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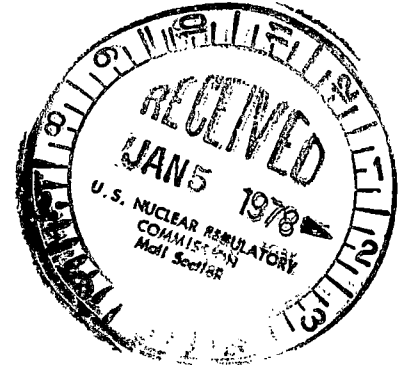
December 30, 1977

Director of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Mr. George Lear, Chief
Operating Reactors Branch 3
Division of Operating Reactors

Gentlemen:

FRACTURE TOUGHNESS AND
POTENTIAL FOR LAMELLAR TEARING
OF SG AND RCP SUPPORT MATERIALS
NO. 1 UNIT
SALEM NUCLEAR GENERATING STATION
DOCKET NO. 50-272



In our letter of December 21, 1977 (attached) on the above subject, the attachments were inadvertently omitted. Enclosed are forty (40) copies of the attachments and six (6) sets of blueprints.

Librizzi

F. P. Librizzi
General Manager -
Electric Production

ADDITIONAL INFORMATION

FRACTURE TOUGHNESS AND POTENTIAL
FOR LAMELLAR TEARING OF STEAM
GENERATOR AND REACTOR COOLANT
PUMP SUPPORT MATERIALS

NO. 1 UNIT
SALEM NUCLEAR GENERATING STATION
DOCKET NO. 50-272

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1. Provide engineering drawings of the steam generator and reactor coolant pump supports sufficient to show the geometry of all principal elements. Provide a listing of materials of construction.

Response

The below listed drawings are attached.

<u>Drawing No.</u>		<u>Title</u>
208900-A-8823-3	-	No. 1 Unit, Steam Generator and Reactor Coolant Pump Supports, Location Plans
208903-A-8823-12	-	No. 1 and 2 Units, Steam Generator Supports
208904-A-8823-12	-	No. 1 and 2 Units, Steam Generator Supports
208905-A-8823-11	-	No. 1 and 2 Units, Reactor Coolant Pump Supports
208906-A-8823-12	-	No. 1 and 2 Units, Reactor Coolant Pump Supports
201320-AB-3557-2	-	No. 1 and 2 units, Reactor Coolant Pump Supports

The supports are constructed of ASTM A441 High Strength Low Alloy steel. Welding was done with the following rods:

AWS E70T-1 FCAW Electrodes
AWS E70T-2 FCAW Electrodes
AWS E7016, 17, 18 SMAW Electrodes
AWS F71-EL12 SAW Electrodes

2. Specify the detailed design loads used in the analysis and design of the supports. For each loading condition (normal, upset, emergency and faulted), provide the calculated maximum stress in each principal element of the support system and the corresponding allowable stresses.

Response

The detailed design loads and stresses and corresponding allowable stresses are provided in the nine tables attached.

3. Describe how all heavy section intersecting member weldments were designed to minimize restraint and lamellar tearing. Specify the actual section thicknesses in the structure and provide details of typical joint designs. State the maximum design stress used for the through-thickness direction of plates and elements of rolled shapes.

Response

Most intersecting primary members are connected flange to flange by butt welds or are connected to gusset plates by fillet welds. These types of connections are not susceptible to lamellar tearing. Those members connected by welded tee and corner joints subject to through-thickness design stresses are as follows:

Steam Generator Supports

- (a) PL 18" x 4" x 2'-0", Section 10-10, Drawing No. 208904-A-8823-12
Maximum Through-Thickness Stress = 19.23 ksi
- (b) Plate Girders and W36 x 280 supporting W14 x 202 columns, Plan B-B and Section 10-10, Drawing Nos. 208903-A-8823-12 and 208904-A-8823-12 respectively. Maximum Through-Thickness Stress = 19.23 ksi.
- (c) PL 20" x 4'-4" x 1'-8", Detail F, Drawing No. 208903-A-8823-12. Maximum Through-Thickness Stress = 16.24 ksi.
- (d) PL 20" x 3" x 3'-10", Section 7-7, Drawing No. 208903-A-8823-12. Maximum Through-Thickness Stress = 15.00 ksi.

Reactor Coolant Pump Supports

- (a) PL 13" x 5" x 1'-8", Detail E and Section 5-5, Drawing No. 208905-A-8823-11. Maximum Through-Thickness Stress = 18.23 ksi.
- (b) Bar 6" x 2", Section 6-6, Drawing No. 208906-A-8823-12. Maximum Through-Thickness Stress = 26.11 ksi.
- (c) PL 18" x 4" x 4'-10", Section 7-7, Drawing No. 208906-A-8823-12. Maximum Through-Thickness Stress = 11.11 ksi.
- (d) PL 22" x 3" x 3'-6", Section 3-3, Drawing No. 208905-A-8823-11. Maximum Through-Thickness Stress = 11.78 ksi.

There is no potential for fatigue crack growth in these members since these through-thickness tensile stresses are based on emergency and faulted conditions.

- 4. Specify the minimum operating temperature for the supports and describe the extent to which material temperatures have been measured at various points on the supports during the operation of the plant.

Response

Material temperatures have not been measured on the supports. The operating temperature for the supports would be at least the ambient temperature within the containment. The average operating temperature in the containment is approximately 100°F with a minimum of 70°F. The fracture toughness of the supports assures that they will not exhibit brittle behavior at these temperatures.

5. Specify all the materials used in the supports and the extent to which mill certificate data are available. Describe any supplemental requirements such as melting practice, toughness tests and through-thickness tests specified. Provide the results of all tests that may better define the properties of the materials used.

Response

Mill certificate data is available for all materials used in the supports. All primary structural members are silicon killed and normalized ASTM A441 steel subject to a supplementary requirement for Charpy V-Notch testing (20 ft.-lb. minimum at 20°F). This toughness requirement was met with ample margin.

6. Describe the welding procedures and any special welding process requirements that were specified to minimize residual stress, weld and heat affected zone cracking and lamellar tearing of the base metal.

Response

All shop welding was done in accordance with AWS D2.0, "Specification for Welded Highway and Railway Bridges." Detailed joint procedure specifications were submitted by the fabricator for review and approval by PSE&G engineering personnel. The following preheat requirements were specified to minimize residual stress:

- (a) Material less than 3/4" thick shall be preheated to 100°F if the ambient temperature falls below 40°F.
- (b) Material 3/4" to 1-1/2" thick shall be preheated to 150°F prior to welding.
- (c) Material 1-1/2" to 2-1/2" thick shall be preheated to 225°F before welding.
- (d) Material over 2-1/2" thick shall be preheated to 300°F before welding.

7. Describe all inspections and non-destructive tests that were performed on the supports during their fabrication and installation, as well as any additional inspections that were performed during the life of the facility.

Response

All welds were subject to visual inspection in accordance with AWS requirements. All full penetration shop welds were subject to magnetic particle inspection at four (4) depths supplemented, where practical, by ultrasonic inspection of the finished weld. After installation, welds on the supports were subject to another magnetic particle inspection. This inspection revealed only minor surface defects on some welds, none critical to the structural integrity of the supports. Nonetheless, these welds were repaired.

SALEM NUCLEAR GENERATING STATION
UNITS NO. 1 & 2

STEAM GENERATOR AND REACTOR COOLANT PUMP SUPPORTS

LOADING COMBINATIONS AND ALLOWABLE STRESS LIMITS

LOADING COMBINATIONS	SUPPORTS - ALLOWABLE STRESS LIMIT
1. Normal Loads	Working stresses per AISC code.
2. Normal loads + operating base earthquake (upset condition)	1-1/3 working stresses AISC code.
3. Normal loads + pipe rupture loads (emergency condition)	90% of yield stress of material.
4. Normal loads + design base earthquake (faulted condition)	90% of yield stress of material.
5. Normal loads + design base earthquake + pipe rupture loads (faulted condition)	Yield stress of material.

SALEM GENERATING STATION

STEAM GENERATOR SUPPORTS

NOMENCLATURE: f_b = BENDING STRESS F_b = BENDING STRESS f_p = BEARING STRESS f_c = COMPRESSIVE STRESS F_p = BEARING STRESS F_c = COMPRESSIVE STRESS f_t = TENSILE STRESS F_t = TENSILE STRESS f_v = SHEAR STRESS F_v = SHEAR STRESS KIP = 1000 LBS K.S.I. = KIPS/IN ²	LOADING COMB.:1 NORMAL LOADS FLOODED CONDITION LOADS IN KIPS		LOADING COMB.:2 UPSET CONDITION OPERATING BASE EARTHQUAKE + NORMAL LOADS KIPS		LOADING COMB.:3 [EMERGENCY CONDITION] NORMAL LOADS + PIPE RUPTURE LOADS LOADS IN KIPS				LOADING COMB.:4 FAULTED CONDITION NORMAL LOADS + DESIGN BASE EARTHQUAKE LOADS IN KIPS			
	NORMAL LOAD FLOODED = 1,235.0 K.		NORMAL + SEISMIC VERTICAL = 1,322.0 K SEISMIC HORIZ. = 50.0 K LOAD ON BELLY BEND = 204.0 K		R.C. PUMP SUCTION PIPE RUPTURE DESIGN LOADS VERTICAL UP = -2,370.0 K HORIZONTAL = 1970.0 K VERTICAL DOWN = 1235.0 K NORMAL LOADS		HOT LEG PIPE RUPTURE DESIGN LOADS HORIZONTAL = 3,140.0 K NORMAL LOADS = 1,235.0 K VERTICAL DOWN		STEAM PIPE RUPTURE LOAD HORIZ. ON BELLY BEND = 3,730.0 K SUPPORT NORMAL LOAD = 2798.0 K PIPE RUPTURE - VERTICAL		NORMAL + SEISMIC VERTICAL LOAD = 1420.0 K HORIZONTAL LOAD = 92.0 K LOAD ON BELLY BEND = 360.0 K	
MEMBER IDENTIFICATION	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.
POST 14WF20Z UNDER S.G. PADS	$f_a = 5.198$	$F_a = 24.5$	$f_a = 5.565$	$F_a = 32.585$	$f_t = 17.845$ $f_a = 6.677$ $f_t \text{ BOLTS} = 125.22$	$F_t = 37.8$ $F_a = 36.75$ $F_t = 148.95$	$f_a = 5.198$	$F_a = 36.75$	$f_a = 11.785$	$F_a = 36.75$	$f_a = 5.977$	$F_a = 36.75$
BEAMS UNDER THE POST 14WF20Z: a. 36WF280	$f_b = 9.9$	$F_b = 28.0$	$f_b = 10.6$	$F_b = 37.24$	$f_b = 23.278$ $f_v = 21.450$	$F_b = 37.8$	$f_b = 9.9$	$F_b = 37.8$	$f_b = 22.4$	$F_b = 37.8$	$f_b = 7.932$	$F_b = 37.8$
b. PLATE GIRDER	$f_b = 12.87$	$F_b = 28.0$	$f_b = 13.7$	$F_b = 37.24$	$f_b = 10.788$ $f_v = 15.100$	$F_v = 23.625$	$f_b = 12.87$	$F_b = 37.8$	$f_b = 29.20$	$F_b = 37.8$	$f_b = 14.796$	$F_b = 37.8$
BEAMS FRAMING INTO 14WF320 EL. 94'-11"	$f_b = 11.27$	$F_b = 28.0$	$f_b = 12.06$	$F_b = 37.24$	$f_b = 24.0$ $f_v = 14.66$ $f_a = 12.135$	$F_b = 37.8$ $F_v = 23.625$ $F_a = 37.8$	$f_b = 11.27$	$F_b = 37.8$	$f_b = 24.8$	$F_b = 37.8$	$f_b = 12.954$	$F_b = 37.8$
a. 36WF280	$f_b = 11.27$	$F_b = 28.0$	$f_b = 8.275$	$F_b = 37.24$	$f_b = 27.879$ $f_v = 16.200$ $f_a = 10.280$	$F_b = 37.8$ $F_v = 23.625$ $F_a = 37.8$	$f_b = 7.73$	$F_b = 37.8$	$f_b = 12.435$	$F_b = 37.8$	$f_b = 8.88$	$F_b = 37.8$
b. PLATE GIRDER	$f_b = 7.73$	$F_b = 28.0$	$f_b = 8.275$	$F_b = 37.24$	$f_a = 9.25$ OR $f_t = 14.65$	$F_a = 34.82$ $F_t = 37.80$	—	—	—	—	—	—
COLUMNS 14WF320	$f_a = 0$ $f_t = 0$	—	—	—	$f_a = 13.9$ OR $f_t = 19.65$	$F_a = 34.860$ $F_t = 37.80$	$f_a = 3.06$	$F_a = 35.55$	$f_a = 8.56$	$F_a = 35.55$	$f_a = 3.557$	$F_a = 35.64$
COLUMNS 14WF426	$f_a = 3.06$ $f_t = 0$	$F_a = 23.7$	$f_a = 3.312$	$F_a = 31.6$	—	—	—	—	—	—	—	—
8 1/2" PINS f_p = BEARING STRESS	$f_p = 5.63$ $f_b = 11.835$ $f_v = 3.375$	$F_p = 87.3$ $F_b = 58.2$ $F_v = 38.8$	$f_p = 6.0$ $f_b = 16.67$ $f_v = 3.6$	$F_p = 87.3$ $F_b = 77.4$ $F_v = 51.604$	$f_p = 30.4$ $f_b = .79.5$ $f_v = 18.8$	$F_p = 87.3$ $F_b = 87.3$ $F_v = 54.56$	$f_p = 5.63$ $f_b = 11.835$ $f_v = 3.375$	$F_p = 87.3$ $F_b = 87.5$ $F_v = 54.55$	$f_p = 12.76$ $f_b = 26.82$ $f_v = 7.650$	$F_p = 87.3$ $F_b = 87.3$ $F_v = 54.55$	$f_p = 6.444$ $f_b = 18.0$ $f_v = 3.866$	$F_p = 87.3$ $F_b = 87.3$ $F_v = 54.55$
BEARING ON 4" PINS	$f_p = 5.63$	$F_p = 37.8$	$f_p = 6.0$	$F_p = 37.8$	$f_p = 30.4$	$F_p = 37.8$	$f_p = 5.63$	$F_p = 37.8$	$f_p = 12.76$	$F_p = 37.8$	$f_p = 6.44$	$F_p = 37.8$
27WF177-TIES	—	—	$f_t = 0.478$	$F_t = 33.51$	—	—	$f_t = 20.15$	$F_t = 37.8$	—	—	$f_t = 0.514$	$F_t = 37.8$
23" A 490 BOLTS	—	—	$f_t = 1.052$	$F_t = 71.8$	—	—	$f_t = 79.77$	$F_t = 103.5$	—	—	$f_t = 1.123$	$F_t = 103.5$

SALEM GENERATING STATION

STEAM GENERATOR SUPPORTS - SALEM GENERATING STATION

NOMENCLATURE:				LOADING COMB.: 1				LOADING COMB.: 2				LOADING COMB.: 3 [EMERGENCY CONDITION]				LOADING COMB.: 4											
f_b = BENDING STRESS F_b = BENDING STRESS f_a = COMPRESSIVE STRESS F_a = COMP. STRESS f_t = TENSILE STRESS F_t = TENSILE STRESS f_v = SHEAR STRESS F_v = SHEAR STRESS KIP = 1000 LBS				NORMAL LOADS FLOODED CONDITION LOADS IN KIPS				NORMAL + SEISMIC VERTICAL = 1,322.0 K SEISMIC HORIZ. = 50.0 K LOAD ON BELLY BEND = 204.0 K				R.C. PUMP SUCTION PIPE RUPTURE DESIGN LOADS VERTICAL UP = -2,370.0 K HORIZONTAL = 1970.0 K VERTICAL DOWN = 1235.0 K NORMAL LOADS				HOT LEG PIPE RUPTURE DESIGN LOADS HORIZONTAL = 3,140.0 K NORMAL LOADS = 1,235.0 K VERTICAL DOWN				STEAM PIPE RUPTURE LOAD HORIZ. ON BELLY BEND = 3,730.0 K SUPPORT PIPE RUPTURE + 1 = 2798.0 K NORMAL LOAD + VERTICAL DOWN				FAULTED CONDITION NORMAL LOADS + DESIGN BASE EARTHQUAKE LOADS IN KIPS NORMAL + SEISMIC VERTICAL LOAD = 1420.0 K HORIZONTAL LOAD = 92.0 K LOAD ON BELLY BEND = 360.0 K			
MEMBER IDENTIFICATION				CALCULATED STRESSES IN K.S.I.		ALLOWABLE STRESSES IN K.S.I.		CALCULATED STRESSES IN K.S.I.		ALLOWABLE STRESSES IN K.S.I.		CALCULATED STRESSES IN K.S.I.		ALLOWABLE STRESSES IN K.S.I.		CALCULATED STRESSES IN K.S.I.		ALLOWABLE STRESSES IN K.S.I.		CALCULATED STRESSES IN K.S.I.		ALLOWABLE STRESSES IN K.S.I.					
HORIZONTAL PLATE GIRDERS AT EL. 100'-8 1/4" FLGS R 17x21" WEB R 26x2"				-		-		-		-		$f_b = 17.26$ $f_v = 16.38$		$F_b = 37.8$ $F_v = 23.625$		$f_b = 35.47$ $f_v = 22.00$		$F_b = 37.8$ $F_v = 23.65$		-		-					
3" SHEAR PLATES EL. 100'-8 1/4" (BEARING)				-		-		-		-		$f_p = 14.388$		$F_p = 37.8$		$f_p = 29.00$		$F_p = 37.8$		-		-					
DIAGONAL BRACING MEMBERS 14WF127				-		-		-		-		$f_a = 20.800$ OR $f_t = 19.50$		$F_a = 34.320$ OR $F_t = 37.8$		-		-		-		-					
SHEAR BLOCK BEAM 14WF158				-		-		-		-		$f_p = 27.7$ $f_a = 27.15$		$F_p = 37.8$ $F_a = 36.0$		-		-		-		-					
EMBEDDED STEEL a. 6" ϕ ANCHOR BOLT				-		-		-		-		$f_t = 37.44$		$F_t = 38.7$		-		-		-		-					
b. 4" PLATES AT PIN- HOLE				$f_p = 5.63$		$F_p = 37.8$		$F_p = 6.0$		$F_p = 37.8$		$f_t = 32.98$		$F_t = 37.8$		$f_p = 5.63$		$F_p = 37.8$		$f_p = 12.76$		$F_p = 37.8$					
BELLY BEND AT EL. 130'-0" a. R 21" x 26"				-		-		$f_t = 1.76$		$F_t = 28.74$		-		-		-		-		$f_t = 32.171$		$F_t = 32.4$					
b. R 21" x 5'-4"				-		-		$f_p = 0.039$		$F_p = 32.400$		-		-		-		-		$f_p = 1.82$		$F_p = 32.4$					
c. LOAD ON SNUBBER				-		-		$P = 51.0$		$P = 1000.0$		-		-		-		-		$P = 932.5$		$P = 1000 K$					

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SALEM GENERATING STATION

STEAM GENERATOR SUPPORT

f_b = BENDING STRESS
 F_b =
 f_a = COMP. STRESS
 F_a =
 f_p = BEARING STRESS
 F_p =
 f_t = TENSILE STRESS
 F_t =
 f_v = SHEAR STRESS
 F_v =
 KIPS = 1000 LBS
 f_{TB} = BOLT TENSILE STRESS

LOADING COMBINATION: 5 [FAULTED CONDITION]

NORMAL LOADS + PIPE RUPTURE LOADS +
 DESIGN BASE EARTHQUAKE
 LOADS IN KIPS

R.C. PUMP SUCTION
 PIPE RUPTURE
 DESIGN LOADS
 PIPE BREAK + SEISMIC
 = -2,555.0 K UP
 NORMAL = 1,235.0 K DN
 HORIZ. LOAD = 2062. K

HOT LEG PIPE
 RUPTURE
 DESIGN LOADS
 HORIZ. = 3,232.0 K
 VERTICAL = 1,420.0 K
 DOWN

STEAM PIPE
 RUPTURE LOAD
 DESIGN LOADS
 HORIZ. ON BELLY
 BEND = 4,090. K
 VERTICAL = 2,983.0 K
 DOWN

MEMBER IDENTIFICATION	CALCULATED STRESSES K.S.I.	ALLOWABLE STRESSES K.S.I.	CALCULATED STRESSES K.S.I.	ALLOWABLE STRESSES K.S.I.	CALCULATED STRESSES K.S.I.	ALLOWABLE STRESSES K.S.I.
1 POST 14WF202 UNDER S.G. PADS	$f_t = 19.23$ $f_a = 7.198$	$F_t = 42.0$ $F_a = 40.425$	$f_a = 5.977$	$F_a = 40.42$	$f_a = 12.56$	$F_a = 40.425$
1 1/2" ϕ VASCOMAX BOLTS	$f_{TB} = 135.0$	$F_{TB} = 165.3$	-	-	-	-
2 BEAMS UNDER THE 14WF202 POST	$f_b = 25.09$ $f_v = 23.12$	$F_b = 42.0$ $F_v = 26.25$	$f_b = 7.932$	$F_b = 42.0$	$f_b = 23.945$ $f_v = 19.69$	$F_b = 42.0$ $F_v = 26.25$
a. 36WF280	$f_b = 11.62$ $f_v = 16.278$	$F_b = 42.0$ $F_v = 26.25$	$f_b = 14.796$	$F_b = 42.0$	$f_b = 33.188$ $f_v = 20.02$	$F_b = 42.0$ $F_v = 26.25$
b. PLATE GIRDER	$f_b = 25.87$ $f_v = 15.803$ $f_a = 13.457$	$F_b = 42.0$ $F_v = 26.25$ $F_a = 37.85$	$f_b = 12.954$	$F_b = 42.0$	$f_b = 26.44$ $f_v = 19.26$	$F_b = 42.0$ $F_v = 26.25$
a. 36WF280	$f_b = 30.05$ $f_v = 17.46$ $f_a = 11.40$	$F_b = 42.0$ $F_v = 26.25$ $F_a = 37.85$	$f_b = 8.88$	$F_b = 42.0$	$f_b = 13.257$ $f_v = 10.12$	$F_b = 42.0$ $F_v = 26.25$
b. PLATE GIRDER	$f_a = 10.25$ $f_t = 16.24$	$F_a = 38.81$ $F_t = 42.0$	-	-	-	-
4 COLUMN 14WF320	$f_a = 15.41$ $f_t = 21.192$	$F_a = 39.67$ $F_t = 42.0$	$f_b = 3.557$	$F_b = 42.0$	$f_a = 9.147$	$F_a = 39.67$
COLUMN 14WF426	$f_p = 33.77$ $f_b = 88.17$ $f_v = 20.85$ $f_t = 36.04$ $f_p = 33.71$	$F_p = 97.0$ $F_b = 97.0$ $F_v = 60.25$ $F_t = 42.0$ $F_p = 42.0$	$f_p = 6.44$ $f_b = 18.0$ $f_v = 3.866$	$F_p = 97.0$ $F_b = 97.0$ $F_v = 60.25$ $F_p = 42.0$	$f_p = 13.603$ $f_p = 28.583$ $f_v = 8.155$	$F_p = 97.0$ $F_b = 97.0$ $F_v = 60.25$
5 8 1/2" ϕ PINS	$f_p = 33.71$	$F_p = 42.0$	$f_p = 6.44$	$F_p = 42.0$	$f_p = 13.603$	
BEARING ON 4" PLS	-	-	$f_t = 20.75$	$F_t = 42.0$	-	-
6 27WF177-TIES	-	-	$f_t = 82.16$	$F_t = 115.0$	-	-
2 3/4" ϕ A-490 BOLTS	-	-	-	-	-	-
7 HORIZONTAL PLATE GIRDERS AT EL 100'-8 1/4" FLG PL 17" x 2 1/2" WEB 26" x 2 1/2"	$f_b = 17.79$ $f_v = 16.88$	$F_b = 42.0$ $F_v = 26.25$	$f_b = 36.53$ $f_v = 22.6$	$F_b = 42.0$ $F_v = 26.25$	-	-
8 3" SHEAR PLATES EL. 100'-8 1/4"	$f_p = 14.83$	$F_p = 42.0$	$f_p = 29.87$	$F_p = 42.0$	-	-
9 DIAGONAL BRACING MEMBERS 14WF127	$f_a = 21.44$ OR $f_t = 20.05$	$F_a = 38.209$ $F_t = 42.0$	-	-	-	-
10 SHEAR BLOCK BEAM 14WF158	$f_p = 23.4$ $f_a = 27.99$	$F_p = 42.0$ $F_a = 40.08$	-	-	-	-
11 EMBEDDED STEEL	-	-	-	-	-	-
a. 6" ϕ ANCHOR BOLT	$f_t = 41.52$	$F_t = 43.0$	-	-	-	-
b. 4" PLS AT PIN HOLE	$f_t = 36.57$	$F_t = 42.0$	$f_p = 6.44$	$F_p = 42.0$	$f_p = 13.60$	$F_p = 42.0$
12 BELLY BEND AT EL. 130'-0"	-	-	$f_t = 3.105$	$F_t = 36.0$	$f_t = 35.5$	$F_t = 36.0$
a. ϕ 2 1/2" x 2'-6"	-	-	$f_p = 0.177$	$F_p = 36.0$	$f_p = 1.997$	$F_p = 36.0$
b. ϕ 2 1/4" x 5'-4"	-	-	-	-	-	-
c. LOAD ON SNUBBER	-	-	$P = 90.0^K$	$P = 1000^K$	$P = 1022^K$	$P = 1000^K$

SALEM GENERATING STATION REACTOR COOLANT PUMP SUPPORTS

NOMENCLATURE:		LOADING COMB: 1		LOADING COMB: 2		LOADING COMB: 3 (EMERGENCY CONDITION)				LOADING COMB: 4			
$f_b = \}$ BENDING STRESS $F_b = \}$ $f_a = \}$ COMPRESSIVE STRESS $F_a = \}$ $F_v =$ SHEAR STRESS $f_t = \}$ TENSILE STRESS $F_t = \}$ $f_w =$ SHEAR STRESS $f_p = \}$ BEARING STRESS $F_p = \}$ $K = 1000 \text{ LBS}$		NORMAL LOADS FLOODED CONDITION LOADS IN KIPS		NORMAL LOADS + OPERATING BASE EARTHQUAKE LOADS IN KIPS		NORMAL LOADS + PIPE RUPTURE LOADS LOADS IN KIPS				[FAULTED CONDITION] NORMAL LOADS + DESIGN BASE EARTHQUAKE LOADS IN KIPS			
		NORMAL LOAD FLOODED = 224.0 K		NORMAL + SEISMIC VERTICAL = 238.0 K HORIZONTAL = 30.0 K		R. C. PUMP SUCTION PIPE RUPTURE - DESIGN LOADS NORMAL = 172.0 K HORIZONTAL BREAK = 2000 K MOMENT = 11,600 K		R. C. PUMP DISCHARGE PIPE RUPTURE - DESIGN LOADS NORMAL = 172 K PIPE RUPTURE LOAD VERTICAL UP = -3,130.0 K		R. C. PUMP DISCHARGE PIPE RUPTURE - DESIGN LOADS NORMAL = 172 K PIPE BREAK HORIZONTAL = 1410.0 K MOMENT = 5,640.0 K		NORMAL LOAD + SEISMIC LOAD = 262.0 K HORIZONTAL SEISMIC = 56.0 K	
MEMBER IDENTIFICATION		CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.
BEAMS UNDER R.C. PUMP PADS. SHOWN IN SECTION 4-4. DWG. 208906A8823	$f_b = 0.82$ $f_v = 0.3$	$F_b = 28.0$ $F_v = 16.8$		$f_b = 0.87$ $f_v = 0.318$	$F_b = 37.24$ $F_v = 22.34$	$f_b = 24.59$ $f_v = 12.03$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 10.78$ $f_v = 3.95$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 6.4$ $f_v = 1.7$	$F_b = 37.8$ $F_v = 23.625$	$f_b = .96$ $f_v = .35$	$F_b = 37.8$ $F_v = 23.625$
R.C. PUMP HOLD DOWN BOLT-4" ϕ VASCOMAX 300 CYM	—			—	—	$f_t = 227.0$ $F_t = 228.0$ (.95 F _y)	$F_t = 228.0$	$f_t = 88.8$ $F_t = 228.0$	$F_t = 228.0$	$f_t = 22.88$ $F_t = 228.0$	$F_t = 228.0$	—	—
VERTICAL PLATE GIRDER. SHOWN IN SECTION 15-15 DWG. 208906A8823	$f_b = 0.71$ $f_v = 0.6$	$F_b = 28.0$ $F_v = 16.8$		$f_b = 0.74$ $f_v = 0.63$	$F_b = 37.24$ $F_v = 22.34$	$f_b = 12.20$ $f_v = 16.0$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 9.46$ $f_v = 8.3$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 8.28$ $f_v = 7.3$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 0.818$ $f_v = 0.701$	$F_b = 37.8$ $F_v = 23.625$
HORIZONTAL PLATE GIRDER. SHOWN IN SECTION 15-15 DWG. 208906A8823 DWG. 208905A8823	—			$f_b = 0.48$ $f_v = 0.18$	$F_b = 37.24$ $F_v = 22.34$	$f_b = 32.2$ $f_v = 12.36$	$F_b = 37.8$ $F_v = 23.625$	—	—	$f_b = 22.78$ $f_v = 8.85$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 0.895$ $f_v = 0.335$	$F_b = 37.8$ $F_v = 23.625$
VERTICAL GIRDER. SHOWN IN SECTION 7-7. DWG. 208906A8823 DWG. 208905A8823	$f_b = 0.425$ $f_v = 0.688$	$F_b = 28.0$ $F_v = 16.8$		$f_b = 0.45$ $f_v = 0.731$	$F_b = 37.24$ $F_v = 22.34$	$f_b = 16.3$ $f_v = 14.65$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 6.13$ $f_v = 5.47$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 2.76$ $f_v = 2.4$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 0.49$ $f_v = 0.80$	$F_b = 37.8$ $F_v = 23.625$
HORIZONTAL GIRDER WHICH IS TIED TO CONCRETE WALL. SHOWN IN SECTION 7-7.	—			$f_b = 0.3945$ $f_v = 0.155$	$F_b = 37.24$ $F_v = 22.34$	$f_b = 26.3$ $f_v = 10.29$	$F_b = 37.8$ $F_v = 23.625$	—	—	$f_b = 9.10$ $f_v = 1.00$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 0.8$ $f_v = 0.29$	$F_b = 37.8$ $F_v = 23.625$
TIE BOLTS - 2 1/2" ϕ A-325 (CONCRETE)	—			$f_t = 0.75$	$F_t = 53.4$	$f_t = 50.0$	$F_t = 60.0$	—	—	$f_t = 35.25$	$F_t = 60.0$	$f_t = 1.4$	$F_t = 60.0$

SALEM GENERATING STATION REACTOR COOLANT PUMP SUPPORTS

NOMENCLATURE:		LOADING COMB: 1		LOADING COMB: 2		LOADING COMB: 3 [EMERGENCY CONDITION]				LOADING COMB: 4			
$f_b = \}$ BENDING STRESS $F_b = \}$ $f_a = \}$ COMPRESSIVE STRESS $F_a = \}$ $f_v = \}$ SHEAR STRESS $f_t = \}$ TENSILE STRESS $F_t = \}$ $f_w = \}$ SHEAR STRESS $f_p = \}$ BEARING STRESS $F_p = \}$ $K = 1000 \text{ LBS}$		NORMAL LOADS FLOODED CONDITION LOADS IN KIPS		NORMAL LOADS + OPERATING BASE EARTHQUAKE LOADS IN KIPS		NORMAL LOADS + PIPE RUPTURE LOADS LOADS IN KIPS				[FAULTED CONDITION] NORMAL LOADS + DESIGN BASE EARTHQUAKE LOADS IN KIPS			
		NORMAL LOAD FLOODED = 224.0 K		NORMAL + SEISMIC VERTICAL = 238.0 K HORIZONTAL = 30.0 K		R. C. PUMP SUCTION PIPE RUPTURE - DESIGN LOADS		R. C. PUMP DISCHARGE PIPE RUPTURE - DESIGN LOADS		NORMAL LOAD + SEISMIC LOAD = 262.0 K HORIZONTAL SEISMIC = 56.0 K			
						NORMAL = 172.0 K HORIZONTAL BREAK = 2000 K MOMENT = 11,600'K		NORMAL = 172 K PIPE RUPTURE LOAD VERTICAL UP = -3,130.0 K		NORMAL = 172 K PIPE BREAK HORIZONTAL = 1410.0 K MOMENT = 5,640.0 K			
MEMBER IDENTIFICATION		CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.		
4	VERTICAL GIRDER SHOWN IN SECT. 16-16 DWG. 208906A-8823	$f_b = 0.398$ $f_v = 0.411$	$F_b = 28.0$ $F_v = 16.8$	$f_b = 0.423$ $f_v = 0.436$	$F_b = 37.24$ $F_v = 22.34$	$f_b = 12.17$ $f_v = 11.12$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 5.19$ $f_v = 5.37$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 3.09$ $f_v = 3.2$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 0.465$ $f_v = 0.48$	$F_b = 37.8$ $F_v = 23.625$
	HORIZONTAL GIRDER SHOWN IN SECT. 16-16 DWG. 208906-A-8823	—	—	$f_b = 0.40$ $f_v = 0.18$	$F_b = 37.24$ $F_v = 22.34$	$f_b = 26.7$ $f_v = 12.5$	$F_b = 37.8$ $F_v = 23.625$	—	—	$f_b = 10.69$ $f_v = 1.04$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 0.75$ $f_v = 0.336$	$F_b = 37.8$ $F_v = 23.625$
5	VERTICAL GIRDER SHOWN IN SECT. 6-6 DWG. 208906-A-8823	$f_b = 0.772$ $f_v = 0.688$	$F_b = 28.0$ $F_v = 16.8$	$f_b = 0.820$ $f_v = 0.710$	$F_b = 37.24$ $F_v = 22.34$	$f_b = 31.0$ $f_v = 16.07$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 9.04$ $f_v = 7.83$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 4.97$ $f_v = 4.19$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 0.902$ $f_v = 0.804$	$F_b = 37.8$ $F_v = 23.625$
	HORIZONTAL GIRDER SHOWN IN SECT. 6-6 TIED TO ZAWF 160	—	—	$f_b = 0.252$ $f_v = 0.157$	$F_b = 37.24$ $F_v = 22.34$	$f_b = 16.8$ $f_v = 10.5$	$F_b = 37.8$ $F_v = 23.625$	—	—	$f_b = 11.8$ $f_v = 7.4$	$F_b = 37.8$ $F_v = 23.625$	$f_b = 0.47$ $f_v = 0.29$	$F_b = 37.8$ $F_v = 23.625$
6	ZAWF 160 TIES TO CONCRETE WALL	—	—	$f_t = 0.381$	$F_t = 33.5$	$f_t = 25.4$	$F_t = 37.8$	—	—	$f_t = 17.9$	$F_t = 37.8$	$f_t = 0.71$	$F_t = 37.8$
	2 1/2" Φ -A 490 BOLTS WITH ZAWF TIES	—	—	$f_t = 1.125$	$F_t = 69.0$	$f_t = 75.0$	$F_t = 103.5$	—	—	$f_t = 52.87$	$F_t = 103.5$	$f_t = 2.1$	$F_t = 103.5$
7	6" DIA. (CAMVAC-200) PINS	$f_p = 1.66$ $f_b = 4.9$ $f_v = 1.18$	$F_p = 148.95$ $F_b = 92.0$ $F_v = 26.0$	$f_p = 1.76$ $f_b = 5.2$ $f_v = 1.25$	$F_p = 148.95$ $F_b = 132.0$ $F_v = 98.0$	$f_p = 35.7$ $f_b = 105.6$ $f_v = 25.5$	$F_p = 148.95$ $F_b = 148.95$ $F_v = 93.0$	$f_p = 22.2$ $f_b = 65.9$ $f_v = 15.9$	$F_p = 148.95$ $F_b = 148.95$ $F_v = 93.0$	$f_p = 11.10$ $f_b = 32.95$ $f_v = 7.95$	$F_p = 148.95$ $F_b = 148.95$ $F_v = 93.0$	$f_p = 1.94$ $f_b = 5.73$ $f_v = 1.38$	$F_p = 148.95$ $F_b = 148.95$ $F_v = 93.0$
	3" Φ S FOR 6" Φ PINS	$f_p = 1.66$	$F_p = 37.8$	$f_p = 1.76$	$F_p = 37.8$	$f_p = 35.7$	$F_p = 37.8$	$f_p = 22.2$	$F_p = 37.8$	$f_p = 11.10$	$F_p = 37.8$	$f_p = 1.94$	$F_p = 37.8$

C-4

C-3

SALEM GENERATING STATION REACTOR COOLANT PUMP SUPPORTS

NOMENCLATURE:		LOADING COMB: 1		LOADING COMB: 2		LOADING COMB: 3 EMERGENCY CONDITION				LOADING COMB: 4		
$f_b = \}$ BENDING STRESS $F_b = \}$ $f_a = \}$ COMPRESSIVE STRESS $F_a = \}$ $f_v = \}$ SHEAR STRESS $F_v = \}$ $f_t = \}$ TENSILE STRESS $F_t = \}$ $f_w = \}$ SHEAR STRESS $F_w = \}$ $f_p = \}$ BEARING STRESS $F_p = \}$ $K = 1000 \text{ LBS}$		NORMAL LOADS FLOODED CONDITION LOADS IN KIPS		NORMAL LOADS + OPERATING BASE EARTHQUAKE LOADS IN KIPS		NORMAL LOADS + PIPE RUPTURE LOADS LOADS IN KIPS				[FAULTED CONDITION] NORMAL LOADS + DESIGN BASE EARTHQUAKE LOADS IN KIPS		
		NORMAL LOAD FLOODED = 224.0 K		NORMAL + SEISMIC VERTICAL = 238.0 K HORIZONTAL = 30.0 K		R. C. PUMP SUCTION PIPE RUPTURE - DESIGN LOADS		R. C. PUMP DISCHARGE PIPE RUPTURE - DESIGN LOADS		NORMAL LOAD + SEISMIC LOAD = 262.0 K HORIZONTAL SEISMIC = 56.0 K		
						NORMAL = 172.0 K HORIZONTAL EARTHQUAKE = 2000 K MOMENT = 11,600 K		NORMAL = 172.0 K PIPE RUPTURE LOAD VERTICAL UP = 3,130.0 K		NORMAL = 172.0 K PIPE RUPTURE HORIZONTAL = 1410.0 K MOMENT = 5,640.0 K		
MEMBER IDENTIFICATION	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.
8 14W 202 COLUMNS	$f_a = 1.29$	$F_a = 22.97$	$f_a = 1.37$	$F_a = 30.55$	$f_a = 28.0$ OR $f_t = 23.4$	$F_a = 35.13$ $F_t = 37.8$	$f_t = 17.0$	$F_t = 37.8$	$f_a = 8.0$ OR $f_t = 8.0$	$F_a = 35.13$ $F_t = 37.8$	$f_a = 1.5$	$F_a = 35.13$
9 SHEAR BEAM 14W 202	—	—	$f_p = 0.9$ $f_a = 0.9$	$F_p = 37.8$ $F_a = 30.55$	$f_p = 4.5$ $f_a = 4.5$	$F_p = 37.8$ $F_a = 34.45$	—	—	—	—	$f_p = 1.68$ $f_a = 1.68$	$F_p = 37.8$ $F_a = 34.45$
10 DIAGONAL 14W 87	—	—	$f_a = 1.65$ OR $f_t = 1.65$	$F_a = 29.77$ $F_t = 33.5$	$f_a = 10.4$ OR $f_t = 10.4$	$F_a = 16.65$ OR $F_t = 37.8$	—	—	—	—	$f_a = 3.08$ OR $f_t = 3.08$	$F_a = 33.57$ $F_t = 37.8$
11 EMBEDDED STEEL 3" THICK PLATES FOR LOWER PINS.	$f_p = 1.66$	$F_p = 37.8$	$f_p = 1.763$	$F_p = 37.8$	$f_p = 37.3$	$F_p = 37.8$	$f_p = 22.2$	$F_p = 37.8$	$f_p = 11.1$	$F_p = 37.8$	$f_p = 1.94$	$F_p = 37.8$
12 5" THICK PLATES AT EL. 91'-0". FOR UPPER 6" PINS.	—	—	—	—	$f_t = 18.33$ $f_b = 27.0$	$F_t = 36.0$ $F_b = 36.0$	$f_t = 13.00$ $f_b = 19.6$	$F_t = 36.0$ $F_b = 36.0$	$f_t = 6.5$ $f_b = 9.8$	$F_t = 36.0$ $F_b = 36.0$	—	—

SALEM GENERATING STATION

REACTOR COOLANT PUMP SUPPORTS

NOMENCLATURE:		LOADING COMB: 5 [FAULTED CONDITION] NORMAL LOADS + PIPE RUPTURE LOADS + DESIGN BASE EARTHQUAKE LOADS LOADS IN KIPS					
f_b = BENDING STRESS	f_p = BEARING STRESS	R.C. PUMP SUCTION PIPE RUPTURE } DESIGN LOADS + NORMAL + SEISMIC LOADS				R.C. PUMP DISCHARGE PIPE RUPTURE + NORMAL + SEISMIC LOADS.	
F_b = BENDING STRESS	F_p = BEARING STRESS						
f_a = COMPRESSIVE STRESS	f_v = SHEAR STRESS	SEISMIC + NORMAL LOAD = 262.0 K HORIZONTAL PIPE BREAK = 2056.0 K + SEISMIC MOMENT = 11,600'K				SEISMIC + NORMAL = 262.0 K SEISMIC HORIZONTAL = 56.0 K PIPE RUPTURE VERTICAL UP = 3130.0 K	
F_a = COMPRESSIVE STRESS	F_v = SHEAR STRESS						
f_T = TENSILE STRESS	$K = 1000$ LBS	CALCULATED STRESSES ALLOWABLE STRESSES IN K.S.I.				SEISMIC + NORMAL = 262.0 K PIPE BREAK HORIZONTAL = 1456.0 K MOMENT = 5640.0 K	
F_T = TENSILE STRESS							
MEMBER IDENTIFICATION		CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.	CALCULATED STRESSES IN K.S.I.	ALLOWABLE STRESSES IN K.S.I.
1	BEAMS UNDER R.C. PUMP PADS. SHOWN IN SECTION 4-4. DWG. 208906-A-8823	$f_b = 24.92$ $f_v = 12.15$	$F_b = 42.0$ $F_v = 26.25$	$f_b = 11.11$ $f_v = 4.07$	$F_b = 42.0$ $F_v = 26.25$	$f_b = 6.73$ $f_v = 4.82$	$F_b = 42.0$ $F_v = 26.25$
	R.C. PUMP HOLD DOWN BOLT - 4" ϕ VASCOMAX 300 CYM	$f_T = 227.0$	$F_T = 239.9$	$f_T = 88.8$	$F_T = 239.0$	$f_T = 22.88$	$F_T = 239.9$
2	VERTICAL PLATE GIRDER SHOWN IN SECTION 15-15. DWG. 208906-A-8823	$f_b = 12.48$ $f_v = 16.24$	$F_b = 42.0$ $F_v = 26.25$	$f_b = 9.74$ $f_v = 8.54$	$F_b = 42.0$ $F_v = 26.25$	$f_b = 8.56$ $f_v = 7.54$	$F_b = 42.0$ $F_v = 26.25$
	HORIZONTAL PLATE GIRDER. SHOWN IN SECTION 15-15. DWG. 208906-A-8823	$f_b = 33.095$ $f_v = 12.895$	$F_b = 42.0$ $F_v = 26.25$	—	—	$f_b = 23.675$ $f_v = 9.185$	$F_b = 42.0$ $F_v = 26.25$
3	VERTICAL GIRDER. SHOWN IN SECTION 7-7. DWG. 208905-A-8823. DWG. 208906-A-8823	$f_b = 16.47$ $f_v = 14.92$	$F_b = 42.0$ $F_v = 26.25$	$f_b = 6.3$ $f_v = 5.74$	$F_b = 42.0$ $F_v = 26.25$	$f_b = 2.93$ $f_v = 2.67$	$F_b = 42.0$ $F_v = 26.25$
	HORIZONTAL GIRDER WHICH IS TIED TO CONCRETE WALL. SHOWN IN SECTION 7-7. DWG. 208906-A-8823	$f_b = 27.3$ $f_v = 10.58$	$F_b = 42.0$ $F_v = 26.25$	—	—	$f_b = 9.83$ $f_v = 1.29$	$F_b = 42.0$ $F_v = 26.25$
	TIE BOLTS - 2 1/2" ϕ A-325. (CONCRETE)	$f_T = 51.4$	$F_T = 67.0$	—	—	$f_T = 36.65$	$F_T = 67.0$
4	VERTICAL GIRDER. SHOWN IN SECT. 16-16. DWG. 208906-A-8823	$f_b = 12.33$ $f_v = 11.29$	$F_b = 42.0$ $F_v = 26.25$	$f_b = 5.35$ $f_v = 5.45$	$F_b = 42.0$ $F_v = 23.625$	$f_b = 3.25$ $f_v = 3.37$	$F_b = 42.0$ $F_v = 23.625$
	HORIZONTAL GIRDER SHOWN IN SECTION 16-16	$f_b = 27.48$ $f_v = 12.836$	$F_b = 42.0$ $F_v = 26.25$	—	—	$f_b = 11.44$ $f_v = 1.376$	$F_b = 42.0$ $F_v = 26.25$
5	VERTICAL GIRDER. SHOWN IN SECT. 6-6 DWG. 208906-A-8823	$f_b = 31.31$ $f_v = 16.34$	$F_b = 42.0$ $F_v = 26.25$	$f_b = 9.35$ $f_v = 8.10$	$F_b = 42.0$ $F_v = 26.25$	$f_b = 5.28$ $f_v = 4.46$	$F_b = 42.0$ $F_v = 26.25$
	HORIZONTAL GIRDER. SHOWN IN SECT. 6-6. TIED TO 24WF160.	$f_b = 17.27$ $f_v = 10.79$	$F_b = 42.0$ $F_v = 26.25$	—	—	$f_b = 12.27$ $f_v = 7.69$	$F_b = 42.0$ $F_v = 26.25$
6	24WF160 TIES TO CONCRETE WALL.	$f_T = 26.111$	$F_T = 42.0$	$f_T = 0.711$	$F_T = 42.0$	$f_T = 18.611$	$F_T = 42.0$
	2 1/2" ϕ A-490 BOLTS WITH 24WF TIES.	$f_T = 77.1$	$F_T = 115.0$	$f_T = 2.1$	$F_T = 115.0$	$f_T = 54.97$	$F_T = 115.0$

