50.55(e)

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September 4, 1981

Mr. R. C. Haynes
Director, Region I
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

SUSQUEHANNA STEAM ELECTRIC STATION
FINAL REPORT OF A DEFICIENCY RELATING TO
IMPROPER QUALITY CLASSIFICATION OF SOLENOID
PILOT VALVES
ERs 100450/100508 FILES 840-4/900-10
PLA-922

References: PLA-588 (dated 12/16/80)
PLA-515 (dated 7/23/80)
PLA-483 (dated 5/13/80)

Dear Mr. Haynes:

This letter serves to provide the Commission with a final report of a deficiency relating to the improper safety classification of pilot solenoid valves. This deficiency was originally reported in PLA-483 and the information contained herein is submitted as a final report pursuant to the provisions of 10 CFR 50.55(e).

The attachment to this letter contains a description of the problem, its cause, safety implications and the corrective action taken and planned to preclude recurrence.

We trust the Commission will find the information forwarded by this letter to be satisfactory.

Very truly yours,

N W Curtis

N. W. Curtis
Vice President-Engineering & Construction-Nuclear

FLW:sab

Attachment

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cc: Mr. Victor Stello (15 copies)
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Mr. G. McDonald, Director (1)
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ATTACHMENT TO PLA-922

SUBJECT

Failure to apply the correct safety related designation (quality classification) to Solenoid Pilot Valves.

Description of the Deficiency

The deficiency involves the incorrect quality classification of solenoid pilot valves. The subject solenoid valves, used as pilot valves for functional safety-related process valves, should have been classified by the designer as functional safety-related.

Cause

The cause of the deficiency was an oversight on the designer's (Bechtel Project Engineering) part. The safety/non-safety boundaries were not correctly identified. In this instance, the system design review process did not ensure that the safety/non-safety identification process was properly and consistently applied.

Analysis of Safety Implications

Improper classified pilot solenoid valves and associated equipment could hypothetically prevent safety system process valves from failing in their safe-positions as the lack of formal QA program controls during their manufacture and installation renders the quality of these components indeterminate.

Examples of potential failure modes are:

1. Non-seismic tubing (connecting pilot solenoid valves and associated valve operators) could be crimped during a seismic event, preventing venting of the air operator pressure.

2. Non-Q solenoid pilot valves could theoretically fail in the position that prevents venting of the air operator pressure.

3. Non-Q control circuits could theoretically act in such a way as to improperly energize the solenoid pilot valve, thereby improperly admitting pressure to the valve operator and incorrectly positioning the process valve.

Any of the above three conditions may result in an undesirable valve lineup in a safety related system. The specific valves and systems are delineated in Table 1.

The affected systems are the Emergency Core Cooling System (ECCS) and ECCS auxiliaries. A specific failure scenario is given below for Valve SV-15626 showing safety impact:

1. The Non-Q control circuit fails in such a way as to improperly energize solenoid valve SV-15626, pilot valve for valve HV-E41-1F026.

2. Valve HV-E41-1F026 improperly opens.

3. Reactor coolant is lost as a result of valve HV-E41-1F026 improperly opening if valve HV-E41-1F025 is not manually closed.

Safe shutdown of the plant could be made more difficult in such an instance. The deficiency will require extensive rework and replacements to establish the adequacy of these systems to perform their intended safety functions. Therefore, this condition is considered reportable under 10 CFR 50.55(e).

Corrective Action

A review of the circumstances surrounding this deficiency have resulted in a conclusion that this occurrence is unique and would not be expected to recur. The existing procedural requirements, if properly followed, provide proper and adequate program controls. Thus the corrective action will require no change in the present design review process. A plan to correct the improperly classified valves has been prepared. Detailed corrective action for each specific valve is tabulated in Table 1. In general, the following steps are to be taken to ensure that the final installation complies with applicable safety criteria.

1. Solenoid pilot valves purchased without QA requirements/programs are to be replaced with valves manufactured under a QA program.

2. All safety-related solenoid pilot valves will have safety-related control circuits, power supplies and safety grade vent tubing, as applicable. (Note that in some cases when non safety grade tubing was used, corrective action was accomplished by relocation of the solenoid valve and accessories directly on the process valve).

Completion of corrective action will be tracked by NCR 6646 and by Design Change Packages DCP-080.1 and DCP-080.2. DCP-080.1 describes the action taken for Unit 1 while DCP-080.2 describes the action taken for Unit 2. A review program has been initiated to assure the clear identification of "Q" designated valves on the Bechtel P&IDs.

In order to preclude recurrence of this deficiency, a meeting was held with the responsible Bechtel Chief Engineers and Group Supervisors (Control Systems and Mechanical) to discuss existing project engineering procedural requirements for design interface coordination, discipline design reviews of Q boundaries, and Group Supervisor, Project Engineer and Chief Engineer reviews/approvals. The need to clearly identify Q-boundaries and to follow established design review procedures was emphasized.

TABLE 1

Functional Safety-Related Solenoid Pilot Valves - Installation Status

Tag. No., SV- (See Note 6)	Originally Purchased "Q"?	Location of Original Installation (See Note 4)	Original grade of Control Circuits, Power Source	Work to Correct Deficiency (Note 1)	If Uncorrected Safety System Affected; (Note 2)
10943A	No	Valve	"Q"	P,I,R;Note 5	A
10943B	No	Valve	"Q"	P,I,R;Note 5	A
11024A	No	Remote	"Q"	P,I,R;Note 5	A
11024B	No	Remote	"Q"	P,I,R;Note 5	A
11274A	Yes	Valve	"Q"	R	B
11274B	Yes	Valve	"Q"	R	B
14319	No	Valve	"Q"	P,R	D
14320	No	Valve	"Q"	P,R	D
14925	Yes	Valve	"Q"	R	F
14926	Yes	Valve	"Q"	R	F
15004	No	Valve	"Q"	P,R	G
15005	No	Valve	"Q"	P,R	G
15122A	No	Valve	"Q"	P,R	H
15122B	No	Valve	"Q"	P,R	H
15150A	Yes	Valve	"Q"	R	H
15150B	Yes	Valve	"Q"	R	H
15151A	Yes	Valve	"Q"	R	H
15151B	Yes	Valve	"Q"	R	H
15152A	Yes	Valve	"Q"	R	H
15152B	Yes	Valve	"Q"	R	H
15188A	No	Valve	"Q"	P,R	H
15188B	No	Valve	"Q"	P,R	H
15189A	No	Valve	"Q"	P,R	H
15189B	No	Valve	"Q"	P,R	H
15191A	No	Valve	"Q"	P,R	H
15191B	No	Valve	"Q"	P,R	H
15203A	No	Valve	"Q"	P,R	J
15203B	No	Valve	"Q"	P,R	J
15206A	Yes	Valve	"Q"	R	J
15206B	Yes	Valve	"Q"	R	J
15528	Yes	Valve	"Q"	R	K
15529	Yes	Valve	"Q"	R	K
15625	No	Valve	"Q"	P,R	L
15626	No	Valve	"Q"	P,R	L

Notes for Table 1:

1) P = solenoid valve replaced with a "Q" valve.
   I = installations of solenoid pilot, air set and lubricator moved to immediately on the process valve/operator.
   E = electrical controls upgraded; power source upgraded.
   R = revise P&ID and location dwg. to correct "Q" designation.

Refer to discussion of corrective action for reasoning and details.

2) Affected systems

   A Emergency Service Water
   B RHR Service Water
   D Reactor Recirculation
   F RCIC
   G RCIC Turbine
   H RHR
   J Core Spray
   K HPCI
   L HPCI Turbine

3) (Deleted)

4) Original installation: Valve = pilot valve mounted on process valve
   Remote = pilot valve mounted remotely, away from process valve

Note: Installation information is "as-built", noted in a walkdown by Construction Engineering.

5) SV-11024A & B were retagged as SV-11024A2, & B2; SV-11024A3, & B3 were purchased. Similar changes were made for SV-10943A & B.

6) Only the Unit 1 valves are listed. Designs and corrective actions for Unit 2 counterparts are the same.