SSINS No.: 6835
IN 85-14

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

February 22, 1985

IE INFORMATION NOTICE NO. 85-14: FAILURE OF A HEAVY CONTROL ROD (B4C) DRIVE ASSEMBLY TO INSERT ON A TRIP SIGNAL

Addressees:

All nuclear power reactor facilities holding an operating license (OL) or a construction permit (CP).

Purpose:

This information notice is to alert recipients of a potentially significant event pertaining to a stuck drive rod assembly of a control rod drive mechanism (CRDM). This event occurred while performing hot rod drop tests at a foreign pressurized water reactor designed by Westinghouse Electric Corporation (Westinghouse). This event was caused by a breech guide screw that became disengaged from the external breech of a drive rod assembly and fell on top of the CRDM latch assembly where it became lodged and prevented driveline motion. It is expected that recipients will review the information contained in this notice for applicability to their facilities and consider actions, if appropriate, to preclude similar problems from occurring at their facilities. However, suggestions contained in this notice do not constitute Nuclear Regulatory Commission (NRC) requirements; therefore, no specific action or written response is required.

Description of Circumstances:

On the afternoon of December 5, 1984, Westinghouse notified Duke Power Company (Duke) of an event that occurred on November 19, 1984, at a foreign reactor concerning the CRDM design similar to the one installed at McGuire 2 (the McGuire 1 design is completely different). Based on initial information, Westinghouse considered the event to be an isolated case. However, on the afternoon of December 6, 1984, Westinghouse notified Duke of unfavorable inspection results on similar CRDMs at several plants and of the impact on the operation of McGuire Unit 2. Based on this new information, Duke orally informed NRC Region II of the event and began a safety assessment of continued operation of McGuire 2, the results of which were provided to NRC personnel by conference telephone call on the afternoon of December 6, 1984, and subsequently documented in a letter dated December 12, 1984, from H. B. Tucker to J. P. O'Reilly.

By letter dated December 7, 1984, E. P. Rahe, Jr. to R. C. DeYoung, Westinghouse documented Mr. Rahe's telephone call of December 7, 1985 with Mr. C. E. Rossi reporting the event associated with CRDM heavy drive rod assemblies under 10 CFR 21, identified as a Potential Substantial Safety Hazard, for one

operating plant (McGuire 2) and for six construction plants (Catawba 1 and 2, Seabrook 1 and 2, Watts Bar 1 and 2). (Note: At that time, Catawba 1 had been issued a low power testing license but had not yet attained initial criticality.) The drive rod became stuck at a foreign reactor during downward stepping while performing hot rod drop tests as part of preoperational testing prior to achieving initial criticality. Subsequent on-site investigations revealed that a breech guide screw from a CRDM heavy drive rod assembly had rotated out of position and fell on top of the CRDM latch assembly where it became lodged and prevented driveline motion.

The function of the breech guide screw is to provide alignment and guidance during coupling and uncoupling of the drive rod from the rod cluster control assembly during refueling. The breech guide screw is 0.52 inch long and has a 0.433 inch diameter. If a breech guide screw were to rotate out of the drive rod assembly, it would fall into the annulus between the external breech and the rod travel housing. Although this annulus is nominally 3/8 inch wide, it is sufficiently flexible to allow a loose breech guide screw to travel downward during rod stepping. The loose breech guide screw would then lodge on top of the CRDM latch assembly, potentially causing misstepping, intermittent sticking of the driveline or a totally stuck driveline. Such a loose breech guide screw would not be able to pass below the above position because the clearance between the guide tube and the drive rod assembly is only 0.055 inch.. Thus, if a breech guide screw should become loose, it would not be able to migrate into the reactor upperhead region during plant operation; therefore, it would not subsequently be expected to become a loose part in the reactor coolant system.

The breech guide screw of a heavy drive rod assembly is designed to be held in position by a locking pin. The locking pin is inserted in a drilled hole that intersects the mating threads of the breech guide screw and those of a threaded hole in the external breech of the drive rod assembly. The locking pin, in turn, is welded to the head of the breech guide screw to ensure that it stays in place. (See Attachment 1, Drive Rod Assembly.) However, in the foreign plant, the breech guide screw was drilled at an angle such that the locking pin did not intersect the threads. Thus, the locking pin was ineffectual in that the breech guide screw was not actually locked in place but was free to unscrew from the external breech.

Subsequent to the drive rod becoming stuck at a foreign facility, Westinghouse recommended that a reverse torque test be conducted on the plant's remaining 51 breech guide screws. This reverse torque test consists of applying twice the installation torque on the breech guide screw but in the reverse direction, with a test failure being either the complete unscrewing of the breech guide screw or a rotation of 15° or more of the screw. Three breech guide screws at the affected foreign plant became unscrewed when tested. Afterwards, the breech guide screws were similarly tested at another foreign reactor using similar CRDM heavy drive rods to those at the plant that experienced a stuck drive rod. These tests revealed several (exact number unknown) breech guide screws that were classified as being either finger tight or loose. In addition, similar tests were conducted at Catawba 2, Seabrook 1, and Watts Bar 1 and 2 with the

following results: (1) Catawba 2 - of the 57 rod drive assemblies tested, five breech guide screws were found to be finger tight and were completely unscrewed, and 20 breech guide screws rotated when reverse torque tested; (2) Seabrook 1 - of the 57 rod drive assemblies tested, 17 breech guide screws became unscrewed and one rotated but did not become unscrewed when reverse torque tested; and (3) Watts Bar 1 and 2 - of the 144 rod drive assemblies tested, two breech guide screws were found to be finger tight and were completely unscrewed and 20 became unscrewed when reverse torque tested. Finally, the breech guide screws at Catawba 1 were reverse torque tested, at which time two breech guide screws became unscrewed and three breech guide screws were found with disfigured heads that blocked the attaching of the torque wrench to the screws. Following these tests, Duke replaced 14 CRDMs at Catawba 1.

Westinghouse has advised its affected utility customers of the event and has provided them with recommendations for operating plants and plants under construction. Westinghouse recommends that potentially affected operating plants take the following actions:

1. Increase the frequency of control rod stepping tests from once every 31 days to once every 7 days.

2. If rod stepping anomalies of a mechanical nature occur during these stepping tests or during any normal rod stepping, the plant should be shut down and the drive rod assemblies inspected.

3. If no rod stepping anomalies of a mechanical nature occur, the drive rod assemblies should be inspected at the next scheduled outage.

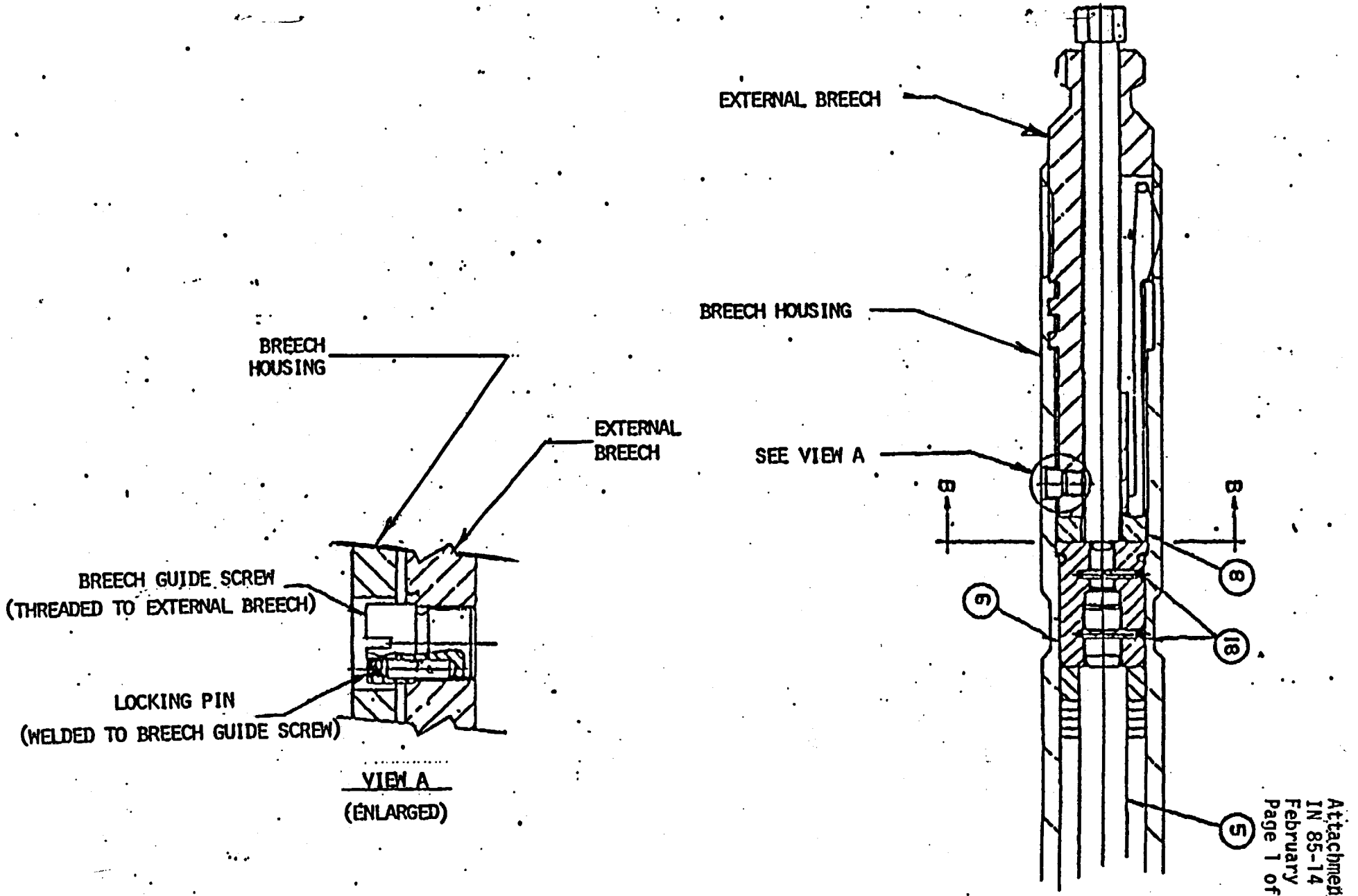
Westinghouse is inspecting the CRDMs of all affected plants under construction and will repair those assemblies with loose breech guide screws. Westinghouse has developed a repair procedure for any breech guide screw that fails the inspection. The procedure consists of drilling another hole in the breech guide screw at least 90 degrees from the existing hole, inserting a locking pin in the new hole and welding the locking pin in place.

No specific action or written response is required by this information notice; however, if you have any question regarding this notice, please contact the Regional Administrator of the appropriate NRC regional office or the technical contact listed below.

Edward L. Jordan, Director
Division of Emergency Preparedness
and Engineering Response
Office of Inspection and Enforcement

Technical Contact: I. Villalva, IE
(301) 492-9007

Attachments:
1. Drive Rod Assembly
2. List of Recently Issued IE Information Notices



ROD DRIVE ASSEMBLY

Attachment 2
IN 85-14
February 22, 1985

LIST OF RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
85-13	Consequences of Using Soluble Dams	02/21/85	All power reactor facilities holding a CP
85-12	Recent Fuel Handling Events	02/11/85	All power reactor facilities holding a CP
85-11	Licensee Programs For Inspection Of Electrical Raceway And Cable Installation	2/11/85	All power reactor facilities holding a CP
85-10	Posttensioned Containment Tendon Anchor Head Failure	2/6/85	All power reactor facilities holding an OL or CP
85-09	Isolation Transfer Switches And Post-Fire Shutdown Capability	1/31/85	All power reactor facilities holding an OL or CP
85-08	Industry Experience On Certain Materials Used In Safety-Related Equipment	1/30/85	All power reactor facilities holding an OL or CP
85-07	Contaminated Radiography Source Shipments	1/29/85	All NRC licensees authorized to possess industrial radiography sources
85-06	Contamination of Breathing Air Systems	1/23/85	All power reactor facilities holding an OL or CP
85-05	Pipe Whip Restraints	1/23/85	All power reactor facilities holding an OL or CP
85-04	Inadequate Management Of Security Response Drills	1/17/85	All power reactor facilities holding an OL or CP, & fuel fabrication & processing facilities

OL = Operating License
CP = Construction Permit