U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50-440
License No:	NPF-58
Report No:	50-440/96015(DRS)
Licensee:	Cleveland Electric Illuminating Company
Facility:	Perry Nuclear Power Plant
Location:	Parmly at Center Road Perry, OH 44081
Date:	October 11, 1996
Inspector:	Eric Duncan, Reactor Engineer
Approved by:	M. A. Ring, Chief, Lead Engineering Branch Division of Reactor Safety

Meeting Summary

Four apparent violations identified during the inspection were discussed, along with the corrective actions taken or planned by the licensee. Two of the apparent violations involved technical specification limiting condition for operation action requirements which were exceeded. One of these involved a 45 hour period where the emergency closed cooling system was inoperable, and the actions required by Technical Specification 3.0.3 were not completed. The remaining two apparent violations involved corrective action issues. In one case corrective actions were neither timely nor adequate to address a leaking safety-related motor-operated butterfly valve. In a second case, corrective actions failed to correct an adverse condition regarding the ability to operate safety-related control room complex chillers at low lake temperatures.

Report Details

1. Persons Present at Conference

Centerior Service Company

L. Myers, Vice President, Perry
N. Bonner, Director, Perry Nuclear Engineering Department
W. Kanda, Director, Perry Nuclear Assurance Department
R. Collings, Director, Perry Quality Assurance Department
F. Kerney, Plant Operations Superintendent, Perry
H. Oates, Design Engineer, Perry

U. S. Nuclear Regulatory Commission

W. Axelson, Acting Deputy Regional Administrator, RIII
G. Grant, Director, Division of Reactor Safety, RIII
M. Ring, Chief, Lead Engineering Branch, RIII
R. Lanksbury, Chief, Division of Reactor Projects, RIII
D. Kosloff, Perry Senior Resident Inspector
J. Hopkins, Perry Project Manager, NRR
B. Burgess, Enforcement Director, RIII
P. Pelke, Enforcement Specialist, RIII
B. Berson, Legal Counsel, RIII

2. Pre-decisional Enforcement Conference

A Pre-decisional Enforcement Conference was held in the NRC Region III Office on October 11, 1996. Apparent violations of NRC regulations were discussed. The inspection findings were documented in NRC Inspection Report No. 50-440/96008, which was transmitted to the licensee by letter dated September 27, 1996. The purpose of this conference was to discuss the apparent violations, root causes, contributing factors, and the licensee's corrective actions.

The licensee's presentation included a discussion of the apparent violations, their safety significance, the circumstances which caused the apparent violations, and an outline of corrective actions taken or planned.

The NRC representatives questioned the licensee to clarify the extent of the licensee's investigation and corrective actions.

A copy of the handouts used during the presentation is attached to this report.

Attachment: As stated

Perry Nuclear Power Plant

Pre-Decisional
Enforcement Conference Presentation
to the
U.S. Nuclear Regulatory Commission

October 11, 1996

Discussion Topics

• Introduction	Lew Myers
• Emergency Closed Cooling (ECC) System Overview	Russ Kearney
• ECC Valve Leakage	Neal Bonner/ Russ Kearney
• ECC System Temperature Control Modification	Harry Oates
• Corrective Action Program Issues	Rick Collings/ Bill Kanda
• Summary	Lew Myers

Introduction

Presented by:

Lew Myers

Introduction

- Both issues involve the Perry Emergency Closed Cooling system; however, the circumstances are unrelated.
- Opportunities to understand the issues and take corrective actions did exist.
- History of corrective action issues are well documented.
- The implications of management controls were significant.
- The potential loss of the Emergency Closed Cooling system was significant; however, after both issues were identified, risk was minimized.

Desired Outcome

- Obtain a common understanding of the facts.
- Provide a common understanding that timeliness of both issues was appropriate for the known design bases.
- Provide a common understanding of the safety significance.
- Provide assurance that the Perry Management Team is dedicated to identification, communications, and prompt corrective actions for station problems.
- The NRC will determine that escalated enforcement is not necessary for these issues.

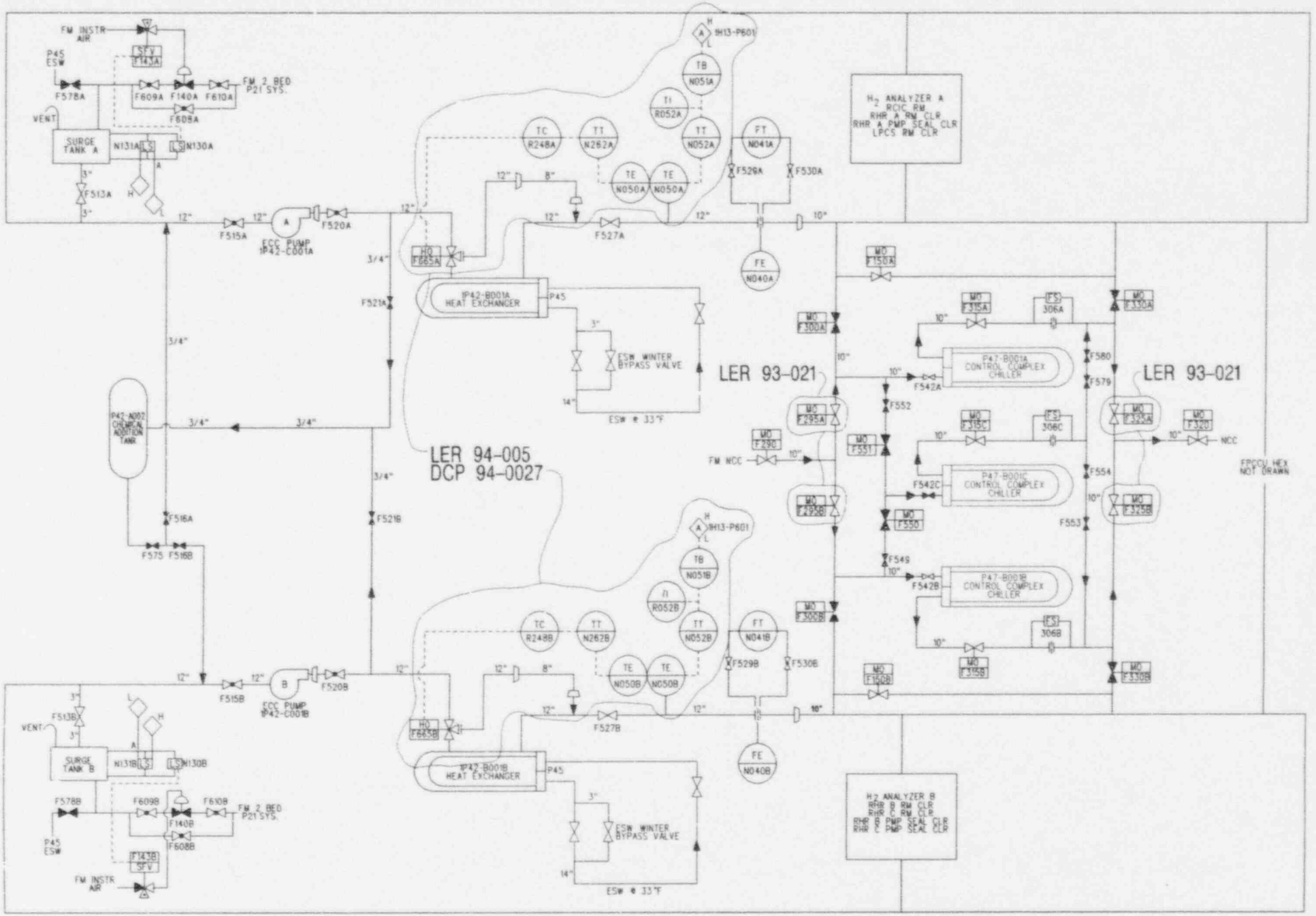
ECC System Overview

Presented by:

Russ Kearney

P42 EMERGENCY CLOSED COOLING WATER

PERRY NUCLEAR POWER PLANT



ECC Valve Leakage

Presented by:

Neal Bonner
Russ Kearney

ECC Valve Leakage

- Sequence of Events
- Safety Significance
- Root Causes
- Corrective Actions
- Issue Summary

Sequence of Events

- *7/1/93* ECC "A" surge tank overflowed.
  - » Temporary Instruction (TXI) - 162 written to determine source and rate of leakage.
- *7/2/93* Motor operated butterfly valve 0P42-F0295A determined to be leaking greater than 250 gpm. This was the first leak test performed on this valve.
  - » Valve 0P42-F0295A adjusted and retested; returned to zero leakage.
  - » Field Clarification Request (FCR) 17843 initiated to determine allowable ECC system leakage rate.
- *7/6/93* Condition Report (CR) 93-132 initiated (first day after Holiday weekend); determined to not be a Technical Specification violation.
- *7/7/93* CR 93-132 initially determined by Regulatory Affairs Section to not be reportable; the scenario necessary for ECC train/system inoperability was not known at that time.

Sequence of Events *(cont.)*

- ***8/25/93*** CR 93-132 root cause investigation completed. Initial cause investigation inadequate; independent external review of reportability being performed.
- ***12/1/93*** CR 93-132 investigation approved by Engineering management.
- ***12/15/93*** External review received which determined ECC could have failed to meet its safety function under certain design basis scenarios.
- ***12/30/93*** Issue was reported to the NRC as a loss of safety function of the ECC system after internal review of contractor's report and a historical reconstruction of issue sequence.
- ***1/23/94*** LER 93-021, "Loss of Safety Function for Emergency Closed Cooling System A," was issued.

Safety Significance

- Scenario assumptions.
  - » Loss of Offsite Power (LOOP)/Loss of Coolant Accident (LOCA) - Nuclear Closed Cooling (NCC) unavailable due to loss of stub bus.
  - » Division 2 diesel generator inoperable - ECC "B" fails to function.
  - » Make-up capability unavailable.
  - » ECC system was only vulnerable for approximately 44 hours due to Emergency Service Water (ESW) work. During a portion of this time, ESW was only "administratively" inoperable.
  - » Probability Safety Assessment.
    - LOOP/LOCA - 5×10^{-6}
    - LOOP/LOCA coincident with division 2 diesel generator inoperability - 1.6×10^{-7}

NOTE: ECC "A" would have isolated during LOOP/LOCA.

Root Causes

- Initial review and classification of ECC/NCC isolation valve (0P42-F0295A) was as an ASME Code, Section XI, Category "B" valve.
  - » Subsequent evaluation and review of FCR 17843 failed to adequately address design bases leak requirements.
  - » The need to reclassify the valve was recognized; however, this action was not adequately resolved in the CR evaluation and corrective actions.
- Improper Settings of ECC/NCC isolation valve (0P42-F0295A).
  - » Combination of personnel error and weak procedural direction for setting MOV limit switches and mechanical stops in 1993. This maintenance was performed to correct a previously identified concern.
  - » Leakage test was not performed since leakage criteria had not been established.

Root Causes *(cont.)*

- ECC leakage corrective action issues.
  - » FCR evaluation was inappropriately used as design input.
  - » Inadequate initial work history review (extent of condition).
  - » Flawed cause analysis and inadequate management review.
  - » Work and corrective action backlogs adversely affected the timeliness of some actions.

Corrective Actions

- Actions Taken Prior to July 1996.
  - » Reviewed other safety-related systems for similar conditions, reviewed work/testing history, and ensured properly set limit switches. No other similar concerns were identified.
  - » Appropriate Maintenance personnel trained; lessons learned were shared with site personnel.
  - » Post-maintenance testing practices have been, and continue to be, enhanced; procedural direction was revised.
  - » FCR processes and controls revised.
  - » Valve has been leak tested within frequency specified for Category "A" valves as a result of Generic Letter 89-10 and preventive maintenance activities.
  - » Actions to reduce backlogs were implemented.

Corrective Actions *(cont.)*

- Other corrective actions taken since issue identification in July 1996.
  - » Valve leakage criteria has been established.
  - » The In-Service Testing program has been revised to identify these valves as Category "A." Associated testing procedures are being revised.
  - » The applicable Alarm Response and Off-Normal Instructions have been revised to delineate required operator actions.
  - » An extent of condition review is being re-performed.

Issue Summary

- Self identified.
- Actions taken at the time were reasonable.
- Corrective actions have resulted in improved Engineering processes.
- Risk significance was minimized.

ECC Temperature Control Modification

Presented by

Harry Oates

ECC Temperature Control Modification

- Sequence of Events
- Safety Significance
- Root Causes
- Corrective Actions
- Issue Summary

Sequence of Events

- *2/86* Control Complex Chiller trips on low refrigerant temperature due to low lake water temperatures.

- *4/86* Design Change Package (DCP) 86-0224 initiated to alleviate low lake water temperature concerns.

- *2/94 - 3/94* During Residual Heat Removal system heat exchanger performance testing, with ESW system flow reduced by the 3" by-pass line, the ECC system temperature is observed drifting below 55 °F. LER 94-05 submitted as a condition prohibited by Technical Specifications and as any condition that alone could have prevented the fulfillment of the safety function.

  - » The 3" diameter bypass line sizing calculation did not consider minimum heat loads.
  - » Operator guidance was established to throttle ESW flow using the 3 inch bypass valve. A modification (i.e., DCP 94-0027) was initiated to control ECC system temperatures with varying lake water temperatures.

Sequence of Events *(cont.)*

- ***10/94*** Design approach shifted from ESW flow control to ECC flow control. It was determined that from a safety perspective, modification should not be installed while the plant was on-line. LER was revised.
- ***4/95*** DCP 94-0027 was issued.
  - » Calculation P42-30 concluded that with minimum or no ECC loads, the valve will by-pass 90% of system flow with stable control.
- ***10/95*** DCP 94-0027 was revised to incorporate TXI-0230 as the post modification test. Precautions were delineated to prevent temperature from dropping below 55 °F.
- ***2/96 - 3/96*** DCP 94-0027 implemented.
- ***3/96*** Following installation of DCP 94-0027, the ECC system was operating with no system loads, and full ESW system flow, when temperature was observed to be decaying.
  - » Flow induced (vortexing) heat transfer at the heat exchanger discharge piping, coupled with potential convective heat losses, resulted in the decay.
  - » The effect of this phenomena was not expected nor assumed in calculations.

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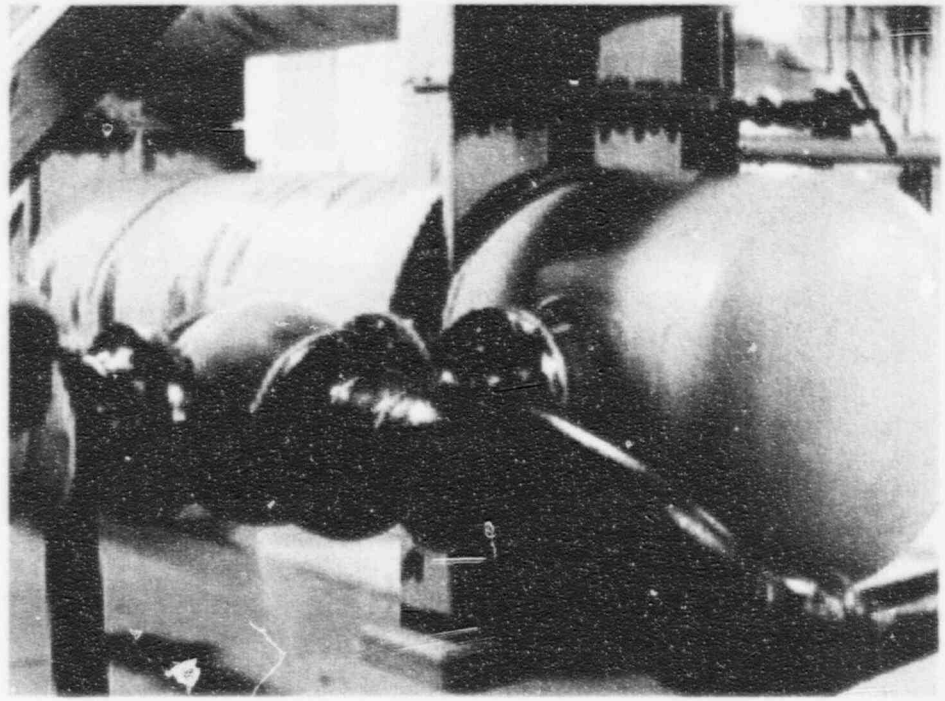
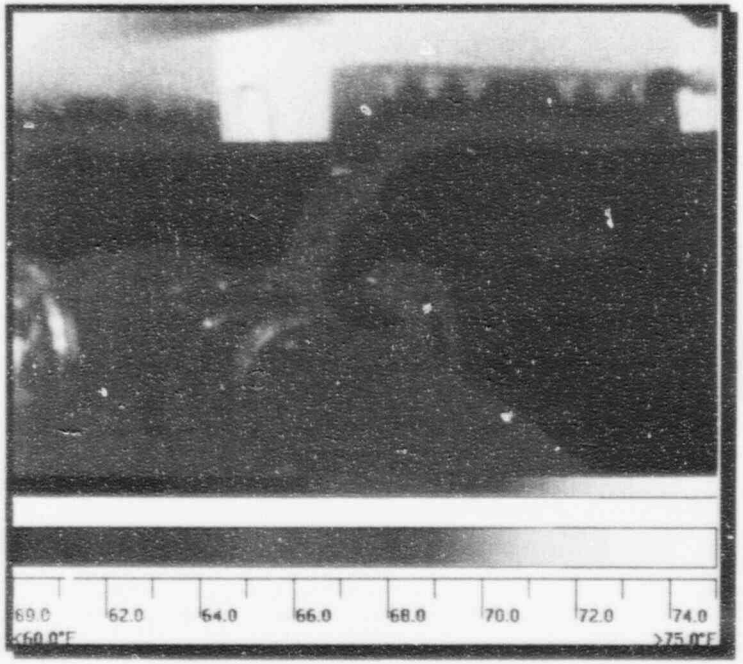
Heat Exchanger
1P42-B0001B
5/20/96
Inlet



The infrared images shown below document the flow test performed on the 1P42-B0001B heat exchanger. This view is of the heat exchanger inlet. The entire test was run with the inlet 3-way temperature control valve in the **full bypass** position.

The image labeled T= -12 min was taken with P42 isolated, and P45 had been running for approximately 1 hour to cool the static water contained in the shell. The P42 Pump was started at T= 0 min. The other thermal image was taken 7 minutes after the start of the P42 pump.



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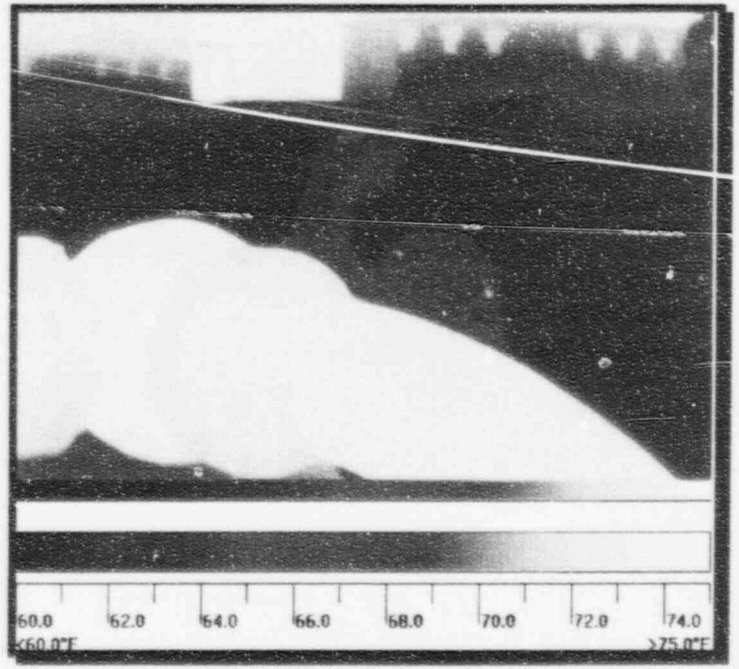

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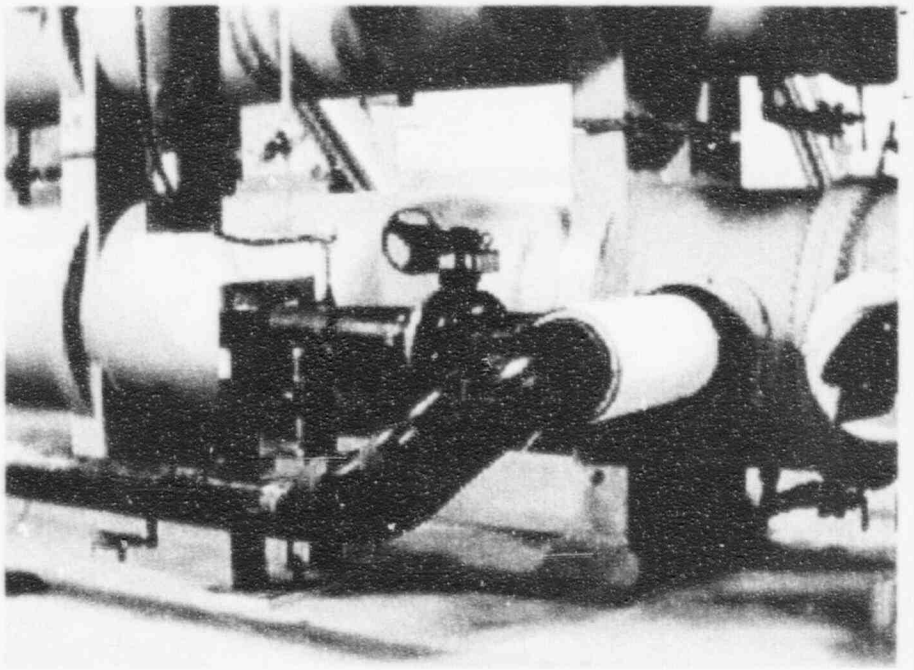
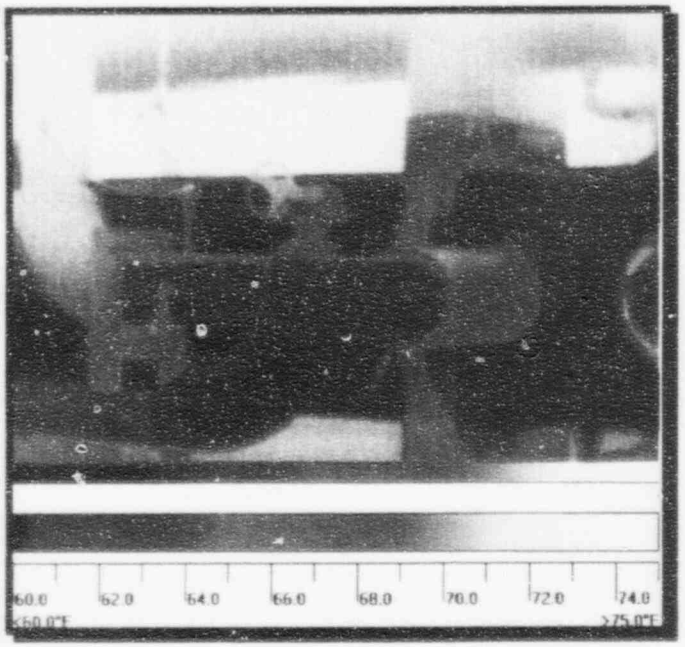
Heat Exchanger
1P42-B0001B
5/20/96
Outlet



The infrared images shown below document the flow test performed on the 1P42-B0001B heat exchanger. This view is of the heat exchanger outlet. The entire test was run with the inlet 3-way temperature control valve in the **full bypass** position.

The image labeled T= -9 min was taken with P42 isolated, and P45 had been running for approximately 1 hour to cool the static water contained in the shell. The P42 Pump was started at T= 0 min. The other two thermal images were taken 1 minute and 5 minutes after the start of the P42 pump.



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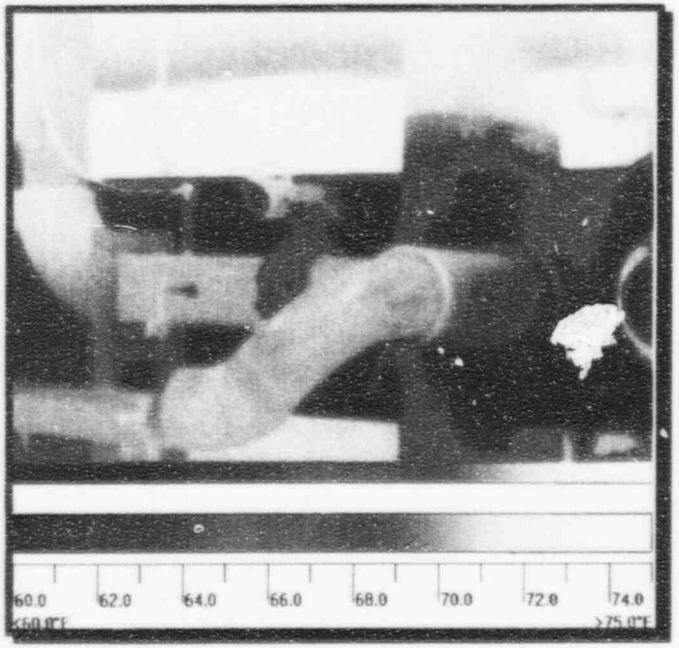

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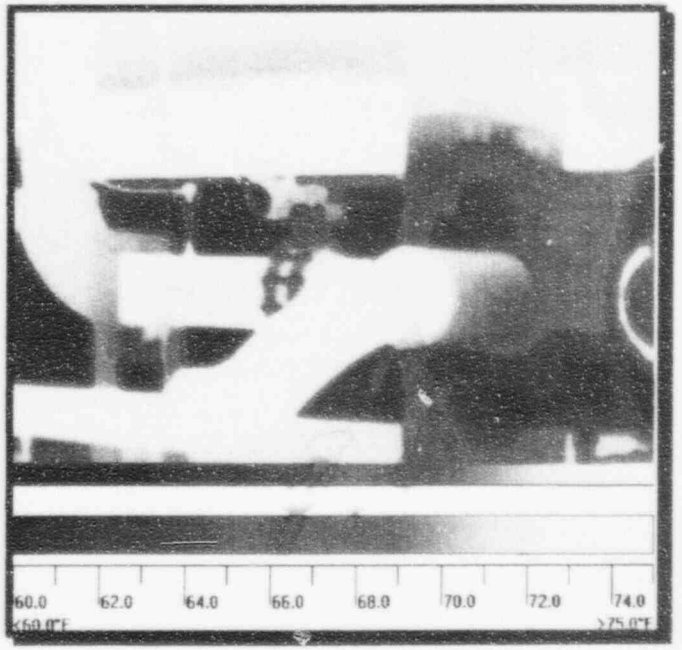

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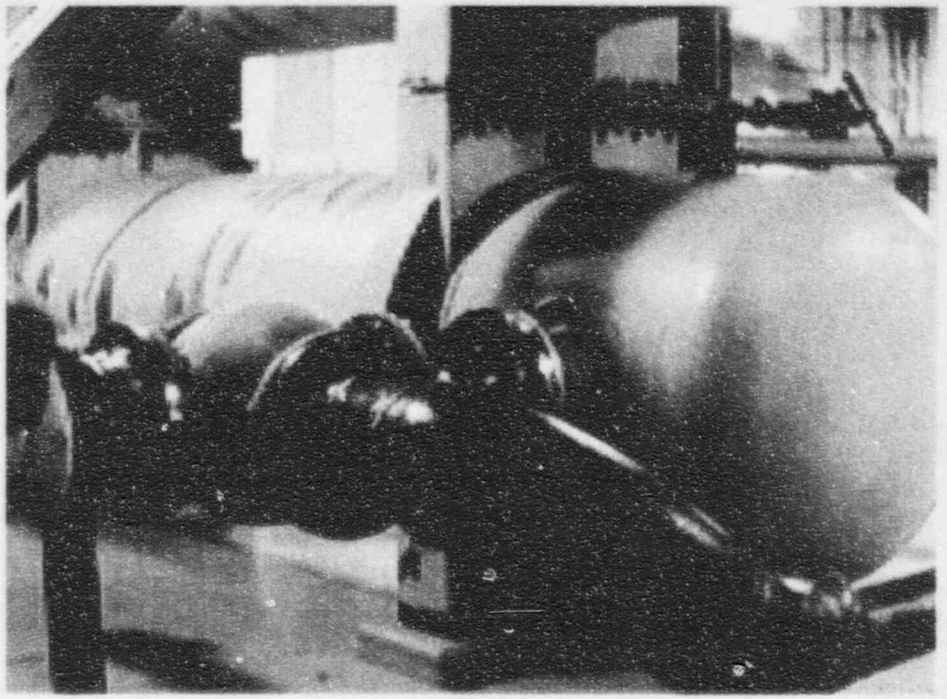
Heat Exchanger
1P42-B0001B
5/20/96
Inlet



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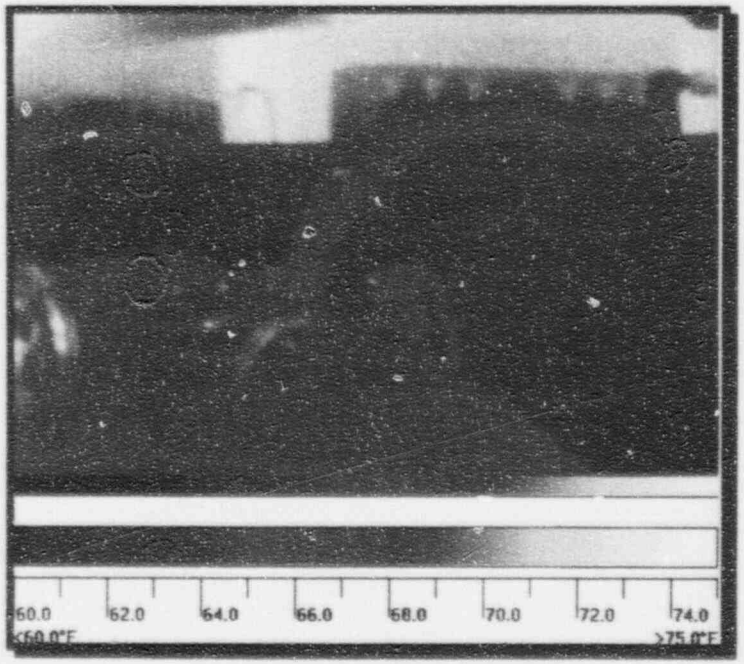

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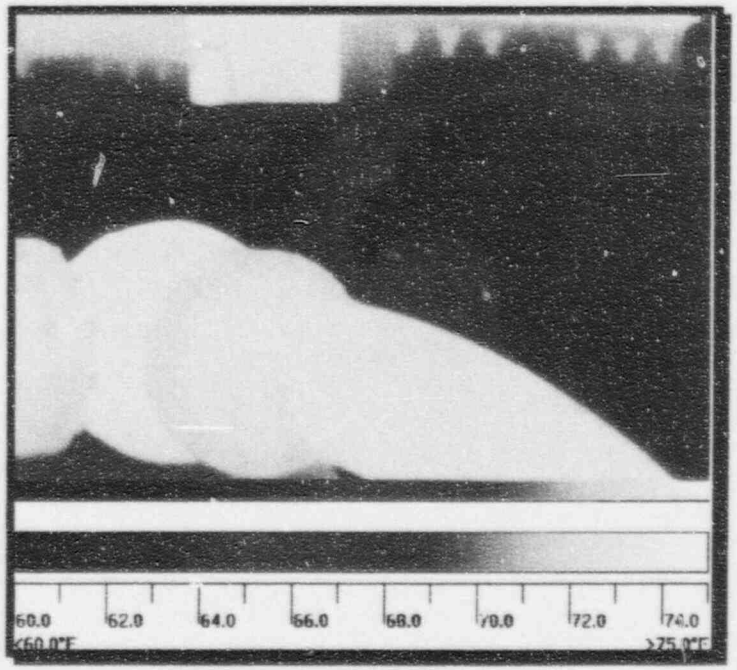

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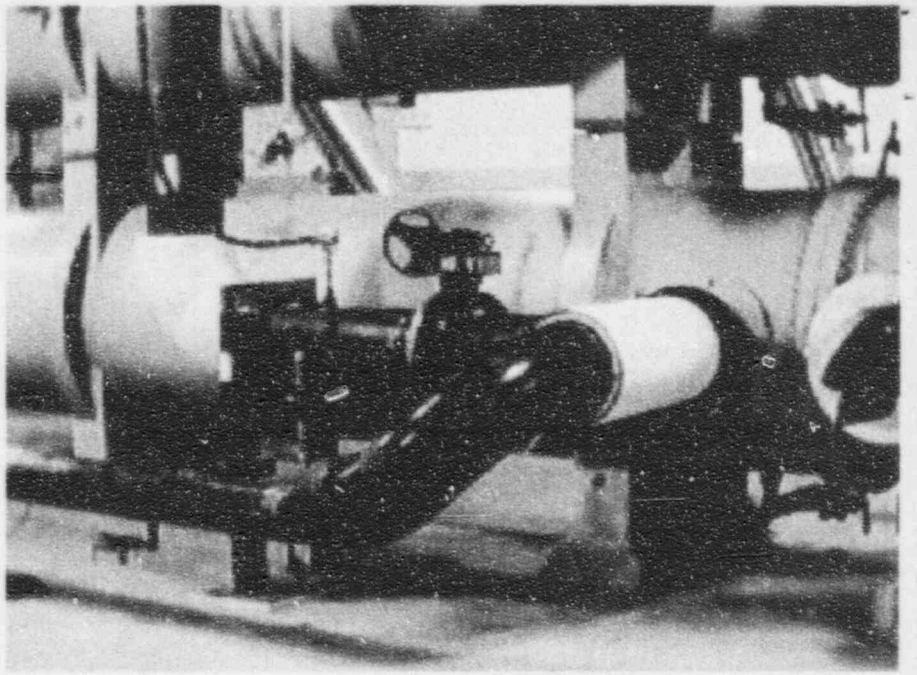
Heat Exchanger
1P42-B0001B
5/20/96
Outlet



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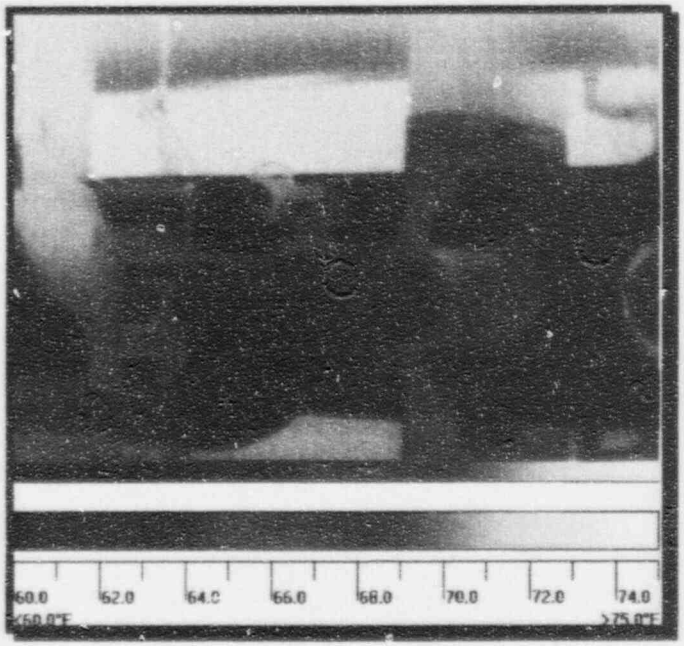

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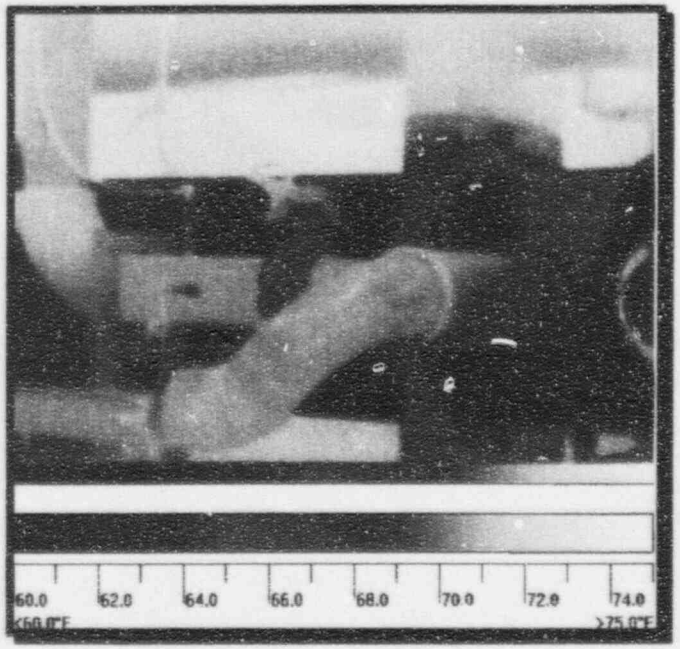

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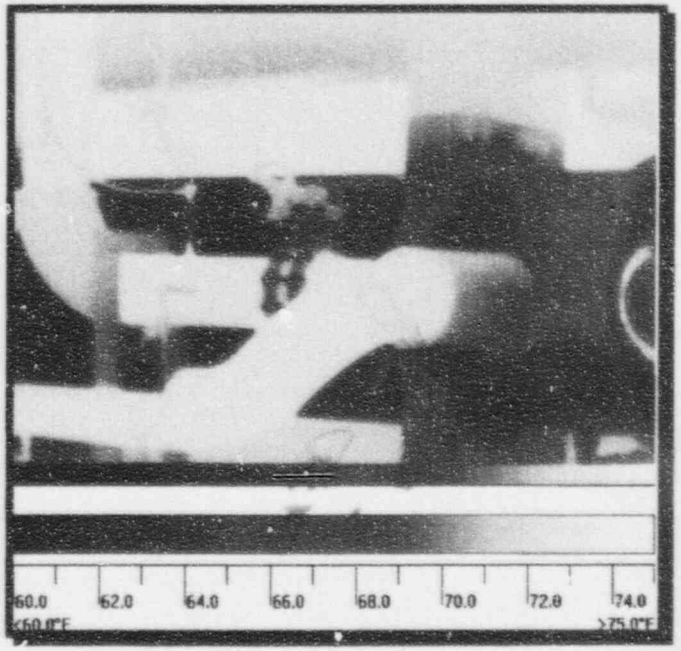

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Safety Significance

- Concerns do not exist during normal or accident configurations.
  - » Adequate heat load is available when system is in normal line-up and when required to perform its safety function.
  - » The testing configuration is the only line-up during which the ECC temperature control modification may not perform its function; low lake water temperature also required.
    - The rate of temperature decay is slow relative to the normal duration (i.e., less than 30 minutes) in which the test evolution occurs.
- Operator actions ensured the system remained operable throughout the fifth operating cycle, while the design process proceeded in a controlled and scheduled manner.

Root Causes

- Heat transfer mechanisms associated with the new configuration were not recognized as being significant during design development/review.
  - » TXI-0230 failed to confirm the adequacy of the design.
  - » Design assumptions inherent to the design of the modification were not confirmed by post modification testing.

Corrective Actions

- Procedural direction has been developed to avoid challenging the ECC system.
- Additional actions are being evaluated:
  - » Post-modification testing development methodology is being evaluated.
  - » Control Complex chiller setpoint evaluation is being performed.

Issue Summary

- Self identified.
- Risk significance.
  - » Condition only existed during testing configurations.
- Actions taken were reasonable. Modification did evaluate the ECC system against all potential plant configurations, including those present during periodic testing.
- The modification has improved system performance.

Corrective Action Program Issues

Presented by:

Rick Collings
Bill Kanda

Corrective Action Program Issues

- Identified weaknesses in the program are well documented (1992-1993).
  - » Inconsistencies in program utilization and problem identification.
  - » Root cause determinations were sometimes incomplete or incorrect.
  - » Not fully effective and timely in correcting problems.

Corrective Action Program Issues
(cont.)

- Improvement actions initiated starting in Fall 1993.
  - » Perry Course of Action/Perry Plan for Excellence.
  - » Post modification/maintenance test manual.
  - » Change in documentation threshold and management expectations.
  - » Complete revision/approach to Corrective Action program.
  - » Root cause and extent of condition emphasized, including additional formal root cause analysis training.
  - » Establishment of a Corrective Action Review Board.
  - » Site and industry experience reviews integrated into process.
  - » Trend analysis and categorization process.
  - » Performance indicators established.

Summary

Presented by:

Lew Myers

Summary

- Ensure a common understanding of the facts, including the timeliness of actions associated with the Emergency Closed Cooling/Nuclear Closed Cooling valve leakage, which was based on what was known at the time.
  - » Use of the Technical Specifications during the time of the issue did not result in entry into the action statement, due to the failure of the design to recognize that the isolation valves should be considered Section XI Category "A" valves. Prompt actions were taken to properly set the limit switches and leak rate tests have been, and continue to be, performed.
  - » During the time period in question, the Emergency Closed Cooling system would not have failed without a design basis scenario, which includes a LOOP/LOCA and a loss of the division 2 diesel generator.
- Emergency Closed Cooling temperature control modification implementation was timely. This modification did improve the operations of the control room chiller system.
- Opportunities existed to identify both issues. Consideration should be given for self identification, time frame, and corrective actions taken for each issue.
- The Perry Management Team is dedicated to prompt identification, communication, and corrective actions for station problems.