Nine Mile Point Unit 1
Alternative Source Term

Calculation H21C087

"Unit 1 LOCA Secondary Containment Bypass Piping Data"

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Table of Contents

Section	Page
Calculation Cover Sheet	1
Table of Contents	2
I. Purpose/Objective	3
II. Methodology	3
III. Data/Assumptions	3
IV. Calculations	7
1. Main Steam Lines	8
2. Feedwater Lines	10
3. Torus Vent Line	22
4. Drywell Vent/Purge Line	23
5. Emergency Condenser Vent Lines	24
6. Emergency Condenser Drain Lines	36
V. Results	45
VI. Conclusions	52
VII. List of Computer Runs	52
VIII. References	52

TABLES

1.a Main Steam Line Lengths	8
1.b Main Steam Line Lengths	9
2.a Feedwater Line Lengths to IVs	10
2.b Feedwater Line Lengths to IVs	11
2.c Feedwater Line Lengths to IVs	12
2.d Feedwater Line Lengths to IVs	13
2.e Feedwater Line Lengths from Outer IV to 5th FW Htrs	16
2.f Feedwater Line Lengths from Outer IV to 5th FW Htrs	19
3. Torus Vent Line Pipe Lengths	22
4. Drywell Purge/Vent Line Lengths	23
5.a Emergency Condenser Vent Line Lengths	24
5.b Emergency Condenser Vent Line Lengths	27
5.c Emergency Condenser Vent Line Lengths	30
5.d Emergency Condenser Vent Line Lengths	33
6.a Emergency Condenser Drain Line Lengths	36
6.b Emergency Condenser Drain Line Lengths	39
6.c Emergency Condenser Drain Line Lengths	41
6.d Emergency Condenser Drain Line Lengths	43
7. Summary of Pipe Lengths	45
8. Calculation of Volumes and Surface Areas	48
9. Minimum Pathway for Each Bypass Leakage Source	51

FIGURES

1. Feedwater IV Model	14
2. Plan above El. 281'-0"	38

Ref.

I. Purpose/Objective

This calculation is to provide data to be used as input to other calculations. Regulatory Guide 1.183 [Ref. 1, Appendix A, Sections 4.5, 6.3 & 6.5] allows credit for holdup and deposition in piping. The computer code RADTRAD [Ref. 2] accounts for deposition and requires specific inputs with respect to the piping. For use in determining transit/holdup time and deposition/plateout in the secondary containment bypass piping, the total length of pipe, the total volume, the total surface area, the length of horizontal pipe, the horizontal surface area and the total degrees of bend are required.

II. Methodology

The NMP1 10CFR50 Appendix J Program [Ref. 3] identifies secondary containment bypass pathways and their associated valves that require leak rate testing. The system P&IDs are used to identify and trace the pathways from their origin to the release point. Isometric drawings are used to determine the lengths of horizontal and vertical piping segments. This information is tabulated using an excel spreadsheet. The piping spec is used to determine the internal diameters of the various pipes. From this data, the total length of pipe, the horizontal pipe length, the total degrees of bend, the internal surface area, the horizontal surface area and the total volume are calculated.

D is the pipe internal diameter L is the length of pipe

Inner surface area = πDL Volume = $\pi D^2 L / 4$

Horizontal surface area = DL [Ref. 33, Issue 2, 3rd paragraph]

III. Data/Assumptions (D/A)

1. Secondary containment bypass leakage is addressed in the 10CFR50 Appendix J Testing Program Plan [Ref. 3]. It includes the following systems and valves:

   a. Main Steam Isolation Valves (MSIV): IV-01-02, IV-01-04, IV-01-01, & IV-01-03

   b. Other Bypass Leakage Pathways:
      1. Feedwater: IV-31-07, CKV-31-01R, IV-31-08, CKV-31-02R
      2. Torus Vent Line: IV-201-16, IV-201-17
      3. Drywell Vent/Purge: IV-201-32, IV-201-31
      4. Emergency Condenser Vent Lines: IV-05-02R, IV-05-03R
      5. Emergency Condenser Drain Lines: IV-39-11R, IV-39-12R, IV-39-13R, IV-39-14R

2. Non-seismic piping is **assumed** to fail at the outer boundary of the reactor building. (If the piping failed within the reactor building, it would not be bypass leakage.)

Ref.

3. For the purposes of this calculation, the Main Steam lines are **assumed** to break at the stop valves. The main steam piping from the reactor outlet to the external isolation valve outlet (System 01) is Class I, safety related (SR). From the external isolation valve outlet to the turbine inlet (System 02), it is Class II, important to safety/ non-safety related (NSR). In order to take credit for holdup and plateout in the main steam piping between the outer isolation valve and the turbine stop valves, the piping must be seismically rugged and is [Ref. 30].

4. The feedwater piping is **assumed** to break at the 5th point heat exchanger. Systems 30 and 31 are both seismically rugged [Ref. 31].

5. Piping that is angled such that it is not horizontal is conservatively **assumed** to be vertical. No credit is taken for particulate deposition in this segment. [Ref. 33, Issue 2, 3rd paragraph]

6. Secondary containment bypass pathways:

   a. Main Steam Isolation Valves (MSIV) Leakage, 2 lines: [Ref. 4]

      Pathway A: Rx N3A, 01-24-A, FE-01-98, **IV-01-02**, Penetration X-2B, **IV-01-04**, 02-24-A, Turbine Stop & Control Valve Manifold

      Pathway B: Rx N3B, 01-24-A, FE-01-101, **IV-01-01**, Penetration X-2A, **IV-01-03**, 02-24-A, Turbine Stop & Control Valve Manifold

   b. Other Bypass Leakage Pathways:

      1. Feedwater, 2 lines [Ref. 5]

         Pathways A & B: Rx, 10" lines, 31-18-A, Penetration X-4A, **IV-31-07**, **CKV-31-01R**, 30-18-A, FE-30-84, 30-13, 30-16-A, 30-10, 5th FW Htr #115
         30-16-A, 30-11, 5th FW Htr #125
         30-16-A, 30-12, 5th FW Htr #135

         Pathway C & D: Rx, 10" lines, 31-18-A, Penetration X-4B, **IV-31-08**, **CKV-31-02R**, 30-18-A, FE-30-85, 30-14, 30-16-A, 30-10, 5th FW Htr #115
         30-16-A, 30-11, 5th FW Htr #125
         30-16-A, 30-12, 5th FW Htr #135

      2. Torus Vent Line [Ref. 6]

         Pathway: Torus Penetration XS-327, 201.1-20-LT, **IV-201-16**, **IV-201-17**, 201.1-20-LG

      3. Drywell Vent/Purge [Ref. 6]

         Pathway: Penetration X-19, 201.1-20-LT, **IV-201-32**, 201.1-24-LT, **IV-201-31**, 201.2-24-LG

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Ref.

4. Emergency Condenser Vent Lines [Ref. 7 & 4]

Pathways A & B: Rx N5A, 39-10-BNG, Pen. X-3A, IV-39-09R, IV-39-07R, 39-12-BNG, 39-12-B, 05-¾-A, 05-1-A, V-05-34, IV-05-01R, IV-05-11, V-05-31, ¾" line, 05-1½-A, **IV-05-02R**, 05-1-A, **IV-05-03R**, 05-1½-A, 01-2-A, Main Steam Line at IV-01-03

Pathways C & D: Rx N5B, 39-10-BNG, Pen. X-3B, IV-39-10R, IV-39-08R, 39-12-BNG, 39-12-B, 05-¾-A, 05-1-A, V-05-33, IV-05-04R, IV-05-12, V-05-32, ¾" line, 05-1½-A, **IV-05-02R**, 05-1-A, **IV-05-03R**, 05-1½-A, 01-2-A, Main Steam Line at IV-01-03

5. Emergency Condenser Drain Lines [Ref. 7 & 4]

Pathways A & B: Rx N5A, 39-10-BNG, Pen. X-3A, IV-39-09R, IV-39-07R, 39-12-BNG, 39-12-B, 39-1-BL, V-39-112, V-39-111, (or V-39-110, V-39-109), 39-1-C, 39-1-A, **IV-39-11R**, **IV-39-12R**, CKV-39-106, FCV-39-15, 05-1½-C, CKV-05-35, V-05-27, V-05-28, 02-2-A, to the condenser

Pathways C & D: Rx N5B, 39-10-BNG, Pen. X-3B, IV-39-10R, IV-39-08R, 39-12-BNG, 39-12-B, 39-1-BL, V-39-95, V-39-94, (or V-39-93, V-39-92), 39-1-C, 39-1-A, **IV-39-13R**, **IV-39-14R**, CKV-39-88, FCV-39-16, 05-1½-C, CKV-05-35, V-05-27, V-05-28, 02-2-A, to the condenser

7. Pipe Inside Diameters (inches): [Refs. 8 & 9]

Pipe Identification: System No. – Line Size – Line/Material Class

Pipe	Sched.	ID	Pipe	Sched.	ID	Pipe	Sched.	ID
01-2-A	160	1.687	30-16-A	100	13.938	39-12-B	80*	11.374
01-24-A	80	21.562	30-18-A	100	15.688	39-12-BNG	80*	11.374
02-11/2-A	160	1.338	31-10-A	100	9.312	201.1-20-LG	10	19.500
02-2-A	160	1.687	31-18-A	100	15.688	201.1-20-LT	Std	19.250
02-24-A	80	21.562	39-1-A	80*	0.957	201.1-24-LT	Std	23.250
05-3/4-A	160	0.612	39-1-BL	80*	0.957	201.2-20-LG	10	19.500
05-1-A	160	0.815	39-1-C	80*	0.957	201.2-24-LG	10	23.500
05-11/2-A	160	1.338	39-1 1/2-C	80*	1.500			
05-11/2-C	160	1.338	39-10-BNG	80*	9.562			

*System No. 39, 10" min wall = 0.522", 12" min wall = 0.622", therefore schedule 80 A, BL & C also assumed to be schedule 80

System No.:

01 – Main Steam, reactor outlet to external isolation valve outlet
02 – Main Steam, external isolation valve outlet to turbine inlet
05 – Emergency condenser vent to main steam line & bypass to torus
30 – High pressure reactor feedwater (from 5th FW Htr to external isolation valve)
31 – High pressure reactor feedwater from external isolation valve to reactor inlet
39 – Emergency condenser, steam supply & condensate return

Ref.

201.1 – Drywell vent & purge air & N_2 (drywell to first isolation valve)
201.2 – Reactor containment N_2 purge & fill

Material Class:

A - Seamless carbon steel – A106 GR B
B - Seamless stainless steel – A376 Type 304 (except as otherwise noted)
BL - Seamless stainless steel SA312 Type 316L
BNG - Seamless or welded stainless steel SA312 or SA358 Type 316, Nuclear Grade
C - Seamless carbon steel ASTM Spec A53 GR A or B
LG - Light gage pipe or Sch. #10
LT - Seamless ASTM A-333 GR 6 GR 0 or ASTM A212 firebox to ASTM A300 Spec.

8. The following are excerpts from R.G. 1.183, Appendix A [Ref. 1],

4.5 – *Primary containment leakage that bypasses the secondary containment should be evaluated at the bypass leak rate incorporated in the technical specifications. If the bypass leakage is through water, e.g., via filled piping run that is maintained full, credit for retention of iodine and aerosols may be considered on case-by-case basis. Similarly, deposition of aerosol radioactivity in gas-filled lines may be considered on a case-by-case basis.*

6.3 - *Reduction of the amount of released activity by deposition and plateout on steam system piping upstream of the outboard MSIVs may be credited, but the amount of reduction in concentration allowed will be evaluated on an individual case basis. Generally, the model should be based on the assumption of well-mixed volumes, but other models such as slug flow may be used if justified.*

6.5 – *A reduction in MSIV releases that is due to holdup and deposition in main steam piping downstream of the MSIVs and in the main condenser, including the treatment of air ejector effluent by offgas systems, may be credited if the components and piping systems used in the release path are capable of performing their safety function during and following a safe shutdown earthquake (SSE). The amount of reduction allowed will be evaluated on an individual case basis. References A-9 and A-10 provide guidance on acceptable models.*

Reference A-9 J.E. Cline, "MSIV Leakage Iodine Transport Analysis," Letter Report dated March 26, 1991. (ADAMS Accession Number ML003683718)

Reference A-10 USNRC, "Safety Evaluation of GE Topical Report, NEDC-31858P (Proprietary GE report), Revision 2, BWROG Report for Increasing MSIV Leakage Limits and Elimination of Leakage Control Systems, September 1993," letter dated March 3, 1999, ADAMS Accession Number 9903110303.

Ref.

IV. Calculation

MSIV leakage is analyzed using the guidance given in Section 6 of Appendix A to Reg. Guide 1.1.83 (Ref. 1). Section 6.5 of Appendix A to Reg. Guide 1.1.83 (Ref. 1) states that reductions in MSIV releases due to holdup and deposition in main steam piping located downstream of the MSIVs may be credited if the components and piping systems used in the release path are capable of performing their safety function during and following a SSE. For this analysis, the main steam lines are assumed to remain intact following a LOCA up to the Turbine Stop valves. This assumption is valid per calculation S11-02P01 (Ref. 30). For purposes of determining holdup and deposition in the main steam lines, the lengths and ID of the horizontal sections of the piping between the inboard MSIV and the Turbine Stop valves are used to determine the volume and surface area of the piping. These data are needed in order to determine the effective removal rate for particulates and elemental iodine due to deposition/plateout in the piping.

Leakage via other secondary containment bypass pathways can be treated similarly.

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

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Ref.

Table 1.a
Main Steam Line Lengths
Pathway A

From Rx Vessel Nozzle N3A to Turbine Stop Valves								
Pipe Segment	Bends (deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N3A, 01-24-A								C26830C,Sh1
1		2	0					
2	90				27	0	0.8125	
3	20				20	1	0.25	
4	90	13	1	0.0625				
5	30	8	3	0.875				
IV-01-02		4	6					
6		7	0					
7	60	25	6					
Pen. X-2B								
IV-01-04								
8	90				4	0		C26831C,Sh1
02-24-A								
9					16	5	0.5	
10	90	22	6					
11	90	64	6					
12	90	105	10	0.5				
13	90				7	3		
14	45				14	3	0.8125	
15	45				15	5	0.8125	
16	90	5	0					C18055C
17	90	4	6					
18	90				4	6		
19	90	11	0					
Turb. Stop Valve								
								Pipe Diameter
From N3A to IV-01-02	230	23	4	0.9375	47	1	1.0625	24"
		23.4115			47.1719			
From IV-01-02 to IV-01-04	60	32	6	0	0	0	0	24"
		32.5000			0.0000			
From IV-01-04 to Turbine Stop Vlve	900	211	28	0.5	60	22	2.125	24"
		213.3750			62.0104			

Note: The length of IV-01-02 is not included in the totals.

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G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

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Table 1.b
Main Steam Line Lengths
Pathway B

From Rx Vessel Nozzle N3B to Turbine Stop Valves								
Pipe Segment	Bends (deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N3B 01-24-A								C26830C,Sh1
1		2	0					
2	90				27	0	0.8125	
3	20				20	1	0.25	
4	90	13	1	0.0625				
5	30	8	3	0.875				
IV-01-01		4	6					
6		7	0					
7	60	25	6					
Pen. X-2A								
IV-01-03								
8	90				4	0		C26831C,Sh1
02-24-A								
9					16	5	0.5	
10	90	26	6					
11	90	68	9					
12	90	101	10	0.5				
13	90				7	3		
14	45				14	3	0.8125	
15	45				15	5	0.8125	
16	90	5	0					C18055C
17	90	4	6					
18	90				4	6		
19	90	11	0					
Turb. Stop Valve								
From N3B to IV-01-01	230	23	4	0.9375	47	1	1.0625	
		23.4115			47.1719			
From IV-01-01 to IV-01-03	60	32	6	0	0	0	0	
		32.5000			0.0000			
From IV-01-03 to Turbine Stop Vlve	900	215	31	0.5	60	22	2.125	
		217.6250			62.0104			

Note: The length of IV-01-02 is not included in the totals.

Ref.

Table 2.a
Feedwater Line Lengths to IVs
Pathway A

From to Rx Vessel Nozzle N4A to CKV-31-02R

Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N4A 31-10-A								C26839C, Sh 1
1		3	3	0.875				
2	90				14	0		
3	45				19	8	0.1875	
4	45				4	5	0.5	
5	90	18	1	0.375				
31-18-A								
6		5	0					
7	60	17	6	0.125				
8	60	21	2	0.4375				
Penetration X-4B								
IV-31-08		5	8					C26838C, Sh 2
CKV-31-02R		4	0					
								Pipe Diameter
From N4A to IV-31-08	270	21	4	1.25	37	13	0.6875	10"
		21.4375			38.1406			
	120	43	8	0.5625	0	0	0	18"
		43.7135			0.0000			
IV-31-08		5	8					
		5.6667			0.0000			
CKV-31-02R		4	0					
		4.0000			0.0000			

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Table 2 b
Feedwater Line Lengths to IVs
Pathway B

From Rx Vessel Nozzle N4B to CKV-31-02R

Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N4B 31-10-A								C26839C, Sh 1
1		3	3	0.875				
2	90				14	0		
3	45				19	8	0.1875	
4	45				4	5	0.5	
18"x18"x10" Tee								
31-18-A								
5	90	5	0					
6	60	17	6	0.125				
7	60	21	2	0.4375				
Penetration X-4B								
IV-31-08		5	8					C26838C, Sh 2
CKV-31-02R		4	0					
								Pipe Diameter
From N4A to IV-31-08	180	3	3	0.875	37	13	0.6875	10"
		3.3229			38.1406			
	210	43	8	0.5625	0	0	0	18"
		43.7135			0.0000			
IV-31-08		5	8					
		5.6667			0.0000			
CKV-31-02R		4	0					
		4.0000			0.0000			

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Table 2.c
Feedwater Line Lengths to IVs
Pathway C

From Rx Vessel Nozzle N4C to CKV-31-01R

Pipe Segment	Bends (deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N4C 31-10-A								C26839C, Sh 1
1		3	3	0.875				
2	90				14	0		
3	45				19	8	0.1875	
4	45				4	5	0.5	
18"x18"x10" Tee								
31-18-A								
6	90	5	0					
7	60	17	6	0.125				
8	60	21	2	0.4375				
Penetration X-4A								
IV-31-07		5	8					C26838C, Sh 2
CKV-31-01R		4	0					
								Pipe Diameter
From N4A to IV-31-07	180	3	3	0.875	37	13	0.6875	10"
		3.3229			38.1406			
	210	43	8	0.5625	0	0	0	18"
		43.7135			0.0000			
IV-31-07		5	8					
		5.6667			0.0000			
CKV-31-01R		4	0					
		4.0000			0.0000			

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Table 2.d
Feedwater Line Lengths to IVs
Pathway D

From Rx Vessel Nozzle N4D to CKV-31-01R								
Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N4D 31-10-A								C26839C, Sh 1
1		3	3	0.875				
2	90				14	0		
3	45				19	8	0.1875	
4	45				4	5	0.5	
5	90	18	1	0.375				
31-18-A								
6		5	0					
7	60	17	6	0.125				
8	60	21	2	0.4375				
Penetration X-4A								
IV-31-07		5	8					C26838C, Sh 2
CKV-31-01R		4	0					
								Pipe Diameter
From N4A to IV-31-07	270	21	4	1.25	37	13	0.6875	10"
		21.4375			38.1406			
	120	43	8	0.5625	0	0	0	18"
		43.7135			0.0000			
IV-31-07		5	8					
		5.6667			0.0000			
CKV-31-01R		4	0					
		4.0000			0.0000			

Pipe Segment 5 is conservatively estimated. It is actually 20'-6" to the "T", however, there is a reducer whose location is not dimensioned on the drawing. The same dimension is used as for Pathway A.

Ref.

The volume between the Feedwater Inner Isolation Valves, IV-31-07 & 08, and the Feedwater Outer Isolation Valves, CHK-31-01R & 02R, is estimated below.

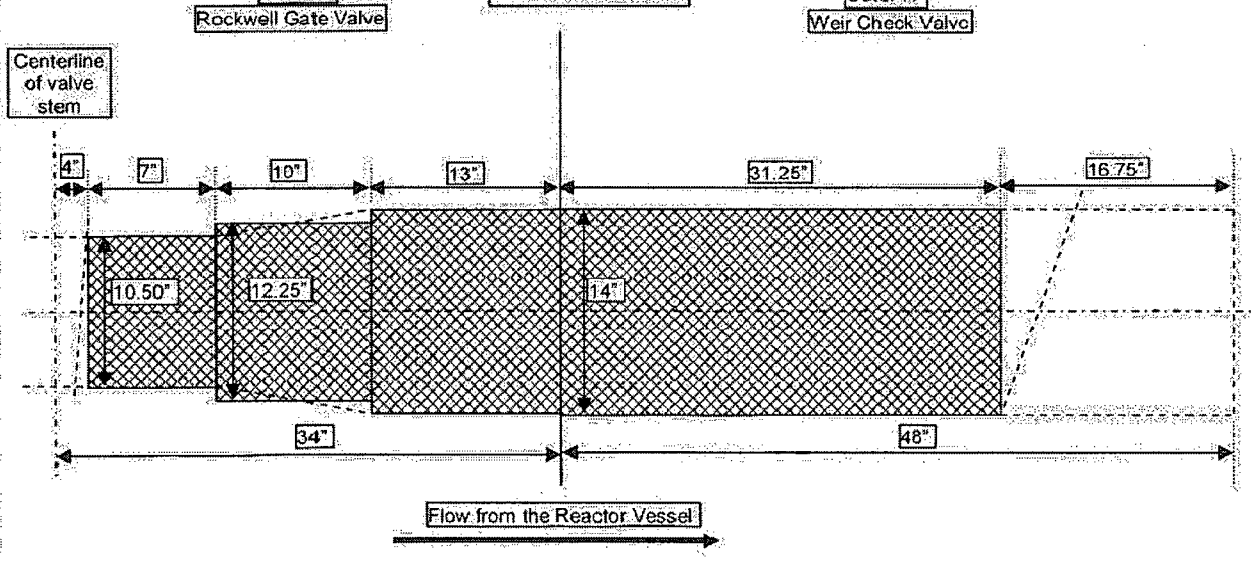
Valves IV-31-07 & 08 are Rockwell Gate Valves. Refs. 26 & 27 include vendor drawings showing the general assembly and the weld end. Some dimensions are provided, however, others must be estimated.

- the overall length of the valve is 68" from inlet to outlet,
- the gate is at the midpoint of the valve, 34" from either end,
- the throat diameter is 10.50",
- 13" on either end include a flange piece and an extension,
- there are sockelets located 11" on either side of the gate,
- the ID tapers from inboard of where the flange is attached to inboard of the body sockelets
- the gate is a wedge, wider at the top than the bottom. It is conservatively estimated to be 8" thick at the top
- the 10.50" diameter section is conservatively assumed to extend as far as the sockelet
- The tapered section is conservatively assumed to extend from the sockelet to where the flange is welded to the body

Valves CHK-31-01R & 02R are Weir 18" Swing Disc Check Valves. Ref. 29 is a vender drawing that provides some dimensions, but as above, others are conservatively estimated.

- The overall length is 48",
- distance from inboard end to closest point on the closed disc is 31.25" (48" – 16.75"),
- ID is assumed to be 14"

Figure 1
Feedwater IV Model



Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref

Based on References 26 thru 29, the dimensions are conservatively assumed in order to underestimate the volumes.

Volume = $\pi D^2/4 \times L$

$\pi\ 10.5^2/4 \times 7 =$	606.13 in^3 = 0.3508 ft^3
$\pi 12.25^2/4 \times 10 =$	1178.59 in^3 = 0.6821 ft^3
$\pi 14^2/4 \times 13 =$	2001.19 in^3 = 1.1581 ft^3
$\pi 14^2/4 \times 31.25 =$	4810.56 in^3 = 2.7839 ft^3
Total =	4.9749 ft^3

The internal surface area = πDL

$\pi 10.5 \times 7 =$	230.91 in^2 = 1.6035 ft^2
$\pi 12.25 \times 10 =$	384.85 in^2 = 2.6725 ft^2
$\pi 14 \times 13 =$	571.77 in^2 = 3.9706 ft^2
$\pi 14 \times 31.25 =$	1374.45 in^2 = 9.5448 ft^2
Total =	17.791 ft^2

The horizontal area = DL

$10.5 \times 7 =$	73.50 in^2 = 0.5104 ft^2
$12.25 \times 10 =$	122.50 in^2 = 0.8507 ft^2
$14 \times 13 =$	182.00 in^2 = 1.2639 ft^2
$14 \times 31.25 =$	437.50 in^2 = 3.0382 ft^2
Total =	5.6632 ft^2

Ref.

Table 2e
Feedwater Line Lengths from Outer IV to 5th FW Htrs
Pathways A & B

From CKV-31-02R to 5th Feedwater Heater #115

Pipe Segment	Bends(deg)	Horizontal Length Feet	Horizontal Length Inches		Vertical Length Feet	Vertical Length Inches		Reference Drawing
CKV-31-02R								C26838C Sh2
30-18-A								
		4	7	0.375				
	90				16	1		
	90	10	0	0.9375				
30-14	90				45	10	0.5	
	90	40	3	0.5				
30-16-A								
30-10		5	8	0.5				
		24	3	0.5				
	90	40	3	0.6875				
	45	4	2	0.9375				
	45	1	8					
	30				4	10	0.875	
5th pt htr #115								
								Pipe Diameter
From CHK-31-02 to Fdwtr Hx #115	210	69	16	2.125	4	10	0.875	16"
		70.5104			4.9063			
	360	54	10	1.8125	61	11	0.5	18"
		54.9844			61.9583			

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 2.e, continued
Feedwater Line Lengths from Outer IV to 5th FW Htrs
Pathways A & B

From CKV-31-02R to 5th Feedwater Heater #125								
Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
CKV-31-02R								C26838C,Sh2
30-18-A								
		4	7	0.375				
	90				16	1		
	90	10	0	0.9375				
30-14	90				45	10	0.5	
	90	30	3					
	90	7	0					
30-11		3	8	0.5				
30-16-A								
		29	6	0.6875				
	45	4	2	0.9375				
	45	1	8					
	30				4	10	0.875	
5th pt htr #125								
								Pipe Diameter
From CHK-31-02 to Fdwtr Hx #125	120	34	16	1.625	4	10	0.875	16"
		35.4688			4.9063			
	450	51	10	1.3125	61	11	0.5	18"
		51.9427			61.9583			

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 2.e, continued
Feedwater Line Lengths from Outer IV to 5th FW Htrs
Pathways A & B

From CKV-31-02R to 5th Feedwater Heater #135

Pipe Segment	Bends(deg)	Horizontal Length Feet	Horizontal Length Inches		Vertical Length Feet	Vertical Length Inches		Reference Drawing
CKV-31-02R								C26838C,Sh2
30-18-A								
		4	7	0.375				
	90				16	1		
	90	10	0	0.9375				
30-14	90				45	10	0.5	
	90	1	1	0.5				
30-16-A								
		6	0					
30-12	90	40	3	0.6875				
	45	4	2	0.9375				
	45	1	11	0.875				
	30				4	10	0.875	
5th pt htr #135								
								Pipe Diameter
From CHK-31-02 to Fdwtr Hx #135	210	51	16	2.5	4	10	0.875	16"
		52.5417			4.9063			
	360	15	8	1.8125	61	11	0.5	18"
		15.8177			61.9583			

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 2f.1
Feedwater Line Lengths from Outer IV to 5th FW Htrs
Pathways C & D

From CKV-31-01R to 5th Feedwater Heater #115

Pipe Segment	Bends(deg)	Horizontal Length Feet	Horizontal Length Inches		Vertical Length Feet	Vertical Length Inches		Reference Drawing
CKV-31-01R								C26838C,Sh2
30-18-A								
		4	8	0.75				
	90				16	1		
	90	10	0	0.9375				
30-13	90				45	10	0.5	
	90	7	9					
30-16-A								
30-10		5	8	0.5				
		24	3	0.5				
	90	40	3	0.6875				
	45	4	2	0.9375				
	45	1	8					
	30				4	10	0.875	
5th pt htr #115								
								Pipe Diameter
From CHK-31-01 to Fdwtr Hx #115	210	69	16	2.125	4	10	0.875	16"
		70.5104			4.9063			
	360	21	17	1.6875	61	11	0.5	18"
		22.5573			61.9583			

Ref.

Table 2f.1, continued
Feedwater Line Lengths from Outer IV to 5th FW Htrs
Pathways C & D

From CKV-31-01R to 5th Feedwater Heater #125

Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
CKV-31-01R								C26838C,Sh2
30-18-A								
		4	8	0.75				
	90				16	1		
	90	10	0	0.9375				
30-13	90				45	10	0.5	
	90	2	3					
	90	7	0					
30-16-A								
30-11		3	8	0.5				
		29	6	0.6875				
	45	4	2	0.9375				
	45	1	8					
	30				4	10	0.875	
5th pt htr #125								
								Pipe Diameter
From CHK-31-01 to Fdwtr Hx #125	120	34	16	1.625	4	10	0.875	16"
		35.4688			4.9063			
	450	23	11	1.6875	61	11	0.5	18"
		24.0573			61.9583			

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 2f.1, continued
Feedwater Line Lengths from Outer IV to 5th FW Htrs
Pathways C & D

From CKV-31-01R to 5th Feedwater Heater #135								
Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
CKV-31-01R								C26838C,Sh2
30-18-A								
		4	8	0.75				
	90				16	1		
	90	10	0	0.9375				
30-13	90				45	10	0.5	
	90	33	7	0.5				
30-16-A		2	7	0.5				
		6	0					
30-12	90	40	3	0.6875				
	45	4	2	0.9375				
	45	1	11	0.875				
	30				4	10	0.875	
5th pt htr #135								
								Pipe Diameter
From CHK-31-01 to Fdwtr Hx #135	210	51	16	2.5	4	10	0.875	16"
		52.5417			4.9063			
	360	47	15	2.1875	61	11	0.5	18"
		48.4323			61.9583			

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

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G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 3
Torus Vent Line Lengths

From to Torus Penetration X-327 to Turbine Building								
Pipe Segment	Bends (deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Penetration X-327								C27186C,Sh1
201.1-20-LT								
					3	6		
IV-201-16						8		
					1	10		
IV-201-17						8		
201.2-20-LG								
					1	10		
	45				14	5	0.9375	
	90	15	9	0.75				
	90				50	6		
	90	2	11					
								Pipe Diameter
From Pen. X-327 to IV-201-16	0	0	0	0	3	6	0	20"
		0.0000			3.5000			
IV-201-16		0	0	0	0	8	0	
		0.0000			0.6667			
From IV-201-16 to IV-201-17	0	0	0	0	1	10	0	20"
		0.0000			1.8333			
IV-201-17		0	0	0	0	8	0	
		0.0000			0.6667			
From IV-201-17 to Turbine Bldg	315	17	20	0.75	65	21	0.9375	20"
		18.7292			66.8281			

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G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 4
Drywell Vent/Purge Line Lengths

From Drywell El. 325'-0" to the Turbine Auxiliary Ext. Building (Column Line 12)								
Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Drywell El. 325'-0", 201.2-20-LG								C18350C,Sh1, C27186C,Sh1
1					12	4	0.8125	
2					2	7	0.1875	
3					9	0		
4	90	10	0	0.5				
Penetration X-19								
24"x20" Eccentric Reducer		3	0					
IV-201-32			8					
DVP-2		1	9					
IV-201-31			8					
201.1-24-LT								
201.2-24-LG								
5		3	9	0.4375				
6	45	4	3					
7	90				9	11		
8		22	0					
9	45	5	7	0.875				
10	45	57	6					
11	45	4	11	0.375				
12	45	7	3	0.5				
								Pipe Diameter
From Drywell to IV 201-32	90	13	0	0.5	23	11	1	20"
		13.0417			24.0000			
From IV-201-32 to IV-201-31	0	1	9	0	0	0	0	24"
		1.7500			0.0000			
From IV-201-31 to Turbine Bldg	315	102	39	2.1875	9	11	0	24"
		105.4323			9.9167			

Ref.

Table 5.a
Emergency Condenser Vent Line Lengths
Pathway A

From Rx Nozzle N5A to MST (via Emergency Condenser #111)

Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N5A 39-10-BNG								C26843C,Sh1
1		1	3					
2	90	6	9	0.5				
3	90				9	3	0.8125	
4	60	4	9	0.5				
5	90	16	7					
Penetration X-3A								
IV-39-09R		3	0					
IV-39-07R		2	6					
12"X10" Reducer								
39-12-BNG								
6		8	1	0.5				C26843C,Sh5
39-12-B								
7		5	11	0.5				
8	90				26	2	0.5	C26843C,Sh1
9	90	10	6					
10	90	13	3					
11	90				14	0		
12	90	14	2	0.5				
13	90	7	1	0.4375				C18355C,Sh1
05-3/4-A								
14	90				2	9		C27165C,Sh1
15	90	3	8	0.5				
16	90	9	4	0.9375				
1"x3/4" Reducer								
05-1-A								
17		14	1					
18	90				1	6	0.25	
IV-05-01R								
19					2	4	0.25	
IV-05-11								
20					1	6		
21	90	1	1	0.5				

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 5.a, cont'd
Emergency Condenser Vent Line Lengths
Pathway A

From Rx Nozzle N5A to MST (via Emergency Condenser #111)

Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
05-1 1/2-A								
22	90					10	0.5	
23	90	4	0	0.4375				
24	90				2	10		
25	90	6	2	0.75				
26	90				6	6	0.8125	
27	60				5	2	0.375	C27165C,Sh2
28	60				11	5	0.375	
29	90	4	0					C18355C,Sh2
30	90	2	3	0.9375				C27165C,Sh2
1 1/2"X1" Reducer								
31			6	0.8125				
IV-05-02R			5	0.5				
32			3					
1 1/2"X1" Reducer								
05-1 1/2-A								
33		1	0					
34	90	1	0					
1 1/2"X1" Reducer								
35			6	0.8125				
IV-05-03R			5	0.5				
36			3					
1 1/2"X1" Reducer								
05-1 1/2-A								
37		1	8	0.6875				
38	90				1	6		
39	90	4	7	0.25				
40*	90				10	2		C18357C
41*	90	22	6					C18358C,Sh1
42*	90				16	6		C18355C,Sh1
43	90	3	3					C18356C
44*	45	21.21						C18355C,Sh1
45*	45	31	0					
46*	90	11	0					
47*	90	16	9					
48*	90				5	4		C18357C
49*	90	3	0					C18355C,Sh1

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 5.a, cont'd
Emergency Condenser Vent Line Lengths
Pathway A

From Rx Nozzle N5A to MST (via Emergency Condenser #111)								
Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N5A 39-10-BNG								C26843C, Sh1
								Pipe Diameter
From N5A to IV-39-09R	330	27	28	1	9	3	0.8125	10"
From IV-39-09R to IV-39-07R	0	5	6	0	0	0	0	
Total 10"	330	34.9167			9.3177			
From IV-39-07R to 05-3/4-A	540	57	24	1.9375	40	2	0.5	12"
		59.1615			40.2083			
From 05-3/4-A to 05-1-A	270	12	12	1.4375	2	9	0	3/4"
		13.1198			2.7500			
From 05-1-A to 05-1 1/2-A	180	15	2	0.5	4	16	0.5	1"
		15.2083			5.3750			
From 05-1 1/2-A to IV-05-02R	750	16	5	2.125	24	33	2.0625	1 1/2"
		16.5938			26.9219			
IV-05-02R	0	0	14	1.3125	0	0	0	1"
		1.2760			0.0000			
From IV-05-02R to IV-05-03R	90	2	0	0	0	0	0	1 1/2"
		2.0000			0.0000			
IV-05-03R	0	0	14	1.3125	0	0	0	1"
		1.2760			0.0000			
From IV-05-03R to MST	990	112.21	33	0.9375	32	18	0	1 1/2"
		115.0381			33.5000			

*The lengths of the following segments are calculated as follows:

Segment 40:	(El. 318'-0" + 2'-0") – (El. 309'-10") = 10'-2"	C18357C
Segment 41:	(9'-6") + (10'-0") + (3'-0") = 22'-6"	C18358C, Sh. 1
Segment 42:	(El. 309'-10") – (El. 298'-0" – 4'-8") = 16'-6"	C18357C
(See Figure 2)		
Segment 44:	SEC 45° [(22'-0") + (5'-0") – (3'-3") – (6'-9") 1.414 x (15'-0") = 21.21'	C18355C, Sh. 1
Segment 45:	(22'-0") + (22'-0") + (5'-0") – (15'-0") – (3'-0") = 31'-0"	C18355C, Sh. 1
Segment 46:	(5'-0") + (6'-0") = 11'-0"	C18355C, Sh. 1
Segment 47:	(23'-0") – (5'-0") – (1'-3") = 16'-9"	C18355C, Sh. 1
Segment 48:	(El. 281'-0" + 12"-4") – (El. 288'-0") = 5'-4"	C18357C
Segment 49:	(1'-3") + 3" + (1'-6") = 3'-0"	C18355C, Sh. 1

These values are applicable for Tables 5.b, 5.c & 5.d, as well.

Ref.

Table 5.b
Emergency Condenser Vent Line Lengths
Pathway B

From Rx Nozzle N5A to MST (via Emergency Condenser #112)

Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N5A 39-10-BNG								C26843C,Sh1
1		1	3					
2	90	6	9	0.5				
3	90				9	3	0.8125	
4	60	4	9	0.5				
5	90	16	7					
Penetration X-3A								
IV-39-09R		3	0					
IV-39-07R		2	6					
12"X10" Reducer								
39-12-BNG								
6		8	1	0.5				C26843C,Sh5
39-12-B								
7		5	11	0.5				
8	90				26	2	0.5	C26843C,Sh1
9	90	10	6					
10	90	10	11					
11	90				14	0		
12	90	14	2	0.5				
13	90	5	6					C18355C,Sh1
05-3/4-A								
14	90				2	9		C27165C,Sh1
15	90	5	6					
16	90	3	8	0.5				
1"x3/4" Reducer								
05-1-A								
17		14	1					
18	90				1	6	0.25	
IV-05-01R								
19					2	4	0.25	
IV-05-11								
20					1	6		
21	90	1	1	0.5				

Ref.

Table 5.b. cont'd
Emergency Condenser Vent Line Lengths
Pathway B

From Rx Nozzle N5A to MST (via Emergency Condenser #112)

Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
05-1 1/2-A								
22	90					10	0.5	
23	90	4	0	0.4375				
24	90				2	10		
25	90	6	2	0.75				
26	90				6	6	0.8125	
27	60				5	2	0.375	C27165C,Sh2
28	60				11	5	0.375	
29	90	4	0					C18355C,Sh2
30	90	2	3	0.9375				C27165C,Sh2
1 1/2"X1" Reducer								
31			6	0.8125				
IV-05-02R			5	0.5				
32			3					
1 1/2"X1" Reducer								
05-1 1/2-A								
33		1	0					
34	90	1	0					
1 1/2"X1" Reducer								
35			6	0.8125				
IV-05-03R			5	0.5				
36			3					
1 1/2"X1" Reducer								
05-1 1/2-A								
37		1	8	0.6875				
38	90				1	6		
39	90	4	7	0.25				
40*	90				10	2		C18357C
41*	90	22	6					C18358C,Sh1
42*	90				16	6		C18355C,Sh1
43	90	3	3					C18356C
44*	45	21.21						C18355C,Sh1
45*	45	31	0					
46*	90	11	0					
47*	90	16	9					
48*	90				5	4		C18357C
49*	90	3	0					C18355C,Sh1

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 5 b, cont'd
Emergency Condenser Vent Line Lengths
Pathway B

From Rx Nozzle N5A to MST (via Emergency Condenser #112)								
Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
								Pipe Diameter
From N5A to IV-39-09R	330	27	28	1	9	3	0.8125	10"
From IV-39-09R to IV-39-07R	0	5	6	0	0	0	0	
Total 10"	330	34.9167			9.3177			
From IV-39-07R to 05-3/4-A	540	52	37	1.5	40	2	0.5	12"
		55.2083			40.2083			
From 05-3/4-A to 05-1-A	270	8	14	0.5	2	9	0	3/4"
		9.2083			2.7500			
From 05-1-A to 05-1 1/2-A	180	15	2	0.5	4	16	0.5	1"
		15.2083			5.3750			
From 05-1 1/2-A to IV-05-02R	750	16	5	2.125	24	33	2.0625	1 1/2"
		16.5938			26.9219			
IV-05-02R	0	0	14	1.3125	0	0	0	1"
		1.2760			0.0000			
From IV-05-02R to IV-05-03R	90	2	0	0	0	0	0	1 1/2"
		2.0000			0.0000			
IV-05-03R	0	0	14	1.3125	0	0	0	1"
		1.2760			0.0000			
From IV-05-03R to MST	990	112.21	33	0.9375	32	18	0	1 1/2"
		115.0381			33.5000			

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 5.c
Emergency Condenser Vent Line Lengths
Pathway C

From Rx Nozzle N5B to MST (via Emergency Condenser #121)

Pipe Segment	Bends (deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N5B 39-10-BNG								C26843C,Sh2
1		1	3					
2	90	8	4	0.625				
3	90	8	5	0.8125				
4	60				5	1	0.5	
5	90	15	1					
Penetration X-3B								
IV-39-10R		3	0					
IV-39-08R		2	6					
12"X10" Reducer								
39-12-BNG								
6		8	3	0.4375				C26843C,Sh5
39-12-B								
7		6	0	0.4375				
8	90				26	1	0.25	C26843C,Sh2
9	90	10	6					
10	90	10	11					
11	90				14	0		
12	90	14	2	0.5				
13	90	5	7					C18355C,Sh1
05-3/4-A								
14	90				2	9		C27165C,Sh1
15	90	5	7					
16	90	3	8	0.5				
1"x3/4" Reducer								
05-1-A								
17		15	10	0.0625				
18	90				1	6	0.25	
IV-05-04R								
19					2	4	0.25	
IV-05-12								
20					1	6		
21	90	1	1	0.5				

Ref.

Table 5.c, cont'd
Emergency Condenser Vent Line Lengths
Pathway C

From Rx Nozzle N5B to MST (via Emergency Condenser #121)

Pipe Segment	Bends (deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
05-1 1/2-A								
22	90					10	0.5	
23	90	4	0	0.4375				
24	90				2	10		
25	90	6	2	0.75				
26	90				6	6	0.8125	
27	60				5	2	0.375	C27165C,Sh2
28	60				11	5	0.375	
29	90	4	0					C18355C,Sh2
30	90	2	3	0.9375				C27165C,Sh2
1 1/2"X1" Reducer								
31			6	0.8125				
IV-05-02R			5	0.5				
32			3					
1 1/2"X1" Reducer								
05-1 1/2-A								
33		1	0					
34	90	1	0					
1 1/2"X1" Reducer								
35			6	0.8125				
IV-05-03R			5	0.5				
36			3					
1 1/2"X1" Reducer								
05-1 1/2-A								
37		1	8	0.6875				
38	90				1	6		
39	90	4	7	0.25				
40*	90				10	2		C18357C
41*	90	22	6					C18358C,Sh1
42*	90				16	6		C18355C,Sh1
43	90	3	3					C18356C
44*	45	21.21						C18355C,Sh1
45*	45	31	0					
46*	90	11	0					
47*	90	16	9					
48*	90				5	4		C18357C
49*	90	3	0					C18355C,Sh1

Ref.

Table 5.c. cont'd
Emergency Condenser Vent Line Lengths
Pathway C

From Rx Nozzle N5B to MST (via Emergency Condenser #121)

Pipe Segment	Bends (deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
								Pipe Diameter
From N5A to IV-39 09R	330	32	13	1.4375	5	1	0.5	10"
From IV-39-09R to IV-39-07R	0	5	6	0	0	0	0	
Total 10"	330	38.7031			5.1250			
From IV-39-07R to 05-3/4-A	540	53	29	1.375	40	1	0.25	12"
		55.5313			40.1042			
From 05-3/4-A to 05-1-A	270	8	15	0.5	2	9	0	3/4"
		9.2917			2.7500			
From 05-1-A to 05-1 1/2-A	180	16	11	0.5625	4	16	0.5	1"
		16.9635			5.3750			
From 05-1 1/2-A to IV-05-02R	750	16	5	2.125	24	33	2.0625	1 1/2"
		16.5938			26.9219			
IV-05-02R	0	0	14	1.3125	0	0	0	1"
		1.2760			0.0000			
From IV-05-02R to IV-05-03R	90	2	0	0	0	0	0	1 1/2"
		2.0000			0.0000			
IV-05-03R	0	0	14	1.3125	0	0	0	1"
		1.2760			0.0000			
From IV-05-03R to MST	990	112.21	33	0.9375	32	18	0	1 1/2"
		115.0381			33.5000			

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 5.d
Emergency Condenser Vent Line Lengths
Pathway D

From Rx Nozzle N5B to MST (via Emergency Condenser #122)								
Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N5B 39-10-BNG								C27165C,Sh2
1		1	3					
2	90	8	4	0.625				
3	90	8	5	0.8125				
4	60				5	1	0.5	
5	90	15	1					
Penetration X-3B								
IV-39-10R		3	0					
IV-39-08R		2	6					
12"X10" Reducer								
39-12-BNG								
6		8	3	0.4375				C26843C,Sh5
39-12-B								
7		6	0	0.4375				
8	90				26	1	0.25	C26843C,Sh2
9	90	10	6					
10	90	13	3					
11	90				14	0		
12	90	14	2	0.5				
13	90	8	8	0.5625				C18355C,Sh1
05-3/4-A								
14	90				2	9		C27165C,Sh1
15	90	3	8	0.5				
16	90	9	3					
1"x3/4" Reducer								
05-1-A								
17		15	10	0.0625				
18	90				1	6	0.25	
IV-05-04R								
19					2	4	0.25	
IV-05-12								
20					1	6		
21	90	1	1	0.5				

Ref.

Table 5 d, cont'd
Emergency Condenser Vent Line Lengths
Pathway D

From Rx Nozzle N5B to MST (via Emergency Condenser #122)

Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
05-1 1/2-A								
22	90					10	0.5	
23	90	4	0	0.4375				
24	90				2	10		
25	90	6	2	0.75				
26	90				6	6	0.8125	
27	60				5	2	0.375	C27165C,Sh2
28	60				11	5	0.375	
29	90	4	0					C18355C,Sh2
30	90	2	3	0.9375				C27165C,Sh2
1 1/2"X1" Reducer								
31			6	0.8125				
IV-05-02R			5	0.5				
32			3					
1 1/2"X1" Reducer								
05-1 1/2-A								
33		1	0					
34	90	1	0					
1 1/2"X1" Reducer								
35			6	0.8125				
IV-05-03R			5	0.5				
36			3					
1 1/2"X1" Reducer								
05-1 1/2-A								
37		1	8	0.6875				
38	90				1	6		
39	90	4	7	0.25				
40*	90				10	2		C18357C
41*	90	22	6					C18358C,Sh1
42*	90				16	6		C18355C,Sh1
43	90	3	3					C18356C
44*	45	21.21						C18355C,Sh1
45*	45	31	0					
46*	90	11	0					
47*	90	16	9					
48*	90				5	4		C18357C
49*	90	3	0					C18355C,Sh1

Ref.

Table 5.d. cont'd
Emergency Condenser Vent Line Lengths
Pathway D

From Rx Nozzle N5B to MST (via Emergency Condenser #122)								
Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
								Pipe Diameter
From N5A to IV-39-09R	330	32	13	1.4375	5	1	0.5	10"
From IV-39-09R to IV-39-07R	0	5	6	0	0	0	0	
Total 10"	330	38.7031			5.1250			
From IV-39-07R to 05-3/4-A	540	59	22	1.9375	40	1	0.25	12"
		60.9948			40.1042			
From 05-3/4-A to 05-1-A	270	12	11	0.5	2	9	0	3/4"
		12.9583			2.7500			
From 05-1-A to 05 1 1/2-A	180	16	11	0.5625	4	16	0.5	1"
		16.9635			5.3750			
From 05-1 1/2-A to IV-05-02R	750	16	5	2.125	24	33	2.0625	1 1/2"
		16.5938			26.9219			
IV-05-02R	0	0	14	1.3125	0	0	0	1"
		1.2760			0.0000			
From IV-05-02R to IV-05-03R	90	2	0	0	0	0	0	1 1/2"
		2.0000			0.0000			
IV-05-03R	0	0	14	1.3125	0	0	0	1"
		1.2760			0.0000			
From IV-05-03R to MST	990	112.21	33	0.9375	32	18	0	1 1/2"
		115.0381			33.5000			

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 6.a
Emergency Condenser Drain Line Lengths
Pathway A

From Nozzle N5A to the Main Steam Tunnel via the Emergency Condenser Drain Lines

Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N5A 39-10-BNG								C26843C,Sh1
1		1	3					
2	90	6	9	0.5				
3	90				9	3	0.8125	
4	60	4	9	0.5				
5	90	16	7					
Penetration X-3A								
IV-39-09R		3	0					
IV-39-07R		2	6					
12"X10" Reducer								
39-12-BNG								
6		1	11					C26843C,Sh5
7		0	0	0				
39-1-BL								
8	90				2	7		
9	90		7	0.25				
10	90	6	10					
11			6					
39-1-C								
12	90					7		
13	90	6	9	0.5				
14	90	1	10					
15	90	5	8	0.5				
39-1-A								
16		2	6	0.25				
IV-39-11R			5	0.5				
17		1	0	0.25				
IV-39-12R			5	0.5				
18			11	0.25				
39-1 1/2-C								
19		2	11	0.75				
FCV-39-15								
05-1 1/2-C								
20	90		9					
21	90	2	1					

Ref.

Table 6.a, cont'd
Emergency Condenser Drain Line Lengths
Pathway A

From Nozzle N5A to the Main Steam Tunnel via the Emergency Condenser Drain Lines

Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
05-1 1/2-A								
22	90		8	0.5				C26843C,Sh5
23	90	8	7					
24	90				12	2		C18358C,Sh1
25*	90	25.08						C18356C
26*	90	6.36						C18355C,Sh1
27*	90	34.67						
28*	45	28.75						
29*	45	3	3					
30*					9	4		C18357C
31*		3	0					
								Diameter
From N5a to IV-39-09R	330	27	28	1	9	3	0.8125	10"
		29.4167			9.3177			
IV-39-09R		3	0	0	0	0	0	
		3.0000			0.0000			
IV-39-07R		2	6	0	0	0	0	
		2.5000			0.0000			
From IV-39-07R to 39-1-BL	0	1	11	0	0	0	0	12"
		1.9167			0.0000			
From 39-12-BNG to IV-39-11R	630	20	56	1.5	2	14	0	1"
		24.7917			3.1667			
IV-39-11R		0	5	0.5	0	0	0	
		0.4583			0.0000			
From IV-39-11R to IV-39-12R	0	1	0	0.25	0	0	0	1"
		1.0208			0.0000			
IV-39-12R		0	5	0.5	0	0	0	
		0.4583			0.0000			
From IV-39-12R to 39-1 1/2-C	0	0	11	0.25	0	0	0	1"
		0.9375			0.0000			
From 39-1 1/2-C to FCV-39-15	0	2	11	0.75	0	0	0	1 1/2"
		2.9792			0.0000			
From FCV-39-15 to MST Wall	810	110.86	28	0.5	21	6	0	1 1/2"
		113.2350			21.5000			

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

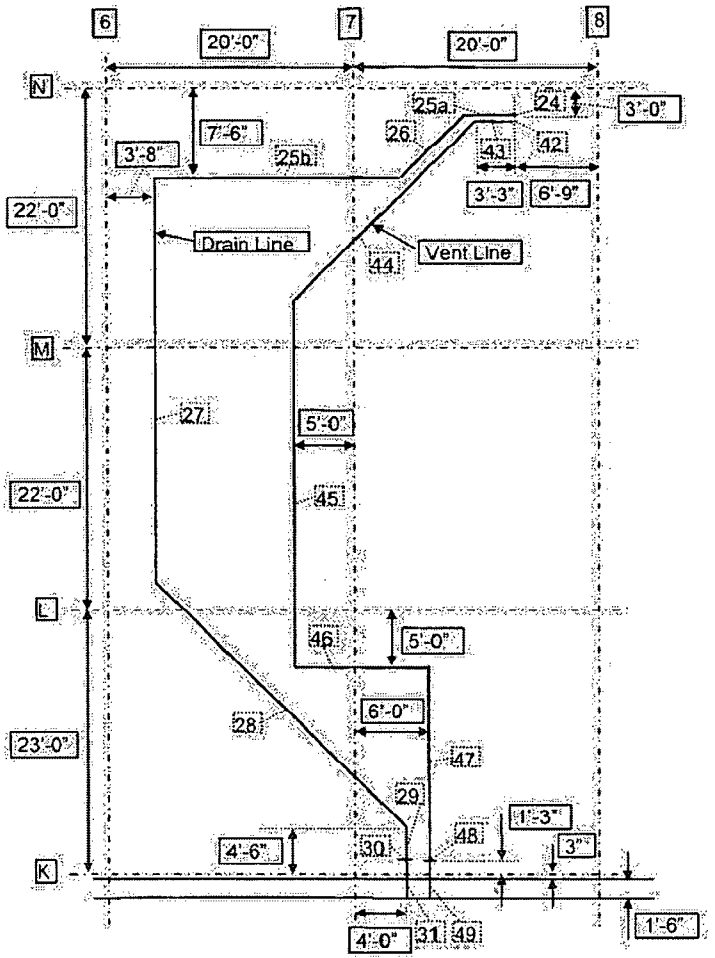
Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

*The lengths of the following segments are calculated below:

Segment 26:	SEC45° [(7'-6") – (3'-0")] = 1.414 x **4.5'** = 6.36'	
Segment 25:	25a + 25b = (20'-0") + (20'-0") – (6'-9") – **4.5'** - (3'-8") = 25.08'	C18355C, Sh. 1
Segment 28:	SEC45° [(20'-0") + (4'-0") – (3'-8") = 1.414 x **20.33'** = 28.75'	C18355C, Sh. 1
Segment 27:	(22'-0") + (22'-0") + (23'-0") – (7'-6") – (**20.33'**) – (4'-6") = 34.67'	C18355C, Sh. 1
Segment 29:	(4'-6") - (1'-3") = 3'-3"	C18355C, Sh. 1
Segment 30:	[El. 281'-0" + (12'-4")] – (El. 284'-0") = 9'-4"	C18357C
Segment 31:	(1'-3") +3" + (1'-6") = 3'-0"	C18355C, Sh. 1

Figure 2



Plan above El. 281'-0"
Dwg. C18355C, Sht. 1

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 6.b
Emergency Condenser Drain Line Lengths
Pathway B

From Nozzle N5A to the Main Steam Tunnel via the Emergency Condenser Drain Lines

Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N5A 39-10-BNG								C26843C,Sh1
1		1	3					
2	90	6	9	0.5				
3	90				9	3	0.8125	
4	60	4	9	0.5				
5	90	16	7					
Penetration X-3A								
IV-39-09R		3	0					
IV-39-07R		2	6					
12"X10" Reducer								
39-12-BNG								
6		8	1	0.5				C26843C,Sh5
39-12-B								
7			7	0.5				
39-1-BL								
8	90				1	0		
9	90		7	0.25				
10	90				1	7	0.5	
11	90		6					
39-1-C								
12	90					7		
13	90	6	9	0.5				
14	90	1	10					
15	90	5	8	0.5				
39-1-A								
16		2	6	0.25				
IV-39-11R			5	0.5				
17		1	0	0.25				
IV-39-12R			5	0.5				
18			11	0.25				
39-1 1/2-C								
19		2	11	0.75				
FCV-39-15								
05-1 1/2-C								
20	90		9					
21	90	2	1					

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 6.b, cont'd
Emergency Condenser Drain Line Lengths
Pathway B

From Nozzle N5A to the Main Steam Tunnel via the Emergency Condenser Drain Lines

Pipe Segment	Bends(deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
05-1 1/2-A								
22	90		8	0.5				C26843C,Sh5
23	90	8	7					
24	90				12	2		C18358C,Sh1
25*	90	25.08						C18356C
26*	90	6.36						C18355C,Sh1
27*	90	34.67						
28*	45	28.75						
29*	45	3	3					
30*					9	4		C18357C
31*		3	0					
								Diameter
From N5a to IV 39-09R	330	27	28	1	9	3	0.8125	10"
		29.4167			9.3177			
IV-39-09R		3	0	0	0	0	0	
		3.0000			0.0000			
IV-39-07R		2	6	0	0	0	0	
		2.5000			0.0000			
From IV-39-07R to 39-1-BL	0	8	8	1	0	0	0	12"
		8.7500			0.0000			
From 39-12-BNG to IV-39-11R	720	14	46	1.5	2	14	0.5	1"
		17.9583			3.2083			
IV-39-11R		0	5	0.5	0	0	0	
		0.4583			0.0000			
From IV-39-11R to IV-39-12R	0	1	0	0.25	0	0	0	1"
		1.0208			0.0000			
IV-39-12R		0	5	0.5	0	0	0	
		0.4583			0.0000			
From IV-39-12R to 39-1 1/2-C	0	0	11	0.25	0	0	0	1"
		0.9375			0.0000			
From 39-1 1/2-C to FCV-39-15	0	2	11	0.75	0	0	0	1 1/2"
		2.9792			0.0000			
From FCV-39-15 to MST Wall	810	110.86	28	0.5	21	6	0	1 1/2"
		113.2350			21.5000			

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Molsan / 8/11/06	H21C087	00

Ref.

Table 6.c
Emergency Condenser Drain Line Lengths
Pathway C

From Nozzle N5B to the Main Steam Tunnel via the Emergency Condenser Drain Lines

Pipe Segment	Bends (deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N5B 39-10-BNG								C26843C,Sh2
1		1	3					
2	90	8	4	0.625				
3	90	8	5	0.8125				
4	60				5	1	0.5	
5	90	15	1					
Penetration X-3B								
IV-39-10R		3	0					
IV-39-08R		2	6					
12"X10" Reducer								
39-12-BNG								
6		8	3	0.4375				C26843C,Sh5
39-12-B								
7			5	0.4375				
39-1-BL								
8	90				2	6		
9	90	1	6					
10	90	2	0					
11	90					10	0.75	
12	90	6	0	0.75				
39-1-C								
13	90	11	2					
14	90	7	9					
39-1-A								
15		2	6	0.5				
IV-39-13R			5	0.5				
16		1	0					
IV-39-14R			5	0.5				
17		1	2	0.5				
39-1 1/2-A								
18		2	1	0.5				
39-1 1/2-C								
19			5					
FCV-39-16			6					
05-1 1/2-C								
20	90	22	1	0.25				
21	0	0	0					

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 6.c, cont'd
Emergency Condenser Drain Line Lengths
Pathway C

From Nozzle N5B to the Main Steam Tunnel via the Emergency Condenser Drain Lines								
Pipe Segment	Bends (deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
05-1 1/2-A								
22	90		8	0.5				C26843C,Sh5
23	90	8	7					
24	90				12	2		C18358C,Sh1
25*	90	25.08						C18356C
26*	90	6.36						C18355C,Sh1
27*	90	34.67						
28*	45	28.75						
29*	45	3	3					
30*					9	4		C18357C
31*		3	0					
								Diameter
From N5B to IV 39-10R	330	32	13	1.4375	5	1	0.5	10"
		33.2031			5.1250			
IV-39-10R		3	0	0	0	0	0	
		3.0000			0.0000			
IV-39-08R		2	6	0	0	0	0	
		2.5000			0.0000			
From IV-39-08R to 39-1-BL	0	8	8	0.875	0	0	0	12"
		8.7396			0.0000			
From 39-12-BNG to IV-39-13R	630	29	23	1.25	2	16	0.75	1"
		31.0208			3.3958			
IV-39-13R		0	5	0.5	0	0	0	
		0.4583			0.0000			
From IV-39-13R to IV-39-14R	0	1	0	0	0	0	0	1"
		1.0000			0.0000			
IV-39-14R		0	5	0.5	0	0	0	
		0.4583			0.0000			
From IV-39-14R to 39-1 1/2-A	0	1	2	0.5	0	0	0	1"
		1.2083			0.0000			
From 39-1 1/2-A to FCV-39-15	0	2	6	0.5	0	0	0	1 1/2"
		2.5417			0.0000			
From FCV-39-16 to MST Wall	720	130.86	19	0.75	21	6	0	1 1/2"
		132.5058			21.5000			

Project: Nine Mile Point Nuclear Station | Unit: 1 | Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 6.d
Emergency Condenser Drain Line Lengths
Pathway D

From Nozzle N5B to the Main Steam Tunnel via the Emergency Condenser Drain Lines

Pipe Segment	Bends (deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
Rx Nozzle N5B 39-10-BNG								C26843C,Sh2
1		1	3					
2	90	8	4	0.625				
3	90	8	5	0.8125				
4	60				5	1	0.5	
5	90	15	1					
Penetration X-3B								
IV-39-10R		3	0					
IV-39-08R		2	6					
12"X10" Reducer								
39-12-BNG								
6		1	11	0.5				C26843C,Sh5
39-12-B								
7		0	0	0				
39-1-BL								
8	90				2	6		
9	90	1	6					
10	90	8	6	0.5				
11	90					10	0.75	
12	90	6	0	0.75				
39-1-C								
13	90	11	2					
14	90	7	9					
39-1-A								
15		2	6	0.5				
IV-39-13R			5	0.5				
16		1	0					
IV-39-14R			5	0.5				
17		1	2	0.5				
39-1 1/2-A								
18		2	1	0.5				
39-1 1/2-C								
19			5					
FCV-39-16			6					
05-1 1/2-C								
20	90	22	1	0.25				
21	0	0	0					

Project: Nine Mile Point Nuclear Station Unit: 1 Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. Stinson / 9/9/05	A.C. Moisan / 8/11/06	H21C087	00

Ref.

Table 6.d, cont'd
Emergency Condenser Drain Line Lengths
Pathway D

From Nozzle N5B to the Main Steam Tunnel via the Emergency Condenser Drain Lines

Pipe Segment	Bends (deg)	Horizontal Length			Vertical Length			Reference Drawing
		Feet	Inches		Feet	Inches		
05-1 1/2-A								
22	90		8	0.5				C26843C,Sh5
23	90	8	7					
24	90				12	2		C18358C,Sh1
25*	90	25.08						C18356C
26*	90	6.36						C18355C,Sh1
27*	90	34.67						
28*	45	28.75						
29*	45	3	3					
30*					9	4		C18357C
31*		3	0					
								Diameter
From N5B to IV-39-10R	330	32	13	1.4375	5	1	0.5	10"
		33.2031			5.1250			
IV-39-10R		3	0	0	0	0	0	
		3.0000			0.0000			
IV-39-08R		2	6	0	0	0	0	
		2.5000			0.0000			
From IV-39-08R to 39-1-BL	0	1	11	0.5	0	0	0	12"
		1.9583			0.0000			
From 39-12-BNG to IV-39-13R	630	35	29	1.75	2	16	0.75	1"
		37.5625			3.3958			
IV-39-13R		0	5	0.5	0	0	0	
		0.4583			0.0000			
From IV-39-13R to IV-39-14R	0	1	0	0	0	0	0	1"
		1.0000			0.0000			
IV-39-14R		0	5	0.5	0	0	0	
		0.4583			0.0000			
From IV-39-14R to 39-1 1/2-A	0	1	2	0.5	0	0	0	1"
		1.2083			0.0000			
From 39-1 1/2-A to FCV-39-15	0	2	6	0.5	0	0	0	1 1/2"
		2.5417			0.0000			
From FCV-39-16 to MST Wall	720	130.86	19	0.75	21	6	0	1 1/2"
		132.5058			21.5000			

Ref.

Table 7
Summary of Pipe Lengths

Secondary Containment Bypass Pathway	Pipe Size (in)	Vessel to Inner IV			Inner IV to Outer IV			Outer IV to Release Point		
		Degrees of Bend	Horizontal (ft)	Vertical (ft)	Degrees of Bend	Horizontal (ft)	Vertical (ft)	Degrees of Bend	Horizontal (ft)	Vertical (ft)
Main Steam										
Pathway A	24	230	23.41	47.17	60	32.50	0.00	900	213.38	62.01
Pathway B	24	230	23.41	47.17	60	32.50	0.00	900	217.63	62.01
Feedwater										
Pathway A	10	270	21.44	38.14						
	16							210	52.54	4.91
	18	120	43.71	0.00	0	5.67	0.00	360	15.82	61.96
Pathway B	10	180	3.32	38.14						
	16							210	52.54	4.91
	18	210	43.71	0.00	0	5.67	0.00	360	15.82	61.96
Pathway C	10	180	3.32	38.14						
	16							120	35.47	4.91
	18	210	43.71	0.00	0	5.67	0.00	450	24.06	61.96
Pathway D	10	270	21.00	37.00						
	16							120	35.47	4.91
	18	120	43.00	0.00	0	5.67	0.00	450	24.06	61.96
Torus Vent	20	0	0	3.50	0	0	1.83	315	18.73	66.83
Drywell Vent/Purge	20	90	13.02	24.00						
	24				0	1.75	0	315	105.43	9.92

Project: Nine Mile Point Nuclear Station | Unit: 1 | Disposition: N/A

Originator/Date	Reviewer/Date	Calculation No.	Revision
G.R. STINSON / 9/9/05	A.C. MOISAN / 8/11/06	H21C087	00

Ref.

Table 7, cont'd
Summary of Pipe Lengths

Secondary Containment Bypass Pathway	Pipe Size (in)	Vessel to Inner IV			Inner IV to Outer IV			Outer IV to Release Point		
		Degrees of Bend	Horizontal (ft)	Vertical (ft)	Degrees of Bend	Horizontal (ft)	Vertical (ft)	Degrees of Bend	Horizontal (ft)	Vertical (ft)
EC Vents										
Pathway A	3/4	270	13.12	2.75						
	1	180	15.21	5.38						
	1 1/2	750	16.59	26.92	90	2.00	0	990	115.04	33.50
	10	330	34.92	9.32						
	12	540	59.16	40.21						
Pathway B	3/4	270	9.21	2.75						
	1	180	15.21	5.38						
	1 1/2	750	16.59	26.92	90	2.00	0	990	115.04	33.50
	10	330	34.92	9.32						
	12	540	55.21	40.21						
Pathway C	3/4	270	9.29	2.75						
	1	180	16.96	5.38						
	1 1/2	750	16.59	26.92	90	2.00	0	990	115.04	33.50
	10	330	38.70	5.13						
	12	540	55.53	40.10						
Pathway D	3/4	270	12.96	2.75						
	1	180	16.96	5.38						
	1 1/2	750	16.59	26.92	90	2.00	0	990	115.04	33.50
	10	330	38.70	5.13						
	12	540	60.99	40.10						

Ref.

Table 7, cont'd
Summary of Pipe Lengths

Secondary Containment Bypass Pathway	Pipe Size (in)	Vessel to Inner IV			Inner IV to Outer IV			Outer IV to Release Point		
		Degrees of Bend	Horizontal (ft)	Vertical (ft)	Degrees of Bend	Horizontal (ft)	Vertical (ft)	Degrees of Bend	Horizontal (ft)	Vertical (ft)
EC Drains										
Pathway A	1	630	24.79	3.17	0	1.02	0	0	0.94	0
	1 1/2							810	116.21	21.50
	10	330	29.42	9.32						
	12	0	1.92	0						
Pathway B	1	720	17.96	3.21	0	1.02	0	0	0.94	0
	1 1/2							810	116.21	21.50
	10	330	29.42	9.32						
	12	0	8.75	0						
Pathway C	1	630	31.02	3.40	0	1.00	0	0	1.21	0
	1 1/2							720	135.05	21.50
	10	330	33.20	5.13						
	12	0	8.74	0						
Pathway D	1	630	37.56	3.40	0	1.00	0	0	1.21	0
	1 1/2							720	135.05	21.50
	10	330	33.20	5.13						
	12	0	1.96	0						

*Feedwater pathways A & B from outer IV CHK-31-02R to Feedwater Heater #135 and pathways C & D from CHK-31-01R to Feedwater Heater #125 are selected because they have the least volume and surface areas.

Ref.

Table 8
Calculation of Volumes & Surface Areas

Secondary Containment Bypass Pathway	ID (in)	Volume (ft^3)			Surface Area (ft^2)			Horizontal Surface Area (ft^2)			Degrees of Bend		
		Inner	Inter	Outer	Inner	Inter	Outer	Inner	Inter	Outer	Inner	Inter	Outer
Main Steam													
Pathway A	21.562	178.98	82.41	698.31	398.44	183.46	1554.53	42.07	58.40	383.40	230	60	900
Pathway B	21.562	178.98	82.41	709.08	398.44	183.46	1578.52	42.07	58.40	391.04	230	60	900
Feedwater													
Pathway A	9.312	28.18	0	0	145.24	0	0	16.64	0	0			
	13.938	0	0	60.87	0	0	209.62	0	0	61.03			
	15.688	58.68	4.97	104.40	179.54	17.84	319.43	57.15	5.66	20.68			
	Total	86.86	4.97	165.27	324.78	17.84	529.06	73.78	5.66	81.71	390	0	570
Pathway B	9.312	19.61	0	0	101.08	0	0	2.58	0	0			
	13.938	0	0	60.87	0	0	209.62	0	0	61.03			
	15.688	58.68	4.97	104.40	179.54	17.84	319.43	57.15	5.66	20.68			
	Total	78.29	4.97	165.27	280.62	17.84	529.06	59.73	5.66	81.71	390	0	570
Pathway C	9.312	19.61	0	0	101.08	0	0	2.58	0	0			
	13.938	0	0	42.78	0	0	147.33	0	0	41.20			
	15.688	58.68	4.97	115.46	179.54	17.84	353.28	57.15	5.66	31.45			
	Total	78.29	4.97	158.24	280.62	17.84	500.60	59.73	5.66	72.65	390	0	570
Pathway D	9.312	27.43	0	0	141.40	0	0	16.30	0	0			
	13.938	0	0	42.78	0	0	147.33	0	0	41.20			
	15.688	57.72	4.97	115.46	176.61	17.84	353.28	56.22	5.66	31.45			
	Total	85.15	4.97	158.24	318.00	17.84	500.60	72.51	5.66	72.65	390	0	570
Torus Vent	19.250	7.07	3.71	172.92	17.64	9.24	431.18	0	0	30.04	0	0	315
Drywell Vent/Purge	19.500	76.78	0	0	188.99	0	0	21.16	0	0			
	23.500	0	5.27	347.44	0	10.77	709.66	0	3.43	206.47			
	Total	76.78	5.27	347.44	188.99	10.77	709.66	21.16	3.43	206.47	90	0	315

Ref.

Table 8, cont'd
Calculation of Volumes & Surface Areas

Secondary Containment Bypass Pathway	ID (in)	Volume (ft^3)			Surface Area (ft^2)			Horizontal Surface Area (ft^2)			Degrees of Bend		
		Inner	Inter	Outer	Inner	Inter	Outer	Inner	Inter	Outer	Inner	Inter	Outer
EC Vents													
Pathway A	0.612	0.032	0	0	2.54	0	0	0.67	0	0			
	0.815	0.075	0	0	4.41	0	0	1.04	0	0			
	1.338	0.42	0.020	1.45	15.24	0.70	52.03	1.85	0.22	12.83			
	9.562	22.06	0	0	110.73	0	0	27.82	0	0			
	11.374	70.11	0	0	295.89	0	0	56.08	0	0			
	Total	92.71	0.020	1.45	428.82	0.70	52.03	87.46	0.22	12.83	2070	90	990
Pathway B	0.612	0.024	0	0	1.92	0	0	0.47	0	0			
	0.815	0.075	0	0	4.41	0	0	1.04	0	0			
	1.338	0.42	0.020	1.45	15.24	0.70	52.03	1.85	0.22	12.83			
	9.562	22.06	0	0	110.73	0	0	27.82	0	0			
	11.374	67.33	0	0	284.12	0	0	52.33	0	0			
	Total	89.91	0.020	1.45	416.42	0.70	52.03	83.51	0.22	12.83	2070	90	990
Pathway C	0.612	0.025	0	0	1.93	0	0	0.47	0	0			
	0.815	0.081	0	0	4.77	0	0	1.15	0	0			
	1.338	0.42	0.020	1.45	15.24	0.70	52.03	1.85	0.22	12.83			
	9.562	21.86	0	0	109.72	0	0	30.84	0	0			
	11.374	67.48	0	0	284.77	0	0	52.63	0	0			
	Total	89.87	0.020	1.45	416.43	0.70	52.03	86.95	0.22	12.83	2070	90	990
Pathway D	0.612	0.032	0	0	2.52	0	0	0.66	0	0			
	0.815	0.081	0	0	4.77	0	0	1.15	0	0			
	1.338	0.42	0.020	1.45	15.24	0.70	52.03	1.85	0.22	12.83			
	9.562	21.86	0	0	109.72	0	0	30.84	0	0			
	11.374	71.33	0	0	301.04	0	0	57.81	0	0			
	Total	93.73	0.020	1.45	433.28	0.70	52.03	92.32	0.22	12.83	2070	90	990

Ref.

Table 8. cont'd
Calculation of Volumes & Surface Areas

Secondary Containment Bypass Pathway	ID (in)	Volume (ft^3)			Surface Area (ft^2)			Horizontal Surface Area (ft^2)			Degrees of Bend		
		Inner	Inter	Outer	Inner	Inter	Outer	Inner	Inter	Outer	Inner	Inter	Outer
EC Drains													
Pathway A	0.957	0.14	0.0051	0.0047	7.00	0.26	0.23	1.98	0.081	0.075			
	1.338	0	0	1.34	0	0	48.24	0	0	12.96			
	9.562	19.32	0	0	96.96	0	0	23.44	0	0			
	11.374	1.35	0	0	5.71	0	0	1.82	0	0			
	Total	20.81	0.0051	1.35	109.68	0.26	48.47	27.23	0.081	13.03	960	0	810
Pathway B	0.957	0.11	0.0051	0	5.30	0.26	0.23	1.43	0.081	0.075			
	1.338	0	0	1.34	0	0	48.24	0	0	12.96			
	9.562	19.32	0	0	96.96	0	0	23.44	0	0			
	11.374	6.17	0	0	26.05	0	0	8.29	0	0			
	Total	25.60	0.0051	1.35	128.32	0.26	48.47	33.17	0.081	13.03	1050	0	810
Pathway C	0.957	0.17	0.0050	0.0060	8.62	0.25	0.30	2.47	0.080	0.10			
	1.338	0	0	1.53	0	0	54.84	0	0	15.06			
	9.562	19.11	0	0	95.95	0	0	26.46	0	0			
	11.374	6.17	0	0	26.02	0	0	8.28	0	0			
	Total	25.45	0.0050	1.53	130.59	0.25	55.14	37.21	0.080	15.15	960	0	720
Pathway D	0.957	0.20	0.0050	0.0060	10.26	0.25	0.30	3.00	0.080	0.10			
	1.338	0	0	1.53	0	0	54.84	0	0	15.06			
	9.562	19.11	0	0	95.95	0	0	26.46	0	0			
	11.374	1.38	0	0	5.83	0	0	1.86	0	0			
	Total	20.70	0.0050	1.53	112.04	0.25	55.14	31.31	0.080	15.15	960	0	720

Ref.

Table 9
Minimum Pathway for Each Bypass Leakage Source

Secondary Containment Bypass Pathway	Inner				Inter				Outer			
	Degrees of Bend	Volume (ft^3)	Surface Area (ft^2)	Horizontal Surface Area (ft^2)	Degrees of Bend	Volume (ft^3)	Surface Area (ft^2)	Horizontal Surface Area (ft^2)	Degrees of Bend	Volume (ft^3)	Surface Area (ft^2)	Horizontal Surface Area (ft^2)
Main Steam A	230	178.98	398.44	42.07	60	82.41	183.46	58.40	900	698.31	1554.53	383.40
Main Steam B	230	178.98	398.44	42.07	60	82.41	183.46	58.40	900	709.08	1578.52	391.04
Feedwater	390	78.29	280.62	59.73	0	4.97	17.84	5.66	570	158.24	500.60	72.65
Torus Vent	0	7.07	17.64	0	0	3.71	9.24	0	315	172.92	431.18	30.04
Drywell Vent/Purge	90	76.82	189.10	21.19	0	5.27	10.77	3.43	315	347.44	709.66	206.47
EC Vents	2070	89.91	416.41	83.50	90	0.02	0.70	0.22	990	1.45	52.03	12.83
EC Drains	960	20.81	109.68	27.23	0	0.01	0.26	0.08	810	1.35	48.47	13.03

Both Main Steam A and B are included because the shorter/smaller line (i.e., A) will be assumed to have the inner IV failed open, while the other line (B) will be assumed to have both IVs closed.

Ref.

VI. Conclusions

Table 7 is a summary of the horizontal and vertical pipe lengths and degrees of bend for each pathway. The piping is divided into three portions: Inboard of the inner isolation valve; Between the inner and outer isolation valves; and Outboard of the outer isolation valve.

Table 8 includes the volumes, surface areas and horizontal surface areas for each pathway.

Table 9 shows the degrees of bend, volumes, surface areas and horizontal surface areas for the most limiting pathways. Both main steam lines are listed because the more limiting one can be used to model the line with the inner IV stuck open while the other is used for the line with both IVs closed.

VII. List of Computer Runs

No computer runs were generated by this calculation.

VIII. References

1. Regulatory Guide –1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors", July 2000.

2. NUREG/CR-6604, "RADTRAD: A Simplified Model for RADionuclide Transport and Removal And Dose Estimation"

3. NMP1 10CFR50 Appendix J Testing Program Plan, NMP1-APPJ-001, Rev. 04

4. Drawing C-18002-C, Sh. 1, Rev. 45, "Steam Flow, Main Steam & High Press. Turbine, P&I Diagram"

5. Drawing C-18005-C, Sh. 2, Rev. 34, "Feed Water Flow, High Pressure, P&I Diagram"

6. Drawing C-18014-C, Sh. 1, Rev. 57, Reactor Containment (Drywell & Torus) Inert Gas (N_2) Purge and Fill Drywell Cooling System P & I Diagram"

7. Drawing C-18017-C, Sh. 1, Rev. 54, "Emergency Cooling System P&I Diagram"

8. Piping Specification Standard, Nine Mile Point Unit No. 1
   a. PSRS-01, Rev. 04, Main Steam
   b. PSRS-02, Rev. 03, Main Steam External to Isolation Valve Outlet to Turbine Inlet
   c. PSRS-05, Rev. 03, Emergency Condenser Vent to Main Steam Line and Bypass to Torus
   d. PSRS-30, Rev. 04, High Pressure Reactor Feedwater (from 5th FW HTR to External Isolation Valve)
   e. PSRS-31, Rev. 05, High Pressure Reactor FW from External Isolation Valve to Reactor Inlet

Ref.

f. PSRS-39, Rev. 08, Emergency Condenser – Steam Supply & Condensate Return
g. PSRS-201.1, Rev. 04, Drywell H_2O_2 Monitoring System #12 Supply from Penetrations 48, 49 and 50 to First Isolation Valve
h. PSRS-201.2-LG/A/J, Rev. 02, Reactor Containment Purge & Fill N_2 Section Inside Vessel & Outside Vessel Beyond Outside Isolation Valve
i. PSRS-201.2-LG/A, Rev. 02, Reactor Containment Purge & Fill N_2 Section Inside Vessel & Outside Vessel Beyond Outside Isolation Valve
j. PSRS-GN, pages 11 & 12 of 14, 44. Index of Classes

9. Crane Engineering Data Catalog, Crane Company, NY, NY, 1976

10. Drawing C-26830-C, Sht. 1, Rev. 10, "Main Steam System No. 1, Piping Isometric from Reactor Outline to External Isolation Valve Outline"

11. Drawing C-26831-C, Sh. 1, Rev. 7, "Main Steam System No. 02 Piping Isometric from External Isolation Valve to Turbine Inlet"

12. Drawing C-18055-C, Rev. 16, "Turbine Building, Main Steam Piping, Sections "4-4" & "5-5"

13. Drawing C-26839-C, Sh. 1, Rev. 14, "High Pressure Reactor Feedwater System #31 & RCU Return System #33.2 Piping Isometric from External Isolation Valves to Reactor Inlet"

14. Drawing C-27186-C, Sh. 1, Rev. 8, "Reactor Containment Purge and Fill N_2 System No. 201.2 Piping Isometric"

15. Drawing C-18350-C, Sh. 1, Rev. 16, "Reactor Bldg., Drywell & Suppression Chamber (Torus) Nitrogen Purge & Fill, Plan Above El. 298'-0" & Sections"

16. Drawing C-26843-C, Sht. 1, Rev. 10, "Emergency Condenser System No. 39, Piping Isometric for Steam Supply from Reactor to Emer. Cond's., West Bank"

17. Drawing C-26843-C, Sht. 5, Rev. 6, "Emergency Condenser, Drain & Overflow Lines, Piping Isometric"

18. Drawing C-18355-C, Sht. 1, Rev. 27, "Reactor Building, Emergency Condenser Piping, Steam Supply & Condensate Return, Plans at El. 340'-0", El. 318'-0" & 281'-0"

19. Drawing C-27165-C, Sht. 1, Rev. 8, "Emergency Condenser Vent Piping, System No. 05, Piping Isometric, Emergency Condenser Vent to Main Steam Line"

20. Drawing C-27165-C, Sht. 2, Rev. 6, "Emergency Condenser Vent Piping, System No. 05 & 05.1, Piping Isometric, Emergency Condenser Vent to Main Steam Line"

21. Drawing C-18355-C, Sh. 2, Rev. 5, "Reactor Building, Emergency Condenser Piping, Vent Steam to Torus, Floor Plan & Section"

22. Drawing C-18357-C, Rev. 27, "Reactor Building, Emergency Condenser Piping, Steam Supply & Condensate Return, Sections "1-1", "3-3" & "4-4"

Ref.

23. Drawing C-18358-C, Sht. 1, Rev. 24, "Reactor Building, Emergency Condenser Piping, Steam Supply & Condensate Return, Section "2-2" Looking West"

24. Drawing C-18356-C, Rev. 20, "Reactor Building, Emergency Condenser Piping, Steam Supply & Condensate Return, Plans above El. 298'-0", El. 281'-0" & 259'-0"

25. Drawing C-26843-C, Sht. 2, Rev. 10, "Emergency Condenser System No. 39, Piping Isometric for Steam Supply from Reactor to Emer. Cond's., East Bank"

26. Vender Drawing D82-26008-01, Rev. C, Rockwell International, "Gate Valve, Pressure Seal Bonnet Motor Operated General Assembly, Fig 12011 (WCC) BFMNPQTY"

27. Vender Manual N1R34400VALVE001, Rev. 0, Rockwell International, "Instruction & Maint. For Main FW Isolation Valve Replacement"

28. DCP N1-03-137, Replacement of Unit 1 Feedwater Containment Isolation Check Valves"

29. Vender Drawing 52242-A, Rev. 01, Weir, "Feed Water Check Valve,18-900 W.E. Assembly"

30. Calculation S11-02P01, Rev. 01, "Main Steam Pipe Analysis"

31. Design Criteria Document DCD-208, Rev. 02, "Piping Design Requirements"

32. Drawing C-26838-C, Sh. 2, Rev. 16, "High Pressure Reactor Feedwater, System 30, Piping Isometric from 5th Feedwater Heater to External Isolation Valves"

33. NRC RIS 2006-4, Experience with Implementation of Alternative Source Terms, March 7, 2006

10 CFR 50.59 APPLICABILITY DETERMINATION			
Part 1 – Initiation			
Implementing Document No. H21C087	Revision 00	Title Unit 1 LOCA Secondary Containment Bypass Piping Data	
(Check one proposed activity type only): ☒ Unit 1 ☐ Unit 2 ☐ Common			
Part 2 – Applicable Regulations/Criteria			
Address the questions below for all aspects of the Proposed Activity. See NAI-DSE-01, Section 4.2 for a discussion of regulatory requirements and controls. If the answer is "YES" for any portion of the activity, apply the identified regulation/process(es) to that portion of the activity. (Note: It is common to have more than one regulation/process apply to a proposed activity.)			
A.	Is the regulatory authority, controlling the proposed activity, any of the following?		
	1. 10CFR50.90 (Operating License, Technical Specifications or Environmental Protection Plan)	☐ YES ☒ NO	If "Yes," process change per CNG-LN-1.01-1000
	2. 10CFR50.54(a) (QA Program Description)	☐ YES ☒ NO	If "Yes," process change per NIP-LPP-01.
	3. 10CFR50.54(p) (Security Plans)	☐ YES ☒ NO	If "Yes," process change per NIP-LPP-01.
	4. 10CFR50.54(q) (Emergency Plan)	☐ YES ☒ NO	If "Yes," process change per NIP-LPP-01.
	5. 10CFR50.55a(f) and (g) (IST/ISI Requirements)	☐ YES ☒ NO	If "Yes," process change per NIP-IIT-01.
	6. 10CFR Part 20 (Standards for Radiation Protection)	☐ YES ☒ NO	If "Yes," process change per NIP-PRO-02 or NIP-PRO-03.
	7. 10CFR50.65(a)(4) (Maintenance Rule) CAUTION: Consult NAI-DSE-01, Section 4.2.2 before checking "Yes" to Maintenance procedure activities • Maintenance activities and associated procedures. • Temporary Alteration (facility or procedure) supporting maintenance that will be installed not longer than 90 days at power (Power operating condition or hot shutdown at NMP1 or Modes 1, 2 or 3 at NMP2)	☐ YES ☒ NO	If "Yes," maintenance activity is assessed under NIP-OUT-01 or GAP-PSH-03 and GAP-OPS-117, and procedure change(s) are processed per NIP-PRO-03 and NIP-PRO-04 under 10 CFR 50 Appendix B.
	8. 10 CFR 50.46 ECCS Model (changes and errors)	☐ YES ☒ NO	If "Yes," process per CNG-LN-1.01-1001.
	9. 10 CFR 50.12, Specific Exemptions (exemption from the requirements of 10 CFR 50)	☐ YES ☒ NO	If "Yes," process per CNG-LN-1.01-1001.
B.	Does the proposed activity change plant-specific programs (ODCM, or COLR,) which are controlled by the Technical Specifications?	☐ YES ☒ NO	If "Yes," process change per NIP-LPP-01.
C.	Does the proposed activity involve an editorial or administrative change to the UFSAR as described in Section 4.2.3 of NAI-DSE-01?	☐ YES ☒ NO	If "Yes," process change per NIP-LPP-01.
D.	Does the proposal have an effect on the environment (e.g., changes to nonradiological gaseous or liquid effluents, power level, or thermal effluents), **OR** involve construction activities that introduce measurable nonradiological environmental effects to onsite areas that were NOT previously disturbed during site preparation and construction?	☐ YES ☒ NO	If "Yes," an Environmental Evaluation may be required. Contact Supervisor Environmental Protection.
E.	Does the proposed activity involve a Fire Protection Program change?	☐ YES ☒ NO	If "Yes," process change per NIP-LPP-01 and the applicable Unit License Condition.
F.	Does the proposed change or activity change or negate an existing NRC commitment?	☐ YES ☒ NO	If "Yes," process per NIP-IRG-01.
G.	Does the proposed activity involve incorporating changes associated with a License Amendment or other regulatory approvals that have been received?	☒ YES ☐ NO	If "Yes," process per CNG-LN-1.01-1000.
H.	Does the proposed activity address a non-conforming or degraded condition that does ***not*** involve an interim compensatory action and that will be restored to its previous condition in a timely manner commensurate with safety as described in Section 4.2.5 of NAI-DSE-01?	☐ YES ☒ NO	If "Yes," process per NIP-ECA-01, NEP-ECA-01, AND RIS-2005-20 (formerly G.L. 91-18) as required.
I.	Does the proposed activity involve a change to an administrative procedure; i.e. a procedure governing the conduct of facility operations? (Consult definition 4.13 before answering).	☐ YES ☒ NO	If "Yes," process per NIP-PRO-02 or CNG-PR-1.01-1000 under 10 CFR 50 Appendix B.
Part 3 – Conclusions (Check Conclusion A or B):			
A.	☒	All aspects of the proposed activity are controlled by one or more of the processes above; therefore, **10 CFR 50.59 is not applicable** and a 10 CFR 50.59 Screening is **not** required. Proceed with change per applicable procedures/processes.	
B.	☐	Activity only partially covered by other regulations. Proceed with covered change(s) per applicable procedure/process. Initiate 10CFR 50.59 Screening for aspects not covered.	
Part 4 – Preparer (Include Completed Applicability Determination with Implementing Document or Activity Package)			
Preparer - (Print/Initial) Glenn R. Stinson		Date Prepared 10/12/06	

ATTACHMENT 1: DESIGN VERIFICATION REPORT

Document being design-verified: ☐ DCP ☒ Calc ☐ Spec ☐ NER ☐ DBD ☐ Other

Doc#, Rev and Title: H21C087, Rev. 00, Unit 1 LOCA Secondary Containment Bypass Piping Data.

Extent of Design Verification (Briefly describe):
Verified that the design output, i.e. bypass leakage pathway piping data, corresponds with the guidance in Regulatory Guide 1.183 and RIS-2006-04. To determine transit/holdup time and deposition/plateout in the secondary containment bypass piping, the total length of pipe, the total volume, the total surface area, the length of horizontal pipe, the horizontal surface area and the total degrees of bend are required.

Method of Design Verification:

☒ Design Review ☐ Qualification Testing
☐ Alternate Calculations ☐ Applicability of Proven Design

Results of Design Verification:

☒ Fully acceptable with no issues identified
☐ Fully acceptable based on the following issues identified and resolved:

The bypass leakage pathway piping data was correctly calculated. It can be used in accordance Regulatory 1.183 and RIS 2006-04 guidance to support the U1 Alternative Source Term License Amendment Request.

☒ Continuation Page Follows

Discipline Involvement and Approvals:

	Name	Signature	Date
Lead Design Verifier:	T. M. Kurtz	T. M. Kurtz	10/13/2006

Discipline Design Verifiers, if required:

Discipline	Name	Signature	Date

ATTACHMENT 2: DESIGN VERIFICATION CHECKLIST

The following questions are required to be addressed based on the Nine Mile Point commitment to NQA-1 (1983) for design verification activities. This checklist is intended to assist when using the Design Review method of design verification to ensure relevant items are addressed in the verification effort. Each "No" answer will require correction or resolution by the originator of the document being verified prior to full acceptance by the design verifier(s).

Doc #: H21C087 00 Lead Design Verifiers Name: T.M. Kurtz

Items Addressed with Basis of Review Answer	Review Check		
	Yes	No	N/A
1. Were the inputs correctly selected ?	✓		
2. Are assumptions necessary to perform the design activity adequately described and reasonable ? Where necessary, are the assumptions identified for subsequent re-verifications when the detailed activities are completed ?	✓		
3. Was an appropriate design method used?	✓		
4. Were the design inputs correctly incorporated into the design ?	✓		
5. Is the design output reasonable compared to design inputs ?	✓		
6. Are the necessary design input and verification requirements for interfacing organizations specified in the design documents or in supporting procedures or instructions ?			✓