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February 26, 1990

Docket No. 50-423
B13429
Re: 10CFR50.90

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

Gentlemen:

Millstone Nuclear Power Station, Unit No. 3
Proposed Revision to Technical Specifications
Containment Pressure

Introduction

The Millstone Unit No. 3 containment structure is a cylindrical, painted carbon steel-lined, reinforced concrete structure which encloses the components and major piping within the reactor coolant pressure boundary. The Millstone Unit No. 3 containment is a subatmospheric-type containment. In the dual containment plant concept for Millstone Unit No. 3, the secondary containment is comprised of the containment enclosure building and the associated supplementary leak collection and release system (SLCRS) provided to mitigate the radiological consequences of postulated accidents. The containment is maintained at a subatmospheric pressure (typically 9.0 to 12.0 psia) during Modes 1 through 4 to limit the peak pressure attained during a postulated accident and to minimize radioactive releases after an accident. Northeast Nuclear Energy Company (NNECO) proposes to modify this operating pressure inside containment. Specifically, the pressure would remain at subatmospheric levels, but would be raised to slightly under atmospheric pressure (14.0 psia) during Modes 1 through 4. The main purpose of the proposed containment pressure increase is to reduce the potential for personnel injury when entering containment due to crossing the pressure boundary and due to oxygen deficiency while facilitating more timely access to containment for minor evolutions without requiring the plant to be in a cold shutdown. It is noted that containment entries are not performed on a routine basis. However, containment entries are required to inspect for unidentified reactor coolant system leakage, boron precipitation investigations (as per Generic Letter 88-05), and plant start-up surveillances/inspections. The proposed increase in the containment pressure is based upon a new containment analysis performed by Stone and Webster at the direction of NNECO. The new containment analysis demonstrates that it is safe to operate Millstone Unit No. 3 at a containment pressure of 14.2 psia with 75°F service water temperature. However, operation at or below 14.0 psia is necessary to account for instrument uncertainty.

A001 Add: NRR/DREP/PRPB 1/1 Ltr Encl 1 1

Background

Millstone Unit No. 3 Technical Specifications require that the containment pressure be maintained greater than 8.9 psia (air partial pressure), but less than atmospheric (above the service water limit line of Figure 3.6-1 in the Technical Specification). Experience has shown that the risk of injury to plant employees performing physical labor in subatmospheric containments is high. Comparatively, very little is known about health effects and stress on people in high-temperature, low-pressure environments. Many studies have been carried out on low-temperature, low-pressure environments such as those experienced by pilots, and the studies have been done on low-pressure environments in which people have had several days to acclimate themselves to the environment (e.g., mountain climbers). Subatmospheric containment entries are different from the above examples in that personnel entering the containment are only allowed 10 to 20 minutes for the pressure equalization versus several hours to days for other low-pressure conditions. In addition, personnel are required to wear self-contained respirators, Rexnord "Bio-Packs" to supply supplemental oxygen. Bio-Packs weigh approximately 40 pounds and reheat the breathing air as a result of the respirator design. Also, the containment environment is warmer than most of the environments for which research has been done. The average containment temperature is about 80°F and may have local hot spots in excess of 100°F. The combination of low pressure and high temperatures has great potential for personnel injury during containment entries. At Millstone Unit No. 3, 38 personnel medical incidents have occurred due to containment entries at subatmospheric conditions during the past four years since the plant received its operating license. In addition, the use of the "Bio-Pack" also causes the personnel working in containment to become less efficient. Hence, radiation exposure to operators is a potential concern.

In an effort to reduce the personnel injury risk associated with entering the containment during Modes 1 through 4, NNECO is requesting the NRC to review and approve a change in the Millstone Unit No. 3 containment operating pressure to allow NNECO to operate the plant at power (during Modes 1 through 4) with a containment pressure of not less than 10.6 psia and not greater than 14.0 psia. However, NNECO intends to maintain the Millstone Unit No. 3 containment pressure between 13.75 psia and 14.00 psia during Modes 1 through 4. Maintaining the containment pressure between 13.75 psia and 14.0 psia would allow plant personnel to enter the containment with a minimal pressure change and would not require the use of supplemental oxygen ("Bio-Packs").

The benefits of this change relate primarily to the reduced risk of injury to personnel from the reduced pressure boundary transition and eliminating the need to carry heavy (40-pound), awkward supplemental oxygen units in this hot environment. All injuries that have occurred to personnel in this environment have been related to these factors.

The personnel risk factors of the subatmospheric containment and benefits of maintaining containment pressure at or above 13.75 psia are shown below:

Factor	Benefits
Elimination of Supplemental Oxygen Requirement	1. Reduced fatigue. 2. Reduced risk of heat stress. 3. Increased mobility/agility. 4. Increased visibility. 5. Enhanced communications (within a confined space). 6. Provides engineering control as a solution to a personnel safety concern. 7. Reduction of time required to perform tasks resulting in reduced ionizing radiation exposure (ALARA). 8. Elimination of Immediately Dangerous to Life and Health (IDLH) atmosphere (oxygen deficient).
Reduction of Pressure Differential (increased Containment Pressure)	Reduced risk of ear injury due to a decreased pressure differential during containment entry.

The benefits to the public include:

A. Reduced time for containment drawdowns which give (1) fewer airborne effluents and (2) lower probability of a LOCA with open containment air ejector valves that subsequently fail to close.

B. More timely and more frequent containment entries to address potential safety issues such as RCS leaks.

Both experience and risk evaluation have shown that working within a subatmospheric containment carries a high risk of injury to plant personnel. Good practice requires the use of engineering controls to reduce or eliminate hazards to employees where possible. This practice is consistent with the Occupational Safety and Health Administration's (OSHA) standards. Increasing the Millstone Unit No. 3 containment pressure yields a significant risk reduction to the plant personnel while maintaining safe operation within the acceptable limits of the accident analysis. The pressure selected for analysis provides an operating band that permits the above benefits yet maintains the important advantage of a subatmospheric containment, of ensuring prompt detection of breaches in containment integrity.

Discussion

A. Existing Design Basis

The existing containment design is subatmospheric. The design basis for the various loss-of-coolant accidents (LOCA) inside containment was a subatmospheric containment operating pressure of 9.8 psia at a service water temperature of 75°F during Modes 1 through 4. The actual containment operating pressure has caused personnel injuries to those who enter containment at subatmospheric conditions during power operation.

The current containment leak rate (L_a) is 0.9 weight percent per day, and the secondary bypass leakage from containment is 0.01 L_a.

The original design basis for the containment and all the LOCA analyses were completed by Stone and Webster using the LOCTIC computer program. The major design basis accidents (DBA) include containment pressure and temperature response following a LOCA, subcompartment pressurization following a LOCA, and combustible gas concentration following a LOCA. Also, the containment pressure and temperature response following a main steam line break (MSLB) and control rod ejection accident (CREA) were analyzed for the original design basis.

The original design basis and associated radiological consequences were analyzed for the LOCA and include the exclusion area boundary (EAB), low population zone (LPZ), Millstone Unit No. 3 control room, Millstone Unit No. 2 control room, and technical support center (TSC). The CREA radiological consequences were analyzed for the EAB and LPZ. Dose calculations for the emergency operations facility and the Millstone Unit No. 1 control room are bounded by the Millstone Unit No. 1 LOCA, even with the proposed changes and hence were not quantitatively analyzed. It is noted that original radiological consequence analysis based on the subatmospheric design shows all containment leakage terminating within 1 hour. Also, with the original design, there is no credit taken for containment spray iodine removal.

The original containment pressure analysis was previously revised and is presented in Amendment 17 to the Final Safety Analysis Report (FSAR). The calculated peak containment pressure decreased from 39.4 psig to 36.1 psig. NRC approval of this analysis is documented in Supplement 5 to the Millstone Unit No. 3 Safety Evaluation Report, NUREG-1031. It is noted that the current Technical Specification does not reflect the containment peak pressure of 36.1 psig. It was decided not to revise the Technical Specifications as the original analyzed value of 39.4 psig bounded the revised value of 36.1 psig.

B. <u>Proposed Design Change</u>

The proposed design change will allow NNECO to operate Millstone Unit No. 3 with a maximum containment pressure of 14.0 psia during Modes 1 through 4. The safety analysis for the proposed change was performed at a maximum allowable containment pressure of 14.2 psia. The proposed change also incorporates a reduction in L_a from 0.9 weight percent per day to 0.65 weight percent per day and an increase in secondary containment bypass leakage from the containment from 0.01 L_a to 0.042 L_a. Pressure transmitters 3LMS*PT43A and 3LMS*PT43B will be used to monitor pressure in containment.

<u>Safety Assessment</u>

NNECO has reviewed the proposed design change pursuant to 10CFR50.59, which accompanied the proposed license amendment, to assess the impact on the accidents evaluated as the design basis, the potential for creation of a new unanalyzed event, and the impact on the margin of safety. NNECO has determined that the proposed design change constitutes an unreviewed safety question (USQ) due to an increase in postaccident radiological consequences, but has determined the proposed design change to be acceptable and safe. The proposed design change also involves a change in the Millstone Unit No. 3 Technical Specifications. Therefore, pursuant to 10CFR50.90, NNECO hereby proposes to amend its operating license, NPF-49, by incorporating the attached changes into the Technical Specifications of Millstone Unit No. 3. Along with this amendment request, supporting documentation is provided as follows:

- Attachment 1 provides the safety evaluation for the design changes.
- Attachment 2 forwards the revised pages of the Technical Specifications.
- Attachment 3 provides a description of the proposed Technical Specification changes. NNECO has reviewed the proposed Technical Specification changes in accordance with 10CFR50.92 and has determined that the changes do not involve a significant hazards consideration. The basis for this determination is discussed in Attachment 3.

Moreover, the Commission has provided guidance concerning the application of the standards in 10CFR50.92 by providing certain examples (March 6, 1986, 51FR7751) of amendments that are considered not likely to involve a significant hazards consideration. Example (vi) provides that a significant hazards consideration finding is unlikely for:

> A change which either may result in some increase to the probability or consequences of a previously analyzed accident or may reduce in some way a safety margin, but where the results of the change are clearly within all acceptable criteria with respect to the system or component specified in the Standard Review Plan; for example, a

change resulting from a small refinement of a previously used calculational model or design method.

This example appears applicable to the proposed changes. The proposed changes result in an increase in the consequences of a LOCA and a CREA accident. For the dose to the public (see Attachment 1), the following values were calculated increases and the percentage that increase represented in relation to allowable (Standard Review Plan) limits:

Accident	Receptor Location	Part of of Body	Increase In Dose	Percent of Limit
LOCA	EAB	Whole Body	2.700 rem	11.00%
LOCA	LPZ	Thyroid	15.500 rem	5.00%
LOCA	LPZ	Whole Body	2.000 rem	8.00%
CREA N-Loop	LPZ	Whole Body	0.018 rem	0.20%
CREA N-1 Loop	LPZ	Whole Body	0.018 rem	0.30%
CREA N-Loop	LPZ	Thyroid	0.040 rem	0.05%
CREA N-1 Loop	LPZ	Thyroid	0.030 rem	0.04%

Based on the above, NNECO has concluded that the increases are a small percentage of allowable limits and hence are not a significant increase in consequences of a previously analyzed accident. All doses remain within the acceptable limits. As seen from Table 2 of Attachment 1, for the control room and TSC personnel, the percentage increase in doses is higher than for the public, particularly for the beta dose (Factors of 3 and 8 for Millstone Unit No. 2 control room and Millstone Unit No. 3 control room, respectively). However, all doses remain within General Design Criterion 19 limits of 30 rem to the thyroid and skin and 5 rem to the whole body, Standard Review Plan Section 6.4 and the Millstone Unit No. 3 FSAR Section 3.1.2.19. The overall conclusion, therefore, is that the control rooms and TSC will remain habitable with acceptably low risk to plant personnel. The results of the proposed changes are "clearly within all acceptable criteria . . . specified in the Standard Review Plan." Therefore, the proposed license amendment does not involve a significant hazards consideration.

Based upon the information contained in this submittal and the environmental assessment for Millstone Unit No. 3, there are no unacceptable radiological or nonradiological impacts associated with the proposed change and the proposed license amendment will not have a significant effect on the quality of the human environment.

The Millstone Unit No. 3 Nuclear Review Board and the Millstone Station Site Operations Review Committee has reviewed and approved the proposed license amendment and has concurred with the above determination.

Regarding our schedule for this proposed amendment, NNECO intends to fully implement the license amendment within 30 days of its issuance by the NRC as follows. The existing limit of lower air partial pressure of 8.9 psia is requested to remain in force for approximately three weeks to permit a gradual rise to 10.6 psia total pressure (the new limit of lower pressure). The instrument air usage in containment results in a gradual increase in the pressure.

The Millstone Unit No. 3 FSAR will be revised within six months once the Staff issues the license amendment. This revised FSAR will reflect the results of the analyses performed for the proposed design changes and the Technical Specification changes.

In accordance with 10CFR50.91(b) we are providing the State of Connecticut with a copy of this proposed amendment.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

E. J. Mroczka
Senior Vice President

cc: Mr. Kevin McCarthy, Director
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Department of Environmental Protection
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W. T. Russell, Region I Administrator
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STATE OF CONNECTICUT)
) ss. Berlin
COUNTY OF HARTFORD)

Then personally appeared before me, E. J. Mroczka, who being duly sworn, did state that he is Senior Vice President of Northeast Nuclear Energy Company, a Licensee herein, that he is authorized to execute and file the foregoing information in the name and on behalf of the Licensee herein, and that the statements contained in said information are true and correct to the best of his knowledge and belief.

Lorraine J. D'Amico
Notary Public
My Commission Expires March 31, 1993

Docket No. 50-423
B13429

Attachment 1

Millstone Nuclear Power Station, Unit No. 3

Safety Evaluation for the Proposed
Design Changes--Containment Pressure

February 1990

Attachment 1
Millstone Nuclear Power Station, Unit No. 3
Safety Evaluation for the Proposed
Design Changes--Containment Pressure

Although an explicit discussion addressing the criteria of 10CFR50.59 is not required to process the proposed license amendment, we have included the safety evaluation on the proposed design change to assist the NRC Staff in its review of this matter.

Introduction

The existing containment design is subatmospheric. The current maximum containment operating pressure at a service water temperature of 75°F during Modes 1 through 4 is 9.8 psia. The proposed design change will modify the maximum allowable containment operating pressure during Modes 1 though 4 to 14.0 psia. The analysis for the proposed change was performed at a maximum allowable containment pressure of 14.2 psia. In addition, the proposed design change also incorporates a reduction in containment leak rate (L_a) from 0.9 weight percent per day to 0.65 weight percent per day and an increase in secondary containment bypass leakage from the containment from 0.01 L_a to 0.042 L_a. NNECO has reviewed the proposed design changes pursuant to 10CFR50.59 to assess the effect on the accidents evaluated as the design basis, the potential for creation of a new unanalyzed event, and the impact on the margin of safety.

I. Effect on the Accidents Evaluated as the Design Basis

A. Accidents Affected

The following accidents and associated consequences are potentially affected by the proposed design change.

1. Loss-of-Coolant Accident (LOCA)

a. Containment pressure and temperature response
b. Subcompartment pressurization
c. Combustible gas concentration

2. Main Steam Line Break (MSLB)

Containment pressure and temperature response

3. Control Rod Ejection Accident (CREA)

B. Safety Systems/Structures Affected

The design bases of the following systems/structure are potentially affected:

1. Containment Structure

The current design bases include the following:

a. The peak calculated containment pressure following a LOCA (36.1 psig) is below the containment design pressure of 45 psig.

b. The containment pressure is reduced to less than atmospheric pressure in less than 60 minutes following a LOCA.

c. After depressurization, the containment atmospheric pressure is maintained below atmospheric pressure.

With the proposed change, the second and third bases will be eliminated. These bases are not directly related to the integrity of the containment structure, but were imposed to establish the basis for fission product leakage from the containment. These two bases permit the assumption of no fission product leakage from the containment after the LOCA. Therefore, a new fission product leakage scenario must be considered in the radiological assessment. This assessment is provided in the subsequent paragraphs of this attachment.

2. Quench Spray System

Since the current radiological analyses do not take credit for fission product removal by the quench spray system, it is not a design basis for the system. This was originally assumed to simplify the dose calculations, and was acceptable because the resultant doses were acceptable.

The radiological evaluation for the proposed change does, however, include the effect of fission product removal by the quench spray system. The effectiveness of the system for fission product removal is based on the as-designed system. Because the quench spray system was designed to provide adequate containment heat removal, and since most system parameters that maximize heat removal also maximize fission product removal, the system is effective for fission product removal. (Performance of the quench spray system as a fission product removal system is discussed further later in this attachment.) The proposed change will therefore result in the addition of fission product removal as a design basis for the quench spray system.

3. Containment Recirculation System

As with the quench spray system, the effect of the containment recirculation system on fission product removal was not included in the current radiological evaluation, but will be included in the evaluation for the proposed change. The proposed change will, therefore, also result in the addition of fission product removal as a design basis for the containment recirculation system.

4. Containment Air Recirculation (CAR) System

The containment air recirculation (CAR) system is designated as safety-related. However, the system is not designed to operate post-LOCA and is automatically shut down by a containment depressurization actuation (CDA) signal (Final Safety Analysis Report [FSAR], Section 9.4.7.2). Therefore, the CAR system and changes related to this design change have no effect on the design basis accident (DBA).

5. Containment Vacuum System

The containment vacuum system reduces the containment pressure from atmospheric to subatmospheric conditions. This is accomplished prior to plant start-up using a vacuum ejector. Subsequent to initial depressurization, one of two containment vacuum pumps removes air from the containment atmosphere to maintain subatmospheric conditions. At the higher operating pressures proposed, the pump will remove a denser air mixture resulting in a higher mass flow rate.

The proposed change in containment maximum operating pressure from 9.5 psia (at 75°F) to 14.0 psia will result in less frequent operation of the vacuum pump in order to maintain the new subatmospheric pressure. The new operating conditions are within the existing design conditions and the normal operating band for the pumps.

The pumps also remove air from containment after a DBA. Since the system is not used until several weeks after a DBA, the system is not an engineered safety feature, is not safety related (reference FSAR Section 9.5.10.2), and does not impact the consequences of a DBA.

6. Containment Pressure Monitors

The current method of setting and maintaining containment pressure is utilizing 3LMS*PT934, 935, 936, and 937. These transmitters have a range of 0 to 60 psia and are used to perform containment isolation. It was determined that based on the range of these transmitters, the instrument error was too large for plant personnel to use these transmitters for maintaining the containment pressure within the desired range yet provide assurance that the pressure was below the proposed Technical Specification limit. Currently, there are two narrow-range transmitters, 3LMS*PT43A and B (8.5 to 13.5 psia), that provide indication on the main control board. These transmitters will be changed to 8.5 to 14.5 psia which will permit control board indication in the new range of operation. The computer readouts will be utilized to set and maintain containment pressure within the Technical Specification requirements.

C. Impact of Change on Performance of Safety Systems

The proposed change has no effect on the performance of the quench spray and containment recirculation system for heat removal.

However, the proposed change necessitates adding fission product removal as a design basis for the quench spray and containment recirculation systems. The performance of these systems in this function was evaluated by determining iodine removal coefficients and decontamination factors. The current design requirements assumed for heat removal were used along with methodology of ANSI/ANS 56.5-1979, "American National Standard for PWR and BWR Containment Spray System Design Criteria," to calculate these factors.

D. Impact of Change on Consequences of Accidents

1. LOCA Containment Pressure and Temperature Response

The containment pressure/temperature response was reevaluated with the proposed maximum operating pressure of 14.2 psia. This evaluation was performed using the same methods and computer models described in Section 6.2.1 of the FSAR. Two LOCA cases were reevaluated: the hot leg double-ended rupture (DER) and the pump suction DER with failure of one Engineered Safety Features (ESF) train. The hot leg DER is the limiting accident for peak containment pressure, with 36.09 psig being the current maximum calculated pressure. This was recalculated to be 38.57 psig with the increased initial containment pressure.

The pump suction DER with failure of one ESF train is the limiting accident for the long-term containment pressure, with current analysis calculating a depressurization time of 2,480 seconds and a margin below atmospheric pressure of 0.05 psig at 15,900 seconds. This pressure transient was recalculated with the increased initial containment pressure. The containment pressure remains above atmospheric pressure for the duration of the analysis, as shown in Table 1.

The revised containment pressure and temperature response for both the hot leg and pump suction DERs are shown in Figures 1 and 2, respectively. Figure 3 shows the long-term pressure transient following the pump suction DER.

The containment post-LOCA temperature/pressure response is an input parameter for other plant equipment and analyses, and the effect of the results of the reevaluation are as follows:

a. Containment Design Pressure

The revised maximum containment pressure of 38.57 psig represents a 2.48 psig increase over the current maximum pressure. This pressure is still well below the containment design pressure of 45 psig. The proposed change, therefore, has a minor effect on the maximum calculated containment pressure.

b. Containment Leakage Scenario

The proposed change alters the scenario for fission product leakage to be used in the radiological evaluation. The current radiological evaluation assumes leakage of fission products from the containment ends at 1 hour after the LOCA, after which time the containment pressure is subatmospheric. The revised containment pressure calculation results in the containment pressure remaining above atmospheric pressure, indicating that continued leakage must be assumed. The effect of this is discussed further later in this attachment.

c. Emergency Core Cooling System (ECCS) Performance

The containment post-LOCA pressure response is an input to the evaluation of ECCS performance; but, because a lower initial containment pressure is limiting, the effect of an increased containment pressure is beneficial to ECCS performance. The proposed change, therefore, has no negative effect on the performance of the ECCS.

d. Integrated Leak Rate Test (ILRT)

The proposed increase in normal containment operating pressure (to 14.2 psia) yielded revised values for containment peak pressure (P_a), L_a, and the bypass leakage limit fraction. The revised values are:

Containment Parameter	Engineering Units	Revised Value
P_a	(psig)	38.57
L_a	(wt%)/day	0.65
L_a	(SCFH)	2206.33
Bypass Limit Fraction of L_a	(wt%)/day	0.042 L_a

The proposed change in containment operating pressure reduces the magnitude of the ILRT test pressure and acceptance criteria. This is also true for the Type B and C testing as well. The bypass leakage limit was increased from 0.01 L_a to 0.042 L_a. This increased bypass fraction was considered necessary because of the difficulty in meeting such a low value for LLRT during the last refueling outage. Failure to meet such a restricted low limit could result in additional unwarranted occupational exposure to repair valves with marginal leakage.

Type A, B, and C testing acceptance criteria are all reduced by the same factor: -27.78 percent from their current values. In terms of SCFH, the change in the acceptance criterion is -30.47 percent. For the bypass leakage limit, it was increased by approximately +192.05 percent.

The net effect of this change will be the imposition of even tighter containment leakage limits (excluding the bypass leakage limit) upon the Type A, B, and C containment boundary systems and their components. Containment integrity will be improved and provide additional assurance that the public will be protected.

The bypass leak limit increase also meets the above requirements. The proposed changes in P_a and L_a will also require administrative revision of the Type B and C leak rate testing procedures.

e. Electrical Equipment Qualification (EEQ) Service Conditions

(i) The service conditions for qualifying equipment required to function in the postaccident containment environment are given in FSAR Appendix 3B. The proposed change affects the following Millstone Unit No. 3 environmental qualification service condition parameters.

(a) Normal pressure and temperature inside containment.

(b) Accident pressure and temperature profiles inside containment.

(c) Postaccident pressure and temperature profiles inside containment.

(d) Certain postaccident radiation total integrated dose (TIDs) outside containment.

(2) The following discussion covers the impact on the qualification of equipment resulting from changes to normal environment and the impact of the change on the accident environmental parameters and the post-DBA operation parameters.

(a) Normal Environment

1) Pressure and Temperature

The present EEQ program is based on a normal containment pressure range of 9.5 to 14.7 psia. The proposed new operating pressure of 14.2 psia falls within this range and will therefore not impact the existing normal pressure qualification of EEQ equipment.

The normal maximum average (NMA) temperature for each environmental zone is used to calculate the qualified life of EEQ equipment in that zone. NNECO has determined that the effect of the proposed change in operating pressure on these NMA values for containment will be negligible. The net effect is expected to be a slight lowering of average ambient temperatures which is conservative for equipment qualification purposes. Therefore, the proposed change will not adversely impact the existing normal temperature qualification of EEQ equipment.

2) Other

The proposed change will not alter any of the remaining normal environment parameters.

(b) Accident/Postaccident Environment

1) Pressure and Temperature

The postulated DBA accident and post-DBA pressure and temperature response envelopes for all containment zones are profiled in the FSAR, Appendix 3B--Attachment 1, Appendix A, page 6. As permitted in NUREG-0588, these qualification parameters are based on the time-dependent pressure and temperature values for the design of the containment structure rather than on any specific or composite accident calculations. Except for the long-term post-DBA pressure value, the calculated new pressure and temperature values are bounded by the existing envelopes. Therefore, the only potential impact on EEQ equipment will be in the post-DBA region between 1 hour and one year.

The pressure parameter is not considered an aging parameter which causes degradation of materials. Equipment is type-tested for the pressure parameter only for the period from initiation of the accident until the pressure service condition returns to essentially the same level that existed before the postulated event. Acceptable thermal and radiation aging results are then presumed to demonstrate the preservation of the material properties required to maintain pressure withstand capability during the post-DBA period. The calculated new post-DBA containment pressure value of 1.75 psig is, for equipment qualification purposes, essentially the same as the preaccident level. Therefore, the proposed increase in the post-DBA containment pressure value will have no adverse impact on the qualification of EEQ equipment.

There will be no change in the pressure or temperature accident environment parameters for zones other than those located in containment.

2) Radiation

For equipment qualification, the accident design bases for the zone radiation environments (FSAR Section 3.11B.5.1) are different for inside and outside containment locations. The inside-containment radiation values are based on the direct consequences of a LOCA (reference FSAR Section 15.6) and will not change since the original distribution of fission product inventory (based on source terms per Regulatory Guides 1.4 and 1.89, and NUREG 0588) remains unchanged. For outside-containment zones, the accident radiation values are typically based on radiation emanating from the containment structure plus exposure from recirculating emergency fluid systems as applicable (Reference FSAR paragraph 3.11B.5.1). However, the accident radiation environment parameters for Zones AB-16 and AB-39 are calculated based on filter loads from operation of the supplementary leak collection and release system (SLCRS) and the auxiliary building ventilation system (ABVS), respectively. Both of these systems are classified as ESF filter systems required to operate post-LOCA (reference FSAR Section 6.5), and since the postulated post-DBA fission product leakage levels are expected to increase with this change, the accident radiation parameter values have been reevaluated.

The original calculated accident radiation values used for Zones AB-16 and AB-39 were based on assumptions that included containment never going subatmospheric post-LOCA and containment sprays not used. This calculation also noted that the amount of containment LOCA leakage filtered by the ABVS would be small, and that all containment leakage is therefore assumed to be filtered by the SLCRS (Zone AB-16). The DBA which yields the worst-case radiation environmental conditions for the ABVS filters (Zone AB-39) is an ECCS leak with all leakage being released through these filters alone.

A revision to this calculation was performed prior to initial plant start-up to incorporate the effect of the containment pressure going subatmospheric 1 hour post-LOCA and to add potential ECCS leakage in the ESF building to the SLCRS filter load. The ABVS filter load was unchanged in this revision. The net SLCRS filter load decreased for the containment subatmospheric case (with no credit taken for containment spray) and is the accident radiation value presently used for Zone AB-16 in the equipment qualification program. The accident radiation value for Zone AB-39, based on the ABVS filter load from the bounding ECCS leak, remained unchanged.

The newly calculated containment spray reduction factor combined with a postaccident positive containment pressure condition yields a new accident radiation value for the SLCRS filters to be used for equipment qualification in Zone AB-16. This calculation is based on a LOCA and considers the increased containment leakage while crediting the effects of the quench spray system. Although the new accident radiation value is an increase over the present value, the existing equipment qualifications remain valid with adequate margin. The accident radiation value for Zone AB-39 remains unchanged. Therefore, the proposed change will not adversely impact the existing accident radiation qualification of EEQ equipment.

3) Other

The proposed change will not alter any of the remaining accident environment parameters.

2. Subcompartment Pressurization

In general, the use of a minimum initial pressure in the subcompartment analysis is conservative. Sensitivity studies reported in NUREG/CR-1199 have shown that peak ΔP is usually higher for a lower initial pressure of the subcompartment. The studies have also shown that a larger initial air mass in the subcompartment causes an increase in the predicted maximum ΔP. Increasing the air compartment initial pressure has the effect of increasing the air mass. However, the influence of the initial pressure is greater than that of the initial air content. Therefore, the net effect of increasing the initial pressure will be a reduction of the predicted maximum ΔP.

3. Combustible Gas Concentration

An increase in the containment operating pressure causes an increase in the mass of air in containment. Because the rate of generation of hydrogen is unchanged, the concentration of hydrogen would be lower. The proposed change, therefore, has no effect on the current evaluation of hydrogen generation and control. The current hydrogen concentration limit in containment is 4 percent.

4. MSLB Pressure and Temperature Response

A review of the containment MSLB analysis (summary of results given in FSAR Table 6.2-22) indicates the maximum containment operating pressure cases are governing for the containment pressure response and the minimum containment operating pressure cases are governing for the containment temperature response. The proposed change, therefore, has no effect on the containment temperature response. The containment pressure response, however, will be increased by the proposed increase in operating pressure.

The current maximum calculated pressure is 31.49 psig for a full DER at hot standby (zero power), which is based on a containment operating pressure of 12.342 psia (10.65 psia air partial pressure). An increase in the operating pressure to 14.2 psia (13.35 psia air partial pressure) will increase the resultant peak pressure following a main steam line break on the order of 3 psig, which is still well below the peak pressure following a LOCA. The proposed change, therefore, has a minor effect on the containment pressure response to an MSLB.

5. Radiological Consequences

a. The following accidents and associated consequences are affected by the above changes:

(1) LOCA

Exclusion area boundary (EAB)--thyroid and whole body doses

Low-population zone (LPZ)--thyroid and whole body doses

Millstone Unit No. 3 control room--thyroid, whole body, and skin doses

Millstone Unit No. 2 control room--thyroid, whole body, and skin doses

Technical support center (TSC)--thyroid, whole body, and skin doses

(2) Control Rod Ejection Accident (CREA)

EAB--thyroid and whole body doses
LPZ--thyroid and whole body doses

The Millstone Unit No. 3 LOCA is not the limiting accident for the Millstone Unit No. 1 control room habitability calculations and it was qualitatively determined that the above changes do not change this conclusion. The LOCA doses are limiting when compared to the control rod ejection accident (CREA) for control room and TSC habitability calculations and the above changes do not affect this conclusion.

Based on Standard Review Plan acceptance criteria and available models, skin dose is not calculated for the public, but was calculated for General Design Criterion 19 compliance.

b. Assumptions

Figure 4 shows the pathways by which activity could be released from the Millstone Unit No. 3 containment following a LOCA or CREA. The CREA also includes a pathway due to primary-to-secondary leakage which is not affected by the changes. Currently, with the containment pressure at < 10 psia, the containment returns to subatmospheric conditions within 1 hour post-LOCA or CREA, and hence the containment leakage paths are assumed to terminate leakage at T = 60 minutes. Changing the allowable pressure to 14.2 psia results in a condition where the containment never returns subatmospheric, and hence leakage is assumed to continue for the full 30 days over which accident dose calculations are performed. (EAB doses are calculated over 2 hours.)

This change in pressure in itself, without modifying other requirements or assumptions, would result in an increase in calculated accident consequences to levels in excess of 10CFR100 or General Design Criterion 19 limits, and hence would be unacceptable.

An effective increase by a factor of 3 in the allowable bypass leakage also increases the thyroid dose consequences as a larger fraction of the release is bypassing the emergency filtration systems. Again, taken by itself, this change would result in unacceptable dose consequence.

In order to ensure a LOCA or CREA result in acceptable doses given the above two changes which increase the dose, other changes in requirements or calculational assumptions were necessary. The following lists all of the changes from the current FSAR dose analyses and the basis for the change.

(1) Containment Leak Rate and Duration (LOCA and CREA)

(a) Current Analysis

0-1 hour--0.9 percent per day
> 1 hour-0-subatmospheric

(b) Proposed Change

EAB and LPZ
0-24 hours-0.65 percent per day
24 hours-30 days-0.325 percent per day

(c) Control Room and TSC

0-1 hour-0.65 percent per day
1 hour-30 days-0.22 percent per day

(d) Basis

The current analysis is based on the subatmospheric design of Millstone Unit No. 3, where all containment leakage terminates within 1 hour. The proposed change in pressure results in the attached post-LOCA pressure curve--Figure 1. The pressure drops to approximately 4 psig within 1 hour, but never goes subatmospheric, varying between 3 and 5.5 psig for the entire 30 days. To help compensate for the increased time release, the allowable Technical Specification leak rate, L_a, is being reduced from 0.9 percent per day to 0.65 percent per day. Conservatively, for calculating the dose to the public, the Standard Review Plan guidance of assuming L_a for the first day and 0.5 L_a for the remaining 29 days was assumed. For the control room and TSC calculations, a more reasonable assumption was made which recognizes the fact that Millstone Unit No. 3 still has the containment cooling systems typical of a subatmospheric containment. Thus, containment pressure is rapidly reduced compared to a standard atmospheric containment, for which the Standard Review Plan guidance was developed. An evaluation was performed to determine the fraction of La leak rate which would exist from 1 hour to 30 days after the break. The fraction was conservatively calculated to be 0.33 L_a. Hence, the control room and TSC calculation assume 0.33 L_a from 1 hour to 30 days.

(2) Containment Spray Iodine Removal (LOCA and CREA)

(a) Current Analysis

No credit is taken for iodine removal.

(b) Proposed Change

Credit is taken for the iodine removal capabilities of the sprays. Effective removal of coefficients were calculated. Since Millstone Unit No. 3 Technical Specifications on sprays and additives are based on its design as a subatmospheric containment, no changes are necessary to ensure their operability and use for the removal rates assumed. For the LOCA, sprays are assumed to be effective immediately. For the CREA, a 10-minute delay is assumed to allow for manual initiation of sprays in case the automatic initiation set point is not achieved.

(c) Basis

Such credit could have been taken for the original LOCA and CREA calculations, but was not since the results were acceptable without the sprays.

(3) Iodine Species (LOCA and CREA)

(a) Current Analysis

91 percent elemental
5 percent particulate
4 percent organic

(b) Proposed Change

95.5 percent elemental
2.5 percent particulate
2 percent organic

(c) Basis

Standard Review Plan 15.6.5 provides the current iodine species breakdown for LOCA dose calculations. However, Standard Review Plan 6.5.2, Rev. 1, specifies that the proposed breakdown be used when iodine removal by sprays is assumed. Since credit for sprays is taken, the new percentage breakdown is assumed.

(4) Millstone Unit No. 3 Control Room and TSC X/Qs (LOCA)

(a) Current Analysis

Control Room and TSC values are assumed to be the same. No credit was taken for the fact that the TSC is farther away from the release point.

	From Ventilation Vent	From Containment
0-8 hours	4.75(-3)	1.92(-3)
8-24 hours	2.30(-3)	1.51(-3)
1-4 days	1.03(-3)	4.24(-4)
4-30 days	1.28(-4)	4.80(-5)

(b) Proposed Change

Control Room

	From Ventilation Vent	From Containment
0-8 hours	2.24(-3)	8.08(-4)
8-24 hours	1.40(-3)	5.49(-4)
1-4 days	5.08(-4)	1.95(-4)
4-30 days	9.68(-5)	2.75(-5)

Technical Support Center

	From Ventilation Vent	From Containment
0-8 hours	1.20(-3)	4.85(-4)
8-24 hours	7.98(-4)	3.22(-4)
1-4 days	4.75(-4)	1.92(-4)
4-30 days	7.45(-5)	3.01(-5)

(c) Basis

The current X/Qs were calculated by Stone and Webster and used an NRC formula to derive a wind speed. The proposed X/Qs used actual Millstone meteorological data to determine the wind speed in accordance with Regulatory Guides 1.145. Additionally, the current X/Qs for the TSC conservatively assumed the same values as the control room (the control room is closer to the vent and containment). The proposed values use the actual distance to the TSC air intake and include a TSC occupancy factor of 0.6 for the first 24 hours in lieu of the control room occupancy factor of 1 for the first day. This reduced occupancy factor is based on our emergency plan requirement to establish two 12-hour shifts for support personnel. The 0.6 factor accounts for shift overlaps.

(5) Bypass Leakage Fraction (LOCA and CREA)

(a) Current Analysis

0.01 L_a = 0.009 percent per day

(b) Proposed Change

0.042 L_a = 0.028 percent per day

(c) Basis

The current value is restrictively low because of the failure of the analysis to take credit for iodine removal by sprays. Because of the effectiveness of the sprays, even though the bypass leakage is increased in the proposed change, there is a significant reduction in the calculated EAB thyroid dose. This increased bypass fraction was considered necessary because of the difficulty in meeting such a low value for LLRT during the last refueling outage. Failure to meet such a restrictively low limit could result in additional unwarranted occupational exposure to repair valves with marginal leakage.

(6) Plate-Out Coefficient (LOCA and CREA)

(a) Current Analysis

An immediate reduction of a factor of 2 for iodine plate-out in the containment is assumed.

(b) Proposed Change

An immediate reduction due to plate-out is no longer assumed. Instead, a plate-out removal coefficient is calculated in the model.

(c) Basis

This change is per the guidelines of Standard Review Plan Section 6.5.2 on the use of sprays for iodine removal. With sprays operating, plate-out is not as effective and the immediate two-factor reduction is no longer appropriate.

7. 0- to 1-Minute Bypass of Secondary Containment (LOCA and CREA)

(a) Current Analysis

The entire 0.9 percent containment leakage is assumed to bypass the filtration systems during the first minute of the accident.

(b) Proposed Change

Other than the fixed bypass fraction (0.042 L_a), no leakage is assumed to bypass the filters during the first minute.

(c) Basis

Secondary containment negative pressure less than 0.25 in water gauge (WG) is achieved within 45 seconds. According to the guidance in Standard Review Plan 6.5.3, if negative pressure is achieved within the first minute, no bypass needs to be assumed. This is appropriate as it would take more than one minute for fuel to fail and the activity to be transported through both the primary and secondary containments.

c. Results

Table 2 presents the results of the dose calculations for the LOCA. The current results are designated "OLD" on the table and are from the FSAR and Stone and Webster calculations. The "NEW" column presents the results with the above assumption changes as calculated by NNECO. There are some minor model differences between Stone and Webster and NNECO, but these are insignificant in terms of the final results and the magnitude of the changes as a result of the assumption changes.

For the EAB, the thyroid dose was reduced from 238 to 150 rem. The whole body dose increased slightly from 16.8 to 19.5 rem. For the LPZ, both the thyroid and whole body doses increased by about a factor of 2. All values remain well within the 10CFR100 limits of 300 rem to the thyroid and 25 rem to the whole body.

For the dose to operating personnel in the Millstone Unit No. 2 and Millstone Unit No. 3 control rooms and TSC, the thyroid dose went down in all cases. The whole body dose increased by approximately a factor of 2 in the control rooms and decreased slightly in the TSC. The beta dose in the Millstone Unit No. 2 and Millstone Unit No. 3 control rooms had the biggest increase (factors of 3 and 8, respectively), and the TSC beta dose increased slightly. All doses remain within the General Design Criterion 19 limits of 30 rem to the thyroid and skin and 5 rem to the whole body.

Table 3 presents the EAB and LPZ doses from the CREA. Doses were calculated for both the N and N-1 loop conditions. The proposed changes only affect the dose contribution from the primary side. Secondary side dose contributions are presented to show the change in the total dose consequence.

For the EAB, the thyroid dose decreased by a factor of 2 and the whole body dose was slightly lower for both the N and N-1 loop analysis. For the LPZ, the thyroid dose only increased by about 5 percent and the whole body dose increased by 50 percent from 0.03 rem to 0.046 rem. All doses remain well within the standard review plan Section 15.4.8 acceptance criteria of 75 rem to the thyroid and 6 rem to the whole body.

The proposed design changes will not have any impact on the probability of occurrence of any DBA. However, the proposed changes do increase some of the calculated dose consequences of the LOCA or CREA. As such, they constitute an Unreviewed Safety Question. Since the overall results remain within the acceptable limits of 10CFR100, General Design Criterion 19 and the Standard Review Plan acceptance criteria, NNECO considers these changes acceptable and safe.

II. Potential for Creation of a New Type of Unanalyzed Event

There are no new failure modes associated with the proposed changes. A relatively small change in the containment operating pressure has no direct effect on systems and components. As discussed above, all of the DBAs which could be adversely affected by the proposed changes were reanalyzed. These analyses showed that all of the acceptance criteria remain satisfied. Therefore, the plant response is not significantly altered as a result of the proposed changes and the proposed changes cannot be considered to create a new accident. Therefore, the proposed changes will not create the possibility of an accident of a different type than any evaluated previously in the safety analysis report.

III. Impact on the Margin of Safety

The proposed changes would cause an increase in the maximum containment pressure following a design basis LOCA by 3 psi. The resultant 38.57 psig pressure is well below the containment design pressure of 45 psig. The containment pressure reduces to less than 50 percent of the peak containment pressure within 24 hours after the postulated accident, thus satisfying the Standard Review Plan Section 6.2.1.A. The calculated radiation doses in the EAB, LPZ, and to operating personnel remain well within the 10CFR100 limits, General Design Criterion 19 limits, and the Standard Review Plan acceptance criteria for the postulated LOCA and CREA.

Summary and Conclusions

Based on the foregoing assessment, the proposed design changes herein are considered an Unreviewed Safety Question (USQ) due to an increase in post-accident radiological consequences, but are acceptable and safe.

Table 1
Millstone Unit No. 3
Long-Term LOCA Pressure and Temperature

Time	Pressure (psig)	Pump Suction DER Minimum ESF Temperature (°F)
11 seconds	31.49	246.2
110 seconds	26.98	235.8
171 seconds	27.09	236.0
325 seconds	24.94	231.0
1800 seconds	8.65	171.2
2990 seconds	4.73	139.9
1 hour	4.19	133.2
1 day	4.07	125.8
2 days	3.43	117.7
30 days*	1.75	90.0

*Extrapolated from end of analysis at 22.75 days

Table 2
Millstone Station
Doses (rem) Due to Millstone Unit No. 3 LOCA[1]

EAB (0- to 2-Hour Dose)

Old		New	
Thyroid	Whole Body	Thyroid	Whole Body
2.38(+2)	1.68(+1)	1.50(+2)	1.95(+1)

LPZ (0- to 30-Day Dose)

Old		New	
Thyroid	Whole Body	Thyroid	Whole Body
1.61(+1)	1.59(+0)	3.16(+1)	3.54(+0)

Millstone Unit No. 3 Control Room

Old			New		
Thyroid	Whole Body	Beta	Thyroid	Whole Body	Beta
2.98(+1)	1.8(+0)	3.2(+0)	2.60(+1)[2]	3.05(+0)	2.45(+1)

Technical Support Center

Old			New		
Thyroid	Whole Body	Beta	Thyroid	Whole Body	Beta
2.50(+1)	1.90(+0)	2.10(+1)	7.37(+0)	1.42(+0)	2.49(+1)

(1) The Standard Review Plan Acceptance Criteria for EAB and LPZ dose limits are (1) 300 rem to the thyroid and (2) 25 rem to the whole body. General Design Criteria 19 limits for the Millstone Unit Nos. 2 and 3 control room and the Technical Support Center are 30 rem to the thyroid and skin and 5 rem to the whole body.

(2) Millstone Unit No. 2 low wind speed: 2.8(+1) is now limiting for thyroid.

Millstone Unit No. 2 Control Room

Old			New		
Thyroid	Whole Body	Beta	Thyroid	Whole Body	Beta
2.48(+1)(3)	2.09(-1)(4)	2.67(+0)(5)	1.84(+1)(2)	4.81(-1)(3)	8.29(+0)(4)

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(3) Millstone Unit No. 1 steam line break: 2.624(+1) is limiting for thyroid.

(4) Millstone Unit No. 1 steam line break was limiting [4.20(-1)]. Millstone Unit No. 3 LOCA is now limiting.

(5) Millstone Unit No. 1 steam line break was limiting [5.87(+0)]. Millstone Unit No. 3 LOCA is now limiting.

Table 3
Millstone Unit No. 3
Doses (rem) Due to Control Rod Ejection Accident(1)

EAB 0 to 2 Hours (rem)

N Loop

	Old		New	
	Thyroid	Whole Body	Thyroid	Whole Body
Primary	1.20(+1)	2.70(-1)	4.79(+0)	2.55(-1)
Secondary	1.70(-1)	2.10(-2)	1.70(-1)	2.10(-2)
Total	1.22(+1)	2.91(-1)	4.96(+0)	2.76(-1)

N-1 Loop

	Old		New	
	Thyroid	Whole Body	Thyroid	Whole Body
Primary	1.30(+1)	2.80(-1)	4.79(+0)	2.55(-1)
Secondary	2.00(-2)	4.40(-3)	2.00(-2)	4.40(-3)
Total	1.30(+1)	2.84(-1)	4.81(+0)	2.60(-1)

LPZ 0 to 30 Days (rem)

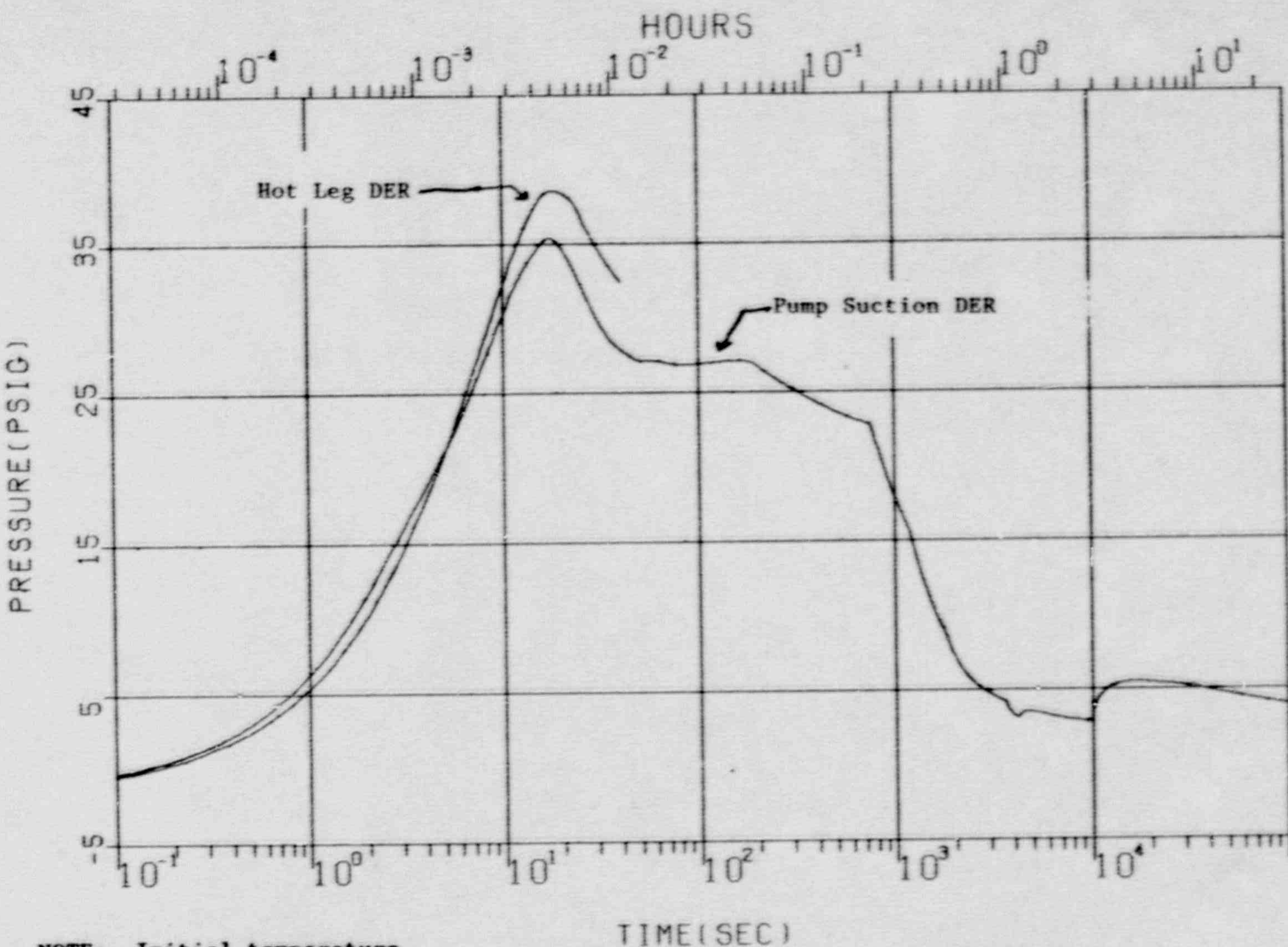
N Loop

	Old		New	
	Thyroid	Whole Body	Thyroid	Whole Body
Primary	7.50(-1)	3.10(-2)	7.90(-1)	4.52(-2)
Secondary	9.10(-3)	1.10(-3)	9.10(-3)	1.10(-3)
Total	7.59(-1)	3.21(-2)	7.99(-1)	4.63(-2)

N-1 Loop

	Old		New	
	Thyroid	Whole Body	Thyroid	Whole Body
Primary	7.60(-1)	2.70(-2)	7.90(-1)	4.52(-2)
Secondary	1.10(-3)	2.30(-4)	1.10(-3)	2.30(-4)
Total	7.61(-1)	2.72(-2)	7.91(-1)	4.54(-2)

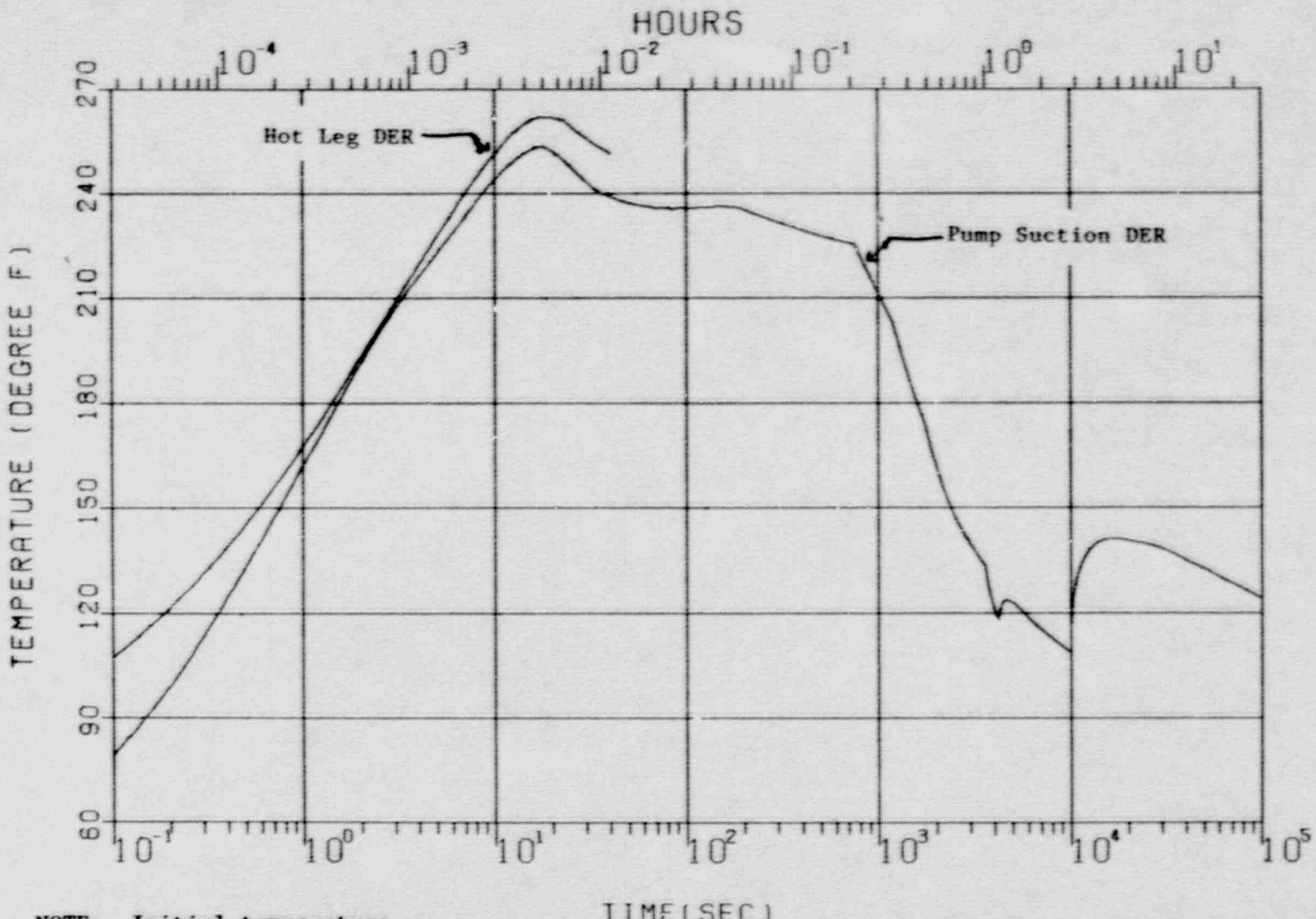
(1) The Standard Review Plan acceptance criteria for the thyroid dose is 75 rem and for the whole body dose is 6 rem.



NOTE: Initial temperature assumed in the analysis has not changed. These conditions are worse case based on parametric study.

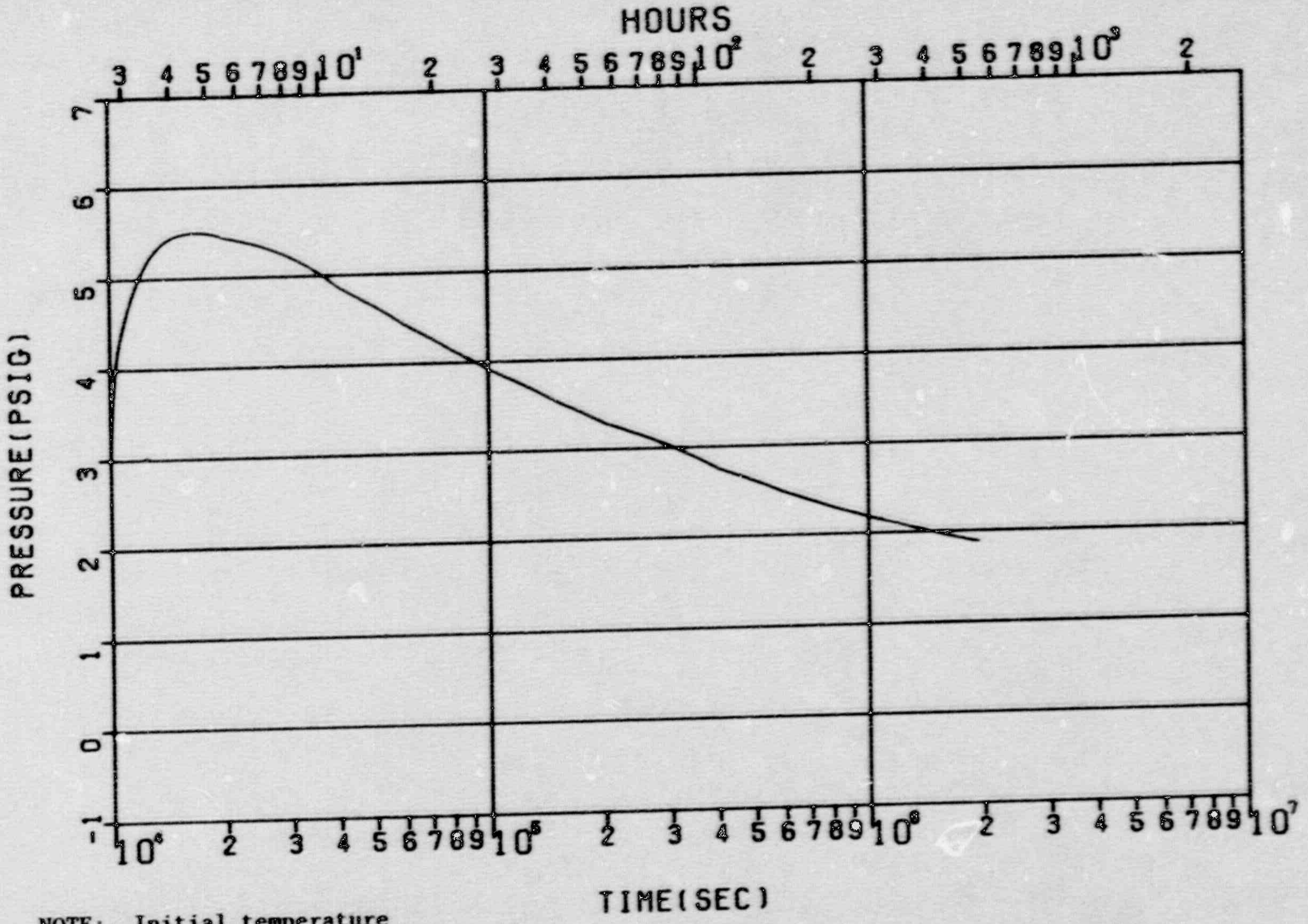
Fig. 1

MILLSTONE-3 CONTAINMENT DEPRESSURIZATION
INITIAL PRESS/TEMP = 14.2PSIA/80F
PSDER(MIN) AND HLDER
PRESSURE(PSIG) VS TIME(SEC)



NOTE: Initial temperature assumed in the analysis has not changed. These conditions are worse case based on parametric study.

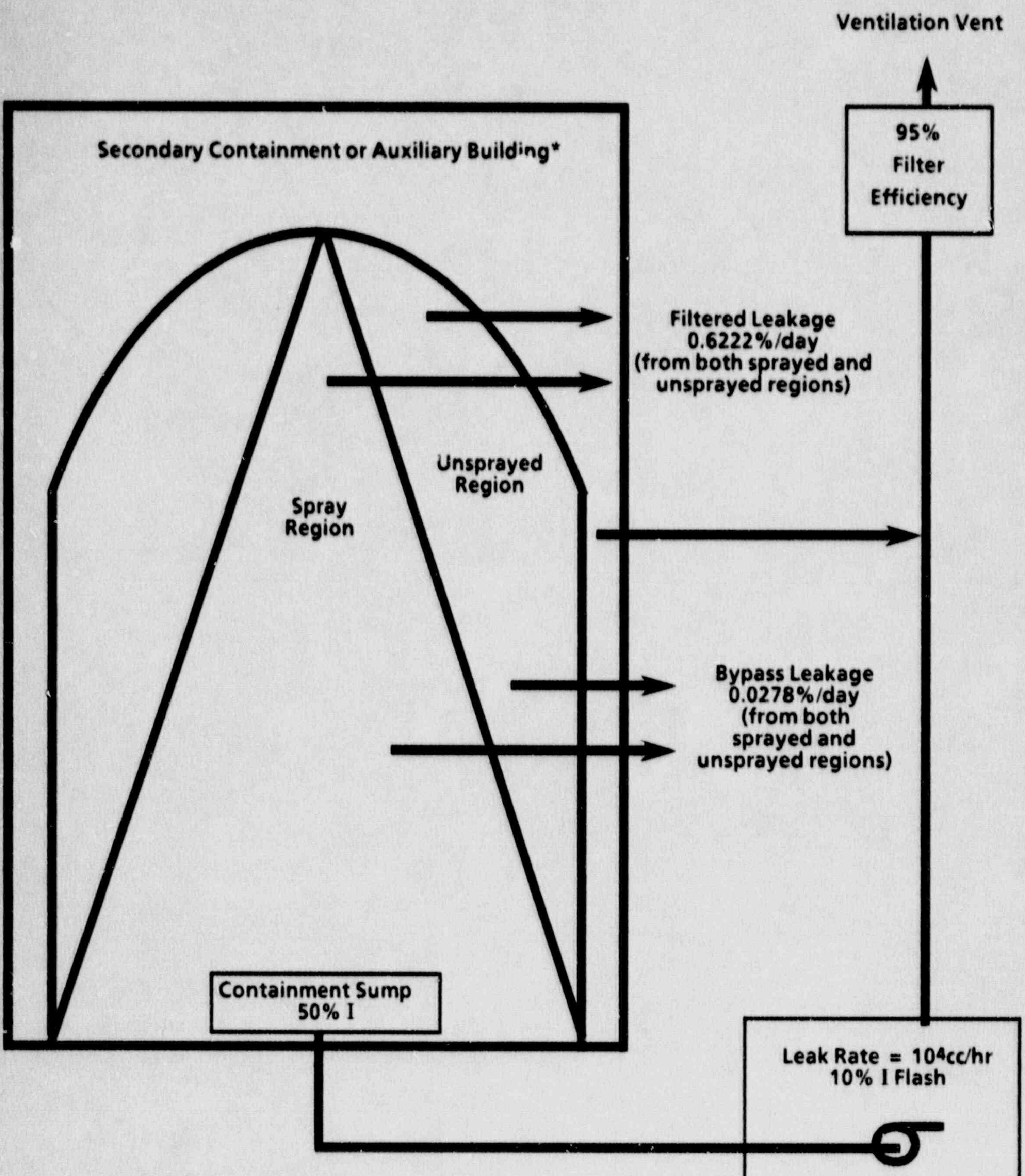
Fig. 2
MILLSTONE-3 CONTAINMENT DEPRESSURIZATION
INITIAL PRESS/TEMP = 14.2PSIA/80F
PSDER(MIN) AND HLDER
TEMPERATURE(DEG F) VS TIME(SEC)



NOTE: Initial temperature assumed in the analysis has not changed. These conditions are worse case based on parametric study.

Fig. 3
MILLSTONE-3 CONTAINMENT DEPRESSURIZATION
INITIAL PRESS/TEMP = 14.2PSIA/80F

Figure 4



* For conservatism, all leakage that is filtered is assumed to originate in the Auxiliary Building and is thus discharged via the ventilation vent. Leakage into the secondary containment would go to SLCRS and to Unit 1 stack. MP1 stack releases would result in lower doses.