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ComEd

March 1, 1996

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Subject: LaSalle County Nuclear Power Station Units 1 and 2
ComEd Response to NRC Staff Request for Additional Information (RAI)
Regarding Modifying the Main Steamline Tunnel Automatic Isolations
NRC Docket Nos. 50-373 and 50-374

References: (a) G. Benes letter to U. S. NRC, dated January 18, 1996, LaSalle Submittal Regarding Main Steamline Tunnel Leak Detection Isolations

(b) M. Lynch letter to D. Farrar, dated February 22, 1996, NRC Request for Additional Information Related to Modifying the Main Steamline Tunnel Automatic Isolation Temperature - Generated Signals for the LaSalle County Station, Units 1 and 2

The purpose of this letter is to respond to the NRC staff's RAI regarding the Reference (a) submittal involving LaSalle Station's Modifying the Main Steamline Tunnel Automatic Isolations. Reference (a) provided LaSalle Station's proposal for revising the Technical Specification requirements for the Main Steamline Tunnel Automatic Isolations. The NRC staff requested additional information in Reference (b) to support the review of LaSalle's submittal. ComEd's responses to the RAI are provided as an attachment to this letter. The original Significant Hazards Consideration, that was included in the Reference (a) submittal, remains valid.

Calculation Documents BSA-L-95-05, BSA-L-96-03, BSA-L-96-06, and BSA-L-96-07 are among the calculations included with this submittal. On page iii of these documents is a "Release of Information Statement". This "Release of Information Statement" does not imply that these calculation documents are proprietary, since there is no proprietary information contained within the documents. In summary, Calculation Documents BSA-L-95-05, BSA-L-96-03, BSA-L-96-06, and BSA-L-96-07 are nonproprietary and do not need to be withheld from public disclosure pursuant to 10 CFR 2.790.

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If there are any further questions, please contact this office.

Sincerely,

Gary G Benes

Gary G. Benes
Nuclear Licensing Administrator

Attachments

cc: H. J. Miller, Regional Administrator - RIII
M. D. Lynch, Project Manager - NRR
P. G. Brochman, Senior Resident Inspector - LaSalle
Office of Nuclear Facility Safety - IDNS

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Response to the RAI on MST T and ΔT

Question 1

Provide a summary of the GOTHIC calculations, including the results for normal operating conditions in the main steamline tunnel (MST) which verify the analytical methods used to determine the differential temperature high-setpoint. Specifically, provide the conditions and the analytical assumptions shown on page G-3 of your submittal dated January 18, 1996.

Response 1

Calculation report BSA-L-95-05 Rev 0 (attached) documents the calculations performed to determine the main steam tunnel temperature response due to steam leakage with ventilation system in operation. The calculation uses a GOTHIC system model to determine the MST temperature due to a variety of leak rates and supply air temperatures. Section 2 of this Calculation report describes the tunnel configuration, the transient due to a steam leak, the analytical model, the computer code, and the input parameters and assumptions used in the analysis. Section 3 provides the benchmark results of the calculations performed to verify the validity of the analytical model. Section 4 presents the calculated temperature responses. Figures 1 through 6 of the report are reproduced here for this response.

A sketch of the existing MST configuration is shown in Figure 1. In the analysis, the MST is subdivided into three areas denoted as the lower, middle and upper MST. The lower and upper MST extend from Elevation 687 to 706 ft and from Elevation 736 ft 7 in to 768 ft 4.5 in, respectively. The middle MST consists of the vertical section of the tunnel between Elevation 706 ft and 736 ft 7 in. The analysis is based on a proposed configuration without the exhaust flow path at B (see Figure 1A).

The temperature of the MST is maintained by the reactor building ventilation (VR) system. Two streams of VR air enter the MST at different elevations and exit the tunnel via an exhaust riser located at the top of the MST.

The VR supply air originates from outside the plant and enters the MST after passing through various areas in the reactor building. Hence, the MST inlet air temperature is dependent on the outdoor air temperature. Two different inlet air temperature values, 65 and 110°F, are used to bound the conditions expected year-round. Another temperature value, 95°F, is used which represents a typical condition expected during a moderately hot summer day. The basis for the upper bound temperature of 110°F is that the MST inlet temperature reached a maximum of approximately 101°F on July 13, 1995. On this date, the highest temperature of 101 °F was recorded last Summer at the meteorological tower at the 33 ft elevation. Also the 1% ASHRAE value for the LaSalle/Peru IL area is 93°F. Therefore, using the 110°F is appropriate. The basis for the lower bound temperature of 65 °F is the temperature control range of the Station Heat (SH) coils and the electric heating coils. The SH control range is 76 to 80°F and the electric coil range is 70 to 78°F.

The air flow through the MST is induced by the VR system exhaust fans. The MST exhaust flow is assumed to be at a constant volumetric flow rate. The flow rates used in the analysis (as shown on page G-3 of the submittal) are:

Upper MST inlet air flow	24,000 cfm
Lower MST inlet air flow	40,000 cfm
MST exhaust air flow	64,000 cfm

The MST inlet flow rates are actual flows measured on both units. The exhaust flow is the sum of the two supply flows. Mass flow rates calculated from these volumetric flow rates are used to account for density variations.

Because the air flow into the MST is induced by the VR exhaust fans, the inlet flow is reduced by the presence of steam. The reduced inlet flow phenomenon may affect the temperature indication from a sensor located in the MST inlet. As the inlet flow reduces to zero due to increased leakage flow, the temperature indicated will be that of the MST instead of the inlet flow. The analysis takes into account the effects of reduced flow phenomenon as follows:

a. As described on page G-3 of the submittal, analyses were performed by assuming only the lower MST inlet flow is reduced. With no reduction in upper MST inlet flow, a conservative upper MST temperature was calculated for leaks in the lower MST. These results form the bases for the analytical values for setpoint determination.

b. Additional analyses were performed that confirmed the bases are bounding by allowing both the upper and lower MST inlet flows to vary according to the thermodynamic conditions in the MST. These analyses consider steam leaks in both upper and lower MST.

The temperature response of the MST due to steam leakage is calculated by considering the mass and energy balances for the MST. A schematic of these quantities is shown in Figure 2. A GOTHIC system model is constructed based on this schematic. Because the basis for establishing a leak detection setpoint is the lowest temperature rise in the MST associated with a postulated leak, the input assumptions and parameters are chosen conservatively to yield a low estimate of the temperature rise due to steam leakage.

The validity of the analytical model is established by comparing the GOTHIC model results with plant measured data. Figure 3 shows the results of the calculated upper MST temperature during normal operation at different MST inlet temperatures. The plant measured data taken in the period from October 8, 1995 to November 20, 1995 are also plotted in the same Figure for comparison. The plot shows very good agreement between the calculated results and plant data.

The analysis assumes continuous steam leakage from cracks in the main steam line. The cracks are postulated to occur at any location along the full length of the steamline inside the MST. For optimum leak detection purposes, the outlet temperature sensors are located in the exhaust riser in the upper MST and are capable of detecting leaks that occur anywhere in the MST. For a given leak rate, the temperature rise is greatest near the vicinity of the crack and decreases as the distance between the crack and the location of interest increases. The basis for the leak detection setpoint for a sensor located in the upper MST is leakage from a crack located in the lower MST near the area where the steam lines exit the tunnel. Thus, only a leak in the lower MST is needed for the purpose of establishing a leak detection setpoint. However, upper MST leaks are also considered to confirm that the lower MST leak location is bounding.

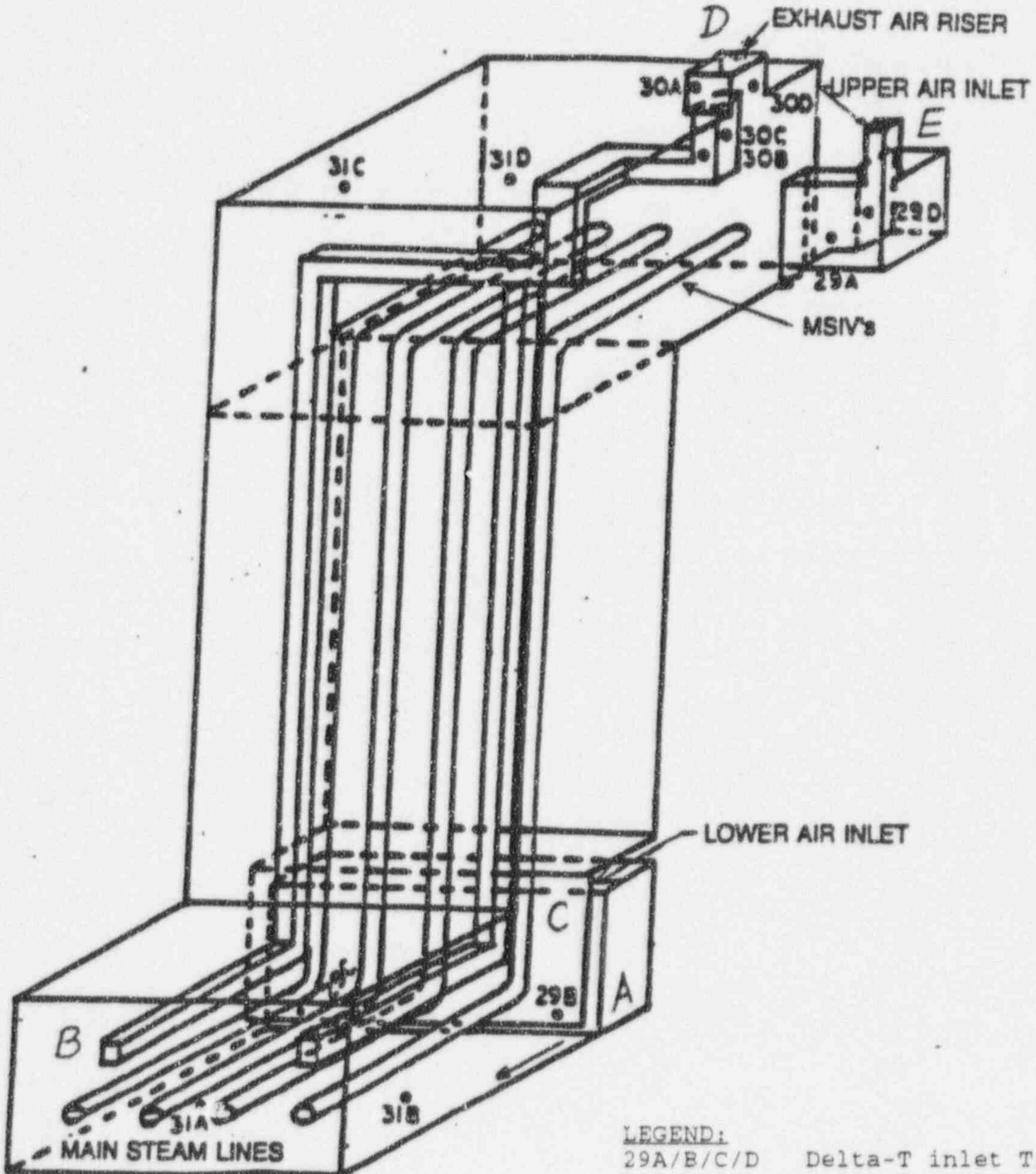
Figure 4 shows the upper MST temperature response as a result of 100 gpm of steam leakage. The MST inlet temperature is 110 °F and the leak is initiated at time equal to 1000 sec. (This initiation time is arbitrarily chosen and does not affect the results as long as the model is at a steady state condition prior to leak initiation.) The temperature increased 45.1 degrees from 137.4 to 182.5 °F in the first 10 minutes but added only 1.1 degrees in the next 30 minutes. The quick temperature response is typical for all the

cases analyzed. The quick response assures that a leak of sufficient quantity produces a sufficient temperature rise which can be detected in a timely fashion.

Figure 5 shows the upper MST temperature for different leakage rates and for different MST inlet temperatures. These are the temperatures at approximately 10 minutes after the leak. In most cases, the temperature has reached a steady state value, and if it has not, it is very close to the steady state value. The results show that the temperature varies directly with the quantity of steam leakage. For a given leakage rate, the upper MST temperature is highest for a MST inlet temperature of 110°F and lowest for a MST inlet temperature of 65 °F. The upper MST temperatures at 10 minutes for a 100 gpm leak are 151.3, 173.5 and 182.5°F respectively for MST inlet temperatures of 65, 95 and 110°F. Corresponding to these MST inlet temperatures, the temperatures for no leak condition are 93.2, 122.9 and 137.4°F. Although the results indicate that the lowest calculated temperature (151.3 °F for 65 °F inlet temperature) for 100 gpm leak is higher than the highest temperature for no leak (137.4°F for 110°F inlet temperature), the temperature experienced in the MST when the VR system is out of service has been observed to be greater than 151.3°F. Therefore, a single year-round high temperature setpoint that would preclude spurious trip can not be established based on an allowable leakage of 100 gpm. (See response 7 for additional details.)

Figure 6 shows the temperature difference between the upper MST exhaust and inlet air (MST Delta T). These are the Delta T's at approximately 10 minutes after the leak. In most cases, the Delta T has reached a steady state value, and if it has not, it is very close to the steady state value. The results show that the Delta T varies directly with the quantity of steam leakage. For a given leakage rate, the upper MST Delta T is highest for a MST inlet temperature of 65°F and lowest for a MST inlet temperature of 110°F. The upper MST delta-T's at 10 minutes for a 100 gpm leak are 86.3, 78.5 and 72.5°F respectively for MST inlet temperatures of 65, 95 and 110°F. Corresponding to these MST inlet temperatures, the delta-T's for no leak condition are 28.2, 27.9 and 27.3°F. If one setpoint value is used to cover the whole range of expected MST inlet temperature conditions, then the lowest calculated delta-T for 100 gpm leak (72.5°F) must be greater than the highest calculated delta-T for no leak (28.2°F). This difference of 44.3 degrees is sufficient to cover the margins and uncertainties associated with the setpoint determination methodology. The calculated delta-T value of 72.5°F is also greater than the delta-T experienced in the MST when the VR system is out of service. The delta-T has been observed as high as 46°F. Therefore, a delta-T setpoint based on 100 gpm leak will not cause spurious trips when no leak is present or when VR system is out of service.

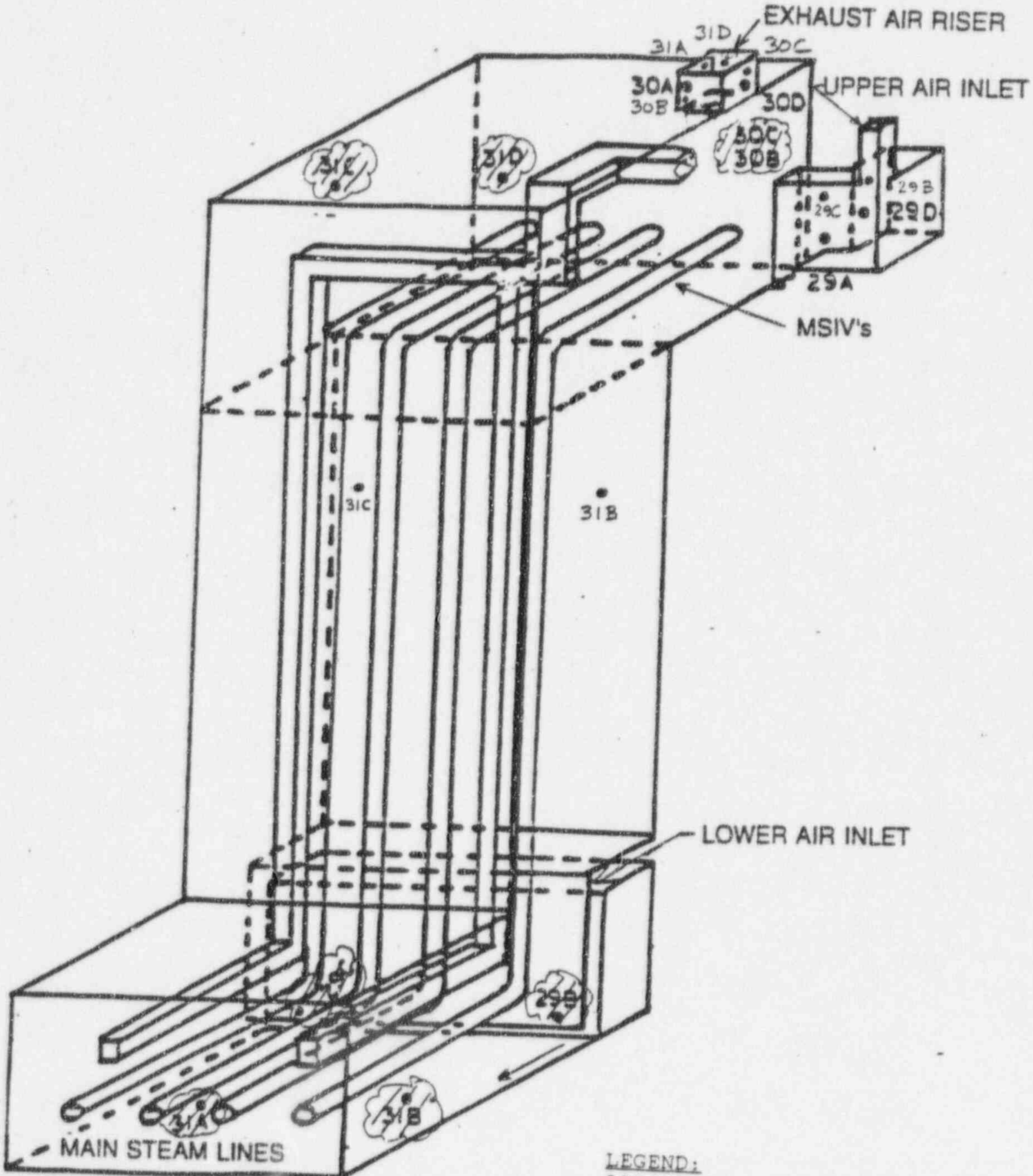
Based on the MST differential temperature analytical value of 72.5°F for a 100 gpm leak, a nominal trip setpoint of 65°F was determined to be acceptable by setpoint calculation, Main Steam Tunnel Temperature Isolation Setpoint Error Analysis, Rev. 0, NED-I-EIC-0208, Dated January 16, 1996 (attached).



LEGEND:

29A/B/C/D	Delta-T inlet T/Cs
30A/B/C/D	Delta-T outlet T/Cs
31A/B/C/D	Ambient-T T/Cs

Figure 1: Sketch of Main Steam Tunnel - Existing Configuration



LEGEND:

29A/B/C/D	Delta-T inlet T/Cs
30A/B/C/D	Delta-T outlet T/Cs
31A/B/C/D	Ambient-T T/Cs

Figure 1A: Sketch of Main Steam Tunnel - Proposed Configuration

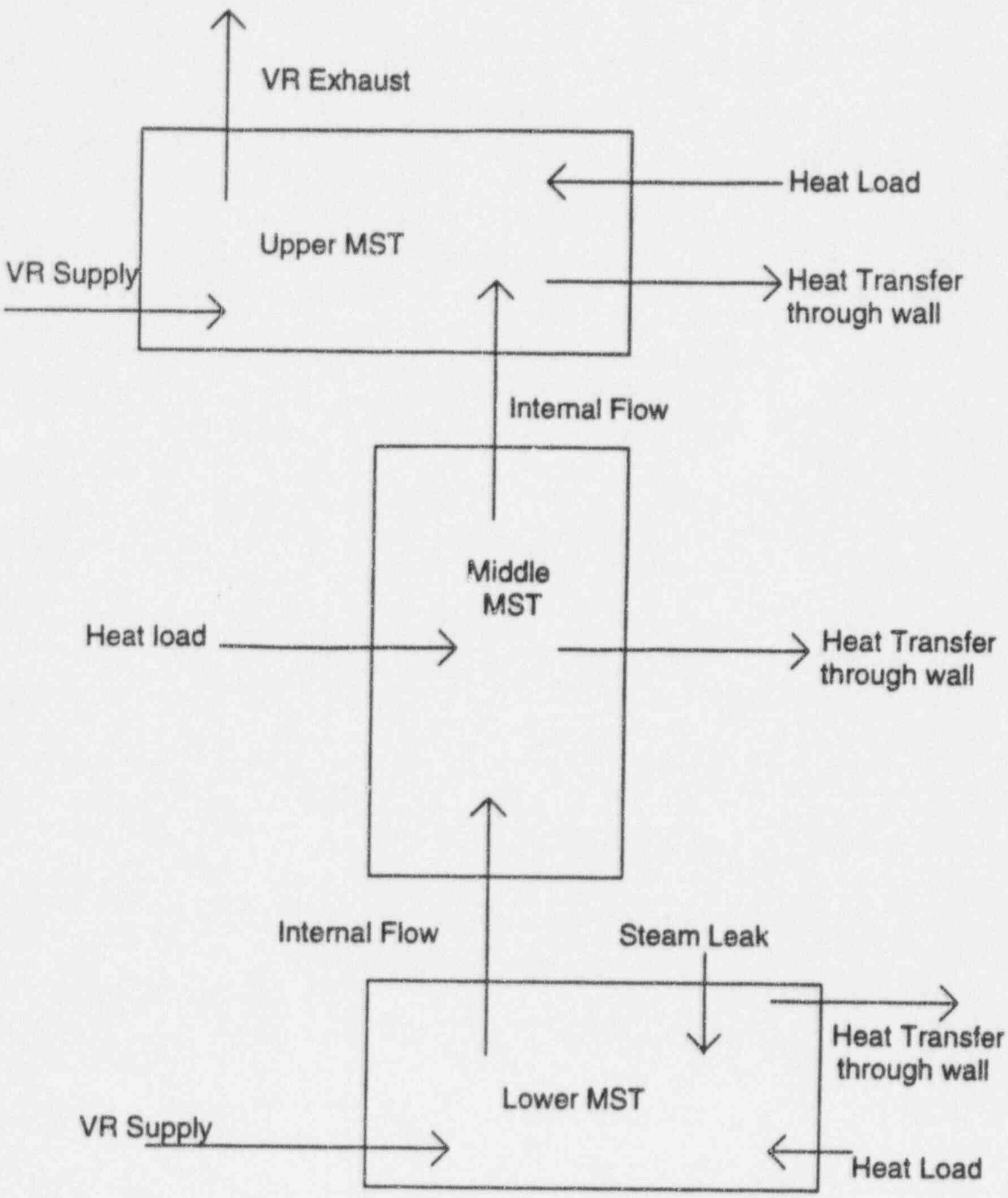


Figure 2: MST Mass and Energy Balance

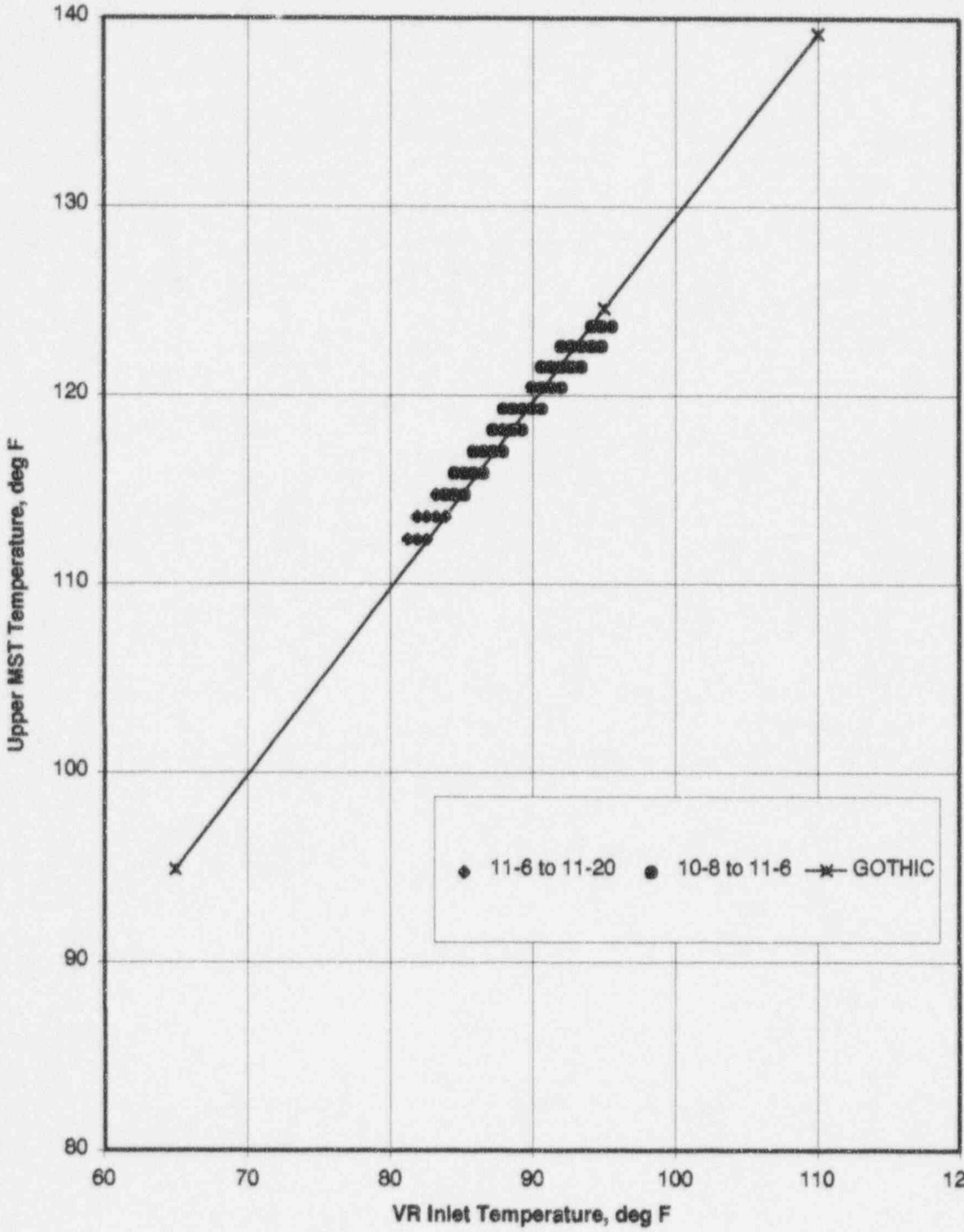


Figure 3: Benchmark Results

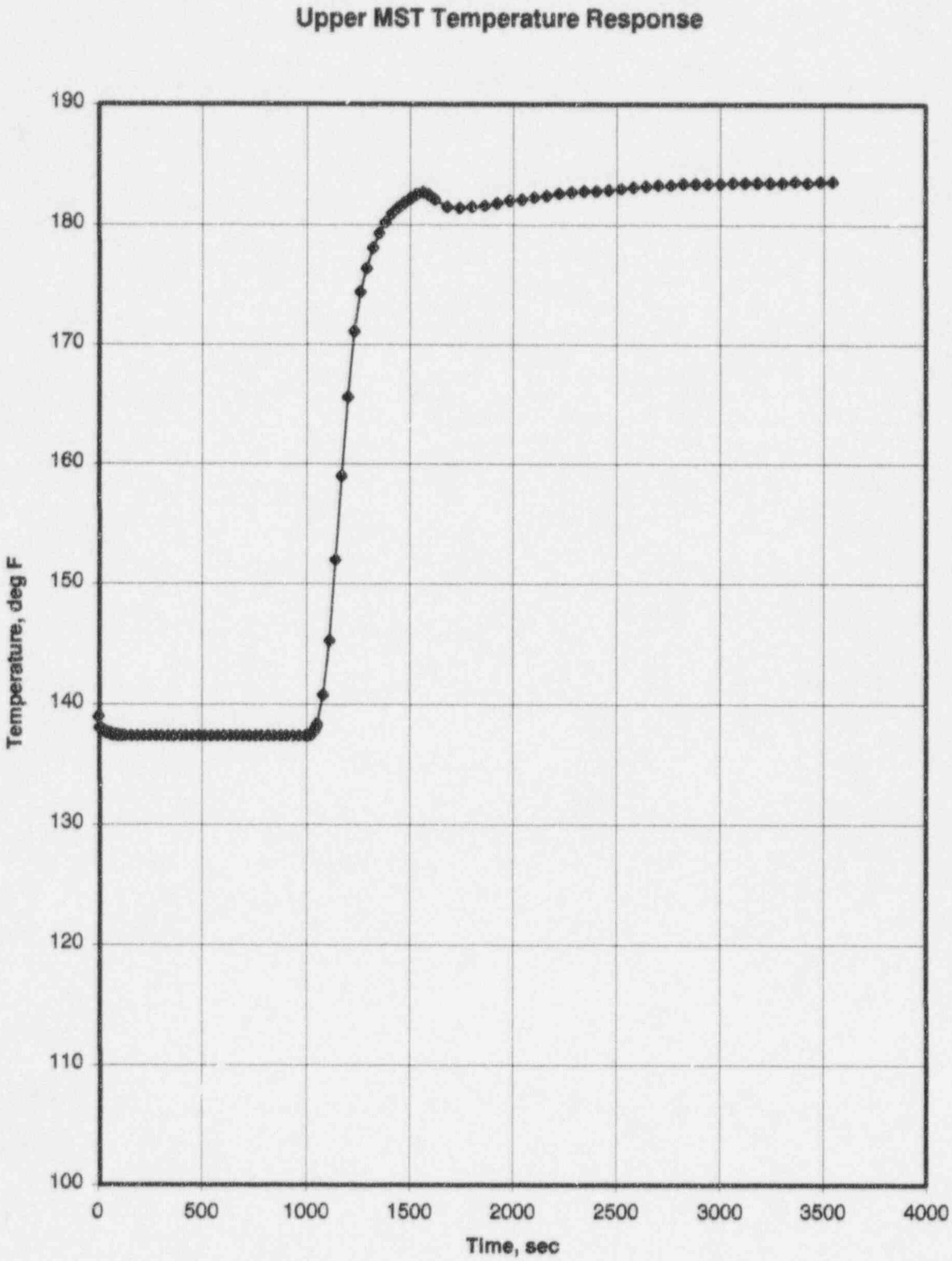


Figure 4: Upper MST Temperature Response for 110 deg F VR Inlet, 100 gpm

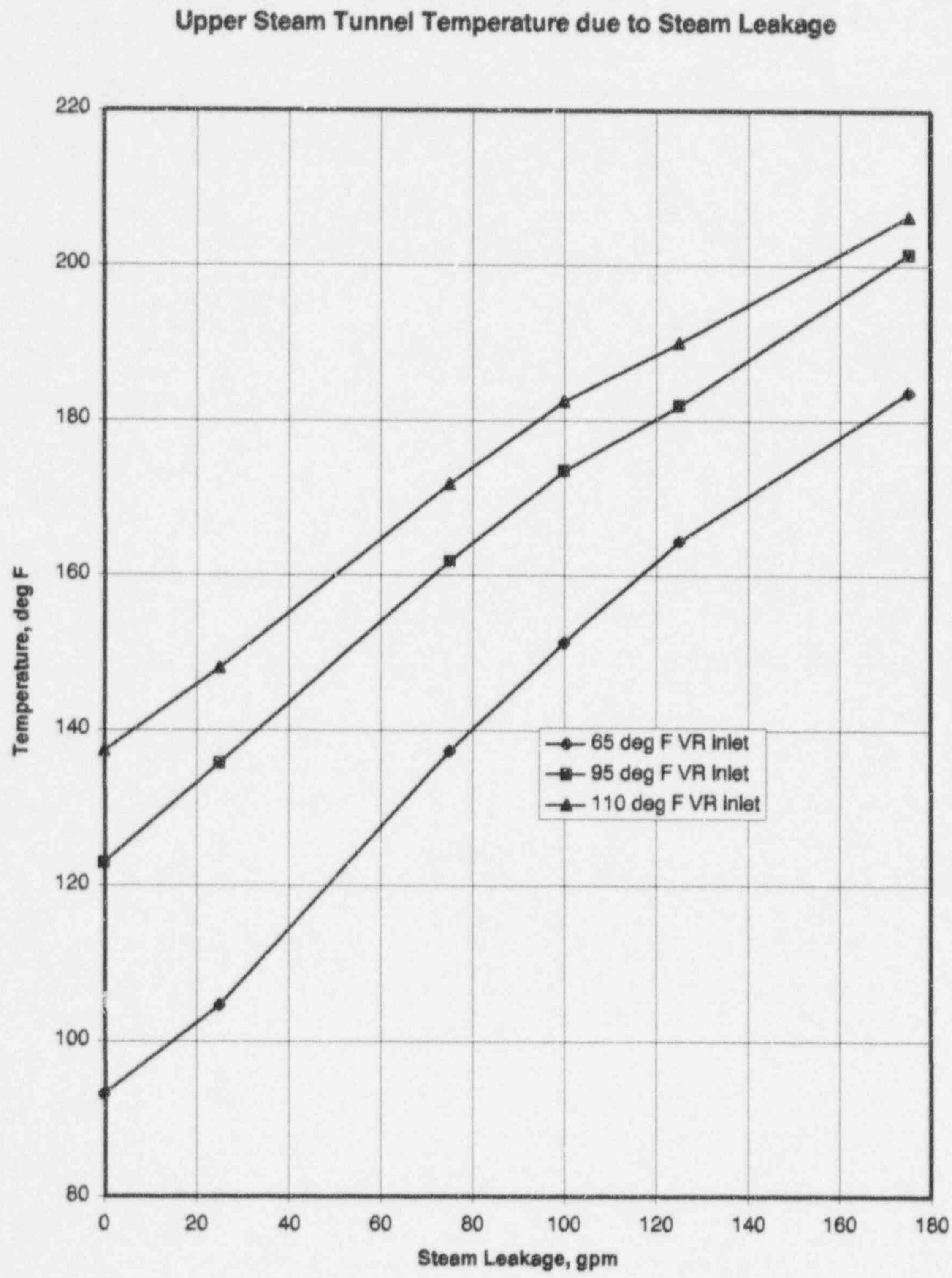


Figure 5: Upper MST Temperature due to Steam Leakage in the Lower MST

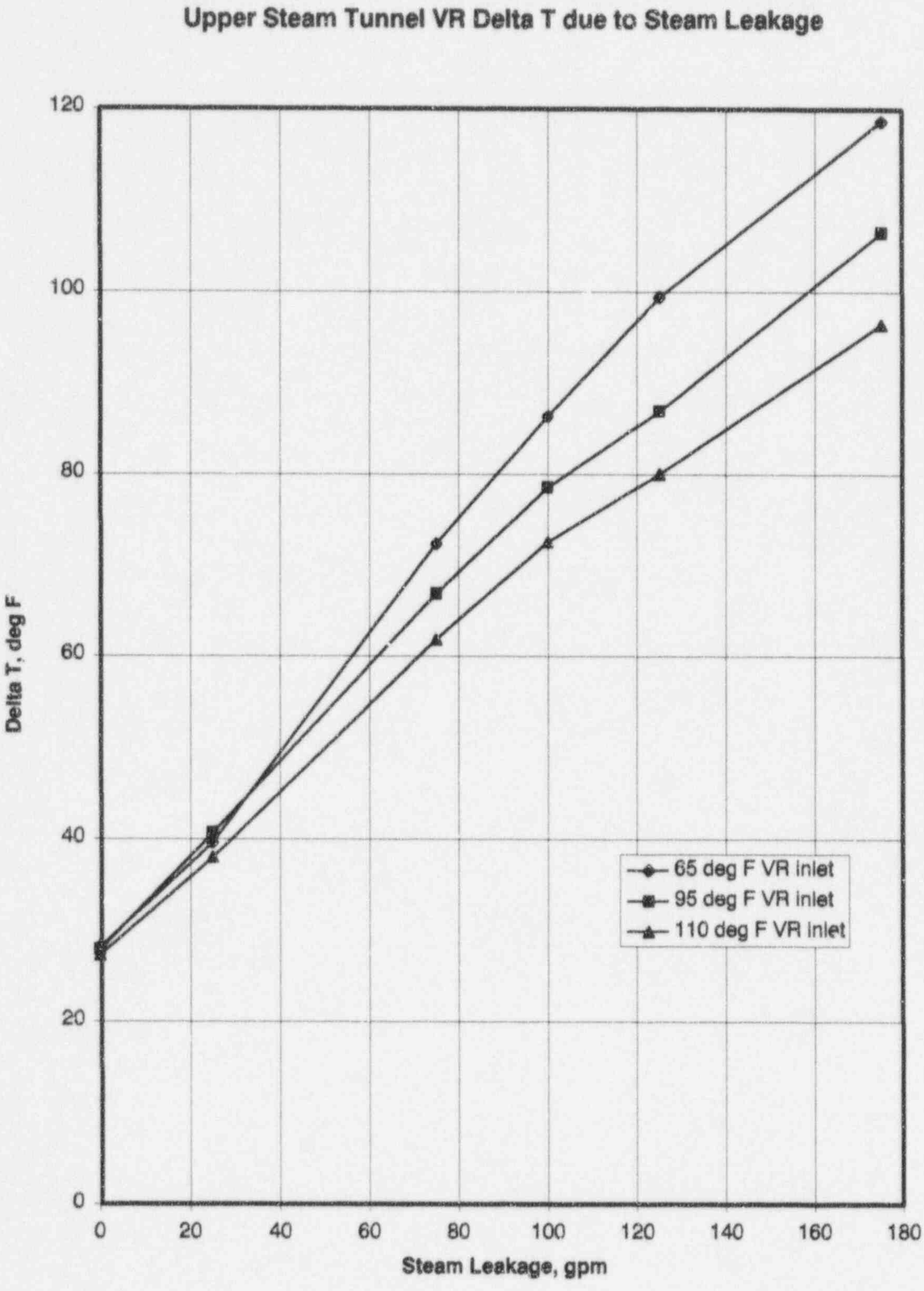


Figure 6: Upper MST VR Delta T due to Steam Leakage in Lower MST

Question 2

Provide a copy of: (1) ComEd calculation BSA-L-95-05, Rev. 0, dated January 13, 1996; (2) ComEd calculation BSA-L-96-03, Rev. 0, dated January 12, 1996; (3) ComEd calculation NED-P-MSD-086, Rev. 0, Dated Dec. 5, 1995; and (4) General Electric Leakage Detection System Design Specification 22A2870, or the relevant portions of this a document; specifically, provide those portions describing the basis for the 5 gpm and 25 gpm steam leakage assumptions.

Response 2

Attached are copies of the requested calculations and design specification.

Question 3

In Attachment G to your submittal, you state that the 100 gpm leakage rate assumption has not been finalized. Accordingly, provide the final value of the assumed leakage rate. If this value is different than the 100 gpm, state whether this has affected the setpoint values for the main steamline tunnel differential temperature-high isolation.

Response 3

The 100 gpm leakage rate has been finalized. Accordingly there are no changes to the submitted setpoint values.

Question 4

On page G-2 of your submittal, you state that your analysis assumes that a crack develops and that a subsequent steam leak develops over a period of 100 seconds. State what the effect of variations in this assumption regarding the time interval. Provide quantitative examples using the same analytical methods.

Response 4

A linear 100 second leakage development profile is used in the analysis. This assumption was made because the temperature response is expected to be quick and a steady state condition is expected to be reached in a short period of time. Hence, the temperature results are not affected by the assumed profile.

A sensitivity study, LaSalle Main Steam Tunnel Temperature Response for Linear Leakage Ramp Rate Sensitivities, BSA-L-96-06 (attached), was performed to show the effects of variations of the period over which a leak develops on the MST temperatures. All values shown are for the 100 gpm leakage case with a MST inlet temperature of 110°F. The model used was the same as that used in BSA-L-95-05. The only change between the different cases is the leak development rate.

The following two tables show the results. Table 1 shows the results for various ramp rates 8.33 minutes after the leak has fully developed which is consistent with the values listed in BSA-L-95-05. Although there are variations of approximately 1% (2.5 degrees) in Table 1, this is not a concern since the temperatures continue to increase. Table 2 shows the results for the ramp rate 28.33 minutes after the leak has fully developed. Table 2 shows that once these temperatures reach steady state there is less than 0.5 degrees variation because of the ramp rate. The results show that the steam tunnel temperature response is relatively insensitive to the linear leakage ramp rate.

Table 1 :Steam Tunnel Temperature Variations with Linear Leakage Ramp Rate 8.33 Minutes after Fully Developed Leakage

Linear Ramp Rate (seconds)	Upper MST Temperature (°F)	Lower MST Temperature (°F)	Middle MST Temperature (°F)
0	182.7	206.3	206.9
50	182.5	204.9	205.6
100*	182.5	204.8	205.6
500	181.4	203.9	204.0
1000	181.8	204.5	206.1

Table 2 :Steam Tunnel Temperature Variations with Linear Leakage Ramp Rate 28.33 Minutes after Fully Developed Leakage

Linear Ramp Rate (seconds)	Upper MST Temperature (°F)	Lower MST Temperature (°F)	Middle MST Temperature (°F)
0	183.3	207.0	207.3
50	183.3	207.0	207.2
100*	183.3	207.0	207.3
500	183.4	207.3	207.5
1000	183.4	207.5	207.7

*The values in BSA-L-95-05 were taken at 10.0 minutes and 30.0 minutes after the leakage was initiated. Based on the 100 second ramp rate used in BSA-L-95-05 this corresponds to 8.33 minutes and 28.33 minutes after the leakage has fully developed (e.g. 10 minutes - 100 seconds = 8.33 minutes).

Question 5

State what operator actions would be performed after detection of a steam leak in the MST below the level of automatic action.

Response 5

If a MST leak is detected at a level below automatic action, the leak will be confirmed using Control Room MST temperature indications, MST sump activity indications, radiation monitors and Main Condenser makeup flowrates. Following confirmation of the leak, entry into the MST will be made to determine the source of leakage. Efforts will be made to isolate the leakage source. If the leak is due to a crack in the steam piping which cannot be isolated, the Unit will be shut down and the leak isolated at a rate commensurate with the severity of leakage. This would include scramming the reactor manually and isolating the steam lines, if required. The Operator response to indications of MST leakage will be specified in an Operator Abnormal Procedure.

Question 6

State the values of the maximum expected temperature and temperature difference which would occur in the MST during normal operation.

Response 6

The values of the expected temperature and temperature difference which would occur in the upper MST during normal operation are calculated in BSA-L-95-05 to be:

	65°F MST inlet	95°F MST inlet	110°F MST inlet
Temperature	93.2	122.9	137.4
Delta-T	28.2	27.9	27.4

The maximum steady state temperature is 137.4 °F for a MST inlet temperature of 110°F. The maximum steady state temperature difference is 28.2°F for a MST inlet temperature of 65°F. The calculations do not include transients due to a loss of station heat recovery system, a loss of electric heat, sudden drop in outside temperature, or changes in ventilation rate which would cause higher differential temperatures in the MST. Note that these calculations are based on a proposed revised configuration of the MST with a section of the VR exhaust ductwork removed as discussed in Response 9.5 and as shown in Figure 1A. These values are different from those used in model benchmarking (Figure 3) which is based on the current configuration.

Question 7

You state on Page A-9 of your submittal that in the event that the reactor building ventilation system is inoperable, compensatory measures will be used to monitor for leakage in the steam tunnel. You also state that these compensatory measures are those approved by the NRC staff in its letter from J.B. Hickman, NRC, to T.J. Kovach, CECo, dated March 21, 1991. Estimate the time required to detect steam leakage when these compensatory measures are in effect, assuming a steam leak of 100 gpm. Discuss the operator's response required by these compensatory measures after leakage detection. State whether the alarm function indicating an ambient temperature-high, will be retained. If the MST ambient temperature-high can be used as a compensatory indication of leakage, explain why it can't be retained as a primary indication initiating an automatic isolation with the setpoint raised to a value of temperature sufficiently high so that a spurious trip is precluded.

Response 7

The compensatory measures for Reactor Building Ventilation System being inoperable requires the Operator to monitor Control Room MST temperature indications, MST sump activity indications, and Main Condenser makeup flowrates. The monitoring will be taken by special log at a 30 minute frequency. If a steam leak is suspected, the Operator actions followed would be the same as that answered in Response 5.

A sudden or gradual increase in MST steam leakage to 100 gpm leak would cause a faster than normal rise in MST ambient temperature after VR shutdown, or an abnormally high peak temperature which would alert the Operators to the potential existence of a steam leak. A 100 gpm would also result in a decrease of Hotwell level of 1.5 inches over about 30 minutes. This would result in opening of the normal hotwell makeup valve and a corresponding increase in Main Condenser makeup flow.

Thirty minutes would be the estimated time for Operator detection of the leakage based on the special log frequency. This does not take credit for the control room normal panel monitoring or other potential alarms e.g., area radiation monitors, sump activity alarms etc. that could result in earlier detection.

The alarm function of the MST ambient high temperature will be retained. The alarm will be used as an indication to the Operator during normal VR operation that temperatures in the MST are abnormally high so action can be taken to determine whether steam leakage is occurring in the MST before the automatic isolation setpoint for differential temperature is reached.

The MST ambient high temperature is not being utilized as an isolation trip because of difficulty in selecting a meaningful setpoint. The temperature setting for a 100 gpm leak would need to be approximately 150°F for winter operational conditions (see Figure 5, Upper Steam Tunnel Temperature due to Lower Steam Tunnel Leakage, for 65°F case). In the bounding summer time condition of MST inlet temperature at 110°F, the upper MST temperature would be 138°F during normal operation (see Figure 5, Upper Steam Tunnel Temperature due to Lower Steam Tunnel Leakage). Based on plant historical data, the shutdown of VR results in an increase in MST temperature of 32°F within the first 10 minutes. A shutdown of VR in the bounding summer time condition would then result in a MST temperature of 170°F within the first ten minutes with subsequent temperature increases until the temperature equilibrium is reached. The MST ambient high temperature setpoint necessary to preclude a spurious trip on shutdown of VR would need to be greater than 190°F (including setpoint tolerance, response time, etc.), and would not be of practical use during the predominate condition of normal VR operation. It was not thought appropriate to set the MST ambient high temperature isolation trip to such a high value, because the higher temperature setpoint of greater than 190°F would correspond to greater than 180 gpm leakage in the lower bounding condition (See Figure 5). By maintaining the MST ambient high temperature as an alarm, the setpoint can be maintained at a lower value than that which would be required for an isolation trip setting to provide the Operator early indication of MST steam leakage under normal operational conditions. Operator action can then be taken to identify, quantify, and isolate the leakage, with an orderly shutdown of the Unit prior to isolating the steam lines, if necessary. Overall safety is improved by not challenging the Unit to the pressure and reactivity transient resulting from spurious MSIV closure with the resulting SCRAM.

Question 8

In Attachment F of your submittal, you discuss abnormal conditions which cause the differential temperature to approach the differential temperature trip; e.g., a loss of station heat recovery system (SH), a loss of electric heaters or a sudden drop in the outside temperature. Show that the proposed increase in the differential temperature trip will not cause an isolation due to these conditions.

Response 8

The MST differential temperature does approach the isolation setpoint when there is a loss of the SH system, electric heaters, or a sudden drop in outside air temperature. The reason for the increase in the differential temperature is that the outlet temperature does not drop as fast as the inlet temperature. This lag in the response of the outlet temperature is due to amount of heat released from the piping, walls, and other structures in the MST as the inlet temperature drops.

The current setpoint for MST differential temperature is 36°F. Based on a search of LER's and DVR's, coded by LD or MS, there have been only three MST

differential isolations. The first isolation was caused by steam venting from two open MSIV upstream drain pressure tap valves. The next two were caused by high differential temperature during a Reactor Building Ventilation (VR) system restart. Besides the isolation due to the MSIV drain valves being open there have been no high MST differential temperature isolations with the VR system running. While the loss of SH system, electric heaters, or a sudden drop in outside air temperature has not caused an isolation in the past, it has challenged the operators. Because we have always recovered from these events the frequency of occurrence provided on the following table is based on operators recollection.

Type of event that caused approach to delta-T	Frequency	Comments
Loss of SH heating coils	1 to 2 per year	these coils normally provide 60°F temp. rise @ 0°F outside.
Loss of VR electric heaters	1 to 2 per year	these coils can provide up to 25°F temp. rise
A sudden drop in outside air temperature	1 to 2 per year	this is a problem if either of the above coils are out of service

Therefore, increasing the differential temperature isolation setpoint to 65°F provides an additional margin which will ensure that spurious isolations will not threaten unit operations.

Question 9

Describe the design changes which are being made in parallel with the changes in the LaSalle Station Technical Specifications.

Response 9

The design changes associated with the proposed Technical Specification changes encompass seven activities as summarized below.

1. Elimination of the high ambient temperature trip logic - This design change involves installing permanent wire jumpers around the relay contacts that currently initiate the high ambient temperature trip function. These jumpers do not defeat the high ambient temperature alarms which will remain functional. As part of this design change, the common alarm window that currently annunciates on both high ambient and high differential temperature will be replaced by separate alarm windows to provide independent annunciation for each condition. This work is scheduled for L1R07/L2R07.

2. Install keylock bypass switches for high differential temperature trip function - This change includes the installation of keylock bypass switches for each channel of high differential temperature trip logic. The current Technical Specifications permit this logic to be bypassed to prevent a spurious MS isolation when the VR system is shutdown for damper maintenance and SBGT 18 month testing. This is currently accomplished by using wire jumpers which are inserted directly into test connections on the Riley Temperature Switchpoint Modules. These switches will also be used in lieu of the temporary wire jumpers to bypass the delta-T MST temperature trip logic during the transient that occurs when the VR system is restarted.

The keylock bypass switches are designed in accordance with the FSAR requirements, and annunciators are provided to indicate that the logic has been bypassed. This work is scheduled for L1R07/L2R07.

3. Revise High Differential Temperature Trip Setpoints - This activity revises the setpoints of the Riley Differential Temperature Switchpoint Modules as discussed in the Request for Technical Specification Amendment. This work is scheduled for L1R07/L2R07.

4. Relocation of Leak Detection Thermocouples in the MST - This change relocates the leak detection thermocouples in the MST to provide consistent leak detection monitoring for all four channels of differential temperature thermocouples (See Figures 1 and 1A). To provide uniform detection, all of the outlet temperature thermocouples will be relocated into the high velocity exhaust airflow discharge area of the MST. Similarly, all of the inlet temperature thermocouples will be relocated into the high velocity supply airflow discharging into the upper area of the MST. This will provide enhanced monitoring of inlet and outlet temperatures, without being affected by convective airflow patterns and dead spots in the more open parts of the MST. The high ambient temperature thermocouples are also being moved to locations that will provide a broader representation of the ambient temperature in the MST. This work is scheduled for L1R07/L2R07.

5. Removal of Section of VR Exhaust Ductwork - This change is being made in conjunction with the above thermocouple relocations and logic changes (See Figures 1 and 1A). The presence of this section of ductwork causes some of the exhaust airflow to be drawn directly from the lower elevations of the MST. Based on the new detector locations and trip logic, all of the MST exhaust airflow must be drawn from the top of the MST. Removal of this duct section eliminates the direct flow path from the lower area, thereby making the airflow patterns in the MST consistent with the new design approach for the leak detection system. This work is scheduled for L1R07/L2R07.

6. Revise SH Pump Low Suction Pressure Setpoint - This activity involves lowering the low suction pressure setpoint for the SH Pumps to a value that will avoid spurious pump trips due to system operating transients, while still providing acceptable NPSH protection for the pumps. Rapid fluctuations in VR system temperatures such as those that result from an SH system trip have challenged the plant in the past. This change is being made to improve the reliability of the SH system by avoiding this type of transient. This work is scheduled for L1R07.

7. Revise Power Supply for Group 4 Isolation Logic From AC to DC - This design change involves switching the power supply for each division of the Group 4 Isolation logic from its current RPS system AC source to a safety-related DC source. The Group 4 isolation logic is designed such that a loss of one division of power results in a Group 4 isolation signal. A Group 4 isolation signal results in secondary containment isolation causing the VR system to shutdown. This causes the MST temperatures to increase which increases the risk of a spurious MS isolation associated with MST leak detection. By switching the power source for Group 4 Isolation to the highly reliable DC power system, the possibility of this type of spurious isolation will be minimized. This work is scheduled for L2R07/L1R08.

Question 10

State whether there are area radiation monitors which would provide an indication of a leak in the MST. If so, state the value of steam leakage that they would detect. Are these radiation monitors safety related?

Response 10

The Reactor Building radiation monitors are safety related, but are not classified as part of the leakage detection system in the UFSAR. These monitors initiate isolation of potentially contaminated plant ventilation effluent paths and initiate Standby Gas Treatment System in the event of excessive amounts of radioactive gasses and particulate in the VR plenum. The VR radiation monitors are in the upper steam tunnel air riser, shielded from the radiation levels from the Main Steam lines. The setpoint of the VR radiation monitors are based on limiting radiation effluent releases and not on limiting or quantifying MST steam leakage. Additionally there are Main Steam Line (MSL) Radiation Monitors in the MST which are also safety related. The function of the MSL radiation monitors is to detect the increase in steamline radiation level due to fuel failure and initiate steamline isolation and reactor shutdown.

A calculation, Rad Monitor Dose Rates Due to Postulated Steam Tunnel Leakage, BSA-L-96-07, Rev. 0, 2/28/96 (attached), has been performed which estimated the radiation levels at the location of the VR radiation monitors from steam leakage in the MST at different locations. The calculation shows that the radiation level contribution from N_{16} is more than a factor of 100 greater than the contribution from the steam concentration of design basis fission products. The calculation assumes ANSI standard steam concentration of activated gases and fission products at the location of the Reactor Vessel nozzle. Because of the short half life of the N_{16} (7.13 seconds) the calculation indicates that a 100 gpm steam leak at the upper MST would result in detectable levels of radiation at the VR radiation monitors, but because of the transport time, may not be detectable for steam leaks in the lower MST. The conclusion of this calculation is that the VR radiation monitors may indicate leakage in the MST, but will not reliably detect the leakage at all locations.

Additionally, on January 22, 1996 at 02:00, the Unit 1 Reactor Building Ventilation Radiation Monitors were found to be reading slightly higher than normal from the previous shift readings (minimal background indication to about 0.4 mR/hr). The cause of the increase in the VR radiation level is believed to have been a result of the N_{16} from a small packing leak on a 1.5" valve, 1B21-F067B, MSL Outboard Drain Isolation Valve, which was observed during a MST entry after the increase was noted. This valve is located in the upper MST. The leakage from the valve packing was not significant enough to cause changes to be noted from Control Room indications of leakage detection. From the event it appears that the radiation monitors will indicate changes in effluent radiation levels for some small MST steam leaks.