

November 8, 1983

Docket No. 50-443/444

MEMORANDUM FOR: The Atomic Safety and Licensing Board
and Parties for Seabrook

FROM: Thomas Novak, Assistant Director
for Licensing

SUBJECT: ALLEGATIONS CONCERNING SEABROOK
(BOARD NOTIFICATION 83-121A)

In accordance with the procedures for Board notification, the following information is provided.

Board Notification 83-121 (8/23/83) provided information that was sent to the NRC staff by Reckoning 80's that contained certain allegations concerning safety relief valve load combinations and seismic stress calculations for Seabrook. The staff conducted an evaluation of these allegations, and the results are documented in Enclosure 1. It should be noted that the staff recently received follow-up information from the allegor regarding his allegations in a letter dated October 25, 1983 (Enclosure 2), subsequent to a telephone communication with the allegor. The staff has evaluated this follow-up information and continues to believe that the allegations do not identify any design deficiencies that could affect the public health and safety.

Original Signed By:

ASchwences for me

Thomas Novak, Assistant Director
for Licensing
Division of Licensing

Enclosures: As stated

DL
MWilliams:mcs
11/7/83

DL
DGEisenhut
11/7/83

DL
Rvöllmer
11/7/83

DL:AD/L
TNovak
11/8/83

DE:MEB
DTerao
11/2/83

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BN 83-121A

Requestor's ID:
MARY

Author's Name:
Williams

Document Comments:
Memo to ASLB-Allegations Concerning Seabrook

FOR CONCURRENCE & SIGNATURE:

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D. Eisenhut
R. Vollmer

~~add doc of nos~~

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Seabrook Station, Units 1&2
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UNITED STATES
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WASHINGTON, D. C. 20555

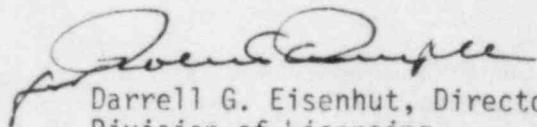
November 7, 1983

MEMORANDUM FOR: Thomas Novak, Assistant Director
for Licensing

FROM: Darrell G. Eisenhut, Director
Division of Licensing

SUBJECT: BOARD NOTIFICATION 83-121A

I have determined that the enclosed Memorandum (Vollmer to Eisenhut, 11/1/83) and the recently received letter from the alieger (Markowitz to Terao, 10/25/83) should be transmitted to the Board and Parties for Seabrook according to the procedures of Office Letter No. 19. Issue this as Board Notification 83-121A.


Darrell G. Eisenhut, Director
Division of Licensing

Enclosures: As stated

cc: S. Black
V. Nerses
P. Hungerbuhler

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

NOV 1 1983

MEMORANDUM FOR: Darrell G. Eisenhut, Director
Division of Licensing, NRR

FROM: Richard H. Vollmer, Director
Division of Engineering, NRR

SUBJECT: EVALUATION OF SEABROOK ALLEGATIONS (TAC #141431)

References: 1) Letter to E. J. Brunner (RI) from G. T. Markowitz
dated June 10, 1983.
2) Memorandum from R. Starostecki to D. Eisenhut
dated August 8, 1983.

In Reference 1 above, a letter was sent to Region I concerning several allegations about the nuclear power industry. Although the allegations appear to address the lack of moral and ethical practices found in the nuclear industry, several examples provided by the allegor did identify a potential technical concern. As a result, NRR was requested in Reference 2 above to provide a technical evaluation of the allegations. This memorandum addresses the evaluation of the allegations pertaining to the safety and relief valve seismic calculations for J. E. Lonergan Company-supplied relief valves and their impact on the Seabrook facility.

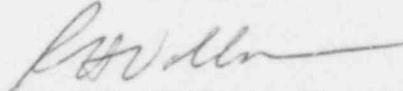
On September 29, 1983, the staff visited the offices of United Engineers & Constructors (UEC) to discuss the allegations concerning the Seabrook safety and relief valves. The meeting included representatives from the utility (Public Service Company of New Hampshire), the valve manufacturer (J. E. Lonergan Company), and the architect-engineer (United Engineers & Constructors). Attached to this memorandum is the trip report summary by the Mechanical Engineering Branch which provides the details of the meeting and the technical resolutions of the allegations.

On October 21, 1983, the staff discussed our findings with the allegor. The staff concluded, based on the many conservative assumptions used in the design calculations and based on the fact that the calculated stresses were found to be within Code allowables, that the allegations did not identify any valid safety concerns. The allegor appeared to be satisfied with the technical conclusions of the staff and stated he would consider our findings and respond.

Therefore, based on the review performed by the staff and based on our discussion with the allegor, we conclude that the allegations concerning the Seabrook safety-related valves do not identify any design deficiencies which could affect the health and safety of the public. This memorandum concludes the work requested in the Task Interface

-8311140472

Agreement (Task No. 83-75) dated August 26, 1983 for TAC #141431. It is requested that DL transmit the results of our evaluation to Region I for overall resolution and response to the allegations.



Richard H. Vollmer, Director
Division of Engineering
Office of Nuclear Reactor Regulation

cc: E. Case
J. Knight
M. Williams
R. Wessman
T. Novak
V. Nersus
F. Bosnak
H. Brammer
G. Terao



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

OCT 2 1 1983

MEMORANDUM FOR: R. J. Bosnak, Chief
Mechanical Engineering Branch DE

FROM: D. Terao
Mechanical Engineering Branch, DE

THRU: *nd/s* H. L. Brammer, Section Leader
Mechanical Engineering Branch, DE

SUBJECT: TRIP REPORT SUMMARY FOR SEABROOK ALLEGATIONS

On September 29, 1983, the staff met with representatives from United Engineers & Constructors (UEC), J. E. Lonergan Company (JELCO), and Yankee Atomic Electric Company (YAEC) to discuss allegations concerning Seabrook safety relief valve load combinations and seismic stress calculations. The allegations were identified in a letter from G. T. Markowitz to E. J. Brunner (RI) dated June 10, 1983. In a memo from R. Starostecki to D. Eisenhut dated August 4, 1983, NRR was assigned responsibility for the technical evaluation of the allegation.

Although the allegations identified by Mr. Markowitz appear to be related more to the lack of ethical and moral practices of engineers today and less to technical safety concerns, some examples provided by Mr. Markowitz regarding his personal working experience while employed by JELCO and his interaction with UEC regarding the safety relief valve seismic calculations do identify a potential technical concern. The major technical concern appears to be that the "unyielding stance by the manufacturer that the safety calculations will not be improved beyond existing legal American Society of Mechanical Engineers code requirements and the stance by the engineering firm that JELCO must comply with a UE&C 'catch-all' specifications which was vague and unreasonable" was left unattended or as last priorities. Mr. Markowitz also expressed concern regarding the resolution of the JELCO model LCT-11 end loads calculation and believed that further analysis was required.

The meeting began with a general discussion of the allegations. UEC had received a copy of the allegations prior to our meeting and reviewed those portions of the allegations relevant to the Seabrook safety and relief valves supplied by JELCO.

The staff asked UEC how the valve end loads as specified in the design specification were resolved or reconciled with JELCO. UEC stated that the design specification requirement for the stipulation of valve end loads was a UEC requirement. The end loads for the valves when quantified is a precaution which adds conservatism to the UEC design

~~831031497~~

process. UEC noted that in ASME Code Case 1711 for Class 2 and 3 pressure relief valves, paragraph 2.2 states that for relief valves 2 inch NPS and under, the wall thickness requirements of paragraph 6.0 shall apply. A stipulation of end loads is not required.

In addressing how the end loads were resolved, UEC first presented the initial design specification (Revision 1) referred to by Mr. Markowitz. In Revision 1 to the design specification, Section 2.6.5, "Imposed Loads (Nozzle Loadings)" stated that seismic Category I valves (Code Class 2 and 3) shall be designed to withstand the nozzle loadings given in Table 2.6.5. The JELCO Design Report No. 609818-1 and 609818-2 calculated (and defined) the maximum axial and bending loads for the valve inlet nozzle which can be transferred to the valve via the inlet piping. Subsequently, in Revision 3 to the design specification, Section 2.6.4, "Imposed Loads (Nozzle Loadings)" states that the "Seller shall submit the maximum load to which the inlet and outlet connections (of each safety/relief valve type) may be subjected." It should be noted that the revised design specification requirement which states that the maximum load to which the outlet connection may be subjected has not been addressed in the JELCO design report. Thus, the allegation concerning the negotiations between UE&C and JELCO being left unattended is partially correct. However, the staff does not believe that a significant safety concern is likely to exist because the thickness of the valve body is greater than the outlet piping (schedule 40) and the allowable stress for the valve body material (SA-479 TYPE 30;) is greater than the outlet piping (assumed to be SA-106 Grade B or equivalent). Thus, the design requirements per NC-3521 are sufficient to consider the valve body adequate to withstand piping end loads when the connected piping is designed to the requirements of NC-3600.

The second significant technical concern expressed by Mr. Markowitz appears to address the alleged inadequacy of the LCT-11 model JELCO relief valve seismic calculation. The specific allegation relates to the potential overstress condition of the valve thrust ring when transferring an axial compression end load from the connected piping.

UEC reviewed the valve drawings and the calculations performed by Mr. Markowitz. UEC's conclusion was that the axial load is transferred to the threads (connecting the base to the bonnet) due to the relative stiffness of the threads to the gasket. In addition, UEC does not believe that the assumption used in the bending stress calculation is appropriate. In the valve calculations, the valve thrust ring was assumed to be a thin plate with hole and the flat-plate formula per Marks' Standard Handbook for Mechanical Engineers (7th Edition) and Roark, "Formulas for Stress and Strain" was used. The actual configurations of the thrust ring is that of a thick plate (the thickness is nearly equal to the length). Thus, the shear stress is the important stress (not bending). The calculated shear stress was shown to be within Code allowables. The staff reviewed the appropriateness

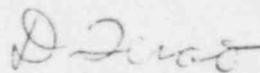
of the formula and concurs with the UEC conclusions that the use of Marks' and Roarks' formula are not appropriate for the bending moment calculation for the valve thrust ring. The important stress to be considered is the shear stress which is shown to be within Code allowables.

UEC responded to the allegations point-by-point (beginning on page "seven" of the letter). UEC will provide a written summary of their responses to the allegations pertaining to the UEC-related issues to the applicant (YAEC). The applicant will transmit the responses formally to the staff.

The staff was provided a copy of the JELCO seismic calculations (Longergan No. 609818-1, 609818-2) Revision 2. The staff noted the signatures of the preparers and the signature of the approver but questioned the JELCO representative regarding the lack of signature of a reviewer. The JELCO representative stated that the quality assurance requirements were upgraded in 1980 and indicated that the procedures currently require a review of safety-related calculations. The staff noted to the JELCO representative that one of Mr. Markowitz's concerns was that "there were no designated individuals to check my arithmetic and I had to be very insistent to have Mr. Glowacki do this". The staff believes that this concern is neither a potential safety concern nor a technical concern for Seabrook, but rather a QA procedural concern that should be covered under the QA audits performed by the applicant. It is apparent from Mr. Markowitz's statement that a calculational review was performed at his insistence.

The staff concluded the meeting with a discussion of the "shear shape factor." UEC stated that the shear shape factor was the distribution of the shear load over the cross-section of the member. UEC stated that for a solid rectangular cross-section a factor of 1.5 is appropriate. (Mr. Markowitz used a factor of 2.0 which is conservative). The shear shape factor was accounted for in the final JELCO calculation.

A list of meeting attendees is provided in Attachment A. A list of documents reviewed is provided in Attachment B.



D. Terao
Mechanical Engineering Branch
Division of Engineering

cc: R. Vollmer, DE J. Knight, DE
G. Knighton, DL V. Nerses, DL
E. Brunner, RI R. Gallo, RI
H. Brammer, DE G. Ankrum, IE

ATTACHMENT A

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J. S. Zimmatore	UE&C/V.P. Engineering
J. E. Littlefield	JE Lonergan/V.P. Engineering
E. Skolnick	UE&C/Mech. Analysis
E. Pilhuj	UE&C/Mech. Analysis
R. F. Perry	UE&C/Mech. Analysis
D. Terao	NRC/Mech. Engineering
H. Katz	UE&C/Licensing
D. H. Rhoads	UE&C/PEM
D. D. Boyle	UE&C/APEM

ATTACHMENT B

List of Documents Reviewed at Meeting

- 1) "Specification for Miscellaneous Safety and Relief Valves for Public Service Company of New Hampshire - Seabrook Station Units 1 and 2," Spec. No. 9763-006-248-7, Revisions 1 and 3
- 2) "Seismic Requirements for Public Service Company of New Hampshire Seabrook Station Units 1 and 2," Blanket Spec. No. 9763-SD-248-7 Specific Issue No. 0, dated 11/17/75
- 3) Seismic Calculations, "Safety and Relief Valves for Public Service of New Hampshire Seabrook Station Units 1 and 2", Lonergan No. 609818-1, 609818-2, dated 8/29/79 (Revision 2)
- 4) Drawing No.1 A2614 Rev. E, "Composite Drawing Model LCT-11 Relief Valve for Nuclear Service", dated 2/7/74

Oct. 25, 1983

c/o Ms. Susan Bagot
The Ethical Society of Washington
7750 16th St. NW
Washington, D.C. 20012

MR. DAVE TERAQ P-522
US NRC
WASHINGTON, DC 20555

Re: Seabrook Station Seismic
Calculations & Related
Concerns

Dear Mr. Terao:

I am responding to our telephone discussion, this past Friday, Oct. 21, 1983. I believe that you stated the following:

1. My second proposal of the Seismic Stress Report, which I submitted to J. E. Lonergan Co., was not signed by a second engineer, at Lonergan Co. In 1980, Lonergan Co. added some sort requirement for a second engineer to review nuclear engineering calculations, in its quality assurance program.
2. It was the position of the NRC that the compression end load calculation, for valve LCT - 11 thrust ring, should be included in this report, which was in conflict with the United Engineers and Constructors Inc. position.
3. It was the position of the NRC that the threads of this valve would not resist this load, which was in conflict with the United Engineers and Constructors Inc. position.
4. It was the position of United Engineers and Constructors that I had used a shear shape factor of two, associated with load.
5. It was the position of the NRC that the model which I had employed in the calculation of this load, was not appropriate and yielded higher stresses that actually would exist. It was the position of the NRC that this valve is therefore acceptable.

I will first respond to some of the above points by ^{way} additional calculations and discussion(attached). I then will comment on some related points, both covered in my report to the NRC, "An Argument Versus Current Nuclear Power Generation, Based on the Experiences of an Engineer," and supplementary to this report.

Regarding point number 5, above, based on the length to height ratio of the thrust ring in question, the model which I used from Roark, Formula of Stress and Strain, was an oversight and is apparently inappropriate. I have not been able to check this in Roark, however. I have examined the possibility of transference of this load via a pure shear panel mechanism, radially, across the ring. I have used optimistic assumptions in the attached calculation, which are as follows:

- a. Diameters for the effective end points of the beam. The points of effective force application could vary from $Dia.=1.394$ to $Dia.=1.294$, or so, depending on the distribution over the gasket. (Fig. 1, Attached) The load, F_L , can not enter the body wall as a vertical compression force within $Dia.=1.5$.

- b. CONSIDERING VARIANCE OF γ AND Y (FIG. I) WITH DIAMETER, σ_T AND σ_C MIGHT INCREASE TOWARD X_A , AND THE MOMENT ARM, $(z - X_A)$, MIGHT BE SMALLER.
- c. The tangential transference of this load has not been considered.
- d. The necessary bias of this load toward the valve outlet side, across the valve inlet crosssection, has not been considered.
- e. The gasket load is neglected.

The stresses seem lower with this calculation, but I still think it would be a good idea to analyze this situation further, and use the computer if necessary. If the load in question travels across the thrust ring via a combination of the beam bending mechanism of my original analysis and the pure shear mechanism of this analysis, this would be in agreement with my calculations. σ_C and σ_T are compression and tension stresses at the top and bottom of the thrust ring, necessary in allowing it to function as a shear panel. These are necessary since, in this case, there are no means of horizontal resistance, above and below the ring, to resist the moment generated by the transference of the shear. I have assumed σ_T and σ_C equal to 28,000 PSI, the particular material yield stress. I have solved for X_A equal to the vertical distance at Dia. = 1.44, necessary to accommodate σ_C and σ_T , which are assumed uniform; and for the shear stress at Dia. = 1.44. It is 13,135 PSI. Please check my arithmetic and assumptions, if you will. ~~If σ_C and σ_T are assumed to be nonuniform and X_A therefore, less, the outer fiber stresses are larger and shear is present within this region.~~ If the area of the ring, less inner diameter than the point of force application, is assumed to aid in resisting σ_C and σ_T , a moment associated with this resistance must be transferred outwardly to the body, through the ring, within the shear panel area, and affecting all areas' stresses.

In addition to possibly being a soft point in the piping system these possibilities might be checked, if there is plastic deformation:

INDUCED FLOW

1. Back pressure leakage through gasket. or closing
2. A malfunction of the valve in opening due to this possible disalignment
3. Leakage at the seat due to disalignment.

In transferring a bending load across this valve the fact that ring bending is to be in balance with the stiffer thread bending, and that threads could be of a surprisingly, high stress. could be checked.

The threads of a tension end load are of fairly high shear stress (page B40, "An Argument Vs. ect) and should be checked further.

(Page 8, Item f. 2. of "An Argument V. ect) Possibly, the gasket loads should be measured or uniform torque used in assembling valves.

Point 4 page 1 of this letter; On page 9 of my report, last paragraph, 17,500 PSI, assumes a shear shape factor of 1.5, not 2.

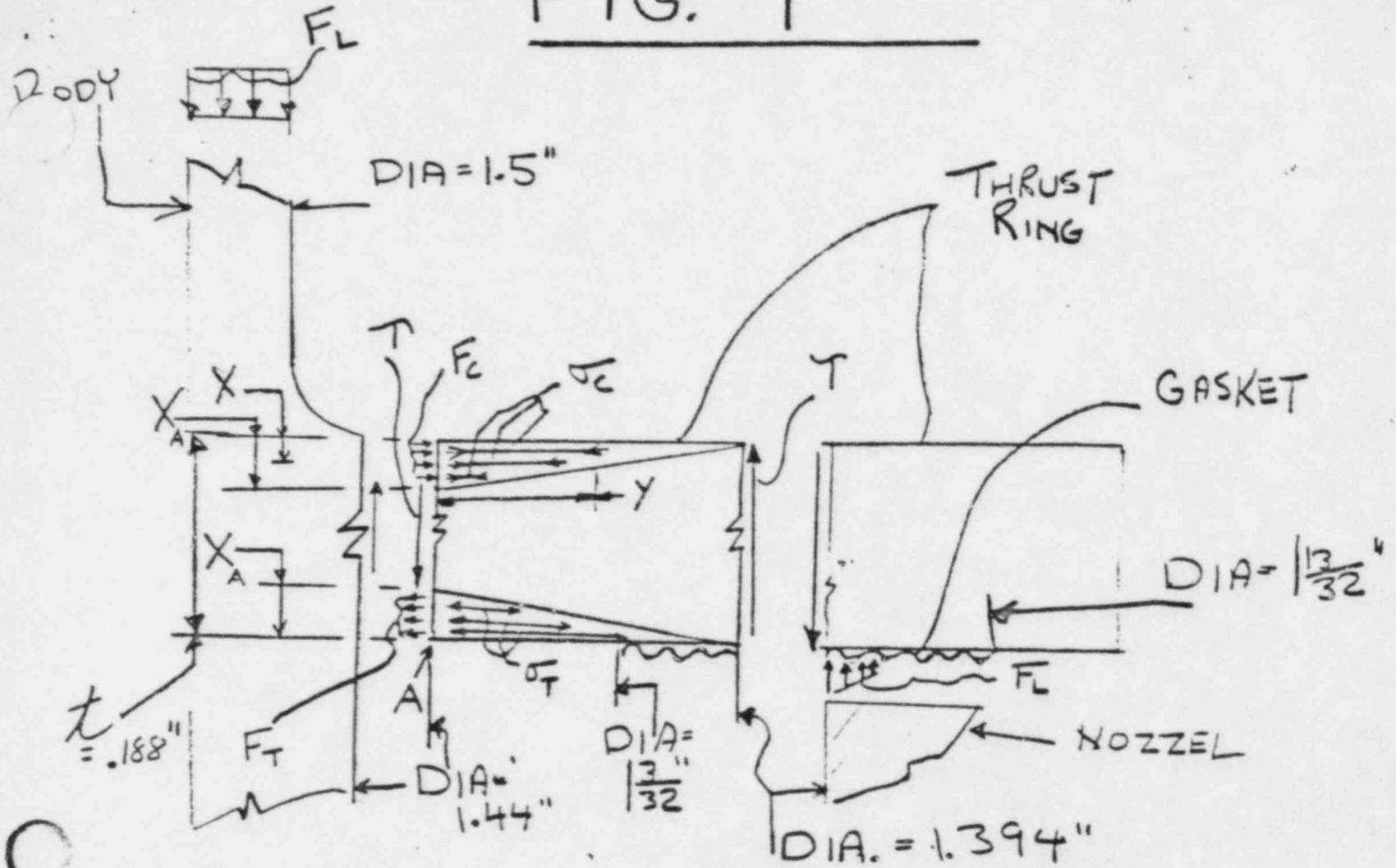
Items a through k, pages 5 through 8 of my report: I emphasize that general problems with ethics and attitudes should be addressed, in addition to the specific technical items.

Thanks for your time.

Respectfully,

George T. Markowitz
George T. Markowitz

FIG. 1



LCT-II THRUST RING

$F_L = 9978 \text{ LBS}$ (UEFC SPECIFIED LOAD)

$D_B = 1.44''$ (INNER MOST BODY DIAMETER)

$D_F = 1.394''$ (DIAMETER @ FORCE APPLICATION)

A POINT ABOUT WHICH MOMENTS OF CALCULATION ARE SUMMED

$t = .188$ (THICKNESS OF THRUST RING)

$\sigma_C = \sigma_T = 28000 \text{ PSI}$ (BY ASSUMPTION)

X = HEIGHT OF COMPRESSION AND TENSION AREAS

$X_A = X$ AT $DIA = 1.44''$

Y = DISTANCE σ_C AND σ_T MUST BE TRANSFERRED FROM A GIVEN DIA.

$$\sum \text{MOMENTS} = 0 = \left(\frac{D_B - D_F}{2} \right) F_L - F_c \left(t - \frac{X_A}{2} \right) + F_T \left(\frac{X_A}{2} \right)$$

? A
ASSUME $t = 1.44$

$$= \frac{1.44 - 1.394}{2} (9978 \text{ LBS}) - \sigma_c \pi D_B (X_A) \left(.188 - \frac{X_A}{2} \right) + \sigma_T \pi D_B (X_A) \left(\frac{X_A}{2} \right)$$

$$= .023 (9978) - 28000 \text{ PSI} \times 3.14 \times 1.44 (X_A) \left(.188 - \frac{X_A}{2} \right) + 28000 (3.14) (1.44) \left(\frac{X_A}{2} \right)$$

$$= 229.5 - 1.266048 \times 10^5 \left(.188 X_A - \frac{X_A^2}{2} \right) + 1.266048 \times 10^5 \left(\frac{X_A^2}{2} \right)$$

$$= 229.5 - 1.266048 \times 10^5 \left[(.188 X_A) - \frac{X_A^2}{2} - \frac{X_A^2}{2} \right]$$

$$0 = 1.266048 \times 10^5 X_A^2 - .238 \times 10^5 X_A + 229.5 = 0$$

$$X_A = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad a = 1.266048 \times 10^5 \quad c = 229.5$$

$$b = -.238 \times 10^5$$

$$X_A = \frac{-(-.238 \times 10^5) \pm \sqrt{(-.238 \times 10^5)^2 - 4(1.266048 \times 10^5)(229.5)}}{2(1.266048 \times 10^5)}$$

$$X_A = \frac{.238 \times 10^4 \pm 2.12 \times 10^4}{2.5321 \times 10^5} \quad \text{USING } -2.12 \times 10^4$$

$$X_A = .01''$$

$$\sigma_T = \frac{F_L}{\pi D_B (t - 2X_A)} = \frac{9978 \text{ LBS}}{3.14 \times 1.44'' [.188'' - 2(.01'')]} = \underline{13135 \text{ PSI}}$$

@ DIA = 1.44''