UNITED STATES
NUCLEAR REGULATORY COMMISSION
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Docket No. 50-244
LS05-82-02-070

Mr. John E. Maier, Vice President
Electric and Steam Production
Rochester Gas & Electric Corporation
89 East Avenue
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Dear Mr. Maier:

SUBJECT: SYSTEMATIC EVALUATION PROGRAM TOPIC III-4.C, INTERNALLY GENERATED MISSILES - R. E. GINNA

Enclosed is a copy of our final evaluation of SEP Topic III-4.C. This evaluation compares your facility as described in the Safety Analysis Report you supplied on December 29, 1981 and other information on Docket No. 50-244 with criteria currently used by the staff for licensing new facilities. The evaluation identifies portions of systems which are inadequately protected from internally generated missiles or which require additional review by the licensee. You are requested to examine the facts upon which the staff has based its evaluation and inform us if your facility differs from that assumed in our report within 30 days. If no comments are received within that time, we will assume this report to be correct.

This evaluation will be a basic input to the integrated assessment of your facility unless you identify changes needed to accurately reflect the as-built conditions at your facility.

Sincerely,

Dennis M. Crutchfield

Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
Division of Licensing

Enclosure:
As stated

cc w/enclosure:
See next page

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SAFETY EVALUATION
R. E. GINNA NUCLEAR POWER PLANT
SYSTEMATIC EVALUATION PROGRAM
TOPIC: III-4.C INTERNALLY GENERATED MISSILES

I. INTRODUCTION

Missiles which are generated internally to the reactor facility (inside or outside containment), may cause damage to structures, systems and components that are necessary for the safe shutdown of the reactor facility or accident mitigation to the structures, systems and components whose failure could result in a significant release of radioactivity. The potential sources of such missiles are valve bonnets, and hardware retaining bolts, relief valve parts, instrument wells, pressure containing equipment such as accumulators and high pressure bottles, high speed rotating machinery, and rotating segments (e.g., impellers and fan blades).

Scope of Review

The scope of review is as outlined in the Standard Review Plan (SRP) Section 3.5.1.1, "Internally Generated Missiles (Outside Containment)," and SRP Section 3.5.1.2, "Internally Generated Missiles (Inside Containment)." The review specifically excludes SRP Section 3.6.1, "Plant Design for Protection Against Postulated Piping Failures in Fluid Systems Outside Containment," 3.6.2, "Determination of Break Locations and Dynamic Effects Associated with the Postulated Rupture of Piping," as well as those SRP sections dealing with natural phenomena (including missiles generated by natural phenomena), missiles generated outside the facility, and turbine missiles.

II. REVIEW CRITERIA

The acceptability of the design of protection for facility structures, systems, and components from internally generated missiles is based on meeting the following criteria:

1. General Design Criterion 4, with respect to protecting structures, systems and components against the effects of internally generated missiles to maintain their essential safety functions.

2. Regulatory Guide 1.13, as related to the spent fuel pool systems and structures being capable of withstanding the effects of internally generated missiles, and preventing missiles from impacting stored fuel assemblies.

3. Regulatory Guide 1.27, as related to the ultimate heat sink being capable of withstanding the effects of internally generated missiles.

III. RELATED SAFETY TOPICS AND INTERFACES

Review Areas Outside the Scope of this Topic

As stated previously, this review specifically excludes the following:

1. SRP Section 3.6.1, "Plant Design for Protection Against Postulated Piping Failure in Fluid Systems Outside Containment" - This matter will be covered under Safety Topic III.5.B, "Piping Break Outside Containment."

2. SRP Section 3.6.2, "Determination of Break Locations and Dynamic Effects Associated with the Postulated Rupture of Piping" - This matter will be covered under Safety Topic III-5.A, "Effects of Pipe Break on Structures, Systems and Components Inside Containment."

3. Natural Phenomena - This matter will be covered under Safety Topics III-6, "Seismic Design Considerations" and III-4.A, "Tornado Missiles."
4. Turbine Missiles - This matter will be covered under Safety Topic III-4.B, "Turbine Missiles."

Interfaces with Other SEP Safety Topics

Satisfactory resolution of the following safety topics will depend, at least in part, on the satisfactory resolution of this topic:

1. Topic VII-3, "Systems Required for Safe Shutdown"
2. Topic VII-4, "Effects of Failure in Non-Safety Related Systems On Selected Engineered Safety Features"
3. Topic IX-1 "Fuel Storage"
4. Topic IX-3 "Station Service and Cooling Water System"
5. Topic II-3.C "Safety-Related Water Supply (Ultimate Heat Sink)"

IV. REVIEW GUIDELINES

Systems and components needed to perform safety functions were identified as those listed in SRP Section 3.2.2, "Systems Quality Group Classification."

1. Systems needed to performed safety functions (safe plant shutdown or accident mitigations);
   a. Reactor Coolant System
   b. Emergency Core Cooling Systems
   c. Containment Heat Removal and Atmosphere Cleanup Systems
   d. Chemical and Volume Control System (portions of)
   e. Residual Heat Removal System
   f. Component Cooling Water System

g. Service Water System

h. Diesel Generator Auxiliary Systems

i. Main Steam System (portions of)

j. Feedwater and Condensate Systems (portions of)

k. Auxiliary Feedwater Systems

l. Standby Auxiliary Feedwater System

m. Ventilation System for Vital Areas

n. Combustible Gas Control System

o. Refueling Water Storage Tank

2. Systems whose failure may result in release of unacceptable amounts of radioactivity:

a. Spent Fuel Pool Cooling and Cleanup System

b. Sampling System

c. Waste Disposal System

d. Containment Purge System

e. Instrument and Service Air Systems

3. Additionally, electrical systems, which are necessary to support those fluid systems needed to perform safety functions are:

a. Diesel Generators

b. Station Batteries

c. 480V Switchgear and Relay Rooms

d. Control Room

e. Cable Spreading Room

V. REVIEW AND EVALUATION

Systems Needed to Perform Safety Functions

1. Reactor Coolant System

The reactor coolant system (RCS) serves as the pressure retaining boundary for the reactor coolant and is comprised of a reactor pressure vessel and two parallel heat transfer loops. Each loop contains one steam generator and one pump, connecting piping and instrumentation. The pressurizer and associated safety and relief valves are connected to one of the reactor hot legs via the surge line. Pressurizer spray lines and associated valves are connected to the top of the pressurizer from one of the reactor coolant cold legs. The purpose of the pressurizer is to maintain primary coolant pressure and compensate for coolant volume changes as the heat load changes. All components of the primary coolant system are located within the containment building. Overpressure protection is provided to assure the coolant system pressure does not exceed design limits.

The reactor closure head and the reactor vessel flange are joined by 48 six-inch diameter studs. It is unlikely that any of the studs would become a missile since they are not subjected to direct reactor pressure and, therefore, are not exposed to sufficient pressure to create an accelerating force sufficient to cause them to become missiles.

The pressurizer safety and relief valves, which are mounted atop the pressurizer, have the potential for becoming missiles. However, the position of the pressurizer within a concrete compartment is such that any missiles generated because of a failure of these valves would not be likely to damage other components or piping of the reactor coolant system. All valves on the pressurizer spray line are located within the loop or pressurizer compartments, and would thus not be expected to damage any safety-related equipment in the event of a valve failure.

Control rod drive assemblies are mounted on the top of the reactor vessel and are considered as an extension of the reactor vessel head. A 1-1/4" thick steel missile shield is placed over the control rods during operation as protection against missile damage to safety systems caused by impacting control rod drives or reactor vessel head studs.

Instrumentation requires some penetration into the reactor coolant system. These penetrations are small and generally take the form of welded wells. Because of their size and orientation, serious damage to the RCS is highly unlikely.

The possibility that missiles may result from destructive overspeeding of one of the primary coolant pumps in the event of a pipe break in the pump suction or discharge was also reviewed. Potentially damaging impeller missile ejection from the broken pipe is minimized by a massive steel pump casing. Generation of missiles from overspeed of the motor, flywheel and the impeller is a generic problem which will be reviewed under Task Action Plan B-68, "Pump Overspeed During a LOCA." This will be discussed in SEP Topics III-10.B and V-7.

The two steam generators have manways held in position by studs on the primary and secondary sides of the shell. These small diameter studs are subject only to stored elastic energy and thus are not considered to be credible missiles.

In summary, relative to the Reactor Coolant System, it is considered that the likelihood of missile generation, and resultant damage, is minimized by virtue of equipment design features, component arrangement and compartmentalization.

2. <u>Emergency Core Cooling System</u>

The emergency core cooling system (ECCS) serves as the means of injecting water for core protection in the event of reactor coolant system water loss. The ECCS is comprised of the high pressure safety injection (HPSI) system, a low pressure safety injection (LPSI) system (also Residual Heat Removal - RHR) and accumulator tanks. HPSI flow and accumulator flow is directed to the reactor coolant system through the two cold leg reactor inlet pipes. The high-head system consists of three pumps, each rated at 300 gpm. Two passive accumulator tanks containing borated water, pressurized with nitrogen to 700 psig, are provided inside the containment building. The LPSI system injects directly into the reactor vessel upper plenum via two nozzles on opposite sides of the vessel. The low-head system consists of two pumps, each rated at 200 gpm.

The initial source of water for the high-head pumps is the Boric Acid Storage Tanks. Suction is automatically transferred to the Refueling Water Storage Tank (RWST) on low level in the Boric Acid Storage Tanks. The RWST are located in the Auxiliary Building. The Boric Acid Storage Tanks are protected from internally generated missiles by virtue of their location within concrete cubicles. The RWST however, is not missile protected, and is further discussed in Part 15 of this section.

The high and low pressure piping systems are separated from each other outside containment, taking suction from opposite sides of the RWST. One train of each of these systems is routed together in the auxiliary building. The redundant trains of these systems are routed separately. Once inside containment, however, separation of the individual injection lines is provided. Each train of the LPSI and HPSI piping is routed in opposite directions inside containment. Injection headers are located outside the missile barriers. Individual injection lines connected to the injection headers, pass through the missile barriers and then connect to the reactor coolant system.

The most likely source of missiles in the ECCS are the LPSI and HPSI pumps. The HPSI pumps are 350 hp horizontal multi-stage centrifugal pumps operating at 1770 rpm. The LPSI pumps are 200 hp horizontal multi-stage centrifugal pumps operating at about 3600 rpm. These pumps have a thick steel casing, making it highly improbable that a source of missiles, such as a broken impeller, would penetrate the casing to cause any damage.

The LPSI (RHR) pumps are located in the RHR pit, separated from other safety-related equipment. During normal plant operation, the portions of the system upstream of the isolation valves are isolated from the high pressure reactor coolant system, and is thus not subjected to forces which might cause a missile to be generated. If a missile were generated as a result of pump failure during normal reactor shutdown, it would affect only the RHR system. The RHR system could be isolated, and the reactor maintained in a stable shutdown condition, using the steam generators, until repairs could be effected.

The HPSI system is also normally not at high pressures. Thus, it is not expected that missiles would be generated. Pressure boundary valves, which are subject to high pressure, have backseats which should prevent missile generation.

Two accumulators, located on separate sides of the containment are situated behind the steam generator missile shielding. The licensee has not yet completed their evaluation of the piping and valving associated with the accumulators with respect to missile generation and missile protection.

Because of the functional design features, separation and component design provisions of the ECCS system, we conclude that the system will be capable of performing its intended functions considering internally generated missile sources as discussed above, with the exception of the accumulator piping and valving.

3. Containment Heat Removal and Atmosphere Cleanup Systems

The containment heat removal and atmosphere cleanup systems consist of two independent systems - the containment air recirculation system and the containment spray system. The containment air recirculation system consists of four fans and heat exchangers, as well as two charcoal filter units. The containment spray system consists of two spray pumps, with associated piping, ring headers, and nozzles. The source of water for the containment spray system is the refueling water storage tank.

The four containment fan cooler units are positioned in pairs on opposite sides of containment. Because of this separation, it is unlikely that a single missile could fail more than one pair of these units. The spray system headers and nozzles are split into redundant "trains". The spray nozzles are located high inside containment. Therefore, it is questionable that any missiles would reach these components. Should some number of the nozzles be damaged, some amount of containment cooling could still be provided using nozzles in the redundant train.

The spray system pumps are located in the auxiliary building, near the HPSI pumps. However the orientation of the HPSI pumps to the spray pumps are such that damage to the spray pumps is highly improbable in the unlikely event of missile generation from any of the HPSI pumps. There are no high energy lines in this vicinity which could be a source of internally generated missiles. Further, the spray system itself is not under pressure during normal plant operation. It is thus concluded that no failure due to internally generated missiles are expected for the containment spray system.

We therefore conclude that the containment heat removal and atmosphere cleanup systems, considering their redundant features and separation, will be capable of performing their design function, from the standpoint of internally generated missiles.

4. Chemical and Volume Control System

The chemical and volume control system (CVCS) controls and maintains reactor coolant system inventory and purity through the process of makeup

and letdown, and provides seal injection flow to the reactor coolant pump seals. The letdown portion of the system consists of a regenerative heat exchanger and a non-regenerative heat exchanger to cool the reactor coolant letdown, and three parallel orifice valves to reduce the pressure. The coolant is then passed through purification and deborating demineralizers, as necessary, where corrosion and fission products are removed. The coolant is then routed to the volume control tank (VCT). Seal return flow passes from the reactor coolant pump seals, through a containment isolation valve and the seal water heat exchanger, before returning to the VCT.

The seal return line is at low pressure and temperature. The charging pumps draw from the VCT and inject into the reactor coolant system, both through the normal makeup path and via the reactor coolant pump seals.

The most likely source of missiles in the CVCS would be generated in the letdown line and charging line on the RCS side of the regenerative heat exchanger, portions of the CVCS connected directly to the RCS and also the CVCS letdown piping up to the non-regenerative heat exchanger.

The licensee has not completed an evaluation of the effects of missile generation along the CVCS letdown line inside containment.

Valve steams are the only potential missile source associated with the charging line inside containment, and the letdown line outside containment. However, these valves all have backseats, and would not be expected to be a source of missiles. The licensee stated there are no other potential missile sources within the vicinity of these portions of the CVCS system. Thus we conclude that the CVCS (with the exception of the letdown line inside containment) is adequately protected from the effects of internally generated missiles.

5. Residual Heat Removal System

This system is discussed as part of the low pressure safety injection portion of the ECCS in Item 2 above.

6. Component Cooling Water System

The component cooling water (CCW) system is a closed system with two motor driven pumps rated at 150 HP and 2980 gpm, and two shell and straight tube heat exchangers. Heat transferred to the component cooling water system is removed by the service water system and is released into Lake Ontario. (See also topic IX-3 "Station Service and Cooling Water System").

The CCW system removes heat from the RHR heat exchangers, engineered safety features pump seals and jackets, CVCS and sampling heat exchangers, reactor coolant pump seals, bearings and motors, reactor support cooling pads, and waste gas compressors, as well as the items in the waste and boric acid systems.

We conclude that this system would be an unlikely source of missiles due to its low operating temperature and pressure. Further, potential missile sources near the CCW system were not identified. However, if a missile strike occurred, a failure of the CCW system could be accommodated by removing residual heat via the auxiliary feedwater system and steam generators until repairs to the CCW system could be made.

We conclude that the component cooling water system is adequately protected from internally generated missiles.

7. Service Water System

The service water system (SWS) consists of four 300 HP 5300 gpm capacity vertical motor driven pumps located in the screenhouse. (See also SEP Topic IX-3 "Station Service and Cooling Water System.") The system is configured such that there are two redundant safety-related trains, each capable of supplying one set of required safety-related equipment. Only one pump from either train is required to provide the necessary safe shut-down and post-accident safety functions, although two pumps are desirable in the long-term post-LOCA pump recirculation phase. These pumps, located approximately seven feet apart, take suction from and discharge to the ultimate heat sink (Lake Ontario).

The system piping is routed underground from the screenhouse to the other buildings. The two service water headers can be tied together via normally closed redundant manual valves. Separation of safety and non-safety loads is provided via redundant isolation valves. The service water pumps are not considered likely sources of missile due to their enclosure (casing) and submergence in the service water pump bay, and their low operating speed and pressure.

Also located in the screenhouse is one diesel driven and one motor driven fire pump. These pumps are not normally in operation and therefore are considered as unlikely sources of internally generated missiles.

There are no potential sources of missiles in the vicinity of the service water system as the piping enters the various building, with the exception of that portion which enters the Intermediate Building. In this building, the only high pressure system in the vicinity of the service water system is the steam generator blowdown system. The licensee has identified one unrestrained valve operator as a potential missile source. Their evaluation of the effects of missile generation has not been completed.

We conclude that the service water system meets the requirements for protection against internally generated missiles with the exception of the possible missile source from the steam generator blowdown system.

8. Diesel Generators Auxiliary Systems

The two diesel generators are located in separate diesel generator rooms, located off the north side of the turbine building. These are low speed engines with no high pressure hydraulic systems.

Due to separation of redundant portions of the system, and the segragation of the system as a whole, we conclude that the system meets the design requirements with respect to internally generated missiles.

9. Main Steam System (Portions of)

The main steam system consists of two steam generators, with two steam lines which connect in the Intermediate Building prior to entering the Turbine Building. Each steam line has four main steam safety valves, an atmospheric dump valve, a steam admission valve to the turbine driven auxiliary feedwater pump, a main steam isolation valve, and a non-return valve, all located in the Intermediate Building, upstream of the junction of the two lines.

The main steam lines are of heavy walled construction, and are unlikely to be damaged by internally generated missiles. The main steam components are routed in a fashion so as to utilize plant structures for missile protection. Should a missile cause damage to the main steam system downstream of the isolation valve, the valve would close and the plant would shut down If damage occurs either to the isolation valve or upstream of the valve, safe shutdown can be accomplished. A steam line break scenario has been evaluated in the safety analysis for the Ginna facility (FSAR, Chapter 14).

In considering the design features and layout of the main steam system for the protection against internally generated missiles, we conclude that the system will be capable of performing its design function considering internally generated missiles.

10. Feedwater and Condensate Systems (Portions of)

The main feedwater system consists of two motor driven feedwater pumps which delivers water to the steam generators. Condensate from the hotwell is pumped by three 50% capacity motor driven condensate pumps, through the hydrogen coolers, air ejectors, gland steam condenser, and then through several stages of preheating. The feedwater then passes into the containment and into the steam generators. The only area of concern for this system is that portion between the main feedwater isolation valves and the steam generators.

Due to the protection afforded by surrounding equipment, we conclude that missile damage to this portion of the feedwater system is unlikely. However, if damage to this area were to occur, the auxiliary feedwater system or the standby auxiliary feedwater system could provide the necessary feedwater flow to the second steam generator in order to effect safe shutdown.

Thus, we conclude that no additional protection is needed for the feedwater and condensate systems to protect them from the effects of internally generated missiles.

11. Auxiliary Feedwater System

The auxiliary feedwater (AFW) system consists of two 100% capacity motor driven auxiliary feedwater pumps, each directing flow to one steam generator, and a 200% capacity turbine driven auxiliary feedwater pump, which directs flow to both steam generators. The design flow of the motor driven pumps is 200 gpm, the turbine driven pump is 400 gpm. The primary suction source of these pumps is from the condensate storage tanks. If necessary, the service water system will provide an indefinite water supply to these pumps.

Our review indicates that the most likely source of missiles would be from the pumps. The turbine driven pump is separated from the motor driven pumps by a concrete enclosure/barrier. Separation is provided such that a postulated missile will not damage both trains associated with the motor driven pumps. Thus in the unlikely event that a missile is generated, each train of the system is sufficiently separated as to assure system performance.

However, in the event that the auxiliary feedwater system becomes unavailable due to a missile strike, the standby auxiliary feedwater system is capable of delivering the required feedwater flow to the steam generators to safely shut down the plant. Therefore we conclude that no additional missile protection is needed for this system.

Thus we conclude that the auxiliary feedwater system, through redundancy and separation, meets the design requriements with respect to internally generated missiles.

12. Standby Auxiliary Feedwater System

The standby auxiliary feedwater system consists of two 100% capacity pumps as well as piping which directs the flow from one pump to one steam generator. A cross-connect would allow each pump to feed any steam generator. The system would be used only in the event of a failure of the auxiliary feedwater system. The standby auxiliary feedwater system is located remote from the auxiliary feedwater system such that a failure in the AFW system would not affect the ability of the standby AFW system to safely shut down the plant.

We conclude that the standby AFW system needs no additional protection against the effects of internally generated missiles.

13. Ventilation Systems for Vital Areas

a. Safety Related Pump Motor Coolers

These systems provide ducted air, cooled by service water, to the rooms which contain the safety injection and containment spray pump motors, as well as the RHR pump and charging pump rooms

b. Control Room

The control room is air conditioned by its own ventilation system. Fresh outside air is filtered and discharged to the control room at a slight positive pressure. In the event of high radiation, the system dampers provide complete internal recirculation

c. Battery Rooms

Ventilation for the two battery rooms is provided by an independent air conditioning system. This system takes suction from the air handling room and discharges to the turbine building.

The ventilation systems are low pressure systems, and therefore are not considered to be sources of potential missiles. No sources of missiles were apparent in the vicinity of the control room, battery room or pump room ventilation systems. Though ductwork can be penetrated by missiles, the total cooling capability is not lost for any area, and time is available for action to restore adequate ventilation.

Thus we conclude that the ventilation systems for these three areas will be capable of performing their design function, considering internally generated missiles.

14. Combustible Gas Control

Redundant hydrogen recombiners located on opposite sides inside containment have been provided. Since the hydrogen recombiner is not normally in operation, it is not considered to be a source of missiles. The system is not needed to shut the plant down. Should a missile strike the system, its repair could be scheduled in a timely manner so as to not interfere with plant operation.

15. Refueling Water Storage Tank

The refueling water storage tank (RWST), located in the auxiliary building is not protected against the effects of tornado missiles or internally generated missiles. Potential sources of internally generated missiles are from the high pressure safety injection systems and the containment spray system, whose piping is routed around the perimeter of the tank.

However, the licensee has noted that the most probable limiting missile damage to the tank would result from tornado missiles rather than internally generated missiles. The licensee has stated that the resolution of the concern regarding the effects of tornado missiles will be addressed in their response to SEP Topic III-4.A, "Tornado Missiles" and that the resolution will discuss the protection provided against internally generated missiles.

Systems Whose Failure May Result in Release of Unacceptable Amounts of Radioactivity

1. Spent Fuel Pool Cooling System

The spent fuel (SFP) cooling system is designed to remove heat from the spent fuel pool, which is generated by stored spent fuel. The present system is a single train system, consisting of a pump, demineralizer, filter, and heat exchanger. Heat is removed from the system by the service water system. The entire system is located in the auxiliary building. Another redundant cooling system has been proposed. The design has been approved by the NRC in a letter dated November 24, 1981. This latter system is not yet installed.

The spent fuel pool cooling system is a low pressure system, and is unlikely to generate missiles. The system arrangement is such that the spent fuel pool itself could not be damaged. If the SFP cooling system was damaged, the large thermal capacity of the pool would maintain temperatures below design (180°F) for many hours. As a means of alternate cooling, a portable skid mounted system can be activated before any excessive heatup occurs.

The licensee has stated that the design of the proposed redundant spent fuel pool cooling system will incorporate design requirements with respect to internally generated missiles.

Thus we conclude that the spent fuel pool cooling system is capable of performing its function considering internally generated missiles.

2. Sampling System

The sampling system provides samples for laboratory analysis to evaluate reactor coolant, feedwater steam system, and other reactor auxiliary systems during normal operation. Samples are routed in an area away from other required safety related equipment and routed into a separate room. Shielding is being provided for the sampling lines. The likelihood of missiles causing damage to the sampling lines is very small. Thus we conclude that the sampling system meets the design requirements with respect to internally generated missiles.

3. Waste Disposal System

The entire waste disposal system is a low pressure system, and is thus, an unlikely source of missiles. The most likely sources, the gas decay tanks, are separated from other safety related systems. The failure of a gas decay tank is a design basis event which has been analyzed. Resultant doses are within allowable limits.

Further, missile damage to other portions of the system will not affect the safe shutdown of the facility. Thus we conclude that this system is adequately protected from the effects of internally generated missiles.

4. Containment Purge System

The containment purge system is provided to periodically purge the containment prior to entry. The system consists of ductwork, dampers, fans, and filters. The normal operating pressure of this sytem is low, and therefore is considered an unlikely source of missiles. Ductwork and components are routed away from potential missile sources. If missile damage were to occur, ample time to perform repairs is available.

We conclude that the missile protection provided for the system is acceptable.

5. Instrument and Service Air Systems

The instrument and service air systems consists of four air compressors (three instrument air, one service air), four aftercoolers, four air receivers as well as air dryers, pre-filters, and filters. The three instrument air compressors and the service air compressors are of the vertical type, with the use of oil-free cylinder construction for the instrument air compressors. The air systems are cooled by the service water system.

The air systems are not safety related. All equipment controlled by the air systems is either not required to operate for safe shutdown or accident mitigation, or fails in the safe position upon loss of air.

The air systems are low pressure systems which operated between 115 and 125 psig. The greatest potential missile generators are the air compressors and air receivers. However, these components are located in the turbine building away from safety related equipment.

We conclude that the instrument and service air systems are not required to perform safety related functions, and that its design with respect to internally generated missiles will not prevent safety related systems from performing their design functions.

Electrical Systems

The effects of missile generation on cabling, cable trays, instrumentation and control panels associated with those systems needed to perform safety functions was evaluated during the overall review of the specific systems, as described above.

1. Diesel Generators

See section V, Part 8.

2. Station Batteries

The two station batteries are in separate rooms, both of which are located away from potential missile sources. Should a missile originate from the batteries themselves, the walls, which separate the two rooms will prevent missile penetration. Thus we conclude that the separate rooms for the two station batteries provide adequate protection from internally generated missiles.

3. 480V Switchgear

Two 480V load centers comprise the engineered safety features electrical system. These load centers are located in separate rooms, on different floors within the auxiliary building. There are no piping or pressurized sources proximate to these rooms which may pose a potential missile source. Thus we conclude that adequate protection from internally generated missiles has been provided.

4. Control Room

Piping, pressurized sources or rotating machinery are not located within the control room. Ventilation duct work is routed into the control room. Damaging missiles from the ventilation system is considered unlikely. We conclude that there are no missile sources which could affect the proper functioning of the control room.

5. Cable Spreading Room

The cable spreading room does not contain any piping or other pressurized sources, or rotating equipment which might produce missiles. The fire protection system in this room is low pressure and thus is not capable of generating damaging missiles. We conclude that there are no potential missile sources in this area which could affect safety functions.

VI. CONCLUSIONS

Based on our review of the systems and components needed to perform safety functions, we conclude that the design of protection from internally generated missiles meet the intent of the criteria listed in Section II - REVIEW CRITERA with the exception of the following:

1. An evaluation of the piping and components associated with the ECCS accumulators with respect to missile generation and protection has not been completed.

2. An evaluation of the effects of missile generation along the CVCS letdown line inside containment has not been completed.

3. An evaluation of the potential effects of an unrestrained valve operator associated with the steam generator blowdown system on safety related components and systems, including the service water system has not been completed.

4. The refueling water storage tank (RWST) is inadequately protected from internally generated missiles. Resolution of this concern is to be incorporated into the resolution of the RWST with respect to protection against tornado missiles - SEP Topic III-4.A "Tornado Missiles."

The need for additional protection in these areas of the plant from the effects of internally generated missiles will be evaluated during the integrated assessment evaluation for Ginna.