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# STUDY OF COMPOSITE BRIDGE STRINGERS

## Pushout Tests with High Strength Pretensioned Bolts

by

Lawrence N. Dallam

TECHNICAL REPORT

Prepared for Cooperative Research Project
Sponsored by
The State Highway Commission of Missouri
and
U. S. Bureau of Public Roads

August, 1966

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ACKNOWLEDGEMENTS

The testing program reported herein was conducted in the Civil Engineering Laboratories of the University of Missouri, Columbia, Missouri. This work represents one phase of a cooperative study of composite bridge stringers undertaken by the Engineering Experiment Station and sponsored by the Missouri State Highway Commission and the Bureau of Public Roads of the U.S. Department of Commerce. This report covers a portion of the work performed on this project during the period September, 1965 to June, 1966.

The program was performed with the guidance of an advisory committee consisting of the following personnel:

Representing the Bureau of Public Roads:

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Mitchell Smith, District Bridge Engineer

Representing the Missouri State Highway Commission:

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All work performed on the project was under the supervision of

L. N. Dallam. Messrs. Sankar Das and Hsiang-Jui Chen were graduate research assistants on the project. Messrs. R. Thornton and D. A. Morton were project technicians. Messrs. J. L. Harpster and F. L. Kieninger were student assistants on the project.

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# I. INTRODUCTION

## 1-1 General

The shear connectors used in composite concrete-steel members have been of the types that are welded to the flange of the steel beam. Examples are studs (headed or L type), standard channel sections and spirals. These connectors can be classified as flexible connectors, because under small shear forces there will be a relative movement or slip between the concrete slab and the steel beam at the interface.

The design of composite members in highway bridges is based upon the current AASHO specifications[(1)*]. These specifications require the use of the elastic elementary beam theory in the design and a factor of safety of about 4.0 for the allowable shear force in the connector. It appears to this investigator that the high factor of safety was selected to insure a more rigid connection at the interface to conform with the design assumptions and also because the fatigue behavior of flexible connectors has not been satisfactorily determined. Whatever the reasons, the resulting design has a very large number of connectors which the designer feels "intuitively" as too many.

These connectors are usually shop welded and are therefore present throughout the construction until the slab is cast. The presence of the connectors during the construction phase has been criticized from the point of view of safety for the workmen.

Because of the above considerations a connector which would provide a more rigid connection between the concrete and steel and which

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*Numbers in parentheses refer to entries in the bibliography.

could transfer a higher shear force and which could be easily installed in the field would certainly be desirable.

## 1-2 Object and Scope of Tests

The object of the testing program was to investigate the behavior of a rigid connector embedded in normal-weight concrete when subjected to a static shear force. The results were to be compared with those of flexible connectors to help determine the feasibility of using rigid connectors in composite construction.

Twelve pushout specimens were tested using high strength bolts. Four specimens each of 1/2, 5/8, and 3/4 inch diameter bolts were tested.

## 1-3 Notation

The notation or mark used to distinguish between pushout specimens with different types of connectors is as follows. The first letter denotes the type of concrete (normal-weight, N, or lightweight, L). The second character is a number which gives the diameter of the connector in eights of an inch for studs and bolts, but for channels it gives the height of the channel. The third character (A or B) indicates the type of pushout specimen. Type A has a steel beam section 23 inches in length and type B has one 20 inches in length. The last character distinguishes between specimens with otherwise identical notation. The remaining characters can best be explained by the following examples.

1. Stud - N5B4a The fourth character gives the total number of studs on the specimen. Therefore, this specimen has four 5/8 inch diameter studs welded to a 20 inch beam and embedded in slabs composed of normal-weight concrete.

2. Channel - L4B<u>C6</u>a The fourth and fifth characters denote a channel connector and its length in inches.

3. High Strength Bolts - N4B<u>4TB</u>2 The fourth character denotes the total number of bolts and the fifth and sixth characters indicate these are high strength pretensioned bolts. Therefore, this specimen has four 4/8 inch diameter high strength pretensioned bolts embedded in normal-weight concrete slabs and is the second specimen of the series.

## II. DESCRIPTION OF SPECIMENS AND APPARATUS

### 2-1 General

Four different kinds of specimens were tested in this investigation; the pushout specimen and three companion specimens which were the cylinder, bolt tensile coupon and what will be called the prestress specimen.

### 2-2 Pushout Specimens

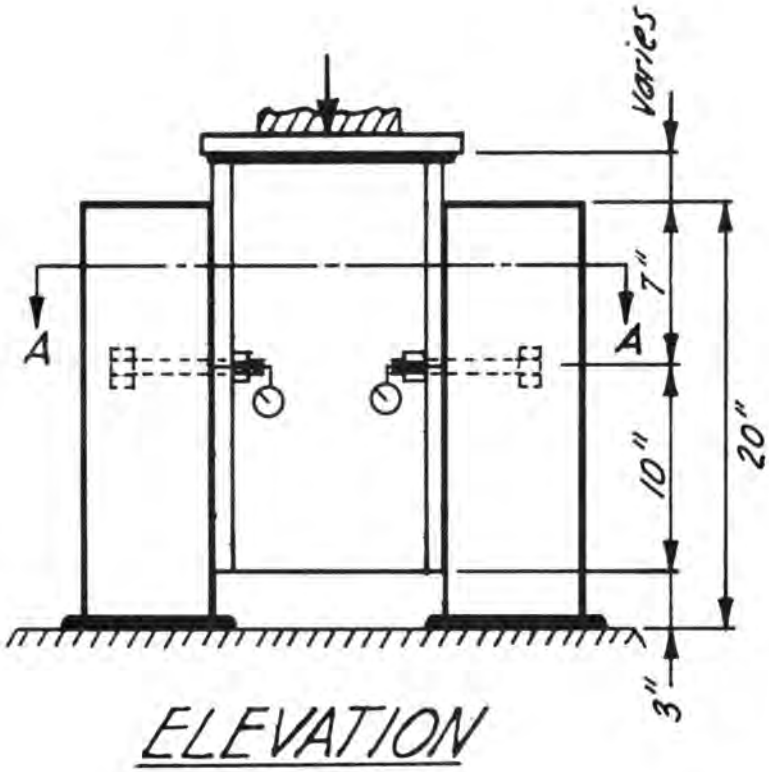
Two types of pushout specimens were used and are shown in detail in Figure 1. Both specimens consisted of an 8 WF 48 beam section and two concrete slabs 20 x 24 x 6 inches. The only difference between the specimens was in the length of the beam section: Type A having a length of 23 inches and Type B a length of 20 inches. There were two bolts placed on each flange of the steel beam stub. The bolts were held in place by a wire "chair" during the placing of the concrete as shown in Figure 2.

The surface of the beam stub in contact with the concrete was sand blasted in an attempt to eliminate the surface condition as a variable.

### 2-3 Companion Specimens

The cylinders were standard 6 x 12 specimens.

The bolt tensile coupons were machined from 3/4-inch diameter A 325 bolts. The ends were threaded and the middle portion was about three inches in length with a diameter of .500 inches. The coupons are shown in Figure 3.



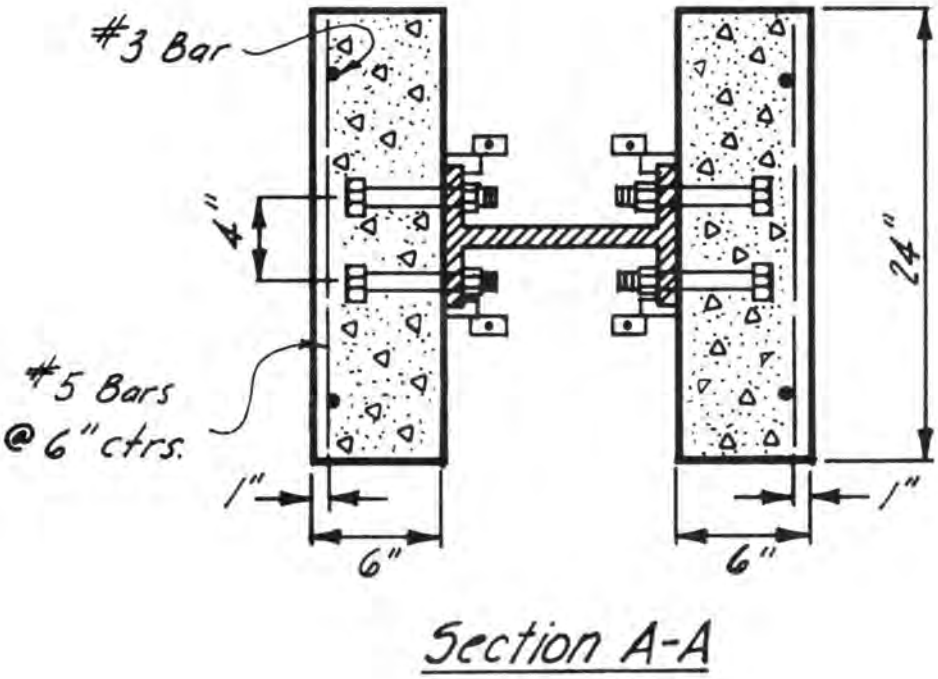




Figure 1 Detail of Pushout Specimens.

Figure 2 Bolt Installation on Pushout Specimens.

The prestress specimens consisted of two A 325 bolts installed on a steel plate 8 x 12 x 3/4 inches in the same manner as those on the pushout specimen. A normal-weight concrete block six inches in thickness was cast on the plate around the bolts. Figure 4 shows typical specimens prior to casting of the concrete.

## 2-4 Materials

The concrete for the slabs of the pushout specimens consisted of normal-weight aggregates and type I portland cement. The coarse aggregate was well-graded crushed limestone with a maximum size of 3/4 inches and the fine aggregate was Missouri River sand. Air entrainment was added to each mix. Typical mix proportions were 1:1.94:3.27 by weight with a water-cement ratio of 5.0 gallons per sack. This mix conformed with the Class B-1 mix required by the State Highway Commission of Missouri for bridge construction. The concrete was obtained from a

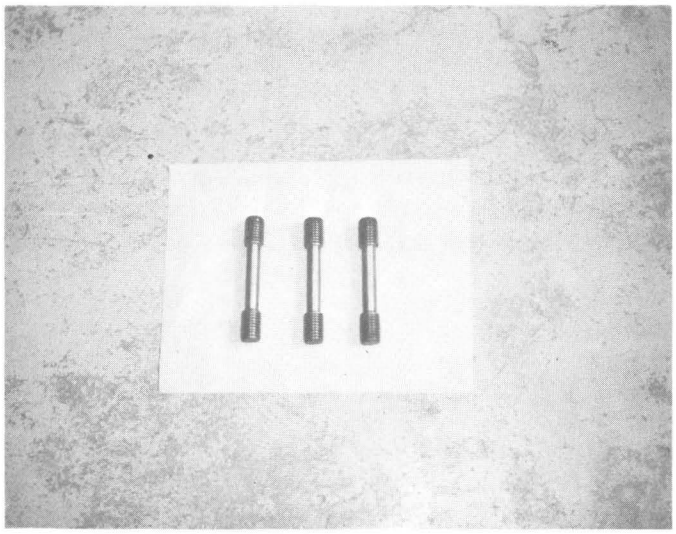


Figure 3 Bolt Tensile Coupons.

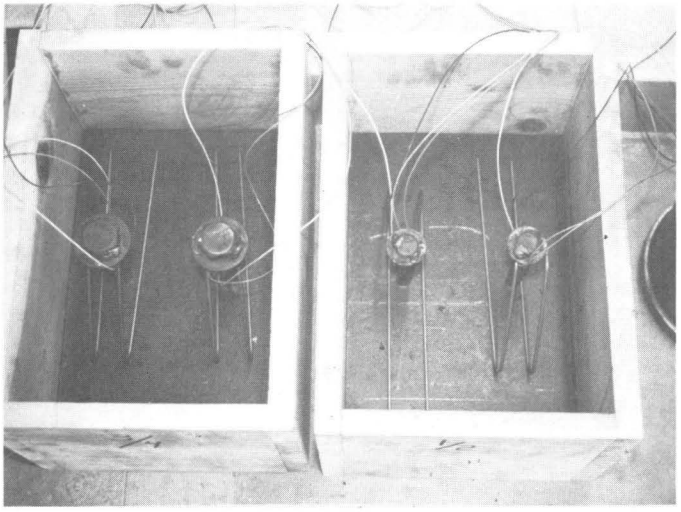


Figure 4 Prestress Specimens.

local reddi-mix plant.

The concrete for the prestress specimens was of two kinds. One was the Class B-1 mix obtained from the local reddi-mix plant while the other consisted of the same constituents as that of the pushout specimens except no air was added, the mix proportions were different and the proportioning and mixing was done in the university laboratory.

All bolts were obtained commercially and were manufactured to conform with the ASTM specification A 325.

## 2-5 Preparation of Specimens

The bolts were loosely attached to the steel beam section in predrilled holes and held in place during the casting of the slabs by a wire spring chair as shown in Figure 2. Standard steel washers with a diameter of about one inch greater than the bolt diameter were spot welded to the under side of the head of the bolt. The flanges of the beam were sandblasted to remove all mill scale and foreign particles.

The slabs were cast on edge and the concrete was carefully vibrated to eliminate air voids in the vicinity of the bolts. The concrete was cured in the laboratory with wet burlap and a polyethylene covering for 28 days. At least six 6 x 12 inch cylinders were cast with each batch and were cured under the same conditions as the pushout specimens.

At the end of 28 days the pushout specimens were allowed to air dry and the bolts were tightened by the "turn-of-nut" method. The procedure was to bring the bolts to a "snug tight" condition which was accomplished by "the full effort of a man using an ordinary spud wrench". After all bolts were snug tight the nuts were rotated 1/2 turn to attain the minimum specified bolt tension.

## 2-6 Loading Apparatus and Instrumentation

The pushout specimens were tested in a 300,000 lb. capacity Riehle hydraulic testing machine. The load was applied to the end of the steel beam section through a spherical block and a steel distributing plate. Strips of lead were inserted between the WF beam and the steel plate to improve the load distribution.

Slip between the slabs and the steel beam section, and total load applied were measured for each specimen. The slip was measured with four 0.0001-inch dial indicators mounted at the locations shown in Figure 1. Each dial was rigidly attached to the appropriate steel beam flange with the dial stem bearing on a bracket cemented to the concrete slab. The dials and brackets were placed directly opposite the shear connectors.

The cylinders were also tested in the 300,000 pound testing machine. The deformation was measured with a compressometer having an eight-inch gage length, a multiplication ratio of 2:1 and a .0001-inch dial indicator.

The tensile coupons machined from the bolts were tested in a 60,000 pound capacity hydraulic testing machine. Elongation in two of the specimens was measured with an extensometer having a 2-inch gage length, a multiplication ratio of 2-1/2:1 and a .0005-inch dial indicator. The other specimen had two SR-4 electrical resistance gages, placed diametrically opposite each other, to measure the strain.

The prestress specimens were instrumented with two SR-4 gages placed diametrically opposite on each bolt. Loads were applied manually by means of wrenches and pipe extensions.

## III. TEST PROCEDURE

### 3-1 Pushout Specimens

Each specimen was preloaded to check the dial indicators. The load was applied in increments of varying magnitude at a speed of about .05 inches per minute. The procedure was to load the specimen in cycles with each successive cycle having a higher peak load. Figure 5 illustrates the loading sequence in a typical test.

Values of load and slip were recorded after each increment of loading. The load was held constant while the slip dials were read. The dials were allowed to stabilize before readings were taken.

### 3-2 Cylinders

Six cylinders were tested in compression for each series of pushout specimens. Three cylinders were tested to failure to determine the compressive strength of the concrete. The remaining three cylinders were then tested to determine the modulus of elasticity of the concrete. Values of load and deformation were recorded at increments of 10,000 pounds until the load at about 40% of the predetermined maximum load was reached. The compressometer was then removed from the cylinder as the test continued to failure. The load was continuously applied and therefore the dials were read at the instant the desired load was reached.

### 3-3 Bolt Tensile Coupons

Load was applied in 2500 lb. increments and elongation was recorded as the load was held constant. The apparent yield point load was

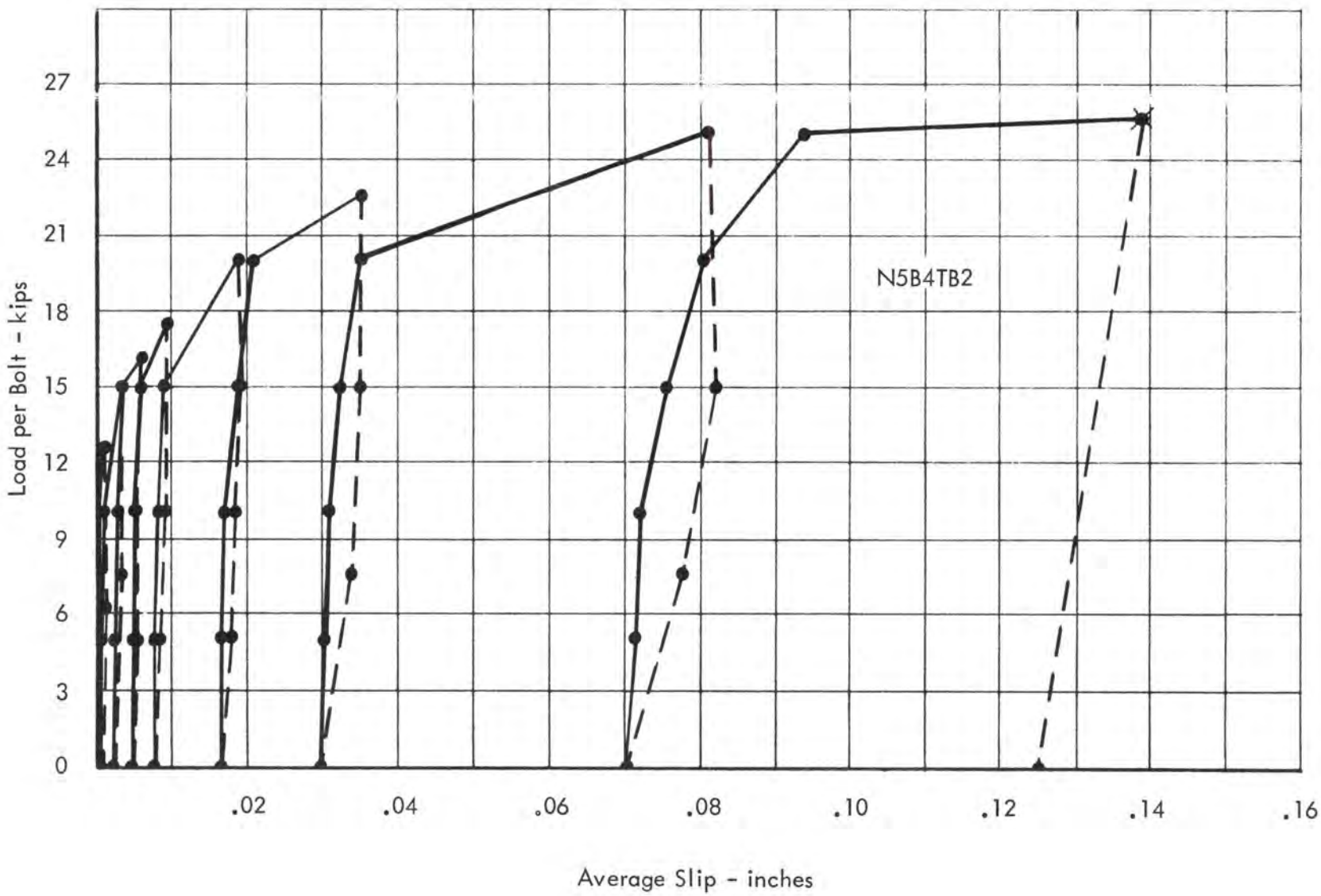



Figure 5 Typical Load-Slip Curve.

determined from the load indicator. The test was continued until fracture occurred, after which the total elongation in a two-inch gage length and the least diameter was measured. Figure 6 shows a test in progress.

## 3-4 Prestress Specimens

The bolts were tightened by the same method as that used in the pushout specimens outlined in Section 2-5 of this report. The strain was recorded when the bolts were in the relaxed state, snug tight state and tensioned state which was when the nut had been rotated 1/2 turn beyond the snug tight state.

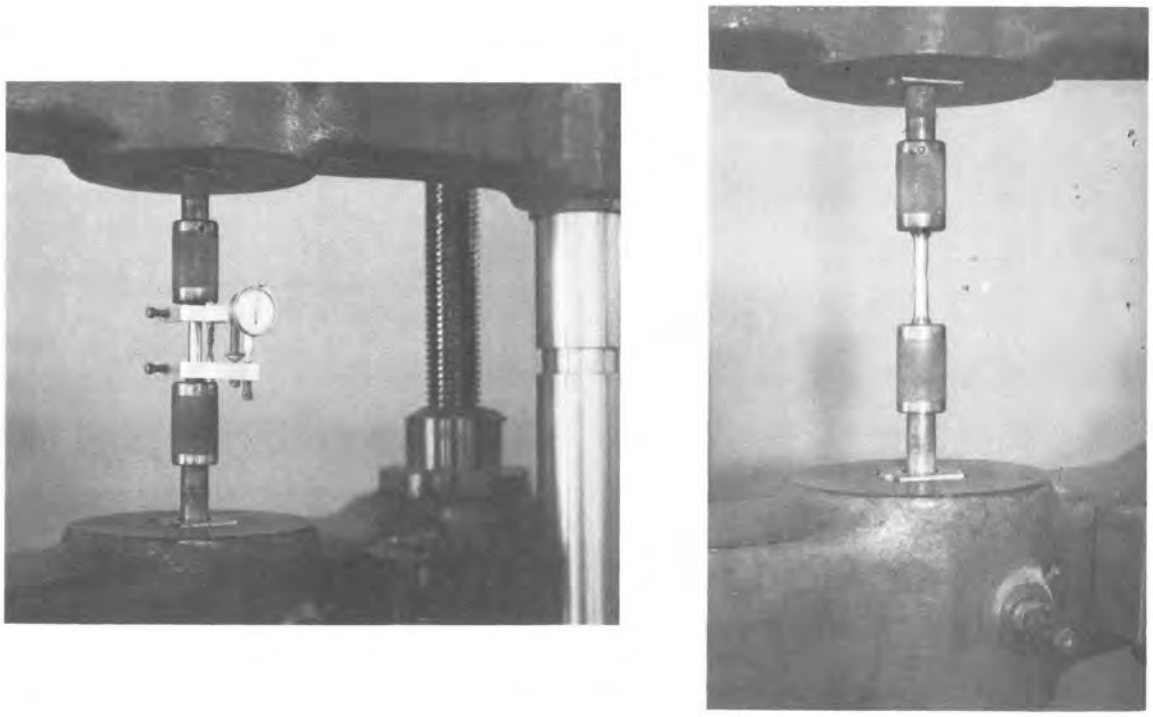


Figure 6 Test of Bolt Tensile Coupon.

# IV. RESULTS

## 4-1 Pushout Tests

The results of the pushout tests are shown in Figures 7 thru 12 and summarized in Table 1. In each case the load per bolt value represents the total load applied divided by the number of connectors on the specimen. This equal distribution of load was justified by the relatively small variance in slip at each connector. However, in the case of specimen N5A4TB4 there was poor alignment of the specimen and consequently the slip readings varied considerably and equal distribution was not justified. For this reason the results of this test are not plotted in Figures 9 and 10.

Two specimens were tensioned when the concrete had reached its 28-day strength and allowed to set for a period of time to determine if a loss in prestress would occur such that the critical and ultimate loads would be noticeably affected. These specimens were N4B4TB4 (No. 4) and N5A4TB4 (No. 8). Specimen No. 4 was tensioned 138 days prior to test and as can be seen from Table 1 and Figures 7 and 8, the critical load was about the same and the ultimate load was higher than the other specimens of the series. Specimen No. 8 was tensioned 54 days prior to test and the ultimate load was greater than two of the other three specimens of the series.

Figures 13, 14 and 15 illustrate typical failure conditions of the bolts and concrete in the pushout tests. In each case failure was taken at that point in the test when the specimen could not sustain additional load for an "adequate" period of time. In the first two speci-

TABLE 1

RESULTS OF PUSHOUT TESTS WITH BOLTS

| Specimen No. | Mark | Bolt Diameter (in.) | $f'_c$ (psi) | Critical Load Avg.Slip (in.) | Critical Load Ld.per Bolt (kips) | Critical Load Res.Slip (in.) | Ultimate Load Avg.Slip (in.) | Ultimate Load Ld.per Bolt (kips) | Ultimate Load Res.Slip (in.) | Type of Failure |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | N4B4TB1 | 1/2 | 6340 | .0030 | 12.3 | .0010 | --- | 20.88 | --- | Bolt |
| 2 | N4B4TB2 | 1/2 | 6340 | .0006 | 10.0 | .0003 | --- | 19.75 | --- | Bolt |
| 3 | N4B4TB3 | 1/2 | 6340 | .0006 | 12.5 | .00008 | --- | 19.50 | --- | Bolt |
| 4 | N4A4TB4 | 1/2 | 6340 | .0023 | 12.4 | .0006 | .234[1] | 22.06 | .129[2] | Bolt |
| 5 | N5A4TB1 | 5/8 | 6650 | .0040 | 16.6 | .0023 | .079[3] | 26.62 | .203 | Concrete |
| 6 | N5B4TB2 | 5/8 | 6650 | .0035 | 15.9 | .0022 | .139 | 25.62 | .125 | Concrete |
| 7 | N5B4TB3 | 5/8 | 6650 | .0040 | 16.6 | .0023 | .143[4] | 30.05 | .231 | Concrete |
| 8 | N5A4TB4 | 5/8 | 6650 | --- | --- | --- | .150[4] | 28.00 | .302 | Concrete |
| 9 | N6B4TB1 | 3/4 | 8440 | .0035 | 27.1 | .0014 | .064[5] | 38.00 | .195 | Concrete |
| 10 | N6A4TB2 | 3/4 | 8440 | .0045 | 27.0 | .0016 | .068[5] | 37.38 | .337 | Concrete |
| 11 | N6A4TB3 | 3/4 | 8440 | .0040 | 24.0 | .0016 | .074[6] | 34.75 | .408 | Concrete |
| 12 | N6A4TB4 | 3/4 | 8440 | .0035 | 26.3 | .0012 | .203[5] | 36.70 | .397 | Concrete |

[1] at 18.75 kips
[2] at 17.5 kips
[3] at 22.5 kips
[4] at 25.0 kips
[5] at 35.0 kips
[6] at 30.0 kips

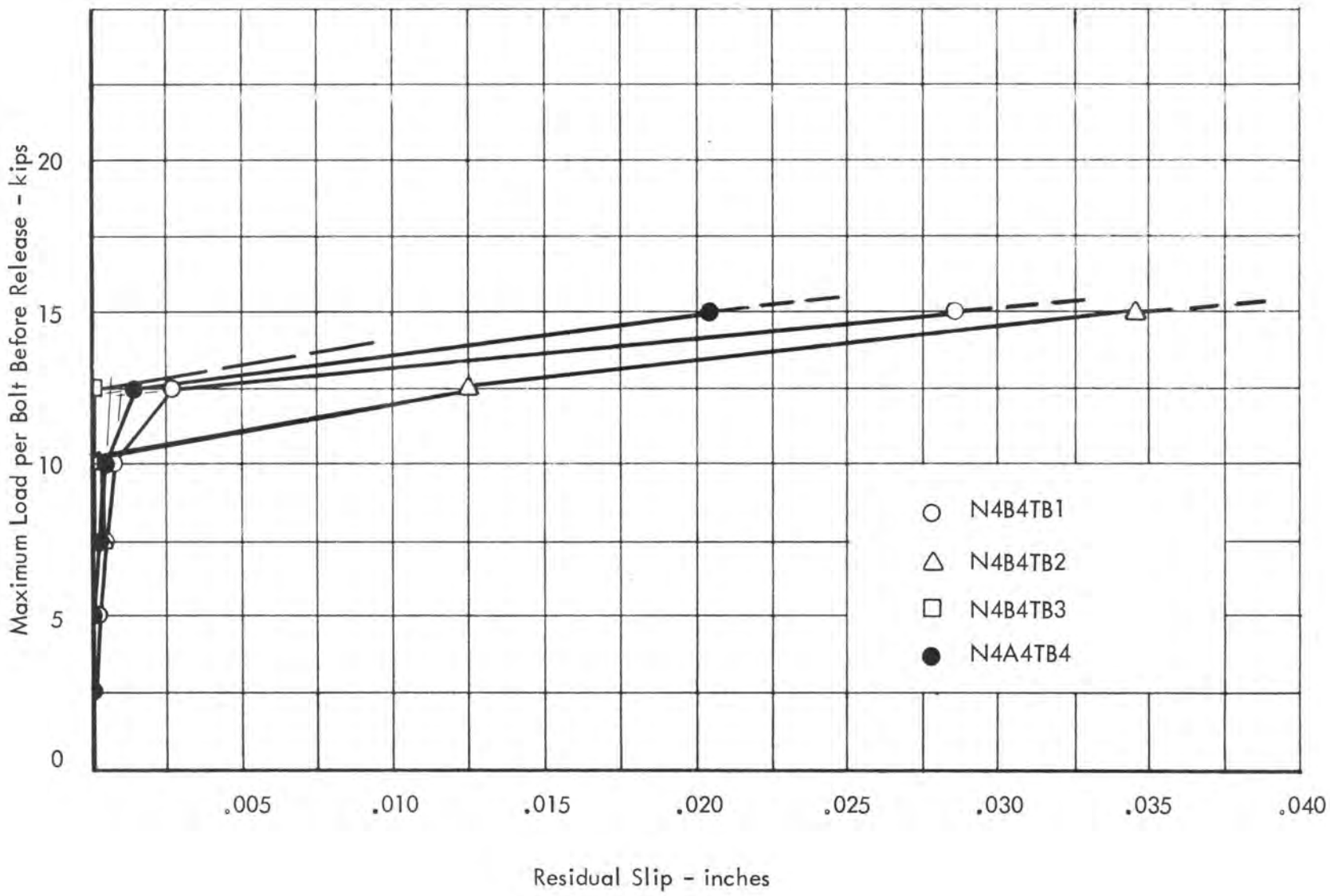



Figure 7 Load-Residual Slip Curves of 1/2-inch Bolts.

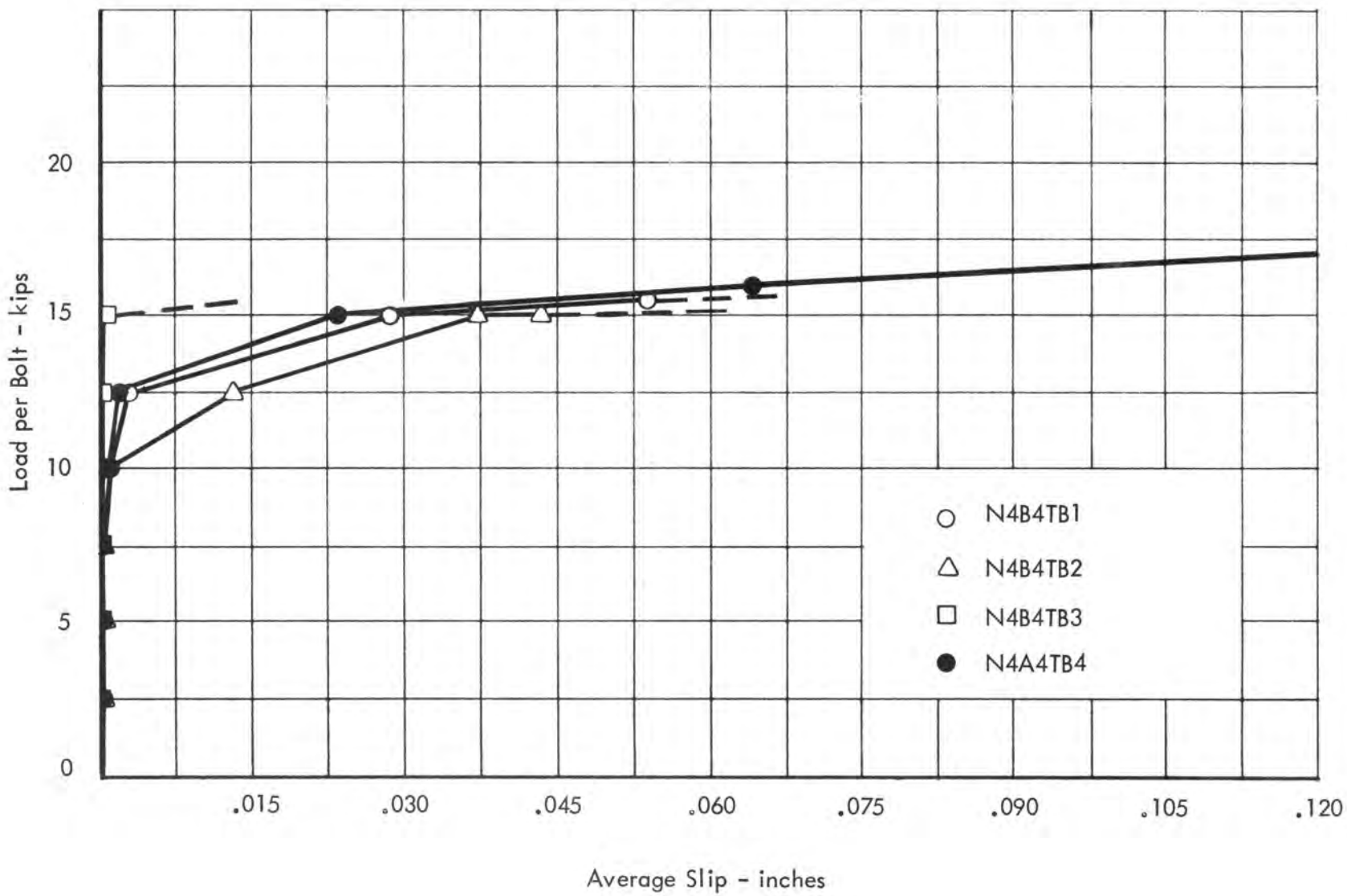



Figure 8 Load-Average Slip Curves of 1/2-inch Bolts.

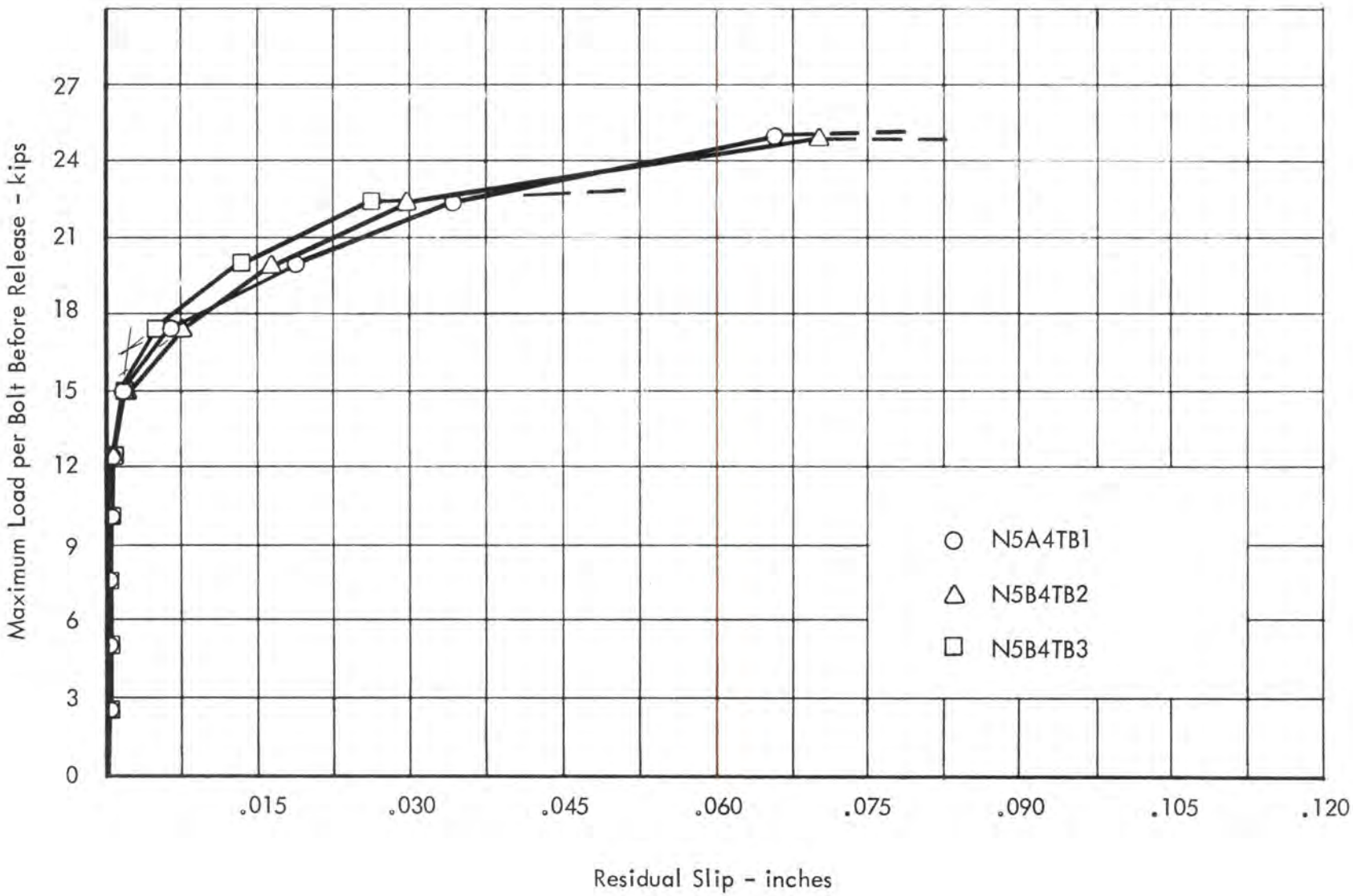



Figure 9 Load-Residual Slip Curves of 5/8-inch Bolts.

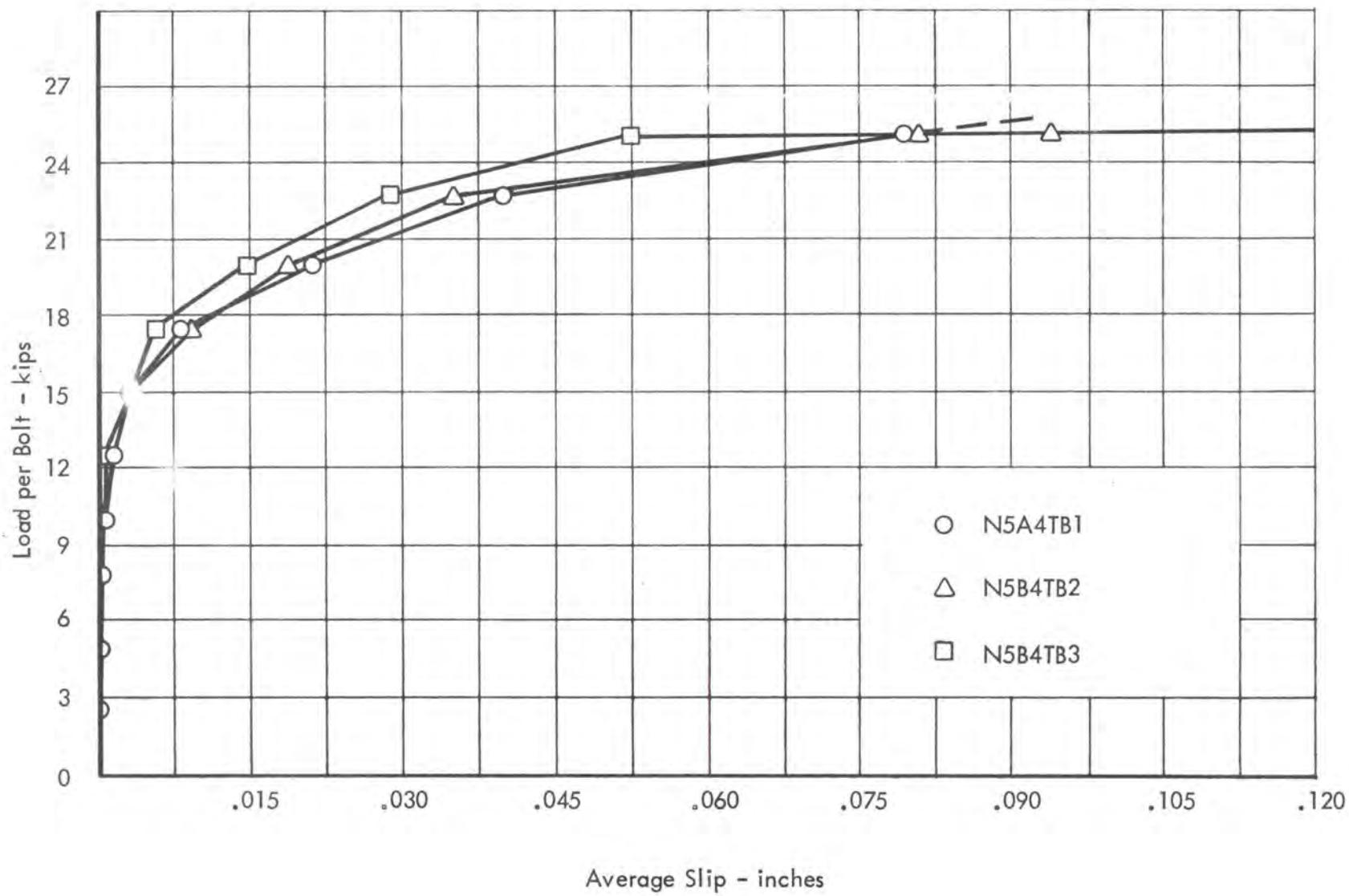



Figure 10 Load-Average Slip Curves of 5/8-inch Bolts.

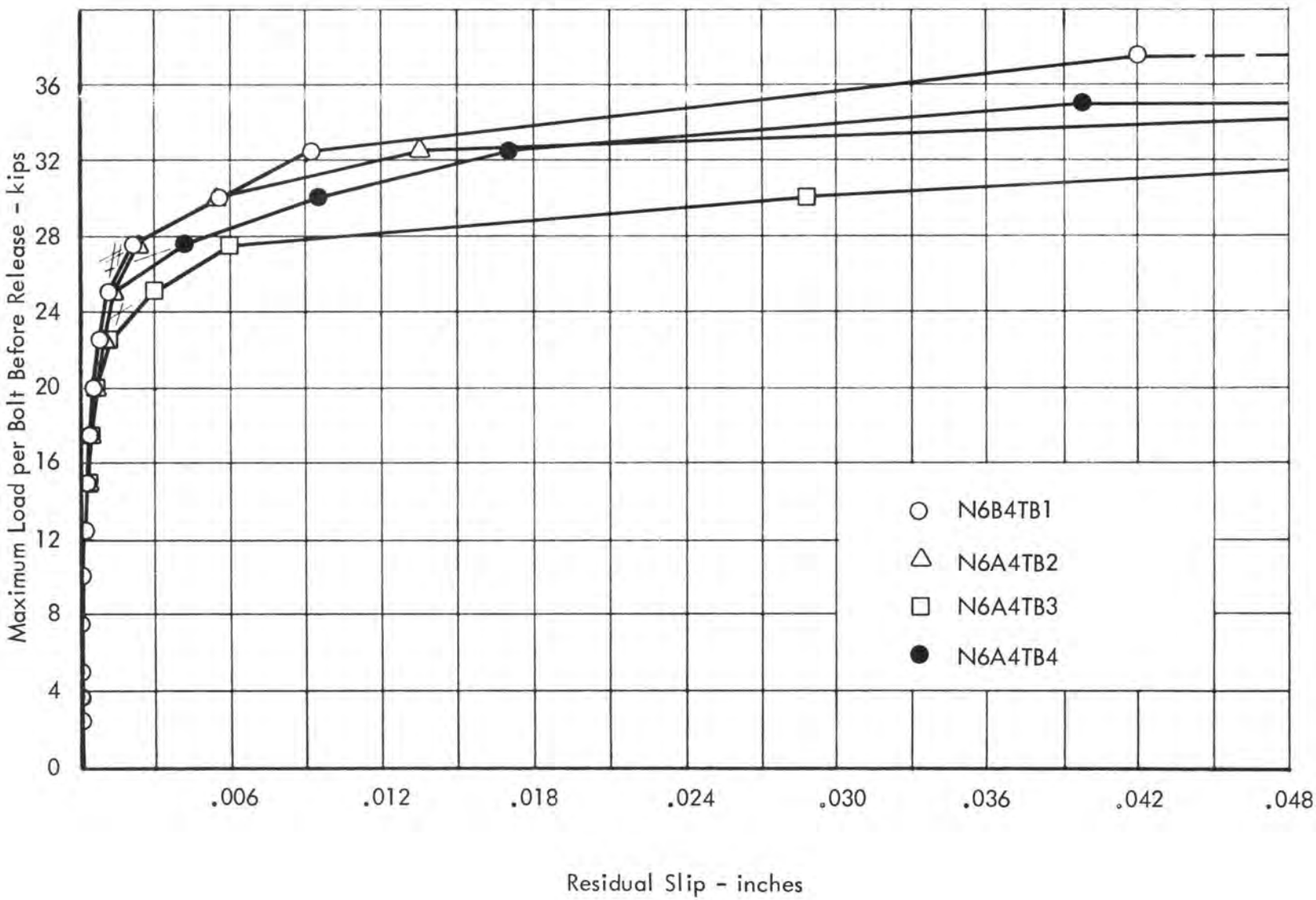



Figure 11 Load-Residual Slip Curves of 3/4-inch Bolts.

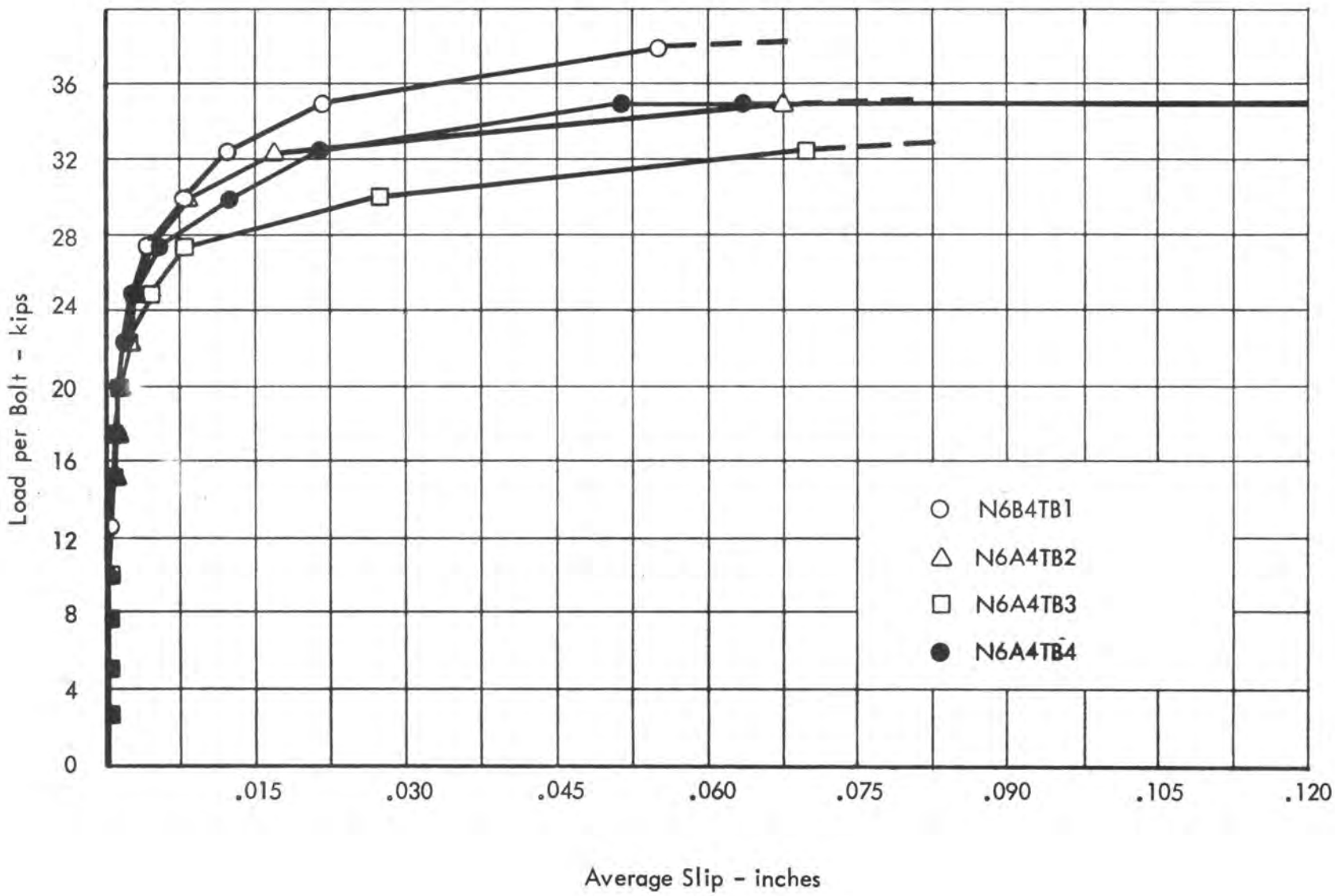



Figure 12 Load-Average Slip Curves of 3/4-inch Bolts.

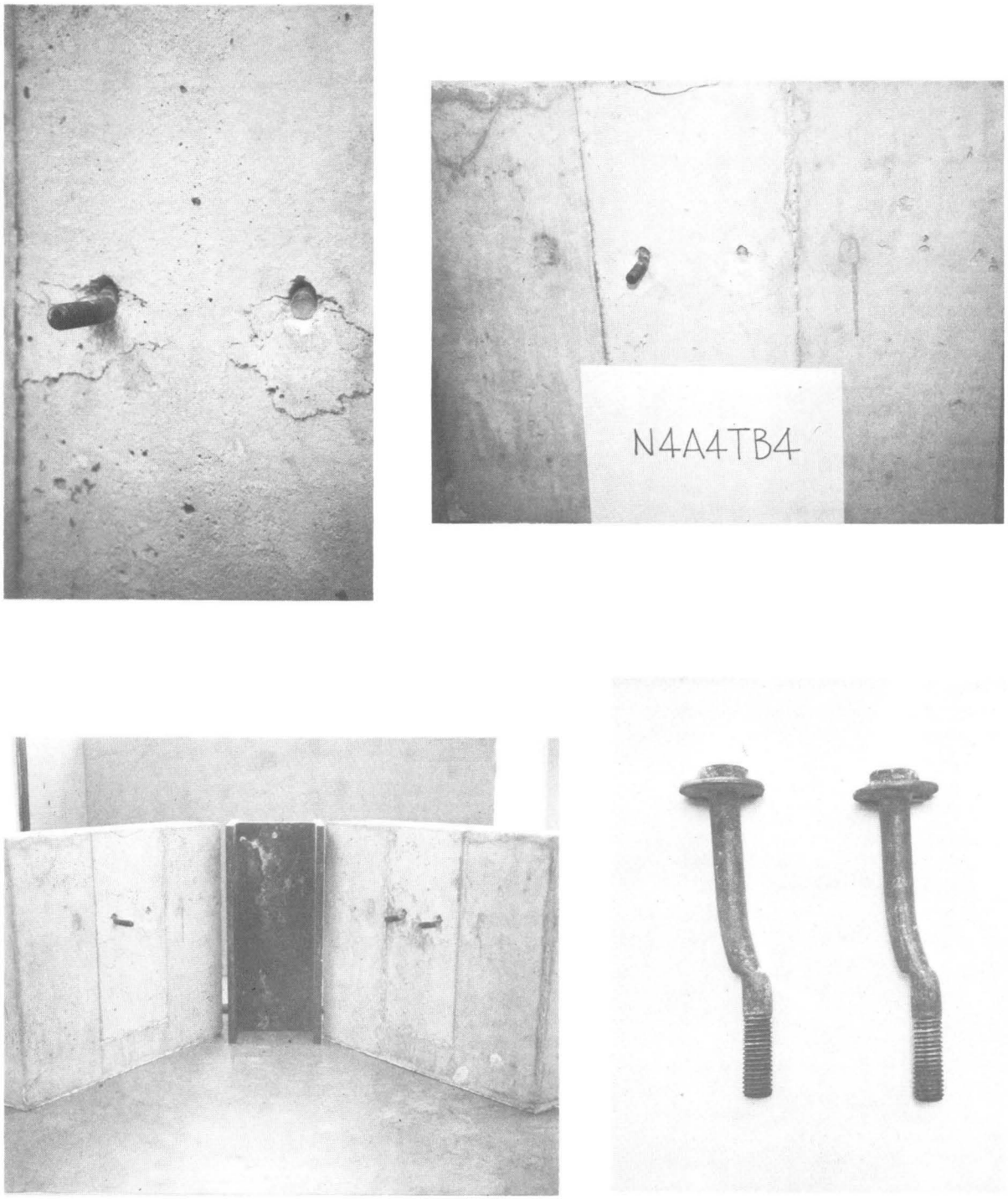
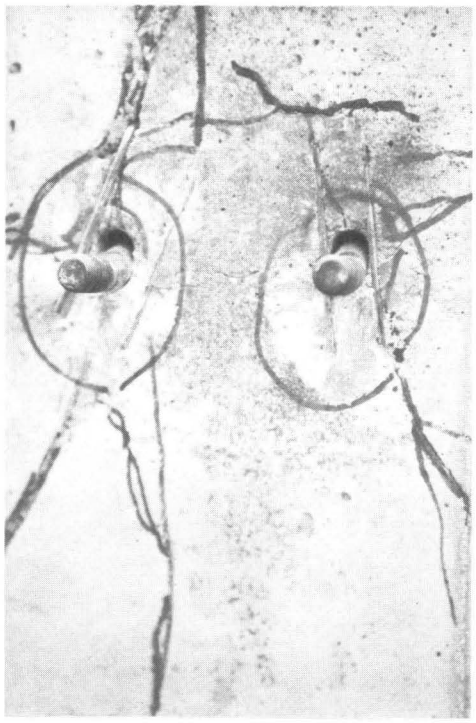



Figure 13 Typical Failure Conditions of 1/2-inch Bolt Pushout Specimens.



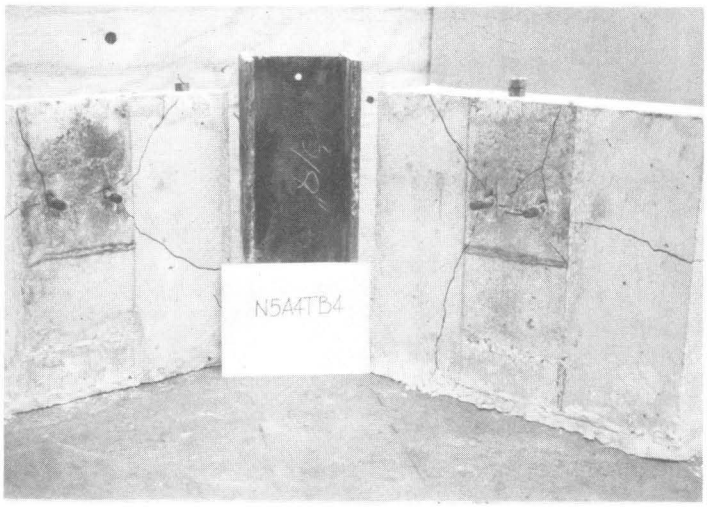


Figure 14 Typical Failure Conditions of 5/8-inch Bolt Pushout Specimens.

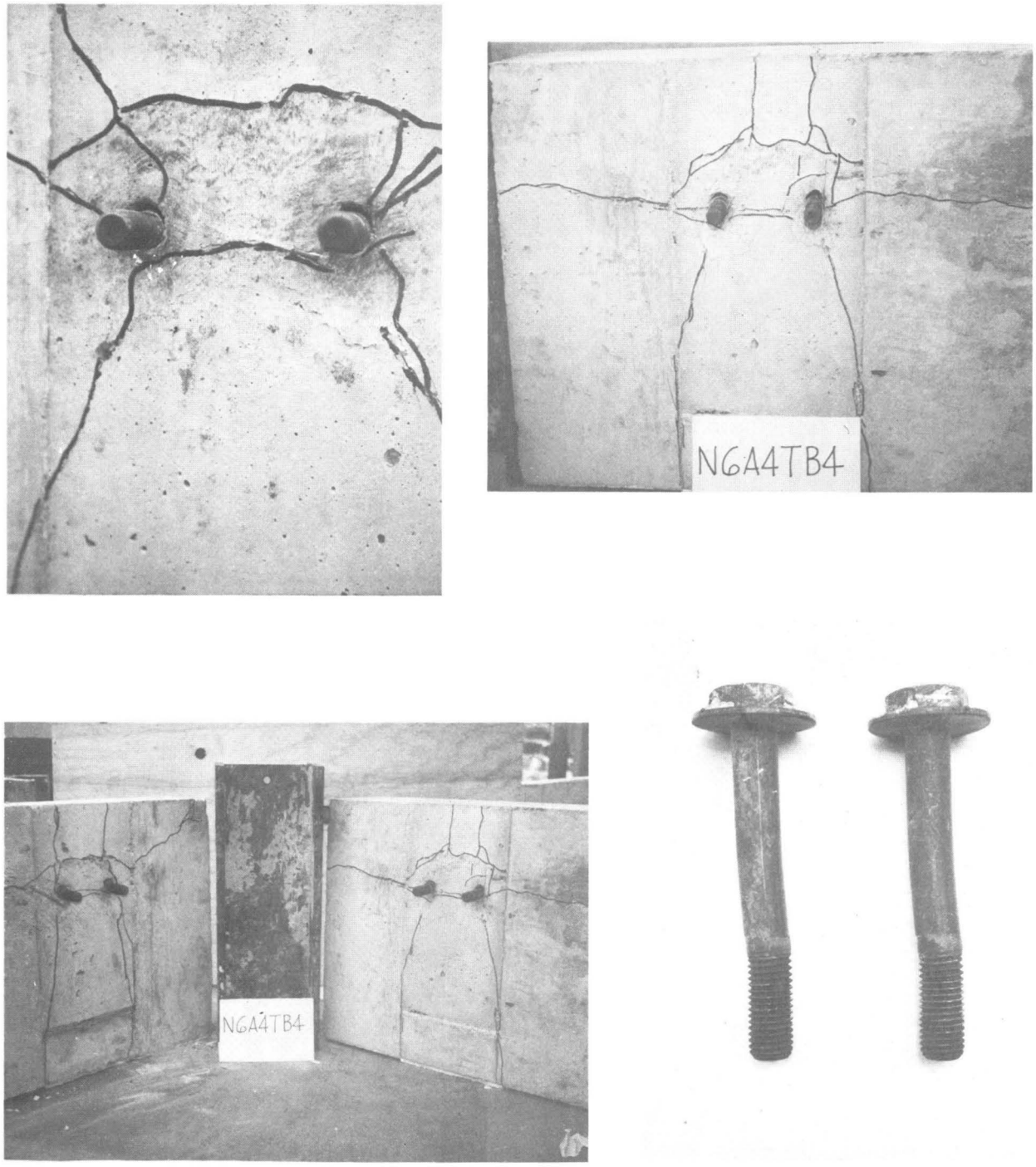



Figure 15 Typical Failure Conditions of 3/4-inch Bolt Pushout Specimens.

mens tested (Nos. 1 and 2) the failure load was apparently reached at about 15 kips per bolt because there was a decrease in load as the operator attempted to increase it. The specimens were still in good condition with a few small cracks visible. The specimens were taken from the testing machine and the slabs removed from the steel beam section. The same thing occurred with specimen No. 3 at 15.62 kips per bolt but it was decided to continue the test to destruction. After a short time interval the specimen again would carry load and did so until the bolts sheared at 19.5 kips per bolt. Realizing that specimens 1 and 2 had not reached their ultimate load the slabs were placed on the beam stub and the bolts again tightened by the turn-of-nut method and the specimens loaded to failure. It is interesting to note that these ultimate loads were slightly higher than the undisturbed specimen No. 3. It is also worthy to note that it was possible to tension the bolts completely in concrete which was slightly cracked.

At failure where considerable slip had occurred, a slip plane developed in the bolt at the interface of the concrete and steel as shown in Figures 13, 14 and 15. This illustrates the rigid behavior of the connector as opposed to a flexible connector which bends as a flagpole. The slip plane was quite pronounced in the 1/2-inch bolt specimens with the concrete relatively uncracked, whereas in the 5/8 and 3/4-inch bolt pushouts the slip plane was less pronounced and the concrete was cracked considerably. In all specimens a large amount of slip had occurred before failure was reached.

In one specimen, N6A4TB3, the test was continued to destruction. Figure 16 shows the extreme cracking of the slab which preceded the shearing of the 3/4-inch bolts.

One phenomenon was observed in the testing of the pushout specimens. At a certain point in the test an audible sound was noticed simultaneous with a sudden decrease in load and increase in slip. The slip dial indicators actually jumped. This phenomenon occurred when the friction force caused by the pretensioning of the bolts was overcome and is quite analogous to the yield phenomenon in ductile steel. Surprisingly, the analogy persisted in the reloading cycles, that is, the load at which friction was overcome increased in the successive loading cycles which is analogous to the strain hardening phenomenon in steel.

If the critical load on a connector is defined as that shear force at which there is a marked increase in slip with little or no increase in force or load, then the merit for using the load-residual slip curve in determining the critical load can be argued with the aid of Table 2. The values obtained from the curves are very close to those observed in the test and in each case, smaller.

## 4-2 Companion Specimens

Cylinder test results are given in Table 3. The compressive strengths are the average of six tests and the moduli of elasticity are the average of three tests. The maximum deviation is the greatest difference between a test and the average.

Bolt tensile coupon test results are shown in Table 4 and compared with the ASTM specifications for specimens machined from bolts.

The prestress test results were in general negative, but nevertheless informative. There were a total of six specimens, each containing two bolts. During the tensioning of the bolts by the turn-of-nut method all specimens split before the required nut rotation was reached. A

Figure 16 Test to Destruction of Specimen N6A4TB3

TABLE 2

CRITICAL LOAD DETERMINATION

| Specimen No. | Mark | Bolt Diameter | Critical Load (kips) Res. Slip Plot | From Test |
|---|---|---|---|---|
| 1 | N4B4TB1 | 1/2 | 12.3 | |
| 2 | N4B4TB2 | 1/2 | 10.0 | |
| 3 | N4B4TB3 | 1/2 | 12.5 | |
| 4 | N4A4TB4 | 1/2 | 12.4 | 13.5 |
| 5 | N5A4TB1 | 5/8 | 16.6 | 17.0* |
| 6 | N5B4TB2 | 5/8 | 15.9 | 16.0 |
| 7 | N5B4TB3 | 5/8 | 16.6 | --- |
| 8 | N5A4TB4 | 5/8 | --- | --- |
| 9 | N6B4TB1 | 3/4 | 27.1 | 29.0 |
| 10 | N6A4TB2 | 3/4 | 27.0 | 28.4 |
| 11 | N6A4TB3 | 3/4 | 24.0 | 24.4 |
| 12 | N6A4TB4 | 3/4 | 26.3 | 28.1 |

* Approximate value

TABLE 3

RESULTS OF CYLINDER TESTS

| Specimen No. | Age (Days) | Compressive Strength (psi) Average | Compressive Strength (psi) Max. Deviation | Modulus of Elasticity x $10^6$ psi Average | Modulus of Elasticity x $10^6$ psi Max. Deviation | Remarks |
|---|---|---|---|---|---|---|
| Pushout | | | | | | |
| 1,2,3,4 | 64 | 6340 | 320 | 4.17 | .01 | |
| 5,6,7,8 | 40 | 6650 | 620 | 4.35 | .17 | |
| 9,10,11,12 | 39 | 8450 | 260 | 4.84 | .12 | |
| Prestress | | | | | | |
| 1,2,3 | 49 | 6530 | 329 | 4.29 | .06 | |
| 4,5,6 | 29 | 6512 | 170 | 4.39 | .36 | |

typical specimen after test is shown in Figure 17. The width of the plate was 8 inches which corresponded to the width of the flange of the 8 WF 48 beam section used in the pushout specimens. The bolts were spaced similarly in each specimen with edge to center of bolt, center to center bolts and center of bolt to edge of plate dimensions of 2, 4 and 2 inches. If the zone of concrete confined in compression during the tensioning of the bolt is as shown in Figure 18, then there was an insufficient amount of concrete at the edge of the specimen and the splitting could be predicted. More study is therefore required before pretensioned bolts are used in haunched composite members.

## 4-3 Comparisons

The behavior of high strength pretensioned bolts in the pushout test as compared with that of equivalent studs is shown in Figures 19 through 24 and Table 5. In each case the embedded length of the bolt or stud was four inches, the thickness of the slab was six inches and the number of connectors was four. The rigidity of the bolt as compared with the stud is particularly evident from Figures 22, 23 and 24. It is seen from Table 5 that the average critical load for bolts is considerably greater than that of studs and occurs at approximately the same residual slip but the average slip is much smaller, especially in the larger connectors. The ultimate load for bolts was consistently higher than that for studs.

The determination of the critical load for bolts is not as subject to the judgment of the investigator as that for studs as can be seen from Figures 19, 20, and 21. The bolt curve is initially straight and breaks rather shaprly near the critical load as compared to the stud

curve which is more parabolic and therefore has led some investigators to specify a limiting residual slip for determining the critical load.

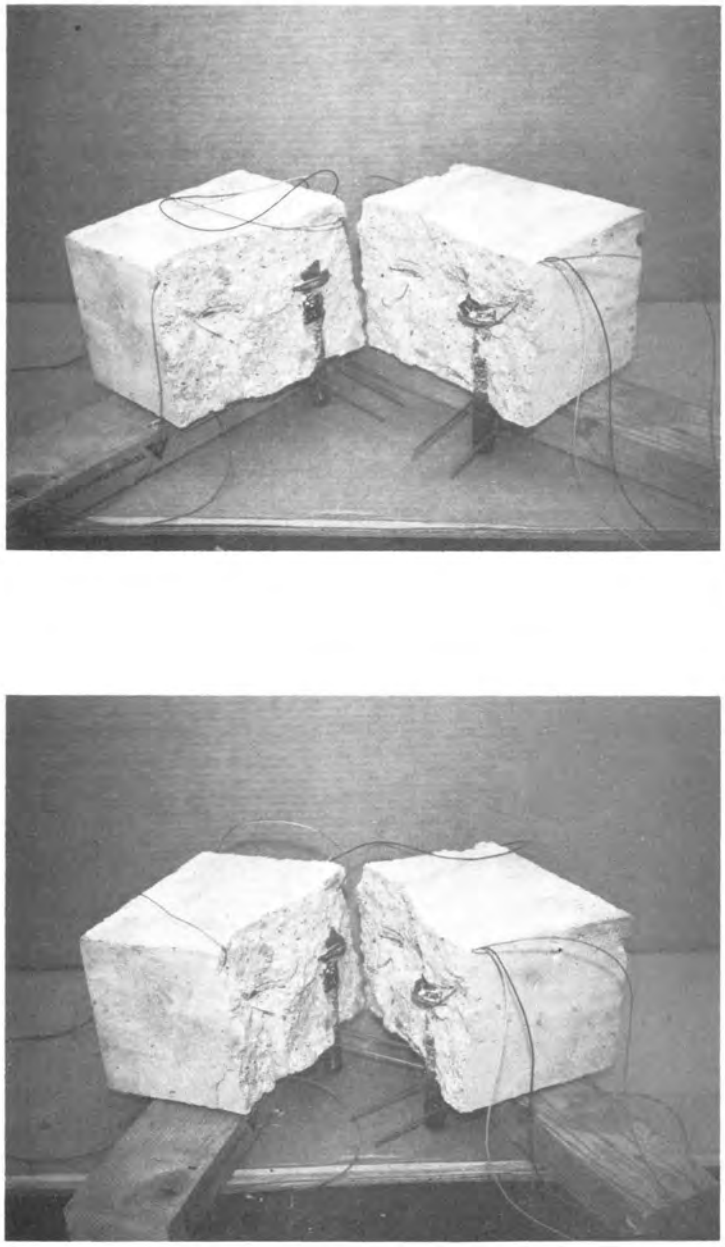


Figure 17 Splitting of 3/4 Prestress Specimen.

TABLE 4

TEST RESULTS OF BOLT TENSILE COUPONS

| Specimen | Stress in psi Yield Pt. | Ultimate | Modulus of Elasticity (psi) | % Elongation in 2 inches | % Reduction in Area |
|---|---|---|---|---|---|
| 1 | 124,700 | 149.700 | 31,400,000 | --- | --- |
| 2 | 106,800 | 127,700 | 30,300,000 | 17.0 | 54.0 |
| 3 | 114,500 | 136,200 | 30,800,000 | --- | --- |
| Average | 115,300 | 137,900 | 30,800,000 | 17.0 | 54.0 |
| ASTM A 325-6IT | 77,000 | 105,000 | --- | 14.0 | 35.0 |

TABLE 5

COMPARISON OF BOLTS WITH STUDS

| Investigator | Conn. Diam. | $f'_c$ (psi) | Critical Load Avg.Slip (in.) | Critical Load Ld.per Conn. (kips) | Critical Load Res.Slip (in.) | Ultimate Load Avg.Slip (in.) | Ultimate Load Ld.per Conn. (kips) | No. of Tests |
|---|---|---|---|---|---|---|---|---|
| a | 1/2B | 6340 | .0016 | 11.80 | .0005 | .234b | 20.55 | 4 |
| Dallam (2) | 1/2S | 5420 | .013 | 5.20 | .0040 | .188 | 12.20 | 1 |
| Viest (3) | 1/2S | 4120 | .0098 | 5.80 | .0023 | .167 | 14.20 | 2 |
| Univ. of Missouri | 1/2S | 6550 | .009 | 5.80 | .0018 | --- | 11.94 | 2 |
| a | 5/8B | 6650 | .0038 | 16.37 | .0023 | .215c | 27.57 | 4 |
| Dallam (2) | 5/8S | 5420 | .013 | 8.00 | .004 | .174 | 19.2 | 1 |
| Viest (3) | 5/8S | 4020 | .012 | 9.60 | .0025 | .299 | 23.2 | 2 |
| Univ. of Missouri | 5/8S | 5600 | .013 | 10.00 | .0040 | .163 | 17.7 | 1 |
| a | 3/4B | 8440 | .0040 | 26.10 | .0016 | .334c | 36.71 | 4 |
| Dallam (2) | 3/4S | 5730 | --- | --- | --- | .203 | 29.4 | 1 |
| Viest (3) | 3/4S | 4060 | .0102 | 11.70 | .0019 | .382 | 32.3 | 2 |
| Thurlimann (4) | 3/4S | 5080 | --- | --- | --- | --- | 24.7 | 1 |

a This investigation

b See Table 1

c Ultimate residual slip

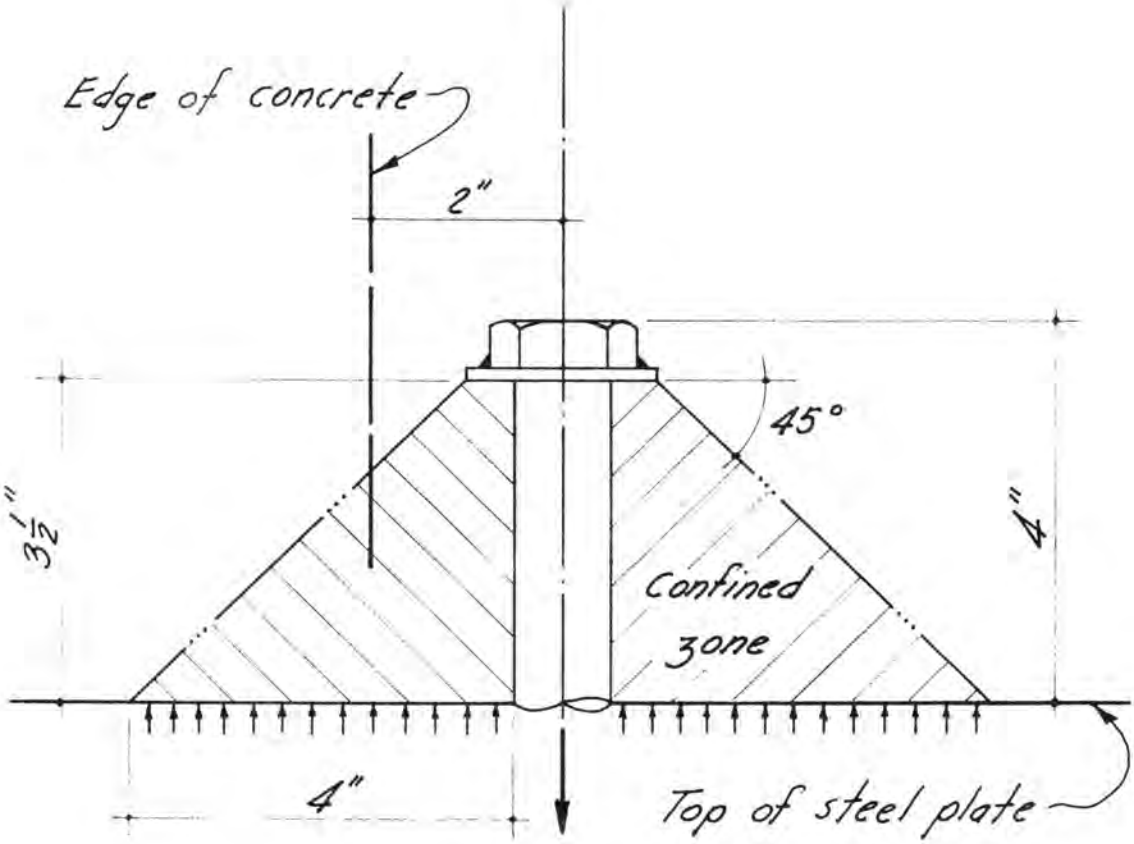



Figure 18 Assumed Compression Zone Confined by Bolt Tension.

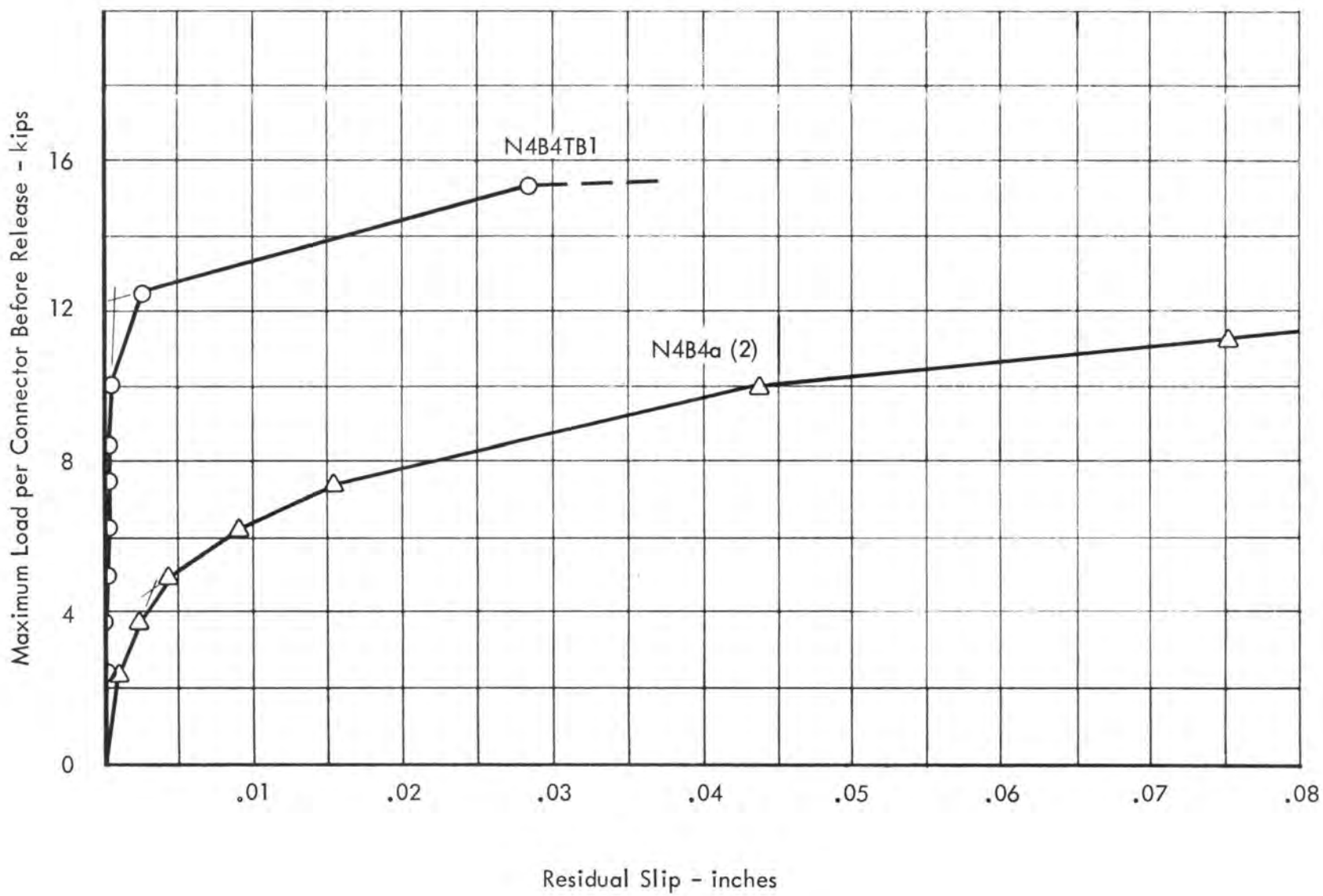



Figure 19 Load-Residual Slip Curves of 1/2-inch Bolts and Studs.

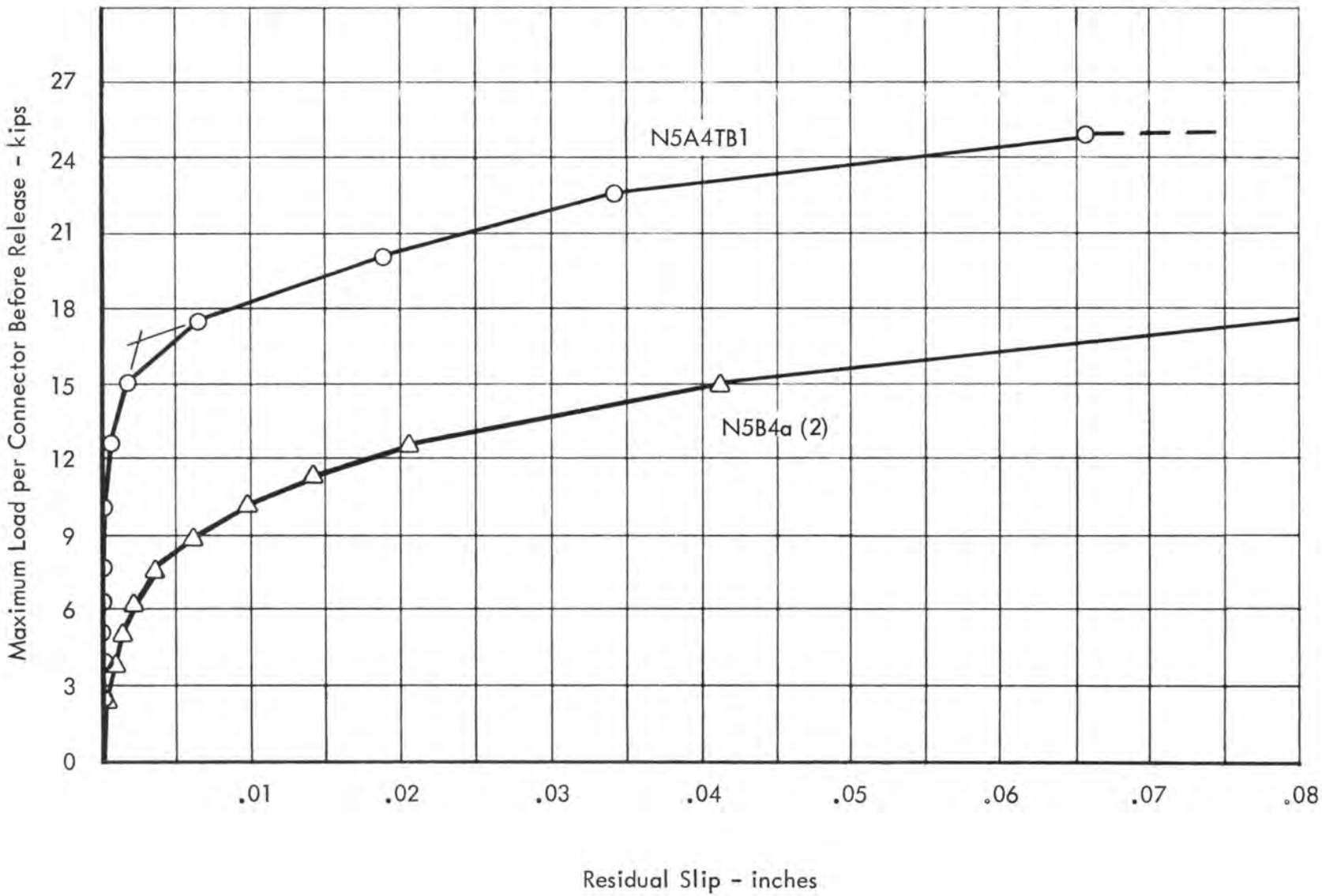



Figure 20 Load-Residual Slip Curves of 5/8-inch Bolts and Studs.

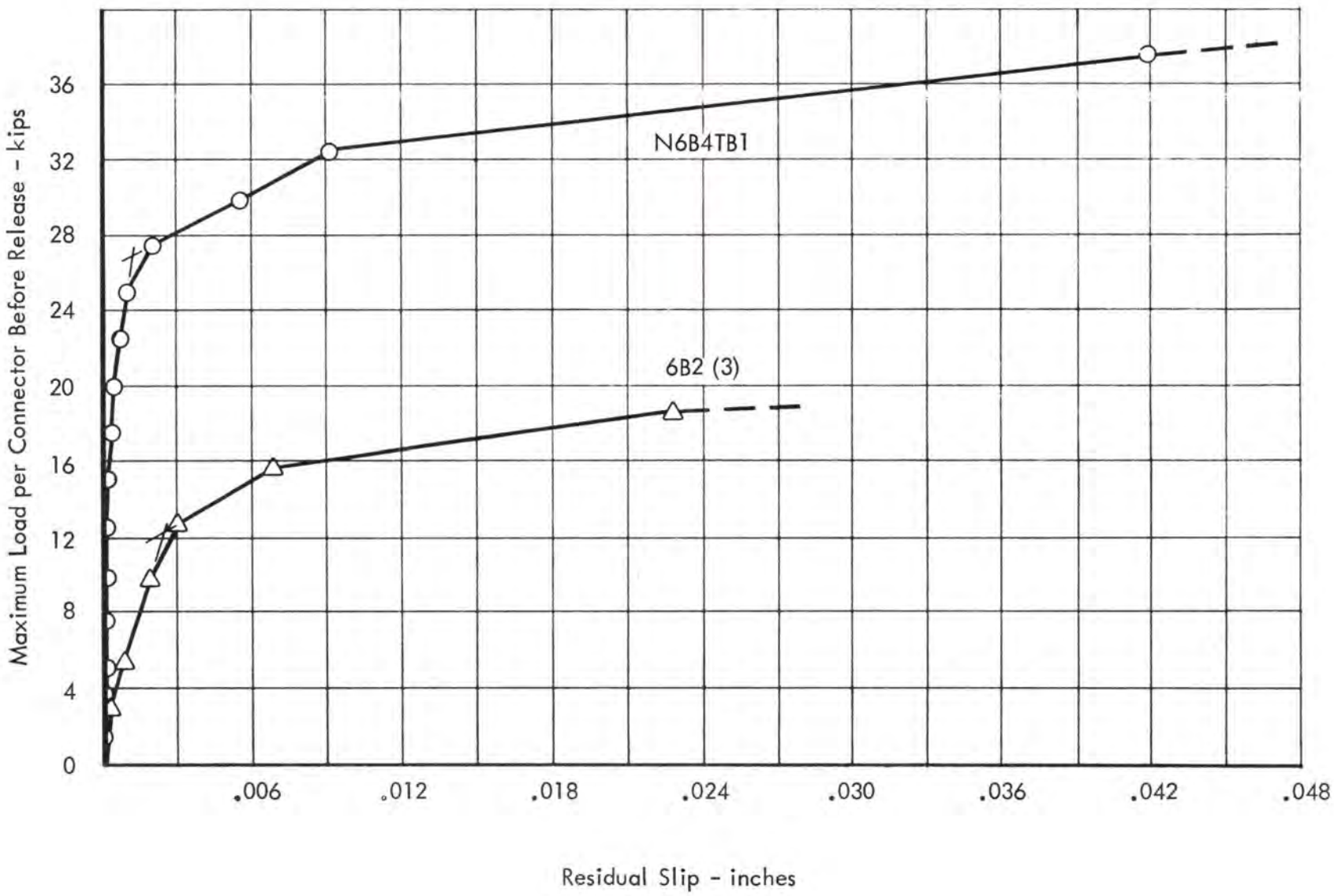



Figure 21 Load-Residual Slip Curves of 3/4-inch Bolts and Studs.

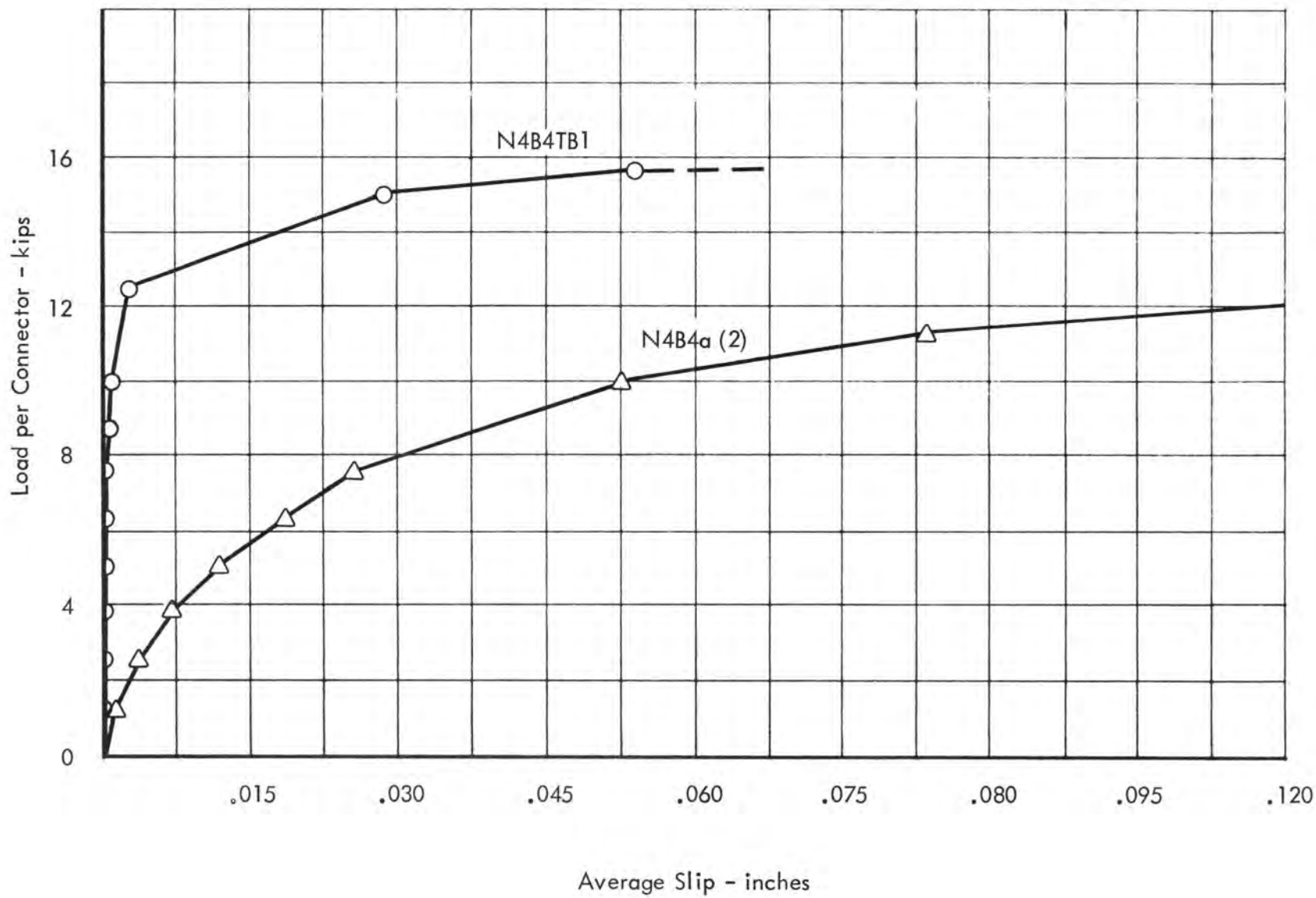



Figure 22 Load-Average Slip Curves of 1/2-inch Bolts and Studs.

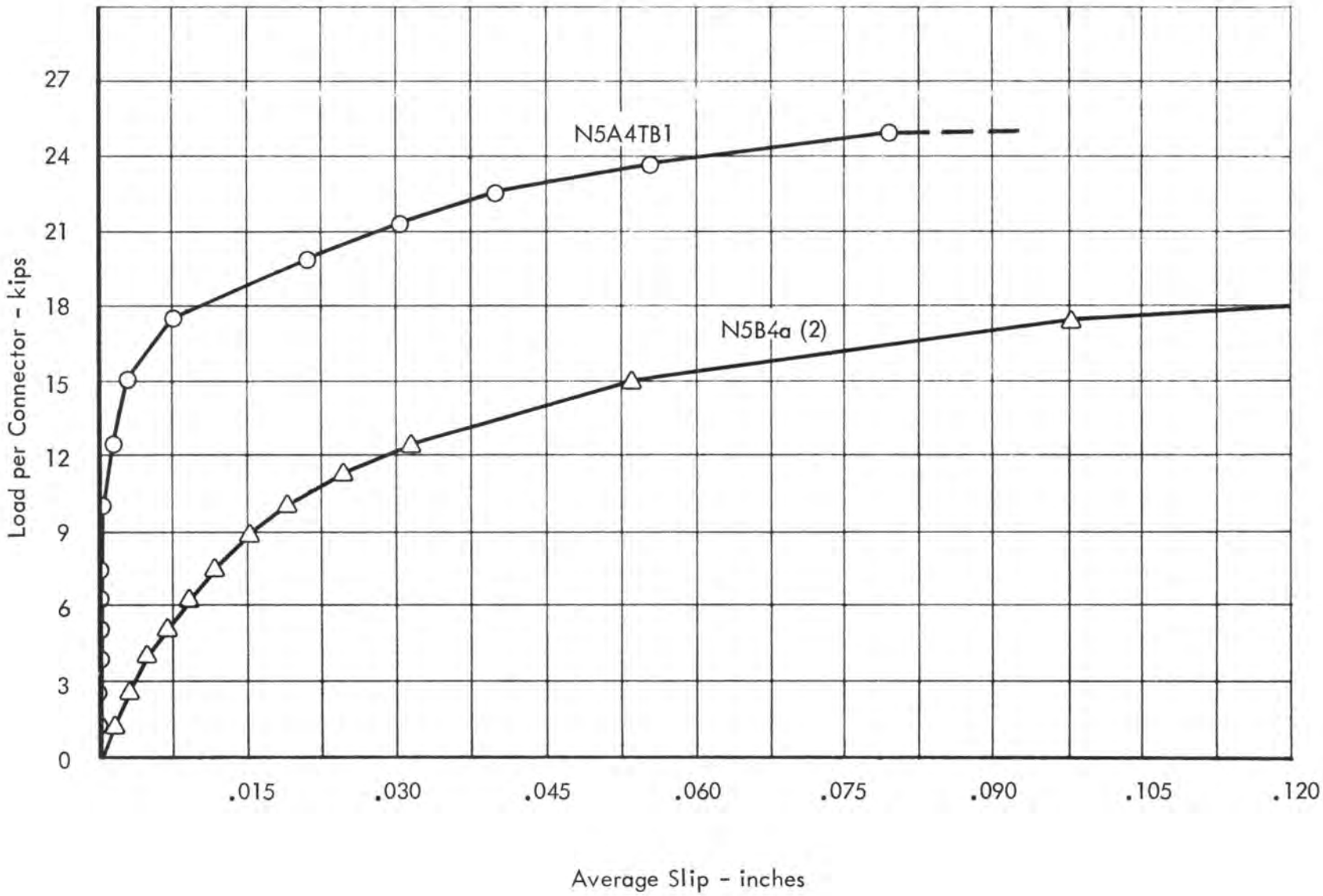



Figure 23 Load-Average Slip Curves of 5/8-inch Bolts and Studs.

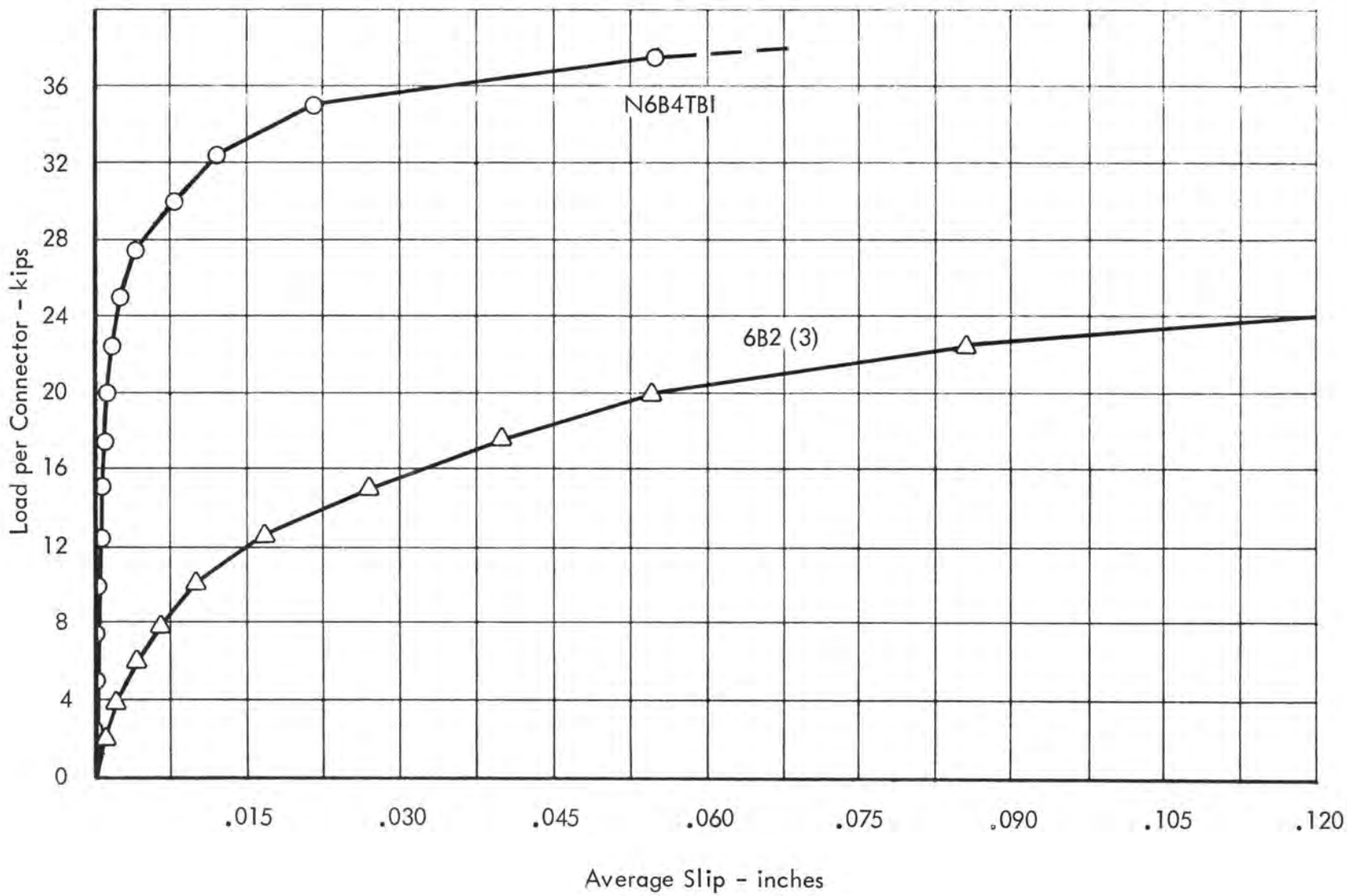



Figure 24 Load-Average Slip Curves of 3/4-inch Bolts and Studs.

# V. SUMMARY AND CONCLUSIONS

## 5-1 Summary

Twelve pushout specimens with high strength pretensioned bolts as connectors were tested under simulated static loading. Bolts with diameters of 1/2, 5/8 and 3/4 inches were tensioned by the turn-of-nut method and embedded in normal-weight concrete slabs.

The load-slip characteristics of bolts were compared with those of studs.

Companion specimens were tested to determine the amount of tension induced in a bolt by the turn-of-nut method and to determine the importance of edge clearance in haunched members.

## 5-2 Conclusions

The following conclusions were made from this investigation:

1. High strength pretensioned bolts exhibit practically zero slip in the working range of the load.
2. Bolts attain a critical load or useful capacity that is about twice that of studs. The ultimate load is also greater for bolts.
3. There is apparently no loss in prestress with time in high quality concrete.
4. More research is needed regarding the spacing and edge clearance requirements in haunched members due to the splitting observed in the tests of the prestress specimens.

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# APPENDIX

# PUSHOUT TEST DATA

# PUSHOUT TEST

SPECIMEN N4B4TB1

DATE CAST 12-22-65 DATE TESTED 2-9-66

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 0 | 3880 | 3900 | 4850 | 3960 | .0000 | .0000 | |
| 5 | 3880 | 3900 | 4850 | 3960 | .0000 | | |
| 10 | 3880 | 3900 | 4850 | 3959 | .0000 | | |
| 5 | 3880 | 3900 | 4850 | 3959 | .0000 | | |
| 0 | 3880 | 3901 | 4850 | 3960 | .0000 | .0000 | |
| 5 | 3880 | 3901 | 4850 | 3960 | .0000 | | |
| 10 | 3880 | 3901 | 4850 | 3959 | .0000 | | |
| 15 | 3879 | 3901 | 4850 | 3958 | .0000 | | |
| 10 | 3879 | 3901 | 4850 | 3958 | .0000 | | |
| 5 | 3879 | 3901 | 4850 | 3958 | .0000 | | |
| 10 | 3879 | 3901 | 4850 | 3959 | .0000 | | |
| 15 | 3878 | 3901 | 4850 | 3958 | .0000 | | |
| 0 | 3879 | 3901 | 4850 | 3960 | .0000 | .0000 | |
| 20 | 3877 | 3901 | 4850 | 3956 | .0001 | | |
| 15 | 3877 | 3901 | 4850 | 3956 | .0001 | | |
| 10 | 3876 | 3901 | 4850 | 3956 | .0001 | | |
| 0 | 3879 | 3901 | 4850 | 3959 | .0000 | .0000 | |
| 10 | 3878 | 3901 | 4850 | 3958 | .0000 | | |
| 20 | 3876 | 3901 | 4850 | 3956 | .0001 | | |
| 25 | 3874 | 3900 | 4850 | 3954 | .0003 | | |
| 20 | 3874 | 3900 | 4850 | 3954 | .0003 | | |
| 10 | 3874 | 3900 | 4850 | 3954 | .0003 | | |
| 0 | 3877 | 3901 | 4850 | 3959 | .0000 | .0000 | |
| 10 | 3877 | 3901 | 4850 | 3957 | .0001 | | |
| 20 | 3875 | 3901 | 4850 | 3955 | .0002 | | |
| 30 | 3871 | 3899 | 4847 | 3951 | .0005 | | |
| 20 | 3871 | 3899 | 4847 | 3951 | .0005 | | |
| 0 | 3876 | 3900 | 4847 | 3956 | .0002 | .0002 | |
| 15 | 3874 | 3900 | 4847 | 3954 | .0003 | | |
| 25 | 3872 | 3900 | 4847 | 3952 | .0004 | | |
| 35 | 3867 | 3898 | 4847 | 3948 | .0007 | | |
| 25 | 3867 | 3898 | 4841 | 3948 | .0009 | | |
| 15 | 3867 | 3899 | 4841 | 3949 | .0008 | | |
| 0 | 3874 | 3900 | 4842 | 3956 | .0004 | .0004 | |
| 15 | 3872 | 3900 | 4842 | 3953 | .0005 | | |
| 30 | 3868 | 3899 | 4842 | 3949 | .0008 | | |
| 40 | 3862 | 3896 | 4842 | 3945 | .0011 | | |
| 30 | 3861 | 3890 | 4840 | 3945 | .0013 | | |
| 5 | 3863 | 3898 | 4840 | 3946 | .0010 | | |
| 0 | 3869 | 3900 | 4842 | 3954 | .0006 | .0006 | |
| 15 | 3865 | 3899 | 4843 | 3945 | .0009 | | |
| 30 | 3861 | 3898 | 4842 | 3941 | .0012 | | |
| 40 | 3858 | 3896 | 4842 | 3939 | .0013 | | |
| 50 | 3838 | 3883 | 4841 | 3912 | .0029 | | |

SPECIMEN N4B4TB1 CONTINUED

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 30 | 3836 | 3878 | 4840 | 3900 | .0034 | | |
| 15 | 3838 | 3881 | 4840 | 3902 | .0032 | | |
| 0 | 3847 | 3884 | 4841 | 3910 | .0027 | .0027 | |
| 20 | 3845 | 3884 | 4841 | 3907 | .0028 | | |
| 40 | 3838 | 3881 | 4841 | 3901 | .0032 | | |
| 50 | 3832 | 3869 | 4841 | 3880 | .0042 | | |
| 60 | 3531 | 3616 | 4670 | 3620 | .0288 | | |
| 40 | 3412 | 3592 | 4650 | 3596 | .0335 | | |
| 20 | 3417 | 3600 | 4652 | 3602 | .0329 | | |
| 0 | 3538 | 3621 | 4669 | 3626 | .0284 | .0284 | |
| 20 | 3536 | 3621 | 4674 | 3625 | .0283 | | |
| 40 | 3526 | 3613 | 4672 | 3615 | .0291 | | |
| 60 | 3463 | 3546 | 4632 | 3558 | .0347 | | DIALS UNSTABLE |
| 62 | 3283 | 3265 | 4485 | 3390 | .0541 | | |
| 83 | | | | | | | ULTIMATE LOAD<br>CRACKS AT 1,3<br>BOLT 4 SHEARED |

# PUSHOUT TEST

SPECIMEN N4B4TB2

DATE CAST 12-22-65 DATE TESTED 2-11-66

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 0 | 3490 | 4390 | 3030 | 3890 | .0000 | .0000 | |
| 5 | 3490 | 4390 | 3030 | 3890 | .0000 | | |
| 10 | 3489 | 4390 | 3030 | 3890 | .0000 | | |
| 5 | 3489 | 4390 | 3030 | 3890 | .0000 | | |
| 0 | 3489 | 4390 | 3031 | 3890 | .0000 | .0000 | |
| 5 | 3489 | 4390 | 3031 | 3890 | .0000 | | |
| 10 | 3489 | 4390 | 3031 | 3890 | .0000 | | |
| 15 | 3489 | 4390 | 3031 | 3890 | .0000 | | |
| 10 | 3489 | 4390 | 3031 | 3890 | .0000 | | |
| 5 | 3489 | 4390 | 3031 | 3890 | .0000 | | |
| 0 | 3489 | 4390 | 3031 | 3890 | .0000 | .0000 | |
| 10 | 3489 | 4390 | 3031 | 3890 | .0000 | | |
| 15 | 3489 | 4390 | 3031 | 3890 | .0000 | | |
| 20 | 3488 | 4389 | 3031 | 3888 | .0001 | | |
| 15 | 3488 | 4389 | 3031 | 3888 | .0001 | | |
| 10 | 3488 | 4389 | 3031 | 3888 | .0001 | | |
| 0 | 3489 | 4390 | 3031 | 3889 | .0000 | .0000 | |
| 10 | 3489 | 4390 | 3029 | 3889 | .0000 | | |
| 20 | 3488 | 4389 | 3029 | 3888 | .0001 | | |
| 25 | 3487 | 4388 | 3029 | 3887 | .0002 | | |
| 20 | 3487 | 4388 | 3027 | 3887 | .0002 | | |
| 10 | 3487 | 4389 | 3027 | 3887 | .0002 | | |
| 0 | 3489 | 4390 | 3028 | 3888 | .0001 | .0001 | |
| 10 | 3488 | 4389 | 3028 | 3888 | .0001 | | |
| 25 | 3487 | 4388 | 3028 | 3887 | .0002 | | |
| 35 | 3484 | 4386 | 3028 | 3883 | .0004 | | |
| 25 | 3484 | 4386 | 3028 | 3883 | .0004 | | |
| 15 | 3484 | 4387 | 3028 | 3883 | .0004 | | |
| 0 | 3488 | 4389 | 3031 | 3886 | .0001 | .0001 | |
| 15 | 3486 | 4388 | 3031 | 3886 | .0002 | | |
| 0 | 3484 | 4386 | 3030 | 3884 | .0004 | .0004 | |
| 40 | 3483 | 4384 | 3028 | 3880 | .0006 | | |
| 30 | 3483 | 4384 | 3028 | 3880 | .0006 | | |
| 15 | 3484 | 4386 | 3028 | 3880 | .0005 | | |
| 0 | 3487 | 4388 | 3030 | 3883 | .0003 | .0003 | |
| 15 | 3486 | 4387 | 3030 | 3883 | .0003 | | |
| 30 | 3484 | 4385 | 3026 | 3882 | .0005 | | |
| 40 | 3482 | 4383 | 3022 | 3879 | .0008 | | |
| 50 | 3361 | 4253 | 2915 | 3728 | .0135 | | |
| 15 | 3363 | 4256 | 2915 | 3728 | .0134 | | |
| 0 | 3376 | 4266 | 2921 | 3734 | .0125 | .0125 | |
| 20 | 3374 | 4266 | 2922 | 3735 | .0125 | | |
| 40 | 3366 | 4257 | 2918 | 3730 | .0132 | | |
| 50 | 3322 | 4218 | 2886 | 3685 | .0172 | | |

SPECIMEN N4B4TB2 CONTINUED

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 60 | 3038 | 4053 | 2821 | 3408 | .0370 | | |
| 40 | 3035 | 4053 | 2818 | 3408 | .0371 | | |
| 20 | 3055 | 4078 | 2815 | 3421 | .0357 | | |
| 0 | 3105 | 4035 | 2812 | 3463 | .0346 | .0346 | |
| 20 | 3102 | 4030 | 2808 | 3463 | .0349 | | |
| 40 | 3081 | 4003 | 2805 | 3447 | .0366 | | |
| 60 | 2955 | 3981 | 2801 | 3325 | .0434 | | DIALS UNSTABLE |
| 79 | | | | | | | ULTIMATE LOAD |

PUSHOUT TEST

SPECIMEN N4B4TB3

DATE CAST 12-22-65 DATE TESTED 2-17-66

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 15 | | | | | | | PRELOAD |
| 0 | 3400 | 4140 | 4010 | 3900 | .0000 | .0000 | |
| 5 | 3400 | 4140 | 4010 | 3900 | .0000 | | |
| 10 | 3400 | 4140 | 4010 | 3900 | .0000 | | |
| 5 | 3400 | 4140 | 4010 | 3900 | .0000 | | |
| 0 | 3400 | 4142 | 4010 | 3900 | .0000 | .0000 | |
| 5 | 3400 | 4142 | 4010 | 3900 | .0000 | | |
| 10 | 3400 | 4142 | 4010 | 3900 | .0000 | | |
| 15 | 3400 | 4142 | 4009 | 3900 | .0000 | | |
| 10 | 3400 | 4142 | 4009 | 3900 | .0000 | | |
| 5 | 3400 | 4142 | 4009 | 3900 | .0000 | | |
| 0 | 3400 | 4142 | 4011 | 3900 | .0000 | .0000 | |
| 10 | 3400 | 4142 | 4011 | 3900 | .0000 | | |
| 15 | 3400 | 4142 | 4010 | 3900 | .0000 | | |
| 20 | 3400 | 4142 | 4009 | 3900 | .0000 | | |
| 15 | 3400 | 4142 | 4009 | 3900 | .0000 | | |
| 10 | 3400 | 4142 | 4009 | 3900 | .0000 | | |
| 0 | 3401 | 4142 | 4011 | 3900 | .0000 | .0000 | |
| 10 | 3401 | 4142 | 4011 | 3900 | .0000 | | |
| 20 | 3400 | 4142 | 4009 | 3900 | .0000 | | |
| 25 | 3399 | 4141 | 4009 | 3900 | .0000 | | |
| 20 | 3399 | 4141 | 4009 | 3900 | .0000 | | |
| 10 | 3399 | 4141 | 4009 | 3900 | .0000 | | |
| 0 | 3401 | 4143 | 4011 | 3900 | .0000 | .0000 | |
| 15 | 3400 | 4143 | 4010 | 3900 | .0000 | | |
| 25 | 3399 | 4142 | 4009 | 3900 | .0000 | | |
| 35 | 3397 | 4140 | 4007 | 3897 | .0002 | | |
| 25 | 3397 | 4140 | 4007 | 3896 | .0002 | | |
| 15 | 3397 | 4140 | 4007 | 3896 | .0002 | | |
| 0 | 3400 | 4142 | 4010 | 3897 | .0000 | .0000 | |
| 15 | 3399 | 4142 | 4009 | 3897 | .0000 | | |
| 30 | 3398 | 4141 | 4008 | 3896 | .0001 | | |
| 40 | 3396 | 4140 | 4006 | 3895 | .0003 | | |
| 30 | 3395 | 4140 | 4006 | 3895 | .0003 | | |
| 15 | 3396 | 4141 | 4008 | 3895 | .0002 | | |
| 0 | 3399 | 4144 | 4010 | 3897 | .0000 | .0000 | |
| 15 | 3399 | 4143 | 4009 | 3897 | .0000 | | |
| 30 | 3397 | 4142 | 4007 | 3895 | .0002 | | |
| 40 | 3395 | 4141 | 4006 | 3894 | .0003 | | |
| 50 | 3392 | 4139 | 4004 | 3890 | .0006 | | |
| 30 | 3391 | 4139 | 4005 | 3890 | .0006 | | |
| 15 | 3393 | 4140 | 4007 | 3891 | .0004 | | |
| 10 | 3397 | 4144 | 4010 | 3896 | .0000 | | |
| 20 | 3396 | 4143 | 4009 | 3895 | .0001 | | |
| 40 | 3393 | 4140 | 4005 | 3872 | .0010 | | |
| 60 | 3386 | 4135 | 3998 | 3881 | .0012 | | |
| 62 | | | | | | | DIALS UNSTABLE |
| 78 | | | | | | | ULTIMATE LOAD |

SPECIMEN N4A4TB4

DATE CAST 12-22-65 DATE TESTED 6-22-66

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | BOLT TENSIONED ON 2-4-66 |
| 0 | 4519 | 4990 | 4486 | 4645 | .0000 | .0000 | |
| 5 | 4519 | 4990 | 4486 | | .0000 | | |
| 10 | 4519 | 4989 | 4485 | | .0000 | | |
| 5 | 4519 | 4990 | 4485 | | .0000 | | |
| 0 | 4519 | 4990 | 4486 | | .0000 | .0000 | |
| 10 | 4519 | 4990 | 4485 | | .0000 | | |
| 20 | 4517 | 4987 | 4483 | | .0002 | | |
| 10 | 4517 | 4987 | 4483 | | .0002 | | |
| 0 | 4518 | 4989 | 4485 | | .0001 | .0001 | |
| 10 | 4518 | 4988 | 4484 | | .0001 | | |
| 20 | 4517 | 4987 | 4483 | | .0002 | | |
| 30 | 4513 | 4984 | 4479 | | .0006 | | |
| 15 | 4514 | 4985 | 4480 | | .0005 | | |
| 0 | 4516 | 4988 | 4484 | | .0002 | .0002 | |
| 10 | 4516 | 4987 | 4483 | | .0003 | | |
| 20 | 4515 | 4985 | 4480 | | .0005 | | |
| 30 | 4513 | 4984 | 4479 | | .0006 | | |
| 40 | 4504 | 4981 | 4470 | | .0013 | | |
| 20 | 4505 | 4982 | 4472 | | .0012 | | |
| 0 | 4510 | 4987 | 4478 | 4645 | .0005 | .0005 | |
| 10 | 4510 | 4986 | 4477 | 4645 | .0005 | | |
| 20 | 4509 | 4984 | 4475 | 4644 | .0007 | | |
| 30 | 4507 | 4982 | 4473 | 4642 | .0009 | | |
| 40 | 4504 | 4981 | 4470 | 4640 | .0011 | | |
| 50 | 4486 | 4976 | 4449 | 4636 | .0023 | | |
| 25 | 4487 | 4977 | 4451 | 4638 | .0021 | | |
| 0 | 4493 | 4986 | 4459 | 4643 | .0014 | .0014 | |
| 10 | 4493 | 4985 | 4458 | 4642 | .0015 | | |
| 20 | 4492 | 4982 | 4456 | 4641 | .0017 | | |
| 30 | 4490 | 4980 | 4454 | 4639 | .0019 | | |
| 40 | 4488 | 4978 | 4451 | 4637 | .0021 | | |
| 50 | 4485 | 4976 | 4448 | 4635 | .0024 | | |
| 54 | | | | | | | SUDDEN SLIP |
| 60 | 4279 | 4753 | 4239 | 4427 | .0235 | | |
| 30 | 4285 | 4757 | 4241 | 4432 | .0231 | | |
| 0 | 4316 | 4785 | 4269 | 4453 | .0204 | .0204 | |
| 20 | 4316 | 4784 | 4267 | 4452 | .0205 | | |
| 40 | 4308 | 4776 | 4258 | 4446 | .0213 | | |
| 60 | 4265 | 4735 | 4220 | 4411 | .0252 | | |
| 64 | | | | | | | SUDDEN SLIP |
| 65 | 3876 | 4341 | 3833 | 4029 | .0640 | | |
| 70 | 2995 | 3459 | 2940 | 3137 | .1527 | | |
| 40 | 3033 | 3497 | 2981 | 3183 | .1486 | | |
| 0 | 3233 | 3696 | 3172 | 3362 | .1294 | .1294 | |
| 20 | 3200 | 3662 | 3141 | 3339 | .1324 | | |
| 40 | 3109 | 3567 | 3055 | 3257 | .1413 | | |
| 60 | 3017 | 3480 | 2968 | 3170 | .1501 | | |
| 75 | 2170 | 2645 | 2127 | 2325 | .2343 | | |
| 88 | | | | | | | ULTIMATE LOAD |

# PUSHOUT TEST

SPECIMEN N5A4TB1

DATE CAST 2-24-66 DATE TESTED 3-29-66

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 0 | 4392 | 4660 | 4600 | 3681 | .0000 | .0000 | |
| 5 | 4392 | 4660 | 4600 | 3681 | .0000 | | |
| 10 | 4392 | 4660 | 4600 | 3681 | .0000 | | |
| 5 | 4392 | 4660 | 4600 | 3681 | .0000 | | |
| 0 | 4392 | 4660 | 4600 | 3681 | .0000 | .0000 | |
| 5 | 4392 | 4660 | 4600 | 3681 | .0000 | | |
| 10 | 4392 | 4660 | 4600 | 3680 | .0000 | | |
| 15 | 4391 | 4659 | 4600 | 3679 | .0001 | | |
| 8 | 4391 | 4659 | 4600 | 3679 | .0001 | | |
| 0 | 4392 | 4660 | 4600 | 3681 | .0000 | .0000 | |
| 10 | 4391 | 4659 | 4600 | 3680 | .0000 | | |
| 15 | 4391 | 4659 | 4600 | 3680 | .0000 | | |
| 20 | 4390 | 4658 | 4600 | 3679 | .0001 | | |
| 10 | 4390 | 4658 | 4600 | 3679 | .0001 | | |
| 0 | 4393 | 4660 | 4600 | 3682 | .0000 | .0000 | |
| 10 | 4392 | 4659 | 4600 | 3681 | .0000 | | |
| 20 | 4390 | 4658 | 4600 | 3679 | .0001 | | |
| 25 | 4389 | 4657 | 4599 | 3678 | .0002 | | |
| 12 | 4389 | 4658 | 4599 | 3678 | .0002 | | |
| 0 | 4393 | 4660 | 4600 | 3682 | .0000 | .0000 | |
| 15 | 4391 | 4659 | 4600 | 3680 | .0000 | | |
| 30 | 4388 | 4656 | 4598 | 3676 | .0003 | | |
| 15 | 4388 | 4657 | 4598 | 3677 | .0003 | | |
| 0 | 4392 | 4660 | 4600 | 3681 | .0000 | .0000 | |
| 15 | 4391 | 4658 | 4600 | 3679 | .0001 | | |
| 30 | 4388 | 4656 | 4597 | 3676 | .0004 | | |
| 40 | 4384 | 4652 | 4593 | 3671 | .0008 | | |
| 20 | 4385 | 4654 | 4593 | 3672 | .0007 | | |
| 0 | 4390 | 4658 | 4598 | 3679 | .0002 | .0002 | |
| 20 | 4388 | 4656 | 4596 | 3676 | .0004 | | |
| 40 | 4383 | 4652 | 4592 | 3670 | .0009 | | |
| 50 | 4375 | 4645 | 4583 | 3662 | .0017 | | |
| 25 | 4377 | 4649 | 4585 | 3664 | .0014 | | |
| 0 | 4384 | 4656 | 4590 | 3673 | .0007 | .0007 | |
| 20 | 4382 | 4653 | 4590 | 3670 | .0009 | | |
| 40 | 4377 | 4648 | 4586 | 3665 | .0014 | | |
| 60 | 4358 | 4631 | 4565 | 3647 | .0033 | | |
| 30 | 4359 | 4636 | 4567 | 3650 | .0030 | | |
| 0 | 4371 | 4647 | 4575 | 3661 | .0019 | .0019 | |
| 25 | 4366 | 4643 | 4570 | 3657 | .0024 | | |
| 50 | 4360 | 4636 | 4568 | 3649 | .0030 | | |
| 65 | 4308 | 4593 | 4514 | 3596 | .0080 | | |
| 70 | 4305 | 4591 | 4512 | 3593 | .0083 | | |
| 35 | 4307 | 4596 | 4514 | 3596 | .0080 | | |

SPECIMEN N5A4TB1 CONTINUED

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 0 | 4320 | 4611 | 4525 | 3611 | .0066 | .0066 | |
| 20 | 4318 | 4608 | 4525 | 3609 | .0068 | | |
| 40 | 4314 | 4602 | 4521 | 3603 | .0073 | | |
| 60 | 4307 | 4594 | 4514 | 3596 | .0080 | | |
| 68 | | | | | | | SUDDEN SLIP |
| 80 | 4177 | 4464 | 4384 | 3456 | .0213 | | |
| 60 | 4177 | 4466 | 4384 | 3456 | .0212 | | |
| 40 | 4181 | 4471 | 4388 | 3461 | .0208 | | |
| 0 | 4202 | 4488 | 4404 | 3484 | .0188 | .0188 | |
| 20 | 4202 | 4487 | 4404 | 3482 | .0189 | | |
| 40 | 4196 | 4482 | 4400 | 3476 | .0194 | | |
| 60 | 4188 | 4474 | 4393 | 3467 | .0202 | | |
| 85 | 4092 | 4378 | 4289 | 3354 | .0305 | | |
| 45 | 4095 | 4384 | 4293 | 3360 | .0300 | | |
| 0 | 4127 | 4410 | 4324 | 3399 | .0268 | .0268 | |
| 20 | 4126 | 4407 | 4324 | 3397 | .0269 | | |
| 40 | 4119 | 4402 | 4317 | 3390 | .0276 | | |
| 60 | 4109 | 4394 | 4307 | 3379 | .0286 | | |
| 90 | 4000 | 4285 | 4194 | 3253 | .0400 | | |
| 50 | 4003 | 4288 | 4196 | 3255 | .0397 | | |
| 0 | 4056 | 4328 | 4261 | 3315 | .0343 | .0343 | |
| 30 | 4046 | 4322 | 4252 | 3308 | .0351 | | |
| 60 | 4027 | 4309 | 4227 | 3288 | .0370 | | |
| 80 | 4008 | 4290 | 4208 | 3265 | .0390 | | |
| 95 | 3853 | 4139 | 4038 | 3082 | .0555 | | |
| 50 | 3858 | 4147 | 4050 | 3101 | .0544 | | |
| 0 | 3935 | 4197 | 4143 | 3185 | .0468 | .0468 | |
| 40 | 3910 | 4186 | 4113 | 3166 | .0489 | | |
| 60 | 3890 | 4174 | 4087 | 3145 | .0509 | | |
| 80 | 3864 | 4149 | 4056 | 3112 | .0538 | | |
| 100 | 3621 | 3905 | 3787 | 2834 | .0796 | | |
| 50 | 3646 | 3932 | 3825 | 2873 | .0764 | | |
| 0 | 3754 | 4003 | 3959 | 2985 | .0658 | .0658 | |
| 30 | 3728 | 3994 | 3928 | 2968 | .0678 | | DIAG. CRACKS AT 1,3 |
| 60 | 3684 | 3968 | 3876 | 2930 | .0718 | | |
| 90 | 3620 | 3905 | 3798 | 2850 | .0790 | | |
| 106 | | | | | | | ULTIMATE LOAD |
| 0 | 2442 | 2684 | 2579 | 1538 | .2022 | .2022 | |

# PUSHOUT TEST

SPECIMEN N5B4TB2

DATE CAST 2-24-66 DATE TESTED 4-1-66

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 30 | | | | | | | PRELOAD |
| 0 | 3930 | 3800 | 4217 | 4350 | .0000 | .0000 | |
| 5 | 3930 | 3800 | 4217 | 4350 | .0000 | | |
| 10 | 3929 | 3800 | 4217 | 4350 | .0000 | | |
| 5 | 3929 | 3800 | 4217 | 4350 | .0000 | | |
| 0 | 3930 | 3800 | 4216 | 4350 | .0000 | .0000 | |
| 5 | 3930 | 3800 | 4216 | 4350 | .0000 | | |
| 10 | 3929 | 3800 | 4216 | 4349 | .0000 | | |
| 20 | 3926 | 3799 | 4216 | 4348 | .0002 | | |
| 10 | 3927 | 3799 | 4216 | 4348 | .0001 | | |
| 0 | 3929 | 3800 | 4216 | 4348 | .0001 | .0001 | |
| 10 | 3928 | 3800 | 4216 | 4349 | .0001 | | |
| 20 | 3926 | 3799 | 4215 | 4347 | .0002 | | |
| 30 | 3924 | 3797 | 4215 | 4346 | .0003 | | |
| 15 | 3925 | 3798 | 4215 | 4346 | .0003 | | |
| 0 | 3929 | 3799 | 4216 | 4348 | .0001 | .0001 | |
| 10 | 3928 | 3799 | 4216 | 4348 | .0001 | | |
| 20 | 3926 | 3798 | 4215 | 4346 | .0003 | | |
| 30 | 3924 | 3797 | 4215 | 4346 | .0003 | | |
| 40 | 3919 | 3794 | 4213 | 4346 | .0006 | | |
| 20 | 3920 | 3795 | 4213 | 4346 | .0005 | | |
| 0 | 3926 | 3799 | 4215 | 4345 | .0003 | .0003 | |
| 20 | 3923 | 3798 | 4215 | 4343 | .0004 | | |
| 40 | 3918 | 3795 | 4213 | 4343 | .0007 | | |
| 50 | 3908 | 3788 | 4210 | 4343 | .0012 | | |
| 25 | 3910 | 3789 | 4210 | 4343 | .0011 | | |
| 0 | 3918 | 3796 | 4212 | 4342 | .0007 | .0007 | |
| 20 | 3915 | 3795 | 4212 | 4342 | .0008 | | |
| 40 | 3910 | 3790 | 4211 | 4342 | .0011 | | |
| 60 | 3889 | 3774 | 4200 | 4295 | .0034 | | |
| 30 | 3892 | 3776 | 4201 | 4300 | .0032 | | |
| 0 | 3902 | 3788 | 4205 | 4312 | .0022 | .0022 | |
| 20 | 3899 | 3786 | 4205 | 4309 | .0024 | | |
| 40 | 3894 | 3781 | 4203 | 4302 | .0029 | | |
| 60 | 3888 | 3774 | 4200 | 4292 | .0035 | | |
| 64 | | | | | | | SUDDEN SLIP |
| 65 | 3863 | 3750 | 4182 | 4257 | .0061 | | |
| 40 | 3865 | 3751 | 4183 | 4290 | .0052 | | |
| 20 | 3870 | 3755 | 4185 | 4266 | .0055 | | |
| 0 | 3878 | 3766 | 4189 | 4277 | .0046 | .0046 | |
| 20 | 3875 | 3765 | 4189 | 4273 | .0048 | | |
| 40 | 3871 | 3761 | 4187 | 4266 | .0053 | | |
| 60 | 3865 | 3754 | 4183 | 4257 | .0059 | | |
| 69 | | | | | | | SUDDEN SLIP |

SPECIMEN N5B4TB2 CONTINUED

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 70 | 3828 | 3720 | 4157 | 4218 | .0093 | | |
| 40 | 3831 | 3722 | 4159 | 4222 | .0090 | | |
| 20 | 3836 | 3727 | 4162 | 4229 | .0085 | | |
| 0 | 3844 | 3739 | 4166 | 4239 | .0077 | .0077 | |
| 20 | 3843 | 3738 | 4166 | 4237 | .0078 | | |
| 40 | 3838 | 3733 | 4164 | 4230 | .0083 | | |
| 60 | 3831 | 3726 | 4160 | 4222 | .0089 | | |
| 80 | 3717 | 3625 | 4072 | 4124 | .0189 | | |
| 73 | | | | | | | SUDDEN SLIP |
| 75 | | | | | | | SUDDEN SLIP |
| 77 | | | | | | | SUDDEN SLIP |
| 60 | 3717 | 3625 | 4072 | 4126 | .0189 | | |
| 40 | 3722 | 3628 | 4076 | 4131 | .0185 | | |
| 20 | 3730 | 3634 | 4081 | 4139 | .0178 | | |
| 0 | 3741 | 3650 | 4089 | 4155 | .0165 | .0165 | |
| 20 | 3740 | 3649 | 4090 | 4153 | .0166 | | |
| 40 | 3735 | 3644 | 4087 | 4147 | .0171 | | |
| 60 | 3727 | 3634 | 4082 | 4137 | .0179 | | |
| 79 | | | | | | | SUDDEN SLIP |
| 80 | 3691 | 3600 | 4055 | 4107 | .0211 | | |
| 81 | | | | | | | SUDDEN SLIP |
| 90 | 3545 | 3440 | 3927 | 3970 | .0353 | | |
| 60 | 3542 | 3441 | 3930 | 3976 | .0352 | | |
| 30 | 3560 | 3452 | 3939 | 3992 | .0338 | | |
| 0 | 3629 | 3490 | 3940 | 4041 | .0299 | .0299 | |
| 20 | 3622 | 3489 | 3937 | 4037 | .0303 | | HOR. CRACKS AT BOLTS 1,3 |
| 40 | 3608 | 3484 | 3935 | 4029 | .0310 | | |
| 60 | 3590 | 3473 | 3928 | 4018 | .0322 | | |
| 80 | 3552 | 3446 | 3892 | 3992 | .0353 | | |
| 100 | 3073 | 2981 | 3429 | 3573 | .0810 | | |
| 60 | 3080 | 2973 | 3398 | 3567 | .0819 | | |
| 30 | 3135 | 3017 | 3422 | 3614 | .0777 | | |
| 0 | 3260 | 3088 | 3440 | 3695 | .0703 | .0703 | |
| 20 | 3229 | 3086 | 3440 | 3688 | .0713 | | |
| 40 | 3187 | 3078 | 3441 | 3677 | .0728 | | |
| 60 | 3146 | 3052 | 3433 | 3651 | .0753 | | |
| 80 | 3091 | 3003 | 3380 | 3602 | .0805 | | |
| 100 | 2941 | 2867 | 3238 | 3484 | .0941 | | |
| 102 | 2500 | 2415 | 2787 | 3027 | .1392 | | ULTIMATE LOAD |
| 0 | 2745 | 2532 | 2826 | 3201 | .1248 | .1248 | |

PUSHOUT TEST

SPECIMEN N5B4TB3

DATE CAST 2-24-66 DATE TESTED 4-28-66

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 0 | 3833 | 4001 | 4111 | 4044 | .0000 | .0000 | |
| 5 | 3833 | 4001 | 4111 | 4044 | .0000 | | |
| 10 | 3833 | 4001 | 4111 | 4043 | .0000 | | |
| 5 | 3833 | 4001 | 4111 | 4043 | .0000 | | |
| 0 | 3833 | 4001 | 4111 | 4044 | .0000 | .0000 | |
| 5 | 3833 | 4001 | 4111 | 4044 | .0000 | | |
| 10 | 3833 | 4001 | 4110 | 4043 | .0000 | | |
| 20 | 3830 | 4001 | 4110 | 4041 | .0001 | | |
| 10 | 3830 | 4001 | 4110 | 4041 | .0001 | | |
| 0 | 3832 | 4001 | 4110 | 4043 | .0000 | .0000 | |
| 10 | 3832 | 4001 | 4110 | 4042 | .0001 | | |
| 20 | 3830 | 4001 | 4110 | 4040 | .0002 | | |
| 30 | 3827 | 4001 | 4110 | 4037 | .0003 | | |
| 15 | 3827 | 4001 | 4110 | 4038 | .0003 | | |
| 0 | 3831 | 4002 | 4110 | 4042 | .0001 | .0001 | |
| 10 | 3831 | 4002 | 4110 | 4041 | .0001 | | |
| 20 | 3829 | 4002 | 4110 | 4039 | .0002 | | |
| 30 | 3827 | 4001 | 4110 | 4037 | .0003 | | |
| 40 | 3820 | 3999 | 4110 | 4029 | .0007 | | |
| 20 | 3819 | 4000 | 4110 | 4031 | .0007 | | |
| 0 | 3826 | 4002 | 4110 | 4036 | .0003 | .0003 | |
| 20 | 3824 | 4002 | 4111 | 4033 | .0004 | | |
| 40 | 3818 | 4000 | 4111 | 4028 | .0008 | | |
| 50 | 3805 | 3997 | 4109 | 4017 | .0015 | | |
| 25 | 3805 | 3998 | 4109 | 4019 | .0014 | | |
| 0 | 3814 | 4001 | 4111 | 4026 | .0009 | .0009 | |
| 20 | 3814 | 4001 | 4111 | 4024 | .0009 | | |
| 40 | 3808 | 3999 | 4110 | 4019 | .0013 | | |
| 60 | 3778 | 3988 | 4102 | 4001 | .0030 | | |
| 30 | 3778 | 3991 | 4102 | 4004 | .0028 | | |
| 0 | 3788 | 3997 | 4106 | 4011 | .0021 | .0021 | |
| 20 | 3788 | 3997 | 4106 | 4009 | .0022 | | |
| 40 | 3782 | 3993 | 4106 | 4005 | .0025 | | |
| 60 | 3775 | 3988 | 4104 | 4000 | .0030 | | |
| 65 | 3756 | 3982 | 4097 | 3992 | .0040 | | |
| 40 | 3755 | 3983 | 4096 | 3993 | .0040 | | |
| 20 | 3758 | 3987 | 4098 | 3997 | .0037 | | |
| 0 | 3767 | 3992 | 4102 | 4002 | .0031 | .0031 | |
| 20 | 3767 | 3992 | 4102 | 4000 | .0032 | | |
| 40 | 3762 | 3988 | 4102 | 3997 | .0035 | | |
| 60 | 3756 | 3983 | 4099 | 3992 | .0039 | | |
| 70 | 3721 | 3967 | 4082 | 3975 | .0061 | | |
| 40 | 3721 | 3970 | 4082 | 3977 | .0059 | | |
| 20 | 3725 | 3974 | 4084 | 3981 | .0056 | | |

SPECIMEN N5B4TB3 CONTINUED

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 0 | 3733 | 3980 | 4090 | 3987 | .0049 | .0049 | |
| 20 | 3734 | 3980 | 4090 | 3986 | .0049 | | |
| 40 | 3730 | 3976 | 4089 | 3982 | .0053 | | |
| 60 | 3723 | 3971 | 4086 | 3977 | .0058 | | |
| 80 | 3603 | 3885 | 4008 | 3895 | .0149 | | |
| 60 | 3601 | 3885 | 4007 | 3895 | .0150 | | |
| 40 | 3603 | 3889 | 4008 | 3899 | .0147 | | |
| 20 | 3607 | 3893 | 4011 | 3903 | .0143 | | |
| 0 | 3617 | 3902 | 4018 | 3911 | .0135 | .0135 | |
| 20 | 3618 | 3901 | 4018 | 3910 | .0135 | | |
| 40 | 3614 | 3898 | 4017 | 3907 | .0138 | | |
| 60 | 3608 | 3892 | 4013 | 3901 | .0143 | | |
| 80 | 3597 | 3885 | 4006 | 3892 | .0152 | | |
| 90 | 3446 | 3745 | 3880 | 3756 | .0290 | | |
| 60 | 3445 | 3748 | 3880 | 3759 | .0289 | | |
| 30 | 3448 | 3756 | 3886 | 3768 | .0282 | | |
| 0 | 3464 | 3778 | 3903 | 3789 | .0263 | .0263 | |
| 20 | 3461 | 3778 | 3903 | 3788 | .0264 | | |
| 40 | 3456 | 3773 | 3901 | 3784 | .0268 | | |
| 60 | 3446 | 3765 | 3895 | 3777 | .0276 | | |
| 80 | 3429 | 3752 | 3883 | 3763 | .0290 | | |
| 100 | 3173 | 3510 | 3655 | 3539 | .0528 | | |
| 60 | 3173 | 3518 | 3658 | 3545 | .0523 | | |
| 30 | | 3544 | 3673 | 3563 | .0458 | | |
| 0 | | 3545 | 3658 | 3567 | .0462 | .0462 | |
| 20 | | 3538 | 3657 | 3565 | .0465 | | |
| 40 | | 3532 | 3657 | 3561 | .0468 | | |
| 60 | | 3516 | 3652 | 3548 | .0480 | | |
| 80 | | 3487 | 3631 | 3521 | .0505 | | |
| 100 | | 3366 | 3505 | 3411 | .0624 | | |
| 120 | | | | | | | ULTIMATE LOAD |

# PUSHOUT TEST

SPECIMEN N5A4TB4

DATE CAST 2-24-66 DATE TESTED 6-23-66

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | BOLT TENSIONED ON 3-31-66 ALIGNMENT BAD |
| 0 | 4125 | 4026 | 3992 | 4196 | .0000 | .0000 | |
| 5 | 4125 | 4026 | 3991 | 4196 | .0000 | | |
| 10 | 4125 | 4024 | 3990 | 4196 | .0001 | | |
| 5 | 4125 | 4024 | 3990 | 4196 | .0001 | | |
| 0 | 4125 | 4025 | 3991 | 4196 | .0000 | .0000 | |
| 10 | 4125 | 4024 | 3990 | 4196 | .0001 | | |
| 20 | 4125 | 4018 | 3987 | 4195 | .0003 | | |
| 10 | 4125 | 4018 | 3987 | 4196 | .0003 | | |
| 0 | 4125 | 4023 | 3990 | 4196 | .0001 | .0001 | |
| 10 | 4126 | 4020 | 3988 | 4196 | .0002 | | |
| 20 | 4126 | 4018 | 3986 | 4195 | .0003 | | |
| 30 | 4128 | 4004 | 3981 | 4195 | .0007 | | |
| 15 | 4129 | 4005 | 3982 | 4196 | .0006 | | |
| 0 | 4127 | 4014 | 3988 | 4197 | .0003 | .0003 | |
| 10 | 4127 | 4011 | 3985 | 4197 | .0004 | | |
| 20 | 4128 | 4007 | 3983 | 4197 | .0006 | | |
| 30 | 4129 | 4002 | 3980 | 4196 | .0008 | | |
| 40 | 4131 | 3939 | 3973 | 4189 | .0026 | | |
| 20 | 4132 | 3940 | 3974 | 4192 | .0025 | | |
| 0 | 4129 | 3950 | 3983 | 4197 | .0020 | .0020 | |
| 10 | 4130 | 3948 | 3980 | 4197 | .0021 | | |
| 20 | 4131 | 3944 | 3977 | 4197 | .0022 | | |
| 30 | 4131 | 3940 | 3975 | 4195 | .0024 | | |
| 40 | 4132 | 3933 | 3973 | 4192 | .0027 | | |
| 50 | 4132 | 3818 | 3964 | 4150 | .0068 | | |
| 25 | 4134 | 3820 | 3966 | 4155 | .0066 | | |
| 0 | 4132 | 3834 | 3974 | 4164 | .0058 | .0058 | |
| 20 | 4133 | 3829 | 3970 | 4164 | .0060 | | |
| 40 | 4133 | 3820 | 3966 | 4159 | .0065 | | |
| 60 | 4133 | 3645 | 3953 | 4072 | .0134 | | |
| 30 | 4135 | 3651 | 3955 | 4075 | .0130 | | |
| 0 | 4134 | 3678 | 3960 | 4098 | .0117 | .0117 | |
| 20 | 4134 | 3672 | 3957 | 4096 | .0120 | | |
| 40 | 4134 | 3663 | 3955 | 4090 | .0124 | | |
| 60 | 4134 | 3611 | 3953 | 4061 | .0145 | | |
| 70 | 4128 | 3449 | 3936 | 3933 | .0223 | | |
| 40 | 4129 | 3455 | 3939 | 3941 | .0218 | | |
| 0 | 4130 | 3511 | 3942 | 3992 | .0191 | .0191 | |
| 20 | 4130 | 3508 | 3940 | 3990 | .0192 | | |
| 40 | 4129 | 3497 | 3939 | 3982 | .0198 | | |
| 60 | 4128 | 3461 | 3937 | 3956 | .0214 | | |

SPECIMEN N5A4TB4 CONTINUED

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 80 | 4094 | 3206 | 3896 | 3726 | .0354 | | |
| 40 | 4094 | 3212 | 3902 | 3748 | .0345 | | |
| 0 | 4094 | 3236 | 3905 | 3836 | .0317 | .0317 | |
| 20 | 4094 | 3229 | 3904 | 3828 | .0321 | | |
| 40 | 4093 | 3223 | 3902 | 3805 | .0329 | | |
| 60 | 4092 | 3188 | 3900 | 3765 | .0348 | | |
| 80 | 4082 | 3012 | 3891 | 3614 | .0435 | | |
| 90 | 3936 | 2615 | 3763 | 3282 | .0685 | | |
| 40 | 3930 | 2612 | 3783 | 3340 | .0668 | | |
| 0 | 3932 | 2695 | 3794 | 3468 | .0612 | .0612 | |
| 20 | 3932 | 2686 | 3793 | 3444 | .0621 | | CRACKS AT 2,4 |
| 40 | 3932 | 2685 | 3790 | 3402 | .0632 | | |
| 60 | 3929 | 2645 | 3786 | 3346 | .0658 | | |
| 80 | 3922 | 2517 | 3775 | 3243 | .0720 | | |
| 100 | 3413 | 1713 | 3330 | 2500 | .1345 | | CRACKS AT 1,3 SLAB/BEAM SEP. |
| 50 | 3413 | 1720 | 3350 | 2565 | .1322 | | |
| 0 | 3464 | 1906 | 3429 | 2806 | .1183 | .1183 | |
| 20 | 3471 | 1898 | 3427 | 2758 | .1196 | | |
| 40 | 3468 | 1897 | 3414 | 2707 | .1213 | | |
| 60 | 3444 | 1827 | 3388 | 2635 | .1261 | | |
| 80 | 3408 | 1716 | 3350 | 2544 | .1330 | | |
| 100 | 3320 | 1450 | 3258 | 2318 | .1498 | | |
| 112 | | | | | | | ULTIMATE LOAD |
| 0 | 1775 | | 1619 | 0790 | .2686 | .2686 | DIAL 2 OUT OF TRAVEL |

# PUSHOUT TEST

SPECIMEN N6B4TB1

DATE CAST 5-12-66 DATE TESTED 6-15-66

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | ALIGNMENT BAD |
| 10 | | | | | | | PRELOAD |
| 0 | 3909 | 4251 | 3821 | 3690 | .0000 | .0000 | |
| 5 | 3909 | 4251 | 3821 | 3690 | .0000 | | |
| 10 | 3909 | 4251 | 3821 | 3689 | .0000 | | |
| 5 | 3909 | 4251 | 3821 | 3689 | .0000 | | |
| 0 | 3909 | 4251 | 3821 | 3689 | .0000 | .0000 | |
| 5 | 3909 | 4251 | 3821 | 3689 | .0000 | | |
| 10 | 3909 | 4251 | 3821 | 3688 | .0000 | | |
| 15 | 3908 | 4251 | 3821 | 3688 | .0000 | | |
| 5 | 3908 | 4251 | 3821 | 3688 | .0000 | | |
| 0 | 3909 | 4251 | 3821 | 3689 | .0000 | .0000 | |
| 10 | 3908 | 4251 | 3821 | 3688 | .0000 | | |
| 15 | 3908 | 4251 | 3821 | 3688 | .0000 | | |
| 20 | 3907 | 4251 | 3821 | 3687 | .0001 | | |
| 10 | 3907 | 4251 | 3821 | 3687 | .0001 | | |
| 0 | 3908 | 4251 | 3821 | 3689 | .0000 | .0000 | |
| 10 | 3908 | 4251 | 3821 | 3688 | .0000 | | |
| 20 | 3907 | 4251 | 3821 | 3687 | .0001 | | |
| 30 | 3905 | 4250 | 3820 | 3685 | .0002 | | |
| 15 | 3905 | 4250 | 3821 | 3686 | .0002 | | |
| 0 | 3907 | 4251 | 3821 | 3688 | .0001 | .0001 | |
| 10 | 3907 | 4251 | 3821 | 3687 | .0001 | | |
| 20 | 3906 | 4251 | 3821 | 3686 | .0001 | | |
| 30 | 3905 | 4250 | 3820 | 3685 | .0002 | | |
| 40 | 3902 | 4249 | 3818 | 3683 | .0004 | | |
| 20 | 3902 | 4249 | 3819 | 3684 | .0004 | | |
| 0 | 3906 | 4250 | 3821 | 3688 | .0001 | .0001 | |
| 10 | 3906 | 4250 | 3820 | 3687 | .0002 | | |
| 20 | 3905 | 4250 | 3820 | 3685 | .0002 | | |
| 30 | 3903 | 4250 | 3819 | 3684 | .0003 | | |
| 40 | 3902 | 4249 | 3818 | 3682 | .0005 | | |
| 50 | 3900 | 4247 | 3816 | 3680 | .0007 | | |
| 30 | 3900 | 4248 | 3817 | 3681 | .0006 | | |
| 10 | 3902 | 4248 | 3820 | 3684 | .0004 | | |
| 0 | 3905 | 4249 | 3820 | 3687 | .0002 | .0002 | |
| 20 | 3903 | 4249 | 3820 | 3684 | .0003 | | |
| 40 | 3901 | 4248 | 3817 | 3681 | .0006 | | |
| 60 | 3897 | 4245 | 3814 | 3678 | .0009 | | |
| 30 | 3897 | 4246 | 3817 | 3680 | .0007 | | |
| 0 | 3904 | 4249 | 3820 | 3686 | .0003 | .0003 | |
| 20 | 3902 | 4249 | 3820 | 3683 | .0004 | | |
| 40 | 3900 | 4247 | 3817 | 3680 | .0006 | | |
| 60 | 3897 | 4245 | 3814 | 3677 | .0009 | | |

SPECIMEN N6B4TB1 CONTINUED

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 70 | 3894 | 4243 | 3811 | 3674 | .0012 | | |
| 40 | 3894 | 4244 | 3814 | 3677 | .0010 | | |
| 0 | 3902 | 4248 | 3819 | 3685 | .0004 | .0004 | |
| 20 | 3901 | 4248 | 3819 | 3682 | .0005 | | |
| 40 | 3898 | 4247 | 3816 | 3679 | .0007 | | |
| 60 | 3895 | 4244 | 3813 | 3675 | .0011 | | |
| 80 | 3890 | 4240 | 3808 | 3670 | .0015 | | |
| 40 | 3891 | 4242 | 3811 | 3674 | .0013 | | |
| 0 | 3900 | 4248 | 3818 | 3683 | .0005 | .0005 | |
| 20 | 3898 | 4248 | 3817 | 3680 | .0007 | | |
| 40 | 3895 | 4246 | 3815 | 3677 | .0009 | | |
| 60 | 3892 | 4243 | 3811 | 3673 | .0013 | | |
| 80 | 3889 | 4240 | 3807 | 3669 | .0016 | | |
| 90 | 3884 | 4238 | 3802 | 3665 | .0020 | | |
| 50 | 3885 | 4239 | 3806 | 3669 | .0018 | | |
| 0 | 3896 | 4247 | 3816 | 3680 | .0008 | .0008 | |
| 20 | 3895 | 4247 | 3815 | 3677 | .0009 | | |
| 40 | 3892 | 4245 | 3813 | 3674 | .0011 | | |
| 60 | 3888 | 4242 | 3809 | 3670 | .0015 | | |
| 80 | 3885 | 4239 | 3804 | 3666 | .0019 | | |
| 100 | 3876 | 4232 | 3796 | 3655 | .0028 | | |
| 50 | 3878 | 4235 | 3801 | 3661 | .0024 | | |
| 0 | 3892 | 4244 | 3814 | 3675 | .0011 | .0011 | |
| 20 | 3891 | 4244 | 3813 | 3672 | .0012 | | |
| 40 | 3887 | 4243 | 3810 | 3668 | .0015 | | |
| 60 | 3883 | 4240 | 3805 | 3664 | .0019 | | |
| 80 | 3880 | 4236 | 3800 | 3659 | .0024 | | |
| 100 | 3875 | 4232 | 3795 | 3653 | .0029 | | |
| 110 | 3859 | 4224 | 3781 | 3638 | .0042 | | |
| 60 | 3861 | 4226 | 3786 | 3643 | .0038 | | |
| 0 | 3879 | 4240 | 3805 | 3662 | .0021 | .0021 | |
| 20 | 3879 | 4239 | 3805 | 3660 | .0022 | | |
| 40 | 3875 | 4238 | 3801 | 3656 | .0025 | | |
| 60 | 3871 | 4235 | 3796 | 3651 | .0029 | | |
| 80 | 3865 | 4230 | 3790 | 3646 | .0035 | | |
| 100 | 3860 | 4226 | 3783 | 3639 | .0040 | | |
| 116 | | | | | | | SUDDEN SLIP |
| 120 | 3822 | 4193 | 3743 | 3590 | .0080 | | |
| 60 | 3826 | 4196 | 3750 | 3590 | .0077 | | |
| 0 | 3847 | 4212 | 3771 | 3618 | .0055 | .0055 | |
| 20 | 3846 | 4212 | 3771 | 3616 | .0056 | | |
| 40 | 3843 | 4211 | 3767 | 3613 | .0059 | | |
| 60 | 3839 | 4208 | 3762 | 3608 | .0063 | | |
| 80 | 3834 | 4204 | 3756 | 3602 | .0068 | | |
| 100 | 3828 | 4199 | 3749 | 3596 | .0074 | | |
| 120 | 3821 | 4193 | 3741 | 3587 | .0082 | | |
| 122 | | | | | | | SUDDEN SLIP |
| 130 | 3792 | 4155 | 3699 | 3537 | .0122 | | |
| 70 | 3792 | 4159 | 3707 | 3545 | .0117 | | |
| 0 | 3817 | 4179 | 3735 | 3571 | .0092 | .0092 | |

SPECIMEN N6B4TB1 CONTINUED

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 20 | 3817 | 4179 | 3735 | 3570 | .0092 | | |
| 40 | 3814 | 4178 | 3732 | 3567 | .0095 | | |
| 60 | 3810 | 4175 | 3727 | 3563 | .0099 | | |
| 80 | 3804 | 4170 | 3720 | 3557 | .0105 | | |
| 100 | 3797 | 4164 | 3711 | 3548 | .0112 | | |
| 120 | 3790 | 4158 | 3702 | 3540 | .0120 | | |
| 129 | | | | | | | SUDDEN SLIP |
| 135 | | | | | | | SUDDEN SLIP |
| 140 | 3705 | 4068 | 3600 | 3426 | .0218 | | |
| 142 | | | | | | | SUDDEN SLIP |
| 144 | | | | | | | HOR. CRACKS AT BOLTS 2,4 |
| 151 | 3409 | 3773 | 3227 | 3061 | .0550 | | |
| 80 | 3421 | 3785 | 3252 | 3081 | .0533 | | |
| 0 | 3530 | 3915 | 3344 | 3205 | .0419 | .0419 | |
| 20 | 3530 | 3915 | 3344 | 3195 | .0421 | | HOR. CRACK AT BOLT 1 |
| 40 | 3521 | 3904 | 3334 | 3180 | .0433 | | |
| 60 | 3511 | 3889 | 3321 | 3163 | .0446 | | |
| 80 | 3499 | 3874 | 3305 | 3142 | .0462 | | |
| 100 | 3475 | 3853 | 3275 | 3111 | .0489 | | |
| 120 | 3450 | 3829 | 3240 | 3074 | .0519 | | SUDDEN SLIP EVERY 5 KIPS |
| 140 | 3360 | 3742 | 3090 | 2919 | .0640 | | |
| 152 | | | | | | | ULTIMATE LOAD |
| 0 | 2136 | 2468 | 1700 | 1572 | .1948 | .1948 | |

# PUSHOUT TEST

SPECIMEN N6A4TB2

DATE CAST 5-12-66 DATE TESTED 6-16-66

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 10 | | | | | | | PRELOAD |
| 0 | 4887 | 3900 | 4621 | 4449 | .0000 | .0000 | |
| 10 | 4887 | 3900 | 4621 | 4449 | .0000 | | |
| 0 | 4887 | 3900 | 4621 | 4449 | .0000 | .0000 | |
| 10 | 4887 | 3900 | 4621 | 4449 | .0000 | | |
| 20 | 4886 | 3900 | 4620 | 4447 | .0001 | | |
| 10 | 4887 | 3900 | 4620 | 4447 | .0000 | | |
| 0 | 4887 | 3900 | 4621 | 4449 | .0000 | .0000 | |
| 10 | 4887 | 3900 | 4621 | 4448 | .0000 | | |
| 20 | 4886 | 3900 | 4620 | 4447 | .0001 | | |
| 30 | 4884 | 3898 | 4619 | 4445 | .0002 | | |
| 40 | 4881 | 3897 | 4618 | 4442 | .0004 | | |
| 20 | 4881 | 3898 | 4618 | 4444 | .0004 | | |
| 0 | 4885 | 3899 | 4620 | 4447 | .0001 | .0001 | |
| 20 | 4884 | 3899 | 4620 | 4445 | .0002 | | |
| 40 | 4881 | 3897 | 4618 | 4442 | .0004 | | |
| 60 | 4874 | 3891 | 4614 | 4435 | .0010 | | |
| 30 | 4874 | 3893 | 4616 | 4438 | .0009 | | |
| 0 | 4882 | 3897 | 4620 | 4444 | .0003 | .0003 | |
| 20 | 4881 | 3897 | 4620 | 4442 | .0004 | | |
| 40 | 4877 | 3894 | 4617 | 4439 | .0007 | | |
| 60 | 4873 | 3891 | 4615 | 4435 | .0010 | | |
| 70 | 4869 | 3888 | 4613 | 4432 | .0013 | | |
| 40 | 4870 | 3890 | 4615 | 4434 | .0012 | | |
| 0 | 4880 | 3895 | 4620 | 4442 | .0005 | .0005 | |
| 20 | 4878 | 3895 | 4620 | 4440 | .0006 | | |
| 40 | 4874 | 3893 | 4617 | 4437 | .0009 | | |
| 60 | 4870 | 3889 | 4614 | 4433 | .0012 | | |
| 80 | 4864 | 3884 | 4610 | 4427 | .0018 | | |
| 40 | 4866 | 3888 | 4614 | 4431 | .0014 | | |
| 0 | 4877 | 3894 | 4619 | 4440 | .0006 | .0006 | |
| 20 | 4876 | 3894 | 4619 | 4438 | .0007 | | |
| 40 | 4872 | 3891 | 4617 | 4434 | .0010 | | |
| 60 | 4867 | 3888 | 4614 | 4430 | .0014 | | |
| 80 | 4863 | 3884 | 4611 | 4427 | .0018 | | |
| 90 | 4857 | 3879 | 4606 | 4420 | .0023 | | |
| 50 | 4857 | 3882 | 4609 | 4424 | .0021 | | |
| 0 | 4873 | 3892 | 4617 | 4435 | .0010 | .0010 | |
| 20 | 4871 | 3891 | 4617 | 4433 | .0011 | | |
| 40 | 4867 | 3889 | 4615 | 4430 | .0014 | | |
| 60 | 4862 | 3885 | 4612 | 4426 | .0018 | | |
| 80 | 4857 | 3881 | 4608 | 4422 | .0022 | | |
| 100 | 4844 | 3873 | 4599 | 4410 | .0032 | | |
| 50 | 4849 | 3878 | 4604 | 4416 | .0027 | | |

SPECIMEN N6A4TB2 CONTINUED

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 0 | 4866 | 3889 | 4615 | 4430 | .0014 | .0014 | |
| 20 | 4865 | 3889 | 4615 | 4428 | .0015 | | |
| 40 | 4860 | 3886 | 4612 | 4424 | .0018 | | |
| 60 | 4855 | 3882 | 4608 | 4420 | .0023 | | |
| 80 | 4849 | 3877 | 4604 | 4415 | .0028 | | |
| 100 | 4843 | 3873 | 4600 | 4410 | .0032 | | |
| 110 | 4827 | 3864 | 4587 | 4396 | .0045 | | |
| 60 | 4831 | 3869 | 4592 | 4401 | .0041 | | |
| 0 | 4852 | 3885 | 4608 | 4418 | .0023 | .0023 | |
| 20 | 4852 | 3884 | 4607 | 4417 | .0024 | | |
| 40 | 4847 | 3881 | 4605 | 4413 | .0027 | | |
| 60 | 4841 | 3877 | 4601 | 4408 | .0032 | | |
| 80 | 4835 | 3872 | 4596 | 4403 | .0037 | | |
| 100 | 4828 | 3867 | 4591 | 4397 | .0043 | | |
| 113 | | | | | | | SUDDEN SLIP |
| 120 | 4784 | 3836 | 4555 | 4355 | .0081 | | |
| 60 | 4790 | 3844 | 4561 | 4362 | .0075 | | |
| 0 | 4814 | 3865 | 4578 | 4382 | .0054 | .0054 | |
| 20 | 4814 | 3865 | 4578 | 4381 | .0054 | | |
| 40 | 4810 | 3862 | 4575 | 4377 | .0058 | | |
| 60 | 4805 | 3857 | 4572 | 4372 | .0062 | | |
| 80 | 4798 | 3851 | 4567 | 4366 | .0068 | | |
| 100 | 4790 | 3844 | 4560 | 4360 | .0075 | | |
| 120 | 4740 | 3792 | 4514 | 4292 | .0129 | | SUDDEN SLIP |
| 125 | | | | | | | SUDDEN SLIP |
| 130 | 4700 | 3756 | 4473 | 4248 | .0170 | | |
| 70 | 4706 | 3763 | 4479 | 4257 | .0163 | | |
| 0 | 4738 | 3788 | 4502 | 4288 | .0135 | .0135 | |
| 0 | 4741 | 3790 | 4504 | 4291 | .0132 | .0132 | ONE HOUR LATER |
| 20 | 4741 | 3790 | 4504 | 4290 | .0133 | | |
| 40 | 4738 | 3786 | 4502 | 4284 | .0136 | | |
| 60 | 4732 | 3782 | 4498 | 4279 | .0141 | | |
| 80 | 4725 | 3777 | 4493 | 4272 | .0147 | | |
| 100 | 4715 | 3769 | 4485 | 4263 | .0156 | | |
| 120 | 4705 | 3760 | 4476 | 4252 | .0166 | | |
| 126 | | | | | | | SUDDEN SLIP |
| 128 | | | | | | | SUDDEN SLIP |
| 130 | | | | | | | SUDDEN SLIP |
| 133 | | | | | | | SUDDEN SLIP |
| 134 | | | | | | | SUDDEN SLIP |
| 137 | | | | | | | LOAD HELD |
| 140 | 4130 | 3291 | 3983 | 3752 | .0675 | | DIAL 2 OUT OF TRAVEL TOTAL SLIP .390 INCH |
| 149 | | | | | | | ULTIMATE LOAD BEGAN CRACKING |
| 0 | 1544 | 414 | 1376 | 1045 | .3369 | .3369 | |

# PUSHOUT TEST

SPECIMEN N6A4TB3

DATE CAST 5-12-66 DATE TESTED 6-17-66

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 0 | 4277 | 4196 | 4520 | 3760 | .0000 | .0000 | |
| 10 | 4277 | 4196 | 4520 | 3759 | .0000 | | |
| 0 | 4277 | 4196 | 4520 | 3760 | .0000 | .0000 | |
| 10 | 4277 | 4196 | 4520 | 3759 | .0000 | | |
| 20 | 4277 | 4196 | 4520 | 3758 | .0000 | | |
| 10 | 4277 | 4196 | 4520 | 3758 | .0000 | | |
| 0 | 4277 | 4196 | 4520 | 3760 | .0000 | .0000 | |
| 10 | 4277 | 4196 | 4520 | 3759 | .0000 | | |
| 20 | 4277 | 4196 | 4520 | 3758 | .0000 | | |
| 30 | 4277 | 4195 | 4519 | 3756 | .0001 | | |
| 40 | 4275 | 4194 | 4516 | 3754 | .0003 | | |
| 20 | 4275 | 4195 | 4518 | 3755 | .0002 | | |
| 0 | 4275 | 4196 | 4519 | 3759 | .0001 | .0001 | |
| 20 | 4275 | 4196 | 4519 | 3757 | .0001 | | |
| 40 | 4275 | 4194 | 4517 | 3754 | .0003 | | |
| 60 | 4268 | 4191 | 4511 | 3750 | .0008 | | |
| 30 | 4269 | 4193 | 4514 | 3752 | .0006 | | |
| 0 | 4271 | 4195 | 4518 | 3757 | .0003 | .0003 | |
| 20 | 4271 | 4195 | 4518 | 3755 | .0003 | | |
| 40 | 4271 | 4193 | 4515 | 3752 | .0005 | | |
| 60 | 4268 | 4191 | 4511 | 3750 | .0008 | | |
| 70 | 4265 | 4189 | 4508 | 3747 | .0011 | | |
| 40 | 4265 | 4191 | 4510 | 3749 | .0009 | | |
| 0 | 4270 | 4195 | 4517 | 3756 | .0003 | .0003 | |
| 20 | 4270 | 4194 | 4516 | 3754 | .0004 | | |
| 40 | 4269 | 4192 | 4513 | 3751 | .0007 | | |
| 60 | 4265 | 4190 | 4510 | 3748 | .0010 | | |
| 80 | 4257 | 4186 | 4502 | 3743 | .0016 | | |
| 40 | 4257 | 4189 | 4507 | 3747 | .0013 | | |
| 0 | 4266 | 4194 | 4514 | 3755 | .0006 | .0006 | |
| 20 | 4266 | 4193 | 4514 | 3752 | .0007 | | |
| 40 | 4264 | 4194 | 4510 | 3749 | .0009 | | |
| 60 | 4261 | 4188 | 4506 | 3746 | .0013 | | |
| 80 | 4257 | 4186 | 4502 | 3743 | .0016 | | |
| 90 | 4244 | 4182 | 4492 | 3738 | .0024 | | |
| 50 | 4244 | 4186 | 4497 | 3741 | .0021 | | |
| 0 | 4254 | 4192 | 4507 | 3752 | .0012 | .0012 | |
| 20 | 4254 | 4192 | 4506 | 3749 | .0013 | | |
| 40 | 4253 | 4189 | 4503 | 3746 | .0015 | | |
| 60 | 4249 | 4187 | 4499 | 3743 | .0018 | | |
| 80 | 4245 | 4183 | 4494 | 3739 | .0023 | | |
| 93 | | | | | | | SUDDEN SLIP |
| 100 | 4209 | 4173 | 4465 | 3724 | .0045 | | |
| 50 | 4210 | 4178 | 4472 | 3729 | .0041 | | |

SPECIMEN N6A4TB3 CONTINUED

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 0 | 4222 | 4187 | 4483 | 3742 | .0029 | .0029 | |
| 20 | 4222 | 4187 | 4483 | 3740 | .0030 | | |
| 40 | 4221 | 4184 | 4480 | 3736 | .0033 | | |
| 60 | 4218 | 4181 | 4476 | 3732 | .0036 | | |
| 80 | 4214 | 4178 | 4471 | 3728 | .0040 | | |
| 100 | 4208 | 4173 | 4465 | 3722 | .0046 | | |
| 102 | | | | | | | SUDDEN SLIP |
| 110 | 4212 | 4103 | 4482 | 3629 | .0081 | | |
| 60 | 4214 | 4109 | 4489 | 3634 | .0076 | | |
| 0 | 4234 | 4120 | 4509 | 3651 | .0059 | .0059 | |
| 20 | 4234 | 4124 | 4509 | 3650 | .0059 | | |
| 40 | 4234 | 4121 | 4506 | 3646 | .0061 | | |
| 60 | 4230 | 4118 | 4501 | 3642 | .0065 | | |
| 80 | 4224 | 4114 | 4496 | 3638 | .0070 | | |
| 100 | 4215 | 4108 | 4485 | 3631 | .0078 | | |
| 120 | 3920 | 4059 | 4204 | 3453 | .0279 | | |
| 60 | 3907 | 4054 | 4198 | 3443 | .0287 | | |
| 0 | 3913 | 4054 | 4209 | 3426 | .0287 | .0287 | |
| 20 | 3911 | 4048 | 4207 | 3422 | .0291 | | |
| 40 | 3911 | 4038 | 4205 | [illegible]20 | .0294 | | |
| 60 | 3908 | 4025 | 4201 | 3417 | .0300 | | |
| 80 | 3893 | 4006 | 4187 | 3407 | .0315 | | |
| 100 | 3865 | 3979 | 4161 | 3383 | .0341 | | |
| 120 | 3765 | 3899 | 4054 | 3285 | .0437 | | |
| 130 | 3506 | 3660 | 3777 | 3005 | .0701 | | |
| 70 | 3500 | 3694 | 3789 | 3022 | .0687 | | |
| 0 | 3542 | 3854 | 3825 | 3035 | .0624 | .0624 | |
| 20 | 3542 | 3845 | 3824 | 3033 | .0627 | | |
| 40 | 3542 | 3824 | 3822 | 3032 | .0633 | | HOR. CRACK |
| 60 | 3542 | 3792 | 3819 | 3030 | .0642 | | |
| 80 | 3526 | 3756 | 3800 | 3023 | .0662 | | |
| 100 | 3495 | 3717 | 3772 | 3003 | .0691 | | |
| 120 | 3444 | 3672 | 3717 | 2963 | .0739 | | |
| 139 | | | | | | | ULTIMATE LOAD |
| 0 | 0 | 728 | -296 | 8 | .4012 | .4012 | |

# PUSHOUT TEST

SPECIMEN N6A4TB4

DATE CAST 5-12-66 DATE TESTED 6-21-66

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 20 | | | | | | | PRELOAD |
| 0 | 4875 | 4897 | 4932 | 4546 | .0000 | .0000 | |
| 10 | 4874 | 4897 | 4932 | 4545 | .0000 | | |
| 0 | 4875 | 4897 | 4932 | 4546 | .0000 | .0000 | |
| 10 | 4874 | 4897 | 4932 | 4545 | .0000 | | |
| 20 | 4873 | 4896 | 4931 | 4545 | .0001 | | |
| 10 | 4873 | 4896 | 4931 | 4545 | .0001 | | |
| 0 | 4875 | 4897 | 4931 | 4546 | .0000 | .0000 | |
| 10 | 4874 | 4897 | 4931 | 4545 | .0000 | | |
| 20 | 4873 | 4896 | 4931 | 4545 | .0001 | | |
| 30 | 4871 | 4894 | 4929 | 4543 | .0003 | | |
| 40 | 4869 | 4893 | 4927 | 4541 | .0005 | | |
| 20 | 4871 | 4894 | 4928 | 4541 | .0004 | | |
| 0 | 4874 | 4897 | 4930 | 4544 | .0001 | .0001 | |
| 20 | 4872 | 4896 | 4930 | 4543 | .0002 | | |
| 40 | 4869 | 4893 | 4927 | 4541 | .0005 | | |
| 60 | 4864 | 4889 | 4922 | 4536 | .0009 | | |
| 30 | 4867 | 4891 | 4925 | 4537 | .0007 | | |
| 0 | 4873 | 4896 | 4929 | 4542 | .0002 | .0002 | |
| 20 | 4870 | 4894 | 4929 | 4541 | .0004 | | |
| 40 | 4867 | 4891 | 4926 | 4538 | .0007 | | |
| 60 | 4864 | 4888 | 4922 | 4536 | .0010 | | |
| 70 | 4861 | 4886 | 4919 | 4533 | .0012 | | |
| 40 | 4864 | 4889 | 4922 | 4534 | .0010 | | |
| 0 | 4872 | 4895 | 4928 | 4540 | .0003 | .0003 | |
| 20 | 4869 | 4894 | 4928 | 4539 | .0005 | | |
| 40 | 4865 | 4891 | 4925 | 4537 | .0008 | | |
| 60 | 4862 | 4888 | 4921 | 4534 | .0011 | | |
| 80 | 4857 | 4883 | 4916 | 4529 | .0016 | | |
| 40 | 4861 | 4887 | 4920 | 4531 | .0012 | | |
| 0 | 4870 | 4894 | 4927 | 4539 | .0005 | .0005 | |
| 20 | 4867 | 4893 | 4927 | 4537 | .0006 | | |
| 40 | 4863 | 4890 | 4923 | 4535 | .0009 | | |
| 60 | 4860 | 4886 | 4919 | 4532 | .0013 | | |
| 80 | 4856 | 4882 | 4915 | 4529 | .0017 | | |
| 90 | 4851 | 4879 | 4911 | 4524 | .0021 | | |
| 50 | 4855 | 4883 | 4916 | 4526 | .0017 | | |
| 0 | 4867 | 4893 | 4926 | 4536 | .0007 | .0007 | |
| 20 | 4864 | 4891 | 4925 | 4535 | .0008 | | |
| 40 | 4860 | 4888 | 4922 | 4532 | .0012 | | |
| 60 | 4856 | 4884 | 4918 | 4529 | .0015 | | |
| 80 | 4852 | 4880 | 4913 | 4526 | .0019 | | |
| 100 | 4835 | 4873 | 4901 | 4518 | .0030 | | |
| 50 | 4841 | 4879 | 4908 | 4521 | .0025 | | |
| 0 | 4855 | 4890 | 4921 | 4532 | .0013 | .0013 | |

SPECIMEN N6A4TB4 CONTINUED

| TOTAL LOAD | SLIP DIAL READING AT LOCATION 1 | 2 | 3 | 4 | AVERAGE SLIP | RES. SLIP | REMARKS |
|---|---|---|---|---|---|---|---|
| 20 | 4852 | 4888 | 4920 | 4530 | .0015 | | |
| 40 | 4848 | 4885 | 4917 | 4527 | .0018 | | |
| 60 | 4843 | 4881 | 4912 | 4524 | .0022 | | |
| 80 | 4839 | 4877 | 4908 | 4521 | .0026 | | |
| 100 | 4832 | 4872 | 4902 | 4516 | .0032 | | |
| 110 | 4783 | 4890 | 4867 | 4490 | .0055 | | |
| 60 | 4789 | 4856 | 4873 | 4494 | .0059 | | |
| 0 | 4806 | 4875 | 4891 | 4510 | .0042 | .0042 | |
| 20 | 4805 | 4873 | 4890 | 4509 | .0043 | | |
| 40 | 4801 | 4869 | 4887 | 4506 | .0046 | | |
| 60 | 4796 | 4864 | 4883 | 4502 | .0051 | | |
| 80 | 4791 | 4859 | 4878 | 4497 | .0056 | | |
| 100 | 4784 | 4853 | 4872 | 4492 | .0062 | | |
| 112 | | | | | | | SUDDEN SLIP |
| 118 | | | | | | | SUDDEN SLIP |
| 120 | 4711 | 4794 | 4813 | 4424 | .0127 | | |
| 60 | 4720 | 4803 | 4822 | 4430 | .0118 | | |
| 0 | 4743 | 4828 | 4843 | 4446 | .0097 | .0097 | |
| 20 | 4742 | 4826 | 4842 | 4446 | .0098 | | |
| 40 | 4737 | 4822 | 4839 | 4444 | .0102 | | |
| 60 | 4732 | 4817 | 4835 | 4440 | .0106 | | |
| 80 | 4726 | 4811 | 4829 | 4435 | .0112 | | |
| 100 | 4719 | 4804 | 4822 | 4429 | .0119 | | |
| 120 | 4693 | 4793 | 4798 | 4417 | .0137 | | |
| 122 | | | | | | | SUDDEN SLIP |
| 125 | | | | | | | SUDDEN SLIP |
| 129 | | | | | | | SUDDEN SLIP |
| 130 | 4619 | 4716 | 4728 | 4332 | .0213 | | |
| 70 | 4630 | 4727 | 4739 | 4338 | .0204 | | |
| 0 | 4673 | 4768 | 4778 | 4350 | .0170 | .0170 | |
| 20 | 4673 | 4767 | 4776 | 4347 | .0171 | | |
| 40 | 4668 | 4761 | 4771 | 4346 | .0176 | | |
| 60 | 4662 | 4755 | 4766 | 4345 | .0180 | | |
| 80 | 4654 | 4748 | 4758 | 4340 | .0187 | | |
| 100 | 4642 | 4738 | 4746 | 4331 | .0198 | | |
| 120 | 4629 | 4726 | 4732 | 4321 | .0210 | | |
| 129 | | | | | | | SUDDEN SLIP |
| 140 | 4332 | 4417 | 4437 | 4000 | .0516 | | |
| 70 | 4353 | 4439 | 4459 | 4002 | .0499 | | |
| 0 | 4472 | 4680 | 4544 | 3962 | .0398 | .0398 | HOR CRACK AT 4 |
| 20 | 4468 | 4661 | 4540 | 3967 | .0403 | | ALL CRACKED |
| 40 | 4456 | 4637 | 4532 | 3970 | .0413 | | |
| 60 | 4443 | 4610 | 4521 | 3971 | .0426 | | |
| 80 | 4426 | 4582 | 4508 | 3971 | .0440 | | |
| 100 | 4399 | 4548 | 4484 | 3959 | .0465 | | |
| 120 | 4370 | 4515 | 4457 | 3931 | .0494 | | |
| 140 | 4233 | 4370 | 4323 | 3784 | .0635 | | |
| 146 | | | | | | | ULTIMATE LOAD |
| 140 | 2817 | 3023 | 2969 | 2320 | .2030 | | |
| 0 | 3225 | 3508 | 3261 | 2394 | .1715 | .1715 | |

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