united engineers & constructors inc.

PRYING EFFECT ON CONCRETE EXPANSION ANCHOR BOLTS DUE TO PIPE SUPPORT BASE PLATE FLEXIBILITY

JULY 20, 1979

Prepared by B. Galunic

Reviewed by M. McKenna

Approved by G. Rigamonti

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SUMMARY OF RESULTS AND RECOMMENDATIONS

An investigation was made on the prying effect on concrete expansion anchors used with flexible base plates. A total of 26 supports from UE&C standard designs were analyzed and the prying factor "α" was calculated. Prying is shown to be strongly affected by the type of installation, the stiffness of the plate and the stiffness of the anchor. Prying is assumed to occur only for the self-drilling anchor bolts which require no preload to make them work. Calculations show that though the largest prying factor was 0.18, most base plates did not exhibit any prying action. However, in the absence of verifying field test data, it is recommended that a prying factor of 0.20 be used for all base plates in design regardless of installation procedure.

INTRODUCTION

UE&C Bulletin (Ref. 3) recommends the use of a factor α = 1.2 to account for the effect of prying in the design of expansion anchor used with pipe support base plates. This report provides technical justification for the above recommendation.

In assessing the effect of prying, two different kinds of anchors and installation comonly used have been addressed. First, the self-drilling or sleeve type anchors (e.g. Phillips Red Heads). These anchors are installed in such a way (Ref. 1) that there is no need to apply a preload on the bolts to attain the anchor's full design load capacity. In this case, if it is assumed that the nut used to connect the base plate to the anchor is only hand tight, the plate can rotate and cause a prying force on the anchor. Second, the wedge-type anehors (e.g. Hilti Kwik-Bolt) have been addressed (Ref. 2). These bolts are installed in such a way that a considerable amount of preload must be applied in order to activate the wedges which grip the concrete. Since a large compressive force is applied on the plate from the nut and the washers, potential rotation of the plate is negligible until the preload in the bolt is nearly overcome. In this situation therefore, prying is negligible until the preload in the anchor is overcome.

The recommended value for α to be used in design calculations has been computed based on an assessment of the relative importance of various parameters in pipe base plate configurations.

BACKGROUND

Design of pipe support base plates have generally been based on the principle of column base plate design. However, due to the nature of the loading (moments are relatively more important than compressive forces), pipe support base plates are generally thinner and more flexible than those employed in the column base plates. Flexibility of the base plate introduces design consideration which are not necessarily addressed in the design of the column base plates. Flexibility, however, can affect significantly the bolt design loads and must be properly accounted for.

Column base plates supported on concrete are used to distribute the large compressive forces of the column to the concrete. To do this effectively, the plates need to be very thick and therefore very stiff. When a bending moment is applied to a stiff plate, it behaves very nearly as a rigid body. When the tensile load in the anchors needs to be calculated, the assumption of plane sections remaining plane is usually made and some variation of the concrete beam theory is used to calculate the anchor bolts tensile load. Prying in these stiff plates does not occur.

In flexible support base plates, the assumption of plane sections remaining plane after bending is no longer valid. The implication of this is that the centroid of the compression reaction is closer to the neutral axis than was with the case of a rigid plate. Also, there is a potential for prying to be induced in the tensile part of the base plate which would induce additional load into the anchors. The method of accounting for the first effect has been described elsewhere (Ref. 3). A method for accounting for prying is discussed herein.

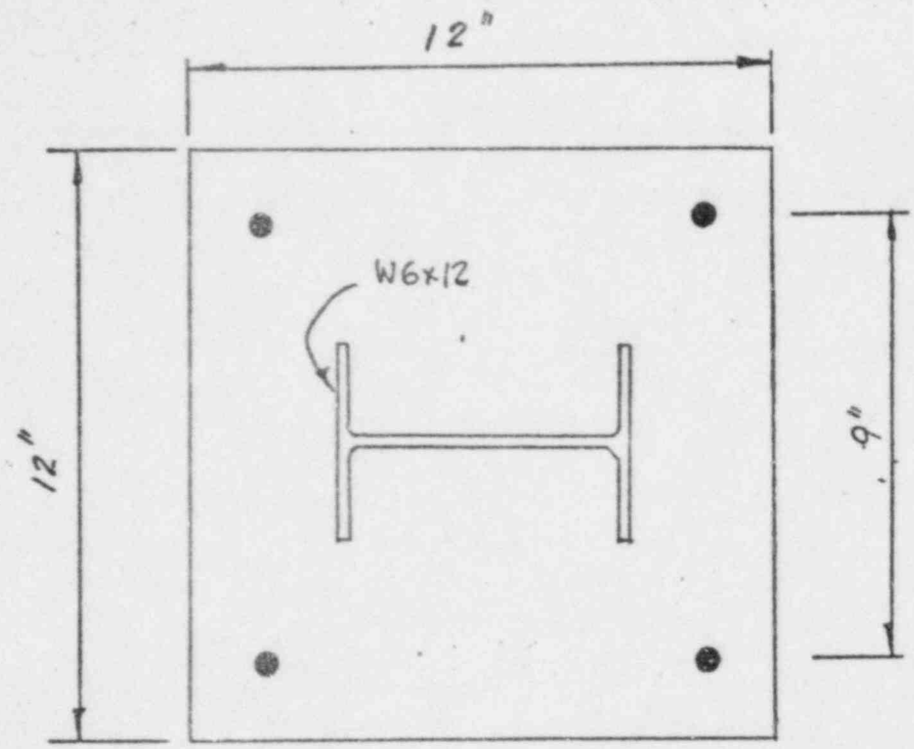
BACKGROUND (Continued)

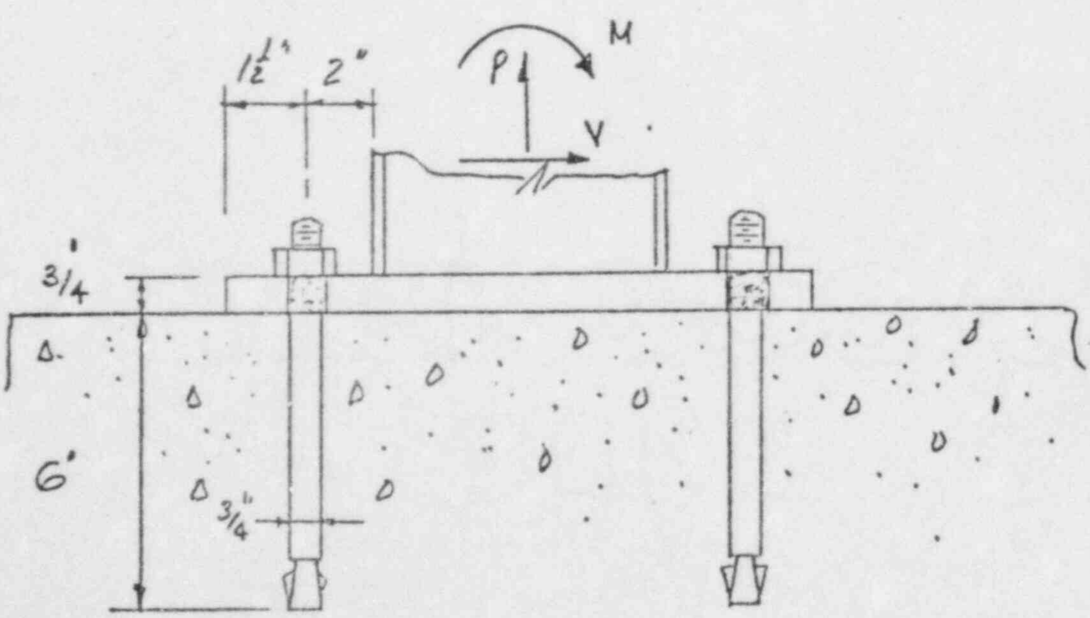
In steel connection designs, equations have been developed (Ref. 4 and 5) to account for the prying effect when calculating the force on the bolt. The presence of prying in those connections with flexible plates have been verified by tests. These tests indicate that prying introduces bolt loads in addition to those which can be calculated with a rigid plate theory and that these additional forces reduce the capacity of the bolt due to static or fatigue type behavior.

However, these results cannot be applied directly to the problem of base plates on concrete. The most important difference between them is that the expansion anchors in concrete are much longer. Also, the reaction of the anchor is in the interior of the concrete. Because of this, the stiffness of the anchor due to tensile loads is much smaller than the stiffness of the bolt in a steel-to-steel connection. As will be shown below, the prying force is significantly reduced as the stiffness of the anchor is reduced.

PHYSICAL DESCRIPTION OF PROBLEM

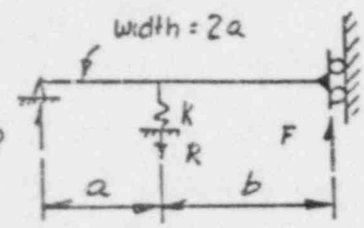
An example of a support is shown below. Dimensions given are representative of actual supports presently used in UE&C design. Other supports with similar dimensions have been analyzed and are shown in Table 1.





ANALYTICAL APPROACH

The mathematical model used to calculate the prying force is shown below. It is assumed that the plate is fixed at the point where the support member is attached. Rotation of the fixed end is neglected. In this model, F is the shear at the fixed end. It is equal to the reaction in the bolt when prying is neglected. Q is the prying force. R is the reaction in the anchor. The width of the beam is assumed to be "2a". The stiffness of the anchor is K.



In the steel design the prying force Q may be calculated by using the formula found on p. 207 of Reference 5:

$Q = \alpha_1 F$ where: $\alpha_1 = \left(\frac{3b}{8a} - \frac{t^3}{20}\right)$

and the anchor reaction is:

$R_1 = (1+\alpha_1)F$ EQ. 1

Alternately, an analytical solution using conventional beam theory may be used to calculate Q. (Similar to approach in Ref. 6.) The resulting equation is:

$Q = \alpha_2 F$

$$\alpha_2 = \frac{\frac{a}{6EI}(2a^2+6ab+3b^2)}{\frac{1}{K} + \frac{a^2}{3EI}(a+3b)}$$

and the anchor reaction is:

$R_2 = (1+\alpha_2)F$ EQ. 2

ANALYTICAL APPROACH (Continued)

The main difference between the two equations is that the stiffness of the bolt is explicitly accounted for in the latter.

RESULTS

The results of analyses are tabulated in Table 1. R_1 is derived from the code equation (Ref 5). R'_2 is the bolt reaction calculated from Eq. 2 by assuming $K = \infty$. R_2'' is a tabulation of anchor reactions by including the stiffness of the anchors. The anchor stiffness of R_2'' was calculated by assuming the anchor pinned a distance L from the top of the concrete (i.e. $K = AE/L$). No preload is assumed in these calculations. R_2''' is a tabulation of anchor reactions calculated by including theeffect of concrete on bolt stiffness. Tests done by the Tennessee Valley Authority (Ref. 7) indicate that the stiffness of the anchor in concrete is approximately 0.4 times the value of stiffness calculated in R_2'' above.

CONCLUSION

From the R_2''' tabulation, it can be seen that the maximum anchor reaction factor is 1.18 while all others are 1.00. Based on these results, it has been concluded that $\alpha = 1.2$ represents a realistic value for the prying factor.

TABLE 1

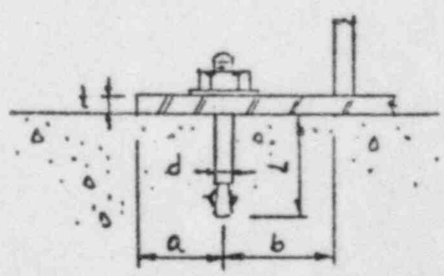
PART NO.	t	L	d	b	a	R_1	R_2'	R_2''	R_2'''
105-1	0.375	2.5	0.50	1.0	1.0	1.50	1.53	1.37	1.18
105-2	.625	4.5	.625	1.375	1.125	1.45	1.48	1.14	1.00
106-1	.50	2.5	.50	1.0	1.0	1.36	1.38	1.15	1.00
106-2	.625	2.5	.50	1.5	1.0	1.55	1.61	1.26	1.00
106-3	.625	4.5	.625	.875	1.125	1.28	1.27	1.00	1.00
106-4	.75	6.0	.75	2.0	1.5	1.48	1.53	1.22	1.00
106-5	.75	6.0	1.00	1.5	1.5	1.35	1.38	1.17	1.00
107-1	.75	6.0	.75	1.5	1.5	1.35	1.38	1.04	1.00
107-2	.75	6.0	.75	1.0	1.5	1.23	1.22	1.00	1.00
107-3	.75	6.0	.75	1.5	1.5	1.35	1.38	1.04	1.00
107-4	.75	6.0	.75	.5	1.5	1.10	1.10	1.00	1.00
107-5	.75	6.0	.75	1.0	1.5	1.23	1.22	1.00	1.00
107-6	1.00	6.0	1.00	1.25	1.75	1.22	1.24	1.00	1.00
108-1	.75	4.5	.625	.8125	1.125	1.25	1.25	1.00	1.00
108-2	.75	6.0	.75	2.00	1.50	1.48	1.53	1.22	1.00
108-3	.75	6.0	1.00	1.25	1.75	1.29	1.30	1.08	1.00
108-4	.75	6.0	1.00	1.25	1.75	1.29	1.30	1.08	1.00
108-5	.75	7.0	1.25	1.875	2.25	1.28	1.28	1.04	1.00
108-6	.75	7.0	1.25	1.125	2.25	1.26	1.26	1.08	1.00
108-7	.75	7.0	1.25	1.125	2.25	1.26	1.26	1.08	1.00
108-8	1.00	7.0	1.25	1.875	2.25	1.30	1.35	1.13	1.00
108-9	1.00	7.0	1.25	1.75	2.25	1.28	1.32	1.10	1.00
108-10	1.00	7.0	1.25	1.75	2.25	1.28	1.32	1.10	1.00
110-1	.75	4.5	.625	.875	1.125	1.27	1.27	1.00	1.00
110-2	.75	6.0	1.00	1.25	1.75	1.29	1.30	1.08	1.00
110-3	.75	7.0	1.25	1.25	2.25	1.29	1.30	1.08	1.00

Dimensions in inches

$$R_1 = (1+\alpha_1)F = 1 + \left(\frac{3b}{8a} - \frac{t^3}{20}\right) F$$

$$R_2 = (1+\alpha_2)F = 1 + \frac{\frac{a}{6EI}\,(2a^2 + 6ab + 3b^2)}{\frac{1}{K} + \frac{a^2}{3EI}\,(a+3b)} \quad F$$

$\alpha_2' \Rightarrow K = \infty$
$\alpha_2'' \Rightarrow K = AE/L$
$\alpha_2''' \Rightarrow K = 0.4\ (AE/L)$



REFERENCES

1. Concrete Anchoring Handbook and Specifiers Guide, Phillips Drill Division, Michigan City, Indiana, 1973.

2. Hilti Architects & Engineers Anchor and Fastener Design Manual, Hilti Fastening Systems, One Cummings Point Road, Stamford, Connecticut.

3. UE&C, POWER DISCIPLINE TECHNICAL BULLETIN #7B, "Design Criteria for Concrete Expansion Anchor Bolts Used with Pipe Support Base Plates," May 2, 1979

4. AISC, Manual of Steel Construction, 7th Ed., American Institute of Steel Construction, N.Y., N.Y.

5. ASCE - Manuals and Reports on Engineering Practice - No. 41, Plastic Design in Steel A Guide and Commentary, ASCE, WRC, 1971.

6. McGuire, W., Steel Structures, Prentice Hall, Inc., Englewood Cliffs, N.J., 1968

7. TVA Division of Engineering Design Thermal Power Engineering, Civil Engineering Branch, Research and Development Staff, Anchorage Tests of Load Transfer Through Flexible Plate Interim Report, CEB Report No. 78-21, July 26, 1978.

EXHIBIT 210.70-2

913 Tampa Road
Knoxville, Tennessee 37923

May 21, 1981

Mr. Branko Galunic
Structural Analysis Group
United Engineers and Constructors
30 South 17th Street
Philadelphia, Pennsylvania 19101

Dear Branko:

Enclosed are copies of the data obtained from the tests performed on May 7, 1981, when you visited our laboratory. These tests were performed under the authorization of P.O. No. 9763.006-210-9, Serial No. SNH-683, and were tests to determine the prying factor for Part No. 807-2 subjected to bending about the strong axis of the attached steel W-section. Also enclosed is a copy of one sheet of notes along with a graph showing the variation with applied moment of the load in the top two bolts of the four-bolt attachment.

The results of the first tests in the project designed to measure prying factor were encouraging. The method of gaging the bolts and the plate was satisfactory, and the test results appear to be reasonable. Based on the test results, part of which are illustrated on the enclosed sheets noted earlier, the following conclusions are drawn:

(1) There was no evidence that any prying occurred at any stage of the testing. The plots of bolt load versus applied moment, as shown on the enclosed graph, indicate that the sum of the loads in the top two bolts increases linearly after the load in each bolt exceeds the applied preload. There is no sharp increase in bolt load at any stage as one would expect if prying occurred. Also, a study of the strains in the gages located along the diagonals near the top corners of the plate (Gages 4 and 7 on the data sheets) indicates a very small tension in the plate at these locations; if a prying force were acting at the top corners of the plate, these gages would be expected to read compression. Thus, the conclusion is that no prying occurred in these three tests.

(2) As indicated and discussed on the enclosed sheets, the straight line portion of the bolt load vs. applied moment curve did not pass precisely through zero. The reason for this is believed to be related to the definition of "zero" for test purposes and the stress condition in the anchorage system when the instrumentation was zeroed. In any event it is clear that in the straight line portion of the curve, the ratio of the change in moment at the face of the concrete block to the change in load in the top two bolts is equal to the effective moment arm of the resisting couple. This moment arm was 8.48-in. and 8.79-in. for the two applicable tests, with an average for the two of 8.64-in. The moment arm predicted by UE & C Power Division Technical Bulletin No. 7 is 8.5-in., remarkably close to the value obtained from the test results.

(3) In Test 81-8-1 the bolts were torqued to 192 ft.-lbs. as specified in "Installation of Concrete Expansion Anchors," No. 9763-006-18-17, Public Service Company of New Hampshire, Seabrook Station, United Engineers and Constructors, Inc., January 4, 1980, Revision 1. There was a time lapse of approximately four hours between the application of torque to the bolts and the performance of the test, sufficient time to permit a large part of the loss in bolt tension to occur and for the curve of bolt stress versus time to level off to a stress that was decreasing very slowly with time. As shown on the enclosed graph, the load in the top bolts at zero moment is approximately one and one-half times the design load in the bolts and increases only a nominal amount as the moment is increased to the design value. Thus, it appears that in a correctly installed anchorage, the magnitude of the preload in the bolts is greater than the design load in the bolts and that this load does not increase appreciably as the moment on the anchorage is increased to the design value. As we have discussed, this situation is a desirable one, particularly where dynamic loading is possible.

Our next step in testing will be to test the same attachment with a preload in the bolts of approximately 4,000 lbs. Then, we will rotate the block 90°

and test weak axis bending. Next, we will cut off the steel beam and perform a tensile test. Finally, we will weld the steel beam back together and test a cantilever beam in strong axis bending to failure. I will be in touch with you at every step of the testing program, and we can modify the planned order of tests if it seems advisable.

I look forward to our continued effort.

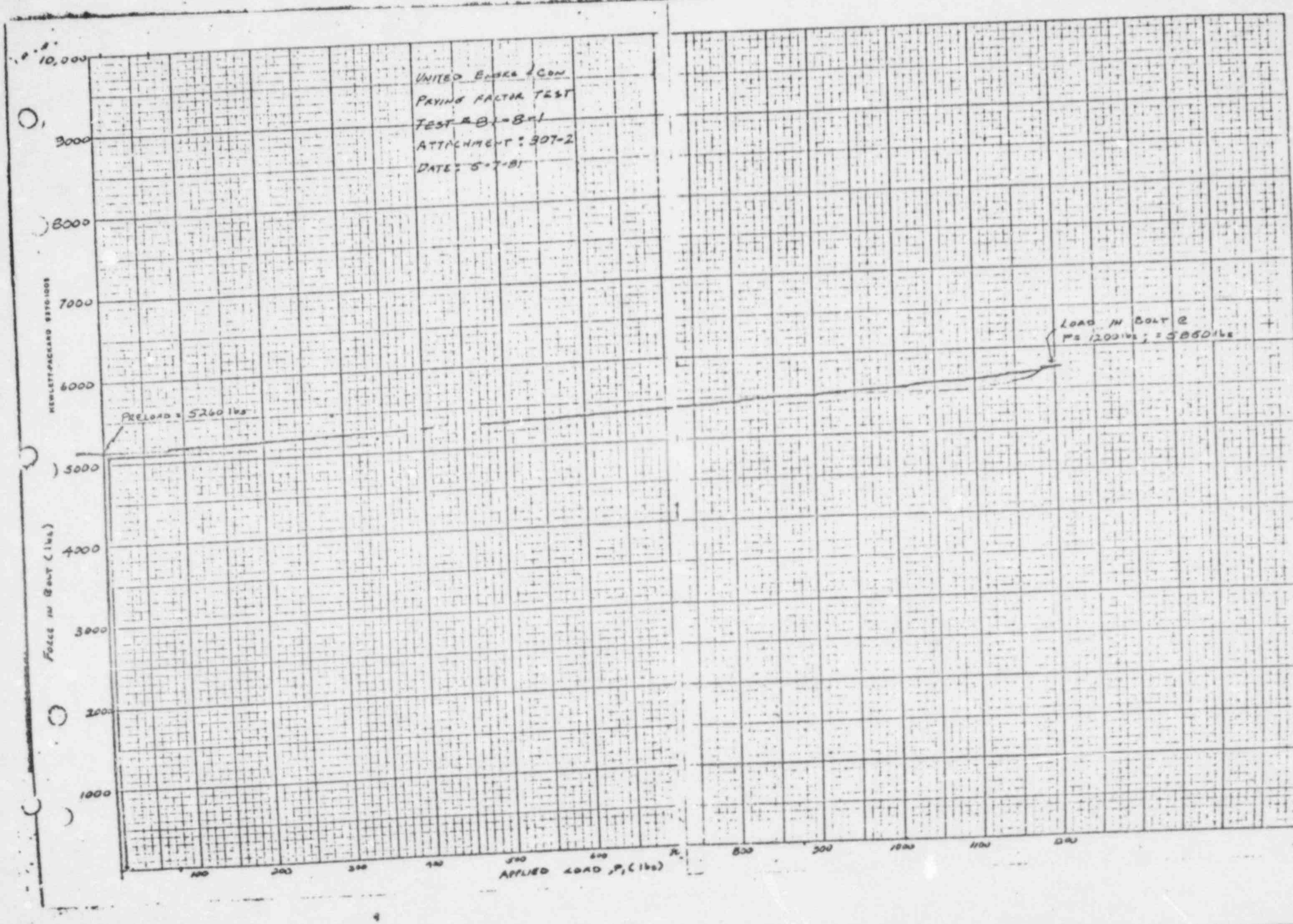
Sincerely,

Ed

Edwin G. Burdette
Consultant

Enclosures.

EGB/vaw

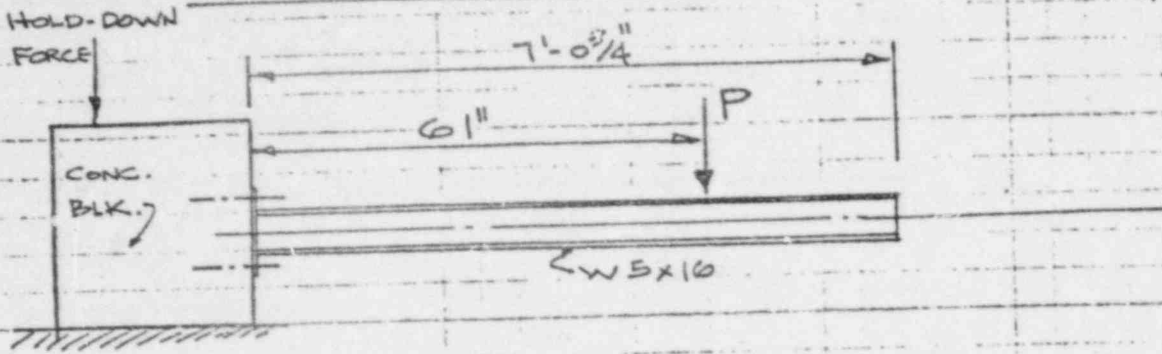


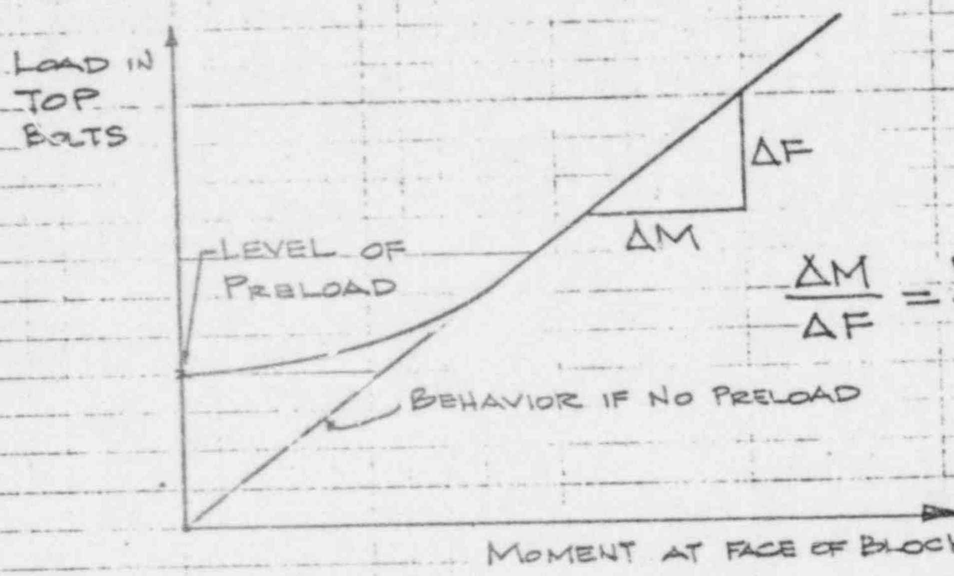
UNITED ENGRS & CON
PRYING FACTOR TEST
TEST #81-8-1
ATTACHMENT: 307-2
DATE: 5-7-81
LOAD IN BOLT @
P= 1200 lbs; = 5860 lbs
PRELOAD = 5260 lbs
10,000
9000
8000
7000
6000
5000
4000
3000
2000
1000
FORCE IN BOLT (lbs)
100
200
300
400
500
600
700
800
900
1000
1100
1200
APPLIED LOAD, P, (lbs)
HEWLETT-PACKARD 9270-1005

EGB
5-19-81
1 OF 1

TESTS ON PART № 807-2

(TESTS 81-8-1, 81-8-2, & 81-8-3)





$$\frac{\Delta M}{\Delta F} = \left\{ \begin{array}{l} \text{MOMENT ARM OF} \\ \text{FORCE IN TOP BOLTS} \end{array} \right\}$$

IDEALIZED BEHAVIOR OF ANCHORAGE

NOTES:

(1) ACTUAL BEHAVIOR OF ANCHORAGE IS SHOWN IN FIG. 1. THE STRAIGHT-LINE PORTION OF THE LOAD VS. MOMENT RELATIONSHIP DOES NOT PASS THRU THE ORIGIN.

(2) REASONS FOR BEHAVIOR NOTED IN #1 ARE PROBABLY RELATED TO THE CONDITION AT "ZERO" IN THE TESTS. A SMALL UPWARD LOAD WAS APPLIED AT THE LOCATION OF P AT THE "ZERO" STAGE; NUTS WERE LOOSENED, AND ALL INSTRUMENTATION WAS ZEROED. THEN THE BOLTS WERE TORQUED TO THE DESIRED VALUE.

(3) MOMENT ARM = CHANGE IN MOMENT ÷ CHANGE IN BOLT LOADS

TEST 81-8-2 : $ARM = \frac{80{,}000}{9{,}430} = 8.48"$

TEST 81-8-3 : $ARM = \frac{80{,}000}{9{,}100} = 8.79"$

AVG. = 8.64"

FROM UE&C POWER DISCIPLINE TECH. BULL. #7: ARM = 8.5"

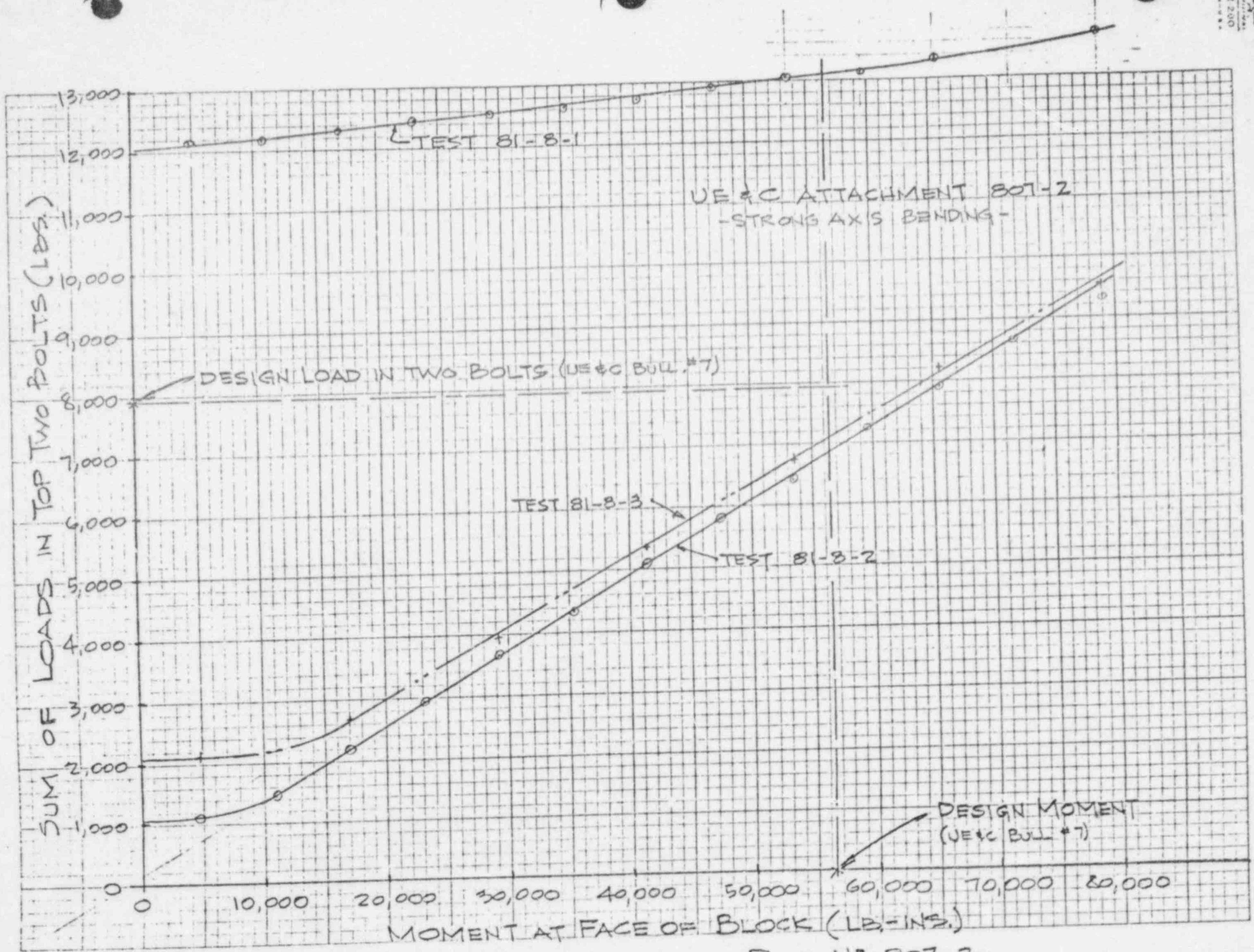


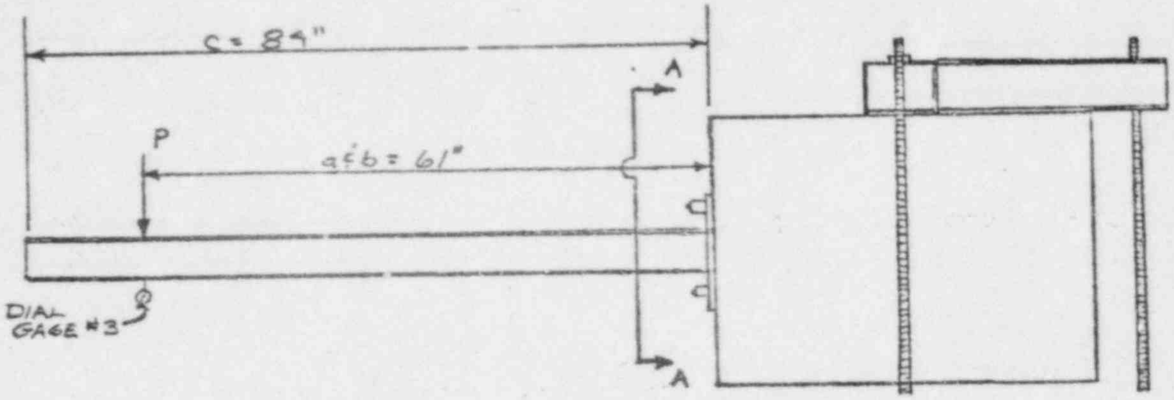
FIGURE 1. BOLT LOAD VS. MOMENT FOR PART Nº 807-2

D. COPLEY

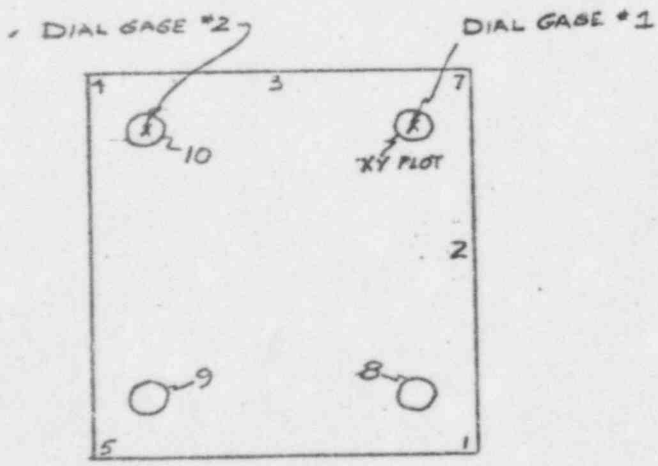
UNITED ENGINEERS AND CONSTRUCTORS PRYING FACTOR TESTS

TEST 81-8-1 (5-7-81)

ATTACHMENT NO: 807-2
STRONG AXIS BENDING
BLOCK: STUDS
f'c:



TEST SET-UP



SECT A-A

GAGE ARRANGEMENT

TEST No: 81-8-1 DATE TESTED: 5-7-81 SHEET 1 OF 1 TESTED BY: BURDETTE, HAYES, ZIMMERMAN, CO:[illegible]

TEST DESCRIPTION: UNITED ENGR. : CON. MOMENT [illegible]LT

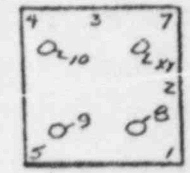
PLATE SIZE: 12" X 12" X 3/4" ATTACHMENT SIZE: W5X16 ANCHOR 3/4" ϕ X 10" LONG, EMB'D 6" TYPE: HILTI

BLOCK/FACE: STUDS 3 f'c/DATE 6,910 PSI / 5-13-81 (229 DAYS OLD) LOAD CELL TYPE/CAPACITY LEBOW / 50 KIP

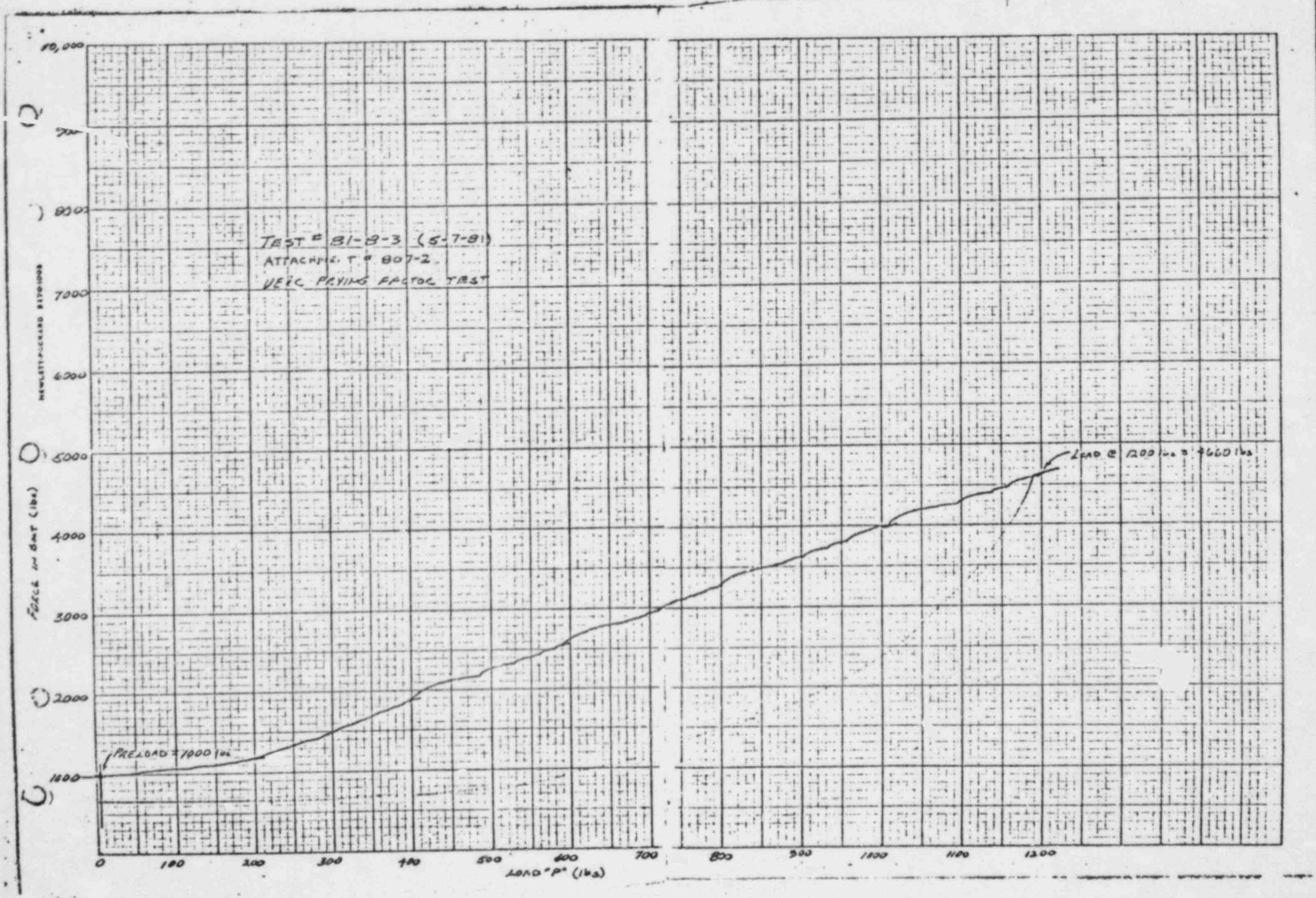
VISHAY-ELLIS CALIB # 1214 (VISHAY-ELLIS) X 10 = LOAD (lbs) DISTANCES (FROM BLOCK FACE) a = 61" (TO LOAD)

REMARKS: TORQUED 5:00 PM, 5-6-81 ; TESTED 1:00 PM 5-7-81 b = 61" (TO DIAL #3) c = 84" BEAM LENGTH

VISHAY-ELLIS READ'G	MULTI-METER READ'G	LOAD (lbs)	DIAL #1 X10^-3 @ BOLT	DIAL #2 X10^-3 @ BOLT	DIAL #3 X10^-3 @ LOAD	GAGE #1	GAGE #2	GAGE #3	GAGE #4	GAGE #5	GAGE #7	GAGE #8	GAGE #9	GAGE #10
000	000	000	—	—	—	1000	1000	1000	1000	1000	1000	1000	1000	400
000	000	FULL TORQUE	—	—	—	1000	1270	1440	1100	995	985	1040	1030	1090
526	000	000	INITIAL 200	INITIAL 200	INITIAL 200	1000	1260	1430	1095	1005	1030	1030	1020	940
529	.036	100	200	200	216	1000	1260	1430	1095	990	1020	1030	1020	940
531	.072	200	200	200	234	995	1260	1410	1100	990	1020	1020	1015	950
535	.109	300	201	201	251	1000	1260	1440	1100	995	1020	1020	1015	955
539	.145	400	201	201	269	1010	1260	1440	1100	1010	1020	1020	1010	960
543	.182	500	201	201	286	1000	1260	1450	1100	1000	1030	1010	1010	965
546	.217	600	202	202	303	1000	1260	1455	1095	990	1020	1010	1000	970
551	.257	700	202	202	322	1000	1255	1460	1100	990	1030	1005	1000	980
556	.291	800	203	202	341	1000	1250	1470	1100	995	1030	1000	990	985
561	.330	900	203	202	358	1000	1250	1475	1100	990	1030	995	985	990
568	.368	1000	204	203	381	995	1250	1480	1100	995	1035	995	980	1000
[illegible]	[illegible]	[illegible]	[illegible]	204	417	1000	1250	[illegible]	[illegible]	990	1050	990	970	1020



GAGE ARRANGEMENT

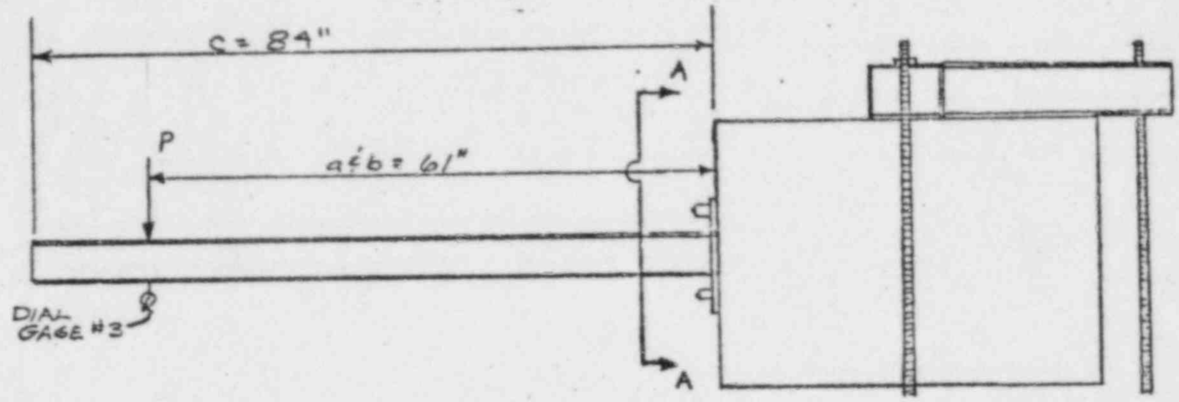

TEST # 81-8-3 (5-7-81)
ATTACHMENT # 807-2
VEIC PRYING FACTOR TEST
PRELOAD = 1000 lbs
LOAD @ 1200 lbs = 4660 lbs
FORCE IN BOLT (lbs)
LOAD "P" (lbs)
HEWLETT-PACKARD
1000
2000
3000
4000
5000
6000
7000
8000
10,000
0
100
200
300
400
500
600
700
800
900
1000
1100
1200

D. COPLEY

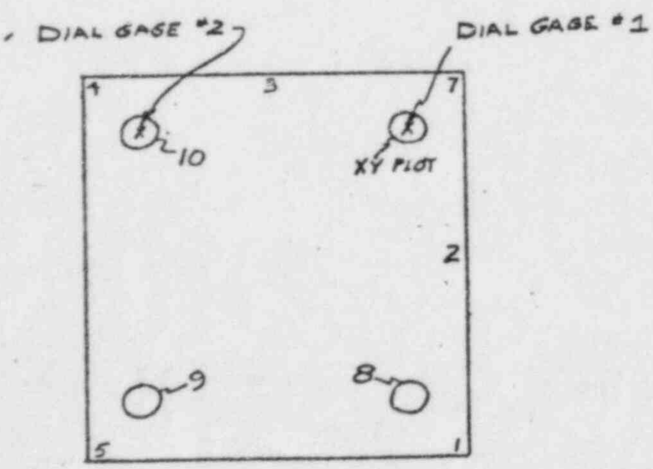
UNITED ENGINEERS AND CONSTRUCTORS PRYING FACTOR TESTS

TEST 81-8-2 (5-7-81)

ATTACHMENT NO: 807-2
STRONG AXIS BENDING
BLOCK: STUDS
f'c:



TEST SET-UP



SECT A-A

GAGE ARRANGEMENT

TEST No: 81-8-2 DATE TESTED: 5-2-81 SHEET 1 OF 1 TESTED BY: BURDETTE, COPLEY, GALUNIC, HAYS

TEST DESCRIPTION: UNITED ENGR. & CON. MOMENT TEST

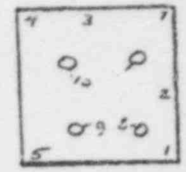
PLATE SIZE: 12"X12"X3/4" ATTACHMENT SIDE: W5X16 ANCHOR 3/4" ϕX 10" LONG, EMB'D 6" TYPE: HILTI

BLOCK/FACE: STUDS 3 f'c/DATE 6,910 PSI/ 5-13-79 (229 DAYS OLD) LOAD CELL TYPE/CAPACITY LEBOW / 50 KIP

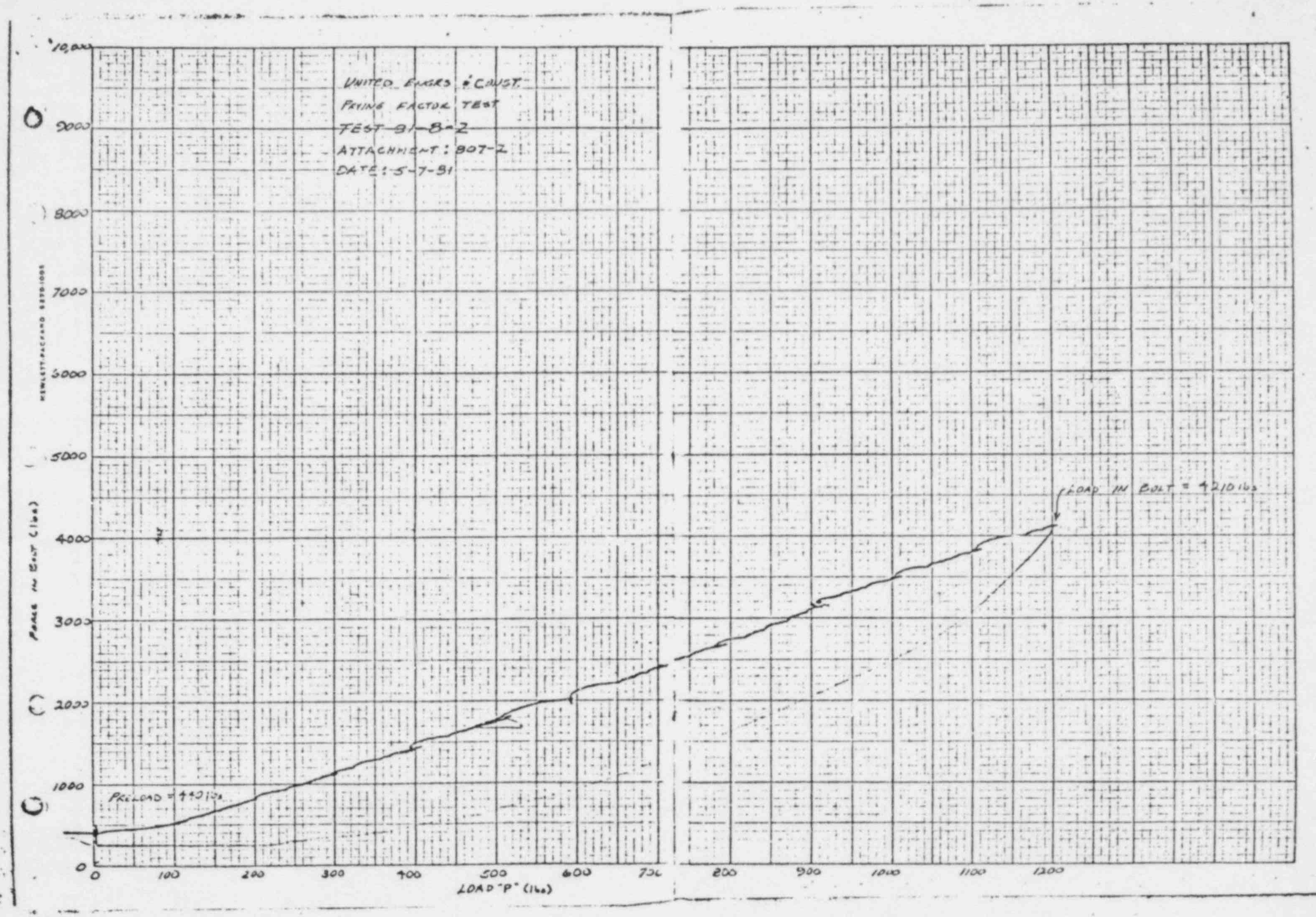
VISHAY-ELLIS CALIB # 1214 (VISHAY-ELLIS) X 10 = LOAD (lbs) DISTANCES (FROM BLOCK FACE) a = 61" (TO LOAD)

REMARKS: BOLTS TORQUED : "FINGER TIGHT" (NO PRELOAD) b = 61" (TO DIAL #3) c = 84" BEAM LENGTH

VISHAY-ELLIS READ'G	MULTI-METER READ'G	LOAD (lbs)	DIAL #1 X10^-3	DIAL #2 X10^-3	DIAL #3 X10^-3	GAGE #1	GAGE #2	GAGE #3	GAGE #4	GAGE #5	GAGE #7	GAGE #8	GAGE #9	GAGE #10
000	000	/	—	—	—	1000	1000	1000	1000	1000	1000	1000	1000	400
50	000	TORQUE "FINGER TIGHT"	—	—	—	—	—	—	—	—	—	1040	1050	435
44	000	000	INITIAL 200	INITIAL 200	INITIAL 200	1000	1035	1060	1000	1005	1010	1015	1025	455
60	.036	100	200	200	231	1000	1040	1070	1010	1000	1010	1010	1025	470
92	.072	200	200	200	272	1000	1050	1095	1020	1000	1010.	1005	1020	500
128	.109	300	200	202	315	1000	1065	1130	1010	1000	1020	1000	1025	530
162	.145	400	200	202	355	1000	1080	1160	1020	1010	1020	1000	1000	560
194	.182	500	200	203	393	1000	1090	1175	1020	1005	1025	1000	995	590
225	.217	600	200	204	421	1000	1100	1220	1020	1005	1030	1000	995	620
261	.257	700	200	204	456	1000	1110	1260	1025	995	1040	1000	990	650
290	.291	800	201	205	485	1000	1120	1285	1030	990	1035	1000	990	675
325	.330	900	202	206	524	1005	1130	1325	1030	1000	1050	995	990	710
357	.3[illegible]	1000	202½	207	554	1005	1150	1355	1035	1000	1050	1000	990	740
390	.406	[illegible]	203½	208	586	1005	1150	1385	1045	995	1050	1000	990	770
[illegible]	.44[illegible]	1200	204	209	615	1010	1160	[illegible]	1046	995	1055	1000	990	800



GAGE ARRANGEMENT

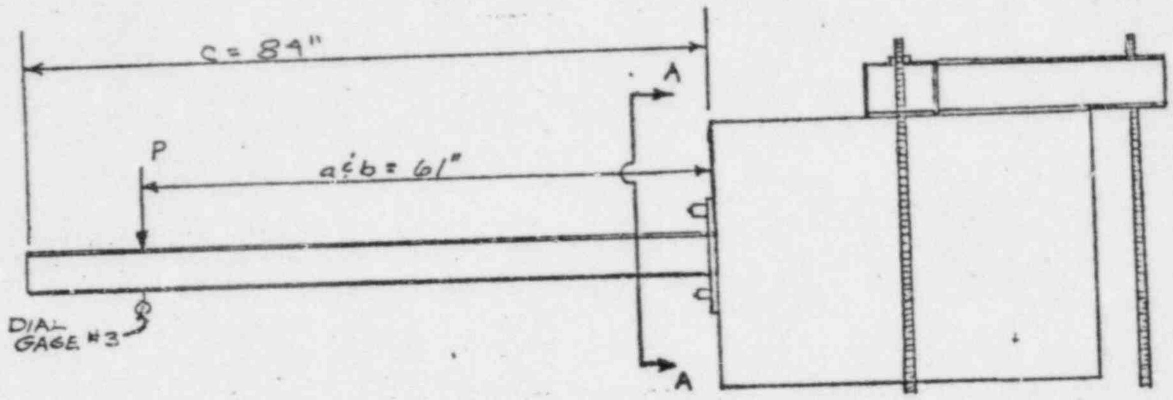

UNITED ENGRS & CONST.
PRYING FACTOR TEST
TEST 81-8-2
ATTACHMENT: 807-2
DATE: 5-7-81
LOAD IN BOLT = 4210 lbs
PRELOAD = 440 lbs
FORCE IN BOLT (lbs)
LOAD "P" (lbs)
HEWLETT-PACKARD

D. COPLEY

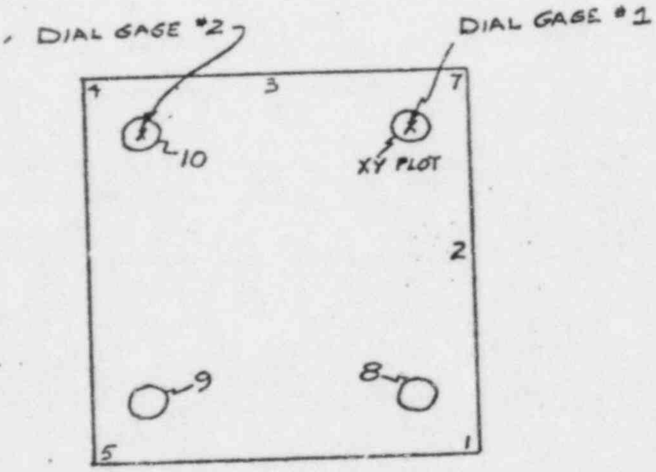
UNITED ENGINEERS AND CONSTRUCTORS PRYING FACTOR TESTS

TEST 81-8-3 (5-7-81)

ATTACHMENT NO: 807-2
STRONG AXIS BENDING
BLOCK: STUDS
f'c:



TEST SET-UP



SECT A-A

GAGE ARRANGEMENT

TEST No: 81-8-3 DATE TESTED: 5-7-81 SHEET 1 OF 1 TESTED BY: BURDETTE, GALUNK, COPLEY, HAYES, RION

TEST DESCRIPTION: VE&C MOMENT TEST

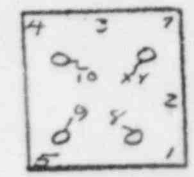
PLATE SIZE: 12"X12" X 3/4" ATTACHMENT SIDE: W5X16 ANCHOR 3/4 ϕX 10" LONG, EMB'D 6" TYPE: HILTI

BLOCK/FACE: STUDS 3 f'c/DATE 6,910 PSI/5-13-81 (229 DAYS OLD) LOAD CELL TYPE/CAPACITY LEBOW / 50KIP

VISHAY-ELLIS CALIB # 1214 (VISHAY-ELLIS) X 10 = LOAD (lbs) DISTANCES (FROM BLOCK FACE) a = 61" (TO LOAD)

REMARKS: TORQED BOLT TO 1000 lbs (ON VISHAY) b = 61" (TO DIAL #3) c = 84" BEAM LENGTH

	VISHAY-ELLIS READ'G	MULTI-METER READ'G	LOAD (lbs)	DIAL #1 X10⁻³ XY	DIAL #2 X10⁻³ #10	DIAL #3 X10⁻³	GAGE #1	GAGE #2	GAGE #3	GAGE #4	GAGE #5	GAGE #7	GAGE #8	GAGE #9	GAGE #10
	000	000	—	—	—	—	1000	1000	1000	1000	1000	1000	1000	1000	400
	100	000	TORQUE "WRENCH"	—	—	—	—	—	—	—	—	—	—	—	478
	97	000	000	INITIAL 200	INITIAL 200	INITIAL 200	1000	1100	1085	1010	990	995	1015	1005	490
	119	.072	200	200	200	248	1005	1090	1110	1010	1000	1005	1015	1000	515
	188	.145	400	202	201½	317	1005	1115	1170	1015	995	1015	1055	1000	565
	258	.217	600	203	202	380	1000	1130	1225	1015	995	1020	1045	990	620
	328	.291	800	205	204	450	995	1150	1290	1020	990	1030	1040	990	670
	399	.369	1000	206	205	517	995	1170	1360	1025	995	1035	1040	990	730
	466	.440	1200	207	207	577	1000	1180	1420	1030	1000	1040	1035	990	785
CHECK ZERO	066	000	000	201½	200	213	1000	1020	1010	1000	1000	995	1065	1015	465



GAGE ARRANGEMENT

RAI 210.71

Provide a numerical example for each of the following flexible plate and bolt configurations showing the calculation of allowable axial loads and bending moments.

a. Square plate/four bolts, either bolts.
b. Rectangular plate/six bolts.

Provide the loac-displacement curves for the anchored bolts on which the allowable bolt loads are based.

RESPONSE

Exhibit 210.71-1 includes calculation for the following cases:

a. Square plate with four bolts.
b. Rectangular plate with six bolts.

The allowable bolt loads are based on the following formula:

Maximum Allowable Design Load = $\frac{Fu}{4}$

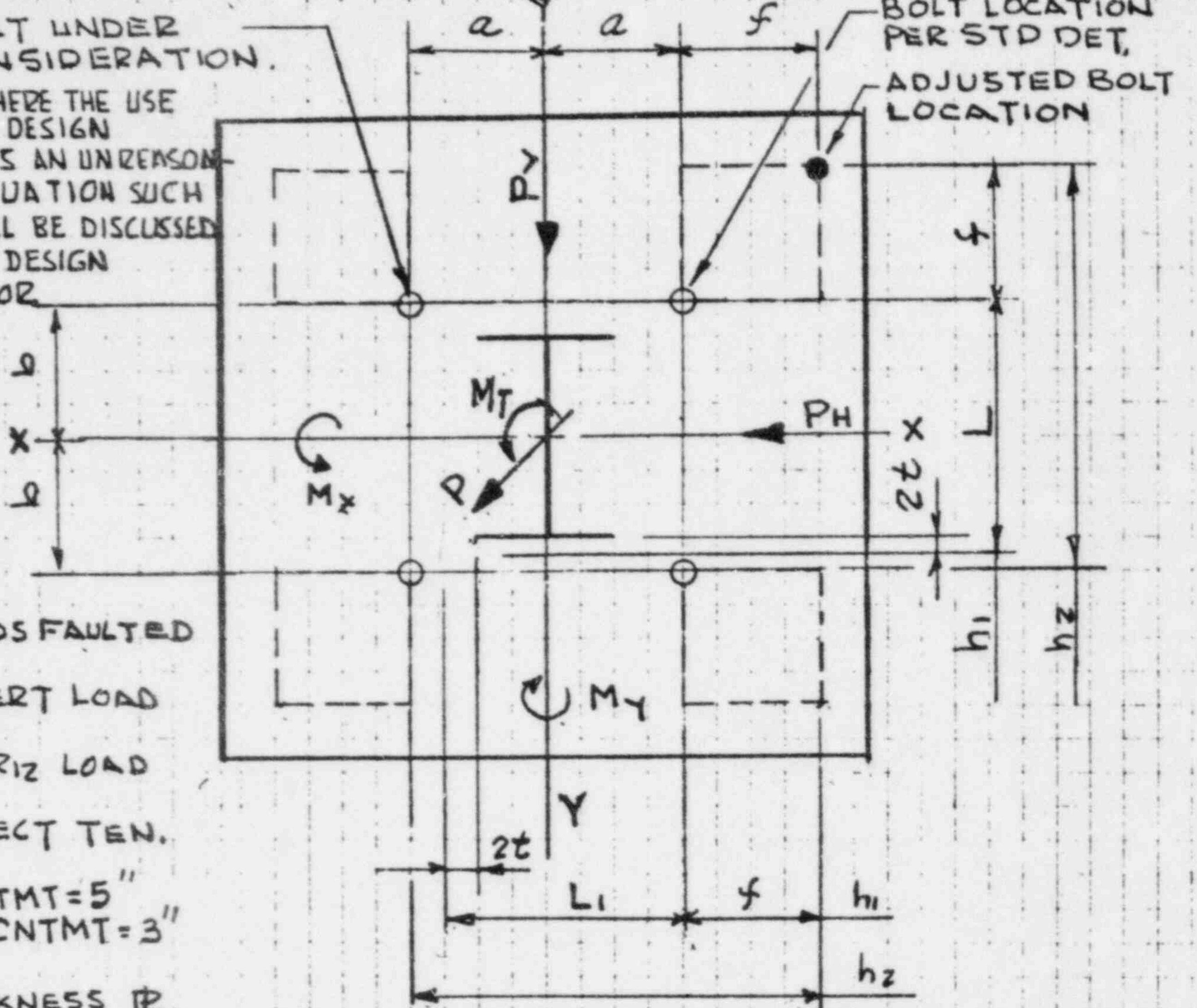
Where Fu = Ultimate Static Capacity of the anchor based on manufacturers' static test for the applicable strength of concrete.

Load - Displacement curve was not used for determing the allowable loads because the design loads are within the linear portion of the curve.

EXHIBIT 210.71-1

A. CALCULATIONS FOR SQUARE PLATE WITH FOUR BOLTS

NOTE- WHERE THE USE OF THIS PL DESIGN PRESENTS AN UNREASONABLE SITUATION SUCH CASE WILL BE DISCUSSED WITH THE DESIGN SUPERVISOR



* ALL LOADS FAULTED
* P_V = VERT LOAD
* P_H = HORIZ LOAD
* P = DIRECT TEN.

f: { CNTMT = 5" ; O.S. CNTMT = 3" }

t = THICKNESS PL.

$$F_1 = \frac{a+f}{2a+f}$$

$$F_2 = \frac{b+f}{2b+f}$$

$$T_1 = \frac{M_X}{L}(F_1)$$

$$T_2 = \frac{M_Y}{L_1}(F_2)$$

$$T_P = P \times F_1 \times F_2$$

$$T_T = 1.2\,(T_P + T_1 + T_2)$$

$$V_1 = \frac{P_Y}{2}(F_1) + \frac{M_T}{8a}$$

$$V_2 = \frac{P_H}{2}(F_2) + \frac{M_T}{8b}$$

$$V_T = \sqrt{V_1^2 + V_2^2}$$

$$\frac{T_T}{T} + \frac{V_T}{V} \le \frac{\text{MIN } 2a \text{ OR } 2b}{\text{C TO C ALLOW}}$$ { BUT NOT TO EXCEED 1.0 }

T, V ← ALLOWABLE DESIGN VALUES

ALL 4 BOLT BASE PLS DESIGNED & CHECKED AFTER 8/10/81 TO FULFILL THIS CRITERIA

DESIGN OF 4 BOLT BASE PL.

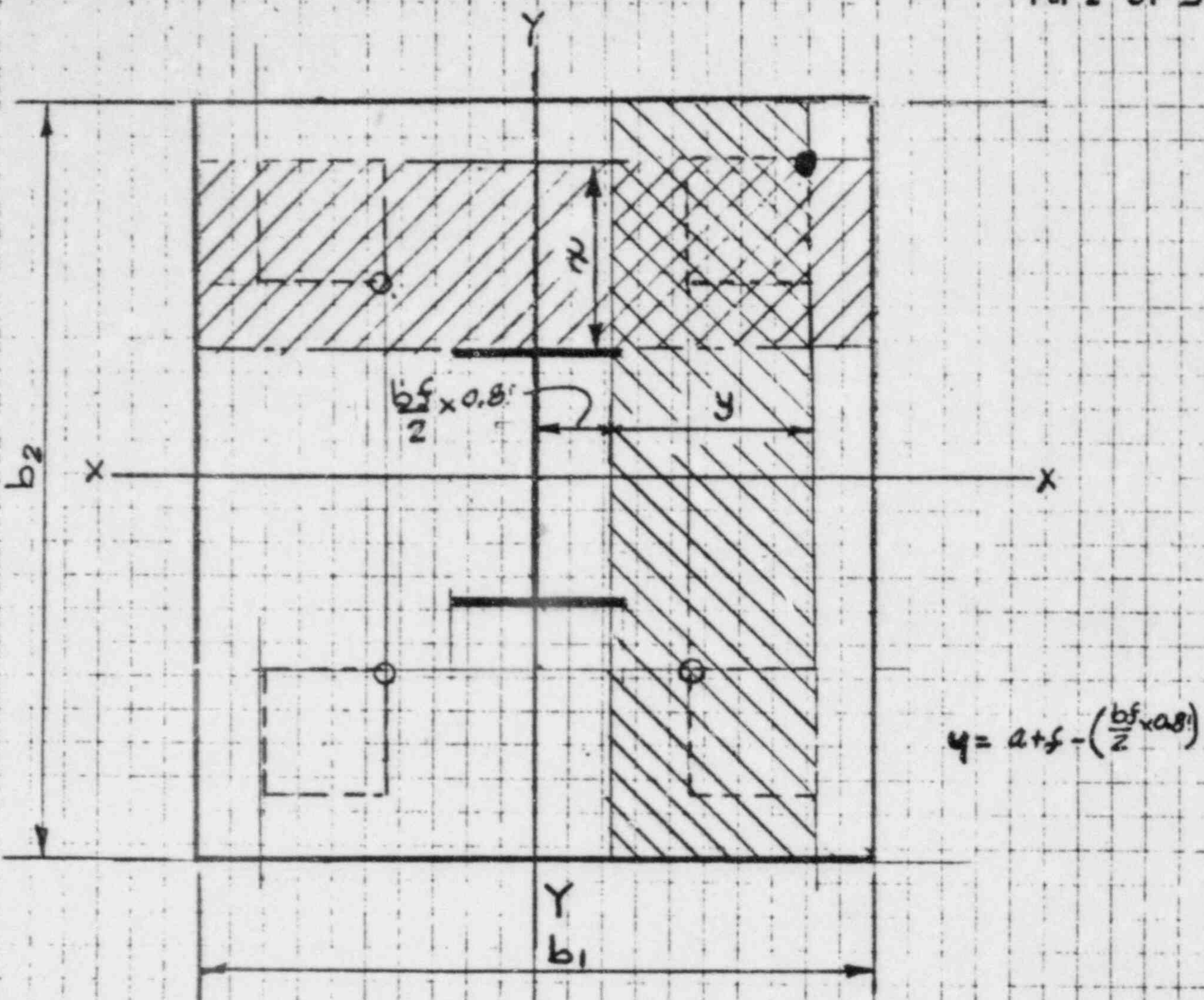
SEABROOK PROJECT

AUG. 10, 1981

7-24-81
263

W. J. TULLIS

SG0008



t = ℄ THICKNESS REQ'D
b_1 OR b_2 EFFECTIVE WIDTH
T_T = TOTAL TEN. FROM CALC.
f_b = ALLOW. BENDING STRESS (SEE GUIDELINES)
bf = FLANGE WIDTH
a & f FROM CALCS.

$M_x = 2T_T \times z$

$M_y = 2T_T \times y$

$$t = \sqrt{\frac{6M}{fb(\ )}}$$

USE EITHER b_1 OR b_2 FOR FACTOR

THE LARGER OF M_x OR M_y

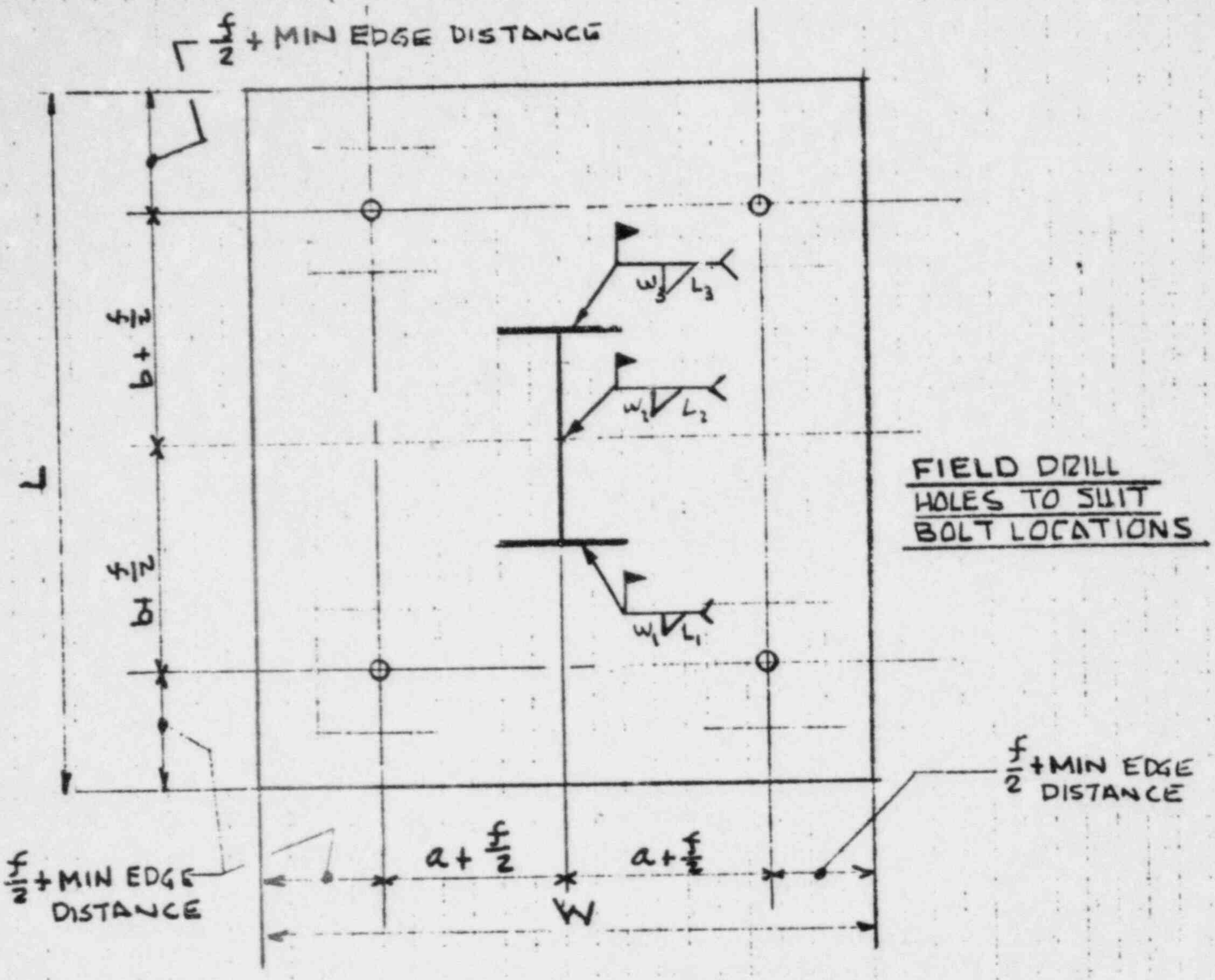
PG 2 OF 3

DESIGN OF 4 BOLT BASE PLATE

SEABROOK PROJ
AUG. 11, 1981
W. TULLIS

7-24-81

SG0008



4 BOLT BASE PL. DETAIL

(FLEXIBILITY OF BOLT = $\frac{f}{2}$ IN ANY DIRECTION)

NOTE ON THE DESIGN SKETCH.

SEABROOK PROJ.

AUG. 11, 1981

W. TULLIS

Form 5007 Rev. 3-77

GENERAL COMPUTATION SHEET

united engineers & constructors inc.

(DISCIPLINE)

NAME OF COMPANY PSNH—SEABROOK STATION UNIT/S 1 & 2

SUBJECT STRUCTURAL CALCS—PIPE SUPPORT

CALC. SET NO.	
PRELIM.	
FINAL	
VOID	
SHEET	2 OF 15
J.O.	9763.006

REV	COMP. BY	CHK'D BY
0	RBL DATE 5-14-82	D.R.P. DATE 6-15-82
	DATE	DATE

AWR	112	SYSTEM	RC
LINE NO.	112-1-4	BUILDING	CNTMNT
ISO. NO.	800112	SUPPORT NO.	112-SG-7 (Y,Y ⊥ TO PIPE)

ISSUE 1 4-20-82

LOADS	F_x OBE	F_x SSE	F_y OBE	F_y SSE	F_z OBE	F_z SSE
D.Wt.	1	1	-174	-174	-7	-7
Thermal	-10	-43	10	48	56	275
Seismic	±26	±52	±96	±192	±150	±300
PAD/TAD						
LAD						
SAD						
Transient						
Total +	+27	+53	0	+66	199	+568
Total −	-35	-99	-270	-366	-157	-307

Movement	Therm	Other	Total *
X	1.774	±0.116	1.39
Y	—	—	—
Z	.313	±.02	0.333

* Total Includes Therm

Safety Class NNS-1

Pipe Dia. 4" φ Sch. 40

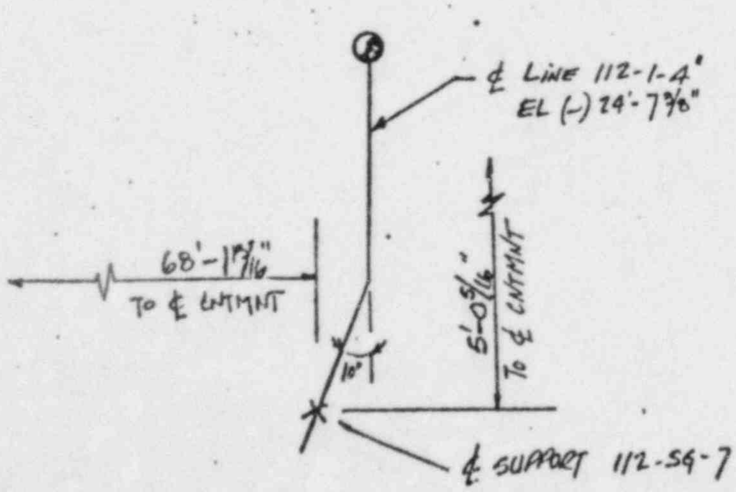
'K' Reqd. 1 X 10⁵

~~Oper.~~ DESIGN Temp 650° Ins —

Ref. Dwgs. **	Rev.No.
805103 PIPING	5
101405 CONCRETE	14
310607 ELEC.	10
31c577 ELEC.	2
101427 EMB. PL	8
604132 MECH.	6

** Comp., Conc., Stl., Emb. Pl., HVAC, Elec., etc.

North



LOCATION PLAN

FORM 5007 REV. 7/79

GENERAL COMPUTATION SHEET

(DISCIPLINE)

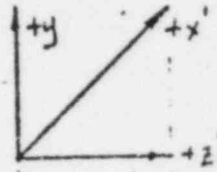
united engineers & constructors inc

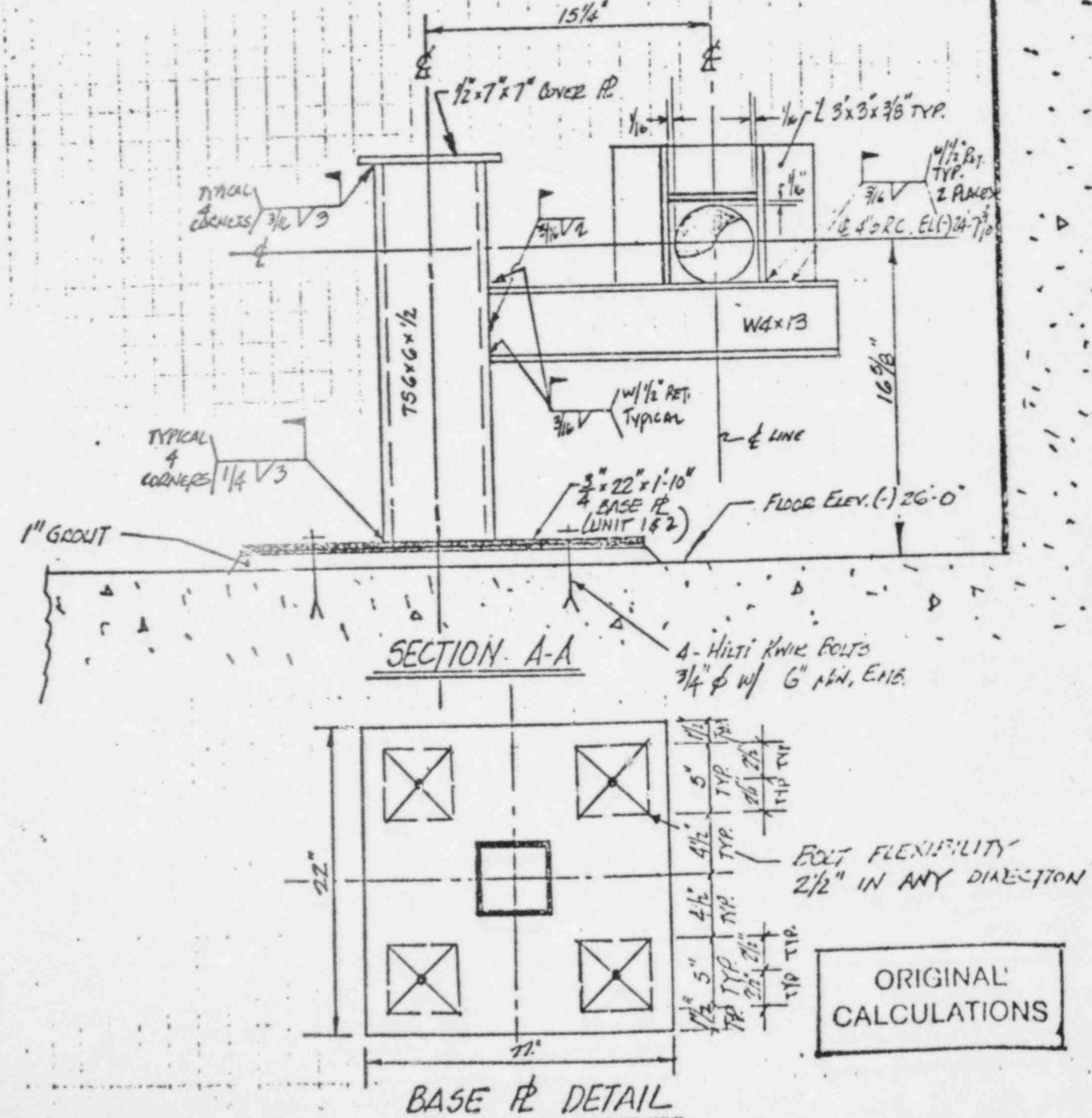
NAME OF COMPANY PSNH—SEABROOK STATION UNIT/S 1&2

SUBJECT STRUCTURAL CALCS—PIPE SUPPORT

CALC. SET NO.		REV	COMP BY	CHK'D BY
PRELIM.		0	KBL	D.R.P
FINAL			DATE 5/11/82	DATE 6-15-82
VOID				
SHEET 4 OF 15			DATE	DATE
J.O. 9763.006				

AWR	112	SYSTEM	RC
LINE NO.	112-1-4"	BUILDING	CNTMNT
ISO. NO.	800112	SUPPORT NO.	112-SG-7





ORIGINAL CALCULATIONS

GENERAL COMPUTATION SHEET

(DISCIPLINE)

united engineers & constructors inc

CALC. SET NO.		REV.	COMP. BY	CHK'D. BY
PRELIM.		0	RSL	D.R.P.
FINAL			DATE 6/2/82	DATE 6-16-82
VOID				
SHEET	15 OF 15			
J.O.	9763.006		DATE	DATE

NAME OF COMPANY: PSNH—SEABROOK STATION UNIT/S: 1 & 2

SUBJECT: STRUCTURAL CALCS—PIPE SUPPORT

AWR	112	SYSTEM	RC
LINE NO.	112-1-4"	BUILDING	CNTMNT
ISO. NO.	800112	SUPPORT NO.	112-SG-7

CHECK BASE ℄ (SEE SHEET 4 OF 14 FOR DETAIL)

$F_x = 159^{\#}$ (P_r) $M_x = 15027$ "# (M_y)

$F_y = 366^{\#}$ (P) $M_y = 2651$ "# (M_T)

$F_z = 568^{\#}$ (P_H) $M_z = 2507$ "# (M_x)

$F_1 = \frac{4.5 + 5}{2(4.5) + 5} = 0.68$ $F_2 = 0.68$

$T_1 = \frac{2507}{8.5}(0.68) = 201$ # $T_2 = \frac{15027}{8.5}(0.68) = 1202$ #

$T_P = 366 \times 0.68 \times 0.68 = 169$ #

$T_T = 1.2(201 + 1202 + 169) = \underline{1886}$ #

$V_1 = \frac{159}{2}(0.68) + \frac{2651}{8(5)} = 120$ $V_2 = \frac{568}{2} + \frac{2651}{8(5)} = 350$

$V_T = (120^2 + 350^2)^{1/2} = \underline{370}$

$I.A = \frac{1886}{3975} + \frac{370}{4210} = 0.56 < 1.0$ USE 4- HILTI KWIK BOLTS 3/4" Φ w/ 6" MIN EMB.

CHECK ℄ BENDING

$M_x = 2(1886) \times 6.5 = 24518$ psi

$t = \sqrt{\frac{6 \times 24518}{15750 \times 22}} = 0.65 < 0.75$

USE 3/4" THICK ℄

Form 3002 Rev. 3-77

(DISCIPLINE)

GENERAL COMPUTATION SHEET

united engineers & constructors inc.

PSNH—SEABROOK STATION

NAME OF COMPANY .... UNIT/S 1 & 2

SUBJECT STRUCTURAL CALCS—PIPE SUPPORT

CALC. SET NO.	
PRELIM.	—
FINAL	
VOID	
SHEET 16 OF 77	
J.O. 9763.006	

REV	COMP. BY	CHK'D BY
0	JSW / DATE 1.26.81	— / DATE —
1	KB / DATE 5.21.81	ST / DATE 5-21-81

AWR 819	SYSTEM CC
LINE NO. CC-819-3-152-8"	BUILDING CTMT
ISO. NO. 800819	SUPPORT NO. 819-RG-3 XX, ZZ

ISSUE 1 DT 12.3.80

LOADS

	F_x		F_y		F_z	
	OBE	SSE	OBE	SSE	OBE	SSE
D.Wt.	-38	-38			70	70
Thermal	-591	-591			-1004	-1004
Seismic	±650	±1300			±1618	±3236
PAD/TAD						
LAD						
SAD						
Transient						
Total +	+612	+1262			+1688	+3306
Total -	-1279	-1929			-2552	-4170

Movement

	Therm	Other	Total *
X	—	—	—
Y	+.141	±.006	+.147
Z	—	—	—

* Total Includes Therm

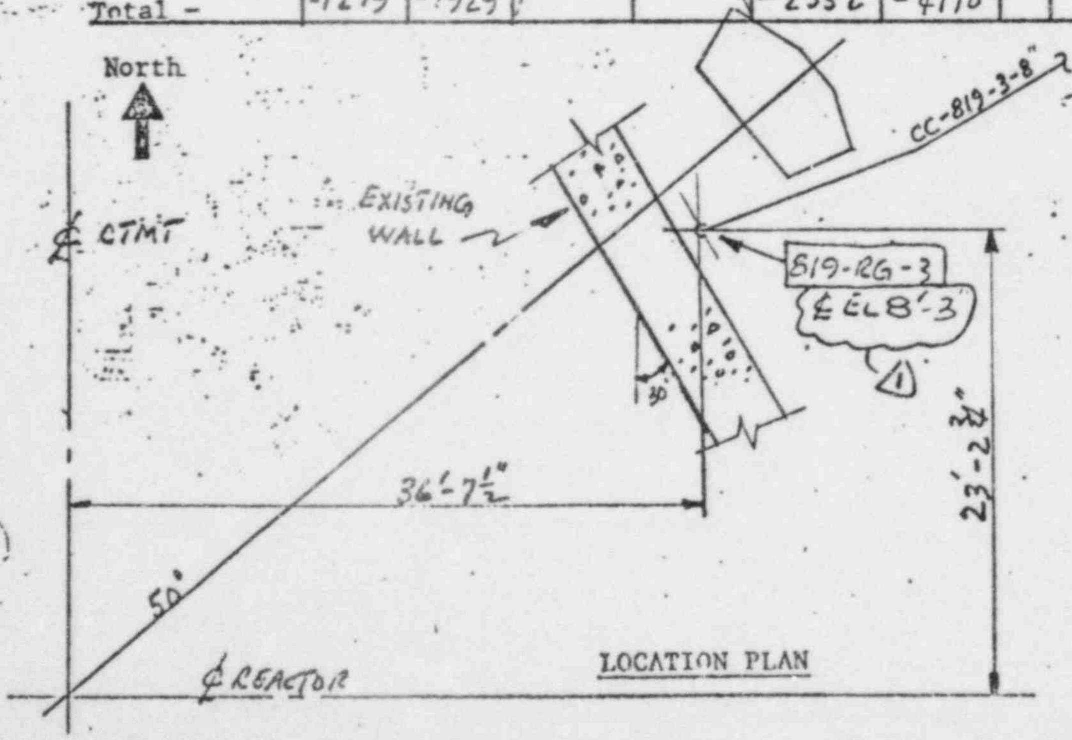
Safety Class 3

Pipe Dia. 8" Sch. 40

'K' Reqd. 1×10^6 #/in

Oper.Temp 300° Ins --

Ref. Dwgs. **	Rev.No.
PIPING 805141	12
CONC 101405	9
ELECT 301608	7
HVAC 604129	12



LOCATION PLAN

** Comp., Conc., Stl., Emb. Pl., HVAC, Elec., etc.

FORM 5022 REV. 7/79

GENERAL COMPUTATION SHEET

(DISCIPLINE)

united engineers & constructors inc

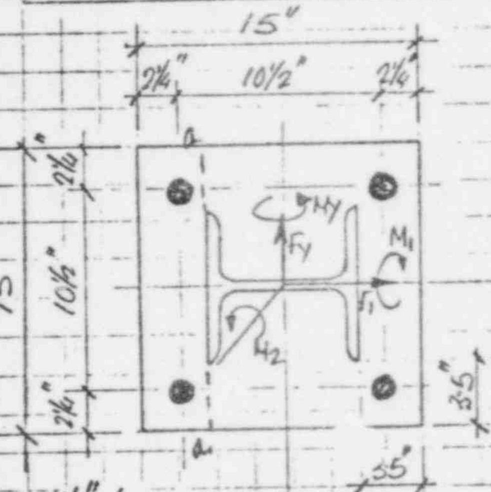
CALC. SET NO.		REV	COMP BY	CHK'D BY
PRELIM		0	J.C.	ST
FINAL			DATE 1.26.81	DATE 2-25-81
VOID				
SHEET 20 OF 137			DATE	DATE
J.O. 9763.006				

NAME OF COMPANY: PSNH—SEABROOK STATION UNIT/S: 1&2

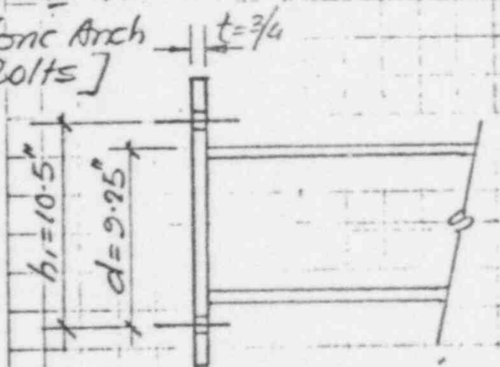
SUBJECT: STRUCTURAL CALCS—PIPE SUPPORT

AWR: 819	SYSTEM: C.C.
LINE NO. CC-819-3152-8"	BUILDING: CTMT
ISO. NO. 800819	SUPPORT NO. 819-RG-3

FACE PL & CONC. ANCHOR BOLT :— (STD. PART NO-807-7)



[4 Nos. 1¼" dia Conc Anch Bolts]



$F_1 = 3178^{\#}$, [F_2 force is neglected as compressive]

$F_y = 567.3^{\#}$

$M_1 = 5673^{\#in}$, $M_2 = 5510^{\#in}$, $M_y = 70104^{\#in}$

Now $a = 2.25"$, $b = 1.25"$

$\therefore a+b = 2.25 + 1.25 = 3.5"$

$\therefore 2t = 2 \times 0.75 = 1.5"$

$\therefore a+b > 2t$ ie $3.5" > 1.5"$

So the base is flexible, $\therefore \alpha = 1.2$

Now h_1 = c/c of bolts = 10.5"

$h_2 = d + 2t = 9.25 + 2 \times 0.75 = 10.75"$

So use $h_1 = 10.5"$ for calculation.

$\therefore$ Maxm tension in (1¼") dia Conc anchor

$$= 1.2\left[\frac{70104}{10.5} \times \frac{1}{2} + \frac{5673}{10.5} \times \frac{1}{2}\right] = 4330^{\#}$$

Shear in conc. anchor due to F_1 force $= \frac{3178}{4} = 795^{\#}$

Shear in conc. anchor due to F_y force $= \frac{568}{4} = 142^{\#}$

AWR	819	SYSTEM	C.C.
LINE NO.	CC-819-3-152-8"	BUILDING	CTMT
ISO. NO.	800819	SUPPORT NO.	819-RG-3

shear in bolt due to Torsional moment = $\frac{5510}{\sqrt{10.5^2+10.5^2}} \times \frac{1}{2} = 186^{\#}$

Resolving, we get

∴ Shear in bolt in F_1 direction = 186 Cos 45° = 132#

∴ Total shear in F_1 " = 795 + 132 = 927#

Shear in bolt in F_y direction = 186 Sin 45° = 132#

∴ Total Shear in F_y " = 142 + 132 = 274#

∴ Resultant shear = $\sqrt{(927)^2+(274)^2} = 967^{\#}$

Allowable tension value of (1¼") dia Conc. Anch = $\frac{10.5}{12.5} \times 6840 = 5746^{\#}$

Allowable shear value of (1¼") dia. Conc. Anch = $\frac{10.5}{12.5} \times 9050 = 7602$

∴ INTERACTION:-

$$\left[\frac{4330}{5746}\right] + \left[\frac{967}{7602}\right] = 0.88 < 1 \quad \text{ok}$$

{Conservative, as F_1 force while resolving was taken Conservative}

FACE PL THK:-

moment about the face of the member i.e. about (a-a)

= (4330×2)×1.25 (Considering the same value of Tension on both bolts. Conservatively)

= 10825 # in

S. of plate (¾" th) = $\frac{15 \times 0.75^2}{6} = 1.406 \text{ in}^3$

$\therefore f_b = \frac{10825}{1.406} = 7699 \text{ \#/in}^2 < 27000 \text{ \#/in}^2$ ok

B. CALCULATIONS FOR RECTANGULAR PLATE WITH SIX BOLTS

Form 5007 Rev. 3-77

GENERAL COMPUTATION SHEET

(DISCIPLINE)

united engineers & constructors inc.

NAME OF COMPANY PSNH—SEABROOK STATION UNIT/S 1 & 2

SUBJECT STRUCTURAL CALCS—PIPE SUPPORT

CALC. SET NO.	
PRELIM.	
FINAL	
VOID	
SHEET 2 OF 13	
J.O. 9763.006	

REV	COMP. BY	CHK'D BY
0	[illegible] DATE 4-6-82	[illegible] DATE 4-6-82
	DATE	DATE

AWR 779	SYSTEM CC
LINE NO. CC-779-2-152-12	BUILDING CNTMNT
ISO. NO. 800779	SUPPORT NO. 779-RG-4

ISSUE 1 DATE 3-16-81

LOADS (lbs.)	F_x		F_y		F_z	
	OBE	SSE	OBE	SSE	OBE	SSE
D.Wt.					-147	-147
Thermal					1160	1160
Seismic					±5417	±10834
PAD/TAD						-274
LAD						
SAD					—	±49
Transient						
Total +					6430	11,906
Total -					5564	11,304

FUNCTION [illegible]

Movement [illegible]

	Therm	Other	Total *
X	-.051"	-.0[illegible]"	-.[illegible]
Y	-.[illegible]"	=.[illegible]"	-.10[illegible]"
Z	—	—	—

* Total Includes Therm

Safety Class 3

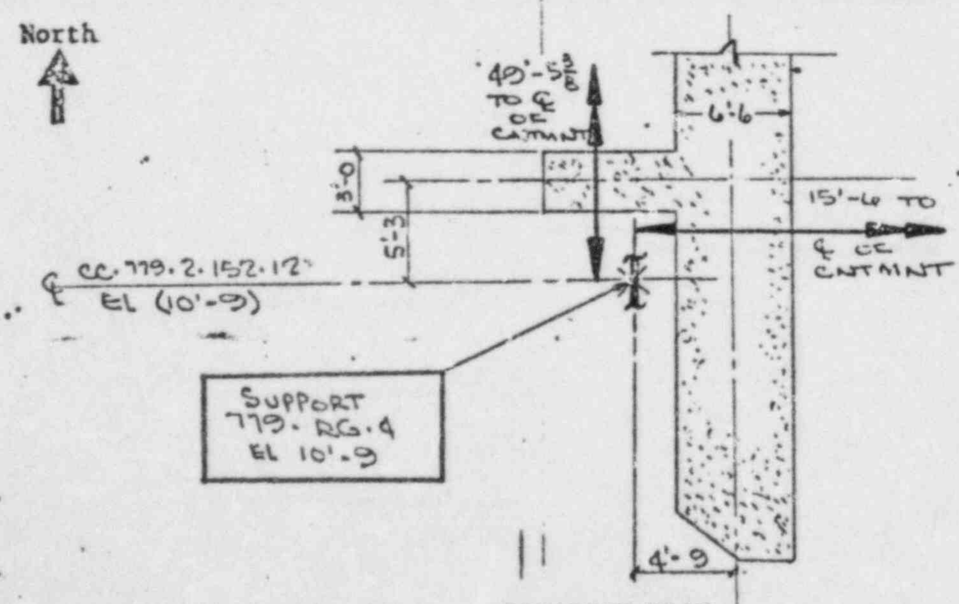
Pipe Dia. 12" Sch. 40S

'K' Reqd. 10⁶ #/"

Oper. Temp 650°F Ins —
DESIGN

Ref. Dwgs. **	Rev.No.
101406	7
805109	4
604129	4
310609	8
309129	4

** Comp., Conc., Stl., Emb. Pl., HVAC, Elec., etc.



LOCATION PLAN

'FORM 5007' REV. 7/79

GENERAL COMPUTATION SHEET

(DISCIPLINE)

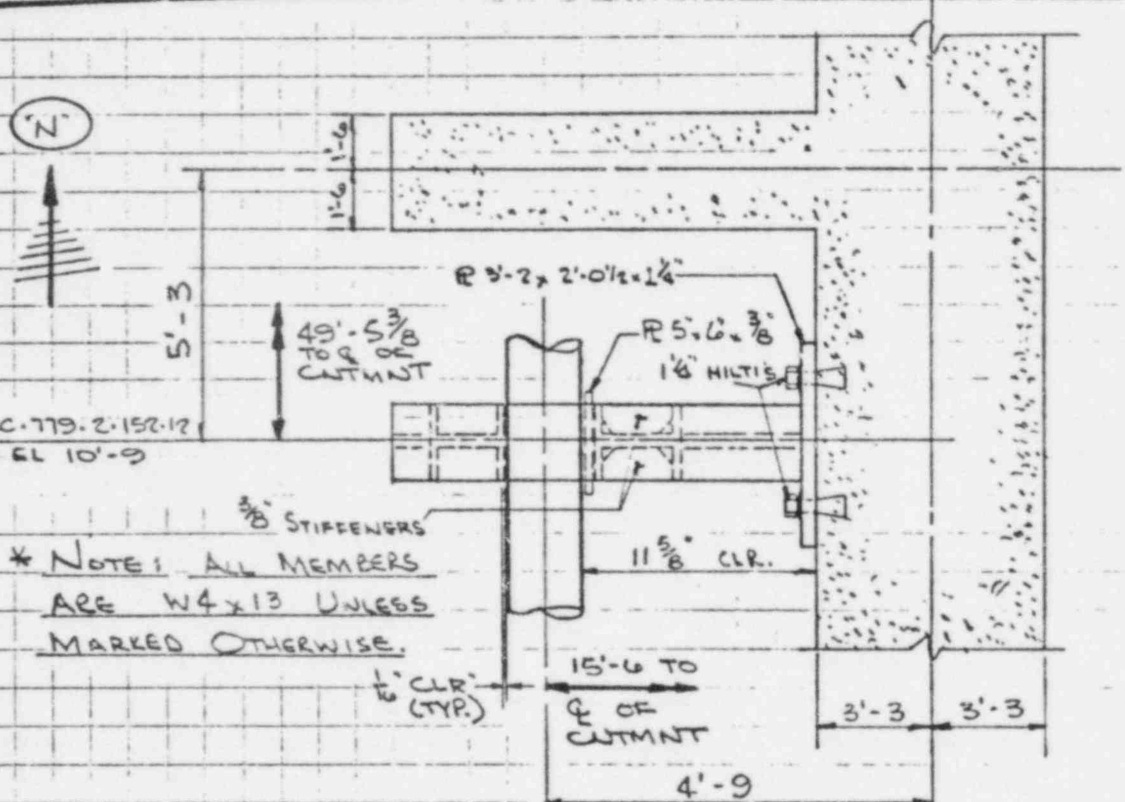
united engineers & constructors inc

NAME OF COMPANY PSNH—SEABROOK STATION UNIT/S 1&2

SUBJECT STRUCTURAL CALCS—PIPE SUPPORT

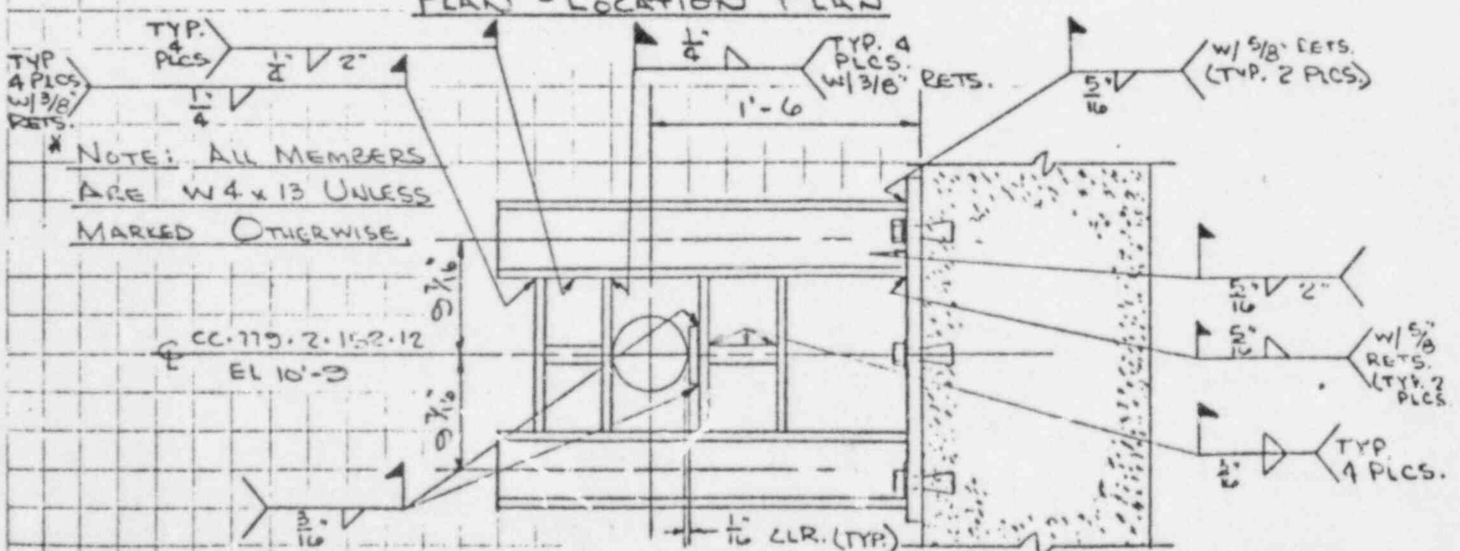
CALC. SET NO.		REV	COMP. BY	CHK'D BY
PRELIM.		0	JFT	JIM
FINAL			DATE 4-6-82	DATE 7/12/82
VOID				
SHEET 3 OF 13			DATE	DATE
J.O. 9763.006				

AWR 779	SYSTEM CC
LINE NO. CC-779-2-152-12	BUILDING CNTMNT
ISO. NO. 800779	SUPPORT NO. 779-RG-4



* NOTE: ALL MEMBERS ARE W4x13 UNLESS MARKED OTHERWISE.

PLAN - LOCATION PLAN



* NOTE: ALL MEMBERS ARE W4x13 UNLESS MARKED OTHERWISE.

ELEVATION LKG NORTH

GENERAL COMPUTATION SHEET

(DISCIPLINE)

united engineers & constructors inc

CALC. SET NO.		REV	COMP. BY	CHK'D. BY
PRELIM.		0	JFT	BIM
FINAL			DATE 4-6-82	DATE 4/12/82
VOID				
SHEET 9 OF 13			DATE	DATE
J.O. 9763.006				

NAME OF COMPANY: PSNH—SEABROOK STATION UNIT/S 1 & 2

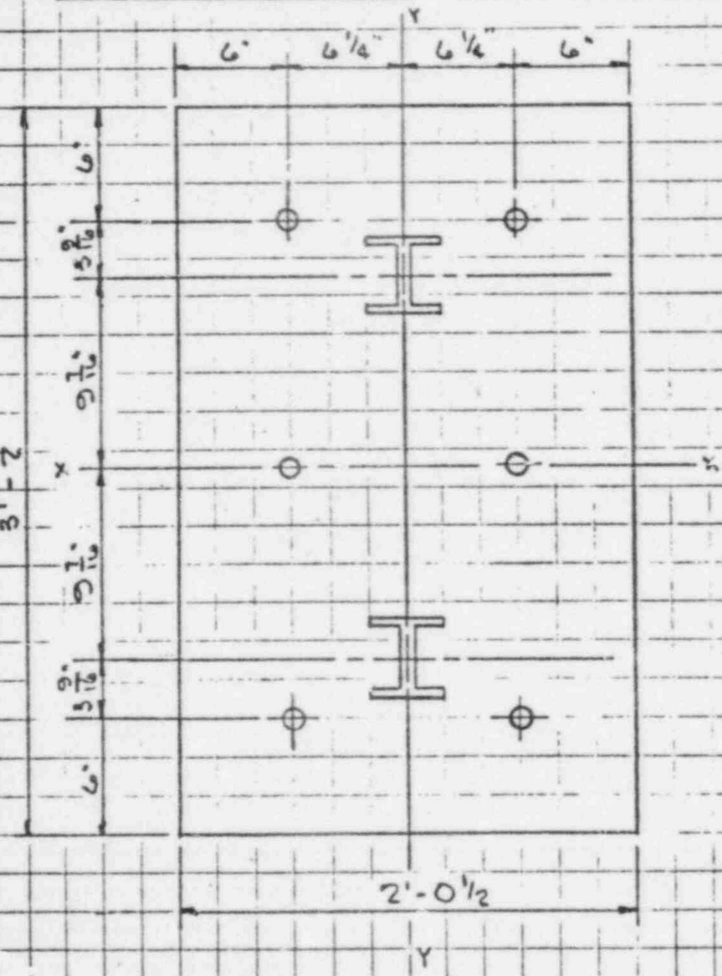
SUBJECT: STRUCTURAL CALCS—PIPE SUPPORT

AWR 779 SYSTEM CC

LINE NO. CC-779-2-152-12 BLDING CNTMNT

ISO. NO. 800779 SUPPORT NO. 779-RG-4

BASE PL DESIGN REF: PSCs GUIDELINES PAGES 262 TO 265



FOR TOP BOLTS: (THESE ARE CRITICAL

$F_1 = (a+f)/(2a+f)$

$= (6.25+5)/(2\times6.25+5) = 0.643$

$F_2 = (b+f)/(2b+f)$

$= (3.5625+5)/(2\times3.5625+5) = 0.706$

FORCES ARE:

Mx = 11,088"# ; Fx = 1112#

MY = 2052"# ; FY = 178#

Mz = 1683"# ; Fz = 6170#

$T_1 = (11,088"\#/7.625)\,0.643 = 935\#$

$T_2 = (2052"\#/10.25)\,0.706 = 141\#$

$T_P = 6170\# \times 0.643 \times 0.706 = 2801\#$

$T_T = 1.2(935\# + 141\# + 2801\#) = 4652\#$

$V_1 = (178\#/2)\,0.643 + (1683"\#/8\times6.25) = 91\#$

$V_2 = (1112\#/2)\,0.706 + (1683"\#/8\times3.5625) = 452\#$

$V_R = 461\#$

I.F. = 4652#/6840# + 461#/9050# = 0.731 ∴ USE 1 1/4" BOLTS

PL THICKNESS REQ'D

$M_x = 2T_T X = 2\times4652\# \times 6.5" = 60,476"\#$

$M_Y = 2T_T Y = 2\times4652\# \times 9.65" = 89,784"\#$

$t_{PL} = \sqrt{6(60,476"\#)/(19,600\times24.5)} = 0.87$

$t_{PL} = \sqrt{6(89,784"\#)/(19,600\times19)} = 1.20$ USE 1 1/4" PL.

FORM 5007 REV. 7/79

GENERAL COMPUTATION SHEET

(DISCIPLINE)

united engineers & constructors inc

NAME OF COMPANY PSNH—SEABROOK STATION UNIT/S 1&2

SUBJECT STRUCTURAL CALCS—PIPE SUPPORT

CALC. SET NO.		REV	COMP BY	CHK'D BY
PRELIM.		0	[illegible]	[illegible]
FINAL			DATE 4.6.82	DATE [illegible]
VOID				
SHEET 10 OF 13			DATE	DATE
J.O. 9763.006				

AWR 779 SYSTEM CC

LINE NO. CC-779-2-152-12 BUILDING CNTMNT

ISO. NO. 800779 SUPPORT NO. 779-RG-4

BASE PL DESIGN (CONT'D)

FOR CENTER BOLTS

$F_1 = 0.643$

$F_2 = (6+5)/(2\cdot 6+5) \cdot (9.4375+5)/(2\times 9.4375+5) = 0.605$

$T_1 = (11{,}088''\# / 13'')\, 0.643 = 548\#$

$T_2 = (2052''\# / 10.25'')\, 0.605 = 121\#$

$T_P = 6170\# \times 0.643 \times 0.605 = 2400\#$

$T_T = 1.2(548\# + 121\# + 2400\#) = 3683\#$

$V_1 = (178\#/2)\, 0.643 + (1683''\# / 8 \times 6.25) = 91\#$

$V_2 = (1112\#/2)\, 0.605 + (1683''\# / 8 \times 7.375) = 365\#$

$V_R = 376\#$ I.F. = $3683\#/6840\# + 376\#/9050\# = 0.58 < 1.0$ ∴ O.K.

PL THICKNESS REQ'D

$M_X = 2 T_T x = 2 \times 3683 \times 9.875 = 72{,}739''\#$

$M_Y = 2 T_T y = 2 \times 3683 \times 6.5 = 47{,}879''\#$

$t_{PL} = \sqrt{(6 \times 72{,}739''\#)/(19{,}600 \times 24.5)} = 0.95''$ ∴ USE 1 1/4" PL.

$t_{PL} = \sqrt{(6 \times 47{,}879''\#)/(19{,}600 \times 19)} = 0.88''$

* FOR DETAILING SKETCH SEE PAGE 11 OF 13.

FORM 500? REV. 7/79

GENERAL COMPUTATION SHEET

(DISCIPLINE)

united engineers & constructors inc.

NAME OF COMPANY PSNH—SEABROOK STATION UNIT/S 1 & 2

SUBJECT STRUCTURAL CALCS—PIPE SUPPORT

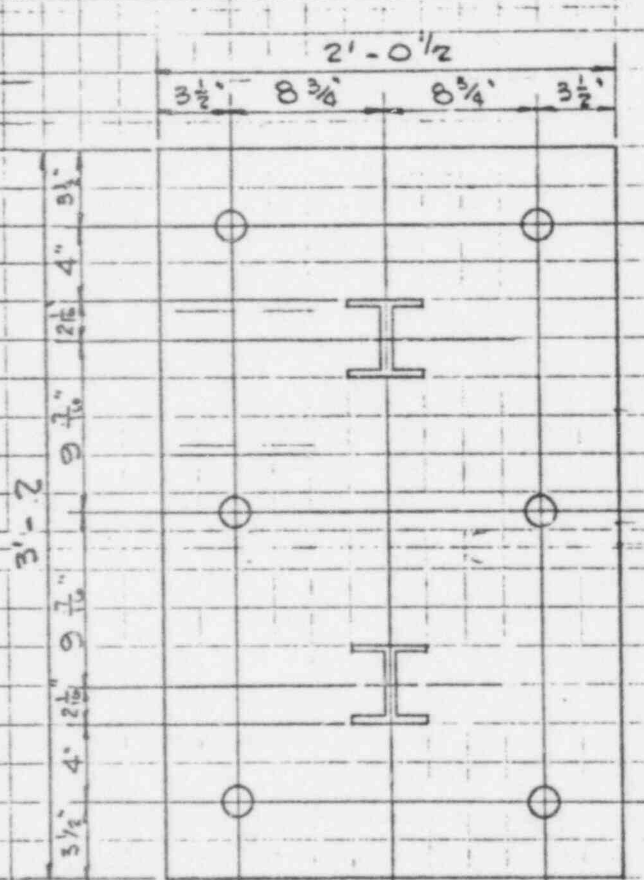
CALC. SET NO.		REV	COMP BY	CHK'D BY
PRELIM.		0	[illegible]	[illegible]
FINAL			DATE 4.6.82	DATE 7/12/82
VOID				
SHEET 11 OF 13			DATE	DATE
J.O. 9763.006				

AWR 779 SYSTEM CC

LINE NO. CC-779-2-152-12 BLDG CNTMNT

ISO. NO. 800779 SUPPORT NO. 779-RG-4

BASE PL DESIGN UNIT #1 DETAIL SKETCH



Form 5007 Rev. 3-77

(DISCIPLINE)

GENERAL COMPUTATION SHEET

united engineers & constructors inc.

NAME OF COMPANY PSNH—SEABROOK STATION UNIT/S 1 & 2

SUBJECT STRUCTURAL CALCS—PIPE SUPPORT

CALC. SET NO.	
PRELIM.	–
FINAL	
VOID	
SHEET 4 OF 137	
J.O. 9763.00	

REV	COMP. BY	CHK'D BY
0	JRL / DATE 1-22-81	ST / DATE 2-23-81
1	S.ADHIKARI / DATE 3-8-82	M.I.I. / DATE 3-12-82

AWR 819	SYSTEM CC
LINE NO. CC-819-3-152-8"	BUILDING CONTAINMENT
ISO. NO. 800819	SUPPORT NO. 819-RG-2 ⊥ TO PIPE

ISSUE-1 DT. 12-..-80

LOADS

	F_x		F_y		F_z	
	OBE	SSE	OBE	SSE	OBE	SSE
D.Wt.	- 9	- 9			3	3
Thermal	59	59			- 22	- 22
Seismic	± 865	± 1730			± 314	± 628
PAD/TAD						
LAD						
SAD						
Transient						
Total +	+ 915	+ 1780			+ 317	+ 631
Total -	- 874	- 1739			- 333	- 647

Movement

	Therm	Other	Total *
X	+.037	±.010	+.047
Y	+.177	±.178	±.355
Z	+.102	±.026	±.128

* Total Includes Therm

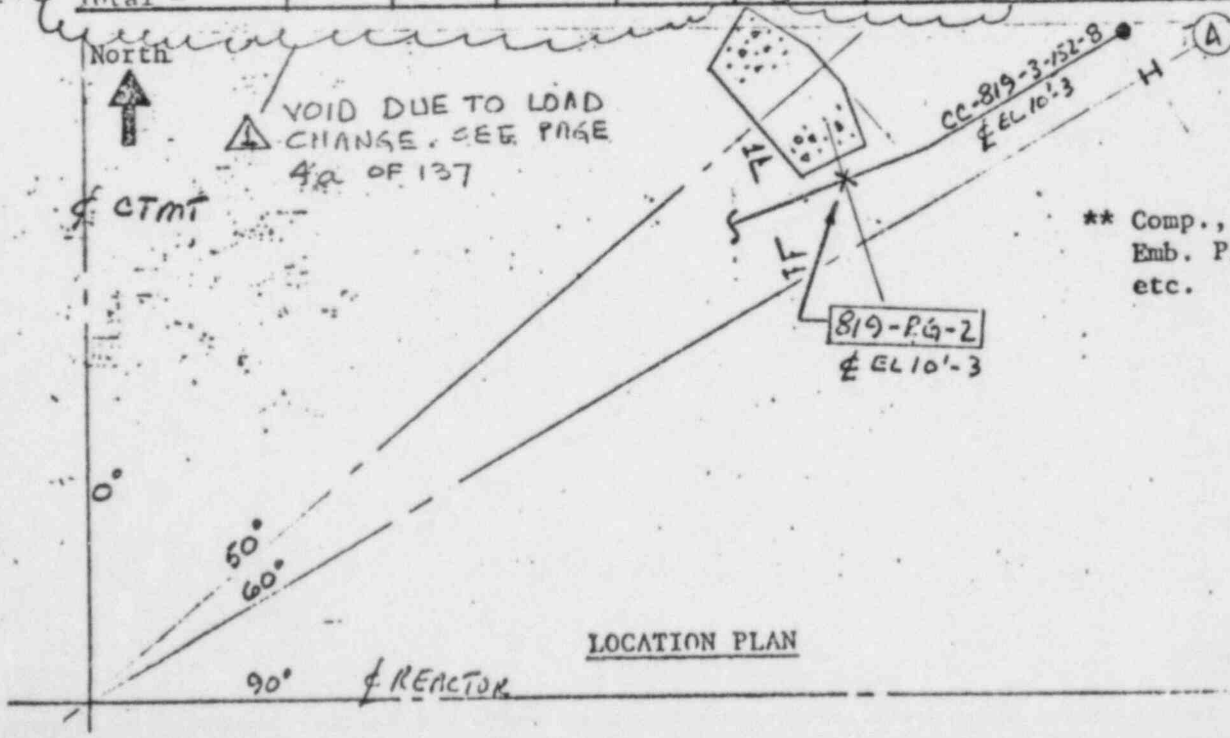
Safety Class 3

Pipe Dia. 3" Sch. 40

'K' Reqd. 1 × 10⁶ #/in

Oper.Temp 300° Ins –

Ref. Dwgs. **	Rev.No.
PIPING 805108	12
CONC 101405	9
ELEC 310609	7
HVAC 604129	2
PIPING 805141	2



** Comp., Conc., Stl., Emb. Pl., HVAC, Elec., etc.

LOCATION PLAN

Form 5007 Rev. 3-77

GENERAL COMPUTATION SHEET

(DISCIPLINE)

united engineers & constructors inc.

NAME OF COMPANY PSNH—SEABROOK STATION UNIT/S 1 & 2

SUBJECT STRUCTURAL CALCS—PIPE SUPPORT

CALC. SET NO.		
PRELIM.		
FINAL		
VOID		
SHEET 4a OF 137		
J.O. 9763.006		
REV	COMP. BY	CHK'D BY
0	DATE	DATE
1	S. ADHIKARI DATE 3-8-82	M. I. I. DATE 3-12-82

AWR 819	SYSTEM C.C.
LINE NO. CC-819-3-152-8"	BUILDING CNTMNT
ISO. NO. 800819	SUPPORT NO. 819-RG-2

ISSUE #3, 4-24-81

LOADS	F_x		F_y		F_z	
	OBE	SSE	OBE	SSE	OBE	SSE
D.Wt.	-27	-27			10	10
Thermal	24	24			-9	-9
Seismic	±1532	±3064			±557	±1114
PAD/TAD						
LAD						
SAD						
Transient						
Total +	1529	3061			567	1124
Total -	1559	3091			556	1113

Movement

	Therm	Other	Total *
X	.040	±.058	.09[illegible]
Y	.077	±.038	.115
Z	.111	±.168	.279

* Total Includes Therm

Safety Class ______

Pipe Dia. ______ Sch. ______

'K' Reqd. ______

Oper. Temp ______ Ins ______

Ref. Dwgs. **	Rev. No.

** Comp., Conc., Stl., Emb. Pl., HVAC, Elec. etc.

North ↑

NOTE:

THE REVISED LOADS WERE COMPARED WITH THE OLD LOADS AND IT IS FOUND THAT THE NEW LOADS ARE INCREASED.

HOWEVER, SINCE ALL THE INTERACTION ACTION FACTORS ARE VERY LOW AND THERE IS PLENTY OF MARGIN AVAILABLE BETWEEN ACTUAL AND ALLOWABLE STRESSES, THE INCREASE IN LOAD WILL NOT OVERSTRESS ANY MEMBERS. THEREFORE, THE ORIGINAL CALCULATIONS, USING THE OLD LOADS, ARE NOT CHANGED TO SHOW NUMBER CHANGES ONLY.

LOCATION PLAN

FORM 5007 REV. 7/79

GENERAL COMPUTATION SHEET

(DISCIPLINE)

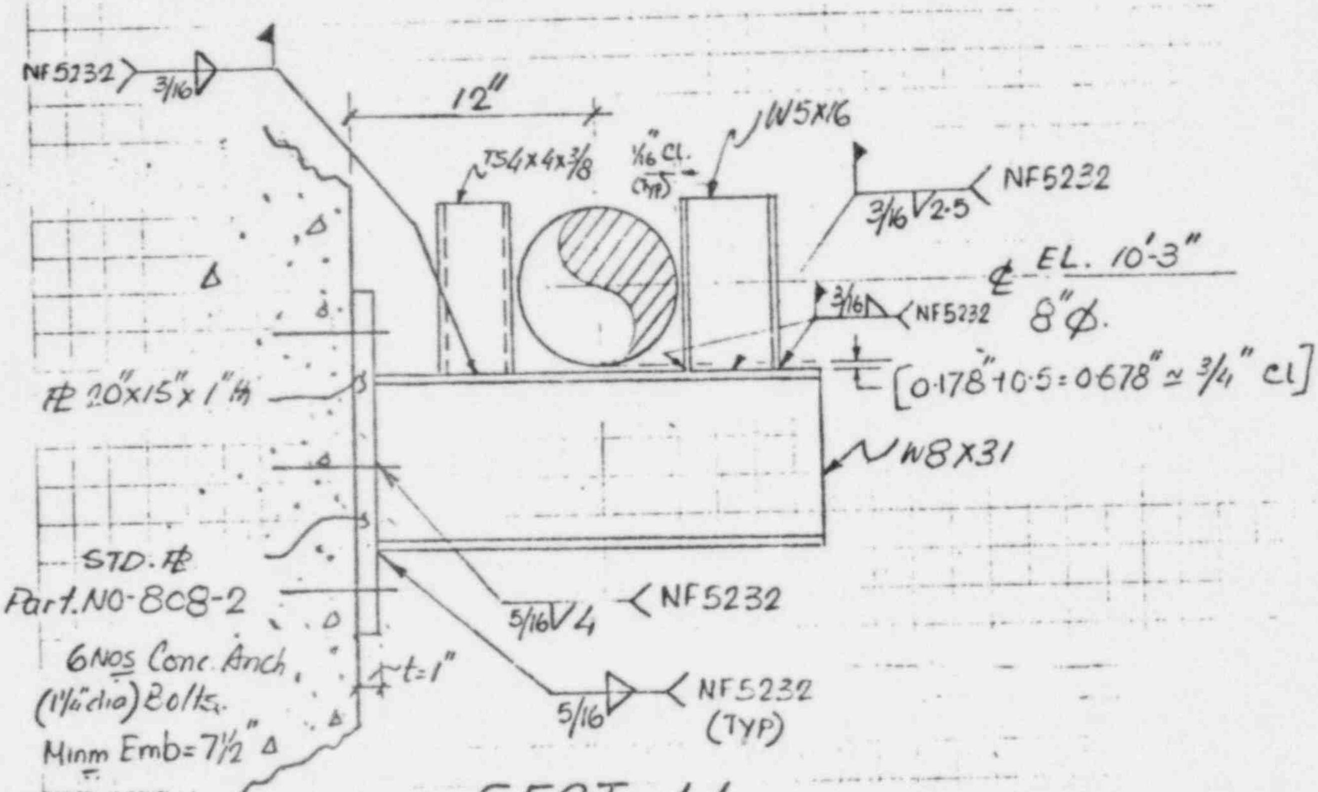
united engineers & constructors inc

NAME OF COMPANY: PSNH—SEABROOK STATION   UNIT/S: 1&2

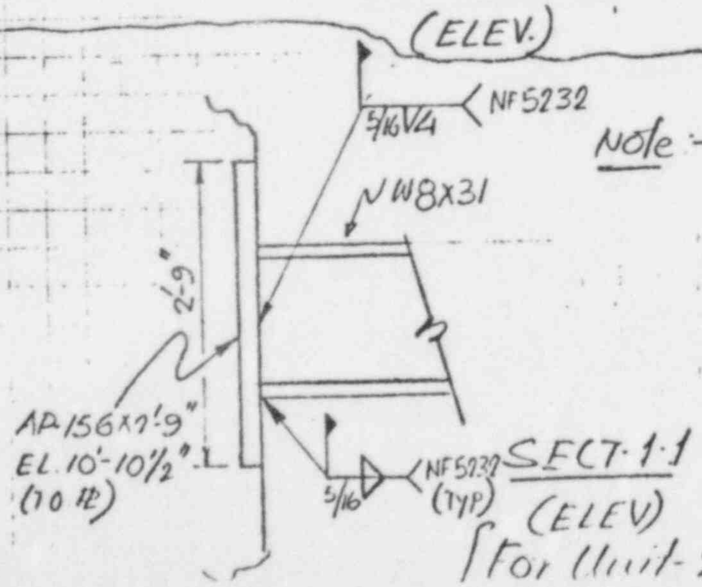
SUBJECT: STRUCTURAL CALCS—PIPE SUPPORT

CALC. SET NO.		REV	COMP BY	CHK'D BY
PRELIM		0	[illegible]	ST
FINAL			DATE 1.22.81	DATE 2-23-81
VOID				
SHEET 6 OF 157			DATE	DATE
J.O. 9763.006				

AWR: 819	SYSTEM: C.C.
LINE NO.: CC-819-2-152-8"	BUILDING: CTMT
ISO. NO.: 800819	SUPPORT NO.: 819-RG-2



SECT. - 1-1
(ELEV.)



SECT. 1-1
(ELEV)
[For Unit-2 only]

Note :- for Unit 2, a new Emb. PL is provided, the member is welded to the Emb PL as shown, all other members and weld sizes are unchanged.

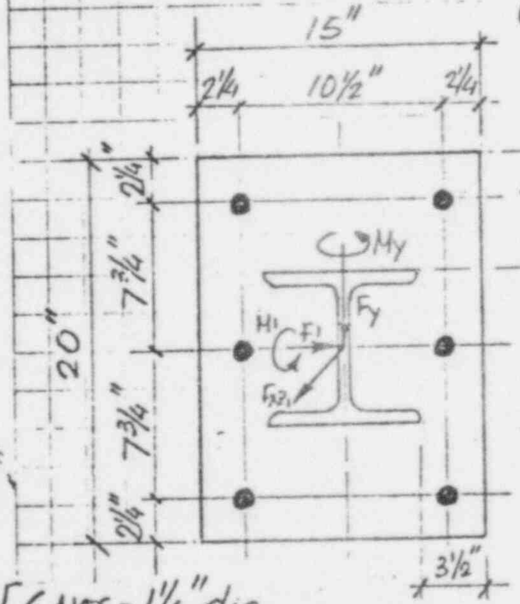
AWR	819	SYSTEM	C.C
LINE NO.	CC-819-3-152-8"	BUILDING	CTMT
ISO. NO.	800819	SUPPORT NO.	819-RG-2

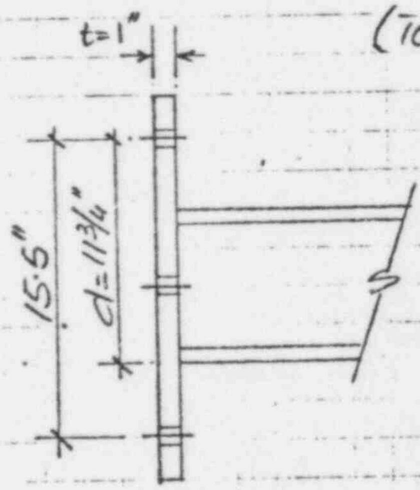
[The member W8x31 will be OK in torsion as the torsional moment is only 88"#in]

FACE ⅊ & CONC ANCHOR BOLTS :— $F_1 = 10^{\#}$, $F_{x2_1} = 1850^{\#}$, $F_y = 16^{\#}$

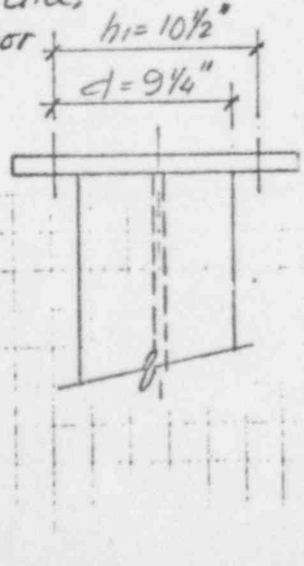
(STD. PART. NO-808-2) $M_1 = 17068^{\#in}$ $M_y = 189^{\#in}$

(Torsional moment is neglected)





[6 NOS - 1¼" dia. Conc. Anchor Bolts]



Now, $a = 2.25"$, $b = 3.75"$

$\therefore a + b = 2.25 + 3.75 = 6"$

$2t = 2 \times 1 = 2"$

$\therefore a + b > 2t$ or $6" > 2"$

So the base is flexible, $\alpha = 1.2$

Now for M_1 moment

h_1 = c.c of bolt = 15.5"

$h_2 = d + 2t = 11.75 + 2 \times 1 = 13.75"$

So use $h_2 = 13.75"$ for Calculation

AWR 819	SYSTEM C.C.
LINE NO. CC-819-3-152-8"	BUILDING CTMT
ISO. NO. 800819	SUPPORT NO. 819-RG-2

Again for My moment,

h_1 = c.c of bolts = 10.5"

$h_2 = d + 2t = 9.25 + 2\times1 = 11.25$"

So use h_1 = 10.5" for Calculation

So maxm tension in (1¼" dia) Conc Anchor

$$= 1.2\left[\frac{17068}{13.75}\times\frac{1}{2} + \frac{189}{10.5}\times\frac{1}{3} + \frac{1850}{6}\right] \quad 1122^{\#}$$

Allowable tension value of (1¼" dia) Conc anchor = 6840#

Reduction of Allowable value :-

$$\text{Reqd Des Value} = \frac{7.75}{12.5}\times 6840 = 4241^{\#}$$

Now shear in bolt due to F_t force = $\frac{10}{6} \simeq 2^{\#}$

Shear in bolt due to F_y force = $\frac{16}{6} \simeq 3^{\#}$

Resultant shear = $\sqrt{2^2+3^2} \simeq 4^{\#}$

Allowable shear value of (1¼" dia) Conc anchor = 9050#

$$\text{Reqd. Des. Value} = \frac{7.75}{12.5}\times 9050 = 5611^{\#}$$

AWR 819	SYSTEM C.C.
LINE NO. 819-3-152-8"	BUILDING CTMT.
ISO. NO. 8C0819	SUPPORT NO. 819-RG-2

∴ INTERACTION:-

$$\left[\frac{1122}{4241}\right] + \left[\frac{4}{5611}\right] = 0.265 < 1 \quad \underline{OK}$$

↳ Conservative

FACE ℄ THK:-

moment about the face of the member ie about (a-a)

$$= (1122 \times 2) \times 3.75 = 8415 \text{ \#in}$$ [Considering the same value of tension on both bolts, conservative.]

$$\therefore S \text{ of } ℄ (1"th) = \frac{15 \times 1.0^2}{6} = 2.5 \text{ in}^3$$

$$\therefore f_b = \frac{8415}{2.5} = 3366 \text{ \#/in}^2 < 27000 \text{ \#/in}^2 \quad \underline{OK}$$

$$\frac{KL}{r}(W8 \times 31) = \frac{2 \times 12}{2.02} = 11.88 < 120 \quad (OK)$$

Dd.WT. DEF:-

$$\Delta = \frac{P}{K}$$ where $P = 90^{\#}$ (Dd.wt. of sh)

$$K = \frac{3EI}{L^3} = \frac{3 \times 29 \times 10^6 \times 110}{12^3} = 5.538 \times 10^6 \text{ \#/in}$$

$$\therefore \Delta \cong \frac{90}{5.538 \times 10^6} = 1.625 \times 10^{-5} \text{ in}$$

$$\Delta_{(Allow)} = \frac{12}{360} = 0.033 \text{ in} > 1.625 \times 10^{-5} \text{ in}$$

<u>OK</u>

210.72 The pressurizer spray valves identified in FSAR 5.2-1 are not in conformance with the Codes and Standards Rule, Section 50.55a of 10CFR Part 50. These valves are constructed to Section III, Class 1 of the ASME Boiler and Pressure Vessel Code, 1971 Edition, through the Summer 1972 Addenda, whereas the regulation requires these valves to be constructed to the same code and edition through the Winter 1972 Addenda to the code. In order to determine the acceptability of these pressurizer spray valves, provide an evaluation between the Summer 1972 and Winter 1972 Addenda to the code and identify any differences between these Addenda and assess the impact of the differences on the pressurizer spray valves.

RESPONSE: The spray valves have been reviewed against the Winter 1972 Addenda and found acceptable. The Westinghouse equipment spec. provided a level of quality that met both Summer 1972 and Winter 1972 Addenda. The attached table provides a comparison of these addenda with respect to the spray valves and shows no impact on these valves.

ATTACHMENT

SUMMER 72 AND WINTER 72 CODE COMPARISON

CODE PARAGRAPH	SUMMER 72	WINTER 72	IMPACT ON VALVES
NA-2140 - RESPONSIBILITY FOR COMPONENT CODE CLASSIFICATION The Owner of a nuclear power plant, directly or through his agent, shall be responsible for determining the appropriate Code Class(es) for each component of the nuclear power plant and shall specify these Code Classes in the Design Specifications as required by NA-3253.	NA-2140 - RESPONSIBILITY FOR COMPONENT CODE CLASSIFICATION The Owner of a nuclear power plant, directly or through his agent, shall be responsible for determining the appropriate Code Class(es) for each component of the nuclear power plant and shall specify these Code Classes in the Design Specifications as required by NA-3253.	NA-2140 - CATEGORIZATION OF LOADING CONDITIONS Components of a nuclear power system may be subject to conditions which can be provided for in design in order to satisfy applicable system safety criteria. For the purposes of design, these conditions are recognized in this Section of the Code as follows: (a) Class 1 components and supports thereof, in addition to satisfying stress limits and design rules established for the Design Conditions defined in NB-3112, shall be evaluated for additional conditions categorized as follows: Normal Conditions Upset Conditions (Incidents of Moderate Frequency) Emergency Conditions (Infrequent Incidents) Faulted Conditions (Limiting Faults) Testing Conditions For definitions of these loading conditions, refer to NB-3113 and NB-3114. Design by analysis rules for [illegible] of these conditions are given in NB-3200, with the exception that Faulted Conditions are considered in Appendix F. Additional or alternative criteria are provided by the specific component Design Subarticles NB-3300 through NB-3600 for all but the Faulted Conditions, which are also considered in Appendix F. It is the responsibility of the Owner to define the acceptability criteria to be applied for Faulted Conditions in the Design Specifications. The rules in Appendix F shall be applied in all instances unless alternative or supplementary criteria, required by public health and safety considerations for specific components or systems, are defined in and made applicable by the Owner's Design Specifications. In any case, the type of system analysis (elastic or inelastic) used by the system designer shall be indicated in the Design Specifications (see F-1322.1). (b) Core Support Structures (In Preparation)	NONE The Equipment Specification for which the valves were designed to (G-678844 Rev. 2) defines the loading conditions and the limiting stress levels for Class 1, Class 2 and Class 3 valves. This meets the Winter 1972 Addenda.

CODE PARAGRAPH	SUMMER 72	WINTER 72	IMPACT ON VALVES
		(c) Class MC components, in addition to satisfying stress limits and design rules established for the Design Conditions defined in NE-3112, shall be evaluated for the conditions defined in NE-3131(c)(Earthquake Loading) and NE-3131.2 (Missile and Jet Effects). (d) Class 2 and Class 3 components and the supports thereof are evaluated in accordance with design criteria which do not explicitly recognize the categorization of loading conditions in the manner described in NA-2140(a) for Class 1 components. The specific component design rules of this Section establish criteria for the definition of the applicable Design Conditions, and these rules conform generally with those of NB-3112 which are applicable to Class 1 components. If postulated conditions other than those considered in determining the Design Conditions are of structural significance for Class 2 or Class 3 components or are required by system safety criteria or by regulatory authorities having jurisdiction at the nuclear power plant site, the Owner shall describe the conditins and provide design criteria as a separate contractual requirement beyond the scope of this Section of the Code.	
NA-2110(c) (c) This Section of the Code recognizes that components of a nuclear power system may be subject to conditions which can be provided for in the design in order to satisfy safety criteria. For the purpose of design, these conditions are identified in this Section of the Code as follows: Normal Conditions Upset Conditions (Incidents of Moderate Frequency) Emergency Conditions (Infrequent Incidents) Faulted Conditions (Limiting Faults) Testing Conditions For definitions see NB-3113 and NB-3114.	NA-2110(c) (c) This Section of the Code recognizes that components of a nuclear power system may be subject to conditions which can be provided for in the design in order to satisfy safety criteria. For the purpose of design, these conditions are identified in this Section of the Code as follows: Normal Conditions Upset Conditions (Incidents of Moderate Frequency) Emergency Conditions (Infrequent Incidents) Faulted Conditions (Limiting Faults) Testing Conditions For definitions see NB-3113 and NB-3114.	NA-2110(c)Revise to read: (c) The Owner of a nuclear power plant, directly or through his agent, shall be responsible for applying such system safety criteria to the establishment and inclusion in the Design Specifications (see NA-3252) of appropriate Code Class(es) (see NA-2120 and NA-2130) and of appropriate Design and, when required, Operating Condition information (see NA-2140).	NONE Valves are classified by Code Class 1, Class 2 and Class 3. The classification is accomplis[illegible] by means of the valve Spec Sheet and the valv[illegible] Equipment Specification.

CODE PARAGRAPH	SUMMER '72	WINTER '72	IMPACT ON VALVES
NA-3252 - CONTENTS OF DESIGN SPECIFICATIONS[1] Each Design Specification shall include: (a) The functions of the component or appourtenance; (b) The design requirements; (c) The environmental conditions, including radiation; (d) The Code classification of the component or appurtenance (see NA-2000); (e) The definition of the component and piping boundaries (NA-3254). The Design Specifications shall contain sufficient detail to provide a complete basis for construction in accordance with this Section of the Code.	NA-3252 After (e), change period to semicolon and add: (f) Materials requirements including impact tests when applicable.	NA-3252(b) Add before the semicolon (see NA-2110(c) and NA-2140)	None NA2110(c) and 2140 are covered by the Valve Equipment Specification.
NB-2110(a) - SCOPE OF PRINCIPAL TERMS EMPLOYED (a) The term materials as used in this Section of the Code applies to those items produced to the requirements of an SA, SB or SFA Specification of Section II of this Code or of any other material specification permitted by this Section of the Code.[1] The term Materials Manufacturer is defined as the Manufacturer who produces the materials to the requirements of the material specification including welding and brazing material.		NB-2110(a) Revise first sentence of Footnote 1 to NB-2110(a) to read: [1]Materials produced under an ASTM designation may be accepted as complying with the corresponding ASME specification provided the ASME specification is designated as being identical with the ASTM specification for the grade, class, or type produced and provided that the material is confirmed as complying with the ASTM specification by a Certified Materials Test Report or Certification from the Materials Manu.	None Valve Equipment Specification permits the use of ASTM Materials.

[1]Material produced under an ASTM designation may be accepted as complying with the corresponding ASME specification provided the latter specification is indicated to be identical with the ASTM specification and provided the material is confirmed as complying with the ASTM specification by a Certified Materials Test Report or certification from the Materials Manufacturer. Welding and brazing material produced under an AWS designation may be accepted as complying with the corresponding ASME specification provided the latter specification is indicated to be identical with the AWS specification and provided the welding and brazing material is confirmed as complying with the AWS specification by a Certified Materials Test Report or certification from the Materials Manufacturer.

CODE PARAGRAPH	SUMMER '72	WINTER '72	IMPACT ON VALVES
NB-2420 - REQUIRED TESTS The required tests shall be conducted for each Lot of covered, flux-cored or fabricated electrodes, for each Heat of bare electrodes, rod or wire, for each Heat of consumable inserts and for each combination of Heat of bare electrodes and Dry Blend of flux-mix to be used for welding. Tests performed on welding material in the qualification of weld procedures will satisfy the testing requirements for the Lot, Heat or combination of Heat and Batch of welding material used, provided the tests required by NB-4000 are made and the results conform to the requirements of NB-2431 and NB-2432. The following definitions apply. (a) A Dry Batch of Covering Mixture is defined as the quantity of dry covering ingredients mixed at one time in one mixing vessel; a dry batch may be used singly or may be subsequently subdivided into quantities to which the liquid binders may be added to produce a number of wet mixes [see (c) below]. (b) A Dry Blend is defined as one or more dry batches mixed in a mixing vessel and combined proportionately to produce a uniformity of mixed ingredients equal to that obtained by mixing the same total amount of dry ingredients at one time in one mixing vessel. (c) A Wet Mix is defined as the combination of a dry batch (a) or dry blend (b) and liquid binder ingredients at one time in one mixing vessel. (d) A Lot of Covered, Flux-Cored or Fabricated Electrodes is defined as the quantity of electrodes produced from the same combination of Heat of metal and Dry Batch or Dry Blend of flux or core materials. (e) A Heat of Bare Electrode, Rod, Wire or Consumable Insert is defined as the material produced from the same melt of metal.	NB-2420 - REQUIRED TESTS The required tests shall be conducted for each Lot of covered, flux-cored or fabricated electrodes, for each Heat of bare electrodes, rod or wire, for each Heat of consumable inserts and for each combination of Heat of bare electrodes and Dry Blend of flux-mix to be used for welding. Tests performed on welding material in the qualification of weld procedures will satisfy the testing requirements for the Lot, Heat or combination of Heat and Batch of welding material used, provided the tests required by NB-4000 are made and the results conform to the requirements of NB-2431 and NB-2432. The following definitions apply. (a) A Dry Batch of Covering Mixture is defined as the quantity of dry covering ingredients mixed at one time in one mixing vessel; a dry batch may be used singly or may be subsequently subdivided into quantities to which the liquid binders may be added to produce a number of wet mixes [see (c) below]. (b) A Dry Blend is defined as one or more dry batches mixed in a mixing vessel and combined proportionately to produce a uniformity of mixed ingredients equal to that obtained by mixing the same total amount of dry ingredients at one time in one mixing vessel. (c) A Wet Mix is defined as the combination of a dry batch (a) or dry blend (b) and liquid binder ingredients at one time in one mixing vessel. (d) A Lot of Covered, Flux-Cored or Fabricated Electrodes is defined as the quantity of electrodes produced from the same combination of Heat of metal and Dry Batch or Dry Blend of flux or core materials. (e) A Heat of Bare Electrode, Rod, Wire or Consumable Insert is defined as the material produced from the same melt of metal.	NB-2420 Revise first sentence to read: The required tests shall be conducted for each lot of covered, flux cored, or fabricated electrodes, for each heat of bare electrodes, rod, or wire for gas metal arc welding or gas tungsten arc welding, for each heat of consumable inserts (backing filler metal), or for each combination of heat and bare electrodes and dry blend of flux mix to be used in welding. Also add new subparagraph (f) to read: (f) A Lot of Submerged-Arc Flux is defined as the quantity of flux produced from the same combination of raw materials under one production schedule.	None Equipment Specification invokes NB-2420

CODE PARAGRAPH

NB-2432 - CHEMICAL ANALYSIS OF FILLER METAL OR WELD DEPOSITS

A chemical analysis shall be performed on ferrousalloy Numbers A7 and A8, Table Q-11.3 of Section IX of this Code and nickel-base alloy weld materials for the elements required by the applicable welding material or welding procedure specification. The specimen for chemical analysis of the welding material shall be removed from undiluted weld deposits or filler metals as specified in (a) and (b) below:

(a) For bare electrode, rod or wire filler metal used with a gas metal-arc welding or the gas tungstenarc welding processes, the chemical analysis may be performed on the electrode, rod, wire or consumable insert or an undiluted weld deposit made with the wire or consumable insert;

(b) For all other processes and filler metal, the chemical analysis shall be performed on an undiluted weld deposit.

SUMMER '72

NB-2432 - CHEMICAL ANALYSIS OF FILLER METAL OR WELD DEPOSITS

A chemical analysis shall be performed on ferrousalloy Numbers A7 and A8, Table Q-11.3 of Section IX of this Code and nickel-base alloy weld materials for the elements required by the applicable welding material or welding procedure specification. The specimen for chemical analysis of the welding material shall be removed from undiluted weld deposits or filler metals as specified in (a) and (b) below:

(a) For bare electrode, rod or wire filler metal used with a gas metal-arc welding or the gas tungstenarc welding processes, the chemical analysis may be performed on the electrode, rod, wire or consumable insert, or an undiluted weld deposit made with the wire or consumable insert;

WINTER '72

NB-2432 Revise to read:

NB-2432 CHEMICAL ANALYSIS TEST

Chemical analysis of filler metal and/or weld deposits shall be made in accordance with NB-2420 and as required by the following subparagraphs.

NB-2432.1 REQUIREMENTS FOR CHEMICAL ANALYSIS

The filler metal or weld deposit shall be analyzed for the elements listed in Table NB-2342.1-1. The results shall be for information.

NB-2432.2 SAMPLING REQUIREMENTS FOR FILLER METAL OR DEPOSITED METAL ANALYSIS

Sampling for filler metals and/or deposited metal analysis shall be as required below.

(a) When consumable insert (backing filler metal), bare electrode, rode or wire filler metal used with gas metal arc, gas tungsten arc, or plasma arc welding processes, a chemical analysis shall be performed on the electrode, rod, wire or consumable insert (backing filler metal), or on a weld deposit made with the bare electrode, rod, wire or consumable insert.

(b) Chemical analysis shall be performed on a weld deposit for welding materials used with processes other than those listed in (a). The weld for analysis shall be made using the process and the combination of materials being certified.

Table NB-2432.1-1

Welding Material Chemical Analysis

Carbon & Low Alloy Materials
C,Cr,Mo,Ni,Mn,Si,P,S,V,Cu
Chromium and Cr-Ni Stainless Materials
C,CR,Mo,Ni,Mn,Si,P,S,V,Cb + Ta,Ti,Cu
Nickel and Ni-Alloy Materials
C,Cr,Mo,Ni,Mn,Si,S,Cb + Ta,Cu,Fe,Co

IMPACT ON VALVES

None

NB-[redacted] is a part of the Specification.

2432

CODE PARAGRAPH	SUMMER '72	WINTER '72	IMPACT ON VALVES
NB-2121 - PERMITTED MATERIAL SPECIFICATIONS (a) Pressure-retaining material and material welded thereto, except as permitted in NB-4435, and except for cladding which is 10% or less of the thickness of the base material (see NB-3122) shall conform to the requirements of one of the specifications for materials given in Table I-1.1, Table I-1.2 or Table I-1.3 of Appendix I of this Section of the Code and to all of the special requirements of this Article which apply to the product form in which the material is used. (b) Other material shall conform to the requirements of the specifications for materials listed in Table I-1.1, Table I-1.2 or Table I-1.3 of Appendix I unless otherwise permitted by other articles of this Section of the Code. (c) The Materials Manufacturer shall satisfy all of the requirements of the material specification and of this Article, except as provided in NB-2122. (d) The requirements of this Article do not apply to items not associated with the pressure-retaining function of a component such as shafts stems, trim, bearings, bushings, wear plates, nor to seals packing, gaskets and valve seats.	NB-2121 - PERMITTED MATERIAL SPECIFICATIONS (a) Pressure-retaining material and material welded thereto, except as permitted in NB-4435, and except for cladding which is 10% or less of the thickness of the base material (see NB-3122) shall conform to the requirements of one of the specifications for materials given in Table I-1.1, Table I-1.2 or Table I-1.3 of Appendix I of this Section of the Code and to all of the special requirements of this Article which apply to the product form in which the material is used. (b) Other material shall conform to the requirements of the specifications for materials listed in Table I-1.1, Table I-1.2 or Table I-1.3 of Appendix I unless otherwise permitted by other articles of this Section of the Code. (c) The Materials Manufacturer shall satisfy all of the requirements of the material specification and of this Article, except as provided in NB-2122. (d) The requirements of this Article do not apply to items not associated with the pressure-retaining function of a component such as shafts, stems, trim, bearings, bushings, wear plates, nor to seals packing, gaskets and valve seats.	NB-2121(f) Add NB-2121(f) to read: (f) Materials for instrument line fittings, 1-in. nominal pipe size and less, may be of materials made to specifications other than those listed in Appendix I of this Code provided that the fittings are in conformance with the requirements of NB-3671.4 and the materials are determined to be adequate for the service conditions by the instrument piping system designer.	Not applicable. This addresses instrument lines. Valves have weld ends. Valves do not use flared or compression fitting joints.
NB-2160 - DETERIORATION OF MATERIALS IN SERVICE Consideration of deterioration of materials caused by service is generally outside the scope of this Code. It is the responsibility of the Owner to select materials suitable for the conditions stated in the Design Specifications (NA-3250) with specific attention being given to the effects of service conditions upon the properties of the materials.	NB-2160 - DETERIORATION OF MATERIALS IN SERVICE Consideration of deterioration of materials caused by service is generally outside the scope of this Code. It is the responsibility of the Owner to select materials suitable for the conditions stated in the Design Specifications (NA-3250) with specific attention being given to the effects of service conditions upon the properties of the materials.	NB-2160 - At end of paragraph add the following: Special consideration shall be given to the influence of elements such as copper and phosphorus on the effects of irradiation on the properties of materials (including welding materials) in the core belt line region of the reactor vessel. Any special requirements shall be specified in the Design Specifications. (See NA-3252 and NB-3124.) When so specified, the check analysis shall be made in accordance with the base metal specifications and in accordance with NB-2420 for the welding materials.	None: The Equipment Specification prohibits the use of copper, lead, aluminum. Valve design complied with the revision.

CODE PARAGRAPH	SUMMER '72	WINTER '72	IMPACT ON VALVES
NB-2510 - EXAMINATION OF PRESSURE-RETAINING MATERIAL Pressure-retaining material shall be examined by nondestructive methods applicable to the material and product form as required by the rules of this Subarticle, except for pumps and valves with inlet piping connections 4 in. nominal pipe size and less and except for seamless pipe, tubes and fittings 2 in. nominal pipe size and less, (see NB-3673). The 2 inch size exemption does not apply to heat-exchanger tubing.	NB-2510 - EXAMINATION OF PRESSURE-RETAINING MATERIAL Pressure-retaining material shall be examined by nondestructive methods applicable to the material and product form as required by the rules of this Subarticle, except for pumps and valves with inlet piping connections 4 in. nominal pipe size and less and except for seamless pipe, tubes and fittings 2 in. nominal pipe size and less, (see NB-3673). The 2 inch size exemption does not apply to heat-exchanger tubing.	NB-2510 - Revise to read: (a) Pressure retaining material shall be examined by nondestructive methods applicable to the material and product form as required by the rules of this Subarticle, except for pumps and valves with inlet piping connections 2-in. nominal pipe size and less. Seamless pipe, tubes, and fittings, 2-in. nominal pipe size and less need not be examined by the rules of this subarticle provided the requirements of NB-3673 are met. The 2-in. size exemption does not apply to heat exchanger tubing. (b) For forged and cast pumps and valves with inlet piping connections over 2 in., up to and including 4-in. nominal pipe size, magnetic particle or liquid penetrant examinations may be performed, in lieu of volumetric examination, except the welding ends for cast pumps and valves shall be radiographed for a minimum distance of t (when t is the design section thickness of the weld) from the final welding end.	None. All valves regardless of size are subjected to nondestructive examinations by the Equip Specification. Valves meet the revision.
NB-3213.21 - LIMIT ANALYSIS-COLLAPSE LOAD The methods of limit analysis are used to compute the maximum load a structure made of ideally plastic (nonstrain-hardening) material can carry. The deformations of an ideally plastic structure increase without bound at this load, which is termed the "collapse load".	NB-3213.21 - LIMIT ANALYSIS-COLLAPSE LOAD The methods of limit analysis are used to compute the maximum load a structure made of ideally plastic (nonstrain-hardening) material can carry. The deformations of an ideally plastic structure increase without bound at this load, which is termed the "collapse load".	NB-3213.21 Revise to read: NB-3213.21 - LIMIT ANALYSIS-COLLAPSE LOAD The methods of limit analysis are used to compute the maximum load or combination of loads a structure made of ideally plastic (nonstrain-hardening) material can carry. The deformations of an ideally plastic structure increase without bound at this load which is termed the "collapse load". Among the methods used in limit analysis is a technique which assumes elastic, perfectly plastic, material behavior and a constant level of moment or force in those redundant structural elements in which membrane-yield, plastic-hinge or critical buckling load has been reached. Any increase in load must be accompanied by a stable primary structure until a failure mechanism defined by the lower bound theorem of limit analysis is reached in the primary structure.	None. All limiting stresses specified in the spec cation are below or equal to the yield stre

CODE PARAGRAPH	SUMMER '72	WINTER '72	IMPACT ON VALVES
NB-3225 - FAULTED CONDITIONS If the Design Specifications (NA-3250) specify any Faulted Conditions, NB-3113.4, the rules which may be used in evaluating these conditions independently of all other conditions, are given in the following subparagraphs and are summarized in Fig. NB-3225-1. NB-3225.1 - PRIMARY STRESSES Primary stresses are to be evaluated in accordance with a limit analysis procedure, NB-3228.2, and the specified loads are not to exceed 100 per cent of the lower-bound collapse load (see NB-3213.22). NB-3225.2 - LIMIT ANALYSIS In applying the limit analysis procedure, the yield strength value used is to be equal to the greater of 150 per cent of the tabulated S_m value or 120 per cent of the tabulated yield strength, with both values taken at the appropriate temperature. NB-3225.3 - PLASTIC ANALYSIS As an alternate to the procedure of NB-3225.1 and NB-3225.2, above, a plastic instability analysis may be performed, considering the actual strain-hardening characteristics of the material, but with the yield strength adjusted to correspond to the tabulated value at the appropriate temperature in Table I-2.1 or I-2.2. The specified loads are not to exceed 90 per cent of the plastic instability loads.	NB-3225 - FAULTED CONDITIONS If the Design Specifications (NA-3250) specify any Faulted Conditions, NB-3113.4, the rules which may be used in evaluating these conditions, independently of all other conditions, are given in the following subparagraphs and are summarized in Fig. NB-3225-1. NB-3225.1 - PRIMARY STRESSES Primary stresses are to be evaluated in accordance with a limit analysis procedure, NB-3228.2, and the specified loads are not to exceed 100 per cent of the lower-bound collapse load (see NB-3213.22). NB-3225.2 - LIMIT ANALYSIS In applying the limit analysis procedure, the yield strength value used is to be equal to the greater of 150 per cent of the tabulated S_m value or 120 per cent of the tabulated yield strength, with both values taken at the appropriate temperature. NB-3225.3 - PLASTIC ANALYSIS As an alternate to the procedure of NB-3225.1 and NB-3225.2, above, a plastic instability analysis may be performed, considering the actual strain-hardening characteristics of the material, but with the yield strength adjusted to correspond to the tabulated value at the appropriate temperature in Table I-2.1 or I-2.2. The specified loads are not to exceed 90 per cent of the plastic instability loads.	NB-3225 Revise to read: If the Design Specifications (NA-3250) specify any Faulted Conditions (NB-3113.4), the rules contained in Appendix F may be used in evaluating these Faulted Conditions, independently of all other Design and Operating Conditions. Delete remainder of this paragraph, including Figure NB-3225.1.	None. The Specification does not allow the compone stresses to exceed the yield point.
NB-3235 - FAULTED CONDITIONS The limits of NB-3225 apply.	NB-3235 - FAULTED CONDITIONS The limits of NB-3225 apply.	NB-3235 Revise to read: If the Design Specifications (NA-3250) specify any Faulted Conditions (NB-3113.4), the rules contained in Appendix F may be used in evaluating these Faulted Conditions, independently of all other Design and Operating Conditions.	None. Faulted Conditions are defined in the specification with the acceptable limits.

CODE PARAGRAPH	SUMMER '72	WINTER '72	IMPACT ON VALVES
NB-3400 DESIGN OF CLASS 1 PUMPS NB-3410 - GENERAL REQUIREMENTS (a) Rules for the design of Class 1 pumps are in course of preparation. Until these rules have been prepared any design method which has been demonstrated to be satisfactory for the specified design conditions may be used. (b) It is recommended that analytical and/or experimental stress analysis methods be used to show that the pressure-retaining portions of the pump meet the requirements of NB-3100 and NB-3200.	NB-3400 DESIGN OF CLASS 1 PUMPS NB-3410 - GENERAL REQUIREMENTS (a) Rules for the design of Class 1 pumps are in course of preparation. Until these rules have been prepared any design method which has been demonstrated to be satisfactory for the specified design conditions may be used. (b) It is recommended that analytical and/or experimental stress analysis methods be used to show that the pressure-retaining portions of the pump meet the requirements of NB-3100 and NB-3200.	PUMPS ONLY NB-3400 Replace Article NB-3400 with new Article. NB-3400 as shown in this Addenda	None.
NB-3541 - GENERAL REQUIREMENTS FOR BODY WALL THICKNESS The minimum wall thickness of a valve body is to be determined by the rules of NB-3542 or NB-3543, except immediately adjacent to a welding end, where the rule of NB-3544.8 is to be followed. Additional metal may be necessary to satisfy other requirements of this Subarticle or for corrosion allowance.	NB-3541 - GENERAL REQUIREMENTS FOR BODY WALL THICKNESS The minimum wall thickness of a valve body is to be determined by the rules of NB-3542 or NB-3543, except immediately adjacent to a welding end, where the rule of NB-3544.8 is to be followed. Additional metal may be necessary to satisfy other requirements of this Subarticle or for corrosion allowance.	NB-3541 In third line, delete. . . immediately adjacent to a welding end, . . .	No effect.
NB-3544.8 - BODY CONTOURS AT WELDING ENDS Valve body contours at welding ends are to be in accordance with ANSI-B16.5 unless otherwise stated in the Design Specifications (NA-3250). For valves larger than 4 in. nominal pipe size the welding-end preparation shall not reduce the body wall thickness to less than the value required by NB-3541 within a region closer to the outside surface of the neck than 1 x t_m measured along the run direction. Alignment tolerances given in Figure NB-4233-1 shall apply to by-pass lines and other similar attached piping assemblies.	NB-3544.8 Revise to read: NB-3544.8 - BODY CONTOURS AT WELDING ENDS Valve body contours at welding ends are to be in accordance with ANSI-B16.25 unless otherwise stated in the Design Specifications (NA-3250). Local violation of the minimum wall thickness requirements of NB-3542 and NB-3543 is permissible provided that this does not occur within a region closer to the outside surface of the neck than 1 x t_m measured along the run direction. The transition to the weld end preparation shall meet the requirements of NB-3544.1 and shall be as short as possible while avoiding sharp discontinuities. The addition of test collars or bands, either as integral or welded parts, is allowed.	NB-3544.8 Add the following at the end of paragraph For socket weld ends, valves of nominal size 2 in. and smaller for which the body cavity consists of cylindrically bored sections shall meet all of the following: (a) d_m shall be port drill diameter (b) The requirements of NB-3542.2 shall be satisfied (c) Socket weld end valves of nominal size greater than 2 in. shall not be used for Class 1 valves.	None. Equipment Specification calls for ANSI B16.[illegible] for socket welds in accordance with NB3661.[illegible] Also no socket weld is permitted of valves above 2" size.

CODE PARAGRAPH	SUMMER '72	WINTER '72	IMPACT ON VALVES
NB-3612.1 - COMPONENTS WITH SPECIFIC RATINGS Where standard components are used, the pressure ratings given as functions of temperature in the appropriate standards listed in Table NB-3691-1 shall not be exceeded. Adherence to these standards in no way replaces or eliminates the requirements of NB-3625. Where established pressure ratings of piping components do not extend to the upper temperature limits permitted by this Section of the Code for the material to be used, the ratings between those established and the upper temperature limit in this Section may be determined in accordance with the rules established in NB-3649.	NB-3612.1 - COMPONENTS WITH SPECIFIC RATINGS Where standard components are used, the pressure ratings given as functions of temperature in the appropriate standards listed in Table NB-3691-1 shall not be exceeded. Adherence to these standards in no way replaces or eliminates the requirements of NB-3625. Where established pressure ratings of piping components do not extend to the upper temperature limits permitted by this Section of the Code for the material to be used, the ratings between those established and the upper temperature limit in this Section may be determined in accordance with the rules established in NB-3649.	NB-3612.1 Revise as follows: 1. Insert (a) before first setence 2. Add new paragraph as follows: (b) Where the adequacy of the pressure design of a component is established by burst tests as permitted in NB-3649 (e.g., ANSI B16.9, Par. 8), the Manufacturer of the component shall maintain a record of burst tests he has conducted to assure adequacy of his components and shall so certify. Such records shall be available to the purchaser.	No effect on valves. This pertains to piping

CODE PARAGRAPH	WINTER '72	IMPACT ON VALVES
TABLE NB-3542-1 VALVE BODY MINIMUM WALL THICKNESS (see below)	TABLE NB-3542-1 VALVE BODY MINIMUM WALL THICKNESS (see below)	No Impact. Valves have 72 Summer tm values which are larger than 72 winter tm values

CODE PARAGRAPH

TABLE NB-3542-1
VALVE BODY MINIMUM WALL THICKNESS

Inside Diameter d_m, In.	Minimum Wall Thickness, t_m – In. 150 lb.	300 lb.	400 lb.	600 lb.	900 lb.	1500 lb.	2500 lb.
1	.25	.25	.25	.25	.28	.28	.44
2	.25	.25	.25	.25	.46	.46	.79
3	.25	.28	.31	.31	.43	.66	1.14
4	.25	.31	.38	.38	.51	.83	1.47
5	.28	.34	.44	.44	.63	1.02	1.81
6	.29	.39	.44	.50	.74	1.21	2.15
7	.30	.41	.50	.57	.83	1.41	2.51
8	.31	.44	.56	.63	.93	1.59	2.83
9	.33	.47	.63	.70	1.03	1.78	3.17
10	.34	.50	.66	.77	1.13	1.94	3.51
11	.36	.53	.72	.85	1.24	2.12	3.86
12	.38	.56	.75	.92	1.36	2.31	4.19
13	.40	.61	.81	.97	1.46	2.50	4.53
14	.42	.66	.84	1.03	1.56	2.68	4.86
15	.43	.68	.88	1.11	1.67	2.86	5.20
16	.45	.71	.91	1.16	1.77	3.05	5.54
17	.46	.75	.94	1.25	1.88	3.24	5.88
18	.48	.78	1.00	1.31	1.98	3.42	6.22
19	.50	.81	1.07	1.38	2.07	3.61	6.55
20	.51	.84	1.10	1.46	2.17	3.79	6.89
21	.53	.88	1.13	1.53	2.28	3.97	7.23
22	.54	.91	1.17	1.59	2.38	4.15	7.57
23	.56	.94	1.20	1.66	2.48	4.33	7.91
24	.57	.97	1.24	1.72	2.58	4.51	8.25
25	.59	1.00	1.28	1.79	2.69	4.69	8.59
26	.61	1.04	1.32	1.85	2.79	4.87	8.92
27	.62	1.07	1.36	1.91	2.89	5.06	9.26
28	.64	1.10	1.39	1.98	2.99	5.24	9.60
29	.66	1.14	1.43	2.04	3.09	5.42	9.94
30	.67	1.17	1.47	2.11	3.19	5.60	10.28
31	.69	1.20	1.51	2.17	3.30	5.78	10.62
32	.71	1.23	1.54	2.23	3.40	5.96	10.96
33	.72	1.27	1.58	2.30	3.50	6.14	11.29
34	.74	1.30	1.62	2.36	3.60	6.32	11.63
35	.75	1.33	1.66	2.43	3.70	6.50	11.97
36	.77	1.37	1.69	2.49	3.80	6.68	12.31
37	.79	1.40	1.73	2.55	3.90	6.87	12.65
38	.80	1.43	1.77	2.62	4.01	7.05	12.99
39	.82	1.47	1.81	2.68	4.11	7.23	13.32
40	.84	1.50	1.84	2.75	4.21	7.41	13.66
41	.85	1.53	1.88	2.81	4.31	7.59	14.00
42	.87	1.56	1.92	2.88	4.41	7.77	14.34
43	.88	1.60	1.96	2.94	4.51	7.95	14.68
44	.90	1.63	1.99	3.00	4.61	8.13	15.02
45	.92	1.66	2.03	3.07	4.72	8.32	15.36
46	.93	1.70	2.07	3.13	4.82	8.50	15.69
47	.95	1.73	2.11	3.20	4.92	8.68	16.03
48	.97	1.76	2.14	3.26	5.02	8.86	16.37
49	.98	1.80	2.18	3.32	5.12	9.04	16.71
50	1.00	1.83	2.22	3.39	5.22	9.22	17.04

WINTER '72

TABLE NB-3542-1
VALVE BODY MINIMUM WALL THICKNESS

Inside Diameter d_m, In.	Minimum Wall Thickness, t_m – In. 150 lb.	300 lb.	400 lb.	600 lb.	900 lb.	1500 lb.	2500 lb.
0.1	.10	.10	.10	.10	.10	.10	.10
0.2	.10	.10	.10	.10	.10	.10	.12
0.3	.10	.10	.10	.10	.12	.12	.16
0.4	.10	.10	.13	.13	.16	.16	.23
0.5	.10	.10	.14	.14	.19	.19	.27
0.6	.10	.12	.15	.15	.21	.21	.30
0.7	.11	.14	.16	.16	.22	.22	.33
0.8	.13	.16	.17	.17	.24	.24	.36
0.9	.15	.17	.18	.18	.26	.26	.40
1	.15	.19	.19	.19	.28	.28	.44
2	.18	.25	.25	.25	.46	.46	.79
3	.22	.28	.31	.31	.43	.66	1.14
4	.23	.31	.38	.38	.51	.83	1.47
5	.28	.36	.44	.44	.63	1.02	1.81
6	.29	.39	.44	.50	.74	1.21	2.15
7	.30	.41	.50	.57	.83	1.41	2.51
8	.31	.44	.56	.63	.93	1.53	2.83
9	.33	.47	.63	.70	1.03	1.78	3.17
10	.34	.50	.66	.77	1.13	1.94	3.51
11	.36	.53	.72	.85	1.24	2.12	3.86
12	.38	.56	.75	.92	1.36	2.31	4.19
13	.40	.61	.81	.97	1.46	2.50	4.53
14	.42	.66	.84	1.03	1.56	2.68	4.86
15	.43	.68	.88	1.11	1.67	2.86	5.20
16	.45	.71	.91	1.16	1.77	3.05	5.54
17	.46	.75	.94	1.25	1.88	3.24	5.88
18	.48	.78	1.00	1.31	1.98	3.42	6.22
19	.50	.81	1.07	1.38	2.07	3.61	6.55
20	.51	.84	1.10	1.46	2.17	3.79	6.89
21	.53	.88	1.13	1.53	2.28	3.97	7.23
22	.54	.91	1.17	1.59	2.38	4.15	7.57
23	.56	.94	1.20	1.66	2.48	4.33	7.91
24	.57	.97	1.24	1.72	2.58	4.51	8.25
25	.59	1.00	1.28	1.79	2.69	4.69	8.59
26	.61	1.04	1.32	1.85	2.79	4.87	8.92
27	.62	1.07	1.36	1.91	2.89	5.06	9.26
28	.64	1.10	1.39	1.98	2.99	5.24	9.60
29	.66	1.14	1.43	2.04	3.09	5.42	9.94
30	.67	1.17	1.47	2.11	3.19	5.60	10.28
31	.69	1.20	1.51	2.17	3.30	5.78	10.62
32	.71	1.23	1.54	2.23	3.40	5.96	10.96
33	.72	1.27	1.58	2.30	3.50	6.14	11.29
34	.74	1.30	1.62	2.36	3.60	6.32	11.63
35	.75	1.33	1.66	2.43	3.70	6.50	11.97
36	.77	1.37	1.69	2.49	3.80	6.68	12.31
37	.79	1.40	1.73	2.55	3.90	6.87	12.65
38	.80	1.43	1.77	2.62	4.01	7.05	12.99
39	.82	1.47	1.81	2.68	4.11	7.23	13.32
40	.84	1.50	1.84	2.75	4.21	7.41	13.66
41	.85	1.53	1.88	2.81	4.31	7.59	14.00
42	.87	1.56	1.92	2.88	4.41	7.77	14.34
43	.88	1.60	1.96	2.94	4.51	7.95	14.68
44	.90	1.63	1.99	3.00	4.61	8.13	15.02
45	.92	1.66	2.03	3.07	4.72	8.32	15.36
46	.93	1.70	2.07	3.13	4.82	8.50	15.69
47	.95	1.73	2.11	3.20	4.92	8.68	16.03
48	.97	1.76	2.14	3.26	5.02	8.86	16.37
49	.98	1.80	2.18	3.32	5.12	9.04	16.71
50	1.00	1.83	2.22	3.39	5.22	9.22	17.04

IMPACT ON VALVES

No Impact.

Valves have 72 Summer tm values which are larger than 72 winter tm values

CODE PARAGRAPH	SUMMER '72	WINTER '72	IMPACT ON VALVES
NB-3649 - PRESSURE DESIGN OF OTHER PRESSURE-RETAINING COMPONENTS Other pressure-retaining components manufactured in accordance with the standards listed in Table NB-3691-1 shall be considered suitable for use provided the design is consistent with the design philosophy embodied in this Section of the Code. Pressure-retaining components not included in Table NB-3691-1 may be used if they satisfy the requirements of NB-3200. The pressure design shall be based on an analysis consistent with the general design philosophy embodied in this Section of the Code, or experimental stress analysis as described in Appendix II or an ANSI B16.9 type burst test. The bursting pressure in a B16.9 type burst test must be equal to or greater than that of the weakest pipe to be attached to the component.	NB-3649 - PRESSURE DESIGN OF OTHER PRESSURE-RETAINING COMPONENTS Other pressure-retaining components manufactured in accordance with the standards listed in Table NB-3691-1 shall be considered suitable for use provided the design is consistent with the design philosophy embodied in this Section of the Code. Pressure-retaining components not included in Table NB-3691-1 may be used if they satisfy the requirements of NB-3200. The pressure design shall be based on an analysis consistent with the general design philosophy embodied in this Section of the Code, or experimental stress analysis as described in Appendix II or an ANSI B16.9 type burst test. The bursting pressure in a B16.9 type burst test must be equal to or greater than that of the weakest pipe to be attached to the component.	NB-3649 Revise last sentence to read: The bursting pressure in a B16.9 type burst test must be equal to or greater than that of the weakest pipe to be attached to the component, where the burst pressure of the weakest pipe is calculated by the equation: $P = 2St/D_o$ where S = specified minimum tensile strength of pipe material, psi t = minimum specified wall thickness of pipe, inches D_o = outside diameter of pipe, inches	This code paragraph does not apply to valves
NB-3656 - CONSIDERATION OF FAULTED CONDITIONS NB-3656.1 - PERMISSIBLE PRESSURE Under any Faulted Conditions specified, the permissible pressure shall not exceed the design pressure (P) calculated in accordance with Equation (2) of NB-3641.1 by more than 100 per cent. NB-3656.2 - ANALYSIS OF PIPING COMPONENTS Under any Faulted Conditions, Equation (9) of NB-3652 shall be met using a stress limit of $3.0S_m$.	NB-3656 - CONSIDERATION OF FAULTED CONDITIONS NB-3656.1 - PERMISSIBLE PRESSURE Under any Faulted Conditions specified, the permissible pressure shall not exceed the design pressure (P) calculated in accordance with Equation (2) of NB-3641.1 by more than 100 per cent. NB-3656.2 - ANALYSIS OF PIPING COMPONENTS Under any Faulted Conditions, Equation (9) of NB-3652 shall be met using a stress limit of $3.0S_m$.	NB-3656 Revise to read: NB-3656 - CONSIDERATION OF FAULTED CONDITIONS If the Design Specifications (NA-3250) specifies any Faulted Conditions (NB-3113.4) the rules contained in Appendix F may be used in evaluating these Faulted Conditions, independently of all other Design and Operating Conditions.	This applies to piping.
NB-3673 - SPECIAL DESIGN REQUIREMENTS For piping components exempted in NB-2510 from the special examination requirements of NB-2500, the following special design rules are applicable: (a) The design stress-intensity values, S_m, of Appendix I used in the design analysis shall be multiplied by 0.6; (b) The alternating stress-intensity value, S_{alt}, determined by the fatigue analysis for nominal pipe sizes larger than 1 inch shall not exceed 0.5 times the value of S_a from the applicable fatigue curves. The S_{alt} values for 1 inch nominal pipe size and smaller shall not exceed the value of S_a from the applicable fatigue curves.	NB-3673 - SPECIAL DESIGN REQUIREMENTS For piping components exempted in NB-2510 from the special examination requirements of NB-2500, the following special design rules are applicable: (a) The design stress-intensity values, S_m, of Appendix I used in the design analysis shall be multiplied by 0.6; (b) The alternating stress-intensity value, S_{alt}, determined by the fatigue analysis for nominal pipe sizes larger than 1 inch shall not exceed 0.5 times the value of S_a from the applicable fatigue curves. The S_{alt} values for 1 inch nominal pipe size and smaller shall not exceed the value of S_a from the applicable fatigue curves.	NB-3673 Revise as follows: 1. To opening paragraph add designation NB-3673.1 - COMPONENTS NOT EXAMINED 2. Add new paragraph NB-3673.2 following paragraph NB-3673(b) to read: NB-3673.2 - EXAMINED COMPONENTS Where the applicable material and product form examinations required under NB-2500 are performed, the full value of the design stress intensity, S_m, and the full fatigue curve value, S_a, may be used in a piping design and analysis.	This applies to piping.

CODE PARAGRAPH	SUMMER '72	WINTER '72	IMPACT ON VALVES
Table NB-4622.1-1 Decrease in Temperature Minimum Holding time at Below Minimum Specified Decreased Temperature Temperature Degrees F / Hours Per Inch of Weld Thickness 50[1] / 2[1] 100[1] / 3[1] 150[2] / 5[2] 200[2] / 10[2] [1]These postweld heat treatment temperatures and times are applicable only to P-1, P-3, P-12A and P-12B. [2]These postweld heat treatment temperatures and times apply only to P-1, P-3, P12A Sub 1, P12B and P12C.	Table NB-4622.1-1 Decrease in Temperature Minimum Holding time at Below Minimum Specified Decreased Temperature Temperature Degrees F / Hours Per Inch of Weld Thickness 50[1] / 2[1] 100[1] / 3[1] 150[2] / 5[2] 200[2] / 10[2] [1]These postweld heat treatment temperatures and times are applicable only to P-1, P-3, P-12A and P-12B. [2]These postweld heat treatment temperatures and times apply only to P-1, P-3, P12A Sub 1, P12B and P12C.	Table NB-4622.1-1 Revise as follows: 1. For P-number 6, change minimum temperature from 1400 to 1250. 2. Add a new Note 1,A,(4) to read: (4) Postweld heat treatment is neither required or prohibited for hard surfacing on base metal having a reported carbon content of not more than 0.30%. 3. Add a new Note 6 to read: Note 6 - P-Number 6 material may be cooled in air from the postweld heat treatment holding temperature in lieu of the cooling requirements of NB-4623.5.	No effect.
NB-5120 - TIME OF EXAMINATION OF WELDS Acceptance examinations of welds shall be erformed at the times stipulated in the following subparagraphs during fabrication and installation, except as otherwise specified in NB-5200 and NB-5400. (b) Magnetic particle or liquid penetrant examinations shall be performed after any required postweld heat treatment except for P-Number 1 materials.	NB-5120 - TIME OF EXAMINATION OF WELDS Acceptance examinations of welds shall be performed at the times stipulated in the following subparagraphs during fabrication and installation, except as otherwise specified in NB-5200 and NB-5400. (b) Magnetic particle or liquid penetrant examinations shall be performed after any required postweld heat treatment except for P-Number 1 materials.	NB-5120(b) Revise to read (b) Magnetic particle or liquid penetrant examinations shall be performed after any required postweld heat treatment except that welds in P-Number 1 materials may be examined either before or after postweld heat treatment. Weld surfaces that are covered with weld-metal cladding shall be examined before the weld-metal cladding is applied. Weld surfaces which are not accessible after a postweld heat treatment shall be examined prior to the operations which caused this inaccessibility.	No effect.
NB-5410 - EXAMINATION AFTER HYDROSTATIC TEST Subsequent to the hydrostatic or pneumatic test of a vessel, all welds and heat-affected surfaces joining ferritic materials, including joints and welds used to repair ferritic material shall, when physically accessible, be examined by the magnetic particle or liquid penetrant method. All austentic stainless steel and nonferrous weld surfaces, including the heat affected zone, shall be examined by the liquid penetrant method subsequent to an intermediate or final postweld heat treatment, if any is performed. This examination may be performed before or after hydrostatic or pneumatic testing. Weld surfaces which are not accessible in the completed vessel, i.e., those covered by internal or external parts of those inside chambers are not designed for internal access, shall be examined prior to the operations which result in this inaccessibility. Welds that are covered with weld-metal cladding shall be examined before the weld-metal cladding is applied. These requirements do not apply to tube-to-tube-sheet joints.	NB-5410 - EXAMINATION AFTER HYDROSTATIC TEST Subsequent to the hydrostatic or pneumatic test of a vessel, all welds and heat-affected surfaces joining ferritic materials, including joints and welds used to repair ferritic material shall, when physically accessible, be examined by the magnetic particle or liquid penetrant method. All austentic stainless steel and nonferrous weld surfaces, including the heat affected zone, shall be examined by the liquid penetrant method subsequent to an intermediate or final postweld heat treatment, if any is performed. This examination may be performed before or after hydrostatic or pneumatic testing. Weld surfaces which are not accessible in the completed vessel, i.e., those covered by internal or external parts of those inside chambers are not designed for internal access, shall be examined prior to the operations which result in this inaccessibility. Welds that are covered with weld-metal cladding shall be examined before the weld-metal cladding is applied. These requirements do not apply to tube-to-tube-sheet joints.	NB-5410 Revise to read: After the hydrostatic or pneumatic test of a vessel, all weld joints and heat affected zones of Categories A,B,C and D used to joint ferritic material and welds used to repair ferritic material, shall, when physically accessible, be examined by the magnetic particle or liquid penetrant method. All of the joints in austenitic stainless steel and nonferrous materials shall be examined by the liquid penetrant method after an intermediate or final postweld heat treatment, if any is performed; this examination may be performed before or after hydrostatic or pneumatic testing. Weld surfaces which are not accessible in the completed vessel, i.e., those covered by internal or external parts of those inside chambers not designed for internal access, shall be examined prior to the operation which caused this inaccessibility. Welds that are covered with weld-metal cladding is applied. These requirements do not apply to tube-to-tube-sheet joints.	NC-5400 applied to vessels.

CODE PARAGRAPH	SUMMER '72	WINTER '72	IMPACT ON VALVES
NB-6111.1 - HYDROSTATIC TESTING All components and appurtenances constructed and/or installed under the rules of this Section of the Code shall be hydrostatically tested, in the presence of the Inspector. Nuts, bolts, studs and gaskets are exempt from hydrostatic testing.	NB-6111.1 - HYDROSTATIC TESTING All components and appurtenances constructed and/or installed under the rules of this Section of the Code shall be hydrostatically tested, in the presence of the Inspector. Nuts, bolts, studs and gaskets are exempt from hydrostatic testing.	NB-6111.1 Revise as follows: 1. Designate first paragraph (a) 2. Add new paragraph (b) and (c) as follows: (b) The hydrostatic test of each line valve and pump with inlet connections over 4-in. nominal pipe size shall be witnessed by the Authorized Inspector and a data report completed for each. (See NA-8400). (c) A hydrostatic test of each line valve and pump with inlet piping connections of 4-in. nominal pipe size and smaller must be performed by the Manufacturer and so noted on the data report form (see NA-8400); however, this hydrostatic test need not be witnessed by the Authorized Inspector. The Inspector's review of the Manufacturer's test records will be his authority to sign the report. (This takes precedence over NA-5280).	The Equipment Specification does not restrict the valves on the basis of size from inspecti witness point.

NB-3352.4 has no impact on control valves as the valves furnished are not fabricated.

210.73 In FSAR Table 5.2-1, identify the code edition and addenda of ASME Section III, Class 1 interconnecting piping to the reactor coolant system and a part of the reactor coolant pressure boundary, as defined in 10CFR Part 50.2(V) of the Commission's regulations.

RESPONSE: Large bore interconnecting piping is fabricated to the requirements of ASME III, 1974 Edition and addenda up to and including the Summer, 1974 addenda. FSAR Table 5.2-1 has been revised in Amendment 46 to incorporate this information.

210.74 In FSAR Table 5.2-1, identify the code edition and addenda of ASME Section III, Class 1 valves in interconnecting lines to the reactor coolant system and a part of the reactor coolant pressure boundary as noted in the previous question.

RESPONSE: Small bore (2" nominal diameter or less) manual valves are fabricated to the requirements of ASME III, 1974 Edition and addenda up to and including Summer, 1975 Edition, FSAR Table 5.2-1 has been revised to incorporate this information.

TABLE 5.2-1

APPLICABLE CODE ADDENDA FOR REACTOR COOLANT SYSTEM COMPONENTS

Reactor Vessel	ASME III, 1971 Edition, through Winter 72
Steam Generator	ASME III, 1971 Edition, through Summer 73
Pressurizer	ASME III, 1971 Edition, through Summer 73
CRDM Housing Full Length	ASME III, 1974 Edition, through Summer 74
CRDM Head Adapter	ASME III, 1971 Edition, through Winter 72
Reactor Coolant Pump	ASME III, 1971 Edition, through Summer 73
Reactor Coolant Pipe	ASME III, 1974 Edition, through Summer 75
Class 1 Interconnecting Piping to the RCS	ASME III, 1974 Edition, through Summer 74
Surge Lines	ASME III, 1974 Edition, through Summer 75
Valves	
Pressurizer Safety	ASME III, 1971 Edition, through Winter 72
Motor Operated	ASME III, 1974 Edition, through Summer 74
Manual (3" and larger)	ASME III, 1974 Edition, through Summer 74
(2" and smaller)	ASME III, 1974 Edition, through Summer 75
Control	ASME III, 1974 Edition, through Summer 75
Pressurizer Spray	ASME III, 1971 Edition, through Summer 72

210.75 Verify that all components within the reactor coolant pressure boundary as defined in 10CFR Part 50.2(V) are classified as Quality Group A and constructed to Section III, Class 1, of the ASME Boiler and Pressure Vessel Code in compliance with the Codes and Standards Rule Section 50.55a of 10CFR Part 50, or as a minimum are classified Quality Group B and constructed to Section III, Class 2, of the code if components meet the conclusion requirements of the rule.

RESPOSE: BOP

All components within the reactor coolant pressure boundary, as defined in 10CFR Part 50.2(V), are classified as either Safety Class 1 or Safety Class 2, as defined in ANSI N18.2a-1975. All Safety Class 1 components are fabricated in accordance with ASME Section III, Class 1, of the issue in effect at the time of award of the purchase order for that component.

Changes of safety class from Class 1 to Class 2 occur beyond the second isolation valve or downstream of a flow restricting orifice in interconnecting lines that form a part of the reactor coolant pressure boundary. For line classifications, see FSAR Figures 5.1-1, 5.4-10, 6.3-1 and 9.3-13.

NSSS

Components within the reactor coolant pressure boundary (RCPB), as defined in 10 CFR 50.2(V), are classified as Safety Class 1 except those components exempted by Footnote 2 of 10 CFR 50.55a. The exempted components, in most cases, are classified as Safety Class 2. In some cases, appropriate safety class interfaces permit the classification of exempted components within the RCPB (as defined in 10 CFR 50.2(V) to be less than Safety Class 2; for example, the SIS (accumulator) test line includes non-nuclear safety piping. In all cases, the equipment classifications are in compliance with 10 CFR 50.55a. The respective industry codes used in the construction of equipment of various safety classification are identified in Table 3.2-2.

Westinghouse utilizes safety class terminology, as defined in ANSI N18.2a-1975, for classification of components rather than the Regulatory Guide 1.26 recommendations for quality group classification (refer to Section 1.8).

210.76 In addition to Code Case 1528 identified in Section 5.2.1.2 of the FSAR, identify all other ASME Code Cases (including those that are listed as acceptable in Regulatory Guide 1.84 and 1.85) that were used in the construction of each Quality Group A component within the reactor coolant pressure boundary. These Code Cases should be identified by the Code Case Number, revision and title for each component to which the Code Case has been applied.

RESPONSE: BOP

In addition to Code Case 1528, the following Code Cases have been used in construction of Quality Group A components:

a. Piping

Code Case N-218, Testing Lots of Carbon Steel Solid, Bare Welding Electrode or Wire.

Code Case N-228, Alternative Rules for Sequence of Completion of Code Data Report Forms and Stamping for Section III, Classes 1, 2, 3 and MC Construction.

Code Case N-237, Hydrostatic Testing of Internal Piping, Section III, Division 1.

b. Small Bore Valves

Code Case 1621, Line Valve Internal and External Items, Section III, Classes 1, 2 and 3, April 29, 1974.

NSSS

The ASME Code Cases utilized for Class 1 components are given below:

Component	Code Case	Title
CRDM	N-228:	Alternate Rules for Sequence of Completion of Code Data Report Forms and Stamping for Section III, Classes 1, 2, 3 and MC Construction
Steam Generator	1528-3:	High Strength Steel SA-508, Class 2, and SA-541, Class 2 Forgings, Section III, Class 1 Components
	1484.3:	SB-163 Nickel-Chromium Iron Tubing (Alloy 600 and 690) and Nickel-Iron-Chromium Alloy 800 at a Specified Minimum Yield Strength of 40.0 Ksi, Section III, Division 1, Class 1

RC Pipe	1423-2:	Wrought Type 304 and 316 with Nitrogen Added
Valves	1553-1:	Upset Heading and Roll Threading of SA-453 for High-Temperature Bolting, Section III, Classes 1, 2, 3 and MC Construction
	1649:	Modified SA-453 - Gr 660 for Classes 1, 2, 3 and CS Construction

The reactor coolant pumps for Seabrook Station will be ASME certified following the cold hydrotest at the site. Following the testing, pumps will be N-stamped, ASME Code Data Forms will be signed and appropriate Code Cases, if any, will be noted.

210.77 The sample lines from the steam and liquid sections of the pressurizer as shown as FSAR Piping and Instrumentation Diagram 9.3-5, of the Nuclear Sampling System are incorrectly classified Safety Class NNS and are unacceptable. These lines are part of the reactor coolant pressure boundary as defined in 10CFR Part 50.2(V) of the Commissions' regulations. Since the lines meet the exclusion requirements of footnote 2 of 10CFR Part 50, Section 50.55a, the lines may be classified Quality Group B (Safety Class 2) in accordance with the guidance provided in Regulatory Guide 1.26.

RESPONSE: The sample lines from the steam and liquid sections of the pressurizer are part of the reactor coolant pressure boundary and are classified Quality Group B (Safety Class 2) in accordance with Regulatory Guide 1.26. This classification applies up to and including the first isolation valve outside the containment. The classification, Safety Class NNS, pertains to the line from the relief valve discharge to a drain, both of which are inside the containment.

210.78 Verify that the delay coils in the sample lines from reactor coolant system loops 1 and 3, as shown on FSAR Piping and Instrumentation Diagram 9.3-5 of the Nuclear Sampling System, are classified Quality Group B (Safety Class 2).

RESPONSE: The sample lines, including their delay coils, from reactor coolant system loops 1 and 3, as shown on FSAR Piping and Instrumentation Diagram 9.3-5, are classified Quality Group B (Safety Class 2) in accordance with Regulatory Guide 1.26. This classification applies up to, and including, the first isolation valve outside the containment.

210.79 The Quality Group C (Safety Class 3) piping and valves associated with the recirculation pumps and surge tank should be identified on Sheet 6 of Table 3.2-2. The component code should be ASME Section III, Class 3. These items should also be classified seismic Category I.

RESPONSE: Table 3.2-2 (Page 6 of 31) has been revised to show the code classification for the recirculation pump and surge tank piping.

(RAI 210.79)

7/13/82

TABLE 3.2-2
(Sheet 6 of 31)

FSAR Section	Systems and Components	ANS Safety Class	Principal Design/Const. Codes/Stds.	Code Class	Seismic Category	Building(11)	Supplier	Notes
6.3	Emergency Core Cooling System							
	Accumulator	2	ASME III	2	I	PA	W	
	Boron Injection Tank	2	ASME III	2	I	PA	W	See Note 1b
	Boron Injection Surge Tank	3	ASME III	3	I	PA	W	See Note 1b
	High Head SIS Pump	2	ASME III	2	I	PA	W	See Notes 1a, 1c & 2
	Boron Injection Tank Recirculation Pump	3	ASME III	3	I	PA	W	See Note 1b
	Boron Injection Flush Orifice	3	ASME III	3	-	PA	W	See Note 6
	Piping							
	Reactor Coolant Pressure Boundary	1	ASME III	1	I	CS/PA	W	
	Sample/drain, vent and test lines beyond the first pressure boundary isolation valve.	NNS	ANSI B31.1	-	-	PA	AE	
	BORON INJECT SURGE TANK - Recirculation Pump Loop piping	3	ASME III	3	I	PA	AE	
	~~Other~~	2	ASME III	2	I	PA	AE	
	Valves	2	ASME III and ANSI B16.5	2	I	PA/CS	AE	
6.5.1	Engineered Safety Feature Filter Systems							
	Containment Enclosure Emergency Cleanup System							

210.80 Why is the hydrogen analyzer on Sheet 5 of FSAR Table 3.2-2 not classified Safety Class 2 as are the other major components of the Combustible Gas Control System? The hydrogen analyzer should also be subject to a Quality Assurance Program that is in conformance with 10CFR Part 50, Appendix B.

RESPONSE: The redundant hydrogen analyzers are considered Class 1 E instruments. They meet all the requirements for a 1E instrument including 10CFR Part 50, Appendix B. The hydrogen analyzer will be removed from Table 3.2-2 as they are classified as instruments and instruments are not included in this table. The hydrogen analyzers are on the 1E Equipment List, Appendix 3H.

210.81 To assure consistency in the classification of fluid system components, the chiller pumps of the Boron Thermal Regeneration System shown on Page 16 of FSAR Table 3.2-2 should be classified Safety Class NNS. These components are currently unclassified.

RESPONSE: Table 3.2-2, page 16, has been modified to show NNS classification for the chiller pumps.

TABLE 3.2-2
(Sheet 5 of 31)

FSAR Section	Systems and Components	ANS Safety Class	Principal Design/Const. Codes/Stds.	Code Class	Seismic Category	Building(11)	Supplier	Notes
6.2.5	Combustible Gas Control in Containment							
	Hydrogen Recombiner Package	2	ASME III	2	I	CS	W	
	Piping and Valves (pressurized)	2	ASME III	2	I	CS	AE	
	Containment Recirculating Filter System							
	Fans	3	MFRS. STDS.	-	I	CS	AE	
	Filter Unit	-	MFRS. STDS.	-	-	CS	AE	
	Ductwork and Dampers	3	MFRS. STDS.	-	I	CS	AE	
	Containment Purge System							
	All pressurized components upstream of emergency exhaust filters (flow meter, throttle valve, piping)	2	ASME III	2	I	CS/CE	AE	
	Containment Atmosphere Sample System							
	~~Hydrogen Analyzer~~	~~NNS~~	~~MFRS. STDS.~~	~~-~~	~~I~~	~~CE~~	~~AE~~	44
	Supply and Exhaust Piping	2	ASME III	2	I	CS/CE	AE	
	Supply and Exhaust Valves	2	ASME III	2	I	CS/CE	AE	

TABLE 3.2-2
(Sheet 16 of 31)

FSAR Section	Systems and Components	ANS Safety Class	Principal Design/Const. Codes/Stds.	Code Class	Seismic Category	Building(11)	Supplier	Notes
	Reactor Coolant Pump Standpipe	NNS	ASME VIII	–	–	CS	W	
	Reactor Coolant Pump Standpipe Orifice	NNS	–	–	–	CS	W	
	Piping		ASME III	2	I	CS/PA	W/AE	See Note 3.
			ASME III	3	I	PA	W/AE	
		NNS	ANSI B31.1	–	–	PA	AE	
	Valves	2	ASME III	2	I	CS/PA	W/AE	See Note 3.
		3	ASME III	3	I	CS/PA	W/AE	
		NNS	ANSI B31.1	–	–	CS/PA	AE	
9.3.4	Boron Thermal Regeneration Subsystem							
	Chiller Pump	NNS	No Code	–	–	PA	W	See Note 6.
	Chiller Surge Tank	NNS	ASME VIII	–	–	PA	W	See Note 6.
	Moderating Heat Exchanger					PA	W	
	Tube Side	3	ASME III	3	–			See Note 6.
	Shell Side	3	ASME III	3	–			See Note 6.
	Letdown Chiller Heat Exchanger					PA	W	
	Tube Side	3	ASME III	3	–			See Note 6.
	Shell Side	NNS	ASME VIII	–				See Note 6.

DRAFT

210.82 The isolation dampers and duct work passing through the containment enclosure of the Primary Auxiliary Building Ventilation System on Sheet 21 of FSAR Table 3.2-2 is incorrectly classified as not designed to Seismic Category I Requirements. These components should be classified as Seismic Category I. Revise Table 3.2-2 accordingly.

RESPONSE: FSAR Table 3.2-2, Sheet 2 is being revised in Amendment 46 to correct the classification to Seismic Category I for isolation dampers and ductwork passing through the containment enclosure.

TABLE 3.2-2
(Sheet 21 of 31)

FSAR Section	Systems and Components	ANS Safety Class	Principal Design/Const. Codes/Stds.	Code Class	Seismic Category	Building(11)	Supplier	Notes
9.4.2	Fuel Storage Building Ventilation System							
	Ventilation Fans	-	MFRS. STDS.	-	-	FS	AE	
	Dampers	3	MFRS. STDS.	-	I	FS	AE	
	Ductwork	-	MFRS. STDS.	-	I	FS	AE	
9.4.3	Primary Auxiliary Building Ventilation System							
	Ventilation Fans	-	MFRS. STDS.	-	-	PA	AE	
	PCCW and SI Pump Area Wall Fans and Dampers	3	MFRS. STDS.	-	I	PA	AE	
	Normal Cleanup Exhaust Fans	-	MFRS. STDS.	-	-	PA	AE	
	Normal Cleanup Filters	-	MFRS. STDS.	-	-	PA	AE	
	Ductwork and Dampers							
	Isolation Dampers and Ductwork Passing through CE	2	MFRS. STDS.	-	I	PA/CE	AE	|
	Other	NNS	MFRS. STDS.	-	-	PA	AE	
9.4.4	Waste Processing Building Ventilation System							
	Fans	-	MFRS. STDS.	-	-	WP	AE	

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210.86 The staff has reviewed the report, "Stress Analysis for Nuclear Valves, FP-91924-07 (Fisher Controls Co. Report) Rev. 2, dated 8/18/80. Page 6 (and other pages) of this document lists, under design conditions, "Maximum Torque Required". This torque is used later (e.g., on P. 13) to calculate Shear Stresses in the shaft. If the "Maximum Torque Required" is substantially less than the torque capacity of the actuator (stall torque), please indicate what checks are made with the actuator stall torque.

RESPONSE: Fisher Controls Company (through their representative C. B. Ives Company, Inc.) has advised there is no problem in this regard because there are travel stops provided in the actuator to limit travel. Two travel stops are provided in the Limitorque Gear Units mounted on the valve shaft. The mechanical travel stops are set for two (2) positions, one at the fully closed position (0^o) and one at the full opened position (90^o) adjusted to prevent damage to the valve.

Limit switches in the Limitorque Operator are set to control the limits of travel and the seating of the valve disc in the rubber seat. In Limitorque Operators, this is referred to as "position seating" as opposed to "torque seating".

Torque switches are provided in the limitorque actuator to shut off the power to the motor if torque becomes excessive, which would happen if the limit switch should fail.

In view of these precautions, transmittal of the maximum possible operator torque to the valve shaft is not considered to be a credible event, and checks of valve shaft stress with maximum operator torque are not considered to be necessary.

210.87 Class 2 or 3 Piping, i-factors

At the 5/13/82 meeting held at United Engineers & Constructors, the applicant stated that presently-completed calculations for stresses at branch connections do not include the stress intensification i-factors as defined in the Code. If our understanding is correct, then the applicant should describe how the applicant can assure that piping systems are in compliance with Code requirements.

RESPONSE: The final documentation for the as-built piping systems, including both run and branch piping, will include the proper i-factors for all branches and tee connections required for full code compliance.

210.88 Bending Moment Checks on Flanged Joints

At the 5/13/82 meeting held at UE&C, the applicant stated that Code-required checks of bending moment capacity of flanged joints have been made. The applicant must provide a commitment to perform the Code-required checks of bending moment capacity of flanged joints in order to assure proper compliance, with Code requirements.

RESPONSE: As part of the as-built documentation for the Seabrook Plant, all flanged joints will be subjected to bending moment capacity checks to ensure compliance with the ASME Code requirements.