ENCLOSURE 4

REACTOR VESSEL BOTTOM MOUNTED INSTRUMENT TUBE ANALYSIS

(50 pages follow)

ISSUE SUMMARY

DESIGN CONTROL SUMMARY			
CLIENT:	Nuclear Management Company	UNIT NO.: 2	Page No.: 1
PROJECT NAME:	Point Beach		
PROJECT NO.:	11165-048	☒ NUCLEAR SAFETY- RELATED	
CALC. NO.:	M-11165-048-1	☐ NOT NUCLEAR SAFETY-RELATED	
TITLE:	Evaluation of Bottom-Mounted Instrument (BMI) Conduits for Postulated Reactor Vessel Displacement		
EQUIPMENT NO.:	N/A		

IDENTIFICATION OF PAGES ADDED/REVISED/SUPERSEDED/VOIDED & REVIEW METHOD

First Issue

INPUTS/ ASSUMPTIONS
☒ VERIFIED
☐ UNVERIFIED

REVIEW METHOD:	Detailed Review	REV.	00
STATUS:	Approved	DATE FOR REV.:	05-19-2005
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IDENTIFICATION OF PAGES ADDED/REVISED/SUPERSEDED/VOIDED & REVIEW METHOD

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☐ UNVERIFIED

REVIEW METHOD:		REV.	
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* The reviewer's signature indicates compliance with S&L procedure SOP-0402 and the verification of, as a minimum, the following items: correctness of mathematics for manual calculations, appropriateness of input data, appropriateness of assumptions, and appropriateness of the calculation method.

CALCULATION
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1.0 PURPOSE AND SCOPE

The purpose of this calculation is to determine the maximum permissible movement downward of the reactor pressure vessel without compromising the integrity of the bottom-mounted instrumentation conduit attached to the reactor pressure vessel (RPV).

2.0 DESIGN INPUT

2.1 The overall configuration and routing of the instrumentation conduits are shown in the Unit 2 drawings (Reference 7.1).

2.2 The AutoPIPE model of a representative Unit 2 instrumentation conduit is based on the as-built walkdown information found in Attachment B.

2.3 Material allowable stresses are obtained from Reference 7.2.

3.0 ASSUMPTIONS

Conservative assumptions have been made to simplify this evaluation; therefore they do not require verification. These assumptions include:

3.1 The representative model is based on the dimensions of the "top" set of conduits, since they have the shortest horizontal run dimensions and hence provide less flexibility to accommodate the vessel movement than do the longer "middle" and "bottom" conduit runs.

3.2 The downward deflections of the conduit are limited by the existing gap between the conduit and the floor. The "bottom" conduit has the smallest gaps; therefore these gaps are conservatively used to determine the allowable tubing movement downward before contact is made with the floor.

3.3 Per the as-built information in Attachment B, the clearance between the bottom set of conduits and the floor varies from 1" to as much as 4.5" (based on the smallest distance between any support hardware attached to the conduit and the floor). The analysis conservatively assumes that the entire run is only allowed to deflect 1" downward before floor contact is made.

3.4 The rigid guides on the riser have gaps of 1/8" to 1/4" between the conduit and the support U-Bolts. These gaps were conservatively not considered in the analysis.

4.0 METHODOLOGY AND ACCEPTANCE CRITERIA

4.1 Methodology

A simplified AutoPIPE model of a representative instrumentation conduit was created, running from the connection to the RPV up to the seal table at elevation 41'-0". Iterative analyses were performed using increasing RPV nozzle movements, until the maximum conduit stress reached the stress limit identified in Section 4.3.

4.2 Acceptance Criteria

Subsection NC-3652.3(b) of Reference 7.2 states that the stress due to any single nonrepeated anchor movement shall be below 3.0*Sc. This may be used as a reasonable upper stress limit in the conduit for the postulated vessel deflection.

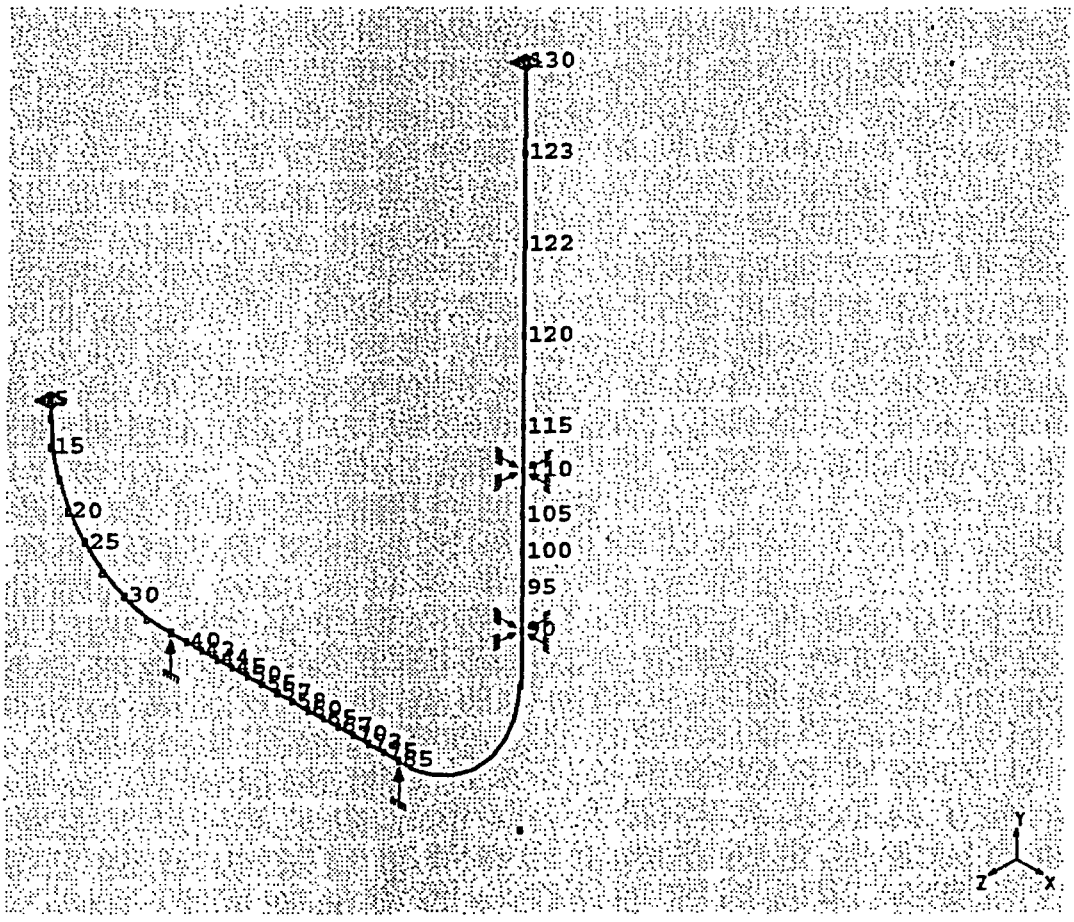
4.3 Computer Programs Used

AutoPIPE Version 6.00.16 (Reference 7.3).

5.0 CALCULATIONS

5.1 AutoPIPE Model

A plot of the AutoPIPE model of the In-core instrumentation conduits is shown below. The model is based on the Unit 2 walkdown information in Attachment B.



5.2 Conduit Properties

The conduit outside diameter was coded as 1", with a wall thickness of 0.313" (average of the two values shown in Reference 7.1.1). The material is ASTM A213 Type 304 per Reference 7.1.3.

5.3 Routing and Support Arrangement

A 1'-0" straight vertical segment was coded from the RPV nozzle to the start of the first bend. The bends were modeled using an 8'-0" radius (per Reference 7.1.2). The first bend off the RPV was subdivided into four sections to provide more accurate displacement information for various parts of the bend. The horizontal skew (approximately 20°) of the run beyond the first bend was ignored to simplify the model. This will not have a significant effect on the results. The dimensions used are approximate, and are representative of the 36 instrumentation conduits entering the bottom of the RPV (see Section 3.1). An SIF of 1.3 was coded at the vessel connection and at various coupling locations as shown in the as-built sketch.

The horizontal portion of the lowest conduit is approximately 4" off the floor, but the minimum clearance between support hardware and the floor is as low as 1" (see Section 3.3). This will be used as the allowable deflection downward before the floor begins to restrain conduit movement.

There are several variable/constant spring hangers and snubbers on the conduit; these are not considered in the analysis since they will not provide significant resistance to the downward movement of the conduit. The as-built information shows that the spring and constant supports have sufficient travel to accommodate a downward deflection of at least 1"; therefore they will not restrain the conduit before it contacts the floor. There are two guides on the riser below the deck plating at the 21'-0" elevation.

5.4 Analysis Methodology

The analyses were performed by inputting a vertical nozzle movement at node 5 and increasing it until maximum stresses in the conduit approached 3.0Sc, which equates to 56,400 psi based on the line material (A213 TP304, per Reference 7.1.3).

It was postulated that the bottom of the bend below the RPV would contact the floor first, after being allowed to displace 1" before being restrained (see Section 3.3). This contact was modeled as a vertical support at node "30 F", with a gap below the conduit of 1" and a large gap above the conduit to allow unrestricted upward movement. The analysis was then performed again, noting the vertical displacements of the conduit on the horizontal run. Any location exceeding 1" downward was then restrained in subsequent runs. The final configuration shown in the preceding plot has supports at nodes "30 F" and "85 N", simulating contact with the floor at those two locations. All the other points either deflect upward, or deflect less than 1" downward.

It is postulated that all 36 lines will move in phase, reducing contact between individual lines when the RPV displaces downward.

The AutoPIPE output is found in Attachment A. The maximum stress for a 23" downward displacement of the RPV is 55,385 psi at node "30 F". This is below the 56,400 psi allowable of 3.0Sc.

6.0 RESULTS

The conduit can accommodate a downward displacement of approximately 23" before stresses approach the 3.0*Sc stress limit.

7.0 REFERENCES

7.1 Westinghouse Drawings of the Bottom-Mounted Instrumentation Lines

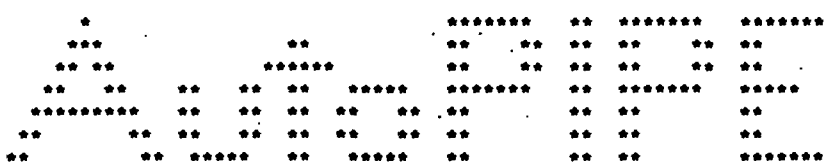
7.1.1 Drawing 685J765, Sheet A, Rev. 7.
7.1.2 Drawing 685J765, Sheet B, Rev. 7.
7.1.3 Drawing 685J765, Sheet C, Rev. 8.

7.2 ASME Boiler and Pressure Vessel Code, Section III, Subsection NC, 1977 Edition with Winter 1978 Addenda.

7.3 AutoPIPE Pipe Stress Analysis and Design Program, Version 6.00.16, REBIS Industrial Workgroup Software.

Attachment A

AutoPIPE Output



Pipe Stress Analysis and Design Program

Version: 6.00.16

Edition: Plus-Win

Developed and Maintained by

REBIS Industrial Workgroup Software
1600 Riviera Ave., Suite 300
Walnut Creek, CA 94596

****
** **
** AUTOPIPE SYSTEM DATA LISTING **
** **
****

SYSTEM NAME : CONDUIT

PROJECT ID : (SEE PAGE 1 FOR SIGNATURES)

PREPARED BY : _____

CHECKED BY : _____

PIPING CODE : B31.1

VERTICAL AXIS : Y

AMBIENT TEMPERATURE : 70.0 deg F

COMPONENT LIBRARY : AUTOPIPE

MATERIAL LIBRARY : AUTOB311

MODEL REVISION NUMBER : 54

CONDUIT REBIS
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P O I N T D A T A L I S T I N G

POINT NAME	TYPE	OFFSETS (ft) X	Y	Z	DESCRIPTION
*** SEGMENT A					
5	Run	0	7.83	0	PIPE ID = 1"
15	Bend	0	-2.59	0	Elbow, Radius = 95.00 inch Bend angle change = 22.54 deg SIF = 1.00 Flex = 1.000
20	Bend	1.22	-2.94	0	Elbow, Radius = 95.00 inch Bend angle change = 22.46 deg SIF = 1.00 Flex = 1.000
25	Bend	2.25	-2.25	0	Elbow, Radius = 95.00 inch Bend angle change = 22.46 deg SIF = 1.00 Flex = 1.000
30	Bend	2.94	-1.22	0	Elbow, Radius = 95.00 inch Bend angle change = 22.54 deg SIF = 1.00 Flex = 1.000
40	Run	2.59	0	0	
43	Run	1.00	0	0	
44	Run	1.00	0	0	
45	Run	1.00	0	0	
50	Run	1.00	0	0	
55	Run	1.00	0	0	
57	Run	1.00	0	0	
58	Run	1.00	0	0	
60	Run	1.00	0	0	
65	Run	1.00	0	0	
67	Run	1.00	0	0	
70	Run	1.00	0	0	
73	Run	1.00	0	0	
75	Run	1.00	0	0	
85	Bend	9.00	0	0	Elbow, Radius = 96.00 inch Bend angle change = 90.00 deg SIF = 1.00 Flex = 1.000
90	Run	0	11.00	0	
95	Run	0	2.33	0	
100	Run	0	2.00	0	
105	Run	0	2.00	0	
110	Run	0	2.46	0	
115	Run	0	2.38	0	
120	Run	0	5.00	0	
122	Run	0	5.00	0	

P O I N T . D A T A L I S T I N G

POINT NAME	TYPE	OFFSETS (ft) X	Y	Z	DESCRIPTION
123	Run	0	5.00	0	
130	Run	0	5.00	0	

Total weight of empty pipes : 0 lb

C O M P O N E N T D A T A L I S T I N G

POINT NAME		X	Y	Z	DATA TYPE	DESCRIPTION
*** SEGMENT A						
5		0.00	7.83	0.00	ANCHOR	Rigid
						Thermal movements : T1
					USRFLX	In = 1.30, Out = 1.30, Flex = Automa
						Override all other values = No
15	N	0.00	6.82	0.00		
15		0.00	5.24	0.00	TI	
15	F	0.60	3.79	0.00		
20	N	0.62	3.76	0.00		
20		1.22	2.30	0.00	TI	
20	F	2.33	1.19	0.00		
25	N	2.36	1.16	0.00		
25		3.47	0.05	0.00	TI	
25	F	4.92	-0.55	0.00		
30	N	4.95	-0.56	0.00		
30		6.41	-1.17	0.00	TI	
30	F	7.99	-1.17	0.00	V-STOP	ID : 30 F1, Connected to Ground
						Gap-Below = 1.00 inch
						Gap-Above = 50.00 inch
						Friction = 0.00
						Gaps set Weightless
40		9.00	-1.17	0.00	USRFLX	In = 1.00, Out = 1.00, Flex = Automa
						Override all other values = No
43		10.00	-1.17	0.00		
44		11.00	-1.17	0.00		
45		12.00	-1.17	0.00	USRFLX	In = 1.30, Out = 1.30, Flex = Automa
						Override all other values = No
					USRFLX	In = 1.30, Out = 1.30, Flex = Automa
						Override all other values = No
					USRFLX	In = 1.30, Out = 1.30, Flex = Automa
						Override all other values = No
50		13.00	-1.17	0.00	USRFLX	In = 1.00, Out = 1.00, Flex = Automa
						Override all other values = No
55		14.00	-1.17	0.00	USRFLX	In = 1.00, Out = 1.00, Flex = Automa
						Override all other values = No
57		15.00	-1.17	0.00		
58		16.00	-1.17	0.00		
60		17.00	-1.17	0.00	USRFLX	In = 1.30, Out = 1.30, Flex = Automa
						Override all other values = No
					USRFLX	In = 1.30, Out = 1.30, Flex = Automa
						Override all other values = No
65		18.00	-1.17	0.00	USRFLX	In = 1.00, Out = 1.00, Flex = Automa
						Override all other values = No
67		19.00	-1.17	0.00		
70		20.00	-1.17	0.00	USRFLX	In = 1.30, Out = 1.30, Flex = Automa
						Override all other values = No
73		21.00	-1.17	0.00		
75		22.00	-1.17	0.00	USRFLX	In = 1.00, Out = 1.00, Flex = Automa
						Override all other values = No

COMPONENT DATA LISTING

POINT NAME	COORDINATE(ft) X	Y	Z	DATA TYPE	DESCRIPTION
85 N	23.00	-1.17	0.00	V-STOP	ID : 85 N1, Connected to Ground Gap-Below = 1.00 inch Gap-Above = 50.00 inch Friction = 0.00 Gaps set Weightless
				USRFLX	In = 1.30, Out = 1.30, Flex = Automa Override all other values = No
85	31.00	-1.17	0.00	TI	
85 F	31.00	6.83	0.00		
90	31.00	9.83	0.00	GUIDE	ID : 90 1, Connected to Ground Stiffness = RIGID
				USRFLX	In = 1.00, Out = 1.00, Flex = Automa Override all other values = No
95	31.00	12.17	0.00	USRFLX	In = 1.30, Out = 1.30, Flex = Automa Override all other values = No
100	31.00	14.17	0.00	USRFLX	In = 1.00, Out = 1.00, Flex = Automa Override all other values = No
105	31.00	16.17	0.00	USRFLX	In = 1.00, Out = 1.00, Flex = Automa Override all other values = No
110	31.00	18.62	0.00	GUIDE	ID : 110 1, Connected to Ground Stiffness = RIGID
				USRFLX	In = 1.00, Out = 1.00, Flex = Automa Override all other values = No
115	31.00	21.00	0.00	USRFLX	In = 1.00, Out = 1.00, Flex = Automa Override all other values = No
120	31.00	26.00	0.00		
122	31.00	31.00	0.00		
123	31.00	36.00	0.00		
130	31.00	41.00	0.00	ANCHOR	Rigid Thermal movements : None
				USRFLX	In = 1.30, Out = 1.30, Flex = Automa Override all other values = No

Number of points in the system : 40

PIPE DATA LISTING

Pipe ID/ Material	Nom/ Sch	O.D. inch	Thickness(inch) W.Th.	Corr	Mill	Insu	Ling	Spec Grav	Weight(lb/ft) Pipe	Other	Total	ZL/ ZC
1"	NS	1.000	0.313	0	0.04	0	0	0	0.00	0	0.00	1.00
NS												1.00

MATERIAL DATA LISTING

Material Name	Pipe ID	Density lb/cu.ft	Pois. Ratio	Temper. deg F	Modulus E6 psi Axial	Hoop	Shear	Expans. in/100ft
NS	1"	0.1	0.30	70.0	28.300	28.300	10.885	

MATERIAL ALLOWABLE DATA LISTING

Material Name	Pipe ID	Temper. deg F	Allow. psi
NS	1"	70.0	18800.0
		70.0	18800.0

TEMPERATURE AND PRESSURE DATA

POINT NAME	CASE 1 PRESS. psi	CASE 1 TEMPER deg F	CASE 1 EXPAN. in/100ft	CASE 2 PRESS. psi	CASE 2 TEMPER deg F	CASE 2 EXPAN. in/100ft	CASE 3 PRESS. psi	CASE 3 TEMPER deg F	CASE 3 EXPAN. in/100ft
*** SEGMENT A									
5	0	70.00	0.000						
130	0	70.00	0.000						

H O T M O D U L U S (E6 psi)

POINT NAME	CASE 1	CASE 2	CASE 3
*** SEGMENT A			
5	28.300*		
130	28.300*		

* Non-standard material

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HOT ALLOWABLES (psi)

POINT NAME	CASE 1 ALLOW	CASE 1 NOT USED	CASE 1 NOT USED	CASE 2 ALLOW	CASE 2 NOT USED	CASE 2 NOT USED	CASE 3 ALLOW	CASE 3 NOT USED	CASE 3 NOT USED
*** SEGMENT A									
5	18800*								
130	18800*								

< User-defined code allowable
* Non-code material

THERMAL ANCHOR MOVEMENTS AND DISPLACEMENTS

POINT NAME	LOAD CASE	DX (in)	DY (in)	DZ (in)	RX (deg)	RY (deg)	RZ (deg)
5	Thermal 1	0.00	-23.00	0.00	0.000	0.000	0.000

ANALYSIS SUMMARY

Current model revision number : 54

Static -	Date and Time of analysis	May 19, 2005 11:27 AM
	Model Revision Number	54
	Number of load cases	2
	Load cases analyzed	GR T1
	Gaps/Friction/Soil considered	Yes
	Tolerance - Force, Displacement	1000.00 lb 0.0010 in
	Friction - Scale Factor, Tolerance	1.00 0.10
	Hanger design run	No
	Cut short included	No
	Include Bourdon rotational effect	No
	Pipe radius for Bourdon calculation ...	Mean
	Occasional load analysis type	Nonlinear
	Non-linear analysis summary file	CONDUIT.LOG
	Use default load sequence	Yes
	Base load cases for nonlinear analysis	GR = None T1 = GR
	Weight of contents included	Yes
	Pressure stiffening case	0
	Water elevation for buoyancy loads	Not considered
	Hot modulus case used in analysis	0
	Use corroded thickness in analysis	No

CODE COMPLIANCE COMBINATIONS

Combination	Category	Method	Load	Factor	M/S	Allowable	Remarks
GR + Max P	Sustain	Sum	Gravity	1.00		Automatic	Default
			Max Long	1.00			
Cold to T1	Expansion	Sum	Thermal 1	1.00		Automatic	Default
Max P	Hoop		Max Hoop	1.00		Automatic	Default

OTHER USER COMBINATIONS

Combination	Method	Load	Factor	Remarks
GR	Sum	Gravity	1.00	Default
T1	Sum	Thermal 1	1.00	Default

CODE COMPLIANCE

Y - Factor	0.40
Weld efficiency factor	1.00
Range reduction factor	1.00
Design Pressure Factor	1.00
Minimum stress ratio used in reports	0.00
Number of stress points per span	0
Include corrosion in stress calcs.	Y
Include axial force in code stress	N
Set sustained SIF to 1.00	N
Total stress	Octahedral
Direct shear	None
Longitudinal pressure calculation	PD/4t
Include rigorous pressure	Not analyzed

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D I S P L A C E M E N T S

Point name		Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
*** Segment A begin ***								
5		GR	0.000	0.000	0.000	0.000	0.000	0.000
		T1	0.000	-23.000	0.000	0.000	0.000	0.000
15	N	GR	0.000	0.000	0.000	0.000	0.000	0.000
		T1	0.062	-23.000	0.000	0.000	0.000	0.689
15	F	GR	0.000	0.000	0.000	0.000	0.000	0.000
		T1	1.957	-22.506	0.000	0.000	0.000	5.964
20	N	GR	0.000	0.000	0.000	0.000	0.000	0.000
		T1	1.996	-22.490	0.000	0.000	0.000	6.037
20	F	GR	0.000	0.000	0.000	0.000	0.000	0.000
		T1	6.993	-18.976	0.000	0.000	0.000	12.729
25	N	GR	0.000	0.000	0.000	0.000	0.000	0.000
		T1	7.064	-18.904	0.000	0.000	0.000	12.800
25	F	GR	0.000	0.000	0.000	0.000	0.000	0.000
		T1	12.393	-10.796	0.000	0.000	0.000	16.359
30	N	GR	0.000	0.000	0.000	0.000	0.000	0.000
		T1	12.437	-10.690	0.000	0.000	0.000	16.365
30	F	GR	0.000	-0.001	0.000	0.000	0.000	0.000
		T1	14.446	-0.999	0.000	0.000	0.000	12.685
40		GR	0.000	-0.001	0.000	0.000	0.000	0.000
		T1	14.446	1.409	0.000	0.000	0.000	10.063
43		GR	0.000	-0.001	0.000	0.000	0.000	0.000
		T1	14.446	3.263	0.000	0.000	0.000	7.674
44		GR	0.000	-0.001	0.000	0.000	0.000	0.000
		T1	14.446	4.637	0.000	0.000	0.000	5.486
45		GR	0.000	-0.001	0.000	0.000	0.000	0.000
		T1	14.446	5.575	0.000	0.000	0.000	3.498
50		GR	0.000	-0.001	0.000	0.000	0.000	0.000
		T1	14.446	6.116	0.000	0.000	0.000	1.709
55		GR	0.000	-0.001	0.000	0.000	0.000	0.000
		T1	14.446	6.304	0.000	0.000	0.000	0.121

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D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
57	GR	0.000	-0.001	0.000	0.000	0.000	0.000
	T1	14.446	6.181	0.000	0.000	0.000	-1.267
58	GR	0.000	-0.001	0.000	0.000	0.000	0.000
	T1	14.446	5.787	0.000	0.000	0.000	-2.455
60	GR	0.000	-0.001	0.000	0.000	0.000	0.000
	T1	14.446	5.166	0.000	0.000	0.000	-3.443
65	GR	0.000	-0.001	0.000	0.000	0.000	0.000
	T1	14.446	4.359	0.000	0.000	0.000	-4.231
67	GR	0.000	-0.001	0.000	0.000	0.000	0.000
	T1	14.446	3.408	0.000	0.000	0.000	-4.818
70	GR	0.000	-0.001	0.000	0.000	0.000	0.000
	T1	14.445	2.354	0.000	0.000	0.000	-5.206
73	GR	0.000	-0.001	0.000	0.000	0.000	0.000
	T1	14.445	1.241	0.000	0.000	0.000	-5.394
75	GR	0.000	-0.001	0.000	0.000	0.000	0.000
	T1	14.445	0.109	0.000	0.000	0.000	-5.381
85 N	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	14.445	-1.000	0.000	0.000	0.000	-5.169
85 F	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	5.175	0.002	0.000	0.000	0.000	9.711
90	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.000	0.002	0.000	0.000	0.000	5.857
95	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	-1.745	0.002	0.000	0.000	0.000	1.549
100	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	-1.844	0.001	0.000	0.000	0.000	-0.881
105	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	-1.169	0.001	0.000	0.000	0.000	-2.145
110	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.000	0.001	0.000	0.000	0.000	-2.102
115	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.837	0.001	0.000	0.000	0.000	-1.279

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D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
120	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	1.459	0.001	0.000	0.000	0.000	-0.015
122	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	1.088	0.001	0.000	0.000	0.000	0.619
123	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.382	0.000	0.000	0.000	0.000	0.624
130	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.000	0.000	0.000	0.000	0.000	0.000

*** Segment A end ***

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RESTRAINT REACTIONS

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
5	Anchor								
	GR	0	0	0	0	0	0	0	0
	T1	-99	175	0	201	0	0	62	62
30 F	V - Stop [ID: 30 F1]								
	GR	0	0	0	0	0	0	0	0
	T1	0	-208	0	208	0	0	0	0
85 N	V - Stop [ID: 85 N1]								
	GR	0	0	0	0	0	0	0	0
	T1	0	-52	0	52	0	0	0	0
90	Guide [ID: 90 1]								
	GR	0	0	0	0	0	0	0	0
	T1	147	0	0	147	0	0	0	0
110	Guide [ID: 110 1]								
	GR	0	0	0	0	0	0	0	0
	T1	-52	0	0	52	0	0	0	0
130	Anchor								
	GR	0	0	0	0	0	0	0	0
	T1	4	85	0	85	0	0	31	31

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G L O B A L F O R C E S & M O M E N T S

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
*** Segment A begin ***									
5	GR	0	0	0	0	0	0	0	0
	T1	99	-175	0	201	0	0	-62	62
15 N	GR	0	0	0	0	0	0	0	0
	T1	99	-175	0	201	0	0	-163	163
15 F	GR	0	0	0	0	0	0	0	0
	T1	99	-175	0	201	0	0	-358	358
20 N	GR	0	0	0	0	0	0	0	0
	T1	99	-175	0	201	0	0	-359	359
20 F	GR	0	0	0	0	0	0	0	0
	T1	99	-175	0	201	0	0	-313	313
25 N	GR	0	0	0	0	0	0	0	0
	T1	99	-175	0	201	0	0	-311	311
25 F	GR	0	0	0	0	0	0	0	0
	T1	99	-175	0	201	0	0	-32	32
30 N	GR	0	0	0	0	0	0	0	0
	T1	99	-175	0	201	0	0	-27	27
30 F-	GR	0	0	0	0	0	0	0	0
	T1	99	-175	0	201	0	0	444	444
30 F+	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	444	444
40	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	411	411
43	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	378	378
44	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	345	345
45	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	312	312
50	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	279	279

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G L O B A L F O R C E S & M O M E N T S

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
55	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	246	246
57	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	213	213
58	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	180	180
60	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	147	147
65	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	114	114
67	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	81	81
70	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	47	47
73	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	14	14
75	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	-19	19
85 N-	GR	0	0	0	0	0	0	0	0
	T1	99	33	0	105	0	0	-52	52
85 N+	GR	0	0	0	0	0	0	0	0
	T1	99	85	0	131	0	0	-52	52
85 F	GR	0	0	0	0	0	0	0	0
	T1	99	85	0	131	0	0	63	63
90 -	GR	0	0	0	0	0	0	0	0
	T1	99	85	0	131	0	0	361	361
90 +	GR	0	0	0	0	0	0	0	0
	T1	-48	85	0	98	0	0	361	361
95	GR	0	0	0	0	0	0	0	0
	T1	-48	85	0	98	0	0	249	249
100	GR	0	0	0	0	0	0	0	0
	T1	-48	85	0	98	0	0	152	152

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G L O B A L F O R C E S & M O M E N T S

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
105	GR	0	0	0	0	0	0	0	0
	T1	-48	85	0	98	0	0	56	56
110 -	GR	0	0	0	0	0	0	0	0
	T1	-48	85	0	98	0	0	-62	62
110 +	GR	0	0	0	0	0	0	0	0
	T1	4	85	0	85	0	0	-62	62
115	GR	0	0	0	0	0	0	0	0
	T1	4	85	0	85	0	0	-52	52
120	GR	0	0	0	0	0	0	0	0
	T1	4	85	0	85	0	0	-31	31
122	GR	0	0	0	0	0	0	0	0
	T1	4	85	0	85	0	0	-11	11
123	GR	0	0	0	0	0	0	0	0
	T1	4	85	0	85	0	0	10	10
130	GR	0	0	0	0	0	0	0	0
	T1	4	85	0	85	0	0	31	31

*** Segment A end ***

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ASME B31.1 (1998) CODE COMPLIANCE

Point name	Load combination	Ma (Sus.) (Moments in ft-lb)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type	Code Stress (Stress in psi)	Code Allow.
*** Segment A begin ***									
5	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.30	(11)	SUST	1	18800
	Cold to T1			62	1.30	(13)	DISP	10062	28200
15 N-	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	0	18800
	Cold to T1			163	1.00	(13)	DISP	20269	28200
15 N+	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	0	18800
	Cold to T1			163	1.00	(13)	DISP	20269	28200
15 F-	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			358	1.00	(13)	DISP	44604	28200**
	with Sus. load margin					(13)		44604	46999
15 F+	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			358	1.00	(13)	DISP	44604	28200**
	with Sus. load margin					(13)		44604	46999
20 N-	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			359	1.00	(13)	DISP	44707	28200**
	with Sus. load margin					(13)		44707	46999
20 N+	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			359	1.00	(13)	DISP	44707	28200**
	with Sus. load margin					(13)		44707	46999
20 F-	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			313	1.00	(13)	DISP	38981	28200**
	with Sus. load margin					(13)		38981	46999
20 F+	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			313	1.00	(13)	DISP	38981	28200**
	with Sus. load margin					(13)		38981	46999
25 N-	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			311	1.00	(13)	DISP	38728	28200**
	with Sus. load margin					(13)		38728	46999

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ASME B31.1 (1998) CODE COMPLIANCE

Point name	Load combination	Ma (Sus.) (Moments in ft-lb)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type	Code Stress (Stress in psi)	Code Allow.
25 N+	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			311	1.00	(13)	DISP	38728	28200**
	with Sus. load margin					(13)		38728	46999
25 F-	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			32	1.00	(13)	DISP	3935	28200
25 F+	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			32	1.00	(13)	DISP	3935	28200
30 N-	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			27	1.00	(13)	DISP	3416	28200
30 N+	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			27	1.00	(13)	DISP	3416	28200
30 F-	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	0	18800
	Cold to T1			444	1.00	(13)	DISP	55385	28200**
	with Sus. load margin					(13)		55385	47000**
30 F+	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	0	18800
	Cold to T1			444	1.00	(13)	DISP	55385	28200**
	with Sus. load margin					(13)		55385	47000**
40	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			411	1.00	(13)	DISP	51216	28200**
	with Sus. load margin					(13)		51216	46999**
43	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			378	1.00	(13)	DISP	47098	28200**
	with Sus. load margin					(13)		47098	46999**
44	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			345	1.00	(13)	DISP	42980	28200**
	with Sus. load margin					(13)		42980	46999
45	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.30	(11)	SUST	2	18800
	Cold to T1			312	1.30	(13)	DISP	50521	28200**

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ASME B31.1 (1998) CODE COMPLIANCE

Point name	Load combination	Ma (Sus.) (Moments in ft-lb)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type	Code Stress (Stress in psi)	Code Allow.
	with Sus. load margin					(13)		50521	46998**
50	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	2	18800
	Cold to T1			279	1.00	(13)	DISP	34744	28200**
	with Sus. load margin					(13)		34744	46998
55	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	2	18800
	Cold to T1			246	1.00	(13)	DISP	30626	28200**
	with Sus. load margin					(13)		30626	46998
57	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	2	18800
	Cold to T1			213	1.00	(13)	DISP	26508	28200
58	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	2	18800
	Cold to T1			180	1.00	(13)	DISP	22390	28200
60	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.30	(11)	SUST	2	18800
	Cold to T1			147	1.30	(13)	DISP	23754	28200
65	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	2	18800
	Cold to T1			114	1.00	(13)	DISP	14155	28200
67	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			81	1.00	(13)	DISP	10037	28200
70	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.30	(11)	SUST	1	18800
	Cold to T1			47	1.30	(13)	DISP	7695	28200
73	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			14	1.00	(13)	DISP	1801	28200
75	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	0	18800
	Cold to T1			19	1.00	(13)	DISP	2317	28200
85 N-	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.30	(11)	SUST	0	18800
	Cold to T1			52	1.30	(13)	DISP	8365	28200

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ASME B31.1 (1998) CODE COMPLIANCE

Point name	Load combination	Ma (Sus.) (Moments in ft-lb)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type	Code Stress (Stress in psi)	Code Allow.
85 N+	Max P.					(3)	HOOP	0	18800
	GR + Max P	0			1.30	(11)	SUST	0	18800
	Cold to T1			52	1.30	(13)	DISP	8365	28200
85 F-	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	0	18800
	Cold to T1			63	1.00	(13)	DISP	7878	28200
85 F+	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	0	18800
	Cold to T1			63	1.00	(13)	DISP	7878	28200
90	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	2	18800
	Cold to T1			361	1.00	(13)	DISP	44995	28200**
	with Sus. load margin					(13)		44995	46998
95	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.30	(11)	SUST	1	18800
	Cold to T1			249	1.30	(13)	DISP	40301	28200**
	with Sus. load margin					(13)		40301	46999
100	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	1	18800
	Cold to T1			152	1.00	(13)	DISP	19006	28200
105	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	0	18800
	Cold to T1			56	1.00	(13)	DISP	7011	28200
110	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	0	18800
	Cold to T1			62	1.00	(13)	DISP	7731	28200
115	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	0	18800
	Cold to T1			52	1.00	(13)	DISP	6498	28200
120	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	0	18800
	Cold to T1			31	1.00	(13)	DISP	3907	28200
122	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	0	18800
	Cold to T1			11	1.00	(13)	DISP	1316	28200
123	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.00	(11)	SUST	0	18800
	Cold to T1			10	1.00	(13)	DISP	1275	28200

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ASME B31.1 (1998) CODE COMPLIANCE

Point name	Load combination	Ma (Sus.) (Moments in ft-lb)	Mb (Occ.)	Mc (Exp.)	S.I.F	Eq. no.	Load type	Code Stress (Stress in psi)	Code Allow.
130	Max P					(3)	HOOP	0	18800
	GR + Max P	0			1.30	(11)	SUST	0	18800
	Cold to T1			31	1.30	(13)	DISP	5025	28200

*** Segment A end ***

SYSTEM SUMMARY

Maximum displacements (in)

Maximum X :	14.446	Point : 30 F	Load Comb.: T1
Maximum Y :	-23.000	Point : 5	Load Comb.: T1
Max. total:	23.000	Point : 5	Load Comb.: T1

Maximum rotations (deg)

Maximum Z :	16.365	Point : 30 N	Load Comb.: T1
Max. total:	16.365	Point : 30 N	Load Comb.: T1

Maximum restraint forces (lb)

Maximum X :	147	Point : 90	Load Comb.: T1
Maximum Y :	-208	Point : 30 F	Load Comb.: T1
Max. total:	208	Point : 30 F	Load Comb.: T1

Maximum restraint moments (ft-lb)

Maximum Z :	62	Point : 5	Load Comb.: T1
Max. total:	62	Point : 5	Load Comb.: T1

SYSTEM SUMMARY

Maximum pipe forces (lb)

Maximum X :	99	Point : 20	N	Load Comb.:	T1
Maximum Y :	-175	Point : 20	F	Load Comb.:	T1
Max. total:	201	Point : 5		Load Comb.:	T1

Maximum pipe moments (ft-lb)

Maximum Z :	444	Point : 30	F	Load Comb.:	T1
Max. total:	444	Point : 30	F	Load Comb.:	T1

S Y S T E M S U M M A R Y

Maximum sustained stress

Point	: 57
Stress psi	: 2
Allowable psi	: 18800
Ratio	: 0.00
Load combination	: GR + Max P

Maximum displacement stress

Point	: 30 F
Stress psi	: 55385
Allowable psi	: 47000
Ratio	: 1.18
Load combination	: Cold to T1

S Y S T E M S U M M A R Y

Maximum sustained stress ratio

Point		: 57
Stress	psi	: 2
Allowable	psi	: 18800
Ratio		: 0.00
Load combination		: GR + Max P

Maximum displacement stress ratio

Point		: 30 F
Stress	psi	: 55385
Allowable	psi	: 47000
Ratio		: 1.18
Load combination		: Cold to T1

* * * The system does not satisfy ASME B31.1 code requirements * * *
* * * for the selected options * * *

Attachment B

As-Built Information

"Marean, Jane" <Jane.Marean@nmcco.com>
05/19/2006 07:54 AM

To: <GEORGE.Z.TOKARSKI@sargentlundy.com>, <JAYESH.N.TOLIA@sargentlundy.com>
cc:
Subject: Walkdown info, unit 2

Here is the file path for the pictures. Picture numbering - The pictures start at the vessel and work back to the keyway entrance at the 21' Elevation.

J:\ShareData\Common\OCC\Engineering\U2R27\Unit 2 Reactor Vessel BMI PIctures

OTHER NOTES:

1. There are two snubbers holding the 'spider web' support under the vessel.

2HS-27 is in-line with the thimble guide tubes.
Field Data on 2HS-27: Grinell Suppressor, Figure 200, Serial # 35271, Model # H-L302, Stroke = 5".
NOTE that CHAMPS Data Differs from the Field Data !

2HS-31 is 90 degrees out (perpendicular to the running direction of the thimble guide tubes)
There were no Model numbers, etc. on 2HS-31.

2. All U-Bolt supports have gaps such that Total clearance from top inide surface of U-bolt and pipe is approx. 3/16" to 1/4" AND Total side-side clearance betwen pipe and U-Bolt is 1/8" to 3/16".

3. Spring Cans are used for the next support after the snubbers (i.e. next support after snubber- spider web as tubes travel back from vessel toward keyway entrance). Two spring cans hold up three structural channel to which the guide tubes are U-bolted.
Spring Can Data: Grinell Spring Hanger, Figure 82, Size No. 8, Type E, Both Cans Read approx. 825#
The support system is such that the support channels could move as much as approx. 1" downward before metal to metal contact occurs.

4. Between the "spider web" support system and the spring cans, the clearance between the floor and bottom row of guide tubes was measured, at the lowest spot the bottom of one tube was 1-1/4" from the floor, most all others were at least 2" from the floor at the lowest spots. Note the tubes are quite flexible in this area and appear to sag a little.

5. Between the "spider web" support system and the spring cans the tubes bend slightly in a horizontal plane right after the spring can U-Bolts, then travel horizontally until they start to bend vertically upward. The approximate "Tangent" Lines for the start of this vertical upward bending is as follows:
Bottom Row of 12 Tubes - Tangent line is approx. 8' - 10' From Spring Can U-Bolt Supports
Middle Row of 12 Tubes - Tangent line is approx. 6' - 8' From Spring Can U-Bolt Support
Top Row of 12 Tubes - Tangent line is approx. 2' - 8' From Spring Can U-Bolt Support

6. First set of Pipe couplings in the tube runs (starting at the vessel and going back towards the keyway entrance) exist after the Sping Can U-Bolts as follows:

Bottom Row of 12 Tubes - Couplings are located 40" - 46" after Spring Can supports
Middle Row of 12 Tubes - Couplings are located 27" - 32" after Spring Can supports
Top Row of 12 Tubes - Couplings are located 14" - 20" after Spring Can supports

7. Constant Supports then exist in the tubing runs 148-1/4" after the Spring Cans.
Constant Support Field Data: Grinell Constant Support, Figure 81-H, Serial #59045 (Serial # taken from one of the supports), Size 800#, Travel 4"
Two of these Constant Supports hold up three structural channels to which the guide tubes are U-bolted.
The support system is such that the channels could move 4-1/2" downward before there is metal to metal contact.

8. The Guide tubes then start bending vertically upward toward the keyway entrance /seal table.
The Tangent line for this bending is approximately right at the Constant Support U-Bolts.
The bending continues until the tubes are vertical which occurs approximately 36" below the next set of U-Bolts in the vertical run up towards the keyway
entrance/seal table.

9. The Vertical runs directly below the keyway entrance area deck plating have two sets of U-Bolts holding them.
One set is 36" after the tubes complete there vertical upward bends (as described in #8 above), these U-bolts are 140" Below the keyway entrance deck plating.
The second set of U-Bolts is 10-1/2" below the Keyway entrance deck plating.

10. There is a second set of pipe couplings, they exist in the vertical runs directly below the keyway entrance deck plating. The couplings are located 28" above the bottom set of U-Bolts in this vertical run (i.e. 112" below the deck plating).

11. There was no "divider plate" that the tubes had to go through like occurs on Unit 2.

I will turn over my field sketches to Jane Marean (or other Design Personnel working on this issue, if Jane is not yet in) and explain any details prior to leaving this morning.

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Point Beach Nuclear Plant
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MAY-18-05 07:32 FROM-CONTROL ROOM +920-755-6258 T-881 P.01/03 F-781

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REMARKS: ATTACHED IS A COPY OF THE WALKDOWN OF THE UNIT 2 INCORE TUBING.

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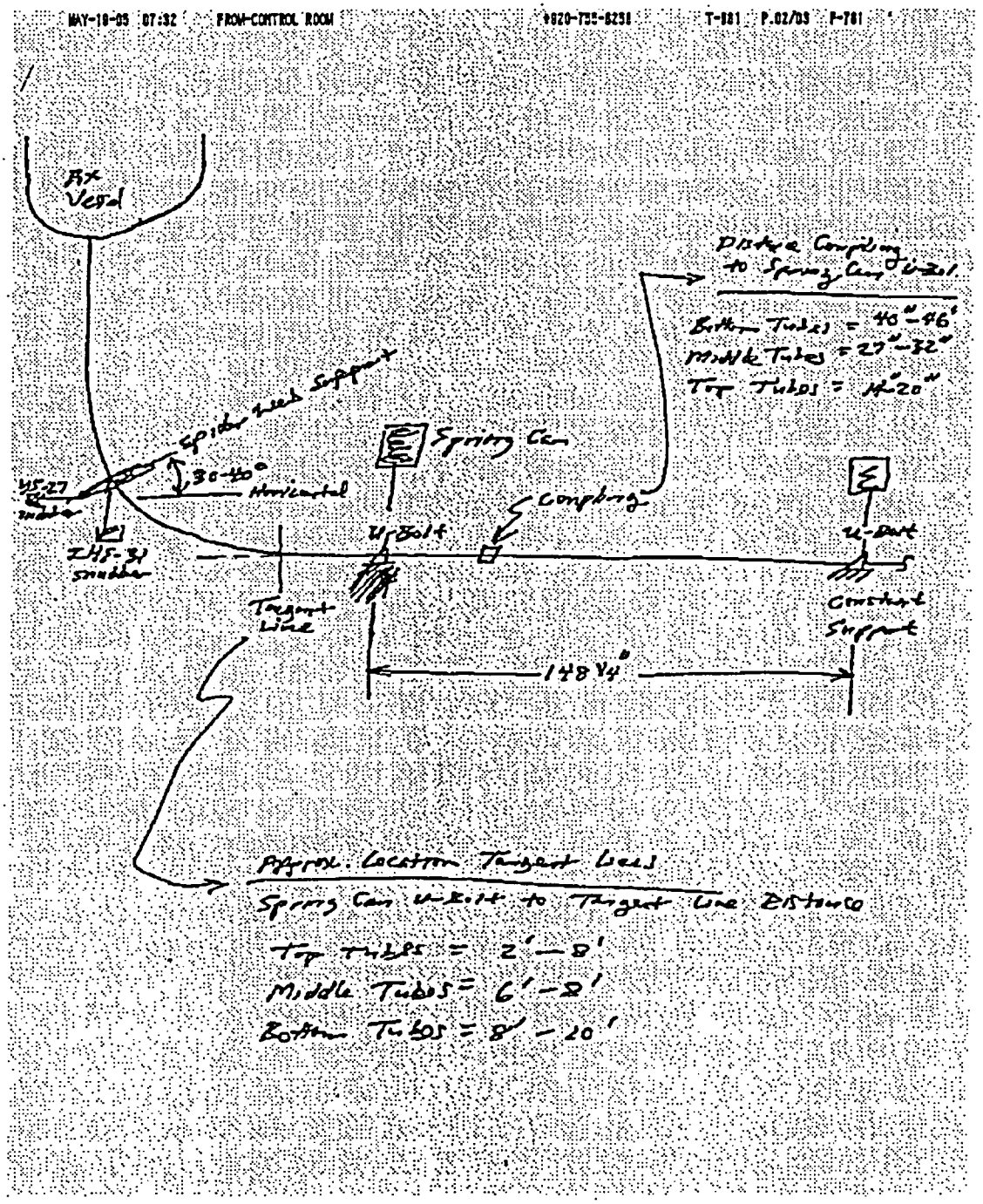

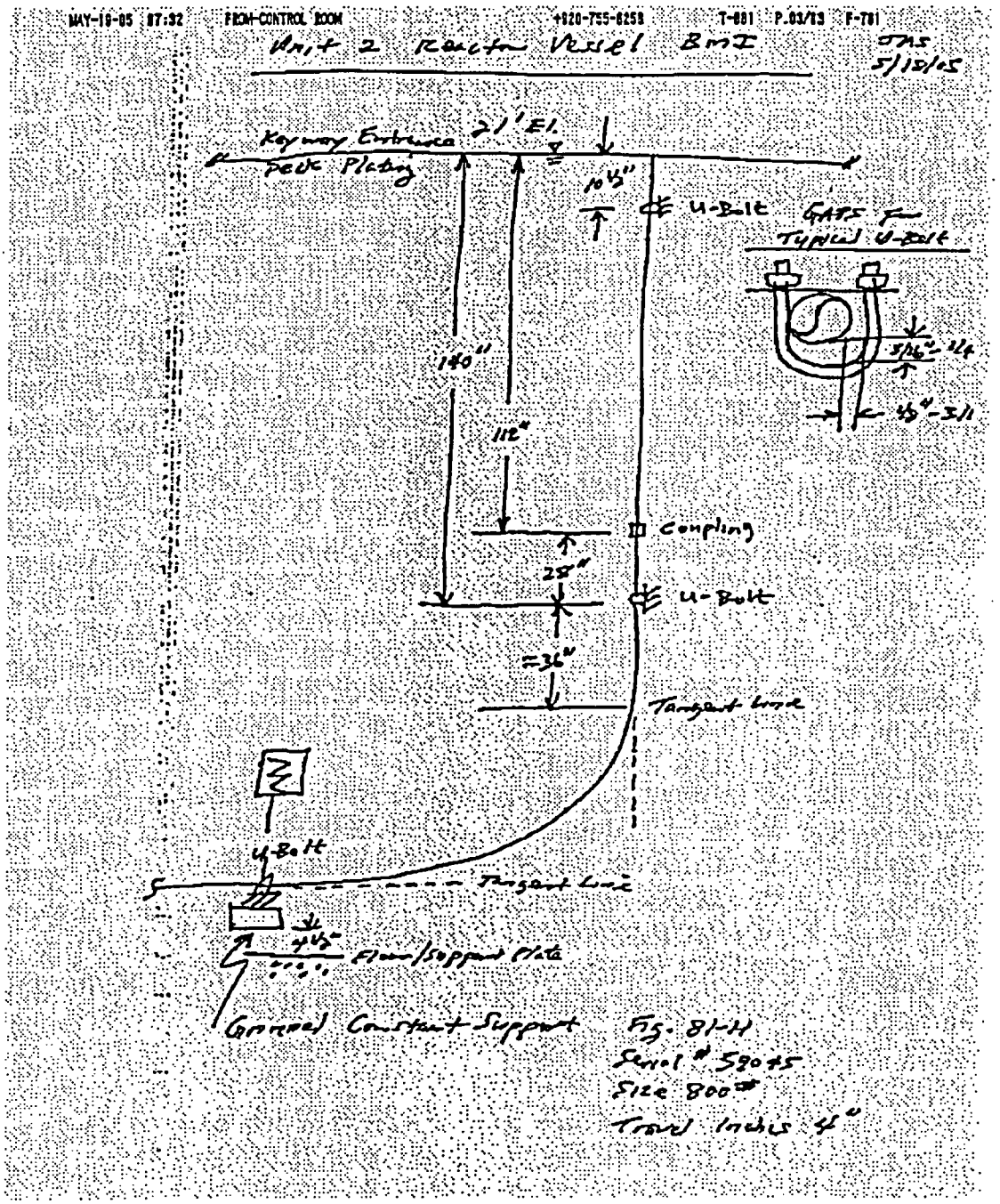
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Unit 2 Reactor Vessel BMI
5/12/05
Keyway Entrance 21' El.
Pedt Plating
10 1/2"
U-Bolt
Typical U-Bolt
5/16" 1/4
1/2"-3/1
140"
112"
Coupling
28"
U-Bolt
=36"
Tangent Line
U-Bolt
Tangent Line
4 1/2"
Floor/Support Plate
General Constant Support
Fig. 81-11
Serial # 59045
Size 800#
Travel Inches 4"