ATTACHMENT C3.6

MAIN STEAMLINE BREAK IN MAIN STEAM TUNNEL

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ATTACHMENT C3.6 - MAIN STEAMLINE BREAK IN MAIN STEAM TUNNEL

I. Introduction

One of the design criteria for the main steam tunnel and valve room subcompartments is to retain functional integrity indefinitely, that is, to have the capability of withstanding peak transient differential pressures under a postulated accident mode.

It was the purpose of this study to determine the transient pressure response in the Unit 1 and Unit 2 main steam tunnels and the associated safety valve rooms in the first and second quadrants at the time of a sudden and complete circumferential failure of a main steamline.

Six break locations for Unit 1 and four for Unit 2 were considered. The common locations are the lower valve room just downstream of the isolation valve; the main steam tunnel just outside the valve room in the first quadrant; the main steam tunnel between the first and second quadrants; and the main steam tunnel just outside the valve room in the second quadrant. Additionally, Unit 1 was evaluated for two breaks in the first quadrant between the valve room and the turbine building opening.

Qualification tests have been conducted for the components in the safety valve house. The components include the main steam and main feedwater isolation valves, the main steam power-operated relief valve, and the main steam safety valves. These tests conservatively applied aging, radiation, seismic, and worst case environmental (temperature, pressure, and humidity) loading to the components, and showed that loss of function did not occur.

The portion of the main steam and main feedwater pipe in the tunnel between the safety valve house and the turbine building meets the guidelines of Branch Technical Position APSCB3-1. A special pipe whip restraint is located around each pipe as it passes through the wall separating the isolation valve room from the main steam tunnel. This restraint limits the amount of strain that can be transmitted to the isolation valves from any pipe break in the tunnel to a level which will not interfere with the proper functioning of the isolation valves.

The safety valve house, the steam tunnel, and the compartment between the containment and the safety valve house all have the same basis for design. These compartments have been designed for pressurization, impingement, and temperature as specified in Table 3.8-10, load combinations 8, 13, and 14.

An assumed pipe crack or break in the tunnel, isolation valve room , or safety valve house cannot cause structural failure. The subcompartment pressurization analysis is included in this attachment. The methods used to calculate the pressure buildup in subcompartments outside the containment are the same as those used for subcompartments inside the containment.

II. Analysis

A. Description of the Computer Code

The analysis was carried out by using the RELAP code, which is a multicell thermal-hydraulic transient analysis computer program.

The basis for the computer code is a network of fluid control volumes (fluid nodes) and fluid paths (interconnecting control volumes) for which the conservation equations of mass, momentum, and energy are solved in space and time. Superimposed on the network are computer subroutines which permit physical modeling of the reactor system, the containment, plant subcompartments, safeguard fluid systems and the pipe break flow.

B. Simulation of the System

1. Assumptions

The following are the major assumptions used in this study:

a. The initial conditions in the steam tunnel and the valve rooms are 14.7 psia of pressure at a temperature of 90°F and a relative humidity of 30%.

b. Only one break occurred per analysis.

c. The Moody choked-flow calculation was used with a multiplier of 0.6 as required by the NRC for choked-flow check between nodes.

d. Homogeneous fine mist for the steam/water-air system in the control volumes with complete liquid carryover was used to produce a conservative solution.

e. The length of a flow path connecting any two control volumes was taken as the distance between the centroids of these volumes.

f. The area of a flow path is the effective area (i.e., the cross-sectional area of the path excluding areas occupied by grating, pipes, louvers, etc.).

g. Mass and energy release rate for a postulated main steamline break is included in Tables 4 and 5 for Unit 1 and Unit 2 respectively.

h. The doors and HVAC louvers/panels in the upper chambers of the valve rooms are initially assumed closed or intact. A differential pressure equal to 1.5 psi will blow open the doors and panels to atmosphere.

2. Analytical Model

To determine the transient pressures and temperatures in the main steam tunnel and the safety valve rooms after a sudden failure of a main steamline, the main steam tunnel was simulated by five control volumes connected by flow paths. The area of each flow path is equivalent to the net area of the steam tunnel.

The subcompartments of the valve room in each quadrant were represented by four control volumes connected by flow paths. The area of each flow path was equivalent to the total vent areas between subcompartments.

Figures 1 and 2 depict a plan of the system and the flow diagram of the analytical model used in the study, respectively.

Tables 1, 2 and 3 give the dimensions of the control volumes and flow paths, while Tables 4 and 5 show the blowdown rates and properties versus time from a postulated main steamline break as provided by Framatome Technologies International for Unit 1 (Reference 2) and Westinghouse for Unit 2, respectively.

III. Results and Conclusions

A. Unit 1 Results

The peak nodal differential pressures, which represent the difference between steam tunnel/valve room nodes and the surrounding areas, are presented in Table 1 and Figures C3.6-3 through C3.6-6.

The peak differential pressures across internal walls and floors are shown in Table 6 and Figures C3.6-7 and C3.6-8.

1. Pipe Break in the Main Steam Tunnel

Five locations of a postulated main steamline break were considered in the main steam tunnel. The first and second locations were just outside the valve rooms in the first and second quadrants (Nodes 6 and 8), respectively. The third location was in the steam tunnel between the first and second quadrants (Node 7). The last two break locations are in the tunnel leading to the entrance to the turbine building (Nodes 13 and 14).

Figures C3.6-4 through C3.6-6 show the differential pressures in the control volumes directly affected by the line breaks in the tunnel.

2. Pipe Break in Valve Room

A pipe break in the lower chamber of the valve room in the second quadrant (Node 5) was evaluated to provide the most conservative differential pressure.

Figure C3.6-3 shows the differential pressures in the control volumes directly affected by the line break in the valve room.

Tables 1 and 6 provide a summary of the peak pressures used in the qualification of the structure (References 3 and 4).

B. Unit 1 Conclusions

The integrity of the Unit 1 main steam tunnel and valve rooms in both the first and second quadrants can be maintained during a postulated main steamline break. These differential pressures, modified by dynamic load factors, were used to qualify the subject walls for the tunnels (Reference 3) and valve rooms (Reference 4).

C. Unit 2 Results

1. Pipe Break in the Main Steam Tunnel

Three locations of a postulated main steamline break were considered in the main steam tunnel. The first and second locations were just outside the valve rooms in the first and second quadrants (Nodes 6 and 8), respectively. The third location was in the steam tunnel between the first and second quadrants (Node 7).

Figures 10 through 18 show the differential pressures in the control volumes directly affected by the line break.

2. Pipe Break in Valve Room

A pipe break in the lower chamber of the valve room in the second quadrant (Node 5) was considered to give the most conservative differential pressure.

Figures 7 through 9 show the differential pressures in the affected control volumes after a line break.

Table 2 gives a summary of the peak pressures to the valves used in the design of the structure.

D. Unit 2 Conclusions

The integrity of the main steam tunnel, the auxiliary feedwater tunnel, and the valve rooms in both the first and second quadrants can be maintained during a postulated main steamline break.

IV. References

1. Calculation 3C8-0282-001, Revision 3.
2. NDIT 960136, "Steam Generator Replacement Project: Transmittal of Steam Line Break Mass and Energy for Steam Tunnel Pressure Analysis," dated September 16, 1996.
3. Calculation 5.6.1-BYR96-233/5.6.1-BRW-96-604, Revision 0.
4. Calculation 5.6.3-BYR96-234/5.6.3-BRW-96-608, Revision 0.

TABLE 1

UNIT 1 SUBCOMPARTMENT NODAL DESCRIPTION

MAIN STEAM LINE BREAK IN UNIT 1 MAIN STEAM TUNNEL OR VALVE ROOMS

VOLUME NO.	DESCRIPTION	HEIGHT ft	CROSS-SECTIONAL AREA ft^2	VOLUME ft^3	INITIAL CONDITIONS TEMP. °F	PRESS. psia	HUMID.* %	DBA BREAK CONDITIONS BREAK LOC. VOL. NO.	BREAK LINE	BREAK AREA ft^2	BREAK TYPE	CALC. PEAK PRESS DIFF. psid	DESIGN PEAK PRESS DIFF. psid	DESIGN MARGIN %
1	Atmosphere	$5x10^3$	$1x10^3$	107	90	14.7	30	-	-	-	-	-	-	-
2	2nd Quadrant Upper Valve Chamber	12.33	133.25	4895.7	90	14.7	30	5	Main Steam	1.4	Double-ended Guillotine	15.3	26.2	71
3	2nd Quadrant Upper Valve Chamber	12.33	183.7	4895.7	90	14.7	30	5	Main Steam	1.4	Double-ended Guillotine	15.3	26.2	71
4	2nd Quadrant Lower Valve Chamber	24.00	213.0	6007.0	90	14.7	30	5	Main Steam	1.4	Double-ended Guillotine	17.7	26.2	48
5	2nd Quadrant Valve Chamber	24.00	213.0	6007.0	90	14.7	30	5	Main Steam	1.4	Double-ended Guillotine	17.7	28.6	62

* Relative humidity.

TABLE 1 (Cont'd)

			CROSS-SECTIONAL		INITIAL CONDITIONS			DBA BREAK CONDITIONS				CALC. PEAK	DESIGN PEAK	
VOLUME NO.	DESCRIPTION	HEIGHT ft	AREA ft^2	VOLUME ft^3	TEMP. °F	PRESS. psia	HUMID.* %	BREAK LOC. VOL. NO.	BREAK LINE	BREAK AREA ft^2	BREAK TYPE	PRESS DIFF. psid	PRESS DIFF. psid	DESIGN MARGIN %
6	2nd Quadrant Main Steam Tunnel	19.00	317.0	13695.0	90	14.7	30	6	Main Steam	1.4	Double-ended Guillotine	16.0	26.5	66
7	Main Steam Tunnel	19.00	203.00	34865.0	90	14.7	30	7	Main Steam	1.4	Double-ended Guillotine	15.2	21.3	40
8	1st Quadrant Steam Tunnel	20.00	432.0	35016.0	90	14.7	30	8	Main Steam	1.4	Double-ended Guillotine	8.3	11.2	35
9	1st Quadrant Upper Valve Chamber	12.33	133.25	4895.7	90	14.7	30	5**	Main Steam	1.4	Double-ended Guillotine	15.3	26.2	71
10	1st Quadrant Upper Valve Chamber	12.33	183.7	4895.7	90	14.7	30	5**	Main Steam	1.4	Double-ended Guillotine	15.3	26.2	71

* Relative humidity.
** Differential pressures calculated for 1st quadrant valve chambers are also applicable to corresponding 2nd quadrant valve chambers.

TABLE 1 (Cont'd)

VOLUME NO.	DESCRIPTION	HEIGHT ft	CROSS-SECTIONAL AREA ft^2	VOLUME ft^3	INITIAL CONDITIONS TEMP. °F	PRESS. psia	HUMID.* %	DBA BREAK CONDITIONS BREAK LOC. VOL. NO.	BREAK LINE	BREAK AREA ft^2	BREAK TYPE	CALC. PEAK PRESS DIFF. psid	DESIGN PEAK PRESS DIFF. psid	DESIGN MARGIN %
11	1st Quadrant Valve Chamber	24.00	213.0	6007.0	90	14.7	30	5**	Main Steam	1.4	Double-ended Guillotine	17.7	28.6	62
12	1st Quadrant Lower Valve Chamber	24.00	213.0	6007.0	90	14.7	30	5**	Main Steam	1.4	Double-ended Guillotine	17.7	28.6	62
13	1st Quadrant Main Steam Tunnel	29.00	432.0	17388.4	90	14.7	30	13	Main Steam	1.4	Double-ended Guillotine	10.7	13.2	23
14	1st Quadrant Main Steam Tunnel	19.00	280.0	13529.9	90	14.7	30	14	Main Steam	1.4	Double-ended Guillotine	11.3	***	***

* Relative humidity.
** Differential pressures calculated for 1st quadrant valve chambers are also applicable to corresponding 2nd quadrant valve chambers.
*** The calculated peak differential pressure in Node 14 has been evaluated to be within plant design basis code allowable stresses (Reference 3).

TABLE 2

UNIT 2 SUBCOMPARTMENT NODAL DESCRIPTION

MAIN STEAM LINE BREAK IN UNIT 2 MAIN STEAM TUNNEL OR VALVE ROOMS

					INITIAL CONDITIONS			DBA BREAK CONDITIONS						
VOLUME NO.	DESCRIPTION	HEIGHT ft	CROSS-SECTIONAL AREA ft^2	VOLUME ft^3	TEMP. °F	PRESS. psia	HUMID.* %	BREAK LOC. VOL. NO.	BREAK LINE	BREAK AREA ft^2	BREAK TYPE	CALC. PEAK PRESS DIFF. psid	DESIGN PEAK PRESS DIFF. psid	DESIGN MARGIN %
1	Atmosphere	$5x10^3$	$1x10^3$	10^7	90	14.7	30	-	-	-	-	-	-	-
2	2nd Quad-rant Upper Valve Chamber	12.33	133.25	4895.7	90	14.7	30	5	Main Steam	1.4	Double-ended Guillo-tine	17.4	26.2	51
3	2nd Quad-rant Upper Valve Chamber	12.33	183.7	4895.7	90	14.7	30	5	Main Steam	1.4	Double-ended Guillo-tine	17.4	26.2	51
4	2nd Quad-rant Lower Valve Chamber	24.00	213.0	6007.0	90	14.7	30	5	Main Steam	1.4	Double-ended Guillo-tine	17.4	26.2	51
5	2nd Quad-rant Valve Chamber	24.00	213.0	6007.0	90	14.7	30	5	Main Steam	1.4	Double-ended Guillo-tine	19.7	28.6	45

* Relative humidity.

TABLE 2 (Cont'd)

VOLUME NO.	DESCRIPTION	HEIGHT ft	CROSS-SECTIONAL AREA ft^2	VOLUME ft^3	INITIAL CONDITIONS TEMP. °F	PRESS. psia	HUMID.* %	DBA BREAK CONDITIONS BREAK LOC. VOL. NO.	BREAK LINE	BREAK AREA ft^2	BREAK TYPE	CALC. PEAK PRESS DIFF. psid	DESIGN PEAK PRESS DIFF. psid	DESIGN MARGIN %
6	2nd Quadrant Main Steam Tunnel	19.00	317.0	13695.0	90	14.7	30	6	Main Steam	1.4	Double-ended Guillotine	16.4	26.5	61
7	Main Steam Tunnel	19.00	203.00	34865.0	90	14.7	30	7	Main Steam	1.4	Double-ended Guillotine	15.5	21.3	38
8	1st Quadrant Steam Tunnel	20.00	432.0	35016.0	90	14.7	30	8	Main Steam	1.4	Double-ended Guillotine	8.8	11.2	28
9	1st Quadrant Upper Valve Chamber	12.33	133.25	4895.7	90	14.7	30	5**	Main Steam	1.4	Double-ended Guillotine	17.4	26.2	51
10	1st Quadrant Upper Valve Chamber	12.33	183.7	4895.7	90	14.7	30	5**	Main Steam	1.4	Double-ended Guillotine	17.4	26.2	51

* Relative humidity.
** Differential pressures calculated for 1st quadrant valve chambers are also applicable to corresponding 2nd quadrant valve chambers.

TABLE 2 (Cont'd)

VOLUME NO.	DESCRIPTION	HEIGHT ft	CROSS-SECTIONAL AREA ft^2	VOLUME ft^3	INITIAL CONDITIONS TEMP. °F	PRESS. psia	HUMID.* %	DBA BREAK CONDITIONS BREAK LOC. VOL. NO.	BREAK LINE	BREAK AREA ft^2	BREAK TYPE	CALC. PEAK PRESS DIFF. psid	DESIGN PEAK PRESS DIFF. psid	DESIGN MARGIN %
11	1st Quad-rant Valve Chamber	24.00	213.0	6007.0	90	14.7	30	5**	Main Steam	1.4	Double-ended Guillo-tine	19.7	28.6	45
12	1st Quadrant Lower Valve Chamber	24.00	213.0	6007.0	90	14.7	30	5**	Main Steam	1.4	Double-ended Guillo-tine	19.7	28.6	45
13	1st Quad-rant Main Steam Tunnel	29.00	432.0	17388.4	90	14.7	30	8	Main Steam	1.4	Double-ended Guillo-tine	8.9	13.2	48
14	1st Quad-rant Main Steam Tunnel	19.00	280.0	13529.9	90	14.7	30	8	Main Steam	1.4	Double-ended Guillo-tine	5.9	10.3	75

* Relative humidity.
** Differential pressures calculated for 1st quadrant valve chambers are also applicable to corresponding 2nd quadrant valve chambers.

TABLE 3

SUBCOMPARTMENT VENT PATH DESCRIPTION

MAIN STEAM LINE BREAK IN MAIN STEAM TUNNEL OR VALVE ROOM

VENT PATH NO.	FROM VOL. NODE NO.	TO VOL. NODE NO.	DESCRIPTION OF VENT PATH FLOW* CHOKED‡ UNCHOKED	AREA† ft^2	LENGTH† ft	HYDRAULIC DIAMETER ft	HEAD LOSS, K: FRICTION K, ft/d	TURNING LOSS, K	EXPAN-SION, K	CONTRAC-TION, K	TOTAL
1	14	1	Main Steam Tunnel to Turbine Building Unchoked	270.8	28.0	13.9	-	-	-	-	1.0656
2	2	5	2nd Quadrant Upper Valve Chamber to Lower Valve Chamber Unchoked	121.0	16.4	5.7	-	-	-	-	1.5207
3	3	4	2nd Quadrant Upper Valve Chamber to Lower Valve Chamber Unchoked	121.0	16.4	5.7	-	-	-	-	1.5207
4	6	4	2nd Quadrant Lower Valve Chamber to Main Steam Tunnel Unchoked	73.0	17.2	4.5	-	-	-	-	1.5685
5	6	5	2nd Quadrant Lower Valve Chamber to Main Steam Tunnel Choked (5)	73.0	17.2	4.5	-	-	-	-	1.5685

* See Figures 1 and 2.
† Length/area is the inertial term input directly into RELAP4/MOD5.
‡ Number in parentheses indicates the volume number of the break location which caused choke flow in the vent. For break locations not indicated, unchoked flow had occurred for the vent.

TABLE 3 (Cont'd)

VENT PATH NO.	FROM VOL. NODE NO.	TO VOL. NODE NO.	DESCRIPTION OF VENT PATH FLOW* CHOKED‡ UNCHOKED	AREA† ft^2	LENGTH† ft	HYDRAULIC DIAMETER ft	HEAD LOSS, K FRICTION K, ft/d	TURNING LOSS, K	EXPAN-SION, K	CONTRAC-TION, K	TOTAL
6	5	4	Openings Between 2nd Quadrant Lower Valve Chambers / Unchoked	100.0	16.1	7.1	-	-	-	-	1.5071
7	6	7	2nd Quadrant Main Steam Tunnel to Main Steam Tunnel / Unchoked	199.8	102.0	13.3	-	-	-	-	2.1860
8	7	8	Main Steam Tunnel to 1st Quadrant Main Steam Tunnel / Unchoked	199.8	132.4	13.3	-	-	-	-	2.7530
9	12	9	1st Quadrant Upper Valve Chamber to Lower Valve Chamber / Unchoked	121.0	16.4	5.7	-	-	-	-	1.5207
10	9	10	Openings Between 1st Quadrant Upper Valve Chambers / Unchoked	100.0	11.2	4.5	-	-	-	-	1.5120
11	11	10	1st Quadrant Upper Valve Chamber to Lower Valve Chamber / Unchoked	121.0	16.4	5.7	-	-	-	-	1.5207

* See Figures 1 and 2.
† Length/area is the inertial term input directly into RELAP4/MOD5.
‡ Number in parentheses indicates the volume number of the break location which caused choke flow in the vent. For break locations not indicated, unchoked flow had occurred for the vent.

TABLE 3 (Cont'd)

VENT PATH NO.	FROM VOL. NODE NO.	TO VOL. NODE NO.	DESCRIPTION OF VENT PATH FLOW* CHOKED‡ UNCHOKED	AREA† ft^2	LENGTH† ft	HYDRAULIC DIAMETER ft	HEAD LOSS, K FRICTION K, ft/d	TURNING LOSS, K	EXPANSION, K	CONTRACTION, K	TOTAL
12	12	11	Openings Between 1st Quadrant Lower Valve Chambers Unchoked	100.0	16.1	7.1	-	-	-	-	1.5071
13	8	13	1st Quadrant Main Steam Tunnel Unchoked	373.6	42.0	17.6	-	-	-	-	2.2600
14	13	14	1st Quadrant Main Steam Tunnel Unchoked	270.8	42.0	13.9	-	-	-	-	2.2600
15	8	11	1st Quadrant Lower Valve Chamber to Main Steam Tunnel Unchoked	73.0	17.2	4.5	-	-	-	-	1.5685
16	8	12	1st Quadrant Lower Valve Chamber to Main Steam Tunnel Unchoked	73.0	17.2	4.5	-	-	-	-	1.5685
17	2	3	Openings Between 2nd Quadrant Upper Valve Chambers Unchoked	100.0	11.2	4.5	-	-	-	-	1.5120

* See Figures 1 and 2.
† Length/area is the inertial term input directly into RELAP4/MOD5.
‡ Number in parentheses indicates the volume number of the break location which caused choke flow in the vent. For break locations not indicated, unchoked flow had occurred for the vent.

TABLE 3 (Cont'd)

VENT PATH NO.	FROM VOL. NODE NO.	TO VOL. NODE NO.	DESCRIPTION OF VENT PATH FLOW* CHOKED‡ UNCHOKED	AREA† ft^2	LENGTH† ft	HYDRAULIC DIAMETER ft	HEAD LOSS, K FRICTION K, ft/d	TURNING LOSS, K	EXPANSION, K	CONTRACTION, K	TOTAL
18	2	1	HVAC Panels in 2nd Quadrant Upper Valve Chambers Choked (5, 6)	51.3	15.2	5.9	-	-	-	-	2.900
19	3	1	Door and HVAC Panels in 2nd Quadrant Upper Valve Chambers Choked (5, 6)	75.8	25.3	5.4	-	-	-	-	2.900
20	9	1	HVAC Panels in 1st Quadrant Upper Valve Chamber Choked (5)§	51.3	15.2	5.9	-	-	-	-	2.900
21	10	1	Door and HVAC Panels in 1st Quadrant Upper Valve Chamber Choked (5)[4]	75.8	25.3	5.4	-	-	-	-	2.900
22(a)**	0	5	Main Steam Line Break in Node 5 Fill	1.0	0.0	0.0	-	-	-	-	0.000
22(b)[5]	0	6	Main Steam Line Break in Node 6 Fill	1.0	0.0	0.0	-	-	-	-	0.000

* See Figures 1 and 2.
† Length/area is the inertial term input directly into RELAP4/MOD5.
‡ Number in parentheses indicates the volume number of the break location which caused choke flow in the vent. For break locations not indicated, unchoked flow had occurred for the vent.
§ Choking results for 2nd quadrant valve room are applied to 1st quadrant valve room.
** Four cases were considered each having a different break location.

TABLE 3 (Cont'd)

VENT PATH NO.	FROM VOL. NODE NO.	TO VOL. NODE NO.	DESCRIPTION OF VENT PATH FLOW* CHOKED‡ UNCHOKED	AREA† ft²	LENGTH† ft	HYDRAULIC DIAMETER ft	HEAD LOSS, K FRICTION K, ft/d	TURNING LOSS, K	EXPANSION, K	CONTRACTION, K	TOTAL
22(c) **	0	7	Main Steam Line Break in Node 7 / Fill	1.0	0.0	0.0	-	-	-	-	0.000
22(d)§	0	8	Main Steam Line Break in Node 8 / Fill	1.0	0.0	0.0	-	-	-	-	0.000

* See Figures 1 and 2.
† Length/area is the inertial term input directly into RELAP4/MOD5.
‡ Number in parentheses indicates the volume number of the break location which caused choke flow in the vent. For break locations not indicated, unchoked flow had occurred for the vent.
§ Choking results for 2nd quadrant valve room are applied to 1st quadrant valve room.
** Four cases were considered each having a different break location.

TABLE 4

UNIT 1 BLOWDOWN RATES AND ENTHALPY FOR MAIN STEAMLINE BREAK

TIME (sec)	FLOW (lb/sec)	ENTHALPY (Btu/lb)
0.0	14,189	1,024.9
0.02	14,189	1,024.9
0.04	13,883	1,116.4
0.06	12,901	1,119.3
0.08	12,479	1,124.6
0.10	12,342	1,133.0
0.12	12,250	1,134.0
0.14	12,093	1,128.3
0.16	11,827	1,119.4
0.18	11,434	1,111.2
0.20	11,022	1,107.3
0.22	10,642	1,105.7
0.24	10,315	1,105.5
0.26	10,041	1,105.9
0.28	9,810	1,106.3
0.30	9,608	1,106.4
0.32	9,424	1,106.4
0.34	9,255	1,106.3
0.36	9,097	1,106.4
0.38	8,954	1,106.8
0.40	8,827	1,107.7
0.42	8,728	1,110.1
0.44	8,633	1,109.1

TABLE 4 (Cont'd)

TIME (sec)	FLOW (lb/sec)	ENTHALPY (Btu/lb)
0.46	8,558	1,112.7
0.48	8,522	1,116.4
0.50	8,512	1,119.5
0.52	8,523	1,122.7
0.54	8,553	1,125.9
0.56	8,598	1,128.8
0.58	8,652	1,131.3
0.60	8,709	1,133.3
0.62	8,765	1,134.8
0.64	8,813	1,135.8
0.66	8,852	1,136.5
0.68	8,879	1,136.9
0.70	8,894	1,137.2
0.72	8,898	1,137.3
0.74	8,892	1,137.4
0.76	8,878	1,137.5
0.78	8,875	1,138.5
0.80	8,846	1,137.5
0.82	8,816	1,137.9
0.84	8,788	1,138.3
0.86	8,761	1,138.5
0.88	8,733	1,138.7
0.90	8,705	1.138.9
0.92	8,679	1,139.1

TABLE 4 (Cont'd)

TIME (sec)	FLOW (lb/sec)	ENTHALPY (Btu/lb)
0.94	8,655	1,139.3
0.96	8,632	1,139.5
0.98	8,611	1,139.6
1.00	8,591	1,139.8
1.02	8,573	1,139.9
1.04	8,557	1,140.1
1.06	8,542	1,140.2
1.08	8,529	1,140.3
1.10	8,518	1,140.4
1.12	8,508	1,140.5
1.14	8,499	1,140.5
1.16	8,492	1,140.5
1.18	8,486	1,140.4
1.20	8,481	1,140.3
1.22	8,477	1,140.2
1.24	8,473	1,140.0
1.26	8,471	1,139.7
1.28	8,468	1,139.4
1.30	8,466	1,139.0
1.32	8,465	1,138.6
1.34	8,463	1,138.1
1.36	8,462	1,137.5
1.38	8,462	1,136.9
1.40	8,461	1.136.2

TABLE 5

UNIT 2 BLOWDOWN RATES AND ENTHALPY FOR MAIN STEAMLINE BREAK

TIME (sec)	FLOW (lb/sec)	ENTHALPY (Btu/lb)
0.0	11,000	1,195.4
2.0	10,434	1,195.1
4.0	9,608	1,196.9
6.0	9,017	1,197.7
8.0	8,613	1,199.4
10.0	9,318	1,199.8
10.1	2,098	1,201.1
20.0	1,993	1,199.2
30.0	1,879	1,208.1
50.0	1,625	1,206.1
75.0	1,064	1,203.0
100.0	814	1,201.5

TABLE 6

SUMMARY OF UNIT 1 PEAK PRESSURES
BETWEEN VALVE ROOM AND MAIN STEAM TUNNEL

WALL LOCATION BETWEEN NODES		DELTA P ACROSS	PEAK PRESSURE (psid)
2-3	9-10	Vertical Wall	5.48
3-4	10-11	Horizontal Floor	12.50
4-5	11-12	Vertical Wall	13.20
2-5	9-12	Horizontal Floor	12.50
4-6 11-8	5-6 12-8	Main Steam Tunnel Vertical Wall	14.40

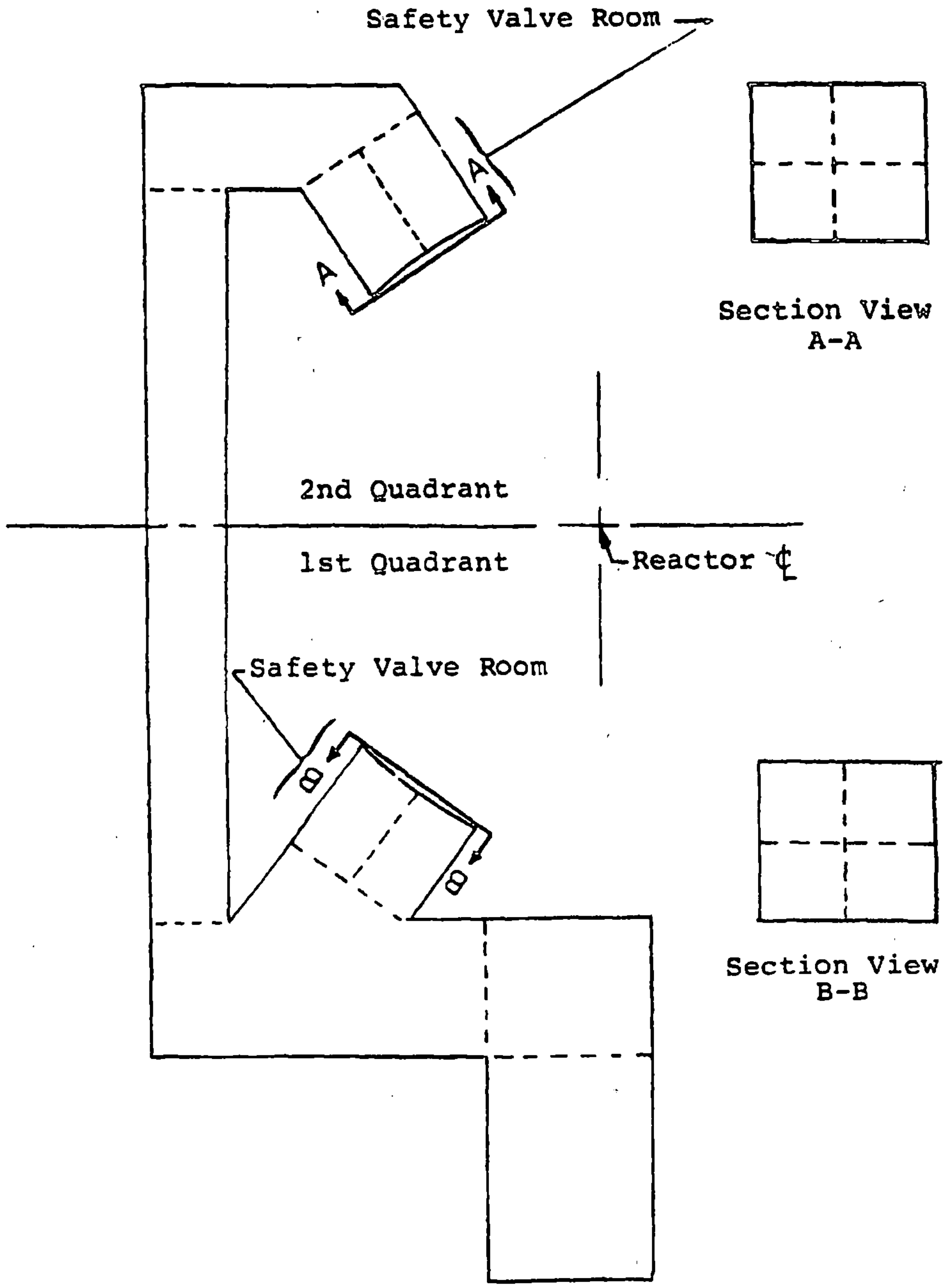

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FIGURE C3.6-1

MAIN STEAM TUNNEL VIEW PLAN

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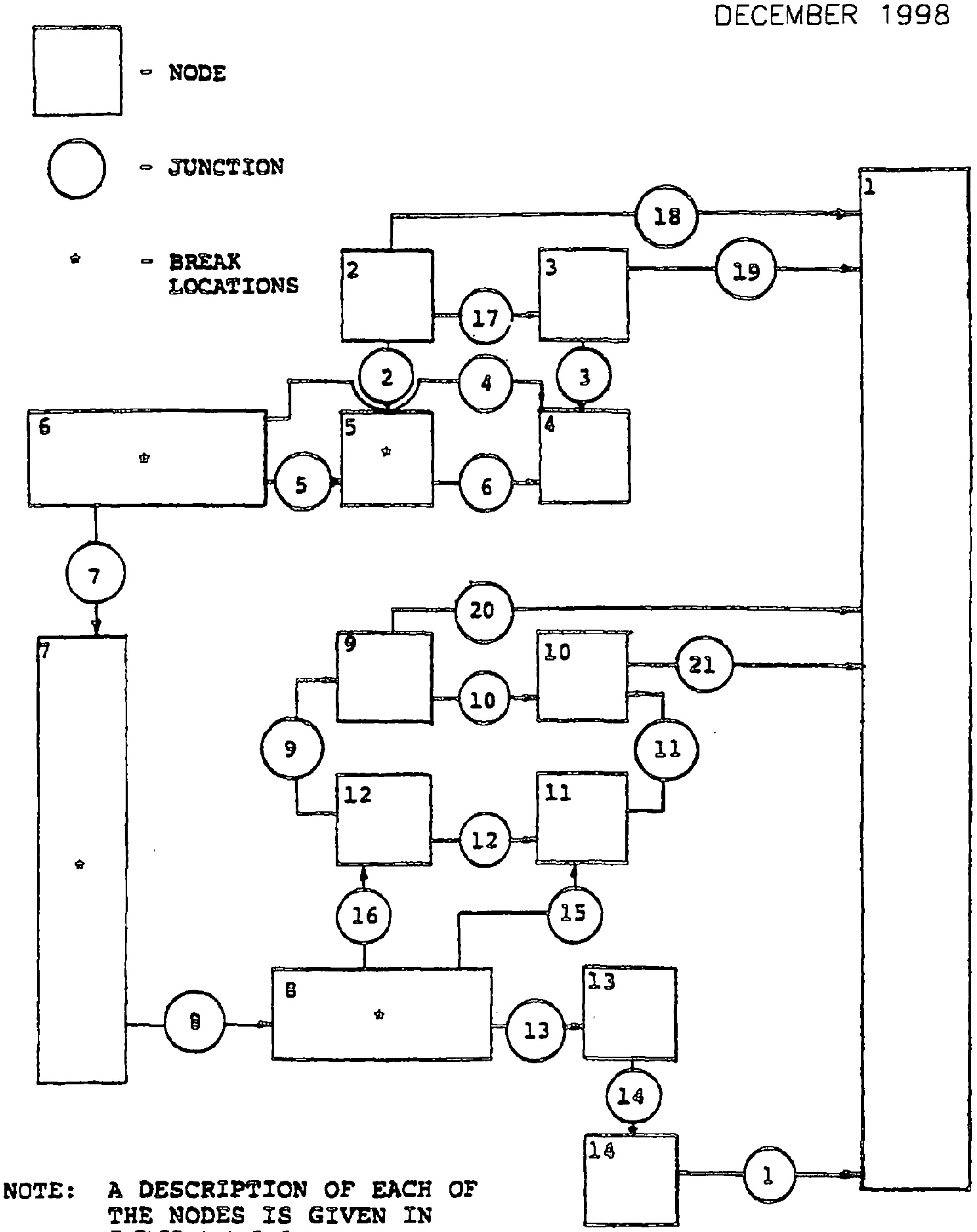

NOTE: A DESCRIPTION OF EACH OF THE NODES IS GIVEN IN TABLES 1 AND 2.

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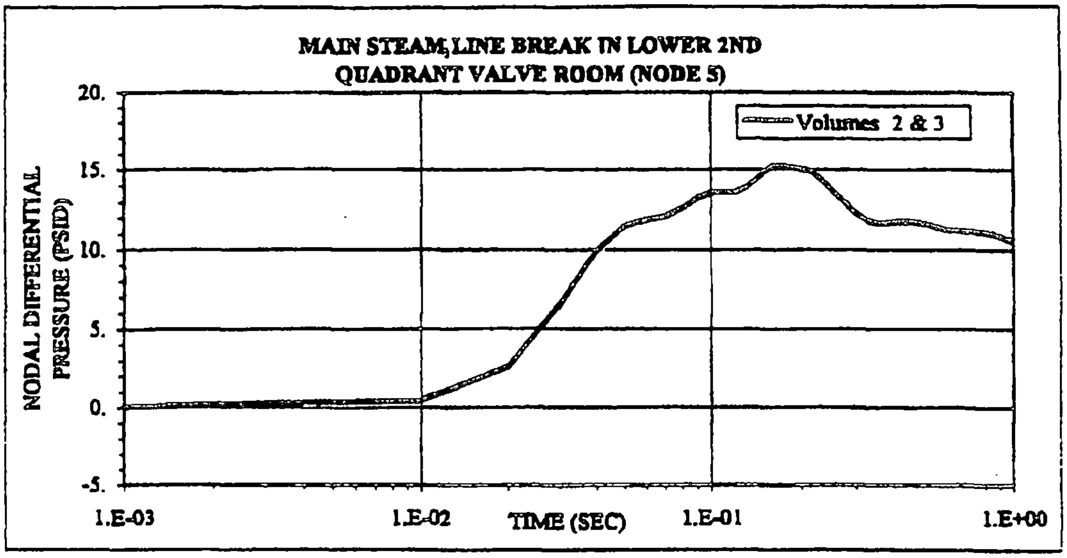
FIGURE C3.6-2 NODALIZATION SCHEMATIC



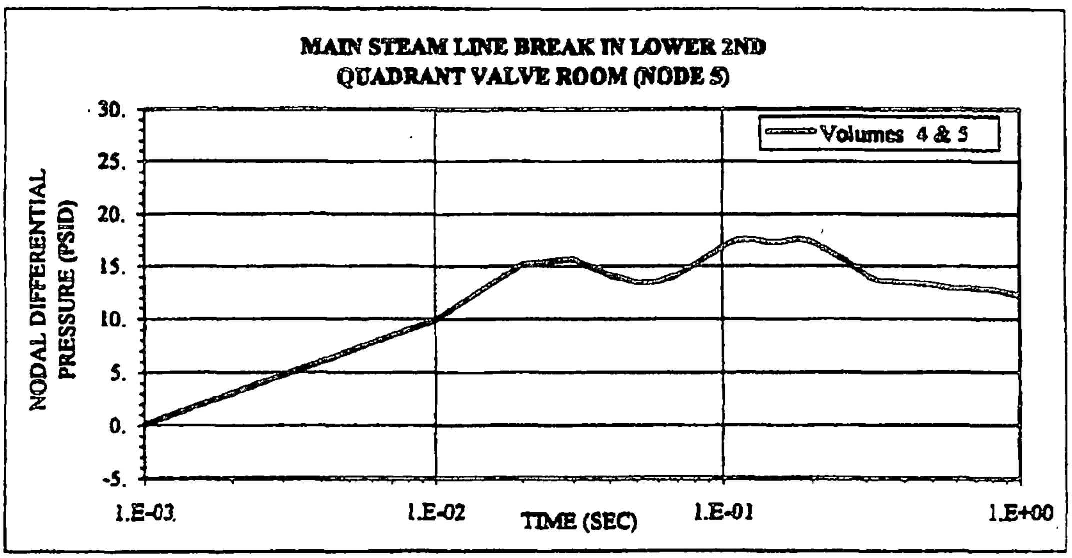


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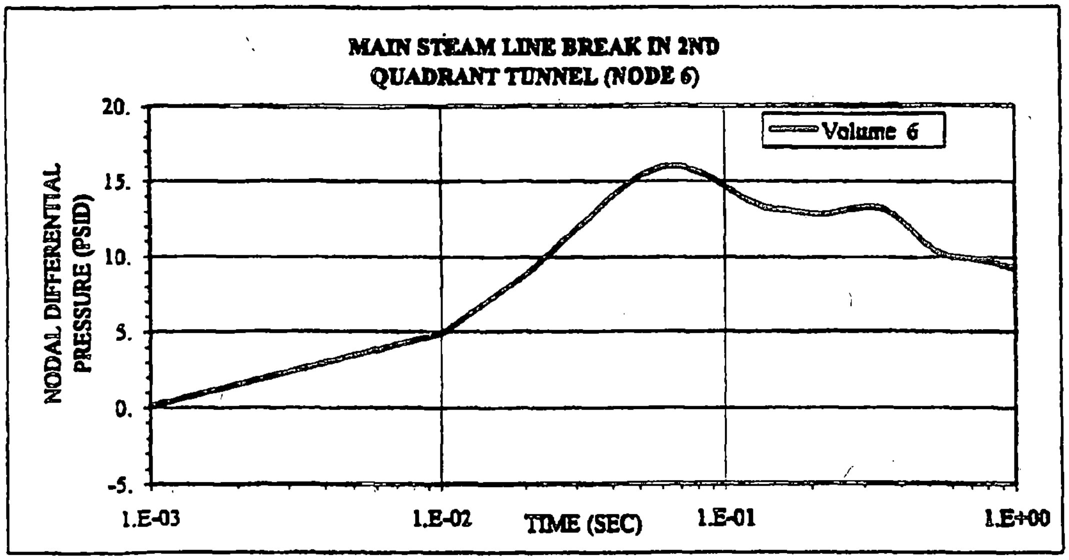
FIGURE C3.6-3
UNIT 1
DIFFERENTIAL PRESSURE VS. TIME
FOR VOLUMES 2 AND 3 (BREAK IN NODE 5)
AND VOLUMES 4 AND 5 (BREAK IN NODE 5)



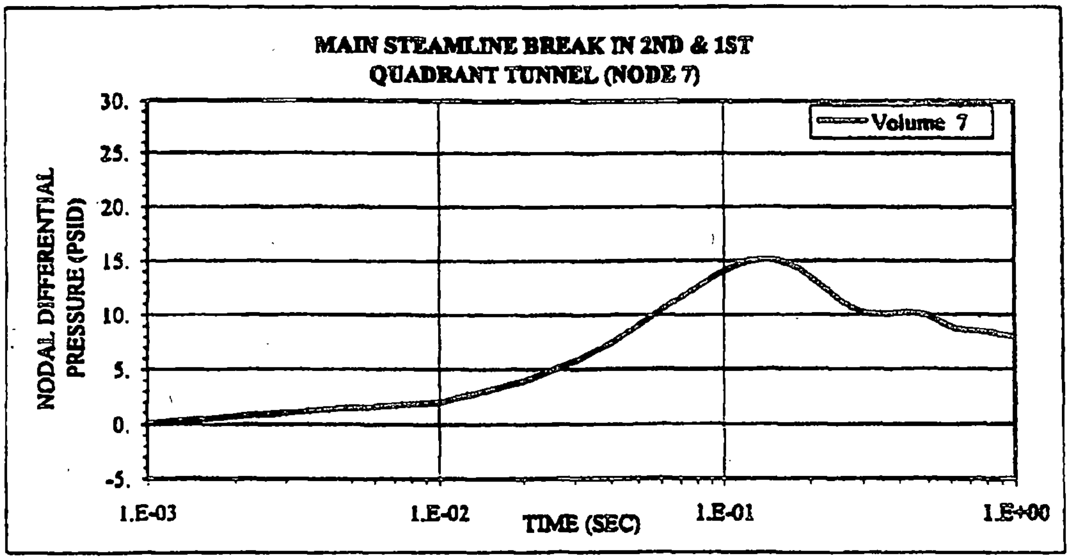


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FIGURE C3.6-4 UNIT 1 DIFFERENTIAL PRESSURE VS. TIME FOR VOLUME 6 (BREAK IN NODE 6) AND VOLUME 7 (BREAK IN NODE 7)

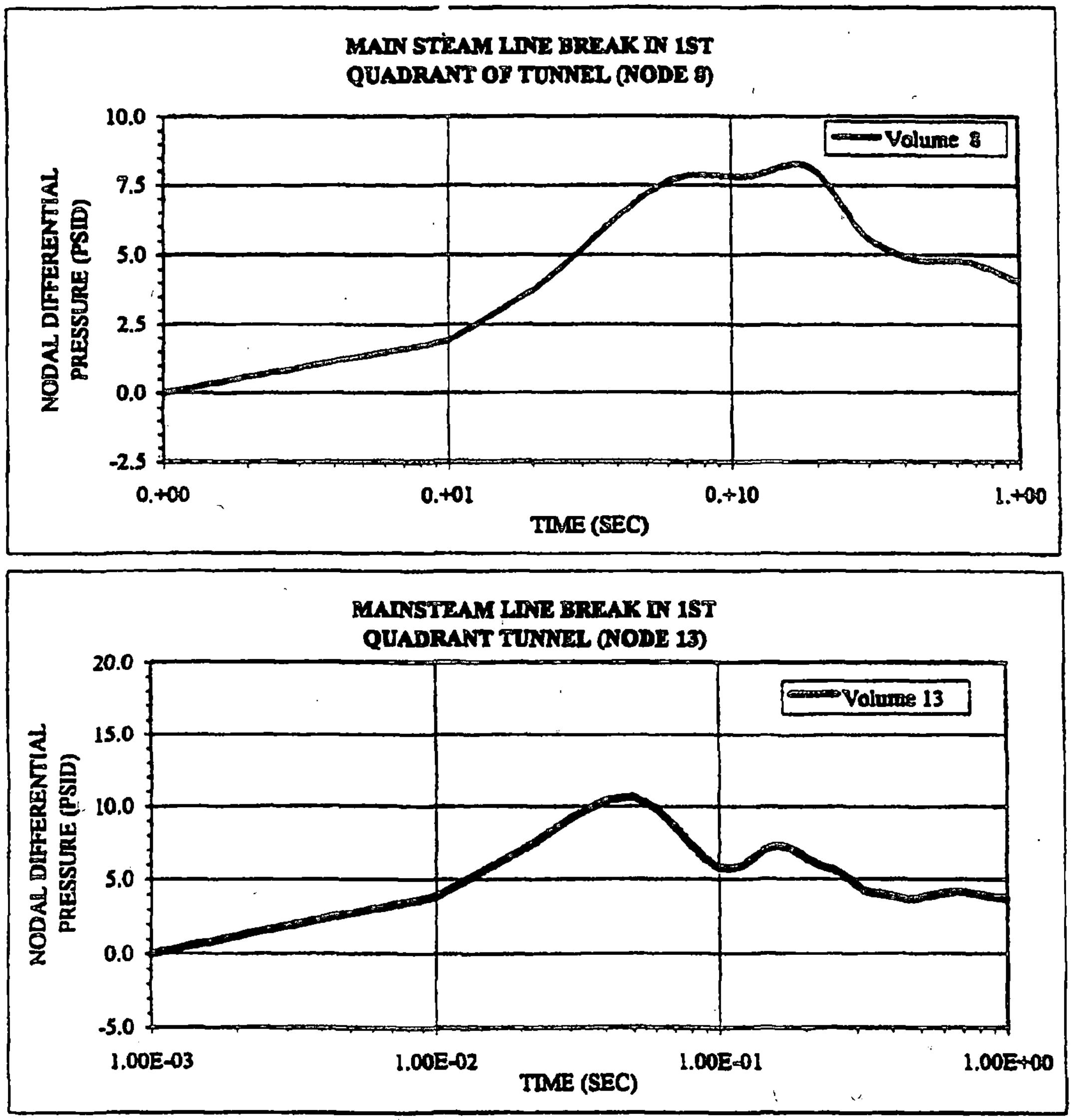

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FIGURE C3.6-5 UNIT 1 DIFFERENTIAL PRESSURE VS. TIME FOR VOLUME 8 (BREAK IN NODE 8) AND VOLUME 13 (BREAK IN NODE 13)

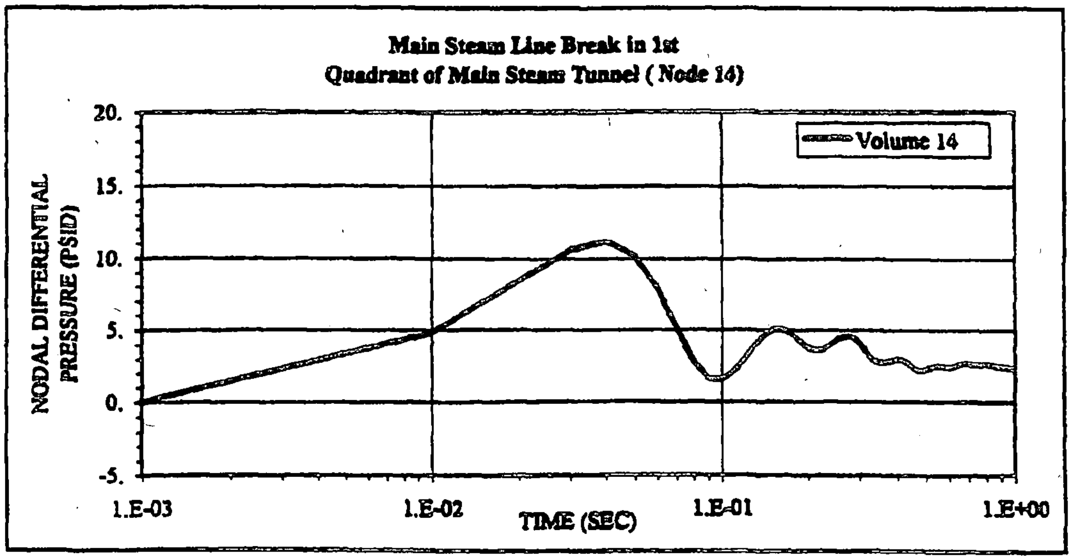

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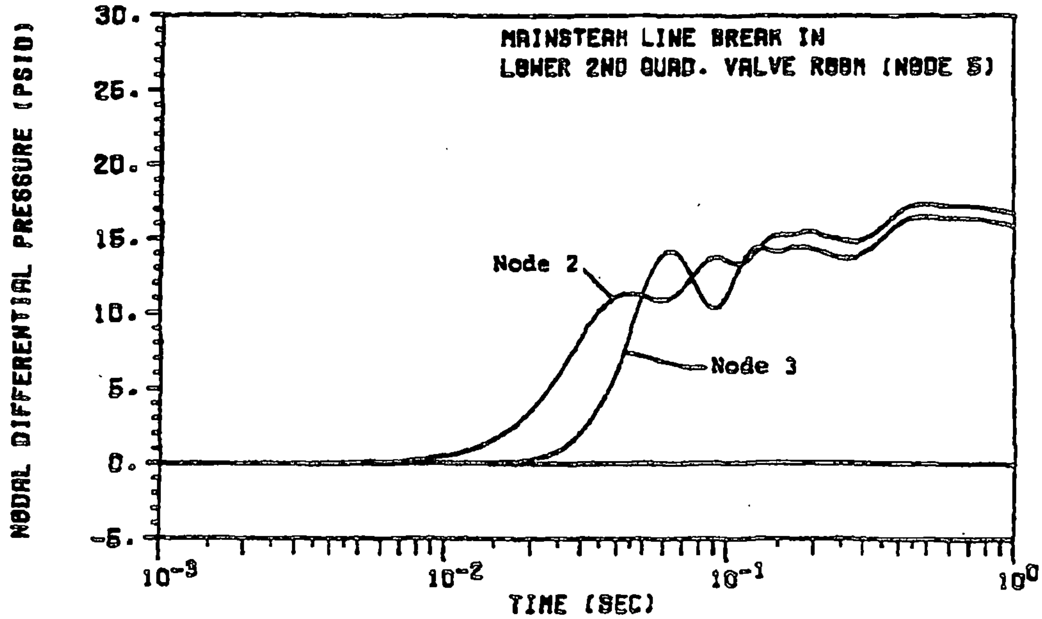
FIGURE C3.6-6

UNIT 1
DIFFERENTIAL PRESSURE VS. TIME
FOR VOLUME 14 (BREAK IN NODE 14)



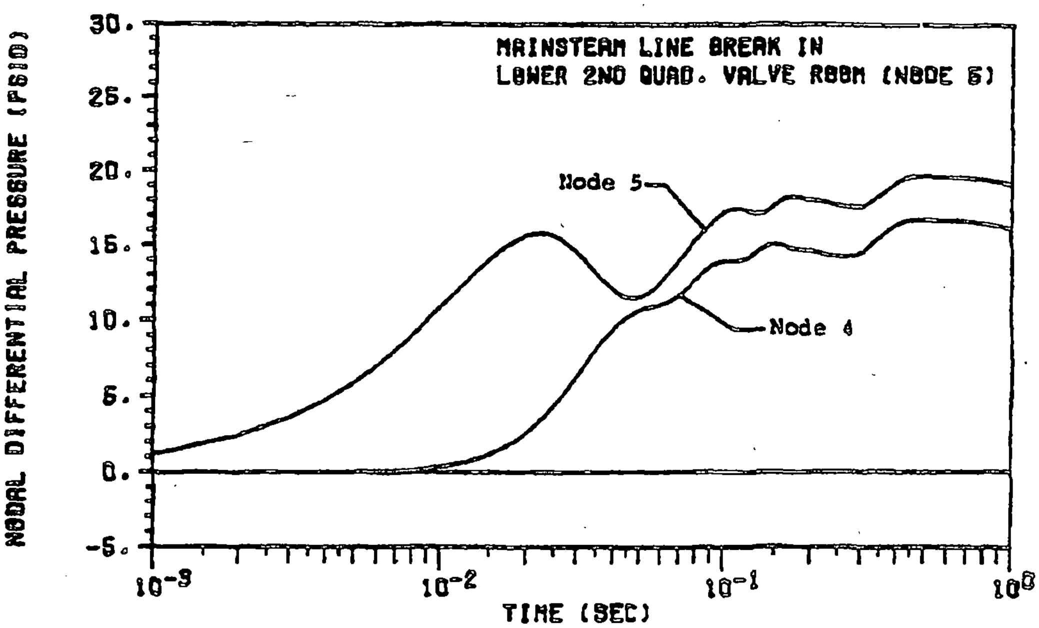


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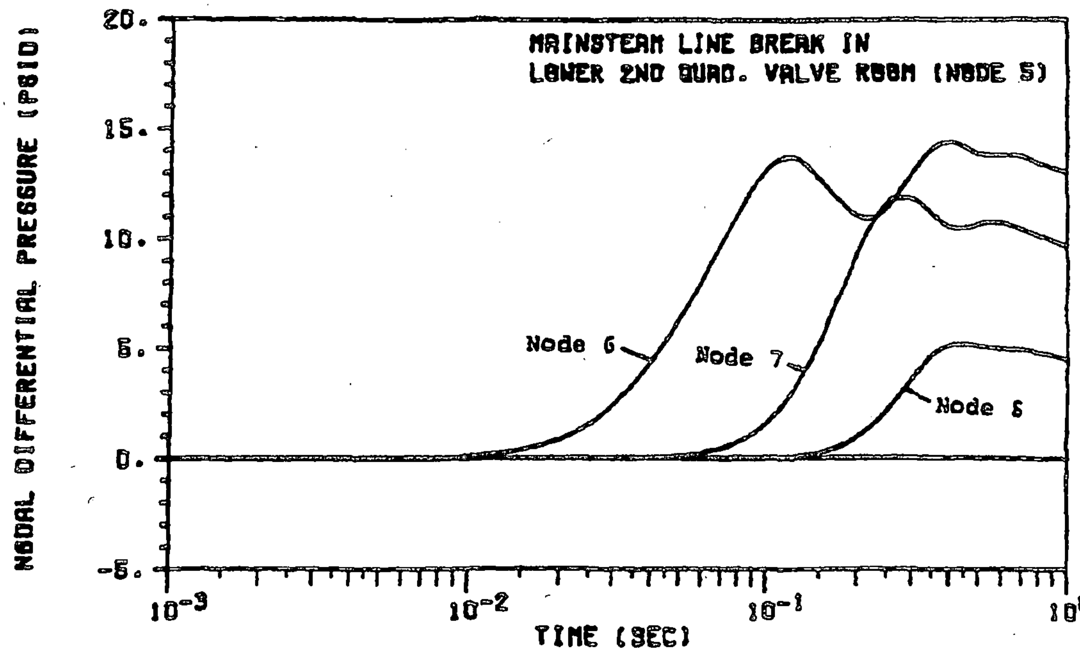
FIGURE C3.6-7 *UNIT 2* DIFFERENTIAL PRESSURE VS. TIME FOR NODES 2,3,4, AND 5 (BREAK IN NODES 5)



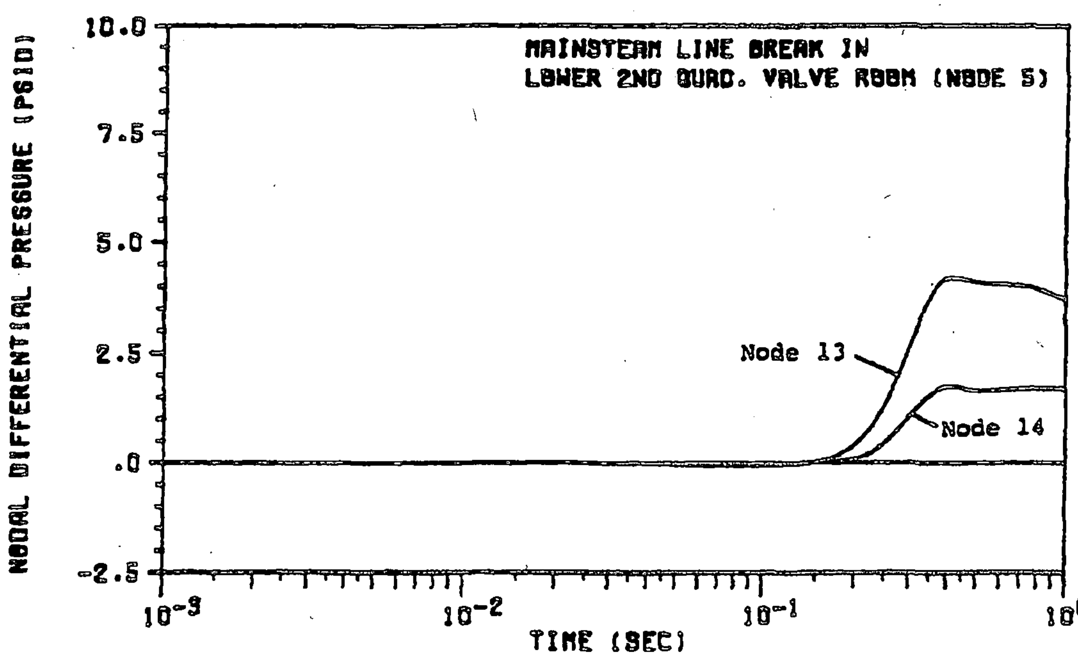


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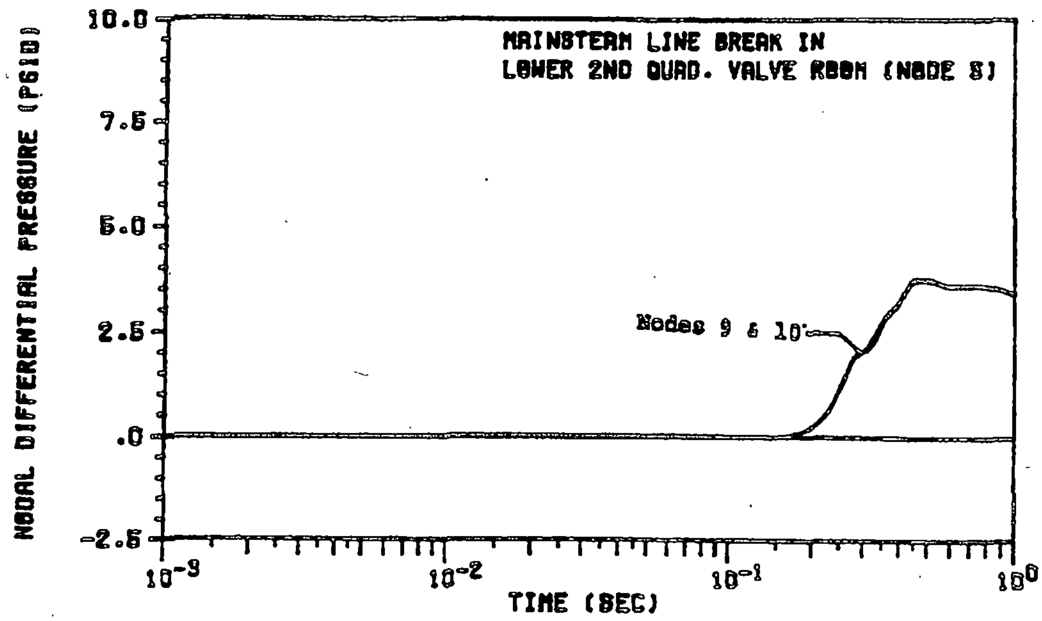
FIGURE C3.6-6 UNIT 2 DIFFERENTIAL PRESSURE VS. TIME FOR NODES 6,7,8,13 AND 14 (BREAK IN NODES 5)



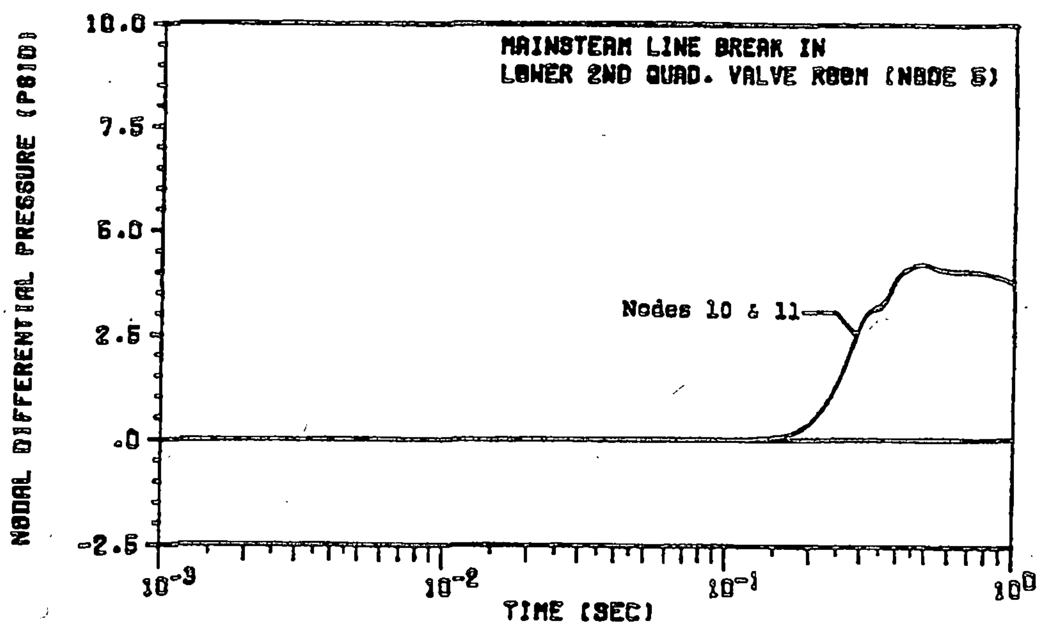


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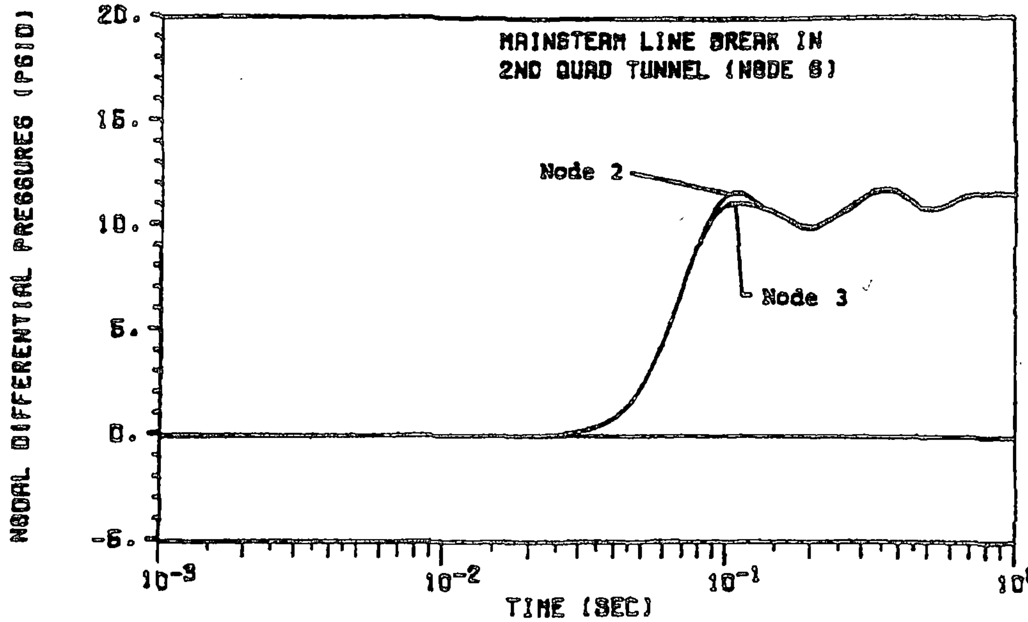
FIGURE C3.6-9 UNIT 2 DIFFERENTIAL PRESSURE VS. TIME FOR NODES 9,10,11 AND 12 (BREAK IN NODE 5)



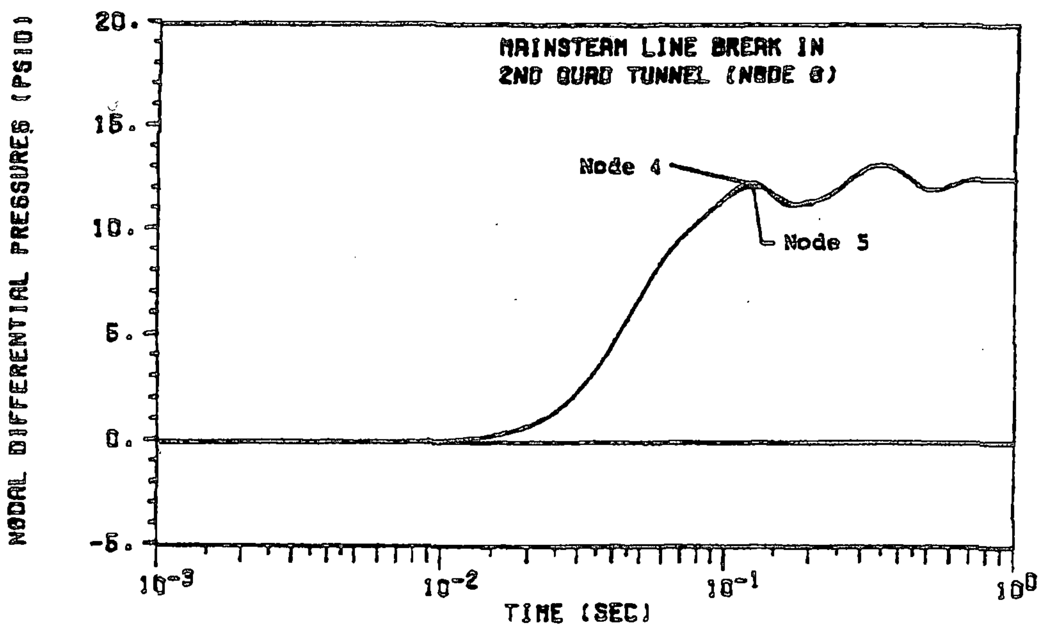


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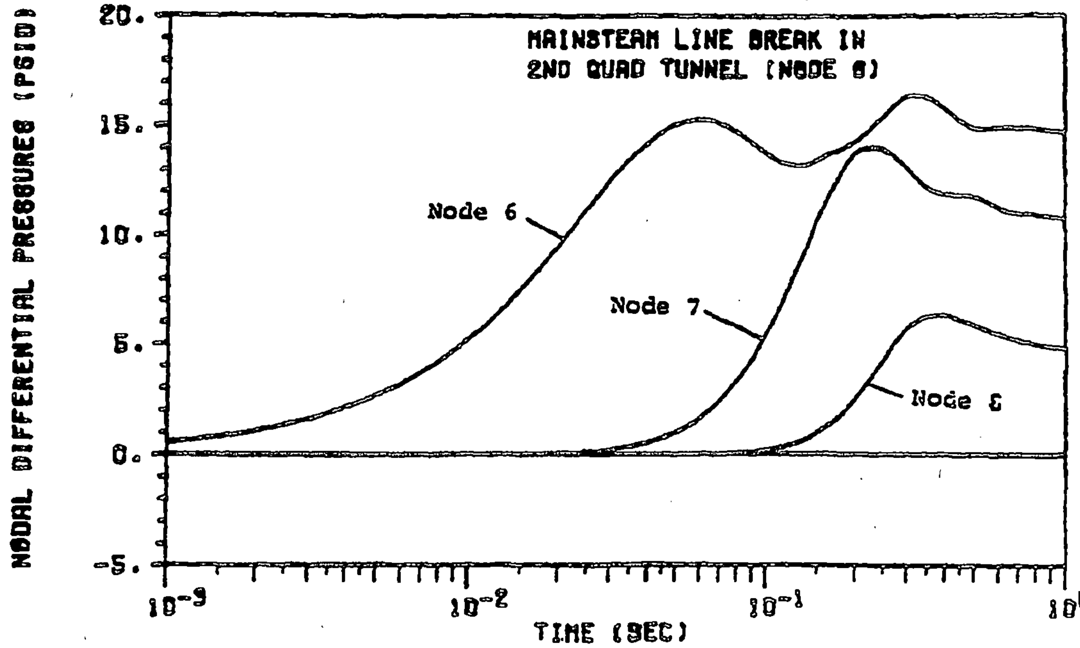
FIGURE C3.6-10 UNIT 2 DIFFERENTIAL PRESSURE VS. TIME FOR NODES 2,3,4 AND 5 (BREAK IN NODE 6)



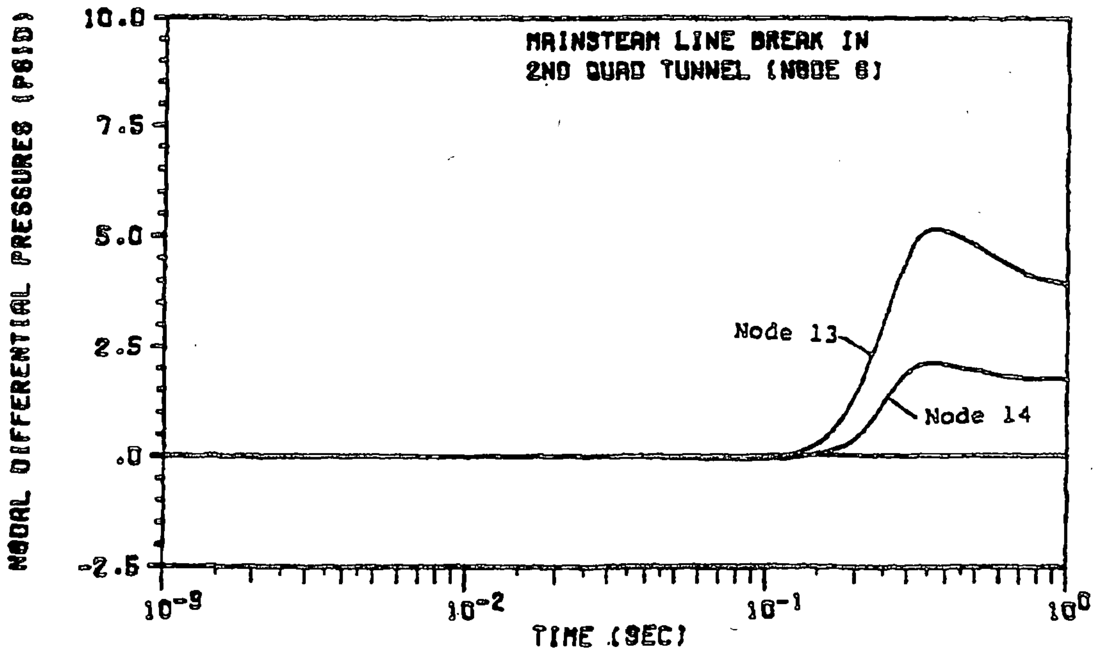


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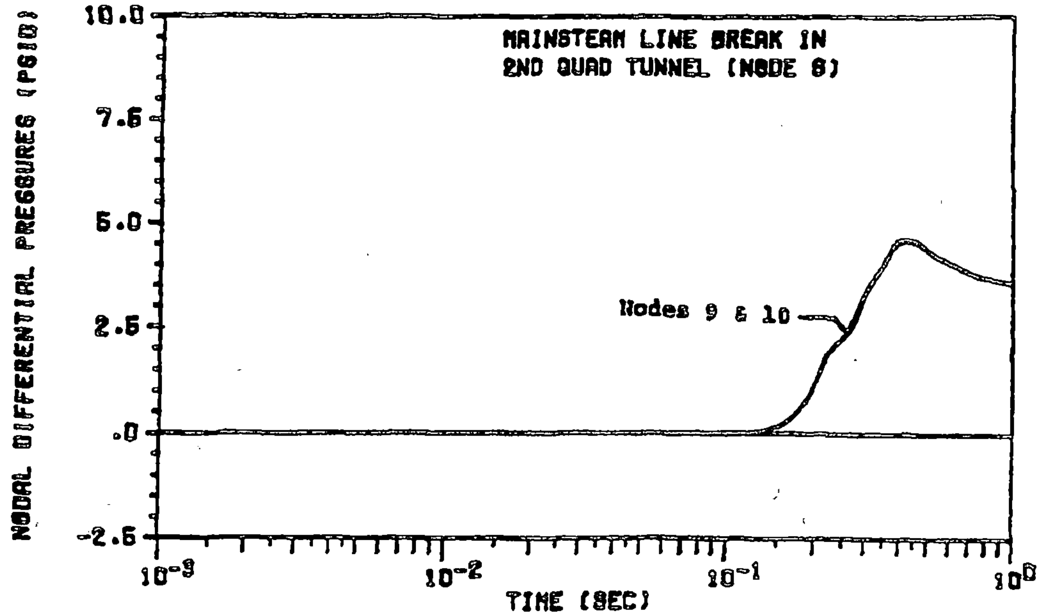
FIGURE C3.6-11 UNIT 2 DIFFERENTIAL PRESSURE VS. TIME FOR NODES 6,7,8,13 AND 14 (BREAK IN NODE 6)



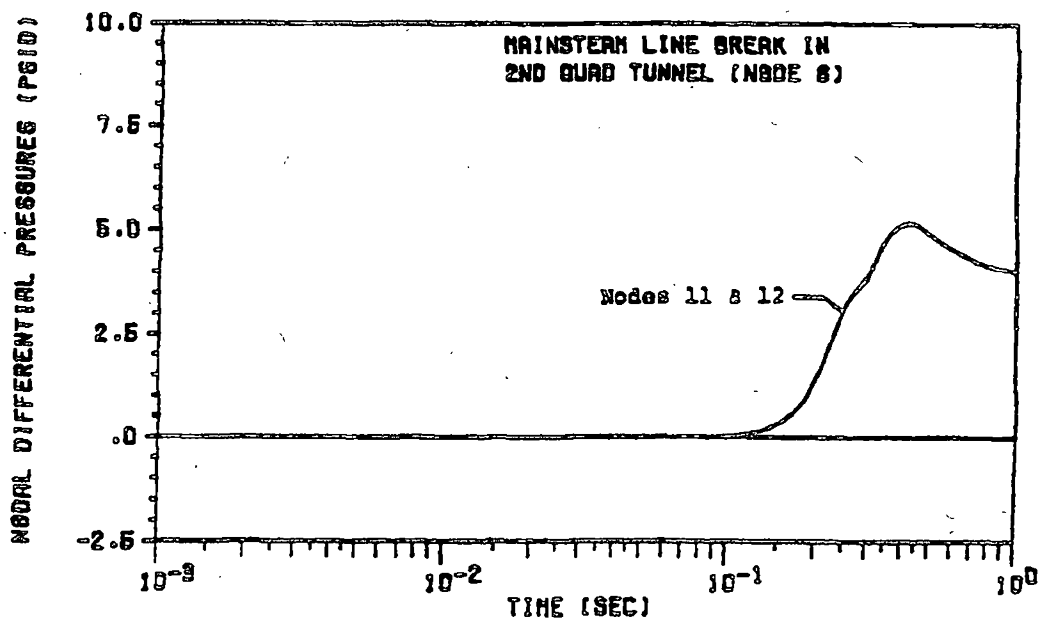


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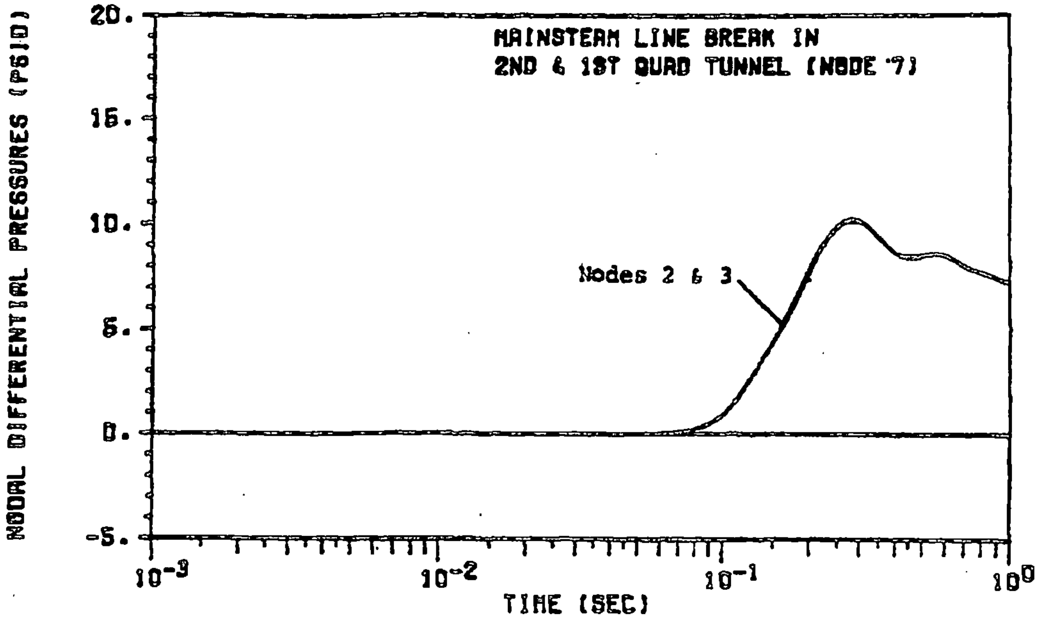
FIGURE C3.6-12
UNIT 2
DIFFERENTIAL PRESSURE VS. TIME
FOR NODES 9,10,11 AND 12
(BREAK IN NODE 6)



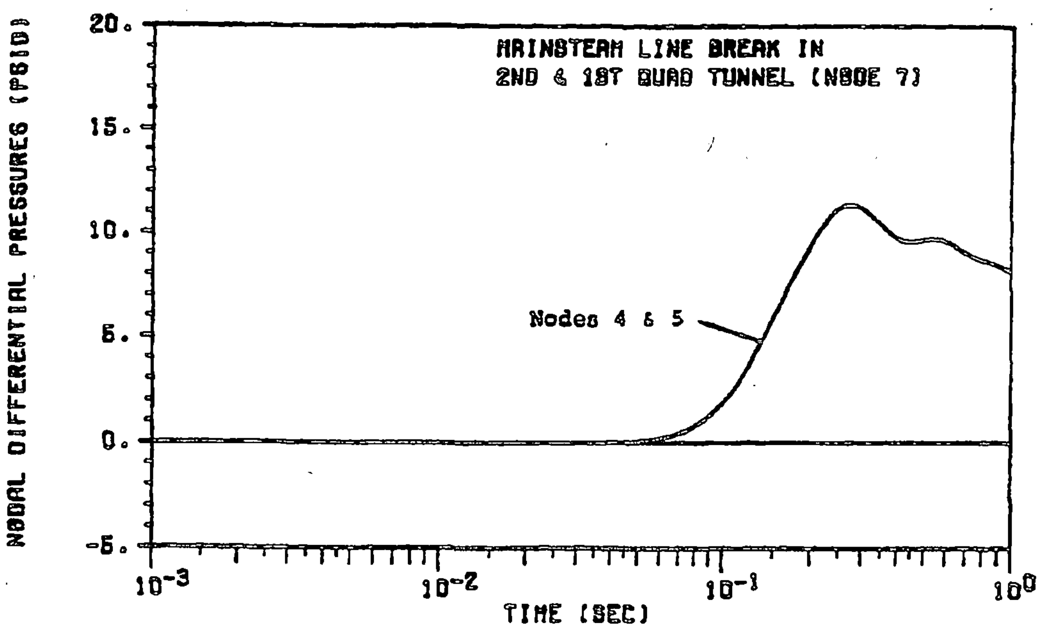


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FIGURE C3.6-13
UNIT 2
DIFFERENTIAL PRESSURE VS. TIME
FOR NODES 2,3,4 AND 5
(BREAK IN NODE 7)

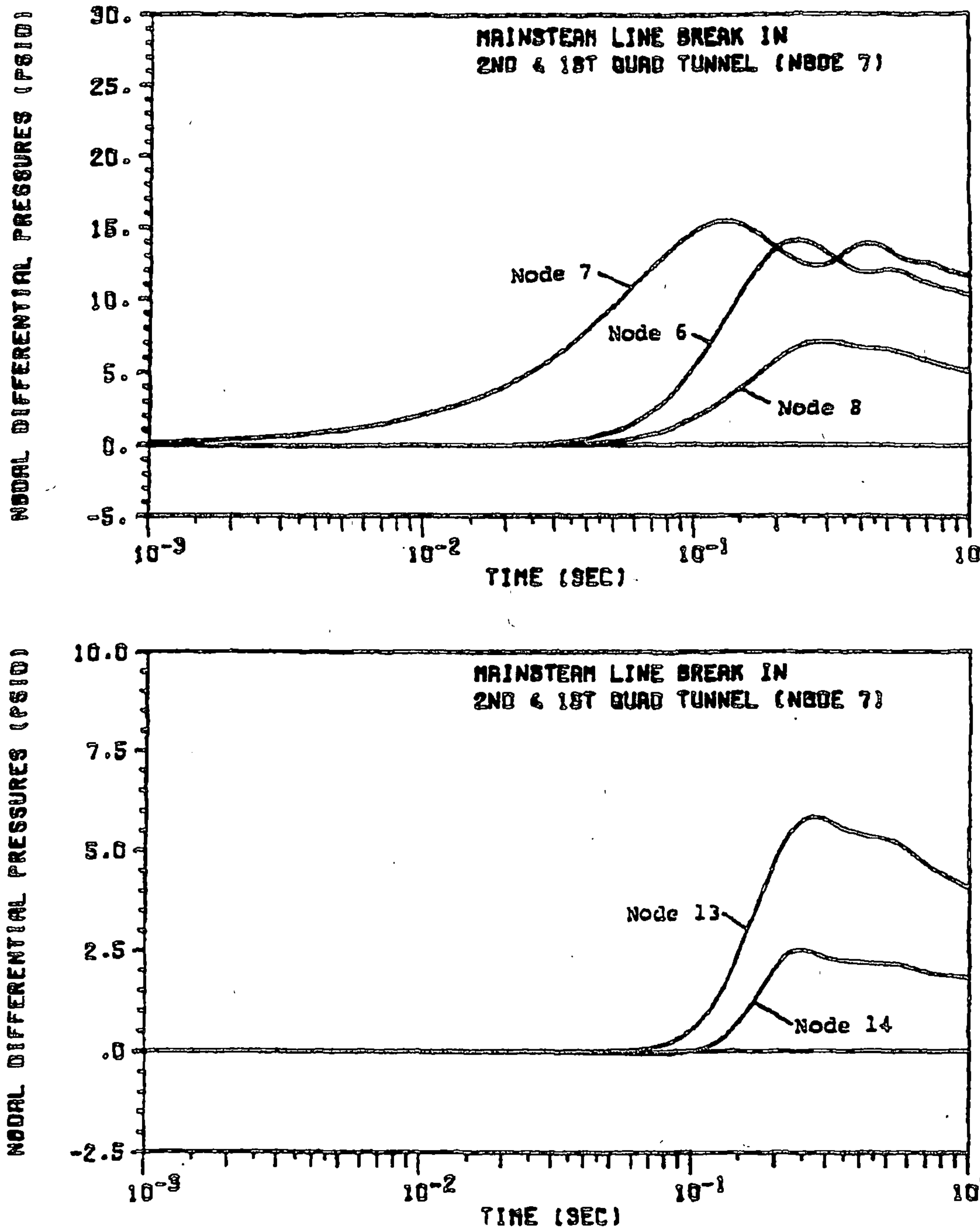

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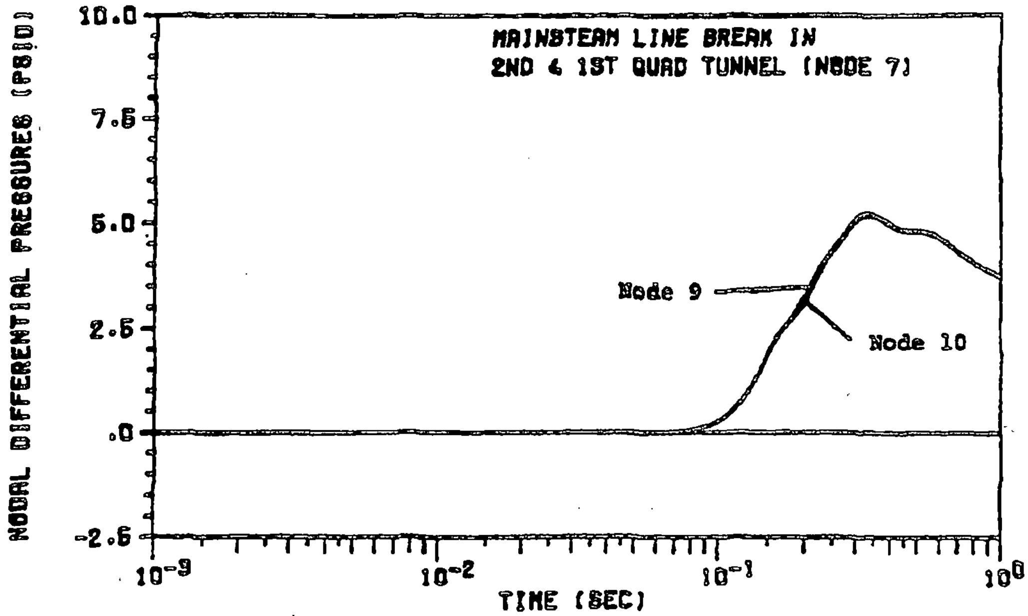
FIGURE C3.6-14 UNIT 2 DIFFERENTIAL PRESSURE VS. TIME FOR NODES 6,7,8,13 AND 14 (BREAK IN NODE 7)



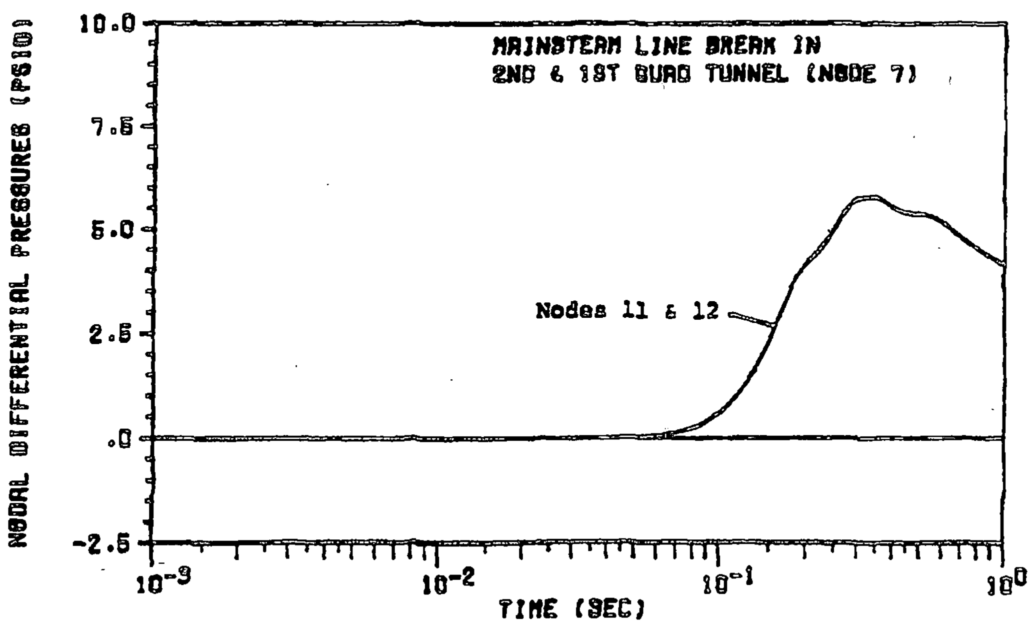


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FIGURE C3.6-15
UNIT 2
DIFFERENTIAL PRESSURE VS. TIME
FOR NODES 9,10,11 AND 12
(BREAK IN NODE 7)

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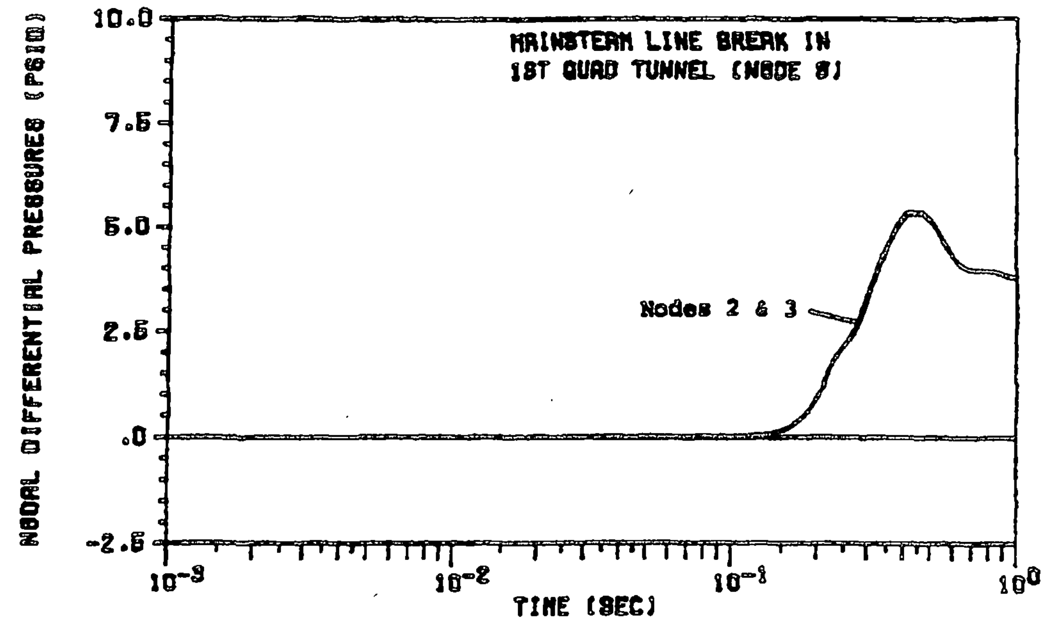

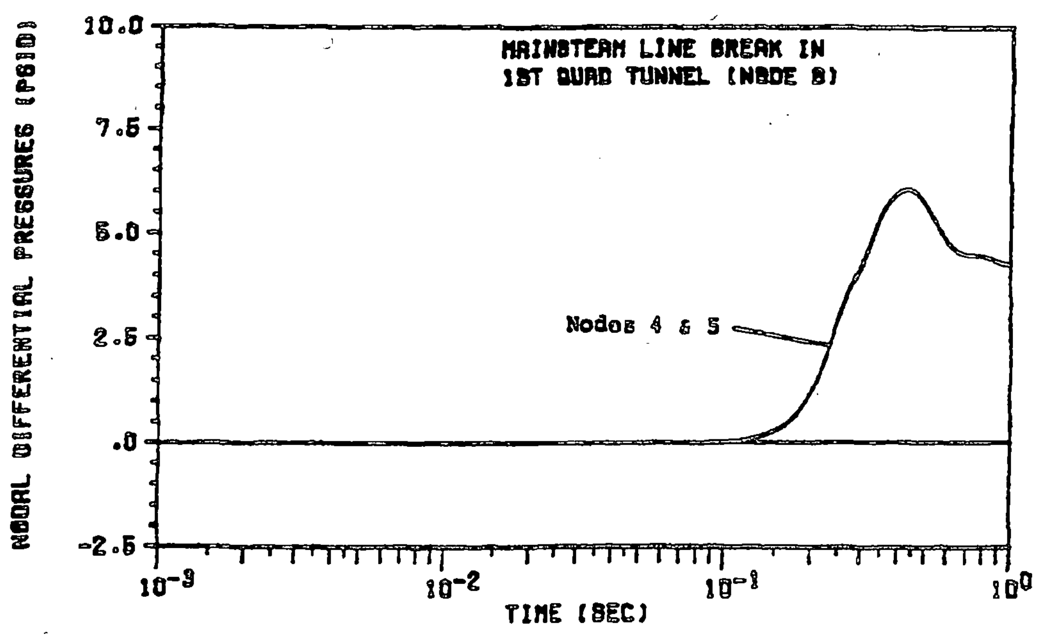

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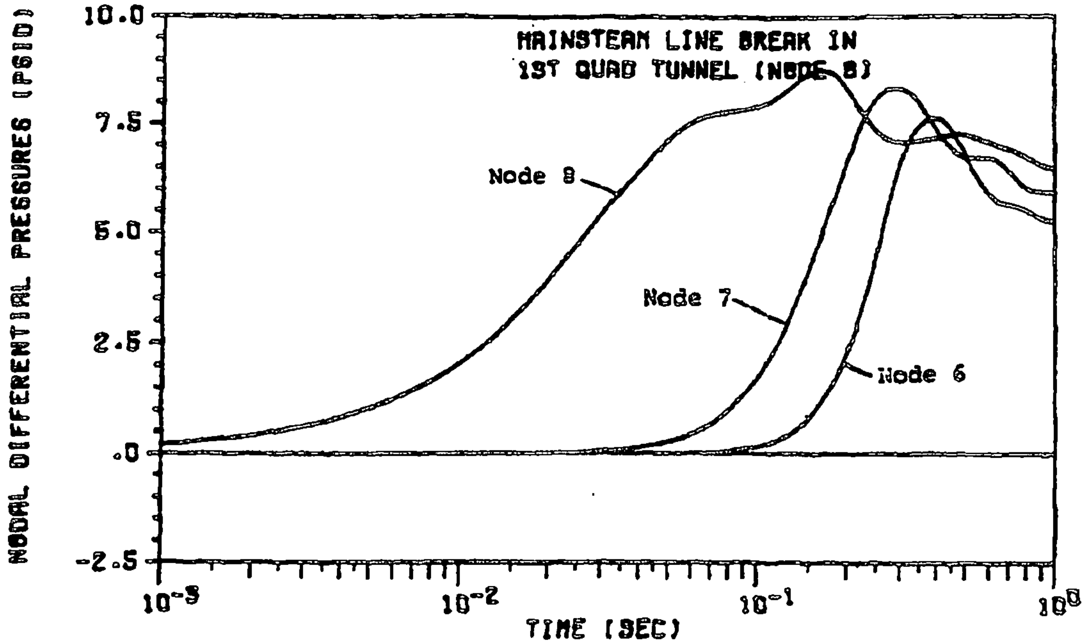
FIGURE C3.6-16

UNIT 2
DIFFERENTIAL PRESSURE VS. TIME
FOR NODES 2,3,4 AND 5
(BREAK IN NODES 8)



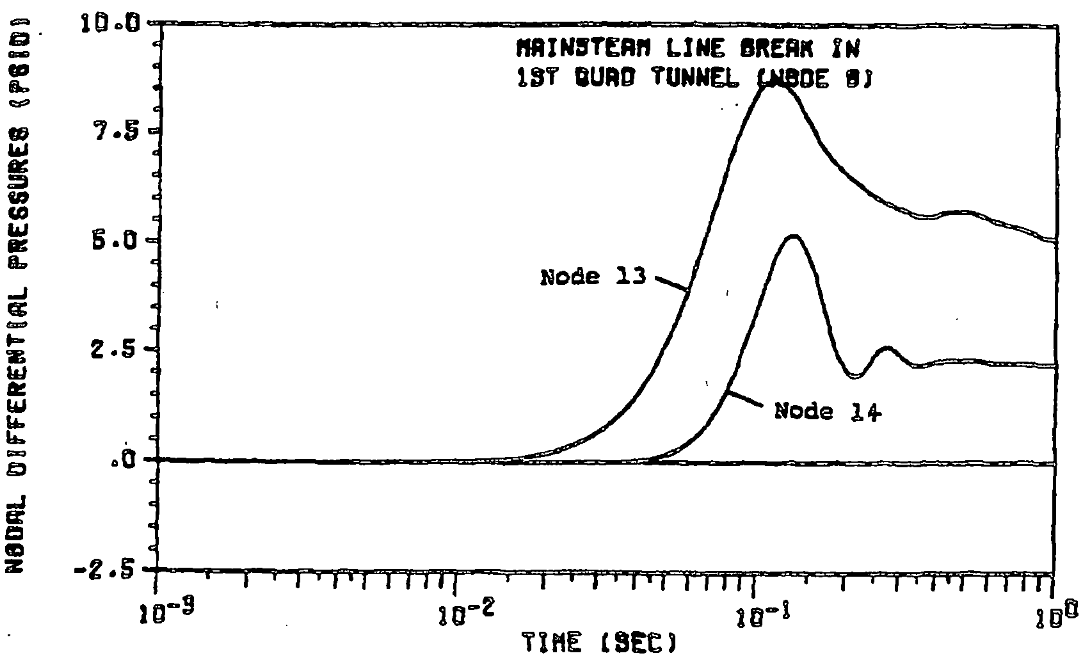


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FIGURE C3.6-17 UNIT 2 DIFFERENTIAL PRESSURE VS. TIME FOR NODES 6,7,8,13 AND 14 (BREAK IN NODE 8)

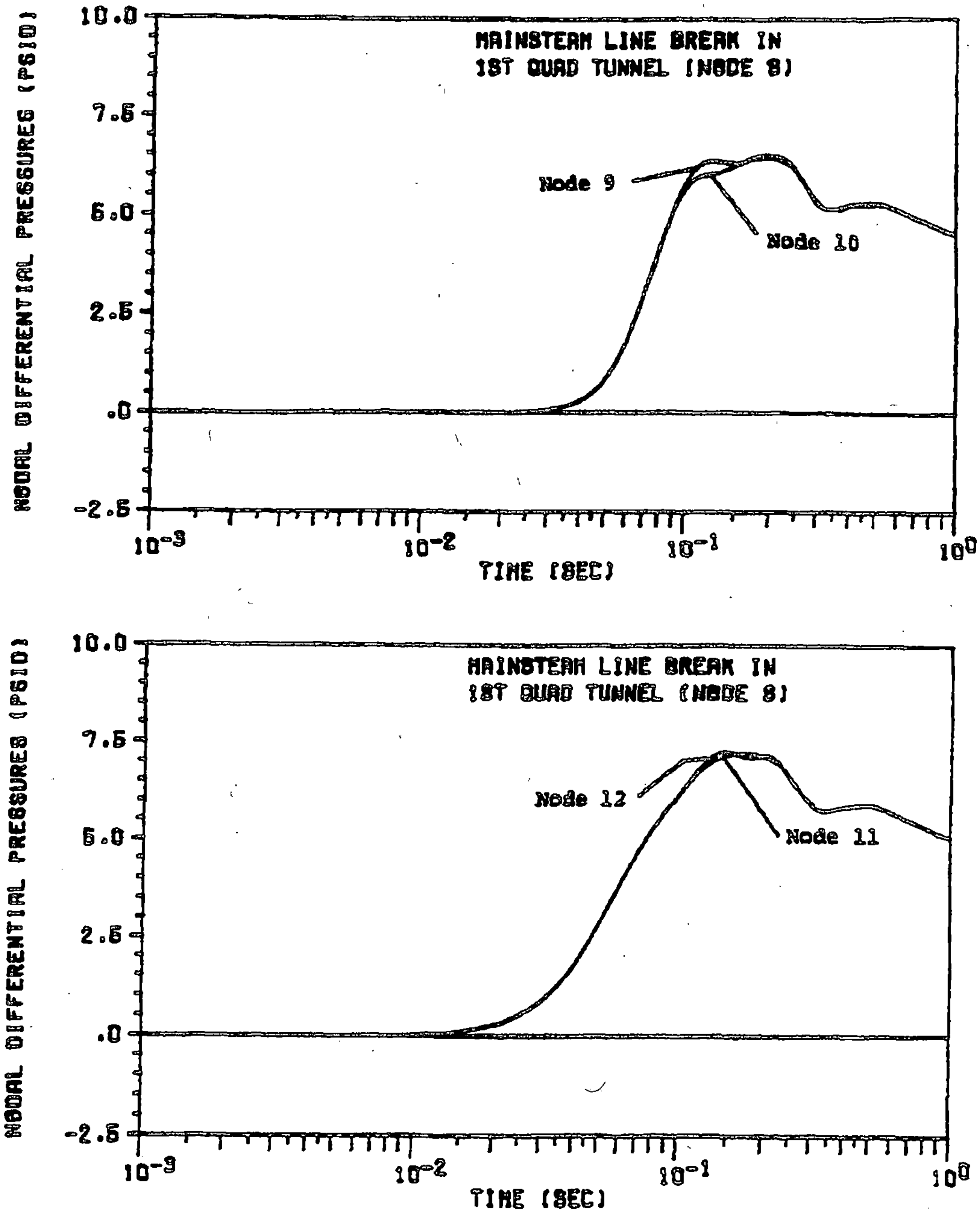

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FIGURE C3.6-18
UNIT 2
DIFFERENTIAL PRESSURE VS. TIME
FOR NODES 9,10,11, AND 12
(BREAK IN NODE 8)