Document Control

AUGUST 1 6 1982

Docket Nos. STN 50-483, 50-445/446
and 50-395

MEMORANDUM FOR: The Atomic Safety & Licensing Board for:

Callaway Plant, Unit 1
Comanche Peak Steam Electric Station, Units 1 & 2

and The Atomic Safety & Licensing Appeal Board for:

Virgil C. Summer Nuclear Station, Unit 1

FROM: Thomas M. Novak, Assistant Director for Licensing
Division of Licensing

SUBJECT: BOARD NOTIFICATION - CONTROL ROD DRIVE GUIDE TUBE SUPPORT PIN FAILURES AT WESTINGHOUSE PLANTS
(Board Notification No. 82-81)

In accordance with present NRC procedures regarding Board Notifications, the enclosed information is being provided for your information as constituting new information relevant and material to safety issues. This information is generic and may have applicability to all Westinghouse plants.

The attached material discusses the failures of the support pins that are attached to the bottom of the control rod drive guide tubes in Westinghouse designed reactors. The support pins align the bottom of the control rod drive guide tube assembly into the top of the upper core plate in a manner that provides lateral support and accommodates thermal expansion of the guide tube relative to the core plate.

Some of the safety concerns to which this information relates are failure to scram, scram system performance during design basis accidents, and potential damage to safety systems and components due to loose parts in the RCS.

We will transmit more information and the staff assessment as it becomes available.

Original signed by:
Thomas M. Novak

Thomas M. Novak, Assistant Director
for Licensing
Division of Licensing

Enclosure:
As stated

Contact: Janis Kerrigan, ONRR
X29788

OFFICE			DL:L	DL:L		
SURNAME			JKerrigan:lb	TNovak		
DATE			08/10/82	08/16/82		

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P PDR

BOARD NOTIFICATION
82-81

CONTROL ROD DRIVE GUIDE TUBE SUPPORT PIN FAILURES AT W PLANTS

✓ Summer
Diablo Canyon
FNP 1-8
✓ Callaway
✓ Comanche Peak

*w/enclosures
Document Control (50-395, 50-275/323, 50-437, 50-445/446, STN50-483,)
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Docket No. STN 50-483

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JUL 2 3 1982

MEMORANDUM FOR: Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulations

FROM: E. L. Jordan, Director
Division of Engineering and
Quality Assurance
Office of Inspection and Enforcement

SUBJECT: BOARD NOTIFICATION OF CONTROL ROD DRIVE GUIDE TUBE SUPPORT PIN FAILURES AT WESTINGHOUSE PLANTS

The purpose of this memorandum is to inform you of an issue which we believe should be brought to the attention of the Atomic Safety Licensing Board Panel and the Atomic Safety Licensing Appeals Panel. The issue involves the failures of the support pins that are attached to the bottom of the control rod drive guide tubes in Westinghouse designed reactors. The support pins align the bottom of the control rod drive guide tube assembly into the top of the upper core plate in a manner that provides lateral support and accomodates thermal expansion of the guide tube relative to the core plate (see enclosed notice for details).

Westinghouse has analyzed the safety implications of a failed pin and concluded that a single pin failure is not a safety concern, either from the effects of a loose part or the failure of a single control rod assembly to fully insert upon a reactor trip signal. Since the failures are due to stress corrosion cracking (SCC), we believe that multiple pin failures are possible. Such failures could introduce several loose parts into the reactor coolant system, and could also inhibit the insertion of several control rod assemblies upon a reactor trip signal. For example, one can assume that SCC had progressed to the point where several pins are on the verge of failing. (Note: Such degradation was detected in a Japanese reactor). With the above preconditioning of the pins, we can postulate that a LOCA or other triggering event could induce higher than normal stresses on the pins such that they could fail simultaneously. We, therefore, plan to request additional analyses from Westinghouse regarding the potential for multiple pin failures and their effects on plant safety. In addition, we plan to determine which actions are needed to resolve this concern.

Contact: I. Villalva
(301) 492-9635

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Based on the above, and the information contained in the enclosure, we believe that this matter is of sufficient safety significance to warrant board notification.

Robert L. Baer

for Edward L. Jordan, Director
Division of Engineering and
Quality Assurance
Office of Inspection and Enforcement

Enclosure:
IE information Notice No. 82-29

cc: R. C. DeYoung, IE
J. H. Sniezek, IE
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SSINS No.: 6835
IN 82-29

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

July 23, 1982

IE INFORMATION NOTICE NO. 82-29: CONTROL ROD DRIVE (CRD) GUIDE TUBE SUPPORT PIN FAILURES AT WESTINGHOUSE PWRS

Addressees:

All nuclear power reactor facilities holding an operating license (OL) or construction permit (CP) using a Westinghouse-designed NSSS.

Purpose:

This information notice is provided as notificatin of an event that may have safety significance. It is expected that recipients will review the information for applicability to their facilities. No specific action or response is required.

Description of Circumstances:

Since 1978, several failures of the control rod drive (CRD) guide tube support pins have occurred. Westinghouse has notified NRC of these occurrences by the following correspondence:

1. June 11, 1979, NS-TMA-2099, Letter to D. Eisenhut from T. M. Anderson concerning support pin and flexure failures in Japan.
2. March 14, 1980, NS-TMA-2214, Letter to Victor Stello from T. M. Anderson; Title 10 CFR Part 21 notification concerning CRD Guide Tube Support Pin Failures at Foreign Plants.
3. April 23, 1980, NS-TMA-2235, Letter to Stephen S. Pawlicki from T. M. Anderson summarizing Westinghouse/TVA/NRC meeting on May 20, 1980 on Sequoyah guide tube support pins.
4. June 10, 1980, NS-TMA-2254, Letter to Stephen Pawlicki from T. M. Anderson concerning inspection of support pins.
5. May 20, 1982, NS-EPR-2251, Letter to Victor Stello from E. P. Rahe, Jr., concerning a pin failure at Graveline 1

Prior to May of this year, at which time a guide tube pin failed at North Anna 1, these failures had occurred only at foreign reactors (Japan and France). The pins are used to align the bottom of the CRD guide tube assembly into the top of the upper core plate. Two support pins are bolted into the bottom plate of each lower guide tube, and are inserted into the top of the upper core plate in a manner that provides lateral support while accommodating thermal expansion of the guide tube relative to the core plate (see attached pin assembly diagram). The pins are about 3½ inches long and have a diameter of 0.507 or 0.537 inch (depending on reactor design). The pin assembly includes (1) a bolt section

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to which a nut (sleeve) is threaded to anchor the pin to the guide tube, (2) a collet that rests against the guide tube, and (3) a leaf spring section with the leaf shaped somewhat like a clothespin. The material is Inconel X-750, which, depending on the manufacturer and the fabrication date, has been solution heat treated and age hardened at various temperatures and for various times. For example, the solution heat treatment temperatures and times ranged from 1625°F to 2100°F and from ½ hour to 24 hours; age hardening temperatures and times ranged from 1148°F to 1544°F and from 8 hours to 20 hours, respectively.

The first failures were detected in early 1978 at Mihama Unit 3 in Japan, at which time the top portion of a support pin with the shank and lock nut engaged was found in a steam generator. Subsequent ultrasonic testing (UT) showed a possibility of cracks in 103 out of 105 pins at the bolt to collet transition region of the pin. Seven of the Mitsubishi-supplied pins were then removed and inspected, confirming the UT results. All pins were subsequently replaced and UT inspection was conducted at other Japanese plants. In all, there have been at least eight support pin failures where a pin has actually broken. These occurred with both Westinghouse and Mitsubishi-supplied pins.

In a recent failure at Fessenheim Unit 1 in France,part of a broken pin caused considerable damage to a steam generator within 72 hours of its failure. It is estimated that the plant will be shutdown for about a year to repair the steam generator. Although the broken part consists of the bolt section including the nut, only the lock nut of the pin has been found and the bolt portion is still missing. Previous to the Fessenheim failure, a leaf from a support pin was found in an accumulator check valve at Graveline 1 in France. It is not known how the leaf traveled to the check valve.

The only domestic pin failure occurred in May 1982 at North Anna 1. The lock nut of a support pin was found in steam generator "A" and a smaller piece of material, also identified as part of a support pin, was found in steam generator "C." Damage to the steam generators is considerable, with about 75% of the tube ends sustaining damage. It is our understanding that the plant was shutdown in less than 24 hours after detecting the loose parts in the steam generators. It is also our understanding that the reactor internals will be video inspected to determine the status of the remaining support pins.

Westinghouse's analysis indicated that the failures are caused by stress corrosion cracking (SCC) of pins that are solution heat treated at less than 1800°F after which they are age hardened, and then highly stressed (60,000 psi nominal on the shank and 130,000 psi on the leaf spring section of the pin). The solution heat treatment of the North Anna 1 support pin was 1625°F for 1 hour followed by an age hardening treatment. The torque on the nut was 210 ft-lb. Westinghouse now recommends that the pins be solution heat treated at 2000°F for 1 hour and age hardened at 1300°F for 20 hours to minimize the SCC problem. Westinghouse also recommends that the torque on the lock nut be reduced to 130 to 140 ft-lb.

The consequences of pin failure for plants with the upper head injection (UHI) design was originally considered to be more acute than those for non-UHI plants. This concern resulted from the potential for CRD misalignment in UHI plants or pin failure. However, domestic operating UHI plants now have support pins meeting the recommended material process standards and the pin body design has been revised to prevent control rod misalignment on pin failure.

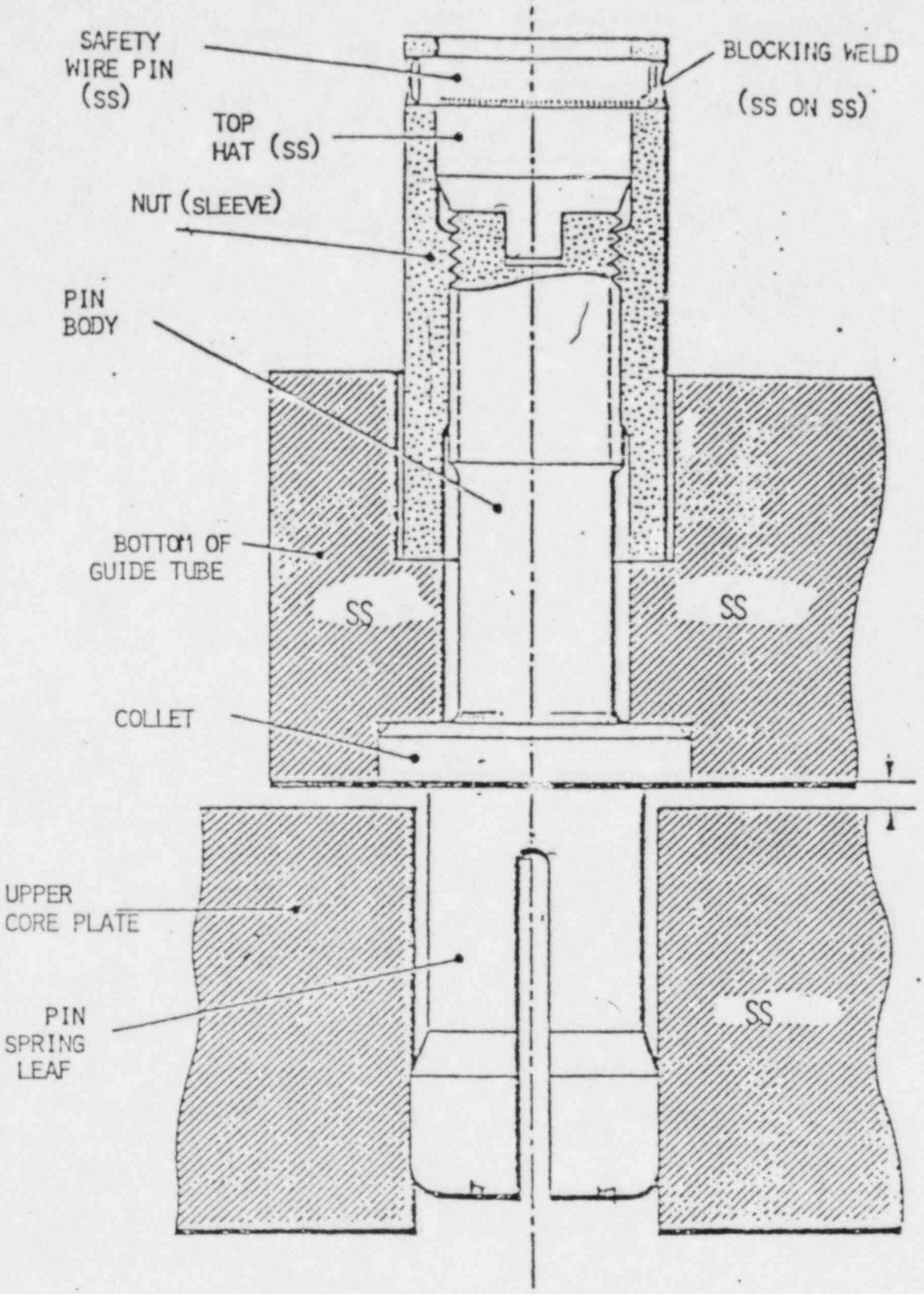
Westinghouse does not consider CRD misalignment as credible in non-UHI plants. The safety consequence of a support pin as a loose part, however, is still under consideration by NRC. It is important to note that, although a single-pin failure is of limited safety significance, the common-mode failure mechanism of stress corrosion cracking could cause several pins to fail. We are concerned that, if not properly detected, multiple pin failures may occur that could affect redundant safety systems.

If you have any questions regarding this matter, please call the appropriate regional administrator or this office.

Edward L. Jordan, Director
Division of Engineering and
Quality Assurance

Technical Contact: I. Villalva, IE
301-492-9635

Attachments:
1. Pin Assembly Diagram
2. List of Recently Issued IE Information Notices



PIN ASSEMBLY

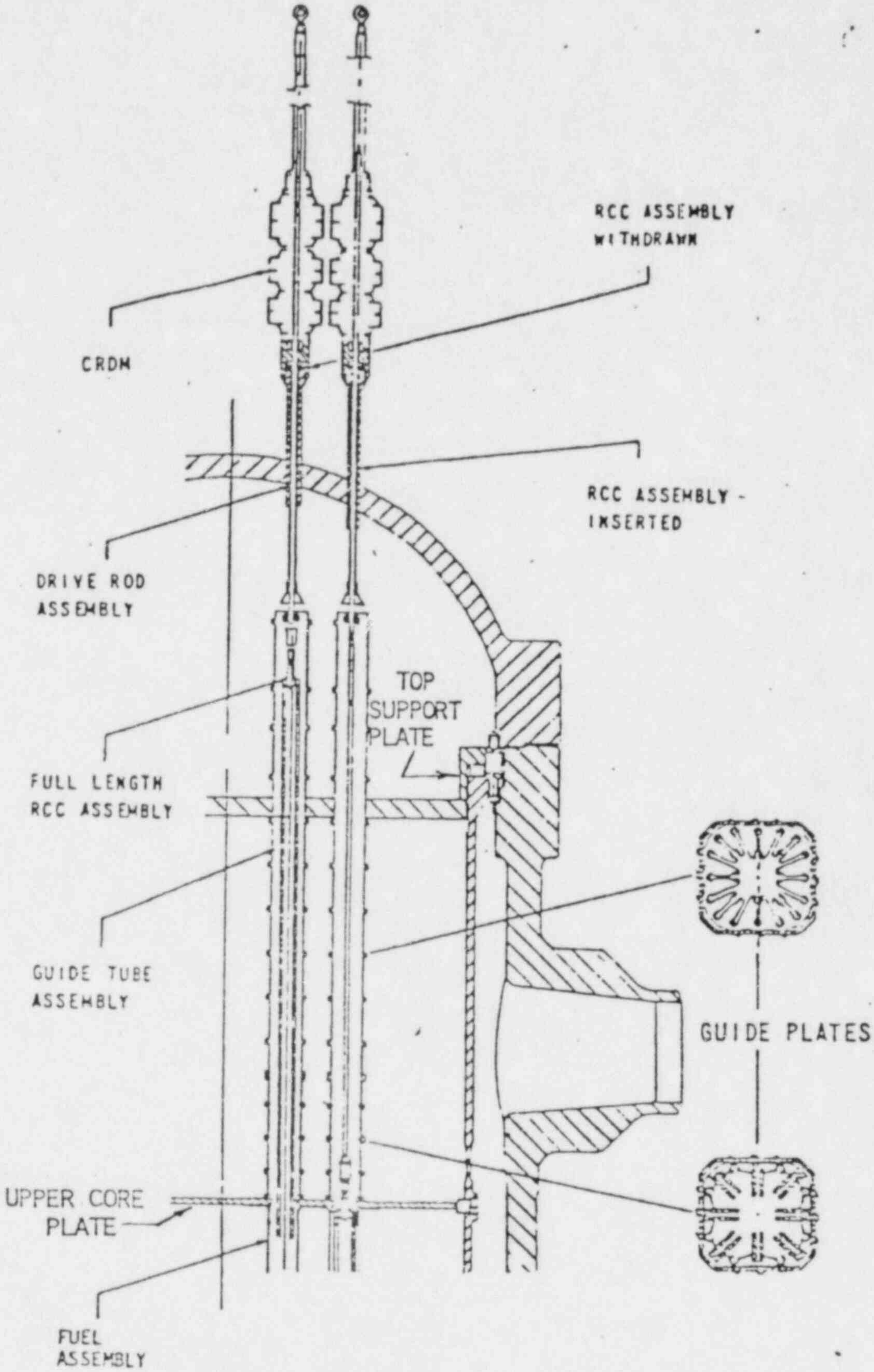
(INCONEL)

Attachment
IN 82-29
July 23, 1982

LIST OF RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
82-28	Hydrogen Explosion While Grinding in the Vicinity of Drained and Open Reactor Coolant System	7/23/82	All power reactor facilities holding an OL or CP
82-27	Control of Radiation Levels in Unrestricted Areas Adjacent to Brachytherapy Patients	7/23/82	All medical institutions
82-26	RCIC and HPCI Turbine Exhaust Check Valve Failures	7/23/82	All BWR power reactor facilities holding and OL or CP
82-25	Failures of Hiller Actuators upon Gradual Loss of Air Pressure	7/22/82	All power reactor facilities holding an OL or CP
82-24	Water Leaking from Uranium Hexafluoride Overpacks	7/20/82	All NRC licensed enriched uranium fuel fabrication plants
81-26, Part 3, Sup. No. 1	Clarification of Placement of Personnel Monitoring Devices for External Radiation	7/20/82	All power reactor facilities holding an OL or CP
82-23	Main Steam Isolation Valve (MSIV) Leakage	7/16/82	All BWR power reactor facilities holding an OL or CP
82-22	Failures in Turbine Exhaust Lines	7/9/82	All power reactor facilities holding an OL or CP
82-21	Buildup of Enriched Uranium in Effluent Treatment Tanks	6/30/82	All uranium and plutonium fuel fabrication licensees
82-20	Check Valve Problems	6/28/82	All power reactor facilities holding an OL or CP

OL = Operating License
CP = Construction Permit



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GUIDE TUBE ASSEMBLY