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NRCB 88-01

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

February 5, 1988

NRC BULLETIN NO. 88-01: DEFECTS IN WESTINGHOUSE CIRCUIT BREAKERS

Addressees:

For Action - All holders of operating licenses or construction permits for nuclear power reactors.

Purpose:

The purpose of this bulletin is to provide information on Westinghouse series DS circuit breakers and safety concerns associated with their use and to request that addressees using these breakers in Class 1E service perform and document inspection of the welds on the pole shafts and inspection of the alignment in the breaker closing mechanism.

Description of Circumstances:

The following occurrences have raised concerns about the use of these circuit breakers:

McGuire 2: On July 2, 1987, a DS-416 reactor trip breaker (RTB) failed tc open in response to manual trip demands from the control room. The RTB had bound mechanically in the closed position because the main roller had become wedged between a raised segment of the close cam and the nearby side frame plate. Excessive lateral movement of the main drive link and a broken center pole lever to pole shaft weld permitted the binding to occur. The failure was reproduced once by the licensee during bench tests of the RTB at McGuire and several times during detailed laboratory investigations performed by Westinghouse. Substandard welding during fabrication (i.e., porosity, lack of fusion, inadequate extent of welding) caused the weld to break. Details of this failure mode are given in Information Notice No. 87-35, Supplement 1, dated December 16, 1987.

The licensee visually inspected the remaining pole shaft welds of the defective McGuire breaker and the other McGuire RTBs and found indications of lack of fusion (i.e., lack of characteristic weld bead ripple, notches at the edges of the weld beads, and small evidence of base metal melting).

Catawba 1 and 2: The licensee inspected all DS-416 RTBs and found a pole shaft with a crack about 1/4 inch long at the finish end of the antibounce lever weld. The licensee also observed lack of fusion at the start ends of the center pole lever and antibounce lever welds. Subsequent examination under magnification of the Catawba pole shaft in the laboratory of an NRC contractor revealed two additional cracks, one at each end of the center pole lever weld. After the cracks from the center pole lever weld were removed, about half (i.e., 67 degrees of weld arc) of the original 120 degrees of weld arc remained.

Similarly, 86 degrees of weld arc remained after the antibounce lever weld defects were removed. The licensee's inspection of the RTBs included checking the alignment of the main roller on the close cam surface. Two RTBs were found with excessive lateral tolerance, allowing the roller to strike the side frame plates located adjacent to the close cam, even though the pole shaft welds were observed to be intact. The licensee also noted that some pole shaft welds of this type of circuit breaker used in its hydroelectric plants had failed several years ago but that they have performed satisfactorily since they were repaired by additional welding on the opposite sides of the levers.

Sequoyah 2: In April 1987, two fillet welds broke on the pole shaft assembly of a DS-416 circuit breaker that energizes the emergency fire protection pumps. The weld failures apparently freed the center moving contact assembly (i.e., the Y-phase contact assembly), allowing it to move independently of the pole shaft that drives the other two moving contact assemblies, as evidenced by an electrical phasing problem and erratic operation of the fire pump. The two failed welds joined adjacent levers (the center pole lever and the antibounce lever) to the pole shaft. The two levers are connected by a pin. On the basis of engineering analysis, the licensee concluded that the center pole lever weld failed first because of excessive porosity; the antibounce lever weld then failed because it was inadequately sized and could not accommodate the load normally supported by the center pole lever weld that was thrust upon it through the connecting pin.

Calvert Cliffs 1: In September 1986, a broken weld connecting the center pole lever to the pole shaft in a DS-206 circuit breaker used in Class 1E service for the control room habitability system was detected during routine maintenance surveillance. No adverse effect on breaker performance had been noted; the weld for the adjacent antibounce lever was observed to be intact and carrying the load of the broken weld. The licensee's measurements showed that the leg size on the pole shaft side was 0.3 inch and the leg size on the lever arm side was 0.1 inch. On the basis of analysis, the licensee concluded that the failure was due to extensive lack of fusion of the weld to the lever as a result of improper weld technique. The licensee examined an additional 10 welds on this pole shaft and another pole shaft and found that the start ends of the welds in general were not fused properly to the levers and that the weld legs generally exhibited mismatches. Cracks were detected in the start ends of 2 of the 10 welds.

Westinghouse: Both commercial grade and Class 1E circuit breakers of the DS series use similar pole shafts or possess features associated with the observed binding and electrical phasing problems. Specifically, Model Nos. DS-206, DSL-206, DS-416, DSL-416, and DS-420 are susceptible to these types of failures. The welds of these pole shafts were randomly inspected during manufacture. However, no documentation confirms either that in-process inspections were performed when the pole levers were welded to the pole shafts or that inspections were performed during the dedication of the commercial grade breakers to Class 1E service.

Discussion:

As a result of the operating experiences and observations discussed above, there is a question concerning the operability of RTBs and other Class 1E circuit breakers of the Westinghouse DS series. Some DS series circuit breakers may not have been fabricated in compliance with General Design Criterion (GDC) 1 and Appendix B, 10 CFR 50, and have inadequate welds joining levers to pole shafts. Excessive misalignment of the main rollers on the close cam also can occur. GDC 1 and Appendix B require, in part, that components important to safety be fabricated to quality standards commensurate with the importance of the safety functions to be performed. Consequently, licensees should take action to confirm compliance with GDC 1 and 10 CFR 50 Appendix B and to inspect all relevant welds and roller clearances according to the manufacturer's specifications and to take appropriate remedial actions to correct deficiencies.

On December 1, 1987, Westinghouse issued Technical Bulletin NSID-TB-87-11 (Attachment 1) as a result of its investigation of the McGuire 2 RTB failure. It recommended inspection of the pole shaft welds and of the alignment in the breaker closing mechanism according to specific criteria and provided guidance for corrective actions if required, including a procedure for the removal and installation of pole shafts. The NRC has reviewed the Westinghouse technical bulletin and finds that it adequately addresses the NRC concerns subject to certain changes discussed below. Specifically, the NRC has concluded that RTBs should be inspected expeditiously, that in view of the Sequoyah 2 weld failures welds should be inspected for porosity, and that a bypass breaker not meeting the weld criteria in the Westinghouse technical bulletin should be removed from service.

Actions Requested:

The phrases "short-term inspection" and "long-term inspection" used in this NRC Bulletin are consistent with the phrases as used in the Westinghouse technical bulletin. Specifically, short-term inspections refer to inspections of the three main pole levers (the left pole lever, the center pole lever, and the right pole lever). These short-term inspections should be performed on breakers at the next available opportunity (e.g., a maintenance outage) or during the next surveillance test for the breaker, whichever is earlier. Long-term inspections refer to inspections of the four remaining welds on the pole shaft and to the direct check of the alignment of the breaker closing mechanism. These long-term inspections should be performed on the breaker prior to restart following the next refueling outage. However, for plants that have not yet received an operating license, the implementation periods for the short-term and long-term inspections are modified by this NRC bulletin to mean before fuel loading.

As used in this NRC bulletin, the phrase "replacement pole shaft" may include a repaired pole shaft. However, since welding of a pole shaft lever may cause distortion and misalignment of the lever, such repairs should be attempted only after consultation with Westinghouse. Any repaired pole shaft weld should meet the criteria in Section 6.1.1 of the Westinghouse technical bulletin, as supplemented below.

Addressees using Westinghouse DS-206, DSL-206, DS-416, DSL-416, and DS-420 circuit breakers in Class 1E applications, including RTBs, are requested to perform short-term and long-term inspections in accordance with the Westinghouse technical bulletin, except that the following changes should be made to the following sections:

6.0 Add the following:

However, inspection of the 3 main pole shaft welds for all RTBs (both main and bypass) should be completed within 30 days of receipt of this NRC bulletin.

6.1.1, 6.1.2, and 7.1 Add the following:

e) porosity - surface pin holes with cumulative diameters less than 1/16 inch in each inch of weld

6.2.4 Delete this section and the reference to it in Section 6.2.3.

With regard to Section 6.2.4, any RTB with a pole shaft that does not meet the criteria in Section 6.1.2 should be deemed inoperable and should not be used in the operating or bypass breaker position in the reactor trip switchgear. Such pole shafts should be removed from service and a replacement pole shaft installed in the breaker before returning it to service. The replacement pole shaft should meet the criteria in Section 6.1.1.

Reporting Requirements:

If addressees cannot meet this suggested schedule for short-term and long-term inspections, they should justify to the NRC their proposed alternative schedules.

Records of inspections and corrective actions in response to this NRC bulletin shall be documented and maintained in accordance with plant procedures for Class 1E equipment. Any addressee who does not have circuit breakers subject to this bulletin shall provide a letter to the NRC stating this fact within 60 days of receipt of this bulletin. Addressees who do have circuit breakers subject to this bulletin shall provide letters of confirmation to the NRC of the completion of the inspections. These letters shall include the number of breakers of each type inspected, the number of breakers of each type requiring corrective actions due to pole shaft welds not meeting the acceptance criteria and the number of breakers of each type requiring corrective actions due to mechanism alignments not meeting the acceptance criteria. These letters of confirmation shall be submitted to the NRC within (1) 30 days of completion of the short-term inspections and (2) 30 days of completion of the long-term inspections.

Since inspection of the three main pole shaft welds for all RTBs should be completed within 30 days of receipt of this bulletin, a letter of confirmation of completion of these inspections including the above information is requested within 60 days of receipt of this bulletin.

The letter of confirmation shall be submitted to the appropriate Regional Administrator under oath or affirmation under the provisions of Section 182a, Atomic Energy Act of 1954, as amended. In addition, the original copy of the cover letter and a copy of any attachment shall be transmitted to the U. S. Nuclear Regulatory Commission, Document Control Desk, Washington D.C. 20555, for reproduction and distribution. For purposes of NRC accounting, all correspondence associated with this bulletin, including the letter of confirmation, should bear the identifying number TACS 65955/65956.

This request for information was approved by the Office of Management and Budget under blanket clearance number 31500011. Comments on burden and duplication should be directed to the Office of Management and Budget, Reports Management, Room 3208, New Executive Office Building, Washington D.C. 20503.

Although no specific request or requirement is intended, the following information would be helpful to the NRC in evaluating the cost of complying with this bulletin:

(1) staff time to perform requested inspections, corrective actions, and associated operability testing

(2) staff time to prepare requested documentation

(3) additional cost incurred as a result of the inspection findings (e.g., costs of corrective actions, costs of down time)

If you have any questions about this matter, please contact one of the technical contacts listed below or the Regional Administrator of the appropriate regional office.

Charles E. Rossi

Charles E. Rossi, Director
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Technical Contacts:

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Attachments:
1. Westinghouse Technical Bulletin NSID-TB-87-11, December 1, 1987
2. List of Recently Issued NRC Bulletins

Subject	Westinghouse Circuit Breakers Type DS/DSL: Welds on Breaker's Pole Shaft		Number NSID-TB-87-11
System(s)	All Plant Systems		Date December 1, 1987
Affected Plants	All Plants with DS/DSL Circuit Breakers		S.O.(s) 309, 386, BOP
References	See Below	Affects Safety Related Equipment Yes ☒ No ☐	Sheet 1 Of 17

REFERENCES:

1. Westinghouse generic project letter on the subject dated 9/87.

2. USNRC Information Notice IN 87-35.

This bulletin applies to DS series breakers - 206, -416, and -420, and DSL series-206 and -416. It provides additional information on the subject noted above, and guidance for follow-up actions if required. To consolidate the total contents on the subject in this document, sections from the 9/87 letter have also been excerpted here and amplified/clarified as needed. This bulletin also includes a procedure for replacement of the pole shaft if the present pole shaft needs to be replaced to meet the required criteria.

This technical bulletin supercedes and replaces the 9/87 letter, and it is to be regarded as the controlling document for inspection of the breaker's pole shaft and alignment, and corrective action if required.

Additional Information, If Required, may be Obtained from the Originator. Telephone 412-374-3492 or (WIN) 284-3492

Originator	Approval
A. Deb, Sr. Engineer	W. J. Smith, Jr., Manager
RCS Engineering	Electrical Support Services

The contents here are organized as follows:

1.0 BACKGROUND

On July 2, 1987, it was reported that a DS-416 reactor trip breaker did not open on demand during rod drop testing following a refueling outage. This malfunction was detected after plant personnel observed smoke in the vicinity of the reactor trip switchgear. Since the breaker had not opened on demand the shunt coil current was not interrupted resulting in a burnt and damaged coil. The breaker could not be tripped manually, but it tripped when the manual charging handle was manipulated. During subsequent cycling on the test bench, the breaker jammed again. An inspection was conducted at the site jointly by Westinghouse, the Utility and the NRC, during which the breaker was cycled about 38 times. It operated successfully each time. Visual inspection noted wear (nearly 3000 cycles of operation) and separation of the weld which attached the center pole lever to the pole shaft. The NRC issued Information Notice 87-35 on July 30, 1987 reporting this event.

2.0 INVESTIGATION RESULTS

The above breaker was subsequently shipped to Westinghouse for a detailed investigation following guidelines jointly developed by the Utility, the NRC and Westinghouse. The breaker malfunctioned after some 130 additional cycles. It was determined that the jamming could be repeated by manually forcing the close cam and main drive link into a unique constrained position. The breaker did not assume this unique position on its own through about thirty subsequent operations.

The stated scenario can be explained as follows: The roller attached to the main drive link normally rests on the outer close cam laminations. The broken weld permitted lateral movement of the main drive link, which could allow the roller to move close to its tolerance limits. In the jammed position, the roller had slipped inward off the outer laminate of the cam. The force exerted by the breaker closing action induced a twisting motion which caused the roller to wedge between the close cam lamination and the side frame. Although it was established that the stacking of part tolerances played a part in the jamming of the breaker, it was also concluded that the breaker would not jam unless a broken weld was present to permit the twisting action that allowed the roller to wedge.

Subsequent evaluation of this weld revealed that the weld had fused originally for only about 15% of its total length. Complete separation of the weld was due to low cycle fatigue, striations indicating that the separation occurred after about 2,500 cycles. This is consistent with the Utility's estimate of operating cycles.

3.0 POTENTIAL SAFETY IMPACT

Westinghouse considers this malfunction of the DS-416 Reactor Trip Breaker to be a random occurrence. DS-416 breakers have operated through many thousands of cycles without any malfunction similar to the one described above. Despite the quality of the weld in the said breaker, it performed for about 3,000 cycles confirming that the weld as designed is conservative. It was also evident that while it is necessary to have a weld separation to initiate the occurrence it also requires other part tolerances to be near maximum.

Although this event does not have any generic implications, Westinghouse considers it prudent, and recommends that the noted breakers be inspected to ensure that a similar condition does not exist in 1E breaker applications. The inspection should be performed in line with normal surveillance and maintenance practices.

4.0 RECOMMENDED ACTIONS

The recommended actions are inspection of the welds on the pole shafts, and inspection of the alignment in the breaker closing mechanism. The inspections are divided into two categories - short-term inspection, and long-term inspection. This grouping is guided by the functional importance of the items to be inspected vis-a-vis the time required for performing the total inspection.

The short-term inspection is aimed at addressing the welds at the three main pole levers, since these receive the major forces during a breaker's opening or closing. Also, the alignment of the moving parts in the breaker's closing mechanism are maintained primarily by these three welds.

The long-term inspection addresses the four remaining welds on the pole shaft. It also includes a direct check of the alignment of the breaker closing mechanism.

5.0 GENERAL NOTES FOR INSPECTION OF WELDS

5.1 The inspection must be performed by a qualified welding inspector, certified per the station's requirements for welding inspection. For the purposes of this bulletin, the welds are to be inspected for the following parameters - fusion at both legs, absence of cracks, weld size and length of weld. The criteria for the inspection are detailed in Sections 6.0 and 7.0. A visual inspection is recommended, with use of inspection tools as appropriate to aid good examination of the areas (example: Inspection mirror, Light Source, Fiber Optics Instrument, etc.).

5.2 Fatigue tests performed on specimens of varying weld sizes and lengths provide the basis for the acceptance criteria given in this bulletin. The given limits reflect a measure of conservatism, therefore, welds meeting these criteria are expected to sustain the performance limits given for them.

5.3 The welds can be inspected with the pole shaft within the breaker, per procedure in Section 5.4. If the inspector chooses to perform the inspection with the pole shaft removed from the breaker, the pole shaft can be removed per Section 8.0 of this bulletin prior to the inspection. Time limitations in the station's Technical Specifications should be considered in planning these procedures.

5.4 Procedure for inspecting the pole shaft within the breaker is as follows.

CAUTION: THIS PROCEDURE MUST BE PERFORMED JOINTLY WITH PERSONS TRAINED IN HANDLING/SERVICING THIS TYPE OF BREAKER.

1. Trip the breaker if energized and closed. Rack it out on cell rails fully extended, or transfer to bench.

2. Remove front panel.

3. Disconnect the leads for the spring charging motor, and the link for the auxiliary switches.

4. Remove the bolts and screws securing the top cover at the front of the breaker. Lay it over on left, making sure that wires in the harness are not damaged.

5. Remove the arc chutes and the barrier plates surrounding them.

6. Inspect the welds visually to the criteria given in Section 6.1, with tools appropriate for enhancing the inspection (Example -

Inspection Mirror, Flashlight, Fiber Optics, etc.). Rotate the pole shaft by manually pushing the moving contacts towards the closed position, so that the inside areas of the weld are exposed to view. For safety of personnel, secure the contacts in this position with a locking ring or wire loop until the inspection is complete for this position.

7. Reinstall all items removed or disconnected before returning the breaker to service.

6.0 SHORT-TERM INSPECTION

This inspection is to be applied to the breakers at the next available opportunity (maintenance outage, e.g.), or during the next surveillance test for the breaker, whichever is earlier.

6.1 Acceptance Criteria

This section lists the criteria to be applied to the welds for the three pole levers on the pole shaft. See Figure 1, items 2, 3, and 6. The remaining welds are discussed in Section 7.0.

6.1.1 A pole shaft, for which the 3 noted welds meet or exceed all of the criteria listed below, is to be considered acceptable for continued service up to the limit defined in Section 6.2.1.

a) weld size - 3/16 inch fillet
b) length - 180° continuous around the pole shaft
c) fusion - fused to lever and shaft for the above length
d) cracks - no cracks are allowed

6.1.2 If the criteria listed in 6.1.1 are not satisfied, the pole shaft can still be retained in service, but for a limited time as defined in 6.2.2, provided it meets or exceeds the criteria given below.

a) weld size and length - 3/16 inch fillet for 90° continuously around the pole shaft, or 1/8 inch fillet for 120° continuously around the pole shaft
b) fusion - fused to lever and shaft for the above length
c) cracks - no cracks are allowed

6.2 Time limits for the use of pole shafts, in consideration of their weld conditions, are defined here.

6.2.1 A pole shaft which meets the criteria in 6.1.1 is suitable for continued use until the time the total breaker is refurbished (due to wear, damage, age, service years, etc.). At such time an assessment can be made for possible replacement of the pole shaft.

Repeated inspection of the welds is not required, provided that the breaker is used and maintained properly in its service.

6.2.2 A pole shaft which does not meet criteria in 6.1.1, but meets those in 6.1.2 may be kept in service until the breaker reaches 4000 cycles of operation, but with the following restrictions and measures:

a) The weld(s) in question must be reinspected to this same criteria periodically after every 200 cycles of operation.

b) For a breaker applied in a system designed for high short-circuit current or interrupting duty, the weld(s) must be inspected after each time such high current may have reached the breaker. This inspection shall be to the same criteria (Section 6.1.2), and, is over and above the periodic reinspection noted in the preceding paragraph 6.2.2.a.

c) Specific attention is to be given during these inspections to ensure that no crack(s) or separation has developed in the weld(s) during the intervening period.

If any weld is found to have developed a crack or separation, the pole shaft must be replaced before returning the breaker to service.

If at any time during this 4000 cycle limit the pole shaft is replaced, the replacement unit shall meet the criteria in Section 6.1.1.

6.2.3 A pole shaft which does not meet the criteria in 6.1.2 must be removed from service immediately, and a replacement pole shaft installed in the breaker before returning it to service. (See exception, Section 6.2.4.) The replacement pole shaft shall meet the criteria in 6.1.1.

6.2.4 A pole shaft which does not meet the criteria in 6.1.2 may, as an exception, be used in the Bypass Breaker position in the Reactor Trip Switchgear, if approved by the welding inspector and station's engineering personnel, based on the weld condition. This exception is permitted in view of the following:

a) A bypass Breaker has very limited duty;
b) There is another breaker in series with the Bypass Breaker; and
c) The two breakers trip independently after receiving the trip signals.

It is strongly recommended, nevertheless, that steps be taken immediately by the station for replacement of this pole shaft.

7.0 LONG-TERM INSPECTION

This inspection is to be applied to the breaker at the latest during the next refueling outage. The general notes in Section 5.0 still apply.

Long-term inspection also includes checking the alignment of the breaker. Section 7.2 provides the direction for this inspection.

7.1 Acceptance Criteria for Welds

This section lists the criteria for acceptance of the 4 welds on the pole shaft, which were not addressed in short-term inspection described in Section 6.0. See Figure 1, items 1, 4, 5 and 7.

a) size and length - at least 3/16 inch fillet for a minimum of 90° continuously around the shaft, or at least 1/8 inch fillet for a minimum of 120° continuously around the shaft.

b) fusion - good fusion along both legs of weld.

c) cracks - no cracks are allowed.

If the above criteria are not met, replace the pole shaft prior to returning the breaker for service.

Exception - The lever for the Auxiliary Switch Drive Link spans about 90° around the shaft, and carries an extremely light load. This lever should be checked for a well fused joint only.

7.2 Alignment of Breaker

This section provides direction for checking that the alignment of the breaker mechanism is within allowable limits. This procedure should be performed, at the latest, during the next refueling outage. Further, this check should be made on the bench with the closing springs disconnected from the cam shaft (common shaft going through the close cam), and the breaker electrically disconnected.

CAUTION: THIS PROCEDURE MUST BE PERFORMED ONLY BY PERSONNEL TRAINED IN HANDLING/SERVICING THIS TYPE OF BREAKER.

7.2.1 Procedure

1) Remove front panel of the breaker.

2) Disconnect the closing springs from the cam shaft. The other end may be left undisturbed.

3) De-energize control power to the breaker, if wired to power supplies. Breaker should be open with springs discharged.

4) Restrain the UVTA with a wire loop so that the breaker is not in a trip-free mode.

5) Simulate manual charge of the closing springs to the charged position, to turn the close cam to the "Ready to Close" position.

6) With the roller as indicated in Figure 2, slowly turn the closing cam manually by the spring charging handle. (Note: To release the cam to turn, depress the manual close button.) Continue to turn the cam until the breaker contacts reach the closed position.

At this time, the maximum lateral play of the roller is in effect.

7) Through the front of the breaker, sight the close cam, the roller and the side frames. Using a flashlight, verify -

   a) Roller is on top of both of the two outer laminates of the close cam. It is not required to be centrally placed with respect to the cam assembly. See Figure 2.

   b) There is a visible gap between the side frame and the roller side at each end of the mechanism.

   If either of the two checks are not satisfactory, contact Westinghouse with details of the observations.

8) Reinstall all components removed before returning the breaker for service.

8.0 REMOVAL AND INSTALLATION OF POLE SHAFT

This section provides instructions for the removal and installation of the pole shaft. This procedure is to be performed on the bench with the breaker open, springs discharged, and circuits deenergized.

CAUTION: THIS PROCEDURE MUST BE PERFORMED ONLY BY PERSONNEL TRAINED IN HANDLING/SERVICING THIS TYPE OF BREAKER.

It is recommended that personnel assigned to do this task review Figure 3 before beginning the tasks. It shows the components involved in this procedure.

8.1 Procedure

1) Remove the front cover.

2) Remove the three arc chutes.

3) Remove the four barrier plates around the arc chutes.

4) Disconnect the opening spring from the top end where it is connected to the pin on the right pole lever on the pole shaft. Lay it down connected at the bottom end.

5) Remove the auxiliary switch drive link by disengaging the retainers connecting the lever on the pole shaft to the switch drive link. Remove the wire spring from the cycle counter if the breaker is so equipped.

   Slide out the switch drive link (and the wire spring if operations counter is present).

Steps 7 through 9 outline the procedure for disengaging the pole shaft from the 3 pole unit assemblies and the main drive link assembly. Before proceeding to those steps, take the caution in step 6 to ensure that the contact settings for the poles are not altered.

6) CAUTION: Mark the top of the insulators to identify orientation. Further, put a dowel pin through the three insulating links as soon as they are disengaged from the pole shaft. This is to prevent inadvertent rotation of the insulator on the reassembly.

7) For each insulating link to be disengaged, only one "X" washer needs to be removed where it connects to the pole shaft via the 3 pole levers on the shaft. Remove the ones noted below.

   a) Either one of the two "X" washers for the center pole.

   b) The "X" washer nearest to the breaker side sheets for the left and the right poles.

8) Slide out the pins connecting the insulating links to the pole levers. Insert the dowel pin as recommended in Step 6.

   Secure the moving contacts in the forward (closed) position using wire or cord loops.

9) Disengage the main drive link from the pole shaft at the center pole lever by removing the "X" washers and the flat washer. Withdraw the pin and disconnect the drive link. The drive link is still attached at the front of the breaker, carefully lay it down to rest on the bottom pan of the breaker.

The pole shaft is now free from its attachments, resting on the bearing plates mounted on the side sheets of the breaker.

10) Remove bolt-nut-lockwasher set at the top of the bearing plates on each side of the breaker.

11) Remove the combination bolt-nut-lockwasher set and stop assembly at the bottom of the bearing plates on each side of the breaker. Support the pole shaft by hand while doing this step to avoid having the shaft slip downwards. Three plates on each side will come out with the shaft.

12) Slowly lift the shaft and the bearing plates forward and upwards out of the breaker.

The following steps re-assemble the replacement pole shaft into the breaker.

13) Prior to installing the new pole shaft in the breaker, lubricate the shaft at both ends and at the center where it rests against the two plates in the closing mechanism frame. The lubricant should be a zinc-oxide grease, like Lubriplate 130-A (Fiske Brothers Refining Co., Newark, N.J.), Westinghouse No. 53701HE.

14) Place the new shaft in the breaker, seating it into the mechanism frame. Install all hardware removed in steps 10 and 11 to anchor the pole shaft in the breaker. Use standard snug fit torque values. The pole shaft should be checked for ability to rotate after the bearing plates are anchored to the breaker side sheets.

15) Reconnect the auxiliary switch drive link and the operations counter (if applicable) to the pole shaft lever using new "X" washers. Use two 1/4 inch flat washers on the pin.

16) Reconnect the main drive link to the pole shaft with two "X" washers. Make sure that the mechanical indicator link and the 1/2 inch washer are installed.

17) Remove the restraint on the contacts.

18) Insure the setting of the insulating links by verifying the marks put on in step 6. Remove the dowel pin.

19) Reconnect the three insulating links to the pole shaft using the three inch link on either side and the 1 1/8 inch link in the middle.

20) Reconnect the opening spring on the right pole pin.

21) Charge and close the breaker manually. Verify that the contact settings are as specified in the published manuals.

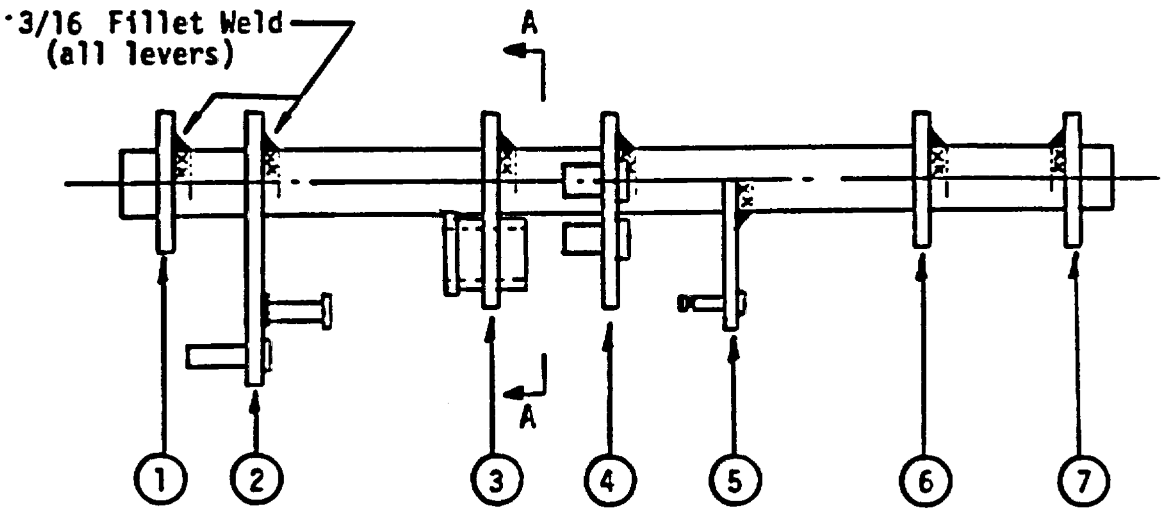
22) Reinstall the arc chutes and the barrier plates, and the top cover.

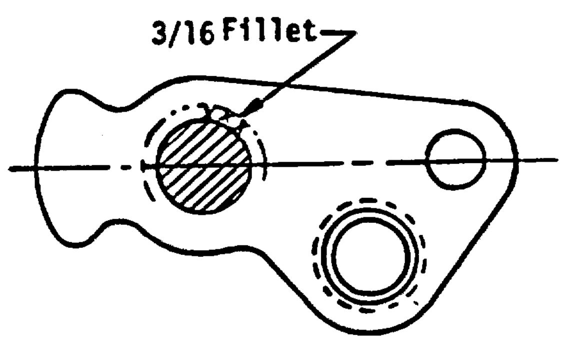
23) Remove all tools, accessories, etc. Reinstall the front cover.

24) Test the breaker electrically for 5 times before returning it to service.

FIGURE 1

POLE SHAFT ASSEMBLY





SECTION A-A

1. Pole shaft is shown as it would be placed in a breaker, viewed from the front.
2. Diagram is schematic, and not to scale.
3. Index:

1 - Stop Lever (Left)
2 - Left Pole Lever
3 - Center Pole Lever
4 - Anti-bounce Lever
5 - Lever for Auxiliary Switch Drive Link
6 - Right Pole Lever
7 - Stop Lever (Right)

FIGURE 2

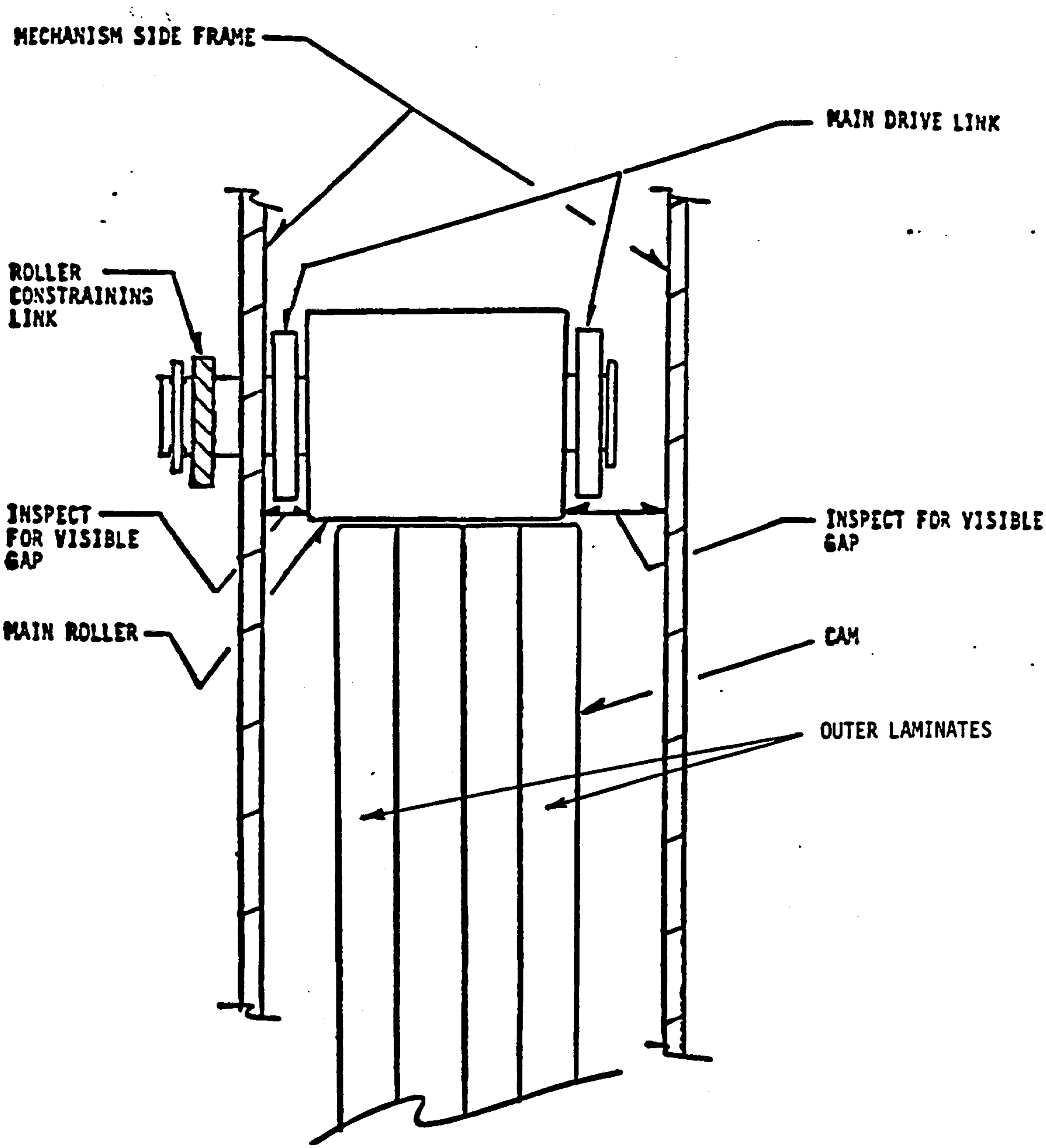
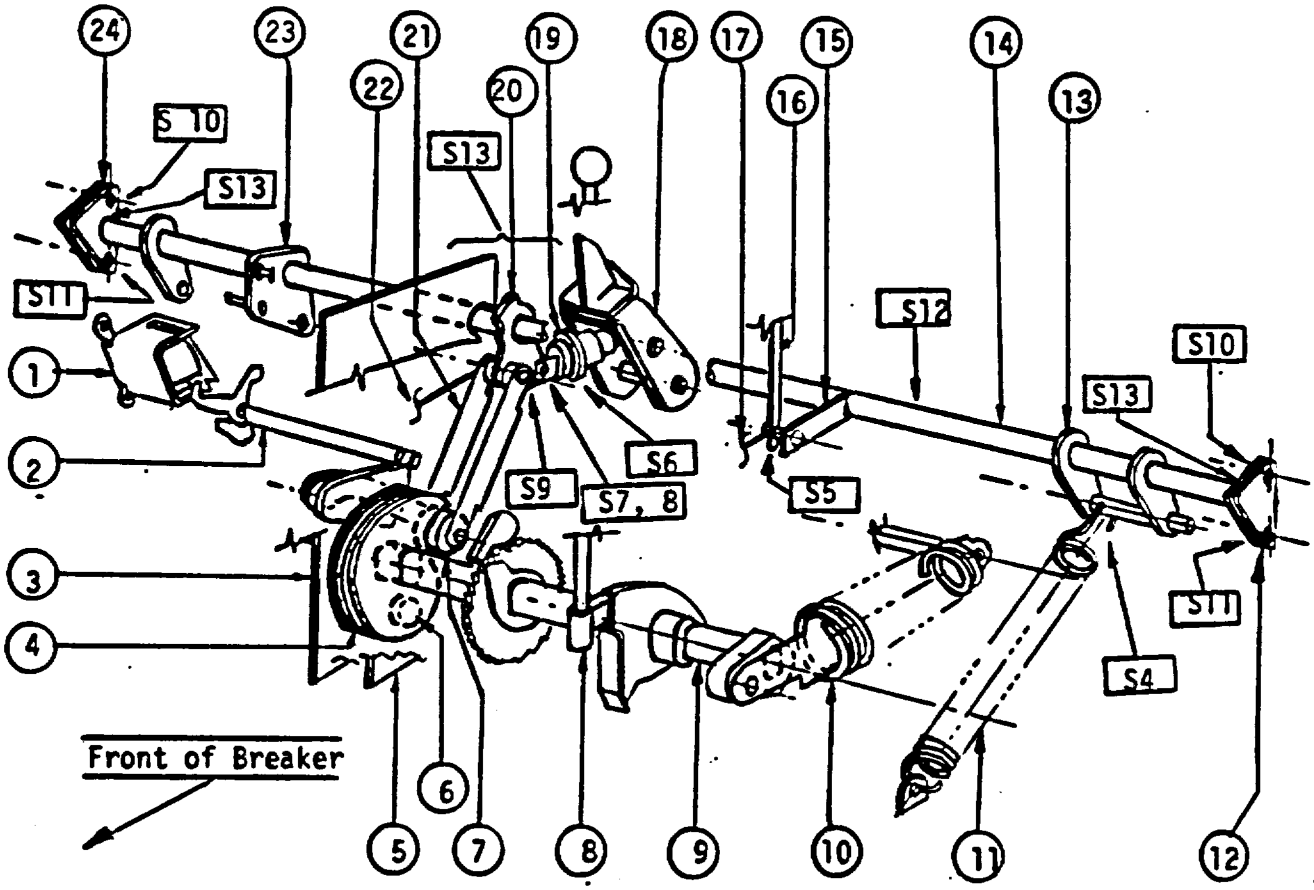

MECHANISM SIDE FRAME
MAIN DRIVE LINK
ROLLER CONSTRAINING LINK
INSPECT FOR VISIBLE GAP
INSPECT FOR VISIBLE GAP
MAIN ROLLER
CAM
OUTER LAMINATES

FIGURE 3

PARTIAL VIEW OF BREAKER COMPONENTS



1. Diagram is schematic, not to scale, and is expanded laterally to show details pertinent to this bulletin.

2. S-numbers reflect step number in procedure section 8.1.

3. Index

1 - Shunt Trip Attachment	13 - Right Pole Lever
2 - Trip Shaft	14 - Pole Shaft
3 - Mechanism Frame (left)	15 - Aux. Sw. Lever
4 - Close Cam	16 - Aux. Sw. Drive Link
5 - Mechanism Frame (right)	17 - Spring to Cycle Counter
6 - Roller (in Cam)	18 - Pole Unit
7 - Main Roller	19 - Insulating Link
8 - Manual Charging Lever	20 - Center Pole Lever
9 - Cam Shaft	21 - Main Roller
10 - Closing Spring	22 - Link to Indicator
11 - Opening Spring	23 - Left Pole Lever
12 - Bearing Plates	24 - Bearing Plates

Attachment 2
NRCB 88-C1
February 5, 1988

LIST OF RECENTLY ISSUED NRC BULLETINS

Bulletin No.	Subject	Date of Issuance	Issued to
87-02	Fastener Testing to Determine Conformance with Applicable Material Specifications	11/6/87	All holders of OLs or CPs for nuclear power reactors.
87-01	Thinning of Pipe Walls in Nuclear Power Plants	7/9/87	All licensees for nuclear power plants holding an OL or CP.
86-04	Defective Teletherapy Timer That May Not Terminate Dose	10/29/86	All NRC licensees authorized to use cobalt-60 teletherapy units.
86-03	Potential Failure of Multiple ECCS Pumps Due to Single Failure of Air-Operated Valve in Minimum Flow Recirculation Line	10/8/86	All facilities holding an OL or CP.
86-02	Static "O" Ring Differential Pressure Switches	7/18/86	All power reactor facilities holding an OL or CP.
86-01	Minimum Flow Logic Problems That Could Disable RHR Pumps	5/23/86	All GE BWR facilities holding an OL or CP.
85-03	Motor-Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings	11/15/85	All power reactor facilities holding an OL or CP.
85-02	Undervoltage Trip Attachments of Westinghouse DB-50 Type Reactor Trip Breakers	11/5/85	All power reactor facilities holding an OL or CP.

OL = Operating License
CP = Construction Permit

Since inspection of the three main pole shaft welds for all RTBs should be completed within 30 days of receipt of this bulletin, a letter of confirmation of completion of these inspections including the above information is requested within 60 days of receipt of this bulletin.

The letter of confirmation shall be submitted to the appropriate Regional Administrator under oath or affirmation under the provisions of Section 182a, Atomic Energy Act of 1954, as amended. In addition, the original copy of the cover letter and a copy of any attachment shall be transmitted to the U. S. Nuclear Regulatory Commission, Document Control Desk, Washington D.C. 20555, for reproduction and distribution. For purposes of NRC accounting, all correspondence associated with this bulletin, including the letter of confirmation, should bear the identifying number TACS 65955/65956.

This request for information was approved by the Office of Management and Budget under blanket clearance number 31500011. Comments on burden and duplication should be directed to the Office of Management and Budget, Reports Management, Room 3208, New Executive Office Building, Washington D.C. 20503.

Although no specific request or requirement is intended, the following information would be helpful to the NRC in evaluating the cost of complying with this bulletin:

(1) staff time to perform requested inspections, corrective actions, and associated operability testing

(2) staff time to prepare requested documentation

(3) additional cost incurred as a result of the inspection findings (e.g., costs of corrective actions, costs of down time)

If you have any questions about this matter, please contact one of the technical contacts listed below or the Regional Administrator of the appropriate regional office.

Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical Contacts:

Darl S. Hood, NRR (301) 492-1442	K. R. Naidu, NRR (301) 492-0980
C. Vernon Hodge, NRR (301) 492-1169	C. D. Sellers, NRR (301) 492-0930

Attachments:
1. Westinghouse Technical Bulletin NSID-TB-87-11, December 1, 1987
2. List of Recently Issued NRC Bulletins

*SEE PREVIOUS PAGE FOR CONCURRENCE

D/DOEA:NRR	*C/OGCB:DOEA:NRR	*PPMB:ARM	*EAD/DEST:NRR	*ADR2/DRP:NRR
CERossi	CHBerlinger	TechEd	JRichardson	GLainas
02/2/88	12/7/87	12/10/87	12/7/87	12/7/87
*OGCB:DOEA:NRR	*PD23:DRP:NRR	*RVIB:DRIS:NRR	*EMTB:DEST:NRR	*DD/DRIS:NRR
CVHodge	DHood	KRNaidu	CDSellers	BKGrimes
12/7/87	12/7/87	12/7/87	12/7/87	12/7/87

such completion. However, the letter of confirmation of completion of the short-term inspections for all RTBs is requested within 60 days of the date of this NRC Bulletin.

The letter of confirmation should be submitted to the appropriate Regional Administrator under oath or affirmation under the provisions of Section 182a, Atomic Energy Act of 1954, as amended. In addition, the original copy of the cover letter and a copy of any attachment should be transmitted to the U. S. Nuclear Regulatory Commission, Document Control Desk, Washington D.C. 20555, for reproduction and distribution. For purposes of NRC accounting, all correspondence associated with this bulletin, including the letter of confirmation, should bear the identifying number TACS 65955/65956.

This request for information was approved by the Office of Management and Budget under blanket clearance number 3150-0011. Comments on burden and duplication should be directed to the Office of Management and Budget, Reports Management, Room 3208, New Executive Office Building, Washington D.C. 20503.

Although no specific request or requirement is intended, the following information would be helpful to the NRC in evaluating the cost of complying with this bulletin:

(1) staff time to perform requested inspections, corrective actions, and associated operability testing

(2) staff time to prepare requested documentation

(3) additional cost incurred as a result of the inspection findings (e.g., costs of corrective actions, costs of down time)

If there are any questions regarding this matter, please contact the Regional Administrator of the appropriate NRC regional office or this office.

Charles E. Rossi, Director,
Division of Operational Events Assessment
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Attachments:
1. Westinghouse Technical Bulletin NSID-TB-87-11, 2 December 1987
2. List of Recently Issued NRC Bulletins

*SEE PREVIOUS CONCURRENCES

D/DOEA:NRR	C/OGCB:DOEA:NRR	PPMB:ARM	EAD/DEST:NRR	ADR2/DRP:NRR
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12/7/87	12/7/87	12/7/87	12/7/87	12/7/87

Although no specific request or requirement is intended, the following information would be helpful to the NRC in evaluating the cost of this bulletin:

1. Staff time to perform requested inspections, corrective actions, and associated operability testing.

2. Staff time to prepare requested documentation.

3. Additional cost incurred from inspection findings, e.g. costs of corrective actions, costs of down time.

If there are any questions regarding this matter, please contact the Regional Administrator of the appropriate NRC regional office or this office.

Charles E. Rossi, Director,
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

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