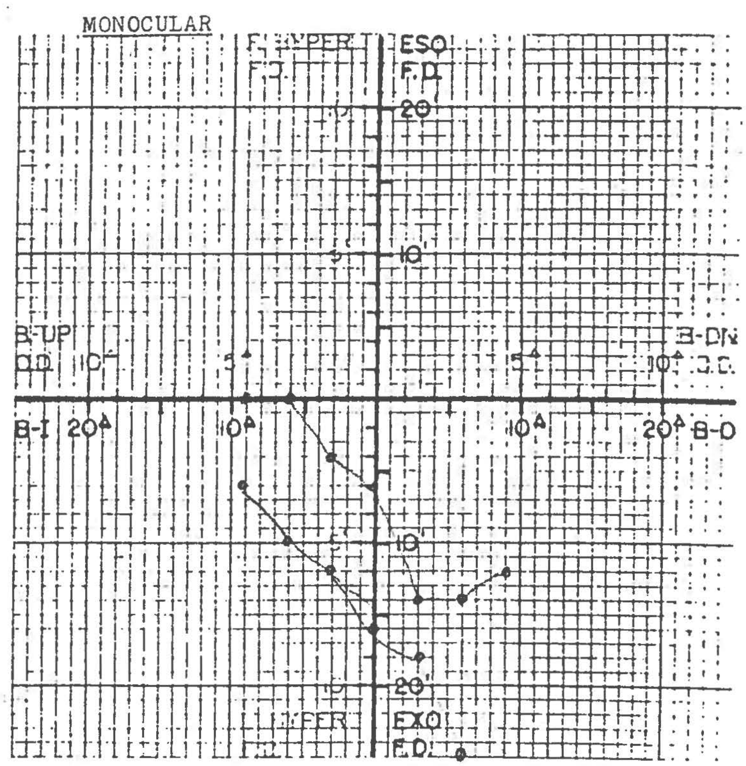



# FIXATION DISPARITY CURVE

NAME J.H.
DATE
DISTANCE
LATERAL  VERTICAL

COMMENTS:
phoria: 3 exo @6m
9 exo @40cm





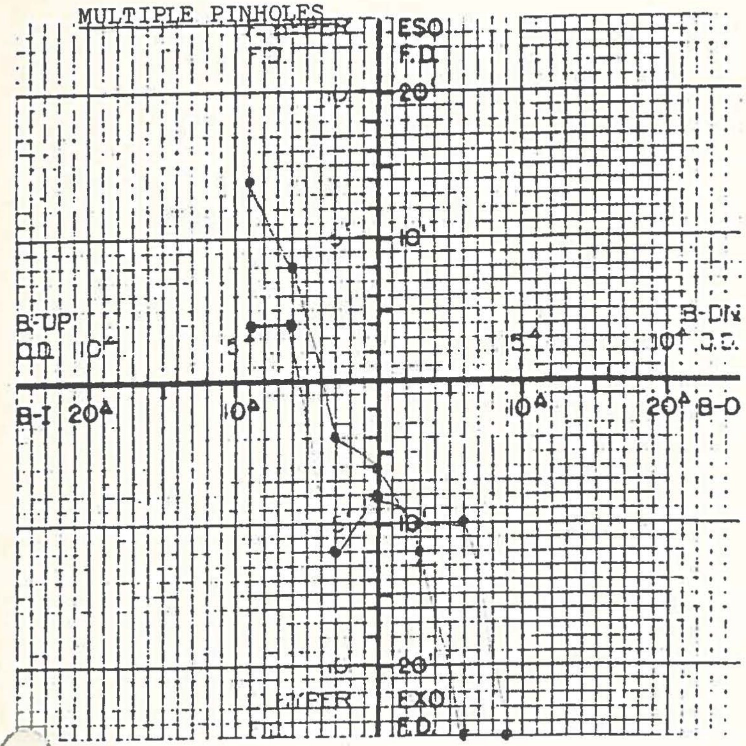

(•) - Prestress
(•) - Poststress

## FIXATION DISPARITY CURVE

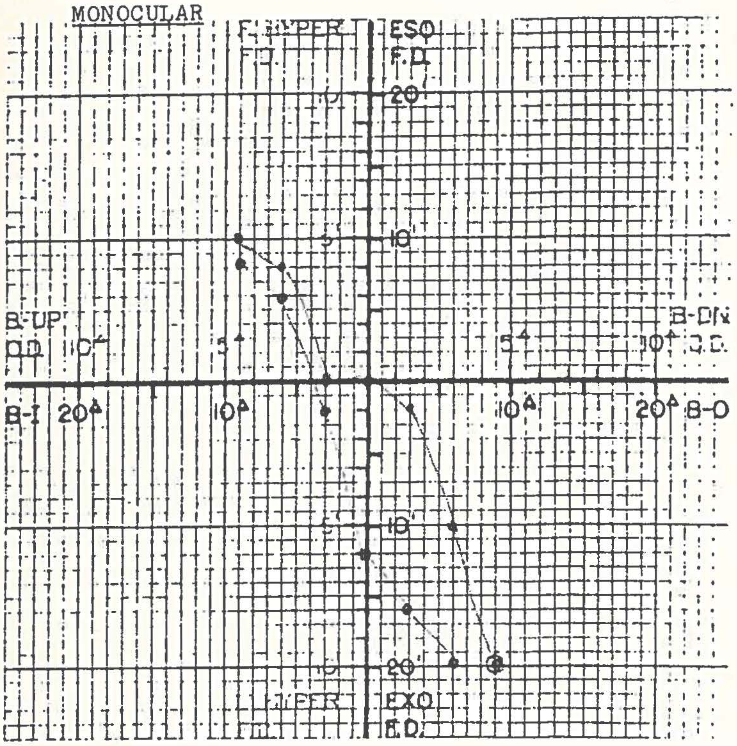
NAME C.L.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS:
phoria: 3 eso @6m
5 exo @40cm

MULTIPLE PINHOLES




MONOCULAR



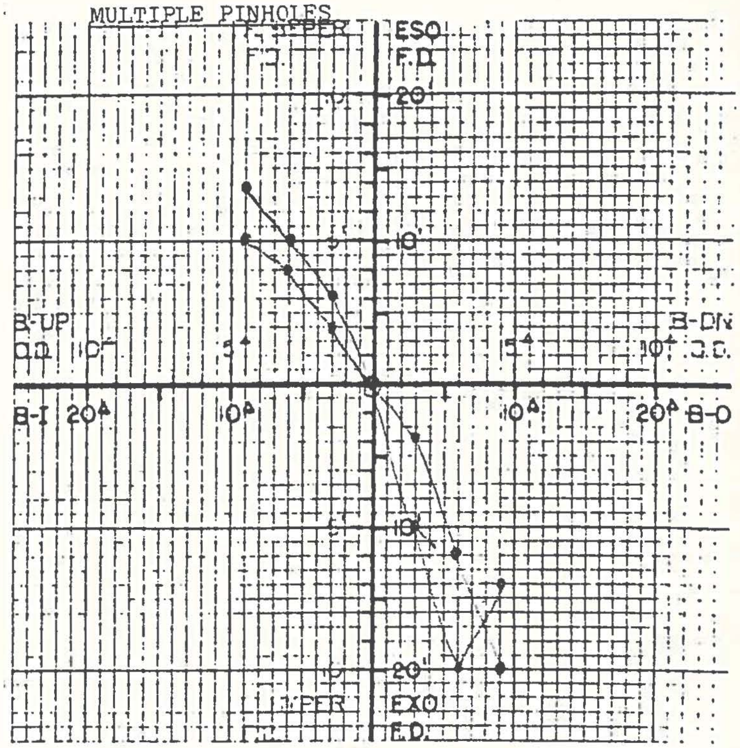



## FIXATION DISPARITY CURVE

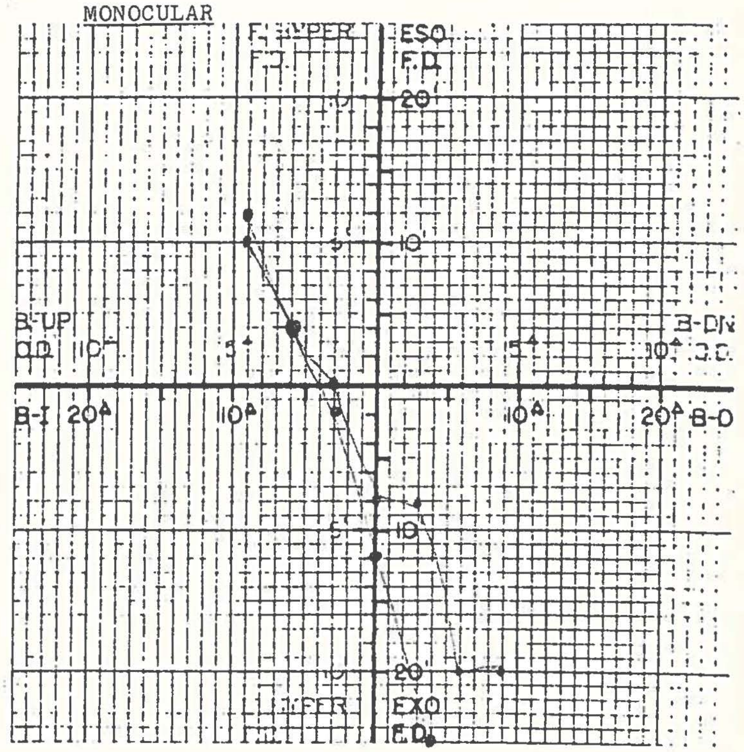
NAME J.C.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS:
phoria: 1 exo @6m
3 exo @40cm

MULTIPLE PINHOLES




MONOCULAR



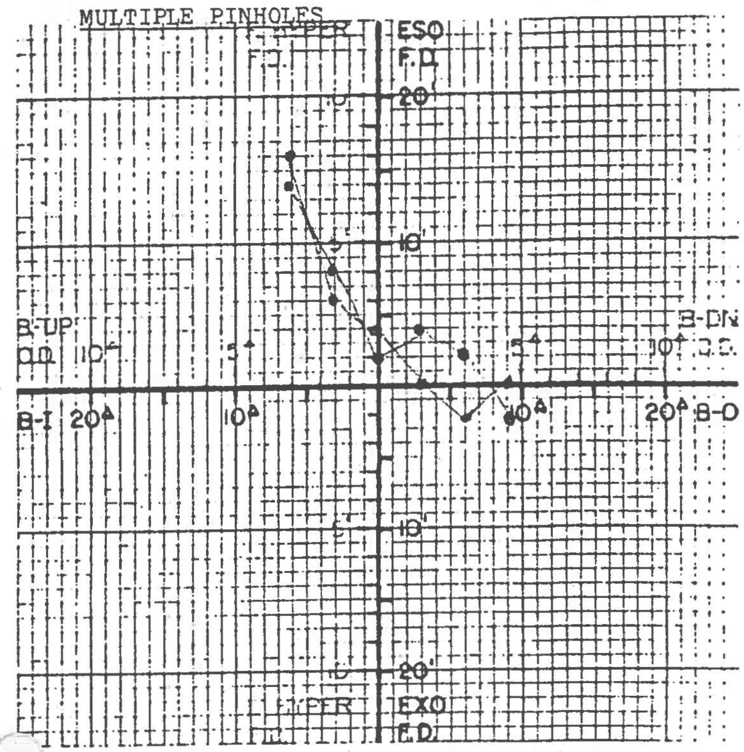


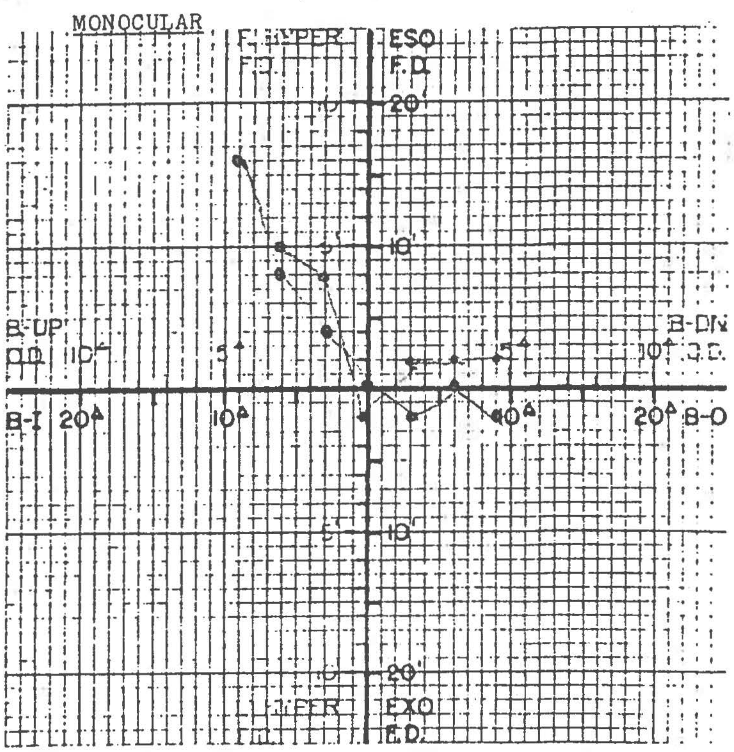

(•) - Prestress
(▪) - Poststress

# FIXATION DISPARITY CURVE

NAME S.H.
DATE
STANCE
☐ LATERAL ☐ VERTICAL

COMMENTS:
phoria: ∅ @6m
2 exo @40cm



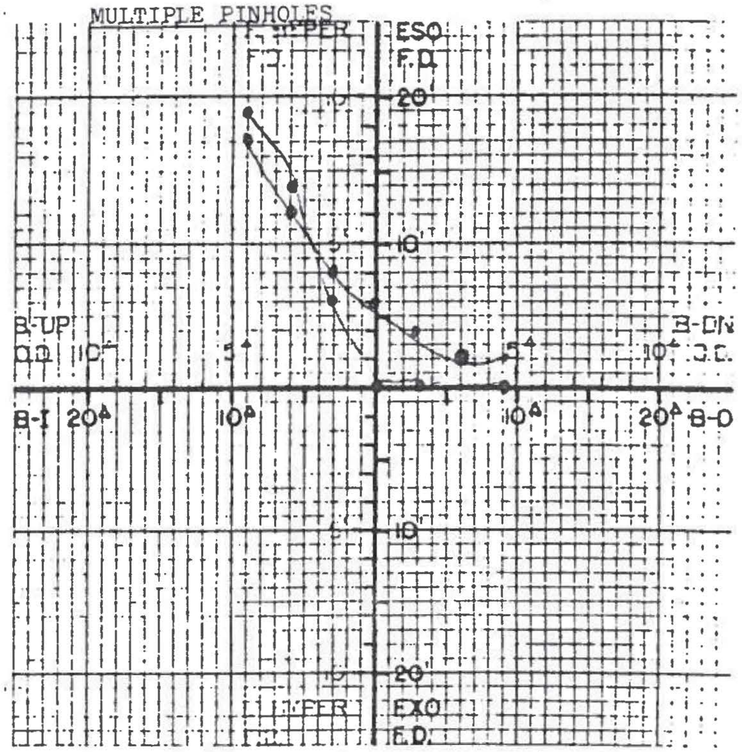



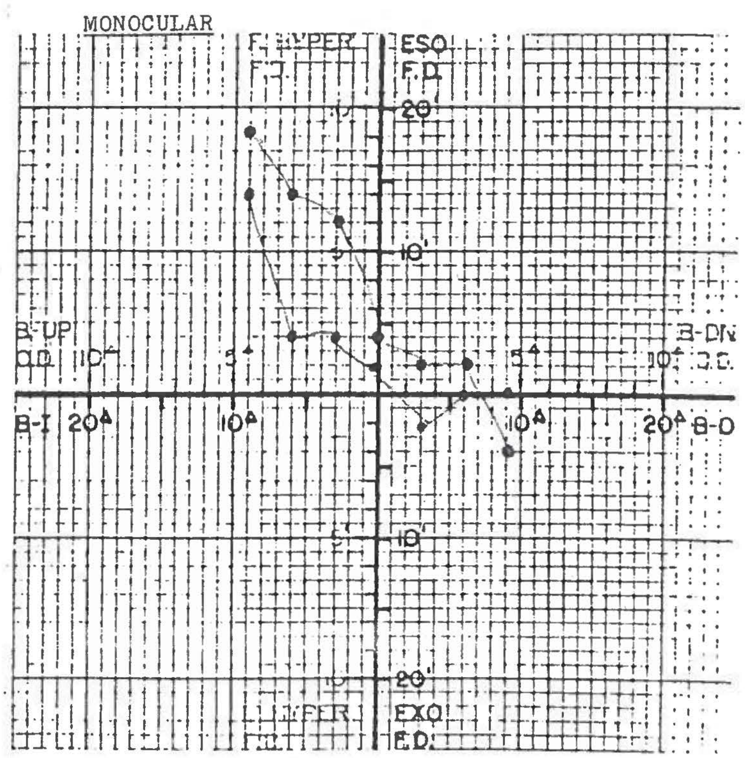



# FIXATION DISPARITY CURVE

NAME C.K.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS:
phoria: 3 eso @6m
∅ @40cm



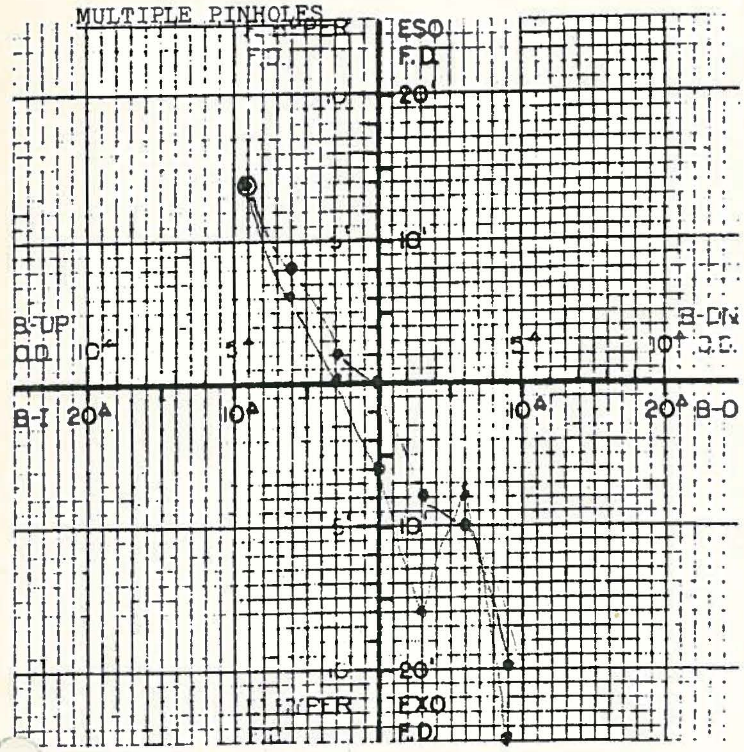


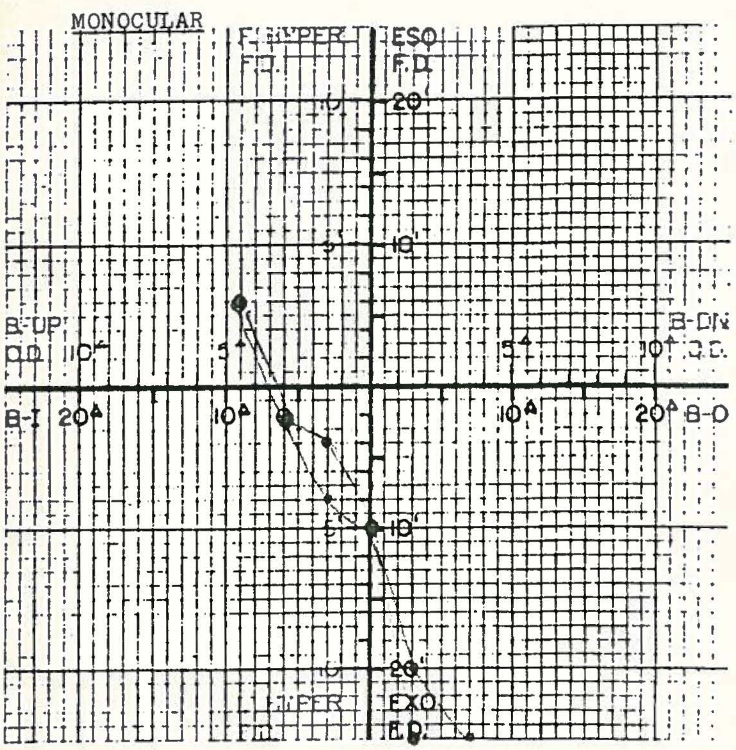

(•) - Prestress
(•) - Poststress

## FIXATION DISPARITY CURVE

NAME J.M.
DATE
DISTANCE
LATERAL □ VERTICAL

COMMENTS:
phoria: ∅ @6m
2 exo @40cm



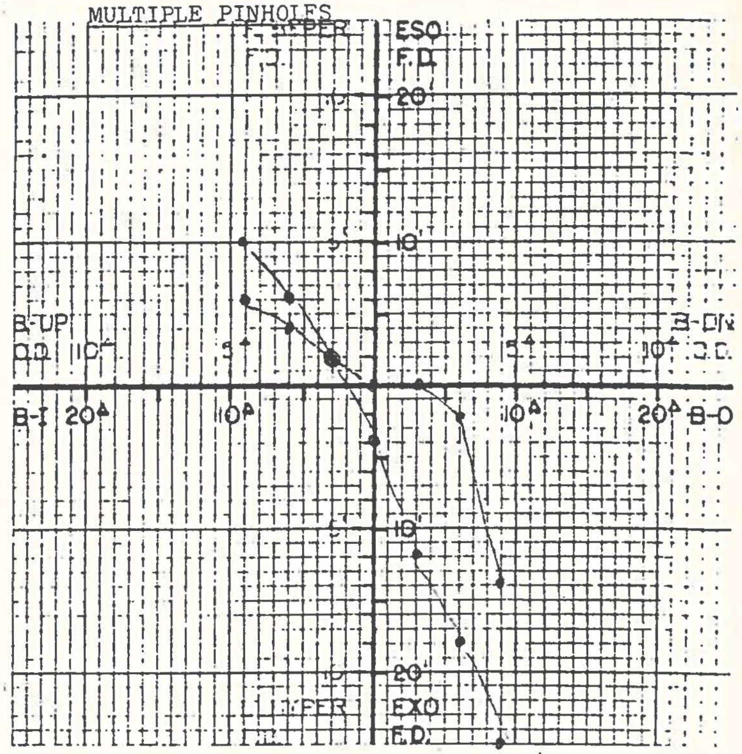



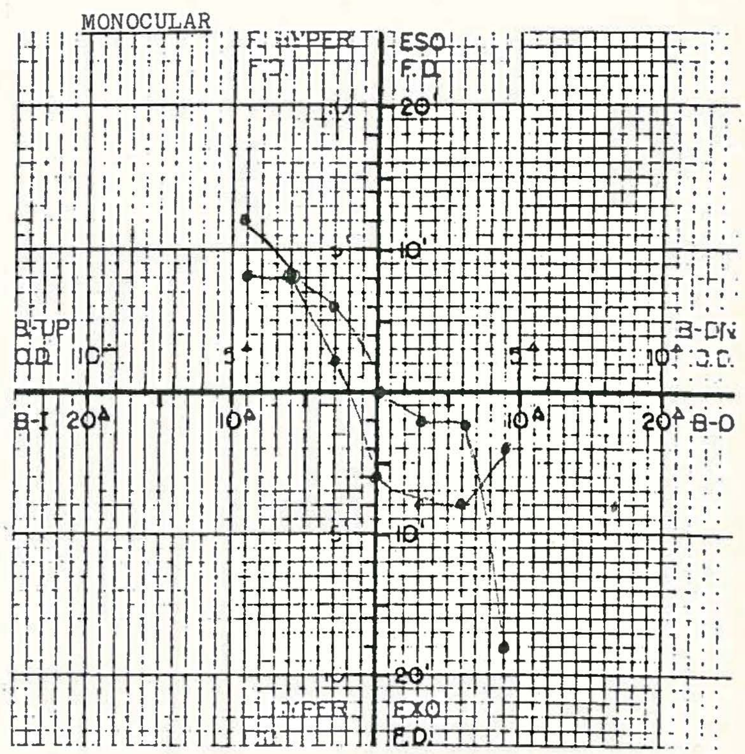



## FIXATION DISPARITY CURVE

NAME J.M.
DATE
DISTANCE
□ LATERAL □ VERTICAL

COMMENTS:
phoria: 2 exo @6m
4 exo @40cm





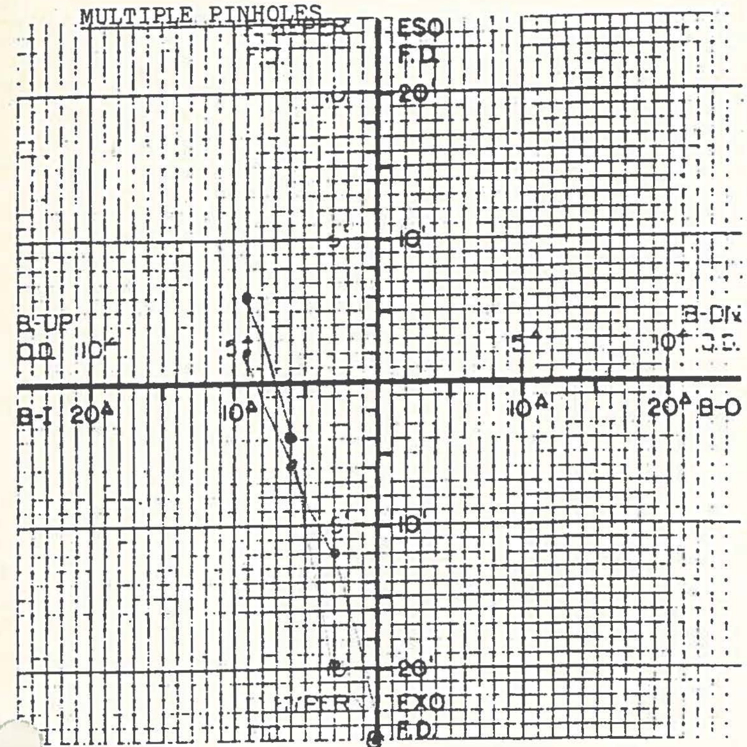

(•) - Prestress
(•) - Poststress

# FIXATION DISPARITY CURVE

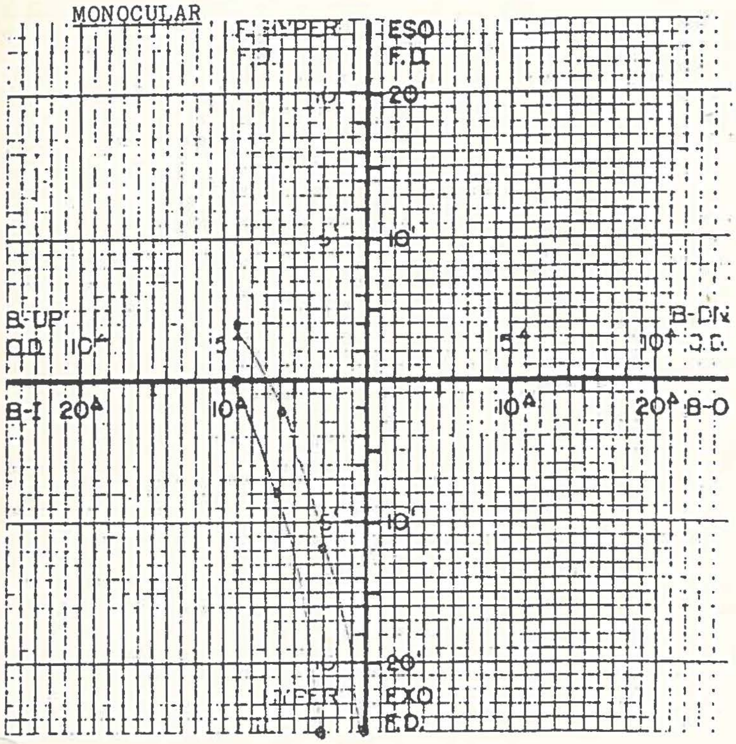
NAME T.G.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS:
phoria: 1 exo @6m
2 eso @40cm

MULTIPLE PINHOLES




MONOCULAR



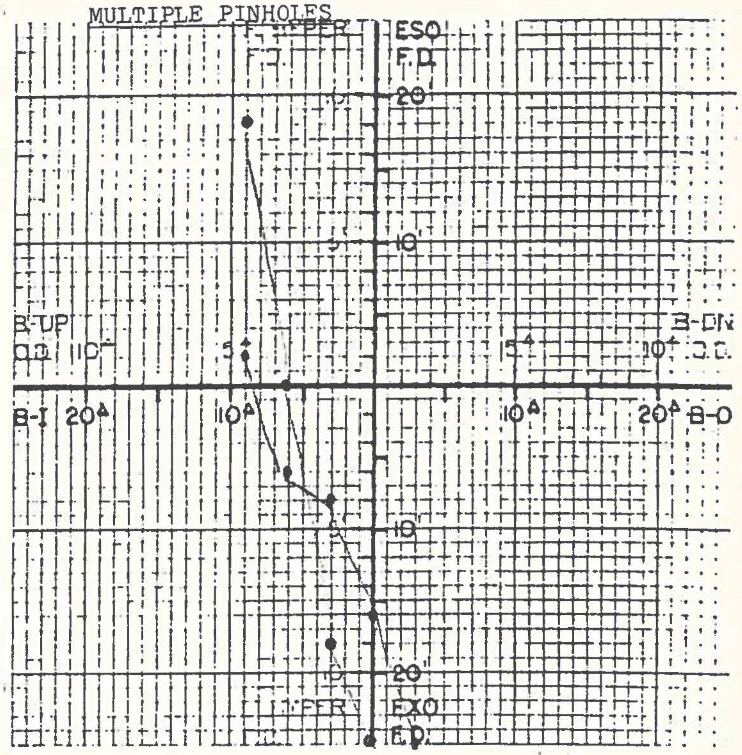



# FIXATION DISPARITY CURVE

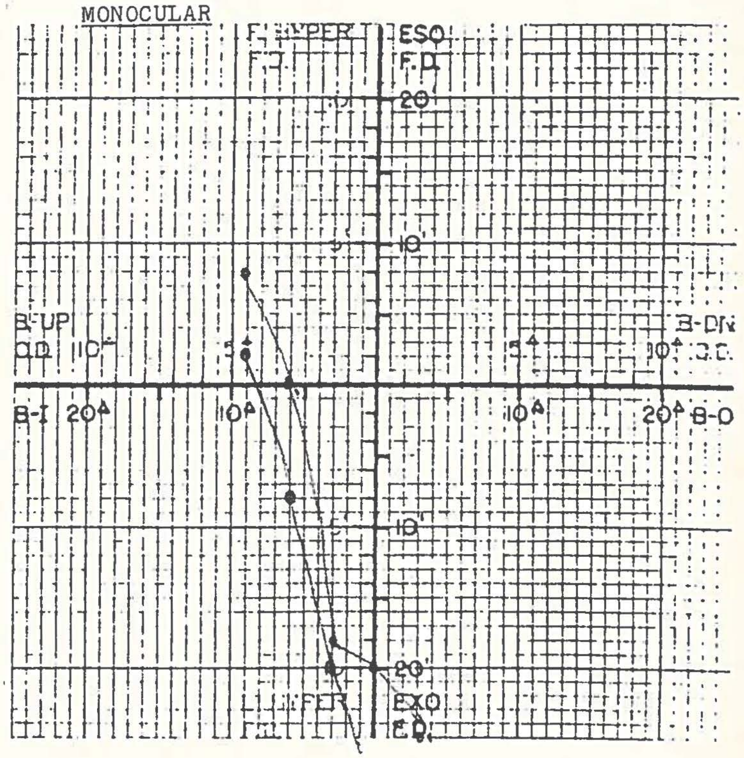
NAME E.M.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS:
phoria: 3 exo @6m
3 exo @40cm

MULTIPLE PINHOLES




MONOCULAR





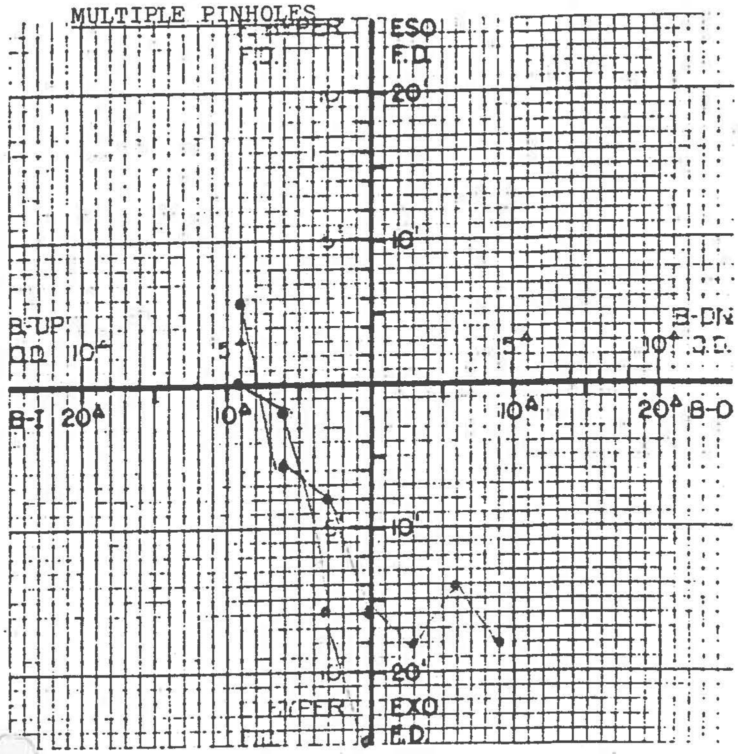

(•) - Prestress
(•) - Poststress

## FIXATION DISPARITY CURVE

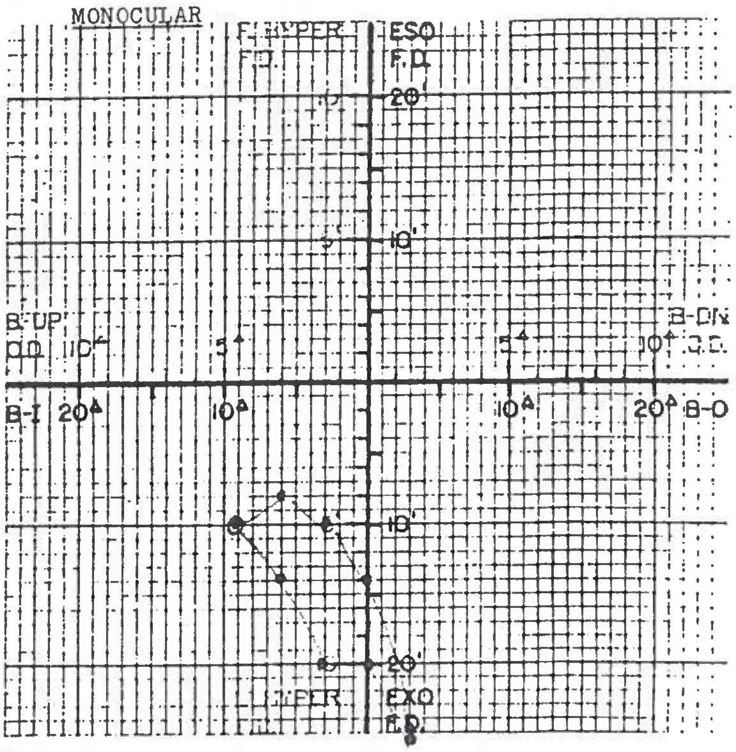
NAME R.G.
DATE
DISTANCE
□ LATERAL □ VERTICAL

COMMENTS: phoria: 6 exo @6m
9 exo @40cm

MULTIPLE PINHOLES




MONOCULAR



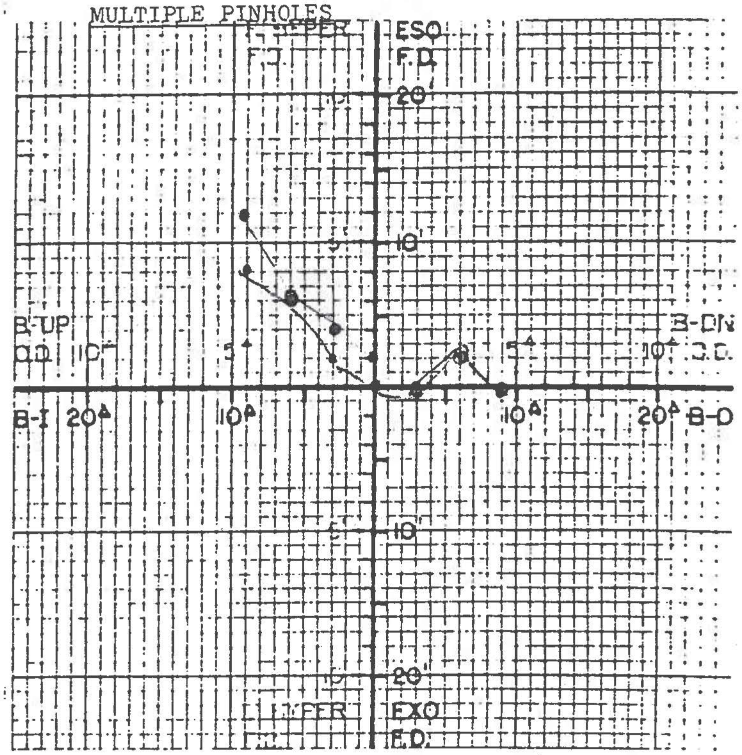



## FIXATION DISPARITY CURVE

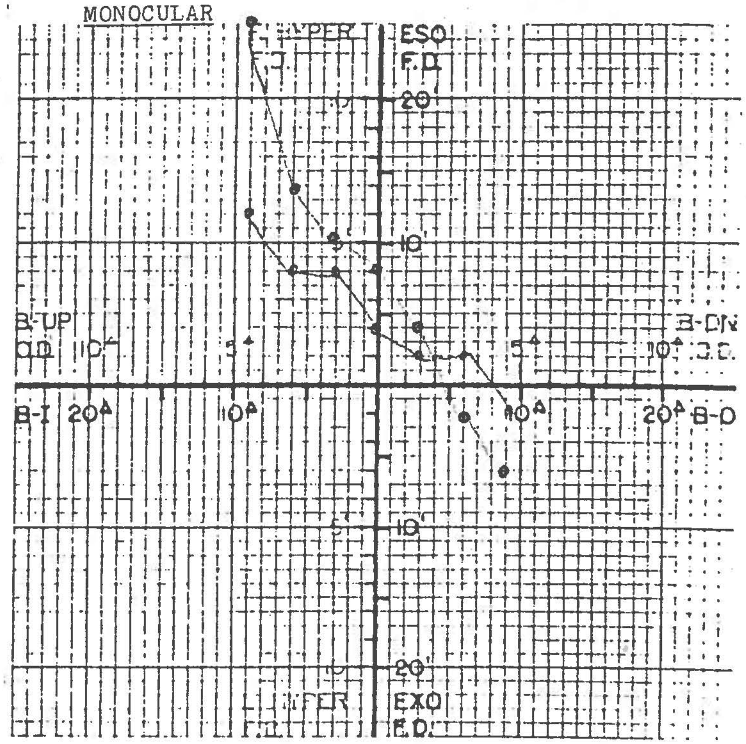
NAME C.B.
DATE
DISTANCE
□ LATERAL □ VERTICAL

COMMENTS: phoria: Ø @6m
6 eso @40cm

MULTIPLE PINHOLES




MONOCULAR



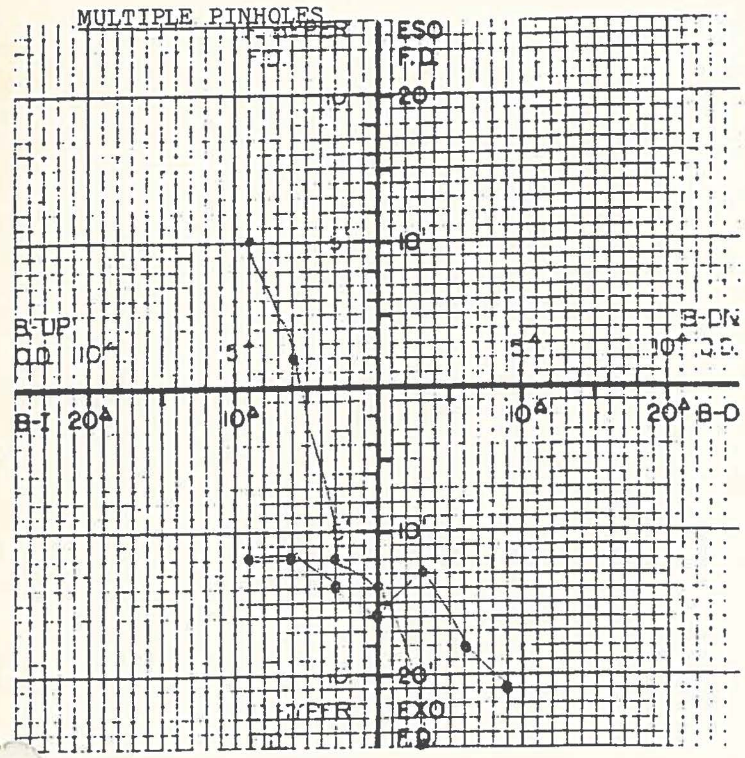


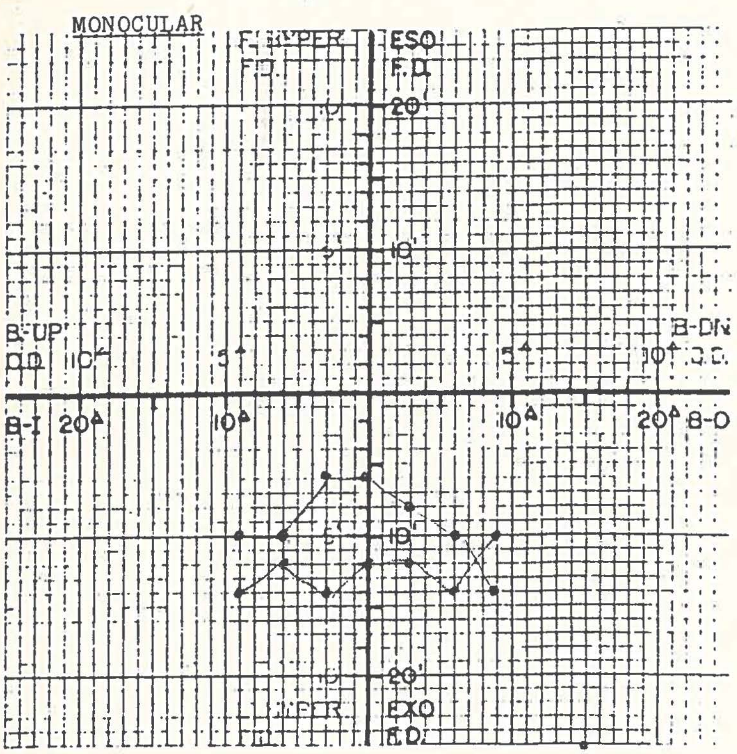

(•) - Prestress
(•) - Poststress

# FIXATION DISPARITY CURVE

NAME L.C.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS:
phoria: 3 exo @6m
2 exo @40cm



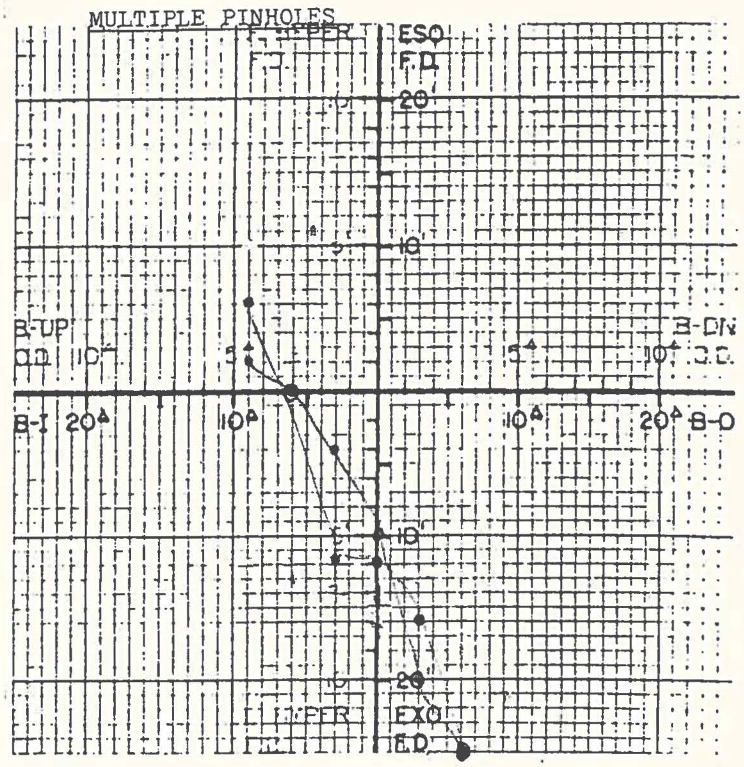


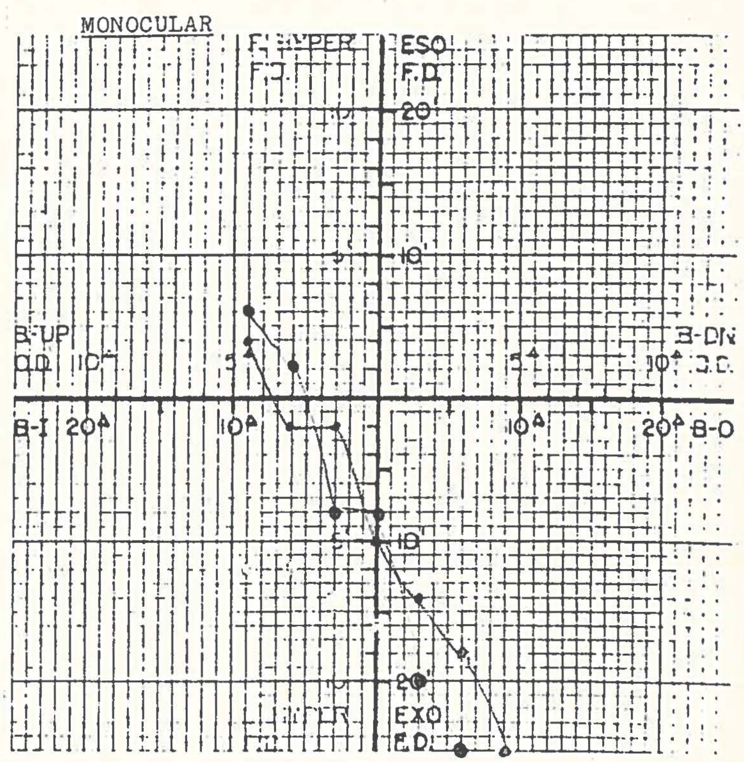

(•) - Prestress
(•) - Poststress

# FIXATION DISPARITY CURVE

NAME J.M.
DATE
DISTANCE
☐ LATERAL ☐ VERTICAL

COMMENTS:
phoria: Ø @6m
4 exo @40cm



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