Westinghouse
Electric Corporation

Water Reactor
Divisions

Nuclear Technology Division

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December 7, 1984

NS-NRC-84-2986

Mr. R. C. DeYoung, Director
Division of Inspection and Enforcement
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Phillips Building
7920 Norfolk Avenue
Bethesda, Maryland 20014

Dear Mr. DeYoung:

This is to confirm the telephone conversation of December 7, 1984, between Mr. E. P. Rahe of Westinghouse and Mr. Ernie Rossi of the NRC. In that conversation Westinghouse notified the NRC of a reportable item associated with Control Rod Drive Mechanism (CRDM) heavy drive rod assemblies. This item was reported under 10CFR21, identified as a Potential Substantial Safety Hazard, for one operating plant (W. B. McGuire No. 2) and for six construction plants (Catawba Nos. 1 and 2, Seabrook Nos. 1 and 2, and Watts Bar Nos. 1 and 2). Westinghouse has advised these utility customers of this issue.

Background and Description

On November 19, 1984, the Korean Unit 5 site reported a CRDM stuck drive rod. The rod became stuck during downward stepping while performing hot rod drops as part of preoperational testing. The plant had not achieved initial criticality. The unit was subsequently cooled down. Westinghouse engineers were dispatched to the site on November 22, 1984 to assist in the evaluation and determine corrective action.

On November 29, 1984, the on-site investigation had determined that the control rod drive mechanism (CRDM) heavy drive rod assembly guide screw rotated out of position, fell from the drive rod and landed on top of the CRDM latch assembly where it became lodged and prevented driveline motion. The guide screw is normally locked into position by a welded pin that engages the mating threads thus preventing the guide screw from rotating out of position.

On December 1, 1984, a reverse torque test was performed at the Korean Unit 5 site on the remaining 53 guide screws. This test was done by applying twice the torque used to installed the screws, but in the opposite direction. Three additional guide screws were removed in this test.

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The function of the guide screw in the heavy drive rod assembly is to provide alignment and guide the breech components for coupling and uncoupling the drive rod from the rod cluster control assembly during refueling. During normal plant operation, a guide screw that backs out of its thread engagement would be expected to migrate into the annulus between the drive rod assembly and the rod travel housing as a result of control rod stepping. It can then lodge on top of the CRDM latch assembly. This could potentially result in misstepping, intermittent sticking of the drive line or a totally stuck driveline.

If a breech guide screw should become loose, it cannot migrate into the reactor upper head region during plant operation and subsequently become a loose part in the reactor coolant system (RCS).

It is extremely unlikely that an accident situation, such as a seismic event, could cause a loose guide pin to move inasmuch as normal rod stepping motions impart loads in the range of 20-30g. Therefore, any loose guide screw migration would most likely be caused by normal rod stepping and any impedance of rod motion would be identified by stepping tests.

With respect to construction plants, a repair procedure has been developed to ensure that the guide screw is locked in place. This procedure constitutes drilling another hole in the guide screw at least 90 degrees from the existing hole, inserting a locking pin and welding it in place. Westinghouse is inspecting all affected non-operating plants and will repair those assemblies with loose guide screws.

It is the Westinghouse opinion that this issue does not constitute an immediate safety concern. This conclusion is based on the following considerations:

1. The inspection results show that most guide screws are properly secured. In addition, these results have shown that only one of the four guide screws at Ko-Ri 5 which failed the reverse torque test backed out of position.

2. Current experience indicates that it is highly unlikely that multiple potentially loose guide screws will become actual loose parts at the same time. Because of the variable resistance to removal of the guide screws during inspections, it is most likely that the times for any potentially loose guide screw to actually back out of position are highly variable.

3. Stepping tests of the kind performed by Technical Specification requirements will identify any control rods affected.

4. Operation to date at McGuire has not shown any mechanical rod stepping anomalies.

5. Current FSAR accident analyses demonstrate safe reactor shutdown with the highest worth control rod stuck in the fully withdrawn position.

In order to provide further assurance that the possibility of this occurrence would not go undetected at an operating plant, the following actions should be taken:

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 shutdown 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 continuing its review of this issue and should you have any questions, please contact W. J. Johnson at (412) 374-5282.

Very truly yours,

E. P. Rahe, Jr., Manager
Nuclear Safety Department

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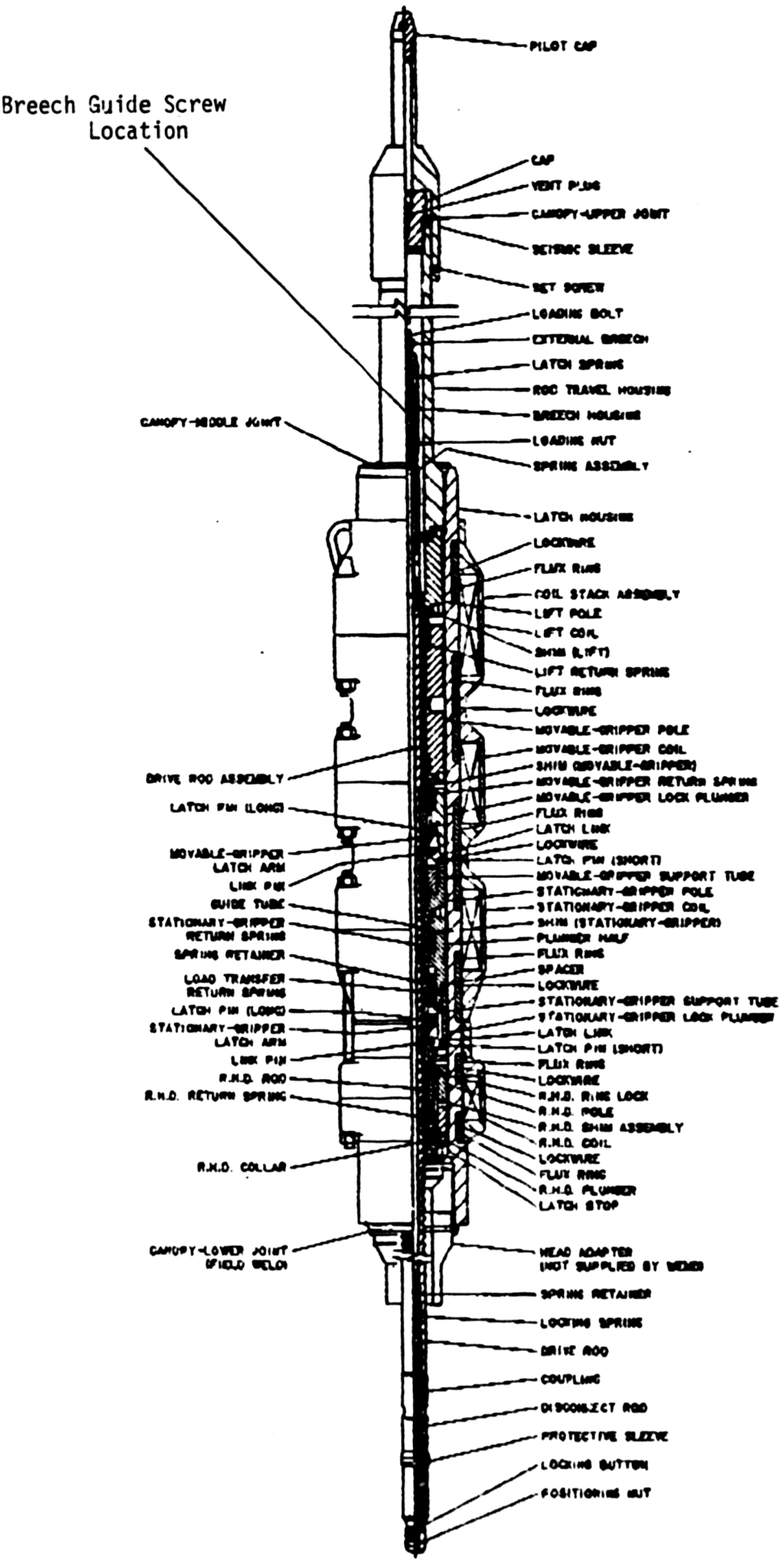
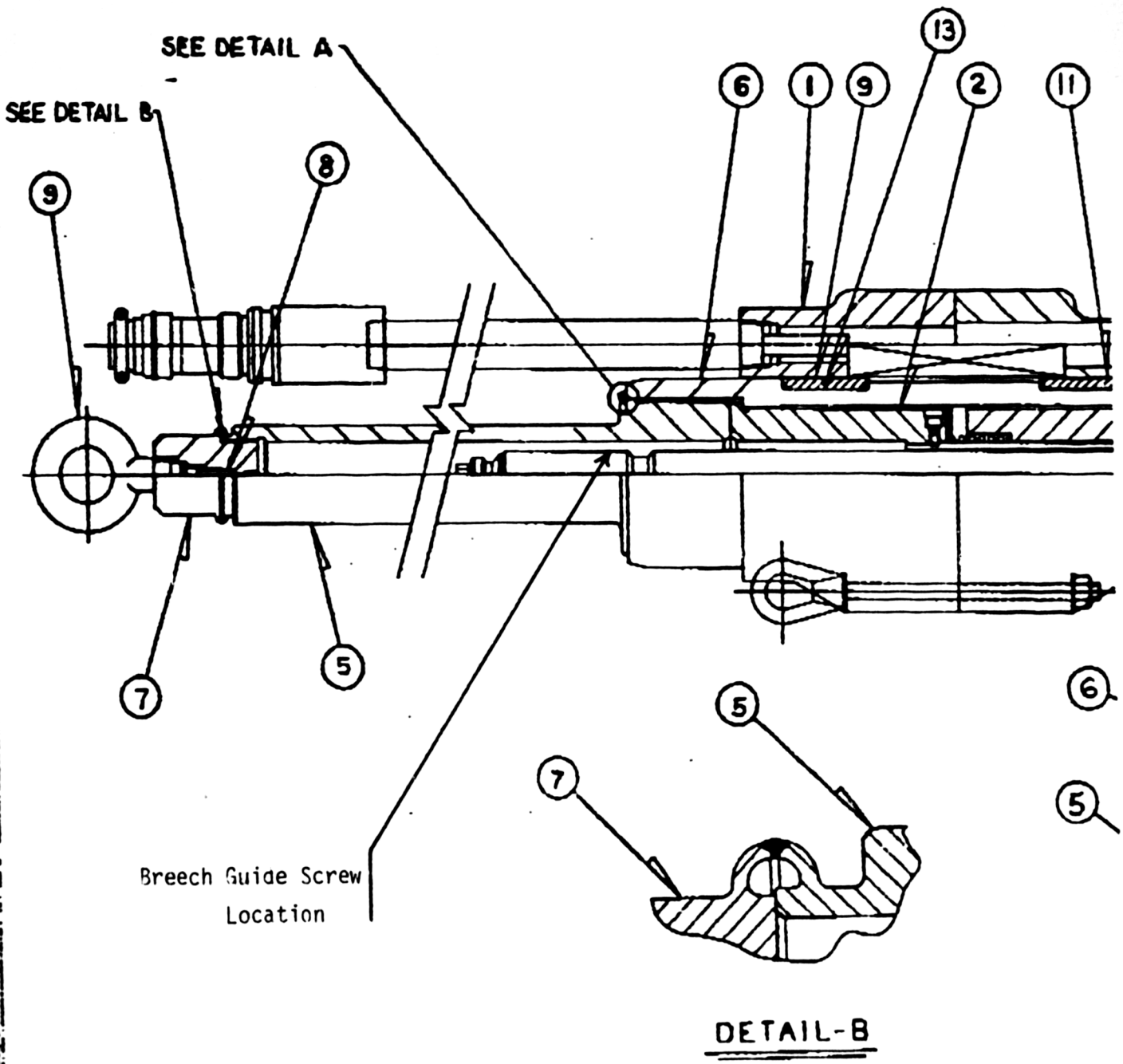
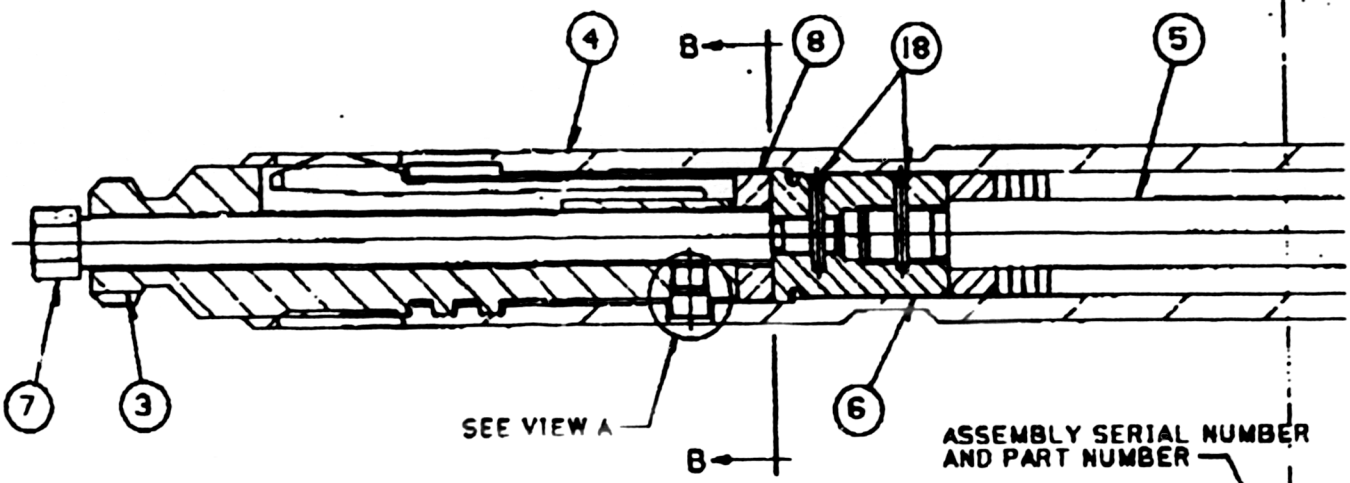
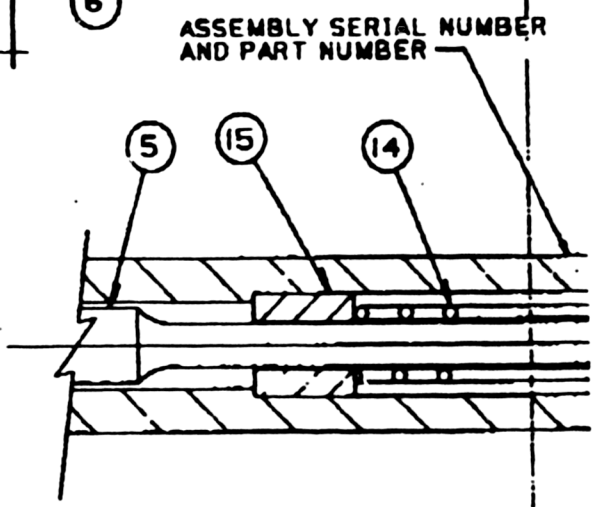
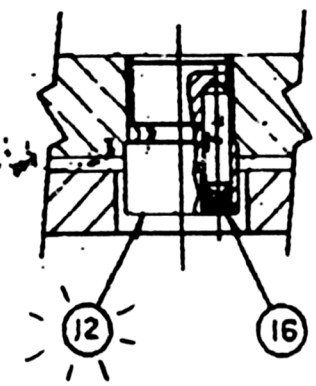

Breech Guide Screw Location
PILOT CAP
CAP
VENT PLUG
CANOPY-UPPER JOINT
SETSCREW SLEEVE
SET SCREW
LOADING BOLT
EXTERNAL BREECH
LATCH SPRING
ROD TRAVEL HOUSING
BREECH HOUSING
LOADING NUT
SPRING ASSEMBLY
CANOPY-MIDDLE JOINT
LATCH HOUSING
LOCKWIRE
FLUX RING
COIL STACK ASSEMBLY
LIFT POLE
LIFT COIL
SHIM (LIFT)
LIFT RETURN SPRING
FLUX RING
LOCKWIRE
MOVABLE-GRIPPER POLE
MOVABLE-GRIPPER COIL
SHIM (MOVABLE-GRIPPER)
MOVABLE-GRIPPER RETURN SPRING
MOVABLE-GRIPPER LOCK PLUNGER
DRIVE ROD ASSEMBLY
FLUX RING
LATCH PIN (LONG)
LATCH LINK
LOCKWIRE
MOVABLE-GRIPPER LATCH ARM
LATCH PIN (SHORT)
LINK PIN
MOVABLE-GRIPPER SUPPORT TUBE
GUIDE TUBE
STATIONARY-GRIPPER POLE
STATIONARY-GRIPPER RETURN SPRING
STATIONARY-GRIPPER COIL
SHIM (STATIONARY-GRIPPER)
PLUNGER HALF
SPRING RETAINER
FLUX RING
SPACER
LOAD TRANSFER RETURN SPRING
LOCKWIRE
STATIONARY-GRIPPER SUPPORT TUBE
LATCH PIN (LONG)
STATIONARY-GRIPPER LOCK PLUNGER
STATIONARY-GRIPPER LATCH ARM
LATCH LINK
LATCH PIN (SHORT)
LINK PIN
FLUX RING
R.H.D. ROD
LOCKWIRE
R.H.D. RING LOCK
R.H.D. RETURN SPRING
R.H.D. POLE
R.H.D. SHIM ASSEMBLY
R.H.D. COIL
R.H.D. COLLAR
LOCKWIRE
FLUX RING
R.H.D. PLUNGER
LATCH STOP
CANOPY-LOWER JOINT (FIELD WELD)
HEAD ADAPTER (NOT SUPPLIED BY WEMCO)
SPRING RETAINER
LOCKING SPRING
DRIVE ROD
COUPLING
DISCONNECT ROD
PROTECTIVE SLEEVE
LOCKING BUTTON
POSITIONING NUT



DETAIL-B







VIEW A
(ENLARGED)

12 breech Guide Screw

#16 Locking Pin