



Flow Control

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NRC's Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Sir or Madam,

This notification is being submitted pursuant to the guidelines of 10 CFR Part 21 to report that a 24" Class 150 Globe valve for RHRSW HX Isolation MOV, E1150F068A at Detroit Edison - Fermi 2, failed to fully open due to the failure of the anti-rotation key.

The site notified WVC USA on January 18th of this issue involving a new bonnet that was installed which included a key bushing/key assembly. The new bonnet used was from originally supplied valve assembly on WVC USA order 0010001147-10 with a quantity of one, Detroit Edison Company PO 4700732583. The key is welded on top and bottom in the key bushing keyway to hold the key in place. After a month in service, during operation the welds failed which caused the key to drop out or be driven out from the key bushing by friction/vibration. Upon review of the design it was found that key and key slot fit were not dimensioned properly for a tight fit allowing a larger than recommended gap between key and keyway. This gap allowed the operational torque loads to put the welds in bending which caused the welds to fail. Loss of the key renders the valve inoperable to open or close.

The site has currently restored the key bushing/key assembly with new keys with proper fit and welds to ensure the key is retained.

Weir Valves & Controls has performed an extent condition review and has concluded that one other operating site, Georgia Power – SNC, Hatch Unit 1 WVC USA order 0010000081-10 (55544A), Southern Nuclear Operating Co PO SNG10025571 has a similar key/key bushing assembly. There was a quantity of six valve assemblies shipped for this purchase order. The site has been contacted to evaluate the fit of the key bushing/key assembly.

Engineering has determined that improper design clearance was the cause of failure. We are performing corrective actions to ensure future re-occurrences cannot occur in design engineering.

Please feel free to contact me with any questions or comments.

Regards,

Allen Fisher
Director of Engineering

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10 CFR PART 21 EVALUATION
Evaluation of Deviation or Potential Failure to Comply

DOCUMENT
10CFR21 01-18-19

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Part 1: Identification of Concern and Preliminary Evaluation

1A Identify the source of the information on the **deviation** or potential **failure to comply**:
DTE Fermi P/P 2 Contacted Weir Valves and Controls on 1/17/19 about a sheared Anti-rotation Key. Reference Customer Complaint 1234.

1B Describe the **deviation** or potential **failure to comply** that has been discovered:
Customer has reported the RHRSW HX Isolation MOV, E1150F068A, failed to open due to a failure of the anti-rotation key. Issue was noted by abnormal system response for RHRSW Pump at Start up.

1C Does the potential failure to comply represent a violation of the Atomic Energy Act of 1954, as amended, or any applicable rule, regulation, order, or license of the NRC, including technical specification limits?
If **Yes** or **Uncertain**, a potential **failure to comply** exists check and complete Section 1F.
If **No**, check and complete Section 1D.

1D(1) Does the **deviation** affect the functionality of items or services provided by Weir Valves & Controls USA?
If **Yes** or **Uncertain**, check and complete Section 1D(2). If **No**, check and complete Section 1E.

1D(2) Does the **deviation** involve a **basic component**?
If **Yes** or **Uncertain**, check and complete Section 1D(3). If **No**, check and complete Section 1E.

1D(3) Has the **basic component** been delivered to a customer?
If **Yes** or **Uncertain**, check and complete Section 1D(4). If **No**, check and complete Section 1E.

1D(4) Does the **basic component** deviate from the requirements of the customer's procurement document?
If **Yes** or **Uncertain**, check and complete Section 1G. If **No**, check and complete Section 1E.

1E No reportable **deviation** or potential **failure to comply** in accordance to 10CFR21 exists based on:

Originator (signature)

Originator (print)

Date

Designated Responsible Officer (signature)

Designated Responsible Officer (print)

Date

Have local Director, Quality Assurance retain this form on file for 5 years

Discovery

1F The **deviation** or potential **failure to comply** warrants further **evaluation** in accordance with 10CFR21.

 _____
Originator (signature)

John Perry


1/18/19

Originator (print)

Date

Forward this form with relevant information to the Designated Responsible Officer.

1G I have reviewed Part 1 and determined that the **deviation** or potential **failure to comply** should be evaluated based on the basis below for reportability in accordance with 10CFR21. (Start of 60-day clock)

 _____
Designated Responsible Officer (signature)


2/8/19

Date

Initial Due Date:


3/19/19

Within the 60-day clock started above, I will evaluate the **deviation** or potential **failure to comply** discovered in Part 1 to determine reportability in accordance with 10CFR21.

 _____
Cognizant Technical Engineer (signature)

2/8/19

Date

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Part 2: Technical Evaluation

2A Identification of the company supplying the **basic component** or activity which contains a **deviation** or potential **failure to comply**:
WVC USA supplied the basic component that failed.


2B Confirm the information in Part 1. Note any discrepancies that need to be addressed:
DTE Fermi has communicated failure of anti-rotation key for E1150F068A in which the valve failed to fully open. Prior to this event a new bonnet was installed which included the key bushing/key assembly. The new bonnet used was from originally supplied valve assembly on WVC USA order 0010001147-10, DTE PO 4700732583. The key is welded on top and bottom in the key bushing keyway to hold the key in place. During operation the welds failed which caused the key to drop out or be driven out from the key bushing by friction/vibration.

2C Provide A) Technical Justification of Unit Acceptability; or B) Proposed Technical Solution
Abnormal gap between a key and bushing key slot led to a failure of the stem anti-rotating feature of the valve. This gap contributed to the premature failure of the welds and the subsequent dropping of the anti-rotation key during system operation/vibration. The key is designed to carry the full torsional force of the actuator and allow for stem displacement in the open and close direction. Due to the gap, a torsional load from the stem induced bending stress to the fillet welds. The fillet welds are only design to support, in pure shear, the weight of the key and any friction force between the stem and the key as the valve opens and closes. The aforementioned bending stress was enough to cause the fillet welds to fail which allowed the key to fall out of the bearing assembly over time. After a thorough engineering review of the original Powell design and the Weir Valves and Controls (WVC) design documentation, two issues were identified below:

1. It was determined, in the original Powell design, the key and key slots were to be machined with the same tolerance to create a zero clearance fit. The WVC bearing assembly drawing specifies that the keyway tolerance shall be in accordance to ANSI B17.1 which allows for maximum gap of 0.007 inches.
2. The original Powell design specified A108 grade 1020 for key material. 1020 p-number is 1 which is the same as the bushing (A106B). WVC design changed the key material to AISI 4140 which does not have a designated P-No. However its composition (Cr-1/2Mo) would place it somewhere close to P-3. Welding 4140 steel requires preheat. No evidence was found that the keys were properly preheated before they were welded to the bushing.

Additionally, the safety classification of the key and bushing was questioned and addressed as follows: The valve design considered Code Case N-62-7 as specified in the original customer specification. The code case provides guidance for classifying valve components not addressed in ASME Section III ND Code. Per N-62-7 The key is designated as a category 7 component. Per Section 4.3.3 of N-62-7, the code case does not specify design rules, stress limits or analytical requirements for category 7 components. Therefore, the key safety significance was not altered from the original POWELL designation at the time it was reverse engineered by WVC.

- This issue is reportable pursuant to 10CFR21.
- This issue is not reportable pursuant to 10CFR21.
- A decision on reportability cannot be made based on the available information.


Cognizant Technical Engineer (signature) 3/11/19
Date

Review with the DRO within 5 days of completion


Designated Responsible Officer (signature) 3/11/19
Date

The DRO will finalize the reporting requirements and submit the reports to the NRC and any affected facilities within 30 days.



Part 3: Conclusion of Reportability Evaluation

3A Basis for decision:

The decision based on supplied information is confirmed. The increased clearance between the key and key bushing and improper welding lead to the failure of the welds which prevented the valve from operating as designed.

3B Number and location of all affected components:

The extent condition review has concluded that one other operating site, Georgia Power – SNC, Hatch Unit 1 WVC USA order 0010000081-10 (55544A), Southern Nuclear Operating Co PO SNG10025571 has a similar key/key bushing assembly. There was a quantity of six valve assemblies shipped for this purchase order. The site has been contacted to evaluate the fit of the key bushing/key assembly.

3C I have evaluated the information and technical assessment developed and

- This issue is reportable pursuant to 10CFR21.
- This issue is not reportable pursuant to 10CFR21.
- A decision on reportability cannot be made based on the available information.

Based on this determination, I will proceed with all proper notifications within the allowable timeframes.



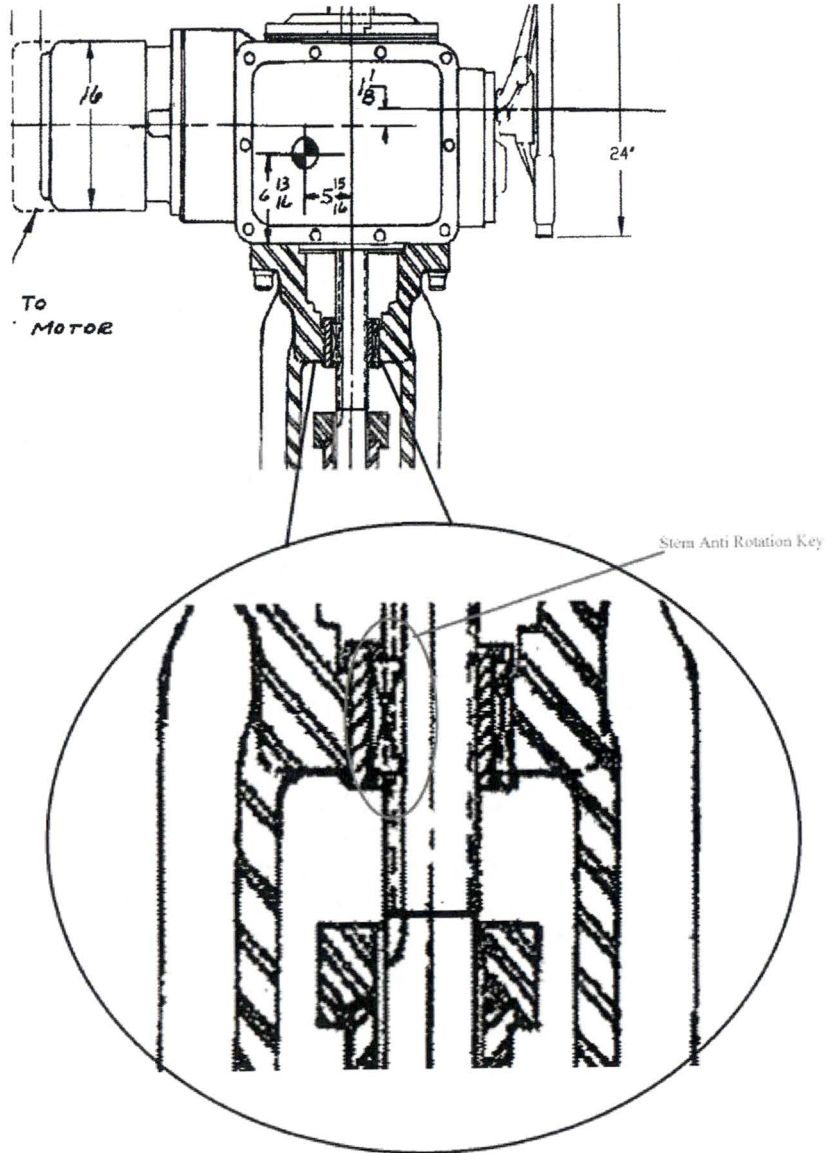
Designated Responsible Officer (signature)

3/11/19

Date

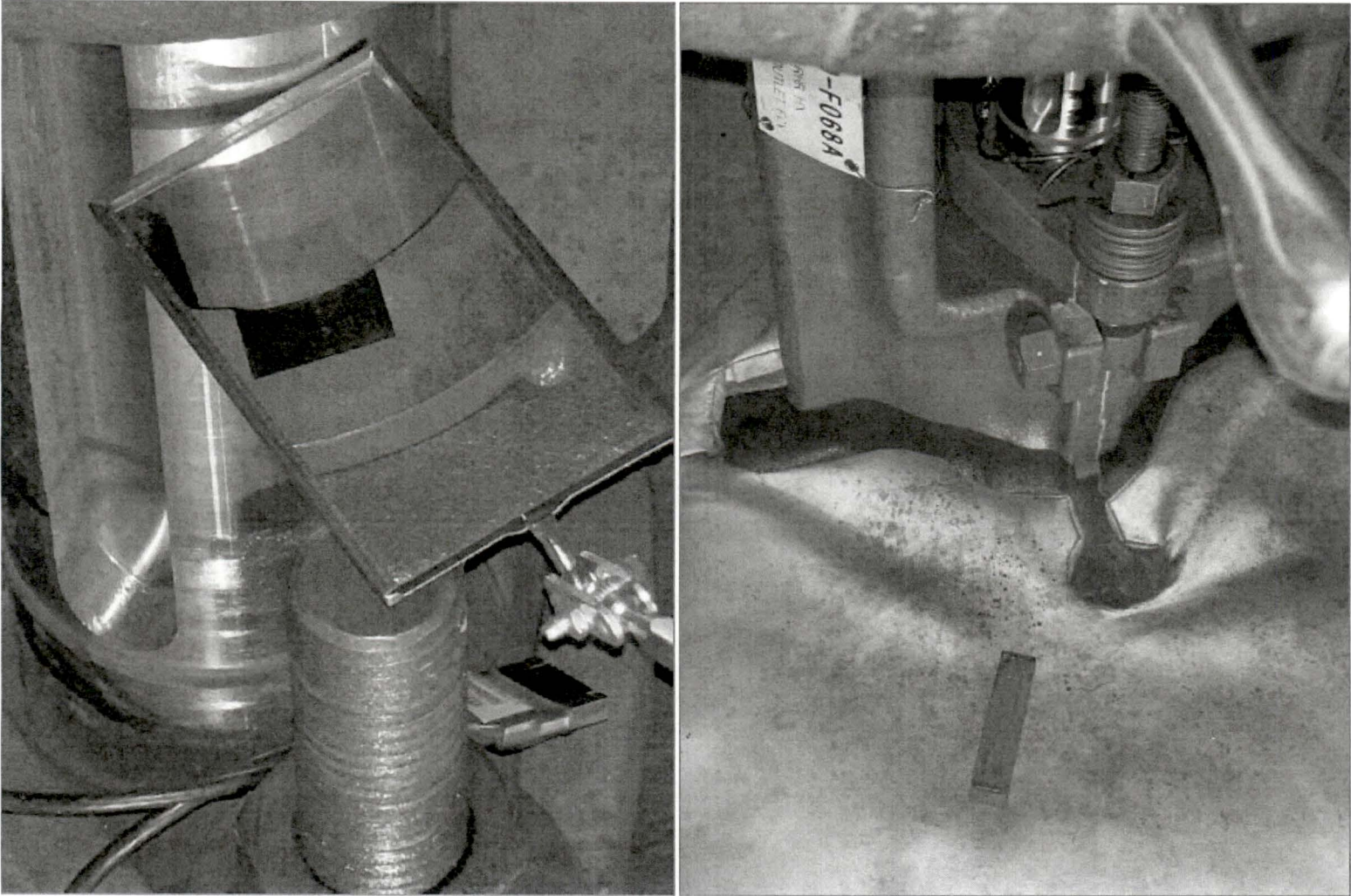
Attachment A

Valve Diagram – 1551WE 24” Globe Valve and anti-rotation key

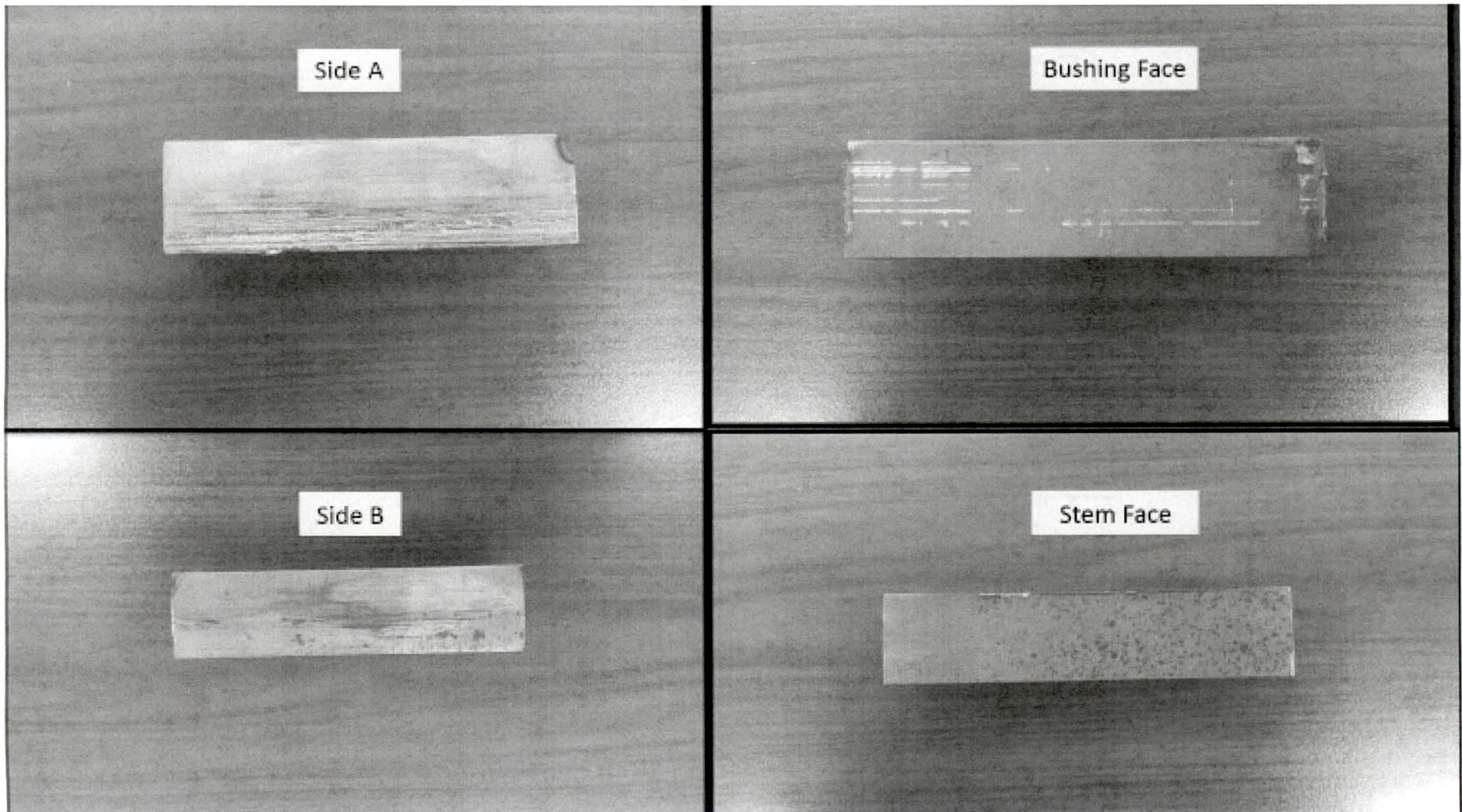


Attachment B

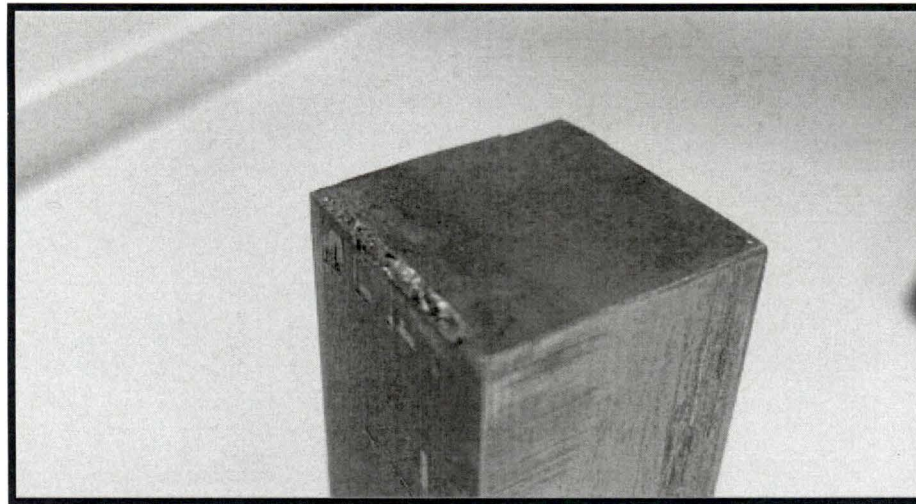
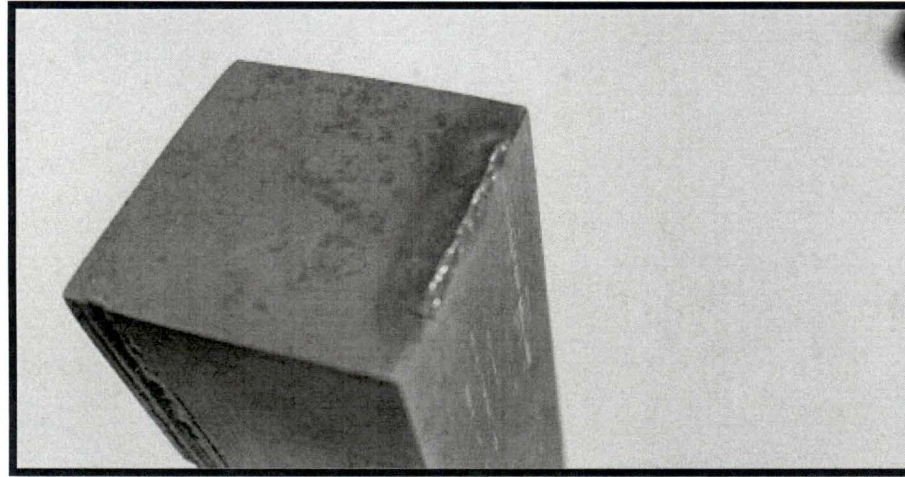
Failed Anti-Rotation Key Location and Misaligned Keyway



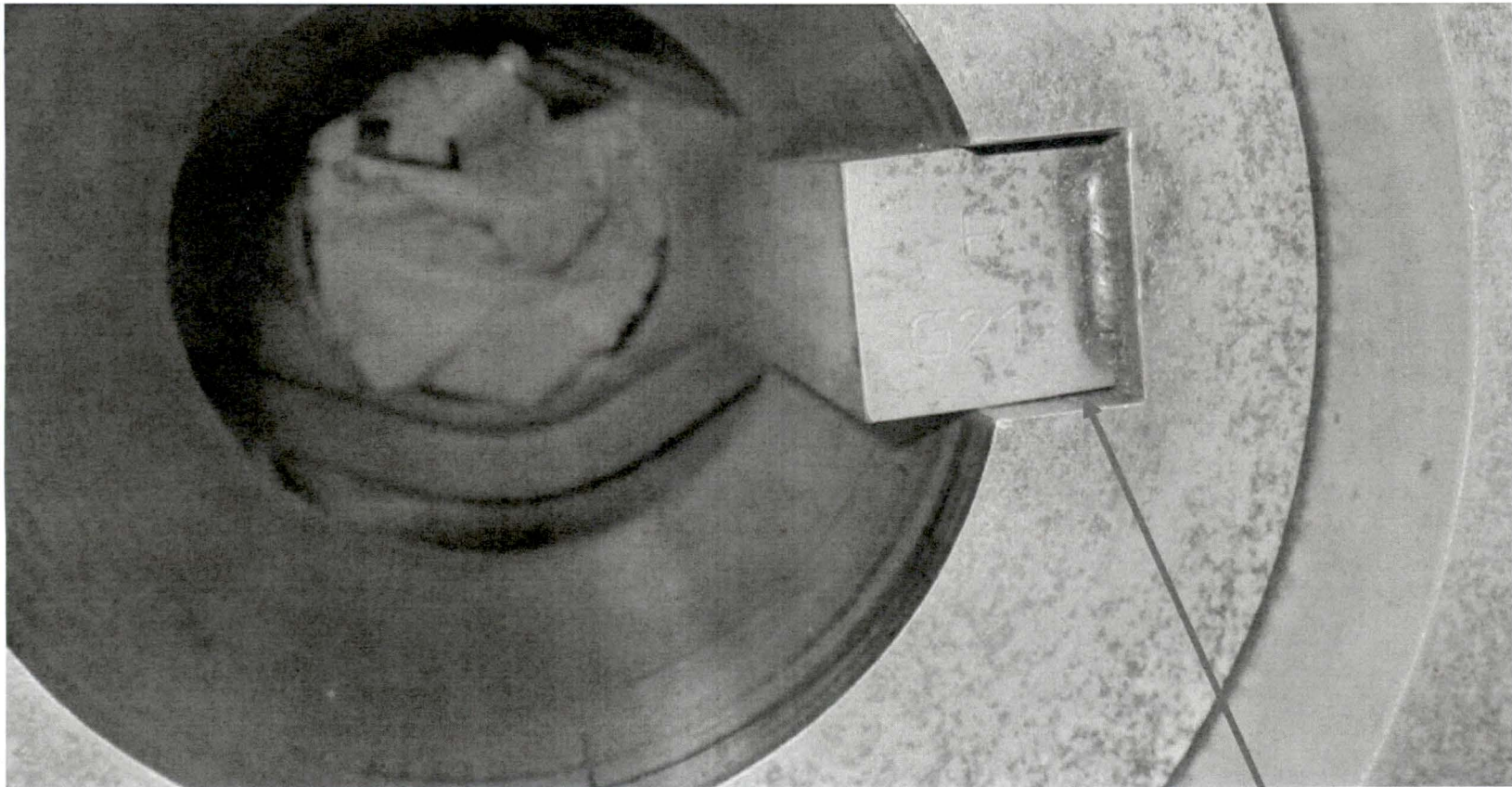
Attachment B
Failed Anti-Rotation Key Profile



Attachment B
Failed Anti-Rotation Key Tack Welds



Attachment C
Warehouse Photo of Installed Anti Rotation Bushing and Key



Abnormal Gap