

February 8, 1991

LICENSEE: Texas Utilities Electric Company (TU Electric)

FACILITY: Comanche Peak Steam Electric Station (CPSES), Units 1 and 2

SUBJECT: SUMMARY OF MEETING ON CPSES UNIT 1 DIESEL GENERATOR RACK
TEETH INSPECTION SCHEDULE

A meeting was held on January 31, 1991, to discuss the CPSES Unit 1 emergency diesel generator (EDG) rack teeth surfaces. A list of attendees and a copy of the handout used by TU Electric in their presentation are provided as Enclosures 1 and 2, respectively.

The purpose of the meeting was to determine if the current inspection schedule for examining the surfaces of the Unit 1 EDG rack teeth is adequate to assure continued safe operation of the Unit 1 EDGs. As specified in SSER 22, the current schedule is to inspect 25 percent of the rack teeth surfaces 5 years after initial operation and the remaining 75 percent at the end of 10 years. The licensee, and its consultants from Cooper Industries, provided the staff with an understanding of the condition of the EDG rack teeth surfaces at the time of their re-assembly in 1984, the implications of the inspection results on the Unit 2 "A" EDG rack teeth, and the history and limitations of the blue check procedure used to determine rack teeth surface trueness. The staff was in general agreement with the licensee's conclusions that, at the time of the 1984 re-assembly, the Unit 1 EDG rack teeth surfaces were free of defects serious enough to cause operational difficulties.

Based on the clarifying information provided in this meeting, the staff concludes that the original inspection schedule for the Unit 1 EDG rack teeth surfaces committed to by the licensee is still acceptable and that no changes are needed in the current inspection plans for the Units 1 and 2 EDG rack teeth surfaces.

(ORIGINAL SIGNED BY)

Mel B. Fields, Project Manager
Project Directorate IV-2
Division of Reactor Projects III/IV/V
Office of Nuclear Reactor Regulation

Enclosures:

- 1. List of Attendees
- 2. Presentation Slides

cc w/enclosures:
See next page

DISTRIBUTION

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PDIV-2 P/F	NRC Participants
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EJordan	JCaldwell

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DATE	: 2/5/91	: 2/5/91	: 2/7/91	: 2/6/91	: 2/5/91

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Document Name: SUMMARY OF MTG/CPSES UNIT 1

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Mr. William J. Cahill, Jr.

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February 8, 1991

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ENCLOSURE NO. 1

ATTENDANCE LIST

MEETING WITH TU ELECTRIC

JANUARY 31, 1991

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M. Patel
J. Bendyk
D. Reimer
G. Yezefski
M. Bagale

COOPER INDUSTRIES

M. Lowrey
A. Barich

NRC

C. Grimes
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M. Fields
J. Clifford
J. Rajan
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D. Terao

TU ELECTRIC

INSPECTION SCHEDULE FOR CPSES

UNIT 1 DIESEL GENERATORS

INSPECTION

TU ELECTRIC
DON WOODLAN

SUMMARY OF CONNECTING
ROD DESIGN AND RACK
TEETH DESIGN

COOPER ENTERPRISE DIV.
ALAN BARICH
MAURICE LOWREY

BLUE CHECKS
BACKGROUND
CRITERIA

COOPER ENTERPRISE DIV.
ALAN BARICH
MAURICE LOWREY

FRETTING
DEFINITION

COOPER ENTERPRISE DIV.
ALAN BARICH
MAURICE LOWREY

CPSES UNIT 1 INSPECTIONS
RESULTS
ACTIONS

TU ELECTRIC
GARY YERZFSKI
DUERK REIMER
MIKE BAGALE

CPSES UNIT 2 INSPECTIONS
RESULTS
ACTIONS

TU ELECTRIC
JOE BENDYK
DUERK REIMER
MIKE BAGALE

MANUFACTURING HISTORY/
FAILURE DATA

COOPER ENTERPRISE DIV.
TU ELECTRIC
ALAN BARICH
MAURICE LOWREY
MANU PATEL

CONCLUSION

TU ELECTRIC
DON WOODLAN
DUERK REIMER
MIKE BAGALE

SUMMARY OF CONNECTING ROD DESIGN
AND RACK TEETH DESIGN

- o CONNECTING ROD DESIGN
- o RACK TEETH DESIGN

FRETTING

- o FRETTING IS METAL TRANSFER THAT CAN OCCUR BETWEEN MATED SURFACES WHEN EXPOSED TO HIGH COMPRESSION AND/OR SHEAR FORCES.
- o THE CONNECTING ROD RACK TEETH ARE EXPOSED TO HIGH COMPRESSION AND SHEAR FORCES WHILE IN NORMAL USE. A PROPERLY FITTED AND ASSEMBLED JOINT WILL EXPERIENCE MINOR FRETTING EVEN AFTER ONLY A FEW HOURS OF OPERATION.
- o ABNORMALLY HIGH LEVELS OF FRETTING-ALTHOUGH NOT A PROBLEM BY ITSELF-IS INDICATIVE OF EXCESSIVE MOVEMENT OR FLEXURE WHICH CAN CAUSE BOLT FAILURE.
- o SINCE SURFACES CANNOT BE REASSEMBLED EXACTLY AS THEY WERE DISASSEMBLED, HIGH SPOTS DUE TO FRETTING-AS GOOD PRACTICE-SHOULD BE REMOVED PRIOR TO JOINT ASSEMBLY.

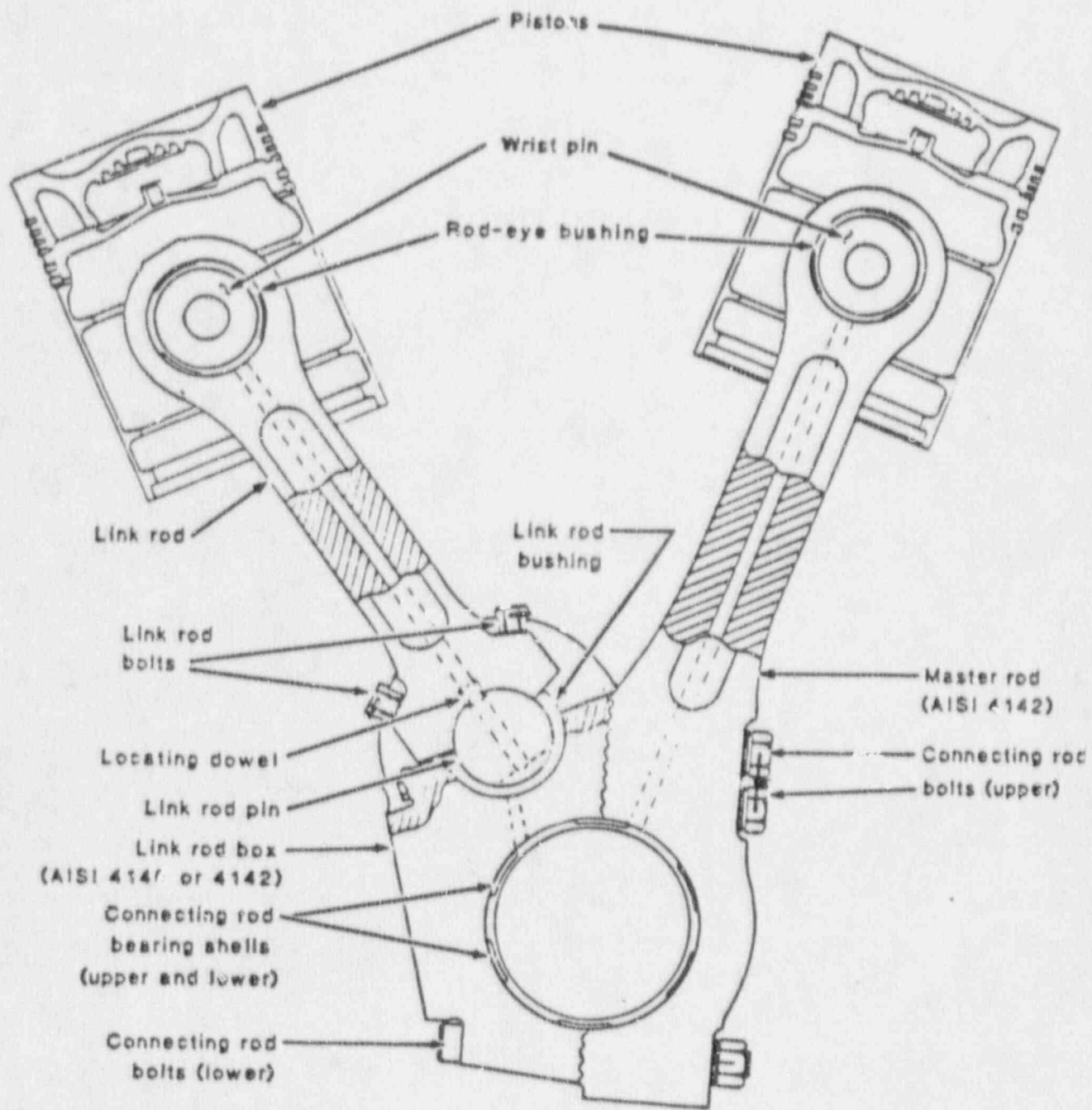


Figure 1-1. V-engine connecting rod, model RV-4 engine.

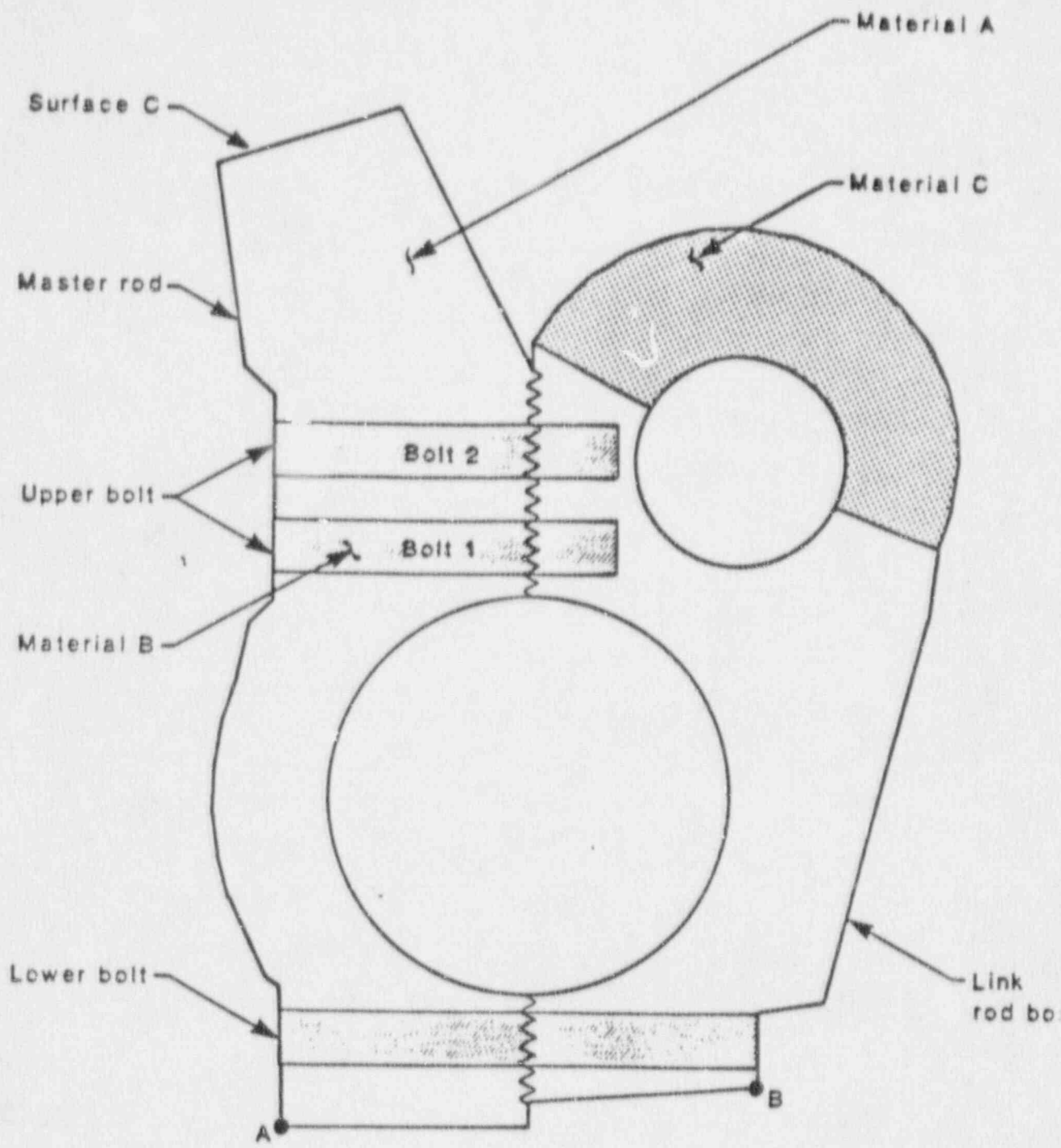


Figure 2-2. V-engine connecting rod assembly.

ROD MANUFACTURING PROCEDURE

- Master rod and box individually semi-machined.
- Serrated joint machined on master rod and box in one machining operation.
- Bolting holes for master rod to box are machined.
- Serrated joint lapped to provide better than 75% contact; rod and box are match marked as a mated pair.
- Serrated joint blued and checked under torque to visually confirm 75% contact.
- Finish bores of crankshaft pin, link rod pin and master rod piston pin are machined.

BLUE CHECKING

- Initial RV-4 engine design incorporates an articulated rod with 1-7/8" fasteners.
- Some failures of this rod assembly occurred from various manufacturing causes.
- One failure analysis identified bowed rack surface pitch lines of the master rod and box as the root cause of the failure. The bowed pitch lines resulted in contact between the master rod and box only at the outer teeth of the joint.
- Investigation discloses a bent machine hob as the cause of the bowed pitch lines.
- Corrective action entailed replacing the hob.
- To preclude recurrence the manufacturing route sheet was revised to require inspection of the joint by blue check.
- A minimum of 75% contact in the blue check (visual only) was established by the manufacturer as the acceptance criteria. This limit was established based on manufacturing and operational experience, as being both reasonably achievable and sufficient to preclude future failures caused by insufficient joint contact.
- Evolution of articulated design continues with design change to 1-1/2" diameter fasteners to increase rod box strength and increase fastener compliance.
- The fastener preload was subsequently increased.
- TU engines are equipped with latest design configuration.

CPSES UNIT 1 INSPECTIONS

- o SURFACES INSPECTED BY LIQUID PENETRANT (LP).
- o MODEST FRETTING EXISTED BUT DID NOT EFFECTS TESTING AND DID NOT INDICATE AS DEFECTS DURING INSPECTIONS.
- o THE MODEST FRETTING WAS DISCUSSED WITH NRC REPRESENTATIVES WHO WERE ON SITE AT THE TIME.
- o THE HIGH SPOTS WERE REMOVED BY HONING PRIOR TO REASSEMBLY.

CPSES UNIT 2 INSPECTIONS

- o ALL RACK TEETH THUS FAR HAVE SUCCESSFULLY PASSED BLUE CHECK.
- o ALL HIGH SPOTS WERE HONED PRIOR TO JOINT ASSEMBLY.

MANUFACTURING HISTORY/FAILURE DATA

- o ALL RACK TEETH ARE BLUE CHECKED AT THE FACTORY (ALTHOUGH SEPARATE DOCUMENTATION IS NOT RETAINED).
- o NO MANUFACTURING PROBLEMS RELATED TO THIS MATTER HAVE OCCURRED SINCE CORRECTIVE ACTION TAKEN.
- o OTHER NUCLEAR PLANTS HAVE NOT DETECTED MANUFACTURING PROBLEMS WHILE BLUE CHECKING.
- o THE ONLY FAILURES (NON-NUCLEAR APPLICATIONS) HAVE BEEN BOLT FAILURES DUE TO IMPROPER ASSEMBLY (IMPROPER JOINT PRELOAD.)
- o ALTHOUGH MANUFACTURED TWO YEARS APART, BOTH UNIT 1 AND UNIT 2 WERE MANUFACTURED AFTER CORRECTIVE ACTION IMPLEMENTED.
- o NO OTHER NUCLEAR UNITS HAVE REPORTED PROBLEMS WITH THESE RACK TEETH OR BOLTS DURING OPERATION.

CONCLUSION

- o CORRECTIVE ACTION BY COOPER, INCLUDING BLUE CHECKS, HAVE BEEN SUCCESSFUL.
- o THE CONFIRMATORY BLUE CHECKS AS PERFORMED BY NUCLEAR UNITS CONFIRM THE ADEQUACY OF THE MANUFACTURING PROCESS SINCE CORRECTIVE ACTION WAS TAKEN.
- o MINOR HIGH SPOTS ("MODEST FRETTING") AS FOUND ON UNIT 1 WAS NORMAL AND WAS PROPERLY REMOVED.
- o ALTHOUGH PROBABLY NO LONGER NECESSARY, UNIT 1 COMMITTED TO BLUE CHECK 25% AT 5 YEAR AND REMAINDER BY 10 YEAR OVERHAUL.