March 3, 1994

Docket No. 50-341

Mr. Douglas R. Gipson
Senior Vice President
Nuclear Generation
Detroit Edison Company
6400 North Dixie Highway
Newport, Michigan 48166

Dear Mr. Gipson:

SUBJECT: FERMI 2 - CONTROL CENTER HEATING, VENTILATION AND AIR CONDITIONING (CCHVAC) SYSTEM - REQUEST FOR ADDITIONAL INFORMATION

The staff has received a request for technical assistance from Region III to evaluate concerns identified by the Fermi Senior Resident inspector related to operation and design of the Fermi 2 CCHVAC system. We have completed our response to that request.

While many of the initial concerns have been resolved, the staff was unable to resolve, with the information available to us, certain concerns related to the seismic loading of the CCHVAC system during peak loading periods. These concerns are discussed in Section 3.3 of the enclosed evaluation. We request that you provide additional information to address the concerns enumerated in Section 3.3 of the enclosed evaluation within 90 days of receipt of this letter. If you propose modifications to address any of the concerns, please include a proposed schedule for completion of the modifications.

The reporting/recordkeeping requirements of this letter affect fewer than ten respondents; therefore, OMB clearance is not required under Pub. Law 96-511.

If you have any questions, please contact me at (301) 504-1341.

Sincerely,

Original Signed By

Timothy G. Colburn, Sr. Project Manager
Project Directorate III-1
Division of Reactor Projects - III/IV/V
Office of Nuclear Reactor Regulation

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

REQUEST FOR ADDITIONAL INFORMATION REGARDING THE EVALUATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO CONTROL CENTER HEATING, VENTILATION AND AIR CONDITIONING SYSTEM

DETROIT EDISON COMPANY

FERMI-2

DOCKET NO. 50-341

1.0 INTRODUCTION

The Director, Division of Reactor Projects, Region III, requested that the Office of Nuclear Reactor Regulation (NRR) provide technical assistance regarding Fermi-2 control center heating, ventilation and air conditioning (CCHVAC) system operability.

The NRR staff visited the Fermi-2 nuclear facility from October 21-24, 1991, to walk down the CCHVAC system, review design documents, and interview the licensee personnel to resolve the outstanding issues on the CCHVAC system identified in the TIA. These issues are:

- Structural integrity of CCHVAC ductwork.
- Pressure testing of CCHVAC ductwork outside of the control room envelope and subject to negative pressures.
- Chlorine detection mode interaction with other mode of CCHVAC operation.
- Operability/unreviewed safety question.

In addition, the licensee has submitted two changes to the Technical Specification regarding the CCHVAC system.

2.0 BACKGROUND

One of the TIA concerns was the adequacy of the CCHVAC chlorine detection and actuation (CDA) system corrective action for deficiencies identified in License Event Report (LER) 90-006 (Ref. 1) and LER 90-006-01 (Ref. 2).

A second concern was the reliability and availability of the instrumentation the operator would use to detect a single failure in the CCHVAC system during a loss-of-coolant accident (LOCA) event with a radiation release that required operator action. This operator action is required to be taken within 30 minutes to prevent operators' radiation exposure from exceeding the guidelines.

A third concern, not part of the TIA, was an inadequate calculation of the chlorine concentration in the control room while in the recirculation mode. Also, a Fermi-2 Immediate Notification, 10 CFR 50.72, Report (Ref. 3) identified a potential unanalyzed condition regarding operator protection from a chlorine release.

A fourth concern pertains to the structural integrity of the CCHVAC ductwork and can be summarized as follows:

1. The ductwork at Fermi-2 was originally designed by the licensee for ±6" water-gage (WG) pressure. Toward the end of the construction process, a recirculation train, including recirculation fans, was added to the CCHVAC system; the maximum peak internal pressure on the suction side of these fans thus increased from -6" WG to -22" WG (actually a vacuum). However, the design/construction specification to which the ductwork was initially designed and constructed was not changed to reflect this pressure change, so that the additional ducts were fabricated with the same gage thickness as that of the existing ducts (18 gage). The design specification was based on the national standard for heating, ventilation, and air conditioning (HVAC) construction, Sheet Metal and Air Conditioning Contractors National Association (SMACNA) High Velocity Duct Construction Standards (Ref. 4). For pressures <-2" WG the design, construction, and testing requirements were supposed to be based on the standard ORNL-NSIC-65 (Ref. 5). This standard was not used in the ductwork design specification, although it is stated as part of the licensing basis for Fermi-2 (Supplement 5 to the SER, NUREG-0798). Based on this standard, the gage thickness should have been specified as 16 gage.

2. Although the CCHVAC system is categorized as Seismic Category 1, there apparently was no documentation verifying the seismic qualification of this system to the postulated site-specific earthquake (SSE) for this site.

3. The Oak Ridge National Laboratory standard required pressure proof-testing to 1.5 times the maximum positive and negative fan pressures. In this case the proof-tests should have been performed to +22.5" WG and -33" WG. No such tests were apparently performed.

Based on these concerns, the licensee reevaluated the seismic qualification and pressure integrity of the CCHVAC system to a current standard, ANSI/ASME N509-1980 (Ref. 6). The licensee concluded that based on the existing gauge thickness the ductwork is acceptably qualified for the expected seismic loading. The licensee also concluded that the analysis met the intent of the standard for ductwork proof-testing.

3.0 EVALUATION

3.1 Chlorine Detection and Isolation System

In 1977, it was assumed that there would be on site a railroad tank car containing chlorine; therefore, the CDA system was added to the CCHVAC system. The CDA system was designed to protect the operators from a chlorine leak. The method of chlorine storage was changed from a railroad tank car to 1-ton cylinders; however, a reanalysis for the need of the CDA system was not made. The threat from chlorine leak was considered to be more of an immediate threat to the operators than radiation exposure from a LOCA. The detection of chlorine by either instrument, located in the normal air intake to the CCHVAC system, causes isolation of both the normal and two emergency air intakes to the CCHVAC system.

In 19\2, it was discovered that when in the chlorine mode there was no way to either automatically or manually transfer from the chlorine mode to the recirculation mode. The recirculation mode is designed to protect the operator from radiation exposure during a LOCA event. The normal air intake is isolated and air is supplied via either of two emergency air (North-South) intakes. This air flows through a high-efficiency particulate air (HEPA)-charcoal filter and keeps the control room pressurized. In addition, air from the control room is recirculated through a separate HEPA-charcoal filter train. A CCHVAC system modification was made to permit the operator to manually transfer from the chlorine mode to the recirculation mode.

In 1989, the old chlorine detectors were replaced with new detectors that were easier to maintain and hardened against radio frequency interference. These new chlorine detectors were installed to duplicate the existing design, i.e., auto initiation of chlorine mode can be manually returned to recirculation mode by operator action.

On July 26, 1990, the licensee's safety system functional inspection (SSFI) team identified that a single failure of a chlorine detector could prevent automatic actuation of the recirculation mode that is required to protect the operators during a LOCA event with a radiation release. The CCHVAC system as designed did not meet the requirements of Title 10 Code of Federal Regulations (CFR) Part 50, Appendix A, General Design Criterion 19 that states in part "Adequate radiation protection shall be provided...without personnel receiving radiation exposure in excess of 5 rem whole body, or its equivalent to any part of the body, for the duration of the accident."

This design deficiency also violated the requirements of 10 CFR 50.55a which endorses The Institute of Electrical and Electronics Engineers (IEEE) Standard: "Criteria for Protection Systems for Nuclear Power Generating Stations,' (IEEE-279). IEEE Standard 279 requirement section 4.2, Single Failure Criterion states: "Any single failure within the protection system shall not prevent proper protective action at the system level when required." The single failure of either chlorine detector would prevent the CCHVAC system from going into the recirculation mode automatically if there was a LOCA and a radiation release.

The licensee submitted by letter LER-90-006 (Ref. 1), and LER-90-006-01 supplement (Ref. 2) addressing the above deficiency, root cause, short-term and long-term corrective action in accordance with the reporting requirements of 10 CFR 50.73.

The licensee prepared a Deviation Event Report (DER 90-0455) to investigate and evaluate the potential unanalyzed condition. An engineering functional analysis was performed to support the operability determination. The analysis concluded that the control room personnel would not be exposed to the post-LOCA thyroid dose limit during the 30 days duration provided the operator manually transferred the CCHVAC to the recirculation mode, should the CCHVAC system be in the chlorine mode, not later than 10 minutes from the start of the LOCA with a radiation release.

An eng ering design change was prepared to allow the automatic control logic for the recirculation mode of the CCHVAC to have priority over the chlorine mode. An Engineering Design Package (EDP-11889) was written to implement the modification to have the recirculation mode of the CCHVAC system be automatically selected in preference to the chlorine mode. This EDP was approved March 20, 1991. The EDP included test instructions to:

- Verify that auto recirculation mode of the CCHVAC will have automatic priority over the chlorine mode.
- Verify that auto chlorine mode will have automatic priority over manually selected recirculation mode. (Note 1)
- Functionally test the CCHVAC mode select switch and reset pushbutton. Verify the logic is designed to always require depressing the reset pushbutton to initiate the mode selected. (Note 2)

Note 1: If the operator selected the recirculation mode manually and a chlorine detector actuation occurred, the CCHVAC system would automatically go to the chlorine mode; however, if the operator wanted to return to the recirculation mode he could do so manually.

Note 2: It was determined that the reset pushbutton was not required to be depressed to go from one mode to another. The licensee made modifications to require that the reset pushbutton be depressed in order to transfer from one mode to another.

The licensee prepared an Engineering Change Request (ECR-11889-1) which was approved on May 2, 1991. The ECR was made to correct a sneak circuit that would not allow reset of two auto recirculation seal-in relays when the reset pushbutton was depressed.

The licensee observed during the SSFI inspection that it was not possible to complete its review of the chlorine concentration in the control room while in the recirculation mode because the document package (calculations) is missing a number of internally referenced pages/exhibits. After reviewing the design calculation it was found to be incorrect. As the result of the above evaluation, the twelve (1-ton) chlorine cylinders were removed from the circulating water pump house located 1000 feet from the control room and relocated to the Fermi-1 Plant service building located 1100 feet from the control room. The additional buildings between the control room and the Fermi-1 Plant service building would help disperse any chlorine gas release. The new design calculation (DC-5252) to assess the control room habitability during an accidental chlorine release shows that the worst-case chlorine concentration will be below regulatory limits with no chlorine cylinders located at the circulating water pump house.

The licensee prepared a safety evaluation (SE 90-0142) dated March 13, 1991. The SE addressed the following safety concerns in reference to the modification of EDP 11889.

- There is no increase in the probability or consequences of an accident previously evaluated in the updated final safety analysis report (UFSAR) nor an increase in probability of an accident of a different type than previously evaluated in the UFSAR.

- There is no increase in the probability or consequences of a malfunction of equipment important to safety previously evaluated in the UFSAR nor an increase in probability of equipment malfunction of a different type than any previously evaluated in the UFSAR.

- There is no reduction in the margin of safety as defined in the bases for any technical specification.

A review of the Fermi-2 Technical Specification "Instrumentation - Chlorine Detection System - Limiting Condition for Operation" 3.3.7.8 was made. It is noted in the action statement that reference is made to "...initiate and maintain isolation of all control room emergency intakes..." This should read "...initiate and maintain isolation of the normal air intakes and both emergency air intakes..."

The licensee performed a Quality Assurance Audit number 91-0185 of the breathing air supply system P5003. The audit identified a number of deviations from the UFSAR and Regulatory Guide (RG) 1.95. RG 1.95 provides guidance for operator protection from a chlorine release event. These deviations are documented in the licensee's DER No. 91-0783 initiated October 7, 1991, and are summarized as follows:

- The UFSAR states: The plant breathing air system will include outlet connections on the control room panels for use by the control room operators.

- The UFSAR states: Breathing apparatus for the control room operators will be readily available in the control room.

  The 12 air tanks that supply the breathing air system are located 1 floor above the control room in the auxiliary building and had their isolation valves closed. These tanks were isolated because:

  - The flex hose between the tanks and the manifold leak.

  - The pressure regulating valve in the control room may leak.

- When opening the pressure regulator any of the five connections on the manifold that does not have an air mask connected will bleed the air from the system.

• The UFSAR states: That five self-contained breathing apparatuses (SCBA) are located in the control room. The SCBAs were stored outside of the control room.

The licensee's corrective action was as follows:

• The UFSAR was revised to correctly indicate that the installed breathing air system consists of five connection points from a manifold located on the south wall of the control room.

• The valves at each tank have been opened. The license has:

  - Installed flex hoses at the air tanks that will not leak.

  - Installed an isolation valve before the regulating valve in the control room.

  - Provided quick disconnects for the connection manifold in the control room so less than five masks may be connected without air from the system.

• The DER recommendation was to do an SE to determine where the SCBAs should be stored in the control room. Based on its determination, the licensee subsequently moved the SCBAs to a closet in the control room.

On October 8, 1991, the licensee telephoned the Nuclear Regulatory Commission (NRC) Operational Center (10 CFR 50.72 report, Message No. 91-022A) to make an information call based on the potential of an unanalyzed condition concerning protection of operators against an accidental chlorine release.

In addition to the above deviations from the UFSAR, compliance with RG 1.97, Regulatory Position C.4.c may not have been met because there were no SCBAs in the control room and the breathing air system was isolated at the air tanks in the auxiliary building. RG 1.97 Position C.4.c states in part: "...that operators can begin using the apparatus within 2 minutes after an [chlorine detection] alarm." The DC-5252 did not provide chlorine toxic concentration in the control room after 2 minutes because it was assumed that the operator would be using breathing equipment within 2 minutes after a chlorine detection alarm.

A new calculation No. 91-0151 dated October 10, 1991, was made to determine the length of time to reach the toxic limit of 15 ppm of chlorine as specified in RG 1.95. This calculation used input from DC-5252 and concluded that it would take 8 minutes to reach the toxic limit from the time the chlorine detector alarmed. This time is based on the removal of the 12 (1-ton) chlorine tanks from the circulating water pump house.

The Scott breathing hose and face mask which can be connected to the emergency bottled air system also has a tank that holds 3 minutes of air. The licensee had an operator put on the air supply, exit the control room, go to the fourth floor of the auxiliary building, key card in, open the isolation valves of the 12 air storage tanks, frisk for radiation, and key card back into the control room before his air supply expired. The licensee proposed to verify that the lengths of breathing air hoses are adequate to allow the operators to perform any required manual control action.

Although there were no procedures in place to address the need for breathing equipment in the control room during a chlorine accident, the operators were trained to use breathing equipment. It was common knowledge by the operators that the emergency air supply tanks were valved shut and an operator would have to go to the auxiliary building to open the valves.

Based on the toxic limit time of 8 minutes from calculation No. 91-0151 (Ref. 15) and walkdown by the operator discussed above, the licensee concluded that the above actions are not part of the intended design of the chlorine protection system at Fermi-2; however, it is recognized that under the postulated circumstances, these types of operator actions are prudent and would be expected to occur. Although DER No. 91-0783 indicated that the concerns identified were outside of the plant design as analyzed, plant safety was not significantly compromised; therefore, the 10 CFR 50.72 report, Message Number 91-022A, associated with the breathing air system required in the control room, was withdrawn on October 11, 1991.

3.2 Single Failure and Action of CCHVAC System

During the recirculation mode the CCHVAC system receives 1800 cfm makeup air from either the North or South emergency intake. The air passes through a HEPA and charcoal filter bank. This air is then combined with 1200 cfm recirculated air which passes through a recirculation HEPA and charcoal filter bank to keep the control room at 1/8-inch WG pressure. The air return from the control room is ducted to the return air fans located outside the control room pressure boundary. The return air flows through the HVAC units and is returned to the control room. Since the HVAC units, return air fans, recirculation filtration unit and the emergency make-up air filtration units are located outside the control room pressure boundary, portions of the duct that is located outside of the control room pressure boundary are normally at a negative pressure which results in unfiltered in-leakage. This negative pressure will increase and the unfiltered leakage will also increase when there are single failures of active components of the CCHVAC.

CCHVAC duct leakage was tested during refueling outage 1 and was found to be as high as 22.57 cfm with a active component single failure in the system and 9.2 cfm when no single failure was present. The licensee determined that the 30-day integrated leakage rate would not exceed the design limit of 10 cfm provided the operator took manual action to reconfigure the system to reduce the negative pressure caused by the active component failure.

The assumption in the leakage calculation is that the operator must identify the single failure that causes the excessive leakage because of increased negative pressure and realign the CCHVAC system. Although redundant equipment will start as the result of a LOCA signal, one division will be shut down by the operator. An increase in negative pressure results at various locations in the duct work when any of the following active components of the operating division fail:

Division 1

- return air fan suction damper AO F039A fails closed;
- return air fan T4100C031 stops;
- return air fan shutoff damper AO F039B fails closed;
- return air modulation damper AO F031A fails closed;
- multizone shutoff damper AO F035 fails closed.

Division 2

- return air fan suction damper AO F040A fails closed;
- return air fan T4100C030 stops;
- return air fan shutoff damper AO F040B fails closed;
- return air modulation damper AO F031B fails closed;
- multizone shutoff damper AO F038 fails closed.

The result of any of the above failures in the operating division will be a control room temperature increase and pressure decrease. The licensee stated that the control room temperature would increase to over 100 degrees F in 10 minutes. There is also a control room pressure alarm, T41K048A and B, and a control room pressure recorder QA1M. Damper position indication lights and fan operating indication lights are available on the control room operating panel. The staff has determined that the resultant indication provide sufficiently rapid notification to the operators of the active single failure such that corrective actions can be taken within a reasonable period of time.

3.3 Structural Integrity Concerns

The licensee's reevaluation of the overall CCHVAC ductwork structural integrity was performed by two separate sets of calculations. These calculations were provided to the staff by the licensee as Design Calculation (DC) 5089, but were actually performed by Hopper and Associates (H&A), consultants to the licensee.

3.3.1 Evaluation of Calculations Reported in H&A Report AH-05/89-686

This set of calculations consisted of four duct systems, which were considered as flexible. These systems are located on the suction side of the recirculation filter unit fans, and may experience significant negative internal pressures.

3.3.1.1 Seismic Analysis

The seismic analysis of these systems was performed using standard linear elastic response spectrum methodology. Finite element models were developed based on the geometry specified in the original design calculations (initially performed by Fluor-Pioneer), and consisted of concentrated mass points connected by beam elements to represent the ducts, and spring elements to represent the supports. External concentrated loads were also specified at certain locations. Some systems consisted of round and square ducts, while other systems consisted of square ducts only. No reconciliation with the as-built geometries was apparently performed to verify that the analysis evaluated the as-built configurations.

These analyses were found to contain the following deficiencies:

1. The seismic analysis was performed using full section properties (moment of inertia and area) of the square ducts. Ducts are essentially thin-walled tubular members. For members where the compression flange width-to-wall-thickness ratio exceeds certain values, the calculation of the natural frequencies, displacements and internal loads are more appropriately based on reduced section properties which depend on the "effective width" of the compressive flange. Under alternating biaxial loading this concept applies to all plates comprising the duct. This has the effect of increasing the flexibility of the system and reducing the natural frequencies. An "effective width" was determined but not used in the response spectrum calculations. It thus appears that the internal moments and the deflections resulting from the seismic loading may have been underestimated.

2. The section properties and the stresses were calculated based on the thickness of the galvanized sheet metal. These should be based on the thickness of the bare metal.

3. In all analyses the beam bending stresses were based on one significant moment. It isn't clear that the highest longitudinal stresses were calculated, based on possible biaxial moment loading and axial loading.

4. There is no discussion of potential stress intensification or local deformation effects at "tee" type connections of equal or different size ducts, elbows and "wye" fittings and rectangular-to-round transitions.

5. The critical stresses and moments for plates in bending (representing the webs) did not consider the interaction with transverse compressive loading. These critical values may therefore be overestimated.

6. The calculation of the edge membrane and bending stresses in panels did not include the seismic inertia loads acting on the panels.

7. No discussion of the seismic qualification of the filter housings, and of the supports or the attachments to the building was presented.

8. In evaluating the seismic spectra on which the dynamic analysis is based, it appears that the vertical spectra are plotted with incorrect horizontal coordinates. The correctness of the spectral values input in the dynamic analysis is therefore uncertain.

9. The analysis states that there will be localized yielding under SSE loading but that the primary membrane stress will not exceed the allowable stress (0.9Sy). In view of the above, this assertion cannot be verified.

10. The structural integrity and air-tightness of the brazed joints in the longitudinal corner and middle seams was not evaluated. These are subject to direct longitudinal stresses due to beam bending, shear stresses due to beam torsion caused by seismic loading, and transverse edge bending and membrane stresses due to internal pressure and seismic loading. There is also a potential of fatigue failure due to repeated starts of the fans over the life of the plant which has not been evaluated.

11. The structural integrity and air tightness of the transverse joints was not evaluated.

3.3.1.2 Internal Pressure

An evaluation of the square ducts subjected to internal pressure was also performed. The bending stresses at the corners under the largest negative pressure differential (-22 in. WG) were determined to exceed the elastic limit, indicating local plastic deformation. At the center of the plates the membrane stresses were stated to be below the allowable stress. On this basis it was concluded that this local plastic deformation at the corners is of a secondary nature, and that the intent of ANSI/ASME N509-1980 is met. However, these ducts are fabricated with "Pittsburgh Lock" or "Corner Lap" type corners, and may also contain middle longitudinal "Acme Lock" type seams (Ref. 10). The structural integrity of these seams was not evaluated, either under negative or positive pressure or combined with dead weight (DW) and SSE loading. The air tightness of these ducts therefore cannot be assured.

3.3.2 Evaluation of Calculations Reported in H&A Report AH-09/89-696

This set of calculations consisted of 55 duct systems. The objective of these analyses was to determine the maximum internal pressure differential capabilities (apparently both positive and negative) of these ducts under DW loading, and combined DW and SSE loading, when limited by the stress allowables in ANSI/ASME N509-80.

The analyses used the existing calculations performed by Fluor-Pioneer, Inc., the original architect/engineer for this plant. In these calculations the ducts were designed based on DW and operating basis earthquake (OBE) loading only, without internal pressure. One system (2850-2) was analyzed as a flexible system, since its lowest frequency was determined to be 5.7 Hz. All other systems were analyzed by the static approach on the assumption that their natural frequencies were higher than the zero-period acceleration (ZPA) frequency (33 Hz) and thus could be considered as rigid.

The existing internal loads due to seismic loading were amplified by the product of the ratio of the SSE ZPA to the OBE ZPA and the ratio of the peak response acceleration to the ZPA, presumably of the SSE. The damping used for this calculation was not specified. However, there are two horizontal and one vertical component for each earthquake, and these are also dependent on the evaluation within the building. It is unclear how these directional components were actually applied in these calculations.

Details of the calculations to determine the maximum permissible internal pressure from the stresses under combined loads were not reported. Maximum permissible internal pressures are shown for two load combinations: DW and DW+SSE. An examination of the stated values indicates that for the rectangular ductwork the permissible internal pressure under combined DW+SSE loading is higher than under DW alone; in fact, in some sections it is considerable higher (in one case about 20 times larger). The basis for these results has not been presented. Since the details of these calculations are not shown, it is not possible to assess the quality or validity of these calculations, and the maximum allowable pressure results must therefore be considered as questionable.

For circular ducts the maximum allowable negative pressure is apparently total vacuum. The basis for this result was not presented, so it isn't clear if it was determined based on the interaction with simultaneous tensile and compressive axial loads, and if manufacturing imperfections were considered. These may have a significant effect on the allowable external pressure.

The report also stated that some of the rectangular duct panels are loaded beyond their "bifurcation" point during an SSE, and that this is structurally inconsequential since the redistributed stresses remain low. This statement is acceptable only if it is shown that the maximum redistributed stress remains below the allowable stress (0.9Sy) under the SSE loading conditions.

Likewise, the analysis of system 2850-2 indicated that this system responded inelastically at one location, and it was thus concluded that a ductility factor of 2 was sufficient to achieve the required pressure load. The meaning of this is unclear since it implies that somewhere in this system the highest stress calculated on an elastic basis was about 2Sy, considerably exceeding the maximum allowable stress.

The analyses in this report address only the ductwork. No safety calculations of the supports, or calculated safety margins determined in such calculations, have been reported. The design calculation report DC-5089 states that all hangers, stiffeners and supports meet the stress criteria of ANSI/ASME N509-80. No documentation has been provided to support this statement.

4.0 CONCLUSION

Based on our evaluation above the staff has determined the following:

1. The licensee has not adequately demonstrated that the structural integrity of the CCHVAC system conforms with the criteria of ANSI/ASME N509-80, when subjected to the specified maximum positive or negative internal pressure, DW and SSE loading. This applies to both the ductwork and the supports.

2. The structural integrity and leak tightness of the longitudinal seams and transverse joints in both rectangular and circular ducts under maximum positive or negative internal pressure and/or SSE loading has not been demonstrated.

3. The staff has determined that the corrective action of the identified deficiency of the chlorine detection system, LER 90-006, (Ref. 1 and 2) was adequate. The licensee should verify that the location of the SCBA equipment in the control room is adequate and verify that the length of the breathing air hoses are adequate to allow the operators to perform any required manual control action.

Principal Contributors: M. Hartzman
T. Chandrasekaran
F. Paulitz

Date: March 3, 1994

5.0 REFERENCES

1. William G. Orser, Sr. V.P. Detroit Edison Company, letter to NRC, NRC-90-0140, 10 CFR 50.73 Licensee Event Report LER No. 90-006, August 27, 1990.

2. William G. Orser, Sr. V.P. Detroit Edison Company, letter to NRC, NRC-91-0027, 10 CFR 50.73 Licensee Event Report LER No. 90-006-01, March 11, 1991.

3. Fermi-2, Immediate Notification 10 CFR 50.72 report by telephone to NRC Operation Center, at 16:30, Message 91-022A, information only, "Potential Unanalyzed Condition Regarding Operator Protection From a Chlorine Release," October 8, 1991.

4. SMACNA (Sheet Metal and Air Conditioning Contractors National Association), "High Velocity Duct Construction Standards," 1969, Vienna, VA.

5. C. A. Burchsted and A. B. Fuller, "Design, Construction and Testing of High-Efficiency Air Filtration Systems for Nuclear Application," Oak Ridge National Laboratory Nuclear Safety Information Center Standard ORNL-NSIC-65, January 1970.

6. American Society of Mechanical Engineers, ANSI/ASME N509-1980, "Nuclear Power Plant Air Cleaning Units and Components," New York, NY.