Commonwealth Edison Company
LaSalle Generating Station
2601 North 21st Road
Marseilles, IL 61341-9757
Tel 815-357-6761

ComEd

October 8, 1999

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

LaSalle County Station, Units 1 and 2
Facility Operating License Nos. NPF-11 and NPF-18
NRC Docket Nos. 50-373 and 50-374

Subject: Supplement to a Request for Approval of an Unreviewed Safety Question concerning the assessment of certain safety-related concrete block walls at LaSalle County Station, Units 1 and 2.

References: (1) Letter from J. A. Benjamin (ComEd) to U.S. NRC dated May 5, 1999, "Request for Approval of an Unreviewed Safety Question concerning the assessment of certain safety-related concrete block walls at LaSalle County Station."

(2) Letter from D. M. Skay (U.S. NRC) to O. D. Kingsley (ComEd) dated September 22, 1999, "LaSalle County Station, Units 1 and 2 – Request for Additional Information (TAC Nos. MA4704 and MA4705)."

In Reference 1, Commonwealth Edison (ComEd) Company requested approval of a license amendment to use a different methodology and acceptance criteria for the reassessment of certain masonry walls subjected to transient high energy line break pressurization loads. During the technical branch review of the proposed change the NRC raised some issues for clarification. These were discussed on telephone conference calls on September 2, 1999, and September 8, 1999. Based on the second phone conversation, the NRC issued a Request for Additional Information, (i.e., Reference 2). The attachment to this letter provides our response to those questions.

The no significant hazards consideration, submitted in Reference 1, remains valid for the information attached.

A001

Should you have any questions concerning this letter, please contact Mr. Frank A. Spangenberg, III, Regulatory Assurance Manager, at (815) 357-6761, extension 2383.

Respectfully,

Jeffrey A. Benjamin
Site Vice President
LaSalle County Station

Attachment

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – LaSalle County Station

STATE OF ILLINOIS)

Docket Nos. 50-373
50-374

IN THE MATTER OF)

COMMONWEALTH EDISON COMPANY)

LASALLE COUNTY STATION - UNITS 1 & 2)

AFFIDAVIT

I affirm that the content of this transmittal is true and correct to the best of my knowledge, information and belief.

Jeffrey A. Benjamin
Site Vice President
LaSalle County Station

Subscribed and sworn to before me, a Notary Public in and for the State above named, this 8th day of October, 1999. My Commission expires on October 1, 2000.

Debra J. Feeney
Notary Public

OFFICIAL SEAL
DEBRA J. FEENEY
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES10-1-2000

By Letter from D. M. Skay (USNRC) to O. D. Kingsley (ComEd) dated September 22, 1999, the NRC transmitted 3 questions that require response. The response is required in order to complete the review of the submittal related to a Request for Approval of an unreviewed safety question concerning the assessment of certain safety-related concrete block walls at LaSalle County Station, by letter dated May 5, 1999. This attachment restates the NRC's questions and provides ComEd's response.

Question 1:

1. "During the September 8, 1999, telephone conference, we understand that you made the following statements:

   a. "LaSalle performed dynamic response spectrum analysis for the masonry walls subjected to the dynamic loads resulting from the differential pressures in the VR exhaust plenum masonry walls;

   b. "the loads imposed by the dynamic loads in item 1.a. on the masonry walls were used without reduction in assessing the adequacy of the masonry walls;

   c. "the loads imposed by the masonry walls on the steel columns were initially used without reduction in assessing the adequacy of the steel columns;

   d. "the analysis results indicate that masonry walls were not cracked due to flexural stresses near the middle span, and that the computed flexural stresses in some of the steel columns were greater than the yield stress, but less than the ultimate yield strength; and

   e. "the shear strength in the masonry block was adequate to transfer the load to the steel column.

   "Please indicate whether our understanding as stated above is correct. If not, make the appropriate corrections."

The responses are as follows for each part of question 1:

Question 1 part "a":

a. "LaSalle performed dynamic response spectrum analysis for the masonry walls subjected to the dynamic loads resulting from the differential pressures in the VR exhaust plenum masonry walls;"

Response:

As a clarification, response spectra were generated for the pressure time histories for each of the masonry walls of the VR exhaust plenum. Based on the computed frequency of the walls, a Dynamic Load Factor (DLF) was then determined for the pressure loading using these response spectra. All computed DLFs exceeded 1.0. A design pressure was then calculated by multiplying the peak pressure from the pressure time history by this DLF. This design pressure was then applied to the walls as a static load, and the resulting wall moments and shears were computed. Therefore, part 1.a is true as stated.

Question 1 part "b":

b. "the loads imposed by the dynamic loads in item 1.a. on the masonry walls were used without reduction in assessing the adequacy of the masonry walls;"

Response:

The loads as discussed in part 1.a above were used for the qualification of the masonry. All walls remained elastic under these loadings. No load reductions were included. Therefore, part 1.b is true as stated.

Question 1 part "c":

c. "the loads imposed by the masonry walls on the steel columns were initially used without reduction in assessing the adequacy of the steel columns;"

Response:

The loads discussed in response to part 1.a were used for the initial check of the masonry wall steel support columns. All of the steel wall supports were qualified for these loads except for two members in wall A2-786-13 which exceeded the design allowable values. The steel wall supports (except for the two noted supports of wall A2-786-13) remained elastic under these loadings. No load reductions for these steel support columns were included. Therefore, part 1.c is true as stated.

Question 1 part "d":

d. "the analysis results indicate that masonry walls were not cracked due to flexural stresses near the middle span, and that the computed flexural stresses in some of the steel columns were greater than the yield stress, but less than the ultimate yield strength; and"

Response:

As discussed in part 1.b, the masonry walls remain elastic for the applied loads. Masonry walls do not crack due to flexural stresses at mid-span, or due to shear stresses at the support columns. The steel wall supports (except for the two noted supports for wall A2-786-13) were qualified elastically. Two supports of wall A2-786-13 exceed the design allowable values, and were qualified considering elasto-plastic behavior. All wall support members are ASTM A36 steel. The stresses in the two members that behave elasto-plastically remain less than the ultimate strength of the A36 steel from which they are fabricated. Therefore, part 1.d is true as stated.

Question 1 part "e":

e. "the shear strength in the masonry block was adequate to transfer the load to the steel column."

Response:

Conservatively, only the area of the masonry block has been considered to resist the shear at the support columns. Calculations have shown that the resulting shear stresses in the masonry at the support columns are less than the masonry allowable shear stress as shown in response to question 2.e. The walls adjacent to each column are grout filled, and horizontal truss reinforcement has been provided at every other course and truss reinforcement is welded to the column. The additional shear resistance from the grout and truss reinforcement has been neglected in the wall qualification. Therefore, part 1.e is true as stated.

Question 2:

2. "We request the following information regarding the initial masonry wall analysis as stated in
item 1, above:

   a. "the magnitude of the maximum flexural stress in a masonry wall, the maximum span of that wall, and the particular load combination on page 9 of Attachment F in your May 5, 1999, submittal which produced that stress;

   b. "the size of the masonry block and the value of the section modulus of the block;

   c. "the magnitude of the maximum flexural stress in a steel column, the size and length of that column, and the tributary length of the wall that was supported by the column;

   d. "a sketch that details the typical connection between the masonry blocks and the steel column, including the horizontal truss reinforcement;

   e. "the magnitude of the maximum shear force or stress in the masonry block at the connection and the shear strength assumed for the block; and

   f. "the value of the modulus of rupture for the masonry block of Clinton Station test data that was used for LaSalle."

The responses are as follows for each part of question 2:

Question 2 part "a":

a. "the magnitude of the maximum flexural stress in a masonry wall, the maximum span of that wall, and the particular load combination on page 9 of Attachment F in your May 5, 1999, submittal which produced that stress;"

Response:

The flexural stresses, wall spans and governing load combination for the wall sections reported in Attachment F, Section G, of our submittal are as follows:

Wall Number	Flexural Masonry Wall Stress	Span	Governing Load Case
A2-786-12	51 psi	6.0'	$D + L + [(E_{SS})^2 + (P_{HELB})^2]^{1/2}$
A2-786-13	89.6 psi	5.92'	$D + L + [(E_{SS})^2 + (P_{HELB})^2]^{1/2}$
A2-786-20	95 psi	7.25'	$D + L + [(E_{SS})^2 + (P_{HELB})^2]^{1/2}$
A2-796-1	86.7 psi	11.75'	$D + L + [(E_{SS})^2 + (P_{HELB})^2]^{1/2}$
A2-796-2	80.0 psi	6.0'	$D + L + [(E_{SS})^2 + (P_{HELB})^2]^{1/2}$

Question 2 part "b":

b. "the size of the masonry block and the value of the section modulus of the block;"

Response:

The subject walls are constructed from hollow masonry block per ASTM C90, Type I, Grade N-1. The walls are 12" thick, constructed from block 12" deep, 8" tall and 16" long (nominal dimensions). The section modulus of the block for horizontal spans is 159.9 in^3/ft.

Question 2 part "c":

c. "the magnitude of the maximum flexural stress in a steel column, the size and length of that column, and the tributary length of the wall that was supported by the column;"

Response:

The stresses for two of the wall supports for wall A2-786-13 were qualified using the elasto-plastic methodology. The members are ASTM A36 steel. The W8x31 spans approximately 25', and supports a tributary wall width of approximately 5.7', in addition to reactions from secondary members framing into this column. The W8x24 spans approximately 19.5', and supports a tributary wall width of approximately 9.75'. The flexural stresses computed for the elastic and the elasto-plastic cases are summarized below:

Member size	Computed Flexural Stress Considering Elastic Behavior	Computed Flexural Stress Considering Elasto-Plastic Behavior
W8x31	50.90 ksi	33.28 ksi
W8x24	54.13 ksi	35.39 ksi

Question 2 part "d":

d. a sketch that details the typical connection between the masonry blocks and the steel column, including the horizontal truss reinforcement;

Response:

A sketch of the typical connection between masonry blocks and a steel column (including horizontal truss reinforcement) is given in Figure 1 (Attachment B).

Question 2 part "e":

e. the magnitude of the maximum shear force or stress in the masonry block at the connection and the shear strength assumed for the block; and

Response:

The shear strength for the horizontally spanning walls is 2052 lbs/ft based on an allowable shear stress of 57 psi (i.e. the NCMA allowable increased by a 1.67 factor, which is the current licensing basis). The magnitude of the maximum computed shear force at the supports for the subject walls is given below:

Wall Number	Maximum Shear Force
A2-786-12	437.2 lbs/ft
A2-786-13	585.2 lbs/ft
A2-786-20	892.6 lbs/ft
A2-796-1	367.1 lbs/ft
A2-796-2	670.9 lbs/ft

As seen above, the wall's shear strength exceeds the maximum computed shear force in all cases.

Question 2 part "f":

f. the value of the modulus of rupture for the masonry block of Clinton Station test data that was used for LaSalle.

Response:

The value for the modulus of rupture used of horizontally spanning walls is 250 psi, and 125 psi fcr vertically spanning walls. These values were based on the Clinton Station test data (Reference: Letter from C. W. Schroeder (Commonwealth Edison) to A. Schwencer (NRC, NRR), dated April 19, 1983).

Question 3:

3. In Attachment G, Table O4.6, you tabulated mass and energy releases, which are used for the transient high energy line break pressurization analysis. Please provide additional information that was used for the calculation of the forward steam, reverse steam, liquid, and reverse liquid values in the table. The information should include initial conditions, assumptions, break sizes, flow models, basis for the flow stop times (such as isolation valve closure times), and the basis for the flow starting time when it is not zero.

Response:

The mass and energy release due to a full guillotine rupture of one Main Steam Line (MSLB) which causes the rupture of one feedwater line is determined in Calculation 3C7-0275-001 Rev. 2. The approach used in that design basis calculation is discussed below.

General Outline:

Following a MSLB, the following events occur:

- Main Steam Line Guillotine Rupture Forward Flow
  - Forward Flow initially exits at the critical flow rate of pipe initial conditions until all the mass between the break and the flow limiter is depleted. This is modeled as Moody critical flow with a flow area equal to that of the ruptured pipe.
  - Once the mass in the Forward flow pipe is depleted, the flow will exit at the critical flow rate past the flow limiter, until either the MSIV closes to a smaller area than the flow limiter, or the flow regime changes. This is modeled as Moody critical flow with the flow area equal to that of the flow limiter.
  - 1 second after the break, it is assumed that the liquid in the reactor reaches the nozzles to the Main Steam Lines (MSL), at this point the flow regime in the main steam lines change from high quality steam to very low quality saturated water and steam with a quality of 0.07. This is modeled as Moody critical flow for saturated liquids with the flow area equal to that of the flow limiter.
  - The low quality release will decrease based on area ratios from the area of the flow limiter to zero as the MSIV closes. Once the MSIV is closed the release will be assumed to go to 0. The MSIV is assumed to close such that the area decreases linearly with time.

- Main Steam Line Guillotine Rupture Reverse Flow

  - The four main steam lines connect to a header; therefore the broken steam line is connected to the header with three intact steam lines. The dry steam between the flow limiters on the intact steam lines and the break will expel out the broken pipe for a duration long enough to deplete the steam in this section. This flow is traveling forward past the flow limiters of the three intact lines to the header, and then out the reverse direction of the broken pipe. This duration is called "t_d". The critical flow rate is based on Moody's critical flow model and a pipe area equal to the area of the broken main steam line.

  - Dry steam will continue in the reverse direction based on choked flow past the flow limiters until the MSIVs close or the flow regime changes. The combined area of the flow limiters is less than the area of an open main steam line pipe. This will occur for 1 second. However, the slug of two-phase liquid is assumed to follow the dry steam thus, at $1+ t_d$ the two-phase fluid will start exiting the broken pipe. This release is based on the Moody critical flow model with an area equal to three times the area of the flow limiter.

  - Following the dry steam release a two-phase flow release will occur. This is due to the water level in the reactor vessel, which will rise up to the MSL nozzles at an assumed 1 second following the pipe rupture. This two-phase release is based on the Moody critical flow model for saturated liquid past the three flow limiters.

  - The two-phase mass and energy release will go to zero linearly as the MSIVs close. At time $t'_i + 0.5 = t_i$ the valve area, and the flow limiter area will be the same size, where t'_i is the time it takes for a MSIV to close from full open to the point when valve flow area and the flow limiter area are the same size. 0.5 seconds is the time assumed that the detection signal requires following the break event to initiate MSIV closure. The valve will be assumed to close linearly between $(t_d + t_i)$ and $(t_c + t_d + 0.5)$. Where t_i is the time when the MSIV flow area is equal to the flow area of the flow limiter, and t_c is the time for the MSIV to close completely.

- Feedwater Forward Flow Mass and Energy Release

  - The Forward feedwater line break is based on the maximum Moody flow rate for saturated liquids, which has been fitted to a function of pressure for a wide range of pressures, and is presented in ANSI N176, Draft 4, May 1975. This flow is assumed to go for an infinite duration at the critical flow rate based on the initial conditions of the feedwater line. This is conservative, as these conditions exceed the runout velocity of the pump.

- Feedwater Reverse Flow Mass and Energy Release
  - The Reverse feedwater line break is based on the maximum Moody flow rate for saturated liquids, and is the same in magnitude as the forward flow. However, the reverse flow is terminated once all the mass between the down stream check valve and the break is depleted. The time of depletion is 1.2 seconds for the break location postulated in this analysis.

Initial Conditions for the Blowdown Immediately Following the Break:

	Temperature	Presssure	Quality
Main Steam Line	550 °F	1050 psia	Saturated Vapor
Feedwater	420 °F	308.5 psia	Saturated Liquid

Assumptions:

1. 1 second after the break the water level in the reactor rises such that the MSL nozzles receive 0.07 quality saturated water.
2. The MSIV area is assumed to decrease linearly as a function of time (i.e., flow area is a linear function of time).

Break Sizes and Flow Models:

	Break Sizes	Flow Models
Feedwater	2.337 ft^2 Inside Area	Moody Correlation (Saturated Liquid)
Main Steam	3.16 ft^2 Inside Area	Moody Critical Flow (Saturated Steam & Liquid)

Break Times:

This is discussed above, and in detail on the following pages.

A clarification to table 04.6 (Reference 1, Attachment G) has been included on the last page of this attachment.

Figure A-1 General Vicinity of the MSL Break

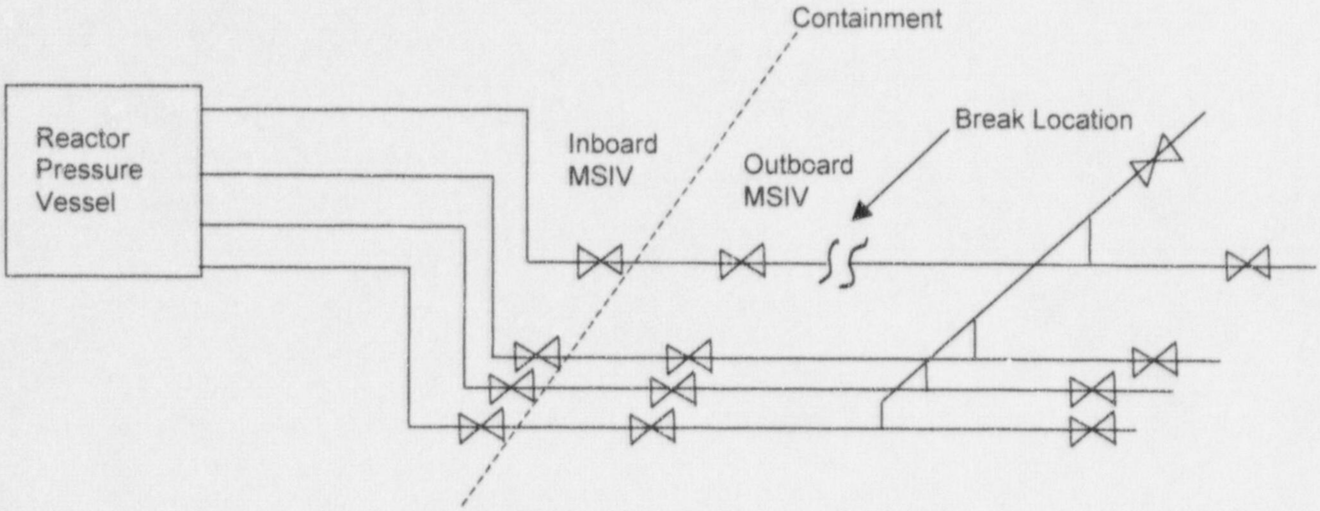
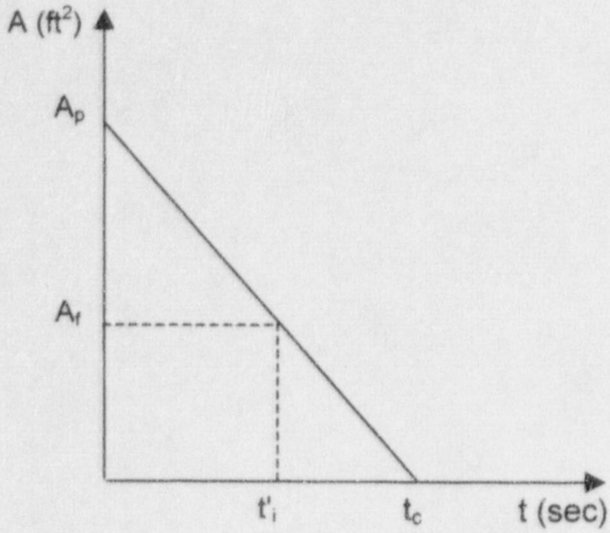


Figure A-1 shows the piping configuration inside the Main Steam Tunnel (MST). The MSIV valves require 5 seconds to close following reciept of the break detection signal. It is assumed that the detection signal requires 0.5 seconds following the break event. Therefore the total isolation time following the break event for the MSIV is 5.5 seconds. There is a flow limiter up stream of the inboard MSIV, however for simplicity the flow limiter and the inboard MSIV are assumed to be in the same location.

The MSIVs will start to close following detection of a break. It is assumed that the flow area through the valve changes linearly as a function of time. However the area through the flow limiter is less than the valve area, therefore the critical flow rate will be controlled by the flow limiter until the valve area due to closing is less than the area of the flow limiter. These values are calculated and can be seen with the following diagram and equation, where A_p is the free flow area of the main steam line, A_f is the free flow area of the flow limiter, and t'_i and t_c were previously defined as the time at which the MSIV open area equals the flow limiter open area, and the time at which the MSIV is completely closed respectively.



$$t_i' = t_c\left(1 - \frac{A_f}{A_p}\right) = 3.6\,\text{sec}$$

However 0.5 seconds is added to both t'_i and t_c to account for the amount of time that it will take for the system to detect that the pipe is broken therefore, t_i = 3.6+0.5= 4.1 seconds, and t_c = 5.0 + 0.5 = 5.5 seconds.

Note: A_f = 0.885 ft^2, and A_p = 3.16 ft^2 for the Main Steam Line, and A_p = 2.337 ft^2 for the Feedwater line.

It is assumed that the liquid in the Reactor Pressure Vessel reaches the MSL nozzle in 1 second. The pressure in the MS Lines is assumed constant and equal to 1050 psia which corresponds to a temperature of 550.7 °F, Hence h_f = 550.0 Btu/lb$_m$ and h_g = 1190.0 Btu/lb$_m$.

<u>0 – 1 second</u>

During the first second there is dry steam coming out of the reactor pressure vessel nozzles. The limiting area is the area of the flow limiter A_f. The maximum mass velocity is calculated using moody's model for choked flow. For p = 1050 psia and h_g = 1190 Btu/lb$_m$, the Moody critical flux (G) is G = 2100 lb$_m$/ft^{2}sec. Where G is based on the fluid pressure and enthalpy.

Hence dry steam = 2100 * A_f = 1858.5 lb$_m$/sec

$(1 - t_i)$ seconds

Wet steam of 7% quality flows through the flow limiter and MSIV. The enthalpy of the steam is:

$h = x * h_g + (1\text{-}x) * h_f = 0.07 * 1190.0 + (1\text{-}0.07) * 550.0 = 594.8$ Btu/lb$_m$.

Hence, G = 7000 lb$_m$ /sec-ft^2

Therefore, dry steam = (7/100) * 7000 * A_f = 490 * A_f = 433.65 lb$_m$/sec
Liquid = (93/100) * 7000 * A_f = 6510 * A_f = 5761.35 lb$_m$/sec

$t_i - (t_c + 0.5)$

dry steam = 490 * A_f = 433.65 lb$_m$/sec to zero linearly

liquid = 6510 * A_f = 5761.35 lb$_m$/sec to zero linearly

Downstream Side of the Break

There are two phenomena, first choked flow out of the broken pipe until all the down stream mass is removed back to the other MSIVs. Once that mass is removed, the three flow limiters on the non-broken lines compose the critical flow area (minimum area for flow). It will be assumed that it takes 1 second for the reactor water level to reach the MSL nozzles, this is the same assumption that is used in the forward flow analysis. After 1 second the flow will be very low quality staturated steam and liquid. This will occur until the MSIVs are closed. Once the MSIVs start to close, the flow past the MSIVs will start to decrease linearly. However, when flow conditions at the MSIV change, there will be a delay time before the change is seen at the break location. This delay time is defined as the critical flow rate (volumetric flow) of the initial steam divided by the volume of the pipe between the break and the MSIVs. This can be easily visualized by thinking about an observer at one of the MSIVs, called observer A, and an observer at the break location called observer B. Observer A will see the following:

Observer A

0-1 second

One second of dry steam limited by the flow limiters with flow area $3 * A_f$. Hence, Dry steam $=3 * 2100 A_f = 3 * 1858.9$ lb_m/sec = 5575.5 lb_m/sec. There are three lines.

$1 - t_l$ seconds

Two-Phase flow

dry steam $= 3 * (7/100) * 7000 * A_f = 3 * 490 * A_f = 1470 * A_f = 1301$ lb_m/sec

Liquid $= 3 * (93/100) * 7000 * A_f = 3 * 6510 * A_f = 19530 * A_f =$ 17264.05 lb_m/sec

$t_l - (t_c + 0.5)$ seconds

dry steam $= 1470 * A_f = 1301$ lb_m/sec to zero linearly

liquid $= 19530 * A_f = 17284.05$ lb_m/sec to zero linearly

Therefore, the observer at the break location, observer B, will see the flow rates with a delay.

Observer B

$0 - t_d$ seconds

dry steam $= 2100 * A_p = 6636$ lb_m/sec.

$t_d - (1 + t_d)$ second

One second of dry steam limited by the flow limiters with flow area $3 * A_f$. Hence, Dry steam $= 3 * 2100 A_f = 3 * 1858.5$ lb_m/sec = 5575.5 lb_m/sec. There are three lines.

<u>$(1 + t_d) - (t_i + t_d)$ seconds</u>

Two-Phase flow:

dry steam = 3 * (7/100) * 7000 * A_f =3 * [illegible]A_f = 1470 * A_f lb_m/sec = 1301 lb_m/sec

Liquid = 3 * (93/100) * 7000 * A_f = 3 * 6[illegible] [illegible]9530 * A_f lb_m/sec = 17284.05 lb_m/sec

<u>$(t_i - t_d) - (t_d + t_c + 0.5)$ seconds</u>

dry steam = 1470 * A_f lb_m/sec = 1301 lb_m/sec to zero linearly

liquid = 19530 * A_f lb_m/sec = 17284.05 lb_m/sec to zero linearly

The following Table summarizes the Main Steam Line Break mass and energy release that was originally presented in Table O4.6 of Reference 1, Attachment G.

<table>
<tr><th>Time</th><th>Vapor Upstream</th><th>Vapor Downstream</th><th>Liquid Upstream</th><th>Liquid Downstream</th></tr>
<tr><td>0 – 0.11</td><td>6636</td><td>6636</td><td>0</td><td>0</td></tr>
<tr><td>0.11 – 1.11</td><td>1858.5</td><td>6636</td><td>0</td><td>0</td></tr>
<tr><td>1.11 – 1.33</td><td>433.65</td><td>6636</td><td>5761.35</td><td>0</td></tr>
<tr><td>1.33 – 2.33</td><td>433.65</td><td>5575.5</td><td>5761.35</td><td>0</td></tr>
<tr><td>2.33 – 4.21</td><td>433.65</td><td>1301</td><td>5761.35</td><td>17284.05</td></tr>
<tr><td>4.21 – 5.43</td><td rowspan="2">433.65 to zero linearly</td><td>1301</td><td rowspan="2">5761.35 to zero linearly</td><td>17284.05</td></tr>
<tr><td>5.43 – 5.61</td><td rowspan="2">1301 to zero linearly</td><td rowspan="2">17284.05 to zero linearly</td></tr>
<tr><td>5.61 – 6.83</td><td>0</td><td>0</td></tr>
</table>

For the Feedwater the mass and energy release is based on the temperature pressure and area.

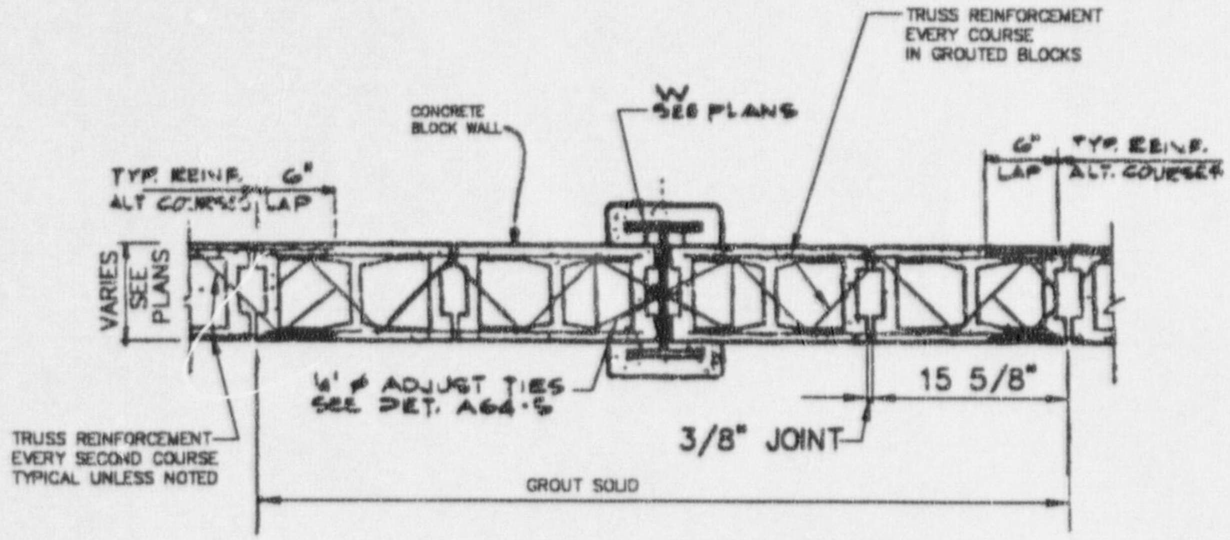
$W_B = A_p * 250 * (p)^{1/2} = 2.337 * 250 * (308.5)^{1/2} = 10262$ lb_m/sec, For each pipe.

Therefore, this value will be applied to both the forward and the reverse feedwater piping. However the reverse feedwater will only last until the liquid up to the first check valve is depleted. The depletion time is 1.2 seconds. Therefore the feedwater break is:

Feedwater Reverse Liquid 10262 lb_m/sec for 1.2 seconds then zero.

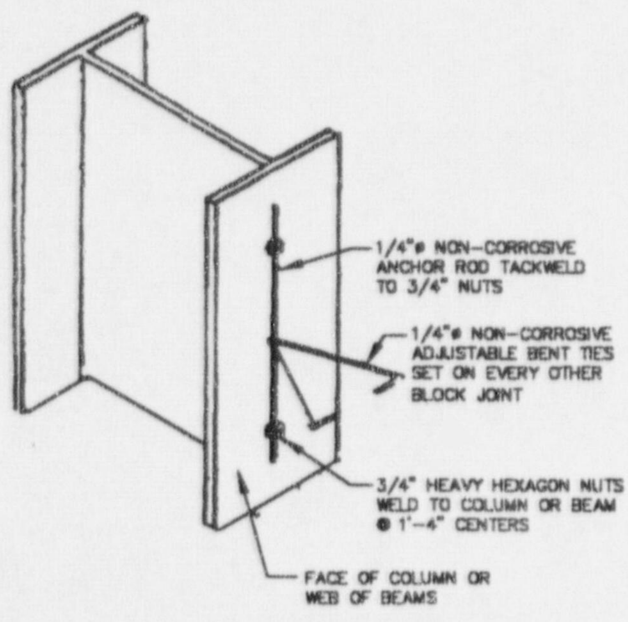
Feedwater Forward Liquid 10262 lb_m/sec for infinite duration.

ATTACHMENT B



TYPICAL WALL SECTION

NOTE: HORIZONTAL TRUSS REINFORCEMENT SHALL BE GALVANIZED 3/16" SIDE RODS AND # 9 CROSS TIES



DETAIL A64-5

FIGURE 1 - TYPICAL MASONRY WALL INTERIOR COLUMN DETAIL

(REFERENCE DWG. NOS. A-64 & A-65)