

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-346/88031(DRS)

Docket No. 50-346

License No. NPF-3

Licensee: Toledo Edison Company
Edison Plaza
300 Madison Avenue
Toledo, OH 43652

Facility Name: Davis-Besse, Unit 1

Inspection At: Oak Harbor, Ohio

Inspection Conducted: August 29 through September 2 and September 12-16, 1988

Inspector: *D.S. Butler*
D. S. Butler

10/3/88
Date

Approved By: *R.N. Gardner*
R. N. Gardner, Chief
Plant Systems Section

10/4/88
Date

Inspection Summary

Inspection on August 29 through September 2 and September 12-16, 1988 (Report No. 50-346/88031(DRS))

Areas Inspected: Special safety inspection of licensee activities with regard to the testing of the Steam and Feedwater Rupture Control System (IE Module 92701); review of potential conditions adverse to quality (IE Module 92701); training (IE Module 41400); and licensee actions on previously identified items (IE Module 92701).

Results: Of the three areas inspected, no violations or deviations were identified. Controls in the areas inspected appeared to be adequate. Based on the inspection, the inspector reached the following conclusions:

- ° Post modification testing was adequately performed.
- ° Root cause determination and disposition of conditions adverse to quality were adequate.
- ° Maintenance craftsmen/technicians appeared to be knowledgeable and conscientious in their work.

DETAILS

1. Persons Contacted

Toledo Edison Company (TED)/Contract Personnel

- *T. Almendinger, Fire Brigade Training Instructor
- *R. Brandt, Fire Protection, Operations
 - E. Chimahusky, Performance Engineering
- *R. Flood, Assistant Plant Manager, Operations
- *G. Gibbs, Performance Engineering Director
- *D. Harris, Quality Assurance Director (Acting)
 - C. Hengge, Nuclear Engineering
- *P. Hildebrandt, Engineering General Director
- *G. Honma, Compliance Superintendent, Nuclear Licensing
- *M. Lalor, Licensing Engineer
- *M. Murtha, Fire Protection Engineer
- *K. Prasad, Nuclear Engineer
- *J. Roskoph, Fire Protection Compliance Manager
- *D. Shelton, Vice President, Nuclear
- *R. Simpkins, Operations Training Manager
- *G. Skeel, Security Operations Manager
- *F. Sondgeroth, Licensing Engineer
- *R. Strauss, Fire Protection Coordinator
- *J. Sturdavant, Licensing Principle
- *J. Syrowski, Nuclear Training Director (Acting)
 - J. Tabbert, Facility Modification Department
- *C. Williams, System Engineering
- *L. Young, Assistant to Fire Protection Compliance Manager
- *A. Zarkesh, Independent Safety Engineering Manager

Innovative Technological Systems, Inc.

- *K. Scown, Operations Support, Fire Protection

U.S. Nuclear Regulatory Commission (U.S. NRC)

- *D. Kosloff, Resident Inspector

*The above persons attended the exit meeting held on September 16, 1988.

The inspector also interviewed other licensee personnel during the course of the inspection.

2. Licensee Action on Previous Identified Items

(Closed) Open Item (346/88006-03): Main Feed Pump Turbine (MFPT) high discharge pressure setpoint tolerance. The MFPT high discharge pressure setpoint tolerance permitted the "As Left" setpoint to exceed the high pressure feedwater heater design pressure (1500 psig). The pressure switch was set to trip the turbine at 1500 ± 15 psig. The licensee

informed the inspector that the high pressure feedwater heaters were constructed to ASME Section VIII, 1971 Edition, Section UG-133. Over pressure protection of the heaters was also accomplished by relief valves FW469 and FW972 which were set to lift at 1500 ± 15 psig. The Code requires pressure protection and requires that the set pressure tolerance not exceed 3% of the maximum allowable working pressure (design pressure). Within this criteria, the pressure protection can be set at 1500 ± 45 psig. Based on the above criteria, the inspector finds the MFPT high pressure setpoint and tolerance to be acceptable.

(Closed) Open Item (346/88006-04): The affect on FCR 85-293 safety evaluation by cold setting the pressurizer code safety valves. The PORV setpoint increase, as evaluated in FCR 85-293, was based on the hot setting of the pressurizer code safety valves. Procedure MP 1401.02, "Pressurizer Code Relief Valve Removal, Disassembly, Repair, Assembly, Installation, Testing, and Reinstallation," provided both a hot and cold setpoint testing method. At the time of NRC Inspection Report No. 50-346/88006, the safeties were set by the cold method. The inspector requested the licensee to evaluate the cold setpoint method for its impact on the safety evaluation performed for FCR 85-293. The licensee concluded that the safety evaluation was not affected by the cold method. However, the Systems Engineering group stated in this evaluation that all future calibration checks of the safety valves will be performed under hot conditions. In addition, the Nuclear Engineering group recommended the pressure gauge used to determine the lift setpoint have an accuracy of $\pm 0.1\%$ and a corresponding error of 5 psi. The inspector reviewed Surveillance Procedure DB-MM-03000 "Pressurizer Code Relief Valve Testing," and determined the above items were incorporated. The inspector reviewed the licensee's analysis and determined that the cold method had no affect on the safety evaluation performed for FCR 85-293.

3. Steam and Feedwater Rupture Control System (SFRCS)

a. Background

The safety function of the SFRCS was to isolate the unaffected steam generator from either a main steam line break or main feedwater break, to automatically start the Auxiliary Feedwater System (AFW) in the event of a main steam line or main feedwater rupture, to automatically start the AFW on low steam generator (SG) level or the loss of all four reactor coolant pumps (RCP), and to prevent SG overfill and subsequent spill over into the main steam lines.

The SFRCS consists of two identical redundant and independent protective action channels. Each protective channel consists of two complimentary logic channels for each input function. The SFRCS is located in four cabinets with Logic Channels 1 and 3 in one cabinet and Logic Channels 2 and 4 in the other. The remaining two cabinets are relay cabinets, one for each actuation channel.

The logic requires two of two inputs from the same parameter in the same actuation channel to actuate equipment. When the logic is satisfied, the trip will seal-in for two seconds. In addition, Dixon Bargraph Indicators have been installed in each logic cabinet and the main control room center console to provide SG level indication.

b. Description of Changes

The modification is being installed during the fifth refueling outage. The following is a description of the changes:

- (1) Add inhibit close signals to AFW Steam Supply and AFW Discharge Valves. This does not include MS-5889A and MS-5889B.
- (2) Delete one out of every two Low Steam Generator Pressure trip switches.
- (3) Ensure only valid trip signals will trip the SFRCS, and ensure complete actuation on valid input signals.
- (4) Provide circuitry for AFW Manual Initiation pushbuttons.
- (5) Provide circuitry to prevent indeterminable AFW action when Low Pressure trip signals are received coincidentally from both Steam Generators.
- (6) Revise ARTS trip such that only a full trip from either actuation channel will trip ARTS. This means that two half trips in opposite actuation channels will not trip ARTS.
- (7) Add capability to send signals from all inputs to the station computer and outputs to the SOE computer for post trip analysis.
- (8) Revise Permission to Block circuitry such that the Permission to Block lights and Annunciators are not on after a Low Steam Generator Pressure trip.
- (9) Change all SFRCS actuated valves that currently require only a half trip to require full trip actuations.
- (10) Provide blocking capability for AF-3869 through 3872, MS-106, MS-106A, MS-107, and MS-107A; revise the blocking capability for SP7A and SP7B, FW-601, FW-612, ICS-11A, ICS-11B, MS-603, and MS-611 to be consistent with other SFRCS actuated valves.
- (11) Provide control circuits for Valves MS-100, MS-101, ICS-11A, ICS-11B, MS-100A, MS-101A, MS-375, and MS-394.
- (12) Delete the initial bypass features on low SG Pressure Block circuitry.

c. Procedure Review

The procedures were reviewed to ensure that the logic output was as expected for the input signal applied. This review was performed to verify that the Description of Changes were incorporated by the modification.

The following procedures were reviewed:

- ° DB-MI-03210 SFRCS Channel 2 Logic Functional Test
- ° DB-SC-03261 Functional Test of SFRCS Actuation Channel 1

The inspector determined that the procedures were adequate to fully test the SFRCS logic and that the SFRCS changes (Paragraph 3.b) had been incorporated. The procedures would also test the two of two coincident logic for each input parameter and block function.

The logic modules contain a time delay that seals-in for two seconds on any channel actuation signal and provides a 0.5 second delay on the pressure differential transmitter output signal. These circuits were adequately tested in Procedure DB-MI-09058, "Consolidated Controls Logic Module P/M 6N566 Functional Test."

d. Testing

The inspector observed portions of the logic acceptance test. This test was performed after all the input and output field wiring had been disconnected. The logic cabinets were temporarily connected to a test simulator box which could input all the input parameters and simultaneously monitor the output signals. The test procedure was over 500 pages in length for each actuation channel. Test deficiencies were written down in a test log as they occurred. The Quality Control (QC) department provided continuous coverage during all the testing. All the deficiencies were resolved in the procedure and the affected steps were retested. The inspector observed that the majority of the deficiencies were typographical errors. The logic responded as designed.

e. Training

Several of the Instrument and Control (I&C) technicians and QC inspectors were involved with the manufacturing and initial testing that was conducted by the vendor. From this involvement, these individuals had obtained a great deal of knowledge and experience with the new design. They provided this information to other technicians and the test engineers. An experienced individual was present during all the testing.

The inspector observed I&C technicians as they performed wire wrap operations on a logic board. The work was performed with adequate instructions. The logic board was worked on in accordance with anti-static procedures and equipment. The wire wrap operations were acceptable and they were independently verified as per the

wiring instructions. The inspector verified that the above individuals were qualified to perform these operations. The training records indicated this to be true and the training lesson plan provided adequate instructions on the handling of static sensitive devices and on how to perform wire wrapping.

The inspector asked the I&C training instructors when training on the SFRCS will be completed. At the time of this inspection, formal training had not been provided to I&C personnel that were not directly involved with the SFRCS modifications. The instructors indicated they were going to provide the training once all the drawings had been updated.

f. Summary

The testing was performed in a satisfactory manner. Good test controls were maintained at all times. There was good communication maintained between the test personnel, engineering, and operations. The shift turnover was conducted in a professional manner. Procedure steps were clear, written in a logical manner, and virtually free of major errors. In conclusion, the SFRCS modification should be able to perform its safety function.

4. Potential Condition Adverse to Quality (PCAQ) Review

- a. 88-0491: Existing internal wiring terminations were loose. The licensee discovered loose lugs in Cabinets JT2703 and JT2704. All the lugs were checked for tightness and reworked as necessary. The licensee's investigation has shown that the major problem was the ring tongue size of the lug did not fit properly on the terminal and therefore, did not compress when tightened. The electricians selected new lugs that would compress adequately, but were designed for a larger stud size.

Procedure MP 1410.24, "Installation and Termination of Electrical Cables," stated, in part, "5.12 The use of lugs with different size stud holes (i.e., matching a lug with a 1/4" hole with one having a 5/16" hole) is acceptable IF the flat washers used fit the bolt AND are of sufficient diameter to ensure compression of the lugs." The inspector was concerned that the selection of lugs intended for larger stud sizes was not adequately controlled. The inspector reviewed Design Specification No. 3614-2-E-14 Section 4.3.3, "Cable Terminations and Splices." The specification stated in part, "Control wires at equipment which has terminal boards with studs instead of screw terminal blocks shall be terminated with compression lugs." No mention of lug size to stud size was found in the specification.

The inspector discussed the selection of lugs and lug contact resistance with the Training Department electrical instructors.

The instructors indicated they did discuss lug contact resistance and the selection of lugs in accordance with Procedure MP 1410.24. The inspector interviewed the electrical foreman and several electricians. They indicated they had received such training and understood the intent of Procedure MP 1410.24. The electricians demonstrated to the inspector as to how they selected lugs for a terminal block that was located in the electrical shop. The lugs selected were acceptable and the inspector has no further concerns on this PCAQ.

- b. 88-0524: Non-essential lighting cable was bridged between two different essential channel relay cabinets. The licensee discovered the bridged lighting circuits during a walkdown of the relay cabinets. The following cabinets were involved:

<u>LIGHTING PANEL NUMBER</u>	<u>CIRCUIT NUMBER</u>	<u>RELAY CABINET NUMBER</u>	<u>CHANNEL NUMBER</u>	<u>ROOM NUMBER</u>
L3701	23	RC3701	1	314
		RC3702	2	314
		RC3703	2	314
		RC3704	1	314
		RC3705	2	314
		RC3801	1	303
L3501	32	RC3601	1	325
		RC3602	2	324
		RC3603	3	322
		RC3604	4	323
L2701	17	RC2701	2	227
		RC2801	1	209
L3012	19	RC3013	1	Intake Structure
		RC3015	3	Intake Structure

The licensee determined this condition had existed since initial plant construction. The licensee red tagged off each of the above circuits. Lighting Circuits 32, 17, and 19 were later dispositioned as not being bridged circuits. The wiring between these cabinets was run in conduit to a junction box. The circuits were spliced together at this point. The inspector verified this condition did exist in the plant and concurs with the licensee's disposition. Circuits 32, 17, and 19 were reenergized. Circuit 23, also run in conduit, remained red tagged off (Tag No. 88-2153-1). The inspector verified the breaker was properly tagged and that it was open. The Red Tag logbook that is maintained in the Shift Supervisor office clearly identified the tag out. The licensee has issued a Maintenance Work Order to correct the bridged circuits on Lighting Circuit 23.

Lighting Circuit 23 does not connect to an essential power source. A failure of this circuit would not disable any essential power sources supplying the relay cabinets. The design process controls have been significantly improved since initial plant construction and should prevent this type of problem from recurring. In addition, bridged circuits are defined and discussed in Electrical Maintenance Training Lesson Plan ELE-TRM-100300. This should aid in the identification of any other bridged circuits. The licensee has issued Licensee Event Report (LER) 88-016. The inspector reviewed the licensee's analysis of this event and concurs with the licensee that operation of the plant with the bridged lighting circuits had negligible safety significance. The inspector considers the LER to be closed and has no further concerns on this PCAQ.

- c. 88-0562: Indicating lights for block switches did not work. The licensee identified this problem during post modification testing. The electricians determined that there was a lack of continuity between internal plug pin connectors. Cables 1CSF1712A and 2CSF1722A are wired to indicating switches that are used to provide a block input to SFAS when a protective action has taken place and to provide confirmatory indication that the block has been accomplished. The licensee determined that a total of ten pins and sockets were not properly seated. All the sockets were re-mated with acceptable pin continuity except for three damaged pins. The licensee used three spare pins to correct the problem. The rework and testing was completed satisfactorily.
- d. 88-0568: Rework/repair/correct broken chips, wire wrap pins, damaged circuit trace, logic truth table, and wire color to an SFRCS logic board. The licensee discovered these items during their receipt inspection. All of the items were adequately dispositioned by the licensee. The inspector has no further questions on this PCAQ.
- e. 88-0635: Unprotected 10 CFR Part 50, Appendix R, Section III.G.2 redundant safe shutdown cables are located in the same manhole (MH). 10 CFR Part 50, Appendix R, Section III.G.2, states, in part, "Fire protection features shall be provided for structures, systems, and components important to safe shutdown. These features shall be capable of limiting fire damage so that one train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage." The licensee identified that the safe shutdown cables for trains one and two of the service water system were located in a common manhole (MH 3001) enclosure that did not provide adequate Appendix R cable separation. The manhole was provided for cable pulling operations during initial plant construction. The cables were run in separated conduits prior to entering and when exiting the manhole. The cables were routed in separate enclosed metal raceways within the manhole. The cable routings and raceways were

designed to meet the requirements of Regulatory Guide 1.75, "Physical Independence of Electric Systems."

The probable cause for a fire in MH 3001 would be from an electrically induced cable insulation fire. The manhole is not easily accessible. It is protected by a bolted metal cover provided with missile protection, and by a metal door. A permanently installed sump pump was used to remove water seepage. The inspector requested the licensee to identify all safety and non safety cables running through the manhole; determine the maximum short circuit current; over current protective device capability; and the allowable short circuit capability of each cable. The licensee supplied the inspector the information that was requested. In all cases, the maximum short circuit current available was less than the allowable short circuit capability of the cable. In addition, the sump pump was provided with adequate short circuit protection.

The inspector discussed this item with Regional and NRR fire protection personnel. Based on the above review, it was concluded that the probability of losing the safe shutdown capability of the service water pumps due to an electrically induced cable fire was highly unlikely. The licensee is preparing a LER on this item. Review of this LER's corrective actions will be tracked as an open item (346/88031-01) pending further review by the NRC.

The licensee further reviewed other manholes for the same problem. The licensee's staff identified that MH 3041 and MH 3042 contained redundant safe shutdown circuits for both Emergency Diesel Generator (EDG) fuel oil transfer pumps that were located in Fire Area BN, "Diesel Generator Week Tank Areas." The inspector reviewed the licensee's findings and determined that MH 3041 and MH 3042 were not an immediate concern. The licensee had adequate steps to perform a manual fill of the EDG Day Tanks utilizing Procedure AB 1203.02, "Serious Station Fire," via the emergency fill connection per Procedure SP 1104.04. The use of procedures to perform manual operations is permitted by 10 CFR Part 50, Appendix R.

The inspector has no further questions at this time regarding MH 3041 and MH 3042 pending review of the planned LER.

- f. 88-0674: Two wire wrap locations in the Integrated Control System (ICS) contained four wire wraps on one pin. This configuration deviates from the manufacturers specifications that a pin has no more than three wire wraps. The licensee discovered the wire wrap configuration during a field walkdown of all the ICS wiring. The walkdown was in response to a Babcox and Wilcox owners group recommendation (TR-105-ICS). The pins were located in an area of the ICS that had never been modified at the plant. The licensee has determined the condition of four wire wraps on a pin was from

initial construction of the equipment as received from the vendor. The licensee has trained their personnel on wire wrapping and has procedures in place that should prevent inadequate wire wrapping techniques. The inspector has no further questions on this PCAQ.

5. Open Items

Open items are matters which have been discussed with the licensee, which will be reviewed further by the inspector, and which involves some action on the part of the NRC or licensee or both. An open item is discussed in Paragraph 4.e.

6. Exit Interview

The inspector met with licensee representatives denoted in Paragraph 1 during and at the conclusion of the inspection on September 16, 1988. The inspector summarized the scope and results of the inspection and discussed the likely content of this inspection report. The licensee acknowledged the information and did not indicate that any of the information disclosed during the inspection could be considered proprietary in nature.