ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket No.:	50-382
License No.:	NPF-38
Report No.:	50-382/97-13
Licensee:	Entergy Operations, Inc.
Facility:	Waterford Steam Electric Station, Unit 3
Location:	Hwy. 18 Killona, Louisiana
Dates:	June 2-6, 1997
Inspector:	G. E. Werner, Project Engineer, Project Branch D
Approved By:	P. H. Harrell, Chief, Project Branch D

ATTACHMENTS:

Attachment 1:	Supplemental Information
Attachment 2:	Section E2.1 from NRC Inspection Report 50-382/96-24
Attachment 3:	Task Interface Agreement (TIA) - "Waterford 3 - Requirements for the Capability of Containment Isolation Valves to Close to Maintain Containment Integrity" (TAC M97234)

EXECUTIVE SUMMARY

Waterford Steam Electric Station, Unit 3
NRC Inspection Report 50-382/97-13

This special inspection was conducted to review the ability of containment isolation valves to perform their intended safety function. This issue was identified as Unresolved Item 50-382/9624-03 in NRC Inspection Report 50-382/96-24. Section E2.1 of the report is provided as Attachment 2 to this report. To obtain resolution of this issue, Task Interface Agreement (TIA) 96TIA017, "Waterford 3 - Requirements for the Capability of Containment Isolation Valves to Close to Maintain Containment Integrity," was issued by the NRC's Office of Nuclear Reactor Regulation (NRR) to provide the requirements that specifically apply to Waterford 3. The TIA is provided as Attachment 3 to this report.

Engineering

- The licensee failed to provide a closed capability for the containment spray header and component cooling water to containment fan cooler containment isolation valves. The failure to maintain containment isolation valves in an operable status is an apparent violation of Technical Specification 3.6.3 (Section E8.1).

- The Updated Final Safety Analysis Report stated that containment isolation valves have the capability to be closed from the control room to isolate a faulted engineered safety feature system. However, the containment spray header and component cooling water to containment fan cooler containment isolation valves could not be closed with a safety injection actuation signal present. The failure to perform a safety evaluation is an apparent violation of 10 CFR 50.59 (Section E8.1).

Report Details

E8 Miscellaneous Engineering Issues

E.8.1 (Closed) Unresolved Item 50-382/9624-03: Requirement for a closed safety function for containment isolation valves. Previously, the inspectors identified that the licensee designated certain engineered safety features containment isolation valves as not having a closed safety function and, as a result, the valves were not provided with the capability to be closed. During the inspection, the inspectors concluded that the valves were required to have a closed safety function and were required to be capable of being closed under all conditions in case of a line or system malfunction. The licensee expressed the position that the plant was licensed without requiring the closed capability for the valves and, therefore, the containment isolation valve design was acceptable. Based on the licensee's contention, this issue was identified as unresolved pending a response to TIA 96TIA017 by NRR. See Attachment 2 for the details provided in NRC Inspection Report 50-382/96-24.

The response to TIA 96TIA017 stated, in part, that containment isolation is always considered a safety function and all containment isolation valves are required to have a closed safety function (refer to Attachment 3 for the complete TIA response). The NRR technical staff acknowledged in the TIA that the system safety function (e.g., containment spray) takes priority over the containment isolation function; however, when the system is no longer able to perform its primary safety function, then containment isolation takes priority.

Technical Requirements Manual Table 3.6.2 lists Valves CS-125A(B), CC-807A(B), CC-808A(B), CC-822A(B), and CC-823A(B) as containment isolation valves applicable to Technical Specification 3.6.3. Based on previous inspections and discussions with licensee personnel, it was established that these valves could not perform their containment isolation safety function because: (1) procedures were not provided that allowed the installation of electrical jumpers to permit closure of the valves with a safety injection actuation signal present, and (2) the air accumulator assemblies for Valves CC-807A(B), CC-808A(B), CC-822A(B), and CC-823A(B) were not capable of supplying the air required to shut the valves. The failure to have operable containment isolation valves capable of providing containment isolation is an apparent violation of Technical Specification 3.6.3 (50-382/9713-01).

Updated Final Safety Analysis Report Section 6.2.4.1.2, "Criteria for Isolation of Fluid Systems Penetrating the Containment," stated that each penetration line shall contain one isolation valve outside containment that shall be capable of either automatic or remote manual operation or locked closed. Further, Section 6.2.4.1.2 stated that remote manual valves have the capability to be shut to isolate a faulted engineered safety feature system and that, "Valves isolating penetrating lines serving engineered safety feature systems are not closed automatically by the CIAS [containment isolation actuation signal], but have the ability to be closed by remote manual operation from the main control room, thereby, isolating any engineered safety feature system which malfunctions." However, the licensee operated the

plant, since construction, without the capability to shut the above listed containment isolation valves when required. The failure to perform a written safety evaluation that provides the basis for the determination that the change does not involve an unreviewed safety question is an apparent violation of 10 CFR 50.59(b)(1) (50-382/9713-02).

V. Management Meetings

X1 Exit Meeting Summary

The senior resident inspector presented the inspection results to members of licensee management on June 5, 1997. The licensee acknowledged the findings presented.

The inspector asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT 1

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee

INSPECTION PROCEDURES USED

IP 92903	Followup - Engineering

ITEMS OPENED AND CLOSED

Open

50-382/9713-01	EEI	An apparent violation of Technical Specification 3.6.3 for failure to maintain containment isolation valves operable
50-382/9713-02	EEI	An apparent violation of 10 CFR 50.59 for failure to perform a safety evaluation associated with a lack of closure capability for numerous containment isolation valves.

Closed

50-382/9624-03	URI	Requirement of a closed safety function for containment isolation valves

LIST OF ACRONYMS USED

EEI	escalated enforcement item
ESF	engineered safety feature
TIA	task interface agreement
URI	unresolved item

ATTACHMENT 2

Excerpt from Inspection Report 50-382/96-24

E2.1 Containment Spray Header and CCW to Containment Fan Cooler Containment Isolation Valves

a. Inspection Scope (37551)

The inspectors reviewed licensee correspondence with the NRC, licensee internal correspondence, the Safety Evaluation Report, the Standard Review Plan, the UFSAR, General Design Criteria (GDC) 56 and 57, and numerous regulatory guidance documents to determine the applicability of a closed safety function for the containment isolation valves associated with containment spray and CCW systems.

b. Observations and Findings

b.1 Containment Spray Isolation Valves CS-125A(B)

Containment spray lines penetrate containment through Penetrations 34 and 35. Technical Requirements Manual Table 3.6-2, "Containment Isolation Valves," lists containment isolation valves that are applicable to Technical Specification 3.6.3, "Containment Isolation Valves." For Penetration 34, Valves CS-125A and CS-128A were listed as containment isolation valves. For Penetration 35, Valves CS-125B and CS-128B were listed as containment isolation valves. In addition, UFSAR Table 6.2-32, "Containment Penetrations and Isolation Valves," list Valves CS-125A(B) as one of the two containment penetration isolation valves.

Valves CS-125A(B) are air-operated gate valves that fail open on loss of IA. Nonsafety-related IA is the normal air supply with backup air supplied by safety-related air accumulators. Valves CS-125A(B) receive an open signal on a containment spray actuation signal.

The containment spray system is classified as an open system inside containment. GDC 56 specifies acceptable means to meet the required containment isolation provisions for systems open to containment atmosphere. The inspectors determined that the containment isolation provisions for containment spray headers were satisfied in accordance with GDC 56 by having one automatic valve (Check Valves CS-128A(B)) inside containment and one remote manual isolation valve (Valves CS-125A(B)) located outside containment. Remote manual valves located outside containment are allowed by American National Standard (ANSI) N271-1976, "Containment Isolation Provision for Fluid Systems," Section 3.6, "Other Defined Basis," Subsection 3.6.3, "Remote Manual Valves," provided provisions are made to detect possible failure of the fluid lines inside and outside containment and the capability is maintained to remote manually isolate these lines.

For Valves CS-125A(B), the control circuitry was designed in such a manner that, once a containment spray actuation signal exists, the valves cannot be shut until

the containment spray actuation signal clears; however, the circuitry could be jumpered to allow closure of the valve in the malfunctioning containment system train. This is significant since an alternate isolation valve cannot be closed until 6 hours after a LOCA because of high radiation levels in the minus 15-foot valve enclosure bay area of the reactor auxiliary building.

b.2 CCW to Containment Fan Cooler Containment Isolation Valves

CCW to the containment fan cooler lines penetrate containment through Penetrations 15 through 22. Technical Requirements Manual Table 3.6-2 lists the CCW to containment fan cooler valves as containment isolation valves applicable to Technical Specification 3.6.3. Further, UFSAR Table 6.2.32 listed Valves CC-807A(B), -808,A(B), -822A(B), and -823A(B) as containment isolation valves. The CCW air-operated, butterfly CCW to containment fan cooler isolation valves fail open on loss of IA. Nonsafety-related IA is the normal air supply with backup air being supplied by safety-related air accumulators.

The CCW to containment fan cooler lines form closed systems inside containment. GDC 57 specifies that for closed systems that penetrate containment, the lines shall have at least one containment isolation valve which is either automatic, or locked closed, or capable of remote manual operation that is located outside containment. The inspectors determined that the containment isolation provisions were satisfied for the CCW to containment fan cooler penetration lines by having a closed CCW system inside containment and remote manual valves located outside containment.

Once a safety injection actuation signal exists, the control circuitry for the containment fan cooler isolation valves does not allow the CCW to containment fan cooler isolation valves to be shut until the safety injection actuation signal clears; however, the circuitry could be jumpered around to allow closure of the valve in the malfunctioning CCW system train.

b.3 Common Containment Isolation Requirements

Regulatory Guide 1.141, "Containment Isolation Provisions for Fluid Systems," April 1978, endorsed the use of ANSI N271-1976, with some exceptions not applicable to the affected valves. ANSI N-271 approved containment configurations required to meet GDC 56 and 57. Safety Evaluation Report, Section 6.2.4, "Containment Isolation System," stated, in part, that the containment isolation provisions met the requirements of GDC 54, 55, 56, and 57, and satisfied the guidance of Regulatory Guide 1.141.

UFSAR Section 6.2.4.1.2, "Criteria for Isolation of Fluid Systems Penetrating the Containment," required that each penetration line contain one isolation valve outside containment that shall be capable of either automatic or remote manual operation or locked closed. Further, Section 6.2.4.1.2 required that remote manual valves have the capability to be shut to isolate a faulted ESF system and that "Valves isolating

penetrating lines serving engineered safety feature systems are not closed automatically by the CIAS [containment isolation actuation signal], but have the ability to be closed by remote manual operation from the main control room, thereby isolating any engineered safety feature system which malfunctions." The inspectors determined that UFSAR Section 6.2.4.1.2 was consistent with regulatory requirements.

b.4 Licensee Position for ESF System Containment Isolation Valves

Throughout the inspection and during the exit meeting, licensee management maintained the following positions:

- Based on the original design and licensing of the plant, the subject valves were considered containment isolation valves.
- All regulatory requirements for containment isolation were satisfied.
- The subject valves did not have a closed safety function.
- The NRC's preliminary position that the valves have a closed safety function is a backfit.
- No testing was required to demonstrate the ability of the accumulators to provide backup air to stroke the subject valves in the closed direction and to maintain them closed since the valves did not have a closed safety function.

The licensee maintained that Valves CS-125A(B) never had a closed safety function as discussed in various letters between the utility and the NRC. The licensee contended that Letter W3P84-0577, dated March 16, 1984, informed the NRC that a water barrier would be maintained in the containment spray system piping. Discussions with various licensing personnel indicated that, based upon this letter, the licensee determined that Valves CS-125A(B) did not have a closed safety function and that containment integrity would be maintained with the water barrier in the containment spray system because it formed a closed system outside containment.

The inspectors noted that Letter W3P84-0577 was used to justify relief from performing Appendix J leak rate testing on various containment isolation valves, including Valves CS-125A(B). Enclosure 1, of the letter, indicated that a water barrier could be maintained in the containment spray system piping for 30 days assuming Valves CS-125A(B) remained closed. However, the valves fail open on loss of IA and cannot be closed without using some type of backup air.

From 1989 to 1994, internal licensee correspondence documented the safety function (both open and closed) for valves CS-125A(B). In 1994, the licensee

concluded the valves had no closed safety function and discontinued accumulator testing in August 1994 (last test completed March 8, 1994 under Work Authorization 01121332). This was documented in a 10 CFR 50.59 screening titled "Revision 1 to STA-001-005, Leakage Testing of Air and Nitrogen Accumulators Safety-Related Valve." The licensee justified not testing CS-125A(B) because, "credit may be taken for containment spray train isolation using CS-117A(B) [stop check valve located outside containment] and CS-118A(B) [normally closed manual recirculation valve to the RWSP]. The CS-125A(B) accumulator tests are therefore not required."

The licensee also maintained that the CCW to containment fan cooler isolation valves did not have a closed safety function. Various licensee documents justified this position by stating that the CCW system is classified as a Seismic Category I, Safety Class 3, closed system whose failure does not have to be postulated during a loss of coolant accident. Therefore, the containment isolation barrier would be the CCW piping system inside containment.

During the inspection and at the exit, licensee management stated that they believed the original design was consistent with regulatory requirements. Licensee management contended that the NRC knew that the containment spray header and CCW to containment fan cooler containment isolation valves could not be shut once a containment spray actuation signal or safety injection actuation signal existed and, therefore, licensed the plant with an approved containment penetration design. Further, management indicated that the requirement for these valves to have a closed safety function was a change in previous NRC position, thereby constituting a backfit.

b.5 Licensee and NRC Management Conference Call

On October 25, 1996, Region IV and NRR personnel, including NRC management, held a conference call with the licensee to understand the licensee's position. During this call, NRC agreed to allow the licensee time to submit a letter detailing the licensing basis for the subject containment isolation valves. In the interim, the Vice President, Operations, committed to performing actions to ensure the isolation capacity of the associated penetrations while NRC evaluated the licensee's position. The commitment involved testing of each containment isolation valve accumulator and establishing procedural guidance to enable closure of the valves from the control room for a line or system fault during accident conditions.

The ten containment isolation valve accumulators and actuating systems were leak tested satisfactorily by November 8, 1996. Valves CS-125A(B) passed without any rework. All of the CCW to containment fan cooler isolation valves required extensive rework. Numerous leaks were repaired on fittings, solenoid valves, and actuating mechanisms. The leakage would have prevented the ability to maintain the valves closed, if containment isolation was required.

Independent of the licensee submittal, Region IV submitted Task Interface Agreement 96TIA017, dated November 13, 1996, requesting NRR to review the regulatory requirements for isolation and closure capability for the containment isolation valves. Pending NRR's review of Task Interface Agreement 96TIA017, the operability requirements of the containment spray and CCW to containment fan cooler isolation valves are identified as an unresolved item (382/9624-03).

c. Conclusions

From review of regulatory requirements and discussions with NRR Containment System Branch personnel, it appeared that Valves CS-125A(B) and the CCW to containment fan cooler containment isolation valves have a closed safety function. Specifically, the valves are required to have the capability to close in case of a line or system malfunction in order to maintain containment integrity under all conditions. However, because of the position expressed by the licensee, Region IV has requested a formal review of the regulatory requirements from NRR.

ATTACHMENT 3

April 22, 1997

MEMORANDUM TO: Thomas P. Gwynn, Director
Division of Reactor Projects, RIV

FROM: William D. Beckner, Director/S/ **ORIG SIGNED BY: JHall for**
Project Directorate IV-1
Division of Reactor Projects III/IV

SUBJECT: TASK INTERFACE AGREEMENT (TIA) - WATERFORD 3 - REQUIREMENTS FOR THE CAPABILITY OF CONTAINMENT ISOLATION VALVES TO CLOSE TO MAINTAIN CONTAINMENT INTEGRITY (TAC NO. M97234)

In a memorandum dated November 13, 1996, from J. E. D[illegible] to W. D. Beckner, Region IV requested the Office of Nuclear Reactor Regulation (NRR) to review the licensee's position on compliance with the general design criteria for dual function (i.e., open safety function on a safety injection actuation signal and/or containment function to isolate the containment) air-operated containment penetration valves. On March 18, 1997, the NRR and Region IV staff met with the licensee to discuss containment isolation design and licensing basis for Waterford Steam Electric Station, Unit 3. While some more discussion with the licensee regarding the long term resolution of the detailed design issues is required, the NRR has determined that the staff position is clear as discussed below.

Before addressing the specific designs, one needs to understand the roles of a system safety function and containment isolation function. In general, a system which penetrates containment has an important role to play in the overall operation of the plant. Some perform a safety function in a pre/post loss of coolant accident (LOCA) manner while others are important to the overall operation of the plant. In either case, however, the requirement to perform a containment isolation function is the same. Containment isolation is always considered to be a safety function. The only remaining question is when the isolation function needs to be performed.

Let us reverse the order and first discuss the role of the containment isolation valves for a nonsafety system. For this system class, it is normally assumed that the need for the system function ceases when the need for containment isolation is identified. Receipt of a containment isolation signal will cause the containment isolation valves to automatically actuate. This satisfies the containment function while at the same time ending the normal functioning of the system.

The safety system containment isolation philosophy is quite similar. The difference relates to the priority of the function. Unlike for a nonsafety system, the safety system function does not cease when the need for containment isolation is identified. The safety function simply takes priority over containment isolation. As long as the system is able to provide its safety function, containment isolation should not be implemented. However, if the system is not able to perform its safety function, then containment isolation becomes its number one priority.

By having the safety system function take first priority eliminates the need for automatic containment isolation. Remote isolation is the accepted mode for this type of system. With remote isolation capability, however, comes the need to know when isolation is needed. This generally means leak detection and some means to determine system operability.

Once it is determined that the safety function is not operable, containment isolation becomes the number one priority. The operators are trained to properly isolate the system which means closing both containment isolation valves.

Now, let us look at the requirements to isolate. The function must be fully safety grade. This means that the instrumentation, motive power, actuator, and valve must be all safety grade. If the valve is motor operated, it should be Class 1E powered. For air power, the valve should either close upon loss of air supply or the supply should be considered essential which generally implies an adequately sized accumulator that will assure valve closure for 30 days.

Therefore, for systems with a dual requirement, the valves can and probably will have a two position criteria. To satisfy the safety system function, the valve position should be open. However, to satisfy the containment isolation function, valve position should be closed. To simply look at the safety system function to establish valve position meets only half of the valve requirements. Additionally, to power the valve actuator with a nonsafety air supply is unacceptable when the failure position is open since the containment isolation function cannot be satisfied.

With this brief background, one can now discuss the specific questions contained with the TIA request. Specifically, Region IV has identified the following questions:

QUESTION 1

Does the licensee comply with the requirements of Criterion 57 (i.e., do the containment spray and component cooling water containment penetration valves have a closed safety function?). In particular, are the air-operated valve accumulators required to maintain the valves closed on a loss of nonsafety related instrument air?

RESPONSE

The valves in question have dual requirements. For the system safety function, the valves have an open function to assure the operability of the system when needed. However, the valves also have a containment isolation function when called upon. Under this sequence, the valves have a closed function. As discussed above, the system safety function has first priority. Therefore, the fail open design is appropriate. But, the containment isolation function is equally important when the situation calls for isolation. This means that the air supply should be safety grade to minimize the times when one loses the air supply to the valve which also loses the containment isolation function. The design needs safety accumulators to assure

an air supply in the event of loss of nonsafety instrument air. For this reason, it is unacceptable to have nonsafety instrument air without a safety backup system.

QUESTION 2

Would similar valves for containment penetrations subject to the requirements of Criteria 55 and 56 also have a closed safety function for containment isolation, even if, the position of greater safety of the valve is to open?

RESPONSE

All containment isolation valves subject to the requirements of Criteria 55 and 56 have a closed safety function. However, it is quite misleading to state that the position of greater safety of the valve is to open. These valves under discussion have a dual requirement; performance of the system safety function and the containment isolation function. Each function is a separate responsibility. Therefore, for the system safety function, the position of greater safety is open. But for the containment isolation function, the position of greater safety is closed. Since the system function has first priority, the valve should fail open upon loss of air. However, since the containment isolation position of greater safety is closed, the air supply should be as reliable as possible to minimize the probability of the loss of air. This is translated to mean safety grade.

QUESTION 3

Is the licensee required to have the capability of remote manual closure of the containment penetration valves with a safety injection actuation signal and/or containment spray actuation signal present?

RESPONSE

The simple response is yes. The licensee is required to be able to remotely close the valve at any time during the transient. This is particularly important if the safety system has a burned in signal to stay open to maintain the safety system function. The solution is to design the logic such that a switch in the control room can be actuated to override this open signal. An example of such a design can be found on the containment isolation valves connected to an external recombiner. Normally the valves are in a closed position. To allow the recombiner to become operational, these valves must be opened even though there exists a containment isolation signal. This override logic eliminates the need to jumper the connections within the control cabinet which would be necessary without this control logic.

Equally important to the ability to change valve position is knowing when to initiate containment isolation. Sufficient instrumentation should be available to the operator for this purpose. This would include leak detection as well as sufficient discrimination to determine which system is leaking.

QUESTION 4

If the answer to Question 3 is yes, are manual actions an acceptable means of meeting this requirement?

RESPONSE

Manual action is an acceptable means for meeting this requirement. But, it should be remote manual and normally from the control room.

With respect to the acceptability of the accumulators that exist at Waterford 3, we are planning to discuss this issue with the licensee. We will include Region IV staff in all of our future interactions with licensee on this issue.

cc: C. Hehl, RI
J. Johnson, RII
J. Caldwell, RIII