ATTACHMENT B

FISHER CONTROLS COMPANY
CONTINENTAL DIVISION

PROJECT NO. CD72-234
CUSTOMER ORDER NO. APO-70
SELLER'S ORDER NO. P-96940

SEISMIC ANALYSIS

OF

3", 20", & 24"

BUTTERFLY VALVE ASSEMBLIES

FOR

STONE & WEBSTER ENGINEERING CORPORATION

AGENT FOR

POWER AUTHORITY OF THE STATE OF NEW YORK

DATE: July 19, 1972

PREPARED BY: William G. Williams
William G. Williams, P. E.

APPROVED BY: Edward G. Holtgraver
Edward G. Holtgraver
Manager of Engineering

FISHER CONTROLS COMPANY
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* Our "procedure" covers a larger number of "planes" than are included in the valve assemblies covered by this analysis; please disregard those that do not apply.

As designated on the General Arrangements in the Appendices, Planes A, B, & C are on the power actuator end of the valve assemblies, and AA, BB, & CC are on the opposite end.

SCOPE OF ANALYSIS

3 different types of butterfly valve assemblies are analyzed in this report which apply to the following item and tag numbers.

Appendix	Continental Item No.	Customer Tag No.	Size	Type	Actuator
A	01	27AOV-114	24"	9222	Bettis 733 SR Phil Gear H2BS Manual
	02	27AOV-113	24"	9222	Bettis 733 SR Phil Gear H2BS Manual
	03	27AOV-111	24"	9222	Bettis 733 SR Phil Gear H2BS Manual
	04	27AOV-112	24"	9222	Bettis 733 SR Phil Gear H2BS Manual
B	05	27AOV-115	20"	9222	Bettis 732 SR Phil Gear H1BS Manual
	06	27AOV-116	20"	9222	Bettis 732 SR Phil Gear H1BS Manual
	07	27AOV-117	20"	9222	Bettis 732 SR Phil Gear H1BS Manual
	08	27AOV-118	20"	9222	Bettis 732 SR Phil Gear H1BS Manual
	11	27AOV-101A	20"	9222	Bettis 732 SR Phil Gear H1BS Manual
	12	27AOV-101B	20"	9222	Bettis 732 SR Phil Gear H1BS Manual
C	09	27MOV-113	3"	9220	Phil Gear SMB 000/5-HOB(
	10	27MOV-117	3"	9220	Phil Gear SMB 000/5-HOB(

CUSTOMER'S SEISMIC REQUIREMENTS

Calculations shall be prepared to demonstrate that these valve assemblies are capable of withstanding inertial loadings of 0.62 g. horizontally and 0.28 g. vertically, acting simultaneously, in addition to normal operating loadings.

Calculations shall also demonstrate that the extended parts of valve have a natural frequency of vibration greater than 50 cps.

The g-factors used were based on the option outlined in Stone & Webster Engineering Spec. APO-70, paragraphs 23.1b and 23.3 (Design Basis Earthquake).

PURPOSE

The purpose of this analysis is to prove mathematically that the equipment supplied by Fisher Controls Company is capable of performing all functions intended within the customer's specifications.

PROCEDURE:

Three "combined stress values," the maximum and minimum normal stress and the maximum shear stress, will be calculated for each area (Plane) being analyzed via our computer program. Only the total tensile stress, S_t, and the total shear stress, S_s, are used as input in the combined-stress-formulas; and these values, which were arrived at through numerous contributing calculations performed within the program, are listed on the printout. The formulas applicable to these contributing calculations will be shown in this report with supplementary explanations as required.

A computer printout sheet is included in this report for each PLANE analyzed, and the location of these planes are marked on the General Arrangements. See Appendices.

CRITICAL AREAS: The critical areas which might be considered under seismic inertial load conditions are Planes A, B, C, D, E. F, G, H, and J. However, as limited by the number of components in this valve assembly, all these Plane designations are not always applicable.

Planes A, C, E, and G are reserved for bolt systems between the valve body and first bracket, between first and second brackets, etc. These apply only to parts located along the shaft centerline including mounting brackets for rotary and manual actuators.

PROCEDURE (Cont'd.)

Planes designated B, D, and F apply to the weakest cross-sections of the aforementioned first three brackets. Planes H and J are only used relative to a linear actuator bracket - Plane H being the weakest cross-section and Plane J the bolt system between the linear actuator and the mounting bracket.

NON-CRITICAL AREAS: The valve body is considered to be rigidly mounted in the pipeline and is stronger than the mating pipe. Previous calculations have shown that the stresses due to seismic loading on the internal parts of the valve (disc, shaft, etc.) are insignificant. Therefore, these specific parts are not analyzed in this report.

STRESS CALCULATIONS: The three combined stress values for each plane were calculated using the "Principal Stress Formulas." The "Maximum Shear Stress Theory" of failure is used as specified in Section III of the ASME Boiler and Pressure Vessel Code, paragraph NB-3212.

The total load at any of these planes consists of the normal operating load, plus the weight of those components supported by the critical area multiplied by the seismic G-factor. The latter is considered to act at the center of gravity of the assembly involved.

The effect of the seismic inertial load acting on a plane is reduced as the distance from the valve centerline to that plane increases, because less components are involved; for example, the seismic load on Plane C is less than on Plane A, etc. The valve body is considered to be rigidly and integrally connected to the pipeline.

PROCEDURE (Cont'd.)

COMPUTER PRINTOUT: Each printout contains two sections: the ANSWERS, given on the lower part of the page; and the VARIABLES on the upper part. The answers include: total tensile stress, S_t; total shear stress, S_s; maximum effective shear stress, S_s max; maximum effective normal stress, S_n max; and the minimum effective normal stress, S_n min. Normal stresses are compressive if negative (-); otherwise they are tensile.

All variables pertinent to calculations for the plane being analyzed are listed on the printout. See pages 6 to 9 for explanation of symbols.

This provides the customer with basic background information contributing to the answers, and enables the engineer performing these calculations to check the variables entered into the computer. Zeros will be used for variables where no numeric value prevails.

The top line of each printout sheet contains the specific PLANE - designation and the corresponding ITEM NUMBER. Please refer to page 1 for the location of the General Arrangement Drawing for each item, where plane locations are marked. NOTE: Each PLANE must be cross-referenced to a particular ITEM NUMBER.

DEFINITION OF VARIABLES

X1 Distance from plane being analyzed to center of gravity of first component

X2 Distance from plane being analyzed to center of gravity of second component

X3 Distance from plane being analyzed to center of gravity of third component

X4 Distance from plane being analyzed to center of gravity of fourth component

X7 Distance from plane being analyzed to center of gravity of linear actuator mounting bracket.

X8 Distance from plane being analyzed to center of gravity of linear actuator.

X9 Distance from mounting surface of linear actuator bracket to its center of gravity

X10 Distance from mounting surface of linear actuator bracket to center of gravity of linear actuator.

X11 Distance from edge of linear actuator mounting surface to centerline of nearer bolts in X-direction.

X12 Distance between linear actuator mounting bolts in X-direction.

THE ABOVE MEASUREMENTS ARE ALONG CENTERLINE OF VALVE SHAFT (X-direction)

Y1 Vertical distance from shaft centerline to center of gravity of first component

Y2 Vertical distance from shaft centerline to center of gravity of second component

Y3 Vertical distance from shaft centerline to center of gravity of third component

Y4 Vertical distance from shaft centerline to center of gravity of fourth component

Y5 Vertical distance from bottom edge of component to centerline of lower bolts

Y6 Vertical distance between bolts

Y7 Vertical distance from shaft centerline to center of gravity of linear actuator mounting bracket

Y8 Vertical distance from shaft centerline to center of gravity of linear actuator

Y9 Vertical distance from mounting surface of linear actuator to its center of gravity.

DEFINITION OF VARIABLES (Cont'd.)

Z1 Transverse distance from shaft centerline to center of gravity of first component.

Z2 Transverse distance from shaft centerline to center of gravity of second component.

Z3 Transverse distance from shaft centerline to center of gravity of third component.

Z4 Transverse distance from shaft centerline to center of gravity of fourth component.

Z5 Transverse distance from edge of component to centerline of nearer bolts

Z6 Transverse distance between bolts.

Z7 Transverse distance from shaft centerline to center of gravity of linear actuator mounting bracket.

Z8 Transverse distance from shaft centerline to center of gravity of linear actuator.

Z9 Transverse distance from edge of linear actuator surface to centerline of nearer bolts.

Z10 Transverse distance between linear actuator mounting bolts.

W1 Weight of first component

W2 Weight of second component

W3 Weight of third component

W4 Weight of fourth component

W7 Weight of linear actuator bracket

W8 Weight of linear actuator

DEFINITION OF VARIABLES (Cont'd.)

G_v Vertical seismic G-factor

G_H Horizontal seismic G-factor

VTR Valve torque required (actuator torque required)

EL Effective lever length of linear actuator

A_b Total root area of bolts

Z_{zz} Section modulus about transverse centroidal axis of area being analyzed

Z_{yy} Section modulus about vertical centroidal axis of area being analyzed

A_s Cross sectional area of plane under analysis

R Distance from valve shaft centerline to centroid of one half of cross sectional area.

F_s Shear force - due to seismic loading and force of linear actuator.

M_t Torsional moment due to actuator output, horizontal and vertical seismic loadings.

VBM Vertical bending moment due to vertical seismic load and linear actuator output

HBM Horizontal bending moment due to horizontal seismic load

DEFINITION OF ANSWERS

Refer to computer printout under "Stress Summary"

S_t	Total tensile stress due to loading
S_s	Total shear stress due to loading
S_s max	Maximum equivalent shear stress calculated via combined stress formula
S_n max	Maximum equivalent normal stress (usually tensile) calculated via combined stress formula
S_n min	Minimum equivalent normal stress (usually compressive) calculated via combined stress formula
$S_{t}yp$	Yield stress in tension of material at section under analysis
$S_{s}yp$	Yield stress in shear of material at section under analysis

PLANES A, C, E, AND G

These are all bolt systems and are subjected to both tensile and shear stresses. In review, only the total tensile and shear stresses are shown on the printout sheet. The formulas necessary to make the step by step contributing calculations to arrive at the above values, are performed within the computer program. These will now be listed and explained. (Definition of symbols on pages 6 through 9.)

CALCULATE TENSILE STRESSES: Tensile stresses result from bending moments caused by the seismic inertial load acting at the center of gravity of the assembly of components supported by these bolts and the actuator force. The magnitude of this stress is greater in the bolts where the maximum strain occurs, and the strain produced in the bolts is proportional to their distance from the edge of the component, which acts as a pivot line. This pivot line is perpendicular to the action line of the force so can be either vertical or horizontal depending on which load is under study.

PLANES A, C, E, AND G (Cont'd.)

By taking moments about a horizontal, then a vertical pivot line, we developed the following formulas: (A1) and (A2) respectively (N = total number of bolts)

(A1) Tensile load per bolt (Due to vertical seismic load) =

$$\frac{VSM}{\left(\frac{Y_5^2}{Y_5 + Y_6} + Y_5 + Y_6\right)(0.5N)}$$

Where VSM (Vertical seismic moment) = $(G_v + 1)(\leq \bar{X}\, W)$

Note #1: Where W = total weight of components supported by the plane being analyzed; and $\bar{X}$ is the distance from this plane to the center of gravity of these components, measured in a direction away from the valve centerline.

(A1.1) For Planes A & B, VSM = $(G_v + 1)\ (X_1 W_1 + X_2 W_2 + X_3 W_3 +$ ---- etc.)

(A1.2) For Planes C & D, VSM = $(G_v + 1)\ (X_2 W_2 + X_3 W_3 + X_4 W_4 +$ ---- etc.)

(A1.3) For Planes E & F, VSM = $(G_v + 1)\ (X_3 W_3 + X_4 W_4 + X_7 W_7 + X_8 W_8)$

(A2) Tensile load per bolt (Due to horizontal seismic load) =

$$\frac{HBM}{\left(\frac{Z_5^2}{Z_5 + Z_6} + Z_5 + Z_6\right)(0.5N)}$$

Where HBM (Horizontal bending moment) = $(G_H)(\leq \bar{X}\, W)$

Refer to "Note #1" above.

(A2.1) For Planes A & B, HBM = $(G_H)\ (X_1 W_1 + X_2 W_2 + X_3 W_3 +$ ---- etc.)

(A2.2) For Planes C & D, HBM = $(G_H)\ (X_2 W_2 + X_3 W_3 + X_4 W_4 +$ ---- etc.)

(A2.3) For Planes E & F, HBM = $(G_H)\ (X_3 W_3 + X_4 W_4 + X_7 W_7 + X_8 W_8)$

PLANES A, C, E, AND G (Cont'd.)

(A3) Tensile load per bolt (Due to actuator force)

$$= \frac{\text{Bending moment due to actuator force}}{\left(\frac{Y_5^2}{Y_5 + Y_6} + Y_5 + Y_6\right)(0.5N)}$$

Where "Bending moment due to actuator torque" $= \frac{VTR}{EL}$ (K) = (F_A) (K)

K = distance from centerline of actuator to plane being analyzed

F_A = force exerted by actuator

(A3.1) For Planes A & B, above bending moment = (F_A) (X_8)

(A3.2) For Planes C & D, above bending moment = (F_A) $(X_8$ - length of first component

(A3.3) For Planes E & F, above bending moment = (F_A) $(X_8$ - length of first and second components)

(A3.4) For Planes G, above bending moment = (F_A) $(X_8$ - length of first, second, and third components)

(A4) Bolt area, $A_b = 0.785 \left(D_b - \frac{1.22}{n}\right)^2 (N)$

Where:

D_b = bolt diameter

n = threads per inch

(A5) Then total tensile stress, $S_t = \frac{\text{Total load}}{\text{Bolt area}} = \frac{(A1) + (A2) + (A3)}{\frac{(A4)}{N}}$

CALCULATE SHEAR STRESSES: The total shear stress will be found by combining all forces causing shear stresses, then dividing by the bolt area. Some forces act in direct shear and others in torsion.

PLANES A, C. E, AND G (Cont'd.)

(A6) Direct shear force due to seismic loading, $F_1 = (\Sigma W)\sqrt{(G_v + 1)^2 + G_H^2}$

Where W = total weight of components supported by plane being analyzed

(A6.1) For Planes A & B, $F_1 = (W_1 + W_2 + W_3 + W_4 + W_7 + W_8)\sqrt{(G_v + 1)^2 + G_H^2}$.

(A6.2) For Planes C & D, $F_1 = (W_2 + W_3 + W_4 + W_7 + W_8)\sqrt{(G_v + 1)^2 + G_H^2}$

(A6.3) For Planes E & F, $F_1 = (W_3 + W_4 + W_7 + W_8)\sqrt{(G_v + 1)^2 + G_H^2}$

Note: Seismic factors are added vectorially for direct shear

(A7) Shear force due to actuator, $F_2 = \frac{VTR}{EL}$ (EL = effective lever length)

The VTR, "Valve torque required", also called "actuator torque", is a function of construction materials, shaft size, valve size, disc interference and pressure drop; and this value is calculated using proprietary methods.

(A8) Shear force due to torsional moments, $F_3 = \frac{\text{Total torsional moment}}{0.5\ BC}$

For Planes A & B, $F_3 = \frac{VTR + (G_v+1)(W_1Z_1 + W_2Z_2 + W_3Z_3 + W_4Z_4 + W_7Z_7 + W_8Z_8)}{0.5\ BC}$ +

$$\frac{G_H\ (W_1Y_1 + W_2Y_2 + W_3Y_3 + W_4Y_4 + W_7Y_7 + W_8Y_8)}{0.5\ BC}$$

For Plane C & D, F_3 = Same as above formula, except delete the terms containing W_1

For Plane E & F, F_3 = Same as above formula, except delete the terms containing W_1 and

Where: Bolt circle diameter, $BC = \sqrt{(Y_6)^2 + (Z_6)^2}$

(A9) Then total shear stress, $S_s = \frac{\text{total shear force}}{\text{total bolt area}} = \frac{(A6) + (A7) + (A8)}{(A4)}$

PLANES A, C, E, AND G (Cont'd.)

CALCULATE THE COMBINED STRESS VALUES (ANSWERS):

(A10) Use the "Principal Stress Formulas"

$$S_n \max = \frac{S_t}{2} + \sqrt{\left(\frac{S_t}{2}\right)^2 + S_s^{\;2}}$$

$$S_n \min = \frac{S_t}{2} - \sqrt{\left(\frac{S_t}{2}\right)^2 + S_s^{\;2}}$$

$$S_s \max = \frac{S_n \max - S_n \min}{2}$$

Note: These answers are on the computer printout under "Stress Summary." The yield stresses in both tension and shear are also given for comparison.

See formula (A5) for the value of S_t

See formula (A9) for the value of S_s

PLANES B, D, AND F

These are the most severely loaded cross sections of the first three brackets and are subjected to both tensile and shear stresses. For all practical purposes, we can consider the loading at Plane B to be equal to that at Plane A, the load at Plane D to be equal to that at Plane C, and the load at Plane F to be equal to that at Plane E.

Again, only the total tensile and shear stresses are given on the computer printout sheet. The formulas for the step by step calculations leading to the above values, which are performed within the computer program, will now be listed and explained. (Definition of symbols on pages 6 through 9).

CALCULATE TENSILE STRESSES: The same loadings that cause tensile stresses on Planes B, D, and F also act on Planes A, C, E, and G. The explanation given for the latter four planes also applies here.

The total tensile stress, S_t, listed on the computer printout, is a summation of three individual tensile stresses caused by the vertical and horizontal bending moments and the actuator force.

(B1) Tensile stress due to vertical bending moment $= \dfrac{\text{Moment}}{\text{Section Modulus}} = \dfrac{VSM}{Z_{zz}}$

The VSM is calculated using formulas A1.1, A1.2, or A1.3 as outlined on page 11.

Note: The section modulus, which depends on the configuration of the cross-sectional area, must be calculated for each plane analyzed.

PLANES B, D, AND F (Cont'd.)

(B2) Tensile stress due to horizontal bending moment $= \frac{HBM}{Z_{YY}}$

The HBM is calculated using formulas A2.1, A2.2, or A2.3 as outlined on page 11.

See "Note" under (B1) above (concerning section modulus).

(B3) Tensile stress due to actuator force $= \frac{\text{(Actuator force) (K)}}{Z_{zz}} = \frac{(F_A)(K)}{Z_{zz}}$

K = distance from actuator centerline to plane being analyzed. See formulas A3.1, A3.2, A3.3, and A3.4 which include values of K for each plane.

(B4) Then total tensile stress, S_t = (B1) + (B2) + (B3)

CALCULATE SHEAR STRESSES: The same loadings that cause shear stresses on Planes B, D, and F also act on Planes A, C, E, and G.

The total shear stress, S_s, listed on the computer printout, is a summation of individual shear stresses caused by the vertical and horizontal seismic inertial loadings, and the actuator output.

(B5) Shear stress due to direct seismic shear forces $= \frac{\text{Force}}{\text{Area of Section}}$

The force and area will vary, depending on the plane being analyzed. For values of "force", see formulas A6.1, A6.2, and A6.3 on page 13.

(B6) Shear stress due to torsional moments $= \frac{\text{Total torsional moment}}{\text{(R) (Area of Section)}}$

Where "R" is the effective radius (See "Definitions of Variables")
The "total torsional moment" varies with the plane being analyzed and is covered in detail by formula (A8) on page 13.

(B7) Total shear stress, S_s = (B5) + (B6)

PLANES B, D, AND F (Cont'd.)

(B8) CALCULATE THE COMBINED STRESS VALUES: (ANSWERS)

Use the same "Principal Stress Formulas" as given under (A10) on page 14.

See formula (B4) for the value of S_t

See formula (B7) for the value of S_s

CALCULATE THE NATURAL FREQUENCY OF VIBRATION

These calculations are based on the following assumptions:

(1) The valve body is firmly clamped and unable to move relative to the pipeline.

(2) The extended parts of the assembly are cantilevered from the valve body and act as a mass at the end of a cantilever beam. The cantilever beam has a uniform cross section equal to the section with the least moment of inertia. Thus, the value calculated is lower than the actual natural frequency.

(3) Damping effects are not large enough to significantly alter the natural frequency.

The spring constant, K, and the natural frequency, F_N, are calculated using the following formulas:

$$K = \frac{3\,E\,I}{L^3}$$

$$F_N = \frac{1}{2\pi}\sqrt{\frac{K\,(g)}{W}} \quad \text{(Cycles per second)}$$

Where:

E = Modulus of elasticity

I = Moment of inertia

L = Length of cantilever, in.

g = Acceleration due to gravity, in/sec^2

W = Weight, lb.

CALCULATE THE NATURAL FREQUENCY OF VIBRATION (Cont'd.)

	POWER ACTUATOR END			OPPOSITE END	
Item	01 - 04	05-08, 11, 12	09, 10	01 - 04	05-08, 11,12
E	30×10^6 →				
I	34.6	34.6	1.216	87.4	87.4
L	14.72	12.38	7.75	15.12	13.02
K	0.976×10^6	1.64×10^6	0.235×10^6	2.276×10^6	3.564×10^6
g	386 →				
W	473	402	269	266	217
F_N	142	200	92	289	400

These calculations demonstrate that the extended parts of the valves have a natural frequency of vibration greater than 50 cps, thus meeting the customer's specifications.

SUMMARY AND CONCLUSIONS

Based on the calculations shown in this report, we have demonstrated that the primary steady state stresses, when combined with the inertial loading resulting from the response to a ground acceleration of 0.28 g. acting in the vertical and 0.62 g. acting in the horizontal planes simultaneously, produce combined stresses which do not exceed 75 % of the minimum yield strength of the material as stated in the customer specifications.

Also, calculations verify that the extended parts of each valve assembly have a natural frequency of vibration greater than 50 cycles per second.

In summary, this seismic analysis proves mathematically that the equipment supplied by Fisher Controls Company is capable of performing all functions intended within the Stone & Webster Engineering Corporation specifications.

REFERENCES:

"Elements of Strength of Materials" Fifth Edition
By: Timoshenko and Young

"Design of Machine Members" Fourth Edition
By: Doughtie and Vallance

"Design of Machine Elements"
By: Faires

ASME Boiler and Pressure Vessel Code-Section III
"Rules for Construction of Nuclear Power Plant Components" 1971

"Mechanical Engineers' Handbook" Seventh Edition
By: Marks

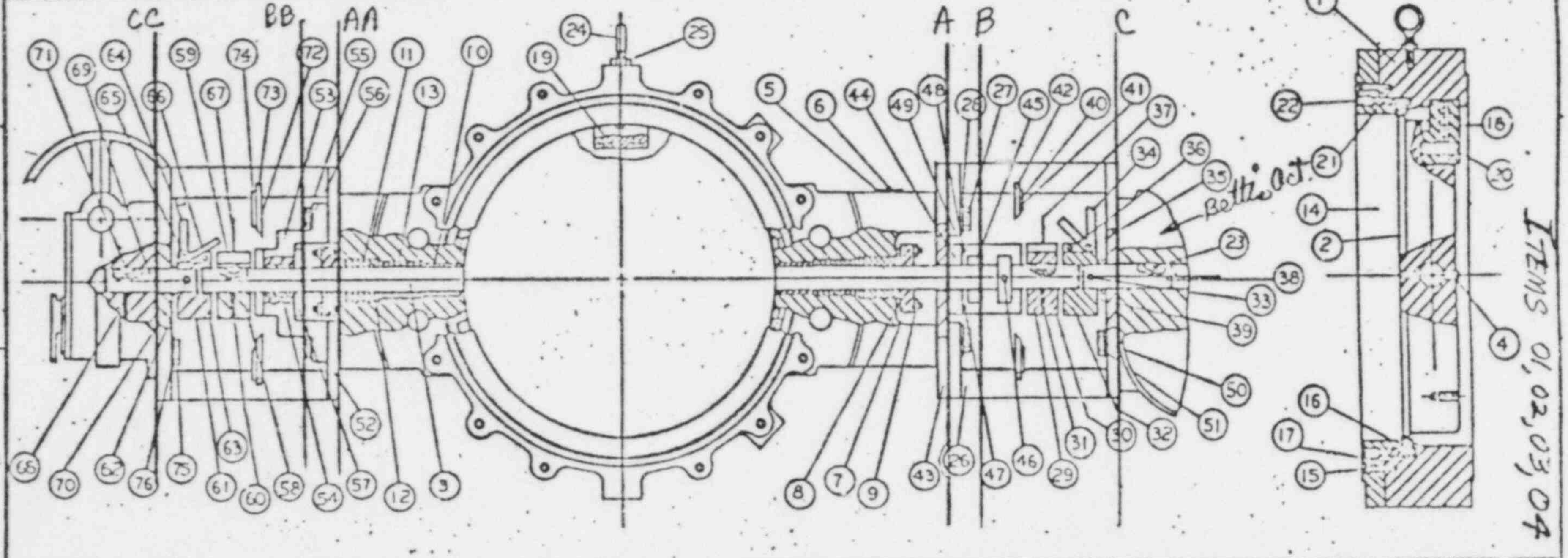
SAE Handbook, 1969 Edition

APPENDIX A

ITEM	QTY	DESCRIPTION	MATERIAL	PART NO.	ITEM	QTY	DESCRIPTION	MATERIAL	PART NO.	ITEM	QUAN	DESCRIPTION	MATERIAL	PART NO.
1	1	VALVE BODY	ASME SA 516-GR-70	F-47266	27	4	HEX HD SCW.	STEEL, PL.	G-13150	53	1	BEARING BRACKET	CAST IRON	G-20622
2	1	DISC	ASME SA 516-GR-70	F-19785	28	4	LOCKWASHER	STEEL, PL.	F-13618	54	1	BUSHING	JOHNSON EN	G-10779
3	1	SHAFT	ASTM A 564 GR.630	E-17649	29	1	COUPLING RD	S/STL #410	R-11009	55	4	HEX HD SCW.	STEEL, PL.	G-17629
4	2	TAPER PIN	ASME-SA-479-316	G-17149	30	1	KEY WOODRUFF	ALLOY STEEL	F-13587	56	4	LOCKWASHER	STEEL, PL.	F-13618
5	1	SERIAL TAG	S/STEEL #302	F-19353	31	1	SET SCW.	ALLOY STEEL	G-10788	57	2	CLAMP TYPE COLLAR	STEEL	J-17787
6	8	DRIVE SCW.	STEEL, PL.	F-16110	32	1	COUPLING RECT.	S/STL #410	R-17118	58	1	COUPLING RD	S/STL #410	R-11009
7	1	PACKING FOLLOWER	DUCTILE IRON	F-15615	33	1	PIN (BLACK)	ALLOY STEEL	R-13616	59	1	KEY WOODRUFF	ALLOY STEEL	F-13587
8	4	STUD	ASME SA 193-B7	F-16365	34	1	DIS. LEVER	S/STL #410	J-11809	60	1	SET SCW.	ALLOY STEEL	G-10785
9	4	HEX NUT	ASTM A 194-GR. 2H (C)	F-13595	35	1	SPRING PIN	S/STEEL	R-13617	61	1	COUPLING RECT.	S/STL #410	R-11529
10	2	GROUND BUSHING	NAVAL BRONZE	F-15291	36	1	SPRING BALL	STEEL	R-13924	62	1	PIN (BLACK)	ALLOY STEEL	R-13616
11	10	PACKING	CRANE 2042	E-11116	37	1	SPRING PIN	S/STEEL	G-11972	63	1	BUSHING	SINT. BRONZE	F-14535
12	2	PACKING WASHER	S/STL #316	F-16166	38	1	OPERATOR SHAFT	S/STL. 17-4 PH	E-12589	64	1	DIS. LEVER	S/STL #410	J-11809
13	2	RETAINER TUBE	S/STEEL #316	G-11088	39	1	RETAINER TUBE	S/STL #316	G-10715	65	1	SPRING PIN	S/STEEL	R-13617
14	1	RETAINING PLATE	ASME SA 516-GR-70	G-21757	40	1	INDICATOR DIAL	S/STL #302	G-21670	66	1	SPRING BALL	STEEL	R-13924
15	10	SOC. HD. CAP SCW.	ALLOY STEEL	F-19096	41	1	ANGLE DIAL MTG.	S/STL #1020 CD. PL.	E-12632	67	1	SPRING PIN	S/STEEL	G-11972
16	1	TEE RING	R.P.T.	E-11775	42	4	SELF TAP SCW.	STEEL, PL.	G-19066	68	1	SET SCW.	ALLOY STEEL	F-16678
17	1	TOP RING	R.P.T.	G-12967	43	1	SWITCH PLATE	STEEL #1020	F-25787	69	1	OPERATOR SHAFT	S/STL 17-4 PH	E-12634
18	1	STOP	STEEL #1020	E-12444	44	2	SPACER BLOCK	STEEL #1020	F-17556	70	1	RETAINER TUBE	S/STL #316	G-17767
19	2	SOC HD CAP SCW.	ALLOY STEEL	F-19098	45	2	CAM	STEEL #1020	R-17726	71	1	WOODRUFF KEY	ALLOY STEEL	R-11561
20	2	SOC HD SET SCW.	ALLOY STEEL	F-15112	46	4	SET SCW.	ALLOY STEEL	F-16110	72	1	ANGLE DIAL MTG.	S/STL #1020 CD PL	E-12639
21	1	COMPRESSION RING	STEEL #1020	E-11778	47	4	RD HD SCW.	STEEL, PL.	G-12676	73	4	SELF TAP SCW.	STEEL, PL.	G-19066
22	12	SOC HD SET SCW.	ALLOY STEEL	F-15679	48	4	RD HD SCW.	STEEL, PL.	F-13673	74	1	INDICATOR DIAL	S/STL #302	G-21673
23	1	KEY WOODRUFF	ALLOY STEEL	F-13592	49	8	LOCKWASHER	STEEL, PL.	F-13617	75	4	HEX HD SCW.	STEEL, PL.	G-17260
24	1	LIFTING EYE	STEEL	F-18197	50	4	HEX HD SCW.	STEEL, PL.	F-19069	76	4	LOCKWASHER	STEEL, PL.	F-13618
25	1	HEX NUT	STEEL, PL.	F-13595	51	4	LOCKWASHER	STEEL, PL.	F-13618	77	20	FLANGE STUD (B)	ASME SA 193 GR. B7	R-17657
26	1	BRACKET	STEEL #1020	F-19106	52	1	BRACKET (FAB.)	STEEL #1020	F-39101	78	40	NUT HEAVY, HEX (C)	ASME SA 194 GR.7	R-17733

REFERENCE DRAWINGS		
DESCRIPTION	DRAWING	MARK

NUCLEAR



ITEMS 01, 02, 03, 04

CD 72-234

B	JG	6-5-76	

F-96760-01
Serial No. BF-171050
Tag No. 2TAOV-11A
F-96760-03
Serial No. BF-171052
Tag No. 2TAOV-11B

CROSS SECTIONAL DRAWING
24" OFFSET TEE RING VALVE W/ BETTIS 733-SR ACTUATOR
AND LIMITORQUE H1BC W/ SPUR GEAR

FISHER CONTROLS COMPANY
CONTINENTAL DIVISION
Coraopolis, Pennsylvania 15108

DISTRIBUTION

JG 5-10-76

F-39121 B

PROJECT #CD 72- 234 ITEM 1 thru 4 PLANE A

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8
7.080	15.562	.000	.000	.000	.000

Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8
.000	3.187	.000	.000	1.750	9.500	.000	.000

Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_7	Z_8
.000	4.937	.000	.000	1.625	2.750	.000	.000

W_1	W_2	W_3	W_4	W_7	W_8
47.200	426.000	.000	.000	.000	.000

G_v+1	G_H	VTR	EL	A_b
1.280	.620	8230.000	.000	1.236

STRESS SUMMARY

S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t yp$	$S_s yp$
2654	2469	2803	4130	-1475	57000	34200

PROJECT #CD 72- 234 ITEM 1 thru 4 PLANE B

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8		
7.080	15.562	.000	.000	.000	.000		
Y_1	Y_2	Y_3	Y_4	Z_{zz}	R	Y_7	Y_8
.000	3.187	.000	.000	42.300	5.980	.000	.000
Z_1	Z_2	Z_3	Z_4	Z_{yy}	F_s	Z_7	Z_8
.000	4.937	.000	.000	11.530	673.009	.000	.000
W_1	W_2	W_3	W_4	W_7	W_8		
47.200	426.000	.000	.000	.000	.000		
C_v+1	C_H	M_t	VTR	A_s	VBM	HBM	
1.280	.620	11763.797	8230.000	7.620	8913	4317	

STRESS SUMMARY

S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t yp$	$S_s yp$
585	346	453	746	-160	30000	18000

PROJECT #CD 72- 234 ITEM 1 thru 4 PLANE C

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8		
.000	3.562	.000	.000	.000	.000		
Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8
.000	3.187	.000	.000	.750	4.062	.000	.000
Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_7	Z_8
.000	4.937	.000	.000	.750	4.062	.000	.000
W_1	W_2	W_3	W_4	W_7	W_8		
.000	426.000	.000	.000	.000	.000		
C_v+1	C_H	VTR	EL	A_b			
1.280	.620	8230.000	.000	1.236			

STRESS SUMMARY

S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t yp$	$S_s yp$
946	3803	3833	4306	-3359	57000	34200

1AA

PROJECT #CD 72- 234 ITEM 1 thru 4 PLANE AA

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8		
8.400	18.610	.000	.000	.000	.000		
Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8
.000	2.107	.000	.000	.750	9.500	.000	.000
Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_7	Z_8
1.000	1.464	.000	.000	.750	2.750	.000	.000
W_1	W_2	W_3	W_4	W_7	W_8		
91.000	175.000	.000	.000	.000	.000		
G_v+1	G_H	VTR	EL	A_b			
1.280	.620	8230.000	.000	.828			

STRESS SUMMARY

S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t YP$	$S_s YP$
2851	2602	2967	4393	-1542	57000	34200

53

PROJECT #CD 72- 234 ITEM 1 thru 4 PLANE BB

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8		
8.400	18.610	.000	.000	.000	.000		
Y_1	Y_2	Y_3	Y_4	Z_{xx}	R	Y_7	Y_8
.000	2.107	.000	.000	61.000	7.040	.000	.000
Z_1	Z_2	Z_3	Z_4	Z_{yy}	F_e	Z_7	Z_8
.000	1.464	.000	.000	21.850	378.318	.000	.000
W_1	W_2	W_3	W_4	W_7	W_8		
91.000	175.000	.000	.000	.000	.000		
C_v+1	C_H	M_t	VTR	A_s	VBM	HBM	
1.280	.620	8786.545	8230.000	10.980	5147	2493	

STRESS SUMMARY

S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t yp$	$S_s yp$
198	148	178	277	-79	30000	18000

CC

PROJECT #CD 72- 234 ITEM 1 thru 4 PLANE CC

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8		
.000	3.110	.000	.000	.000	.000		
Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8
.000	2.107	.000	.000	.750	10.875	.000	.000
Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_7	Z_8
.000	1.464	.000	.000	.750	4.500	.000	.000
W_1	W_2	W_3	W_4	W_7	W_8		
.000	175.000	.000	.000	.000	.000		
G_v+1	G_H	VTR	EL	A_b			
1.280	.620	8230.000	.000	1.236			

STRESS SUMMARY

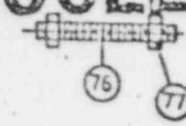
S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t yp$	$S_s yp$
198	1409	1412	1512	-1313	57000	34200

APPENDIX B

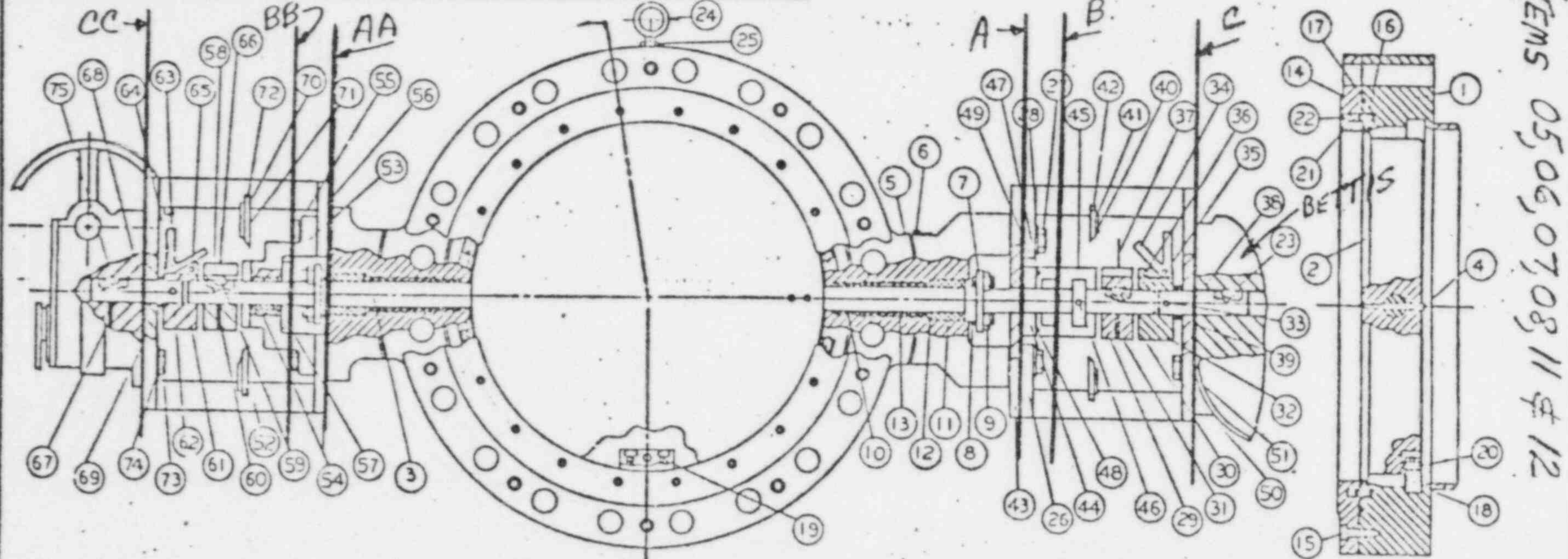
ITEM	QUAN	DESCRIPTION	MATERIAL	PART NO.
1	1	VALVE BODY	ASME SA 515 GR-70	F-42093
2	1	DISC	ASME SA 515 GR-70	F-39107
3	1	SHAFT	ASTM A 564-GT-630	E-12610
4	2	TAPER PIN	ASME-SA-479-316	F-13517
5	1	DETAIL TAG	S/STEEL #302	F-19153
6	2	[illegible]	STEEL, PL.	F-14160
7	2	PACKING FOLLOWER	DUCTILE IRON	F-10799
8	4	STUD	ASME SA 193-B7	F-14745
9	4	HEX NUT	ASTM A194 GR. 2H	F-13576
10	2	INWARD BUSHINGS	[illegible] BRONZE	0-10983
11	10	PACKING	GRAPH FOIL	F-12956
12	2	PACKING WASHER	S/STEEL #316	F-16363
13	2	RETAINER TUBE	S/STEEL #316	F-13331
14	1	RETAINING PLATE	ASTM SA 516 GR-70	F-39095
15	20	SOC HD CAP SCW.	ALLOY STEEL	F-19096
16	1	T RING	E.P.T.	E-12690
17	1	"O" RING	E.P.T.	0-12961
18	1	STOP	STEEL #1020	E-12589
19	2	SOC HD CAP SCW.	ALLOY STEEL	F-10630
20	2	SOC HD SET SCW.	ALLOY STEEL	0-12445
21	1	COMPRESSION RING	STEEL #1020	E-12591
22	20	SOC HD SET SCW.	ALLOY STEEL	F-15578
23	1	KEY WOODRUFF	ALLOY STEEL	F-15678
24	1	LIFTING EYE	STEEL	F-19197
25	1	HEX NUT	STEEL, PL.	F-12795
26	1	BRACKET	STEEL #1020	F-39105
27	4	HEX HD.SCW.	STEEL, PL.	F-14301
28	4	LOCKWASHER	STEEL, PL.	F-13417
29	1	COUPLING RD.	S/STL. #410	R-13278
30	1	KEY WOODRUFF	ALLOY STEEL	F-13501
31	1	SET SCW.	ALLOY STEEL	0-10738
32	1	COUPLING RECT.	S/STEEL #410	0-10773
33	1	PIN (BLACK)	ALLOY STEEL	0-12373
34	1	DISENGAGING LEVER	S/STEEL #410	0-12077
35	2	SPRING PIN	S/STEEL	0-11972
36	1	SPRING BALL	STEEL	0-10953
37	1	GROOVE PIN	STEEL	R-12773
38	1	OPERATOR SHAFT	17-4 PH	E-17590
39	1	RETAINER TUBE	S/STEEL #316	0-10984
40	1	INDICATOR DIAL	S/STL. #302	0-21670
41	1	ANGLE DIAL MTG.	STL. #1020 CD. PL.	E-12832
42	4	SELF TAP SCW.	STEEL, PL.	0-19066
43	4	SWITCH PLATE	STEEL, #1020	F-27657
44	2	SPACER BLOCK	STEEL #1020	F-12856
45	2	CAMS	STEEL #1020	R-12970
46	4	SET SCW.	ALLOY STEEL	F-13756
47	4	RD. HD. SCW.	STEEL, PL.	0-12674
48	4	RD. HD. SCW.	STEEL, PL.	F-13573
49	8	LOCKWASHERS	STEEL, PL.	F-13412
50	4	HEX HD. SCW.	STEEL, PL.	F-19029
51	4	LOCKWASHER	STEEL, PL.	F-13418
52	1	BRACKET	STEEL #1020	F-39106
53	1	BEARING BRACKET	CAST IRON	0-71396
54	1	BUSHING	JOHN #[illegible]	F-15316
55	4	HEX HD. SCW.	STEEL, PL.	F-15678
56	4	LOCKWASHERS	STEEL, PL.	F-13417
57	2	CLAMP TYPE COLLARS	STEEL	J-17736
58	1	COUPLING RD.	S/STEEL #410	R-13278
59	1	KEY WOODRUFF	ALLOY STEEL	F-13501
60	1	SET SCW.	ALLOY STEEL	0-10738
61	1	COUPLING RECT.	S/STL. #410	0-10773
62	1	PIN (BLACK)	ALLOY STEEL	0-12373
63	1	DISENGAGING LEVER	S/STL. #410	0-12077
64	2	SPRING PIN	S/STEEL	0-11972
65	1	SPRING BALL	STEEL	0-10953
66	1	GROOVE PIN	STEEL	R-12221
67	2	SET SCW.	ALLOY STEEL	F-13784
68	1	OPERATOR SHAFT	17-4 PH	E-17541
69	1	RETAINER TUBE	S/STL. #316	0-10683
70	1	INDICATOR DIAL	S/STL. #302	0-21673
71	1	ANGLE DIAL MTG.	STEEL #1020 CD. PL.	E-12619
72	4	SELF TAP SCW.	STEEL,PL.	0-19066
73	4	HEX HD. SCW.	STEEL, PL.	F-15011
74	4	LOCKWASHER	STEEL, PL.	F-13417
75	1	KEY WOODRUFF	ALLOY STEEL	F-13501
76	20	FLANGE STUD (N)	ASME SA 193 GR. B7	E-12656
77	40	NUT HVY. HEX (N)	ASME SA 194 GR. 7	J-10404

REFERENCE DRAWINGS		
DESCRIPTION	DRAWING	DATE

NUCLEAR



ITEMS 05, 06, 07, 08, 11 & 12



CD 72-234

B	JCL	6-2-72	

P-96710-06
Serial No. BF 171055
Tag No. 27AOY-116
P-96710-07
Serial No. BF 171056
Tag No. 27AOY-117

P-96710-11
Serial No. BF-171060
Tag No. 27AOY-101A
P-96710-12
Serial No. BF-171061
Tag No. 27AOY-101B

CROSS SECTIONAL DRAWING
20" OFFSET TEE RING VALVE W/BETTIS T312R ACTUATOR
AND LIMITORQUE HBC W/SPUR GEAR

FISHER CONTROLS COMPANY
CONTINENTAL DIVISION
Coraopolis, Pennsylvania 15108

JG 3/72

DISTRIBUTION

F-39119 B

PROJECT #CD 72- 234 ITEM 5,6,7,8,11 & 12 PLANE A

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8		
5.590	13.062	.000	.000	.000	.000		
Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8
.000	3.187	.000	.000	1.875	8.250	.000	.000
Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_7	Z_8
.000	9.437	.000	.000	2.000	2.000	.000	.000
W_1	W_2	W_3	W_4	W_7	W_8		
36.600	365.000	.000	.000	.000	.000		
C_v+1	C_H	VTR	EL	A_b			
1.280	.620	5105.000	.000	.828			

STRESS SUMMARY

S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t yp$	$S_s yp$
2957	3602	3893	5372	-2415	57000	34200

PROJECT ØCD 72- 234 ITEM 5,6,7,8,11 & 12 PLANE B

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8		
5.590	13.062	.000	.000	.000	.000		

Y_1	Y_2	Y_3	Y_4	Z_{zz}	R	Y_7	Y_8
.000	3.187	.000	.000	38.500	5.480	.000	.000

Z_1	Z_2	Z_3	Z_4	Z_{yy}	Z_s	Z_7	Z_8
.000	9.437	.000	.000	11.530	571.176	.000	.000

W_1	W_2	W_3	W_4	W_7	W_8
36.600	365.000	.000	.000	.000	.000

G_v+1	G_H	M_t	VTR	A_s	VBM	HBM
1.280	.620	10235.184	5105.000	7.620	6364	3082

STRESS SUMMARY

S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t yp$	$S_s yp$
432	320	336	602	-169	30000	18000

PROJECT #CD 72- 234 ITEM 5,6,7,8,11 & 12 PLANE C

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8		
.000	3.562	.000	.000	.000	.000		
Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8
.000	3.187	.000	.000	.750	4.062	.000	.000
Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_7	Z_8
.000	9.437	.000	.000	.750	4.062	.000	.000
W_1	W_2	W_3	W_4	W_7	W_8		
.000	365.000	.000	.000	.000	.000		
C_v+1	C_H	VTR	EL	A_b			
1.280	.620	5105.000	.000	1.236			

STRESS SUMMARY

S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t yp$	$S_s yp$
810	3303	3327	3733	-2922	57000	34200

5AA

PROJECT #CD 72- 234 ITEM 5,6,7,8,11 & 12 PLANE AA

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8		
7.150	16.220	.000	.000	.000	.000		
Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8
.000	1.857	.000	.000	.625	8.250	.000	.000
Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_7	Z_8
.000	1.758	.000	.000	.625	2.000	.000	.000
W_1	W_2	W_3	W_4	W_7	W_8		
76.400	140.000	.000	.000	.000	.000		
C_v+1	C_H	VTR	EL	A_b			
1.250	.620	5105.000	.000	.828			

STRESS SUMMARY

S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t yp$	$S_s yp$
2497	1959	2323	3572	-1075	57000	34200

555

PROJECT #CD 72- 234 ITEM 5,6,7,8,11 & 12 PLANE BB

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8		
7.150	16.220	.000	.000	.000	.000		
Y_1	Y_2	Y_3	Y_4	Z_{xx}	R	Y_7	Y_8
.000	1.857	.000	.000	50.600	6.040	.000	.000
Z_1	Z_2	Z_3	Z_4	Z_{yy}	F_s	Z_7	Z_8
.000	1.758	.000	.000	21.850	307.775	.000	.000
W_1	W_2	W_3	W_4	W_7	W_8		
76.400	140.000	.000	.000	.000	.000		
G_v+1	G_H	M_t	VTR	A_s	VBM	HBM	
1.280	.620	5581.221	5105.000	10.980	3605	1746	

STRESS SUMMARY

S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t YP$	$S_s YP$
151	112	135	210	-59	30000	18000

5CC

PROJECT #CD 72- 234 ITEM 5,6,7,8,11 & 12 PLANE CC

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8		
.000	3.220	.000	.000	.000	.000		
Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8
.000	1.857	.000	.000	.625	9.250	.000	.000
Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_7	Z_8
.000	1.758	.000	.000	.625	3.812	.000	.000
W_1	W_2	W_3	W_4	W_7	W_8		
.000	140.000	.000	.000	.000	.000		
C_v+1	C_H	VTR	EL	A_b			
1.280	.620	5105.000	.000	.828			

STRESS SUMMARY

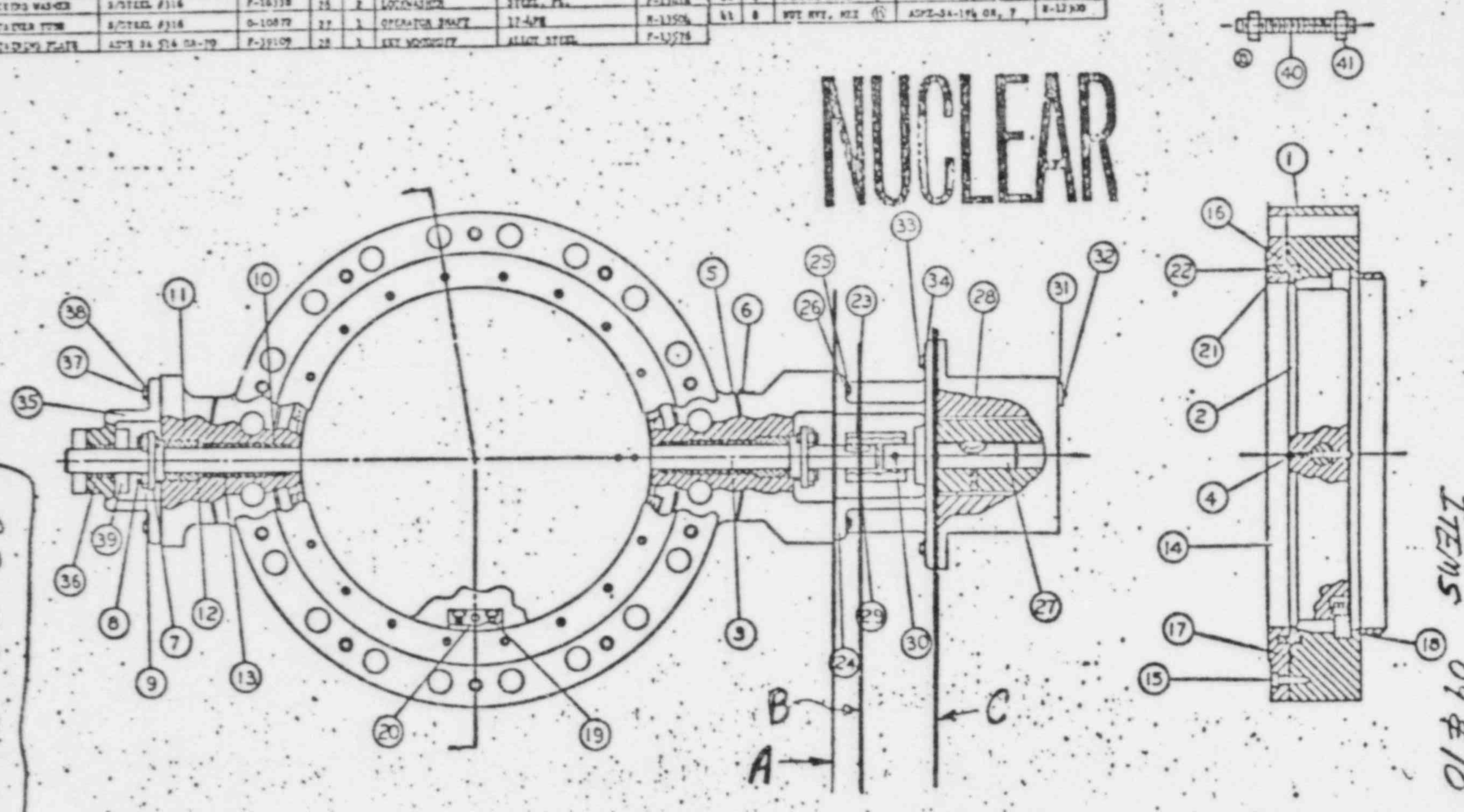
S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t yp$	$S_s yp$
289	1587	1594	1739	-1449	57000	34200

APPENDIX C

ITEM	QUAN	DESCRIPTION	MATERIAL	PART NO.
1	1	VALVE BODY (N)	ASME-SA-216 GR. WCB	F-42090
2	1	DISC	ASME-SA 351 GR. CF-8M	D-71472
3	1	SHAFT	ASTM A 564 GR-630	E-12651
4	2	TAPER PIN	ASME-SA-479-316	D-17514
5	1	SERIAL TAG	S/STEEL #302	F-19153
6	2	DRIVE SCW.	STEEL, PL.	F-14140
7	2	PACKING FOLLOWER	DUCTILE IRON	F-10[illegible]
8	4	STUD	ASME SA 193-B7	F-14761
9	4	HEX NUT	ASTM A194 GR. 2H	F-13599
10	2	INBOARD BUSHING	MANG. BRONZE	D-10548
11	10	PACKING	CRANE PCKG	E-12580
12	2	PACKING WASHER	S/STEEL #316	F-16338
13	2	RETAINER RING	S/STEEL #316	D-10872
14	1	RETAINING PLATE	ASTM SA 516 GR-70	F-39109
15	6	SOC HD.CAP SCW.	ALLOY STEEL	F-14767
16	1	TEE RING	E.P.T.	E-12695
17	1	TOP RING	E.P.T.	E-12579
18	1	STOP	STEEL #1020	E-12650
19	2	SOC HD CAP SCW.	ALLOY STEEL	F-14767
20	1	SOC HD SET SCW.	ALLOY STEEL	F-13953
21	1	COMPRESSION RING	STEEL #1020	E-12583
22	8	SOC HD SET SCW.	ALLOY STEEL	F-15285
23	1	KEY WOODRUFF	ALLOY STEEL	F-13576
24	1	BRACKET	DUCTILE IRON	D-71479
25	2	HEX HD SCW.	STEEL, PL.	F-13707
26	2	LOCKWASHER	STEEL, PL.	F-13414
27	1	OPERATOR SHAFT	17-4PH	E-13504
28	1	KEY WOODRUFF	ALLOY STEEL	F-13576
29	1	COUPLING	S/STL. #410	D-17154
30	1	PIN (BLACK)	ALLOY STEEL	D-17171
31	1	INDICATOR DIAL	S/STL. #302	F-17450
32	2	SELF TAP SCW.	STEEL, PL.	D-19056
33	4	HEX HD SCW.	STEEL, PL.	F-14292
34	4	LOCKWASHER	STEEL, PL.	F-13414
35	1	BEARING BRACKET	CAST IRON	D-71475
36	1	BUSHING	JOHNSON [illegible]	D-10718
37	2	HEX HD SCW.	STEEL, PL.	F-13[illegible]
38	2	LOCKWASHER	STEEL, PL.	F-13414
39	2	CLAMP TYPE COLLAR	STEEL	J-17781
40	4	FLANGE STUD (N)	ASME-SA-193 GR. B7	E-12637
41	8	NUT HVY. HEX (N)	ASME-SA-194 GR. 7	E-12330

REFERENCE DRAWINGS

DESCRIPTION	DRAWING	MARK



ITEMS 09 & 10

CD 72-234

P-96960-09
Serial No. BF-171058
Tag No. 1TW07-113
P-96960-10
Serial No. BF-171059
Tag No. 1TW07-117

CROSS SECTIONAL DRAWING
3" OFFSET TEE RING VALVE
W/ LIMITORQUE SMB-00/5-H3BC

FISHER CONTROLS COMPANY
CONTINENTAL DIVISION
Coraopolis, Pennsylvania 15108

DWN. JG
CHK.

DISTRIBUTION

F-39120 B

PROJECT #CD 72- 234   ITEM 9 & 10   PLANE A

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8		
2.210	8.050	.000	.000	.000	.000		
Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8
.000	7.800	.000	.000	.562	4.625	.000	.000
Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_7	Z_8
.200	.000	.000	.000	.875	.000	.000	.000
W_1	W_2	W_3	W_4	W_7	W_8		
13.540	255.000	.000	.000	.000	.000		
G_v+1	G_H	VTR	EL	A_b			
1.280	.620	74.000	.000	.230			

STRESS SUMMARY

S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t yp$	$S_s yp$
8898	3388	5592	10042	-1143	57000	34200

45

PROJECT #CD 72- 234 ITEM 94 10 PLANE B

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8		
2.210	8.050	.000	.000	.000	.000		
Y_1	Y_2	Y_3	Y_4	Z_{xx}	R	Y_7	Y_8
.000	7.800	.000	.000	3.030	1.810	.000	.000
Z_1	Z_2	Z_3	Z_4	Z_{yy}	F_s	Z_7	Z_8
.200	.000	.000	.000	.847	381.931	.000	.000
W_1	W_2	W_3	W_4	W_7	W_8		
13.540	255.000	.000	.000	.000	.000		
G_v+1	G_H	M_t	VTR	A_s	VBM	HBM	
1.280	.620	1310.646	74.000	2.530	2665	1291	

STRESS SUMMARY

S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t yp$	$S_s yp$
2404	437	1279	2481	-77	45000	27000

4C

PROJECT #CD 72- 234   ITEM 9 & 10   PLANE C

VARIABLES

X_1	X_2	X_3	X_4	X_7	X_8		
.000	5.300	.000	.000	.000	.000		
Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8
.000	7.800	.000	.000	.500	8.250	.000	.000
Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_7	Z_8
.200	.000	.000	.000	.500	8.250	.000	.000
W_1	W_2	W_3	W_4	W_7	W_8		
.000	255.000	.000	.000	.000	.000		
G_v+1	G_H	VTR	EL	A_b			
1.280	.620	74.000	.000	.517			

STRESS SUMMARY

S_t	S_s	$S_s max$	$S_n max$	$S_n min$	$S_t YP$	$S_s YP$
1131	1134	1268	1833	-702	57000	34200

CUSTOMER STONE & WEBSTER SHS/NHS 29
PASNY
CUSTOMER P. O. APO-70

PROCEDURE SUBMITTAL RECORD

PLANT NAME JAMES A. FITZPATRICK NUCLEAR PLANT
NINE MILE POINT

AGENT P. O. Z-17961

LOCATION SCRIBA, NEW YORK

	FISHER SPEC'S	VENDOR'S PROCEDURES					1ST SUBMITTAL			2ND SUBMITTAL			3RD SUBMITTAL	
		10-VICS	LED	[illegible]	ORLA		SUBMIT	REPLY	COMMENTS	SUBMIT	REPLY	COMMENTS	SUBMIT	REPLY
[illegible]	NHS 29													
[illegible]														
1 [illegible]							[illegible]							
2 LED 4-23-70			WP-WLD				5-23-72							
3 ORLA					P-1		5-23-72							
[illegible]														
2 ORLA 9-4-69					P-8		5-23-72							
[illegible]														
[illegible]														
[illegible]														
[illegible]														
[illegible]		RP 51903					6-14-72							
[illegible]	EMP 2G1						5-23-72							
1 [illegible]	EMP 2F1						5-23-72							
2 [illegible]		PT-02					6-2-72							
MAGNETIC PARTICLE														
1 [illegible]		MT 10.1					6-20-72							
[illegible]														
DIAPHRAGM TO CASE [illegible]														
[illegible]	EMP 2X14						5-23-72							
[illegible]	EMP 2X16						↓							
[illegible]	EMP 2X17						↓							
[illegible]	EMS 7X6						↓							
[illegible]							↓							
[illegible]	EMP 11A2						↓							
SEALING	EMP 12[illegible]						↓							
WES/DEL							↓							
SHS-ONLY HANDLING	SHS253						↓							