Rev. 9
Supersedes Rev. 8 dated 6/8/79

PROCEDURE FOR EVALUATION OF SURRY UNIT NO. 1 DYNAMIC PIPE STRESS ANALYSIS

J.O. No. 12846.22

To be used in conjunction with Logic for Pipe Stress Study - Surry Unit No. 1 (attached).

THE ONLY FORMS ACCEPTABLE FOR DOCUMENTATION ARE FORMS LISTED IN THE ENCLOSED TABLE OF CONTENTS. FORMS MAY BE REVISED ONLY BY REVISING THIS PROCEDURE. ISSUANCE OF NEW OR REVISED FORMS DOES NOT REQUIRE BACKFITTING UNLESS SPECIFICALLY STATED.

APPROVED

D. L. Sla

ENGINEERING ASSURANCE

Brian H Crane

PROJECT ENGINEER

6/15/79

DATE

PROCEDURE FOR EVALUATION OF
SURRY UNIT 1
DYNAMIC PIPE STRESS ANALYSIS
J.O. No. 12846.22

Table of Contents

SECTION I

PROCEDURE TEXT

I. GENERAL

When a form is completed, this shall be noted on Form A. When a problem package is completed, Form Z shall be completed.

II. STRESS ANALYSIS REVIEW

1. Compile a list of dynamically analyzed systems. This shall be done as follows:

   A. Compile the list of dynamically analyzed systems. On that list, identify all problems that were analyzed by:

      - SHOCK O/I
      - SHOCK II
      - Other - Manual, NUPIPE, SHOCK III

   B. Obtain a legible copy of each MSK for the listed systems, and add the problem identification.

   C. Compare the list of systems and problems with the problems recorded on cassettes.

   D. Ensure the entire line has been analyzed by color coding the Pipe Arrangement Drawings (FP's) vs. MSK's.

   E. Ensure the entire system has been analyzed by color coding the Flow Diagrams vs. FP's.

2. Compile a list of all systems which have swing check valves for which an incorrect weight may have been used in the original analysis in accordance with NRC Bulletin IE 79-04. Identify the specific location and the correct weight to be used in the current analysis.

3. Compile a list of all supports, including type and function.

4. Compile a list of all equipment connections.

5. Compile a list of all penetrations.

   NOTE: The completed lists, Nos. 1-5 above, shall be signed by the preparer and signed and dated by the Project Engineer or designee. Signature of the Project Engineer indicates the list is complete and accurate.

6. Prepare a Work Sketch from the latest copy of the Piping Fabrication Drawing (FP) and any available Field Data. All inputs, including the FP and Field Data, shall be referenced on the work sketch. The Analyst (preparer) shall sign the sketch when completed.

7. Check the Work Sketch. An engineer competent in the concerned discipline shall be assigned to check the sketch to ensure it is complete and accurate. When this check is complete, he shall sign the sketch.

NOTE: Work Sketches shall be field verified in accordance with Section 3. Before the Stress Analysis can be documented as being complete, the field-verified work sketch shall be compared to the work sketch used as input to the NUPIPE run. If there are no changes, complete Form 1. If the NUPIPE run accuracy is affected by any changes noted on the field-verified work sketch, complete Form 6 and rerun the problem with the revised input.

8. Code the input date into NUPIPE, and run the problem with the original ARS. Ensure that branch lines on the as-built MKS have been modelled into the run in accordance with EMD-79-15, and that stress Intensification Factors from EMD-79-11 are applied to these branch connections which have been modelled into the run.

NOTE: The development of the NUPIPE run constitutes a new calculation. As such, it must meet the requirements of EAP-5.3. Particular attention should be paid to complete documentation and referencing of sources of inputs and summarizing results. Forms 9 and 10 shall be used for documentation of telecons with Vendors. Completed forms shall be included in the final calculation package.

9. If the results of this run show stresses to be within allowables go to Step 11; if not rerun the problem with SSI ARS and go to Step 10.

Review Section V entitled "Plan Interim Start-up Pipe Stress" to determine the correct procedure for combining pipe stresses.

10. If the SSI ARS was used in the analysis, the preparer shall complete Form 11 prior to Form 2. Form 11 provides for the inertial portion of the DBE stress at the point of maximum total stress and at the point of highest DBE inertial stress to be bumped by 1.5 times the NUPIPE SSI ARS generated DBEI stress. The following steps shall be performed when completing Form 11:

(a) Per the NRC letter of May 25, 1979, the Surry 1 Project is required to "bump" (magnify) the seismic inertial stresses in the DBE case by a factor of 1.5. This is equivalent to the equation:

$$S'_T = S_T + 0.5\ S_{DBEI}$$

Where S_T is the total stress from the NUPIP run

S_{DBEI} is the seismic inertial stress from the NUPIPE run

S'_T is the new total stress after bumping

It is necesaary to find the point at which S_T' is a maximum. This may occur at the point where S_T is a maximum (maximum total stress) or where S_{DBEI} is a maximum (maximum seismic stress). However, maximum S'_T may also occur at other points, which must be examined.

(b) Designating the point at which the NUPIPE total stress is a maximum as Point 1, enter the values under maximum total stress point on Form 11.

(c) Designating the point at which the seismic inertial stress is a maximum as Point 2, enter the coresponding values under the maximum inertial stress point on Form 11.

(d) If the point of maximum total stress coincides with the point of highest DBE inertial stress, enter on Form 2 the bumped stress from this point (For DBE condition).

(e) If the point of maximum total stress does not correspond with the point of highest inertial stress, the preparer must compare the bumped stress from all other applicable points per the following criteria:

(1) If the bumped stress at the point of maximum total stress is greater than or equal to the bumped stress at the point of highest inertial stress, bump the stresses at all points where S_{Total} is higher than the S_{Total} at the point of maximum inertial stress.

(2) If the bumped stress at the point of maximum total stress is less than or equal to the bumped stress at the point of highest inertial stress, bump the stress at the point of highest inertial stress. Bump the stresses at all points where the S_{DBEI} is larger than the S_{DBEI} at the point of maximum total stress. The largest bumped stress at these other points shall be entered on Form 11 under "Other Points".

(f) The largest of the bumped stresses on Form 11 shall be entered on Form 2.

(g) The preparer and checker shall sign and date Form 11.

11. The preparer of the calculation (step 8 or 10) shall complete Form 2 and sign it.

12. Review and check the calculation (steps 8 or 10) in acordance with EAP-5.3. Upon completion of the review, the reviewer shall sign and date Form 2.

    NOTE: Engineering Assurance shall audit some of the calculations to applicable procedures.

13. If the results of the NUPIPE run indicate that the line is not overstressed, proceed with Support, Nozzle, and Penetration load Verification.

14. If the results of the NUPIPE run indicate that the line is overstressed, complete Form 8 and transmit the form plus attachments to the Options Review Committee in accordance with Engineering Mechanics Procedure EMD-79-06. If the need for hardware modifications/additions is evident, the project will complete Form 8, indicating their modification under "Project Suggested Solutions." Option Review Committee shall concur that hardware modifications/-additions are necessary, or recommend other solutions under Options Review Committee Recommendations. Any differences between the Project and ORC will be resolved by the Senior Engineering Manager sponsor for the Engineering Mechanics Division.

15. The problem shall then be rerun with a model reflecting the hardware addition/modification and the results documented as specified previously in this section.

16. Following Engineering Assurance audit of the Pipe Stress Analysis results and satisfactory resolution of any EA findings, the Pipe Stress Engineer shall forward Form 12 to the Project Engineer. If hardware modifications are required, Form 12 "Request for Generation of Hardware Modifications"/ Detailed Modification"shall be completed and shall, if required, have a marked-up MKS attached to show the physical location of the hardware to be modified. Form 12 shall be signed and dated by the preparer and checker. A copy of Form 12 shall be a part of the documentation package prior to the completion of Form Z. Form 12 is the document which will track the design and or detailed analysis.

III REVIEW OF NUPIPE SUPPORT LOADS

1. Upon completion of the NUPIPE Stress Analysis in Section II, all new loads shall be transmitted to the Supports Review Group by completing the NUPIPE section of Form 7. Also, the NUPIPE Support Summary pages from the computer run shall be sent with Form 7.

2. If the problem was run on the Soil Structure Interaction ARS, all DBEI inertial forces and moments shall be increased by 1.5 times the values listed on the computer run. The Stress Engineer shall "bump" these forces and moments by 1.5 and enter the "bumped" values on Form 7. Evaluation shall be made using these bumped values.

3. The Support Review Group shall complete the SHOCK II section of Form 7, using the original MSK. Review by the group shall be in accordance with EMD Procedure 79-04. EMD 79-04 shall be used in conjunction with with Section IV of this procedure entitled "Plan for Interim Start-up Pipe Support Design Criteria".

4. If the new loads are acceptable, the Supports Review Group shall complete the "accept" block of Form 7 by signing and dating the block.

5. Upon completion of the pipe suppport recalculation, fill out Form 7A, summarizing the results of the calculation.

6. If after further examination the support is acceptable, the Supports Review Group shall complete the RECALC ACCEPTED block of Form 7 by showing the calculation number and signing the block.

7. If after further examination the support is not acceptable, the Supports Review Group shall complete Form 8 and note in the COMMENT block of Form 7 the date the support was sent to the Options Review Committee. Recommended hardware modifications/additions shall be stated under Project Suggested Solutions on Form 8. Options Review Committee shall concur that hardware modifications/additions are necessary, or recommend other solutions under Options Review Committee Recommendations. Any difference between the Project and ORC will be resolved by the Senior Engineering Manager sponsor for the Engineering Mechanics Division. Final proposed hardware modifications/additions resulting from steps 14 or this step shall be transmitted to parties responsible for performing work through the Operations Services Division via Form 12.

IV. NOZZLE LOAD AND PENETRATION EVALUATION

1. Upon completion of the NUPIPE Stress Analysis in Section II, the PSAS Section shall complete Form 4 in accordance with EMD Procedures 79-03 and 79-05. They shall also fill in the old loads using the original calculations. If the original calculations are not available, the information shall be obtained by the Project. Review of the form shall be in accordance with the above procedures.

2. If the Soil Structure Interaction ARS was used, all DBEI loads shall be increased by 1.5 times the NUPIPE loads prior to being entered on Form 4.

3. If loads have increased, Form 4 shall be sent to EMD Structural Mechanics Engineer for Hot Penetrations in accordance with EMD Procedure 79-02, or to EMD Mechanical Section in accordance with EMD Procedure 79-05. Their review shall be in accordance with these procedures.

V. CRITERIA FOR USE OF SSI ARS

The use of the new SSI ARS will be only when authorized by Project Engineer or designee. Generally, it will be used in those cases where NUPIPE results based on the original licensed ARS for Surry produce:

- o Pipe Stress over Code allowable.
- o Support loads increased over Design
- o Nozzle reaction loads increased ovr Design allowable.

VI. HARDWARE MODIFICATIONS/DETAILED EVALUATIONS

The Project shall maintain a log of Form 12's generated as a result of this Pipe Stress reanalysis program.

Section II

Procedure for Processing Information Requests

1.0 PURPOSE AND SCOPE

This procedure establishes an administrative system for processing information requests between S&W Project Headquarters and S&W personnel at Surry Power Station.

2.0 GENERAL

Personnel with questions concerning Field originated information from Surry shall prepare a "Field Information Request" form (Attachment I) for documenting both the specific problem and the Field resolution.

Personnel requiring details of existing pipe supports shall prepare a "Support Information Request" form (Attachment III) for documenting both the specific request and the Field response.

2.1 Field Information Request Form Preparation and Processing

2.1.1 Field Information Requests (FIR's) shall be used only for questions pertaining to Field as-built drawings (MKS series) used in the preparation of NUPIPE Stress runs. Questions which could in any way change information shown on MKS drawings (i.e., geometry, support type, nomenclature) shall be addressed to S&W Surry Site personnel on Field Information Requests.

2.1.2 The FIR shall be forwarded to the Project Engineer (or his designee) for transmitting to the Surry Site.

2.1.3 The Project Engineer (or his designee) shall log each FIR according to the instruction established in paragraph 2.2 and transmit the FIR to the Responsible Engineer at the Surry Site for resolution.

2.1.4 Completed FIR's returned from the Surry Site shall be logged in as returned, reviewed by the Project Engineer (or his designee) and forwarded to the preparer.

2.1.5 The Project Engineer (or designee) shall determine whether the new information requires a drawing change and shall note that it does/does not on the FIR.

2.2 FIR Logging Instructions

2.2.1 When received, the Project Engineer (or his designee) shall log in each FIR, prior to transmittal, using the Attachment II.

2.2.2 Each entry shall consist of the log number, problem number, preparer's name, date of transmittal to the Responsible Engineer at the site, and date returned from the site.

2.2.3 The FIR's shall be sequentially numbered. This log number shall also appear in the appropriate space on each FIR.

2.2.4 The determination by the Project Engineer (or his designee) of whether a drawing change is required after receipt of information shall be noted in the log. All information shall be incorporated by revising the affected document.

2.3 Support Information Request Form Preparation and Processing

2.3.1 Support Information Requests (SIR's) shall be used only for questions pertaining to missing information or clarification of information necessary to analyze the support. This includes requests for as-builts, dimensions, member sizes. Support Information Requests shall not be used to request information which could change MKS drawings such as hanger-type verification. One SIR shall be prepared per problem, if possible.

2.3.2 The SIR shall be forwarded to the Project Engineer (or his designee) for transmitting to the Surry Site.

2.3.3 The Project Engineer (or his designee) shall log each SIR according to instructions in paragraph 2.4 and transmit the SIR to the Responsible Engineer at the Surry Site for response.

2.3.4 All dispositioned SIR's shall be received by the Engineering Mechanics Division Engineer at the Surry Site for completeness.

2.3.5 Completed SIR's returned from the Surry Site shall be logged in, reviewed by the Project Engineer/Designee, then forwarded to the Design Supervisor/Designee. The Design Supervisor/Designee shall review dispositioned SIR's for completeness before returning it to the originator. If a dispositioned SIR results in a change to the MKS drawing (i.e., changes hanger type, adds or deletes supports), the Project Engineer/Design Supervisor/Designee shall prepare a Field Information Request, forwarding one copy to the Lead Stress Engineer immediately.

2.4 SIR Logging Instructions

2.4.1 The Project Engineer (or his designee) shall log in each SIR prior to transmittal to the site, using Attachment IV.

2.4.2 Each entry shall consist of the log number, the problem number, the applicable MKS number(s), the preparer's name and date, the date transmitted to the site, the date returned from the site, and the date reviewed by the Project Engineer (or his designee).

2.5 Filing Instructions

2.5.1 The Project Engineer (or his designee) shall maintain a file of all FIR's and SIR's transmitted to and returned from the site with Field resolution.

2.6 SIR Independent Review

2.6.1 Surry Quality Control will independently review all answered SIR forms.

3.0 ATTACHMENTS

3.1 Field Information Request (FIR) - Attachment I

3.2 FIR Log Sheet - Attachment II

3.3 Support Information Request (SIR) - Attachment III

3.4 SIR Log Sheet - Attachment IV

Attachment I

FIELD INFORMATION REQUEST

Surry Units 1 & 2

Date: Log #_____

Problem #_____ MKS_____ Rev._____ J.O No._____

System _____

Information Request:

_____

Preparer Ext.

_____

Project Engineer

Date:

Answer:

Drawing Change Required

Yes_____ No_____

_____

Preparer (Surry)

_____

Reviewed by Project Engineer (Boston)

Attachment II

FIELD INFORMATION REQUEST

Surry Units 1 & 2

J.O.No._____
Page ___of___

Log Number	MKS/Problem Number	Preparer	Date Transmitted	Date Returned	Dwg. Change Yes/No	Comments

Attachment III

Support Information Request
Surry Units 1 & 2

PROBLEM # _____ APPLICABLE MKS DWG _____ REV _____

SYSTEM _____

SUPPORTS FOR WHICH INFORMATION IS REQUESTED * _____

* Attach Marked Up MKS For Clarification If Necessary

INFORMATION REQUIRED FOR SUPPORTS LIST ABOVE (Check Applicable Boxes)

_____ Complete As-Built Details ☐

_____ Member Dimensions and Sizes ☐

_____ Welded Attachment Details ☐

_____ Other (_____) ☐

_____ / _____
Preparer Date

_____ / _____
Project Engineer Date

RESPONSE (Attach Additional Pages As Required)

_____ / _____
Preparer (Surry) Date

_____ / _____
Reviewed by Date
Project Engineer (Boston)

Attachment IV

Support Information Request
Surry Units 1 & 2

J.O.No._____

Page ___ of ___

LOG NUMBER	PROBLEM NUMBER	APPLICABLE MKS DRAWING(S)	PREPARER		DATE TRANSMITTED	DATE RETURNED	REVIEWED BY PROJ. ENGR.	REMARKS
			NAME	DATE				

Section III
SURRY

PROCEDURE FOR CONFIRMATION OF INPUT DATA
NUPIPE WORK SHEET FIELD VERIFICATION

PURPOSE: To provide a detailed piping isometric of computer analyzed piping showing hanger locations and type.

PROCEDURE:

1. Obtain latest issue of work sketch.

2. Priority lines will be walked in accordance with Surry I Pipe Stress/Pipe Support/Equipment Bar Chart.

3. Locate pipe in field - confirm by checking with FP or equipment connections.

4. Confirm dimensions or add dimensions to work sketches.

   -Location of valves
   -Pipe lengths
   -Centerline of Pipe Supports

   Note: Tolerances shall be as accurate as possible and will be within ±6 inches unless otherwise noted. Indicate on work sketch if dimension tolerance can not be met.

5. Working point dimensions shall be indicated to column lines where possible, particularly in the case of annulus piping. As a guide-line: every 50 feet should be dimensioned to a column.

6. Check for addition or removal of supports and locate on work sheet.

7. Show all additional branch piping (excluding those vent and drain lines which have no pipe supports and all instrumentation lines) to a point where ONE of the following criteria is met:

   (a) Branch connections should be shown for a minimum total of 5 feet of piping in each of two directions. Annular piping should be shown for a distance of 15 feet. Rigid hangers on this pipe should be located and identified.

   (b) Branch piping should be shown up to the first constraint for each of the X,Y,Z directions.

   (c) Branch piping should be shown up to the first anchor.

PROCEDURES (cont'd)

8. Confirm type and orientation of all supports. All supports shall be identified on work sketch with one of the following classifications:

Type	Abbreviation
ANCHOR	ANC RIGID
LATERAL RESTRAINT	LAT
AXIAL RESTRAINT	AXIAL
VERTICAL RESTRAINT	VERT
SPRING HANGER	S.H.
ROD HANGER	R.H.
SLIDING SUPPORT	S.S.
MONO BALL	MONO-BALL
LATERAL SHOCK SUPPRESSOR	LSS
AXIAL SHOCK SUPPRESSOR	ASS
VERTICAL SHOCK SUPPRESSOR	VSS
VERTICAL SUPPORT	VS

Hanger combinations should be shown, i.e. VERT-LAT. Piping orientation will be determined later from piping drawings, and therefore, need not be shown by the field. These symbols represent hanger function only. Multiple snubber arrangements sharing a commom line of action may be represented as a single snubber. Similarly, trapeze type spring hanger arrangements may be represented as a single spring.

9. The field verified Work Sketch shall be assigned a unique drawing number.

10. The Work Sketch shall be signed and dated by the Project.

11. The Field working copy of the work sketch and FIR shall be signed and dated by the Surry Engineer or his designee.

12. Surry Quality Control will independently review the final revision of MKS prints.

SECTION IV

PLAN FOR INTERIM START-UP

PIPE SUPPORT DESIGN CRITERIA

(REFERENCE EMD-79-04)

1. Support structure loading conditions and allowable stress.

   (1) DL + THER $\leq$ Allowable * (Form 5B)

   (2) DL + (SSEI x $B^{\blacktriangle}$) + SSEA $\leq$ 1.33 allowable* (Form 5C)

2. Integral welded attachments (similar to Option 1, EMD-79-04.)

   (1) Press + Sustained Load + (DBEI X $B^{\blacktriangle}$ + DBEA) +
   MNS_{DL} + (DBEI X $B^{\blacktriangle}$ + DBEA) $\leq$ 1.8 Sh

   Any new supports added or modifications to existing supports will be required to meet DBE conditions but in addition will be checked to ensure that they also meet the following OBE conditions. The applicable equations for pipe supports then become:

3. Support structure - add the following condition to item 1 above

   1. DL + THER + SRSS [(OBEI X $B^{\blacktriangle}$ + OBEA), OCCU] $\leq$ 1.33 allowable* (Form 5A)

4. Integral Welded Attachments (similar to Option 1, EMD-79-04)

   (1) Press + Sustained Load + SRSS [(OBEI X $B^{\blacktriangle}$ + OBEA), OCCU] +
   MNS_{DL} + SRSS [(OBEI X $B^{\blacktriangle}$ + OBEA), OCCU] $\leq$ 1.5 Sh

   (2) Press + Sustained Load + (DBEI X $B^{\blacktriangle}$ + DBEA) +
   MNS_{DL} + (DBEI X $B^{\blacktriangle}$ + DBEA) $\leq$ 1.8 Sh

   (3) Press + Sustained Load + (OBEI X $B^{\blacktriangle}$ + OBEA) + THER +
   MNS_{DL} + (OBEI X $B^{\blacktriangle}$ + OBEA) + THER $\leq$ 3.0 Sh

★ Allowable = basic allowable as applicable per EMD-79-04

▲ B = Factor = 1.5 when using SSI-ARS
= 1.0 when using original ARS

Option II as outlined in EMD 79-04 can only be used with the Project Engineer's written approval.

SECTION V

PLAN FOR INTERIM START-UP

PIPE STRESS

Per direction of VEPCO on 1 June 1979, stress and load calculations for pipe and supports will include the effects of support displacements. The requirement for modification will be based on the DBE Case only. The applicable equations for pipe stress are:

$$S_{LP} + S_{DW} + B\,S_{DBEI} + S_{DBEA} \leq 1.8\,S_h$$

$$S_{LP} + S_{DW} \leq S_h$$

$$S_{TH} \leq 1.25\,S_c + 0.25\,S_h$$

where S_{LP} = Longitudinal Pressure Stress

S_{DW} = Dead Load Stress

S_{DBEI} = Seismic Inertial Stress, Design Basis Earthquake

S_{DBEA} = Seismic Stress Due to Anchor Movements, Design Basis Earthquake

S_h = Allowable stress at maximum (hot) temperature

S_C = Allowable stress at minimum (cold) temperature

S_{TH} = Thermal Stress

B = 1.5 when using SSI ARS; 1.0 when using original ARS

COMPLETE DOCUMENT PACKAGE

PROBLEM _____

MSK _____ Rev. _____

FIELD VERIFIED
WORK SKETCH _____

Included in the package are:

Checked and Field Verified Work Sketch _____

Checked Stress Analysis Calc. _____
(Nupipe Run)

Form No.	
Form 1	COMPARISON OF NUPIPE & FIELD VERIFIED WORK SKETCH _____
Form 2	REVIEW OF NUPIPE RUNS _____
Form 4	EQUIPMENT/PENETRATION LOADING SUMMARY _____
Form 6	REVISING PIPE MODEL FOR NUPIPE RUNS _____
Form 7	PIPE SUPPORT REVIEW SHEET _____
Form 5	TOTAL DESIGN LD TAB SHEET _____
Form 7A	PIPE SUPPORT ANALYSIS SUMMARY SHEET _____
Form 8	PIPE STRESS & SUPPORTS OVERSTRESS CONDITION REPORT _____
Form 9	VALVE INFORMATION REQUEST _____
Form 10	EQUIPMENT INFORMATION REQUEST _____
Form 11	SOIL STRUCTURE INTERACTION "BUMPED STRESS CALCULATION" _____
Form 12	REQUEST FOR GENERATION OF HARDWARE MODIFICATIONS/DETAILED EVALUATION _____
Form Z	FINAL REVIEW _____

The above package has been reviewed for completeness and accuracy and meets the requirements of the Task Procedure for the Evaluation of the Surry Unit 1 Dynamic Pipe Analysis.

Revision No. _____ Date _____

_____ REVIEWER

_____ PROJECT ENGINEER

_____ DATE

COMPARISON OF NUPIPE INPUT AND FIELD VERIFIED WORK SKETCH

PROBLEM NO. _____

ORIGINAL MSK/REV_____

FIELD VERIFIED
WORK SKETCH MKS NO/Rev_____

PIPE STRESS ANALYSIS
WORK SKETCH NO./REV_____

Statement of Review:

Review of the Nupipe input and the Field Verified Work Sketch shows satisfactory similarity to assure the accuracy of the Nupipe stresses and loads.

_____ REVIEWER

_____ SUPERVISOR

_____ DATE

REVIEW OF NUPIPE RUNS

PROBLEM _____

P.S.A.
Work sketch No./Rev _____ _____

A review of the Nupipe output for the above problem for the points with the largest combined stresses shows that;

A. The line is stressed to a point over the allowables _____

B. The line is within allowable _____

	ALLOWABLE (PSI)	MAX CALCULATED (PSI)	PT. NO.
$S_{LP} + S_{DL} + S_{OBE} \leq 1.2S_h$ $S_{LP} + S_{DL} + S_{DBE} \leq 1.8S_h$ $TH \leq S_a$			

_____ REVIEWER

_____ SUPERVISOR

_____ DATE

CLIENT _____ J.O. 12846.22 SURRY Form 4 Rev. 1

MSK _____ PROBLEM _____

SYSTEM _____ FP NO. _____ Page 22

DISPOSITION: ACCEPT _____ REVIEWER _____

FURTHER EVALUATION _____ SUPERVISOR _____
(EMD)

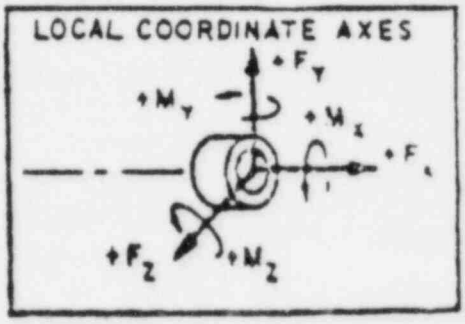
DATE _____

THE LOCAL SYSTEM IS DEFINED AS FOLLOWS:

(+ X) IS ALONG THE AXIS OF THE PIPE, OUTWARD FROM EQUIPMENT

(+ Y) IN THE PLANE OF THE LOCAL X-AXIS AND THE GLOBAL +Y-AXIS UNLESS THE LOCAL X-AXIS IS ALIGNED WITH THE GLOBAL Y-AXIS, THEN THE LOCAL Y-AXIS WILL BE PARALLEL TO THE GLOBAL X-AXIS

(+ Z) ACCORDING TO RIGHT HAND RULE



EQUIPMENT/PENETRATION LOADING SUMMARY

POINT NO. _____ EQUIPMENT/PENETRATION NO. _____

(fill in rows as applicable)

	LOADING CONDITION	CALCULATED FORCES (LB) FX	FY	FZ	CALCULATED MOMENTS (FT.LBS.) MX	MY	MZ
CALCULATED USING	MAX. THERMAL 1						
	DEADLOAD						
	OBET						
	DBET						
PREVIOUSLY ACCEPTABLE	MAX. THERMAL						
	DEADLOAD						
	OBET						
	DBET						

ALLOWABLE LOADS

CONDITION	FX	FY	FZ	MX	MY	MZ

SURRY Form 6
12846.22 Rev. 2

REVISING PIPE MODEL
FOR
NUPIPE RUNS

REASON FOR REVISION:

1. Latest Nupipe run is not in satisfactory agreement with Field Verified Work Sketch.
2. Other -

Release to Re-run _____ STRESS ENGINEER

_____ SUPERVISOR

_____ DATE

PIPE SUPPORT REVIEW SHEET

SURRY FORM 7 REV. 1 PAGE ____ OF ____

SYSTEM: ____________ ORIGINAL MSK-REV. ________ FP DWG ________ PROB NO. ________ P.S.A. WORKSHEET NOS. ________

LINE NUMBER	SUPPORT NO.	MSK PT. NOS.		LOADING CONDITION	$F_{( )}$ = LBS SHOCK II			$M_{( )}$ = FT. LBS			$F_{( )}$ = LBS NUPIPE			$M_{( )}$ = FT. LBS			ACCEPT #	RECALC REQ'D / RECALC ACCEPTED	COMMENTS
		OLD	NEW		F_X	F_Y	F_Z	M_X	M_Y	M_Z	F_X	F_Y	F_Z	M_X	M_Y	M_Z			
				THERMAL DEADLOAD OBET * DBET OCCASIONAL															
				THERMAL DEADLOAD OBET * DBET OCCASIONAL															
				THERMAL DEADLOAD OBET * DBET OCCASIONAL															
				THERMAL DEADLOAD OBET * DBET OCCASIONAL															
				THERMAL DEADLOAD OBET * DBET OCCASIONAL															
				THERMAL DEADLOAD OBET * DBET OCCASIONAL															
				THERMAL DEADLOAD OBET * DBET OCCASIONAL															
				THERMAL DEADLOAD OBET * DBET OCCASIONAL															

# INDICATES ACCEPTANCE BASED ON THE FOLLOWING RESTRICTIONS:
1) NEW SEISMIC LOADS ≤ OLD SEISMIC LOADS
2) NEW TOTAL DESIGN LOADS ≤ OLD TOTAL DESIGN LOADS

SHOCK II TAB PREPARER ____________ CHECKED BY: ____________
NUPIPE TAB PREPARER ____________ CHECKED BY: ____________
PIPE SUPPORT EXAMINER ____________ CHECKED BY: ____________

* SHOCK II ARS : DBET = DBET
NUPIPE SSI ARS : DBET = DBEI × 1.5 + DBEA
NUPIPE ORIGINAL ARS : DBET = DBET

ORIGINAL ARS

TOTAL DESIGN LOAD TABULATION SHEET

SYSTEM _____ CALC. NO. _____

LINE NO. _____ FOR. NO. _____

SUPPORT NO. _____ TYPE _____

STRESS PT. NO. _____ SUPPORT

MSK/REV _____ DWG/REV _____

	LOAD TYPE		FX(LB)	FY(LB)	FZ(LB)	MX(FT LB)	MY(FT LB)	MZ(FT L
	OCC	LARGEST +	+	+	+	+	+	+
	A,B,D	LARGEST -	-	-	-	-	-	-
	EARTHQUAKE (LARGEST VALUE OBET OR DBET)		±	±	±	±	±	±
	$-\left[\lvert COL1\rvert^2 + \lvert COL3\rvert^2\right]^{1/2}$		+	+	+	+	+	+
	$-\left[\lvert COL2\rvert^2 + \lvert COL3\rvert^2\right]^{1/2}$		-	-	-	-	-	-
	DEADLOAD			-				
	THERMAL	MOST POSITIVE ALGEBRAICALLY						
		MOST NEGATIVE ALGEBRAICALLY						
	+(COL4)+(COL6)+(COL7)							
	+(COL5)+(COL6)+(COL8)							
	SUPPORT DESIGN LOAD (COL9&10 COMPARED)							

NOTE: Check hydro load against design load

Preparer _____ Date _____

CHECKED BY _____ Date _____

SSI ARS

Form 5A
Rev. 0

DESIGN LOAD TABULATION SHEET CASE I

LOADING CASE 1: DL+THERM+SRSS [(OBEIX B▲+OBEA), OCCU]

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SYSTEM _____ CALC. NO. _____

LINE NO. _____ PROB. NO. _____

SUPPORT NO. _____ TYPE _____

STRESS PT. NO. _____ SUPPORT DWG/REV _____

SPRT SUMMARY RUN NO & DATE _____

COL	LOAD TYPE		FX (LB)	FY (LB)	FZ (LB)	MX (FT LB)	MY (FT LB)	MZ (FT LB)
1	OCCU	LARGEST +	+	+	+	+	+	+
2		LARGEST -	-	-	-	-	-	-
3	EARTHQUAKE (OBEI X B▲+OBEA)		±	±	±	±	±	±
4	+ $[\lvert COL1\rvert^2 + \lvert COL3\rvert^2]^{1/2}$		+	+	+	+	+	+
5	- $[\lvert COL2\rvert^2 + \lvert COL3\rvert^2]^{1/2}$		-	-	-	-	-	-
6	DEADLOAD			-				
7	THERMAL	MOST POSITIVE ALGEBRAICALLY						
8		MOST NEGATIVE ALGEBRAICALLY						
9	+ (COL4) + (COL6) + (COL7)							
10	+ (COL5) + (COL6) + (COL8)							
12	SUPPORT DESIGN LOAD (COL9&10 COMPARED)							

NOTE: Check hydro load against design load

Preparer _____ Date _____

CHECKED BY _____ Date _____

SSI ARS

DESIGN LOAD TABULATION SHEET CASE II

LOADING CASE 2: DL + THER

SYSTEM _____ CALC. NO. _____

LINE NO. _____ PROB. NO. _____

SUPPORT NO. _____ TYPE _____

STRESS PT. NO. _____ SUPPORT DWG/REV _____

SPRT SUMMARY RUN NO & DATE _____

COL	LOAD TYPE		FX(LB)	FY(LB)	FZ(LB)	MX(FT LB)	MY(FT LB)	MZ(FT LB)
1								
2								
3								
4								
5								
6	DEADLOAD							
7	THERMAL	MOST POSITIVE ALGEBRAICALLY						
8		MOST NEGATIVE ALGEBRAICALLY						
9	+(COL6)+(COL7)							
10	+(COL6)+(COL8)							
12	SUPPORT DESIGN LOAD (COL9&10 COMPARED)							

NOTE: Check hydro load against design load

Preparer _____ Date _____

CHECKED BY _____ Date _____

DESIGN LOAD TABULATION SHEET CASE III

LOADING CASE 3: DL + (DBEI x B + DBEA)

SYSTEM _____ CALC. NO. _____

LINE NO. _____ PROB. NO. _____

SUPPORT NO. _____ TITLE _____

STRESS PT. NO. _____ SUPPORT

SPRT SUMMARY RUN NO & DATE _____ DWG/REV _____

COL	LOAD TYPE	FX(LB)	FY(LB)	FZ(LB)	MX(FT LB)	MY(FT LB)	MZ(FT LB)
1							
2							
3	EARTHQUAKE (DBEI X B + DBEA)	±	±	±	±	±	±
4	+ COL 3	+	+	+	+	+	+
5	- COL 3	-	-	-	-	-	-
6	DEADLOAD		-				
7							
8							
9	+ (COL4) + (COL6)						
10	+ (COL5) + (COL6)						
12	SUPPORT DESIGN LOAD (COL9&10 COMPARED)						

NOTE: Check hydro load against design load

Preparer _____ Date _____

CHECKED BY _____ Date _____

CALC NO _____

SUPPORT NO _____

PROB NO _____

J.O. NO _____

VEPCO SURRY

PIPE SUPPORT ANALYSIS SUMMARY SHEET

SYSTEM _____ SPRT SUMMARY RUN NO & DATE _____ POINT NO _____

LINE NO _____ SUPPORT DWG/REV _____ P.S.A WORK SKETCH NUMBER _____

TYPE _____

	Fx	Fy	Fz	Mx	My	Mz
OLD TOTAL DESIGN LOAD						
NEW TOTAL DESIGN LOAD (LOADING CONDITION/S GENERATING THE MAX SPRT DESIGN LD PER GLOBAL DIRECTION)						

☐ MANUAL CALC ☐ STRUDL RUN NO _____ DATE _____

MAX MEMBER STRESS NORMAL CALC _____ ALLOW _____

SHEAR CALC _____ ALLOW _____

WELDS CALC _____ ALLOW _____

VENDOR QUALIFIED ITEMS CALC _____ ALLOW _____

INTEGRAL ATTACHMENTS

☐ PI LUG ☐ PI TRUST RUN NO _____ DATE _____
MAX STRESS CALC _____ ALLOW _____

COMMENTS:

DISPOSITION OF SUPPORT ACCEPT REJECT - USE Form 8

PREPARER _____ DATE _____

CHECKED BY _____ DATE _____

PIPE SUPPORT MODIFICATION OR ADDITION REVIEW

SURRY NO. 1
SYSTEM _____ PROBLEM NO. _____
MKS NO. _____

DETAIL OF PROBLEM _____

PROJECT SUGGEST SOLUTIONS _____

SUBMITTED BY: _____
Principal Engineer

OPTION REVIEW COMMITTEE RECOMMENTATION _____

AGREED UPON RESOLUTION _____

RESOLUTION BY SR. ENG. MANAGER (IF REQUIRED) _____

_____
Sr. Eng. Manager

_____
Option Review Committee

Date _____

_____
Project Engineer

J.O./CALCULATION NO. 12846.22 Rev. Page ___ of ___ Form 9Surry Rev 0

VALVE INFORMATION REQUEST

PROBLEM NO._____ VALVE NO._____

MSK NO._____ VENDOR_____

SYSTEM NAME_____

LINE NO._____ ANALYST_____

INFORMATION REQUESTED:

INFORMATION FROM VENDOR to be filled out by Project

_____

VENDOR CONTACT

_____

S&W RESPONSIBLE ENGINEER & DATE

J.O./CALCULATION NO. Rev. Page ___ of ___ Form 10 Surry Rev 0

12846.22

EQUIPMENT INFORMATION REQUEST

PROBLEM NO._____ VALVE NO._____

MSK NO._____ VENDOR_____

SYSTEM NAME_____

LINE NO._____ ANALYST_____

INFORMATION REQUESTED:

INFORMATION FROM VENDOR - to be filled out by Project

VENDOR CONTACT

S&W RESPONSIBLE ENGINEER & DATE

SOIL STRUCTURE INTERACTION
BUMPED STRESS CALCULATION

PROBLEM NO. _____

MSK NO. _____

Run No. _____

Run No. _____

Allowable Stress = 1.8 SH _____

1. Maximum Tool Stress Point

Point No.	S_{DBEI}	S_T (max)	$S_{T(max)} + (.5)\ S_{DBEI}$

2. Maximum Inertial Stress Point

Point No.	S_{DBEI} (max)	S_T (DBEI, max)	S_T (DBEI, max.) $+(.5) S_{DBEI}$

3. Other Points (Per Section I Item 10)

Point No.	S_{DBEI}	S_{TOTAL}	$S_{TOTAL} + (.5)\ S_{DBEI}$

4. Report Maximum of 1,2, or 3 on Form 2
(For DBE Condition)

Preparer _____ Date _____

Checked By _____ Date _____

Project
Log Number _____

Surry Unit 1
J.O. No. 12846.22
Form 12
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REQUEST FOR GENERATION
OF
HARDWARE MODIFICATION(S)/DETAILED EVALUATION

Problem No. _____

MKS No. _____ Rev. No._____

System _____

Date _____

Description of Hardware Modification(s)

Include: Line No. _____

Type of Support _____

Reason for Modification _____

Listing of Design Loads (If Applicable) _____

_____

_____

Preparer _____Date_____

Checked By_____Date_____

FINAL REVIEW

Problem _____

Original MSK/REV._____

P.S.A. Work Sketch
NO./REV._____

STATEMENT OF INTENT:

To review consistently for all problems and systems the approach, development, and adequacy of documentation for the review of seismically designed piping at Surry. Requests for hardware modification(s)/detailed analysis as listed below have been transmitted to Operations Services Division. These requests are not part of the pipe stress reanalysis effort.

_____

_____

_____

_____

JOINT REVIEW COMMITTEE

Engineering Mechanics _____ Date _____

Engineering Assurance _____ Date _____

Project Management _____ Date _____