LIS ORIGINAL

SSINS No.: 6820
Accession No.:
8002280648

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

April 4, 1980

IE Bulletin No. 80-07

BWR JET PUMP ASSEMBLY FAILURE

Description of Circumstances:

On February 2, 1980, Commonwealth Edison Company (CECo) reported that a jet pump failed in Dresden Unit 3 while operating at about 67 percent of full power in a coastdown mode to a refueling shutdown. Observed changes in plant parameters during the event indicated an individual jet pump failure had occurred. In accordance with T.S., an orderly plant shutdown was begun to bring the unit to cold shutdown within 24 hours.

The plant parameter changes reported by the licensee were (1) generator electrical output decreased from 539 to 511 MW electrical, (2) core thermal power decreased as indicated by decreased APRM readings and steam flow to the turbine, (3) indicated total core flow increased from 97.6 to 104.7 x 10^6 lb./hr., (4) core plate differential pressure decreased from 16.1 to 13.8 psid., and (5) B recirculation loop flow increased from 49 to 54 x 10^3 gpm while A recirculation loop flow remained at 49 x 10^3 gpm. These changes were readily observed by the operator in the control room and it was postulated that a jet pump had failed. Individual jet pump readings were taken, the jet pump operability surveillance was performed, and an apparent failure of jet pump No. 13 was determined.

Following vessel head removal and defueling, TV camera and visual inspections of the jet pumps and vessel annulus revealed the hold-down beam assembly of the suspect jet pump had broken across its ligament sections at the mean diameter of the bolt thread area. Failure of the beam assembly resulted in pump decoupling at the diffuser connection. Subsequent insitu ultrasonic examination of all other jet pump hold-down beams, using a special UT technique developed by General Electric revealed ultrasonic indications of cracking at the same location in 6 of the remaining 19 beams examined. Initial estimates of crack depth ranged from 6 to 20 mils. A sketch of the typical jet pump assembly is shown in figures 1 and 2.

On March 15-16, 1980, insitu ultrasonic examination was performed on all 20 jet pump hold-down beam assemblies at Quad Cities 2 (currently shutdown for refueling). One beam was found to contain a crack indication estimated to be in excess of 100 mils depth in the same location on the beam as found at Dresden.

On March 28, 1980, Boston Edison reported that ultrasonic examination revealed crack indications in three (3) hold-down beam assemblies at Pilgrim Unit 1.

The beam assemblies having crack indications are scheduled for replacement during the current refueling outage of the above units. A metallurgical analysis has been initiated by GE to determine the probable cause(s) of the cracking.

General Electric notified utilities having operating BWR units with jet pumps of this potential problem on March 17 and 18, 1980. The NRC staff was advised on March 19, 1980 as to the actions being taken by GE in this regard. The staff was also notified of a hold-down beam failure experienced at a foreign BWR facility.

On the basis of information provided by General Electric and the recent experience at Dresden Unit 3, Quad Cities Unit 2 and Pilgrim Unit 1, concern arises that the hold-down beam assemblies and subsequent jet pump function may degrade significantly during operation. This potential for degradation could lead to jet pump disassembly and possibly reduce the margin of safety during postulated accidents.

The following actions are to be taken by licensees of GE designed BWR-3 and BWR-4 facilities with operating licenses:

A. Plants Now in Scheduled Refueling Outage Prior to Restart

1. Visual inspections assisted by TV camera shall be conducted to assess the integrity of the jet pump structures, the hold-down beam assembly, hold-downs, wedge and restrainer assembly. Particular attention should be given to areas of unusual wear, failed keeper welds or other evidence of distress that could be indicative of loss of beam assembly preload.

2. Ultrasonic examinations, utilizing GE procedure TP-508.0642 (Rev. A) or equivalent, shall be conducted to assess the integrity of the jet pump hold-down beams at the mid length ligament areas bounding the beam bolt.

3. Upon completion of the inspections required by paragraph 1 and 2 above, the appropriate NRC regional office shall be promptly notified, followed by a 14 day written report, on the results of the inspections including any deficiencies thus identified and corrective actions taken.

4. When startup for power operation begins, the surveillance described in Item B.2 shall be initiated.

B. Plants Currently Operating or Resuming Operations

1. The NRC staff has determined that the operating plants warrant inspection as required by paragraph 1 and 2 above. Therefore, licensees are requested to provide within 30 days of receipt of this

bulletin, written justification for any continued operation until these inspections are made and any defects thus identified are corrected.

2. For plants intending to justify continued operations or resume operation, the following surveillance, if not already performed, shall be initiated within 10 days after receipt of this bulletin and shall be continued until the plant technical specifications are revised or the cause of beam failure has been identified and corrected. This surveillance should improve the ability of the plant to identify an early indication of jet pump degradation or failure. Individual jet pump differential pressure readings should be recorded and used to establish a data base for expected characteristics for each jet pump. Periodic surveillance readings and individual jet pump trends when evaluated against this data base should assist in providing indication of jet pump degradation and supplement other conditions checked to determine jet pump operability.

   a. Prepare the necessary procedures and perform jet pump operability surveillance including the items specified in b. below on a daily basis, and following recirculation pump restart, and following unexpected changes observed in core flow indications, recirculation system flow indications, or established power-core flow relationships.

   b. If any of the following deviations occur during surveillance, evaluate and record the reason:

      (1) The recirculation pump flow differs by more than 10% from the established speed-flow characteristics for that pump.

      (2) The indicated total core flow is more than 10% greater than the core flow value derived from established power-core flow relationships.

      (3) The diffuser to lower plenum differential pressure reading on an individual jet pump exceeds the expected characteristics established for that pump (B.2 above).

3. If it is determined that a jet pump is inoperable or significantly degraded, the reactor shall be shutdown in accordance with technical specification requirements.

4. Review your procedures for instructing plant operators regarding identification and response to sudden individual jet pump failure. Revise procedures as required and instruct operating staff of any changes.

C. Reporting Requirements

The information in Items A.3, and B.1, is requested under the provisions of 10 CFR 50.54 (f). Accordingly, you are requested to provide within the time periods specified in these items, written statements of this information, signed under oath or affirmation.

Approved by GAO, B180225 (R0072); clearance expires 7-31-80. Approval was given under a blanket clearance specifically for identified generic problems.

Attachments:
Figures 1 and 2
Jet Pump Sketches

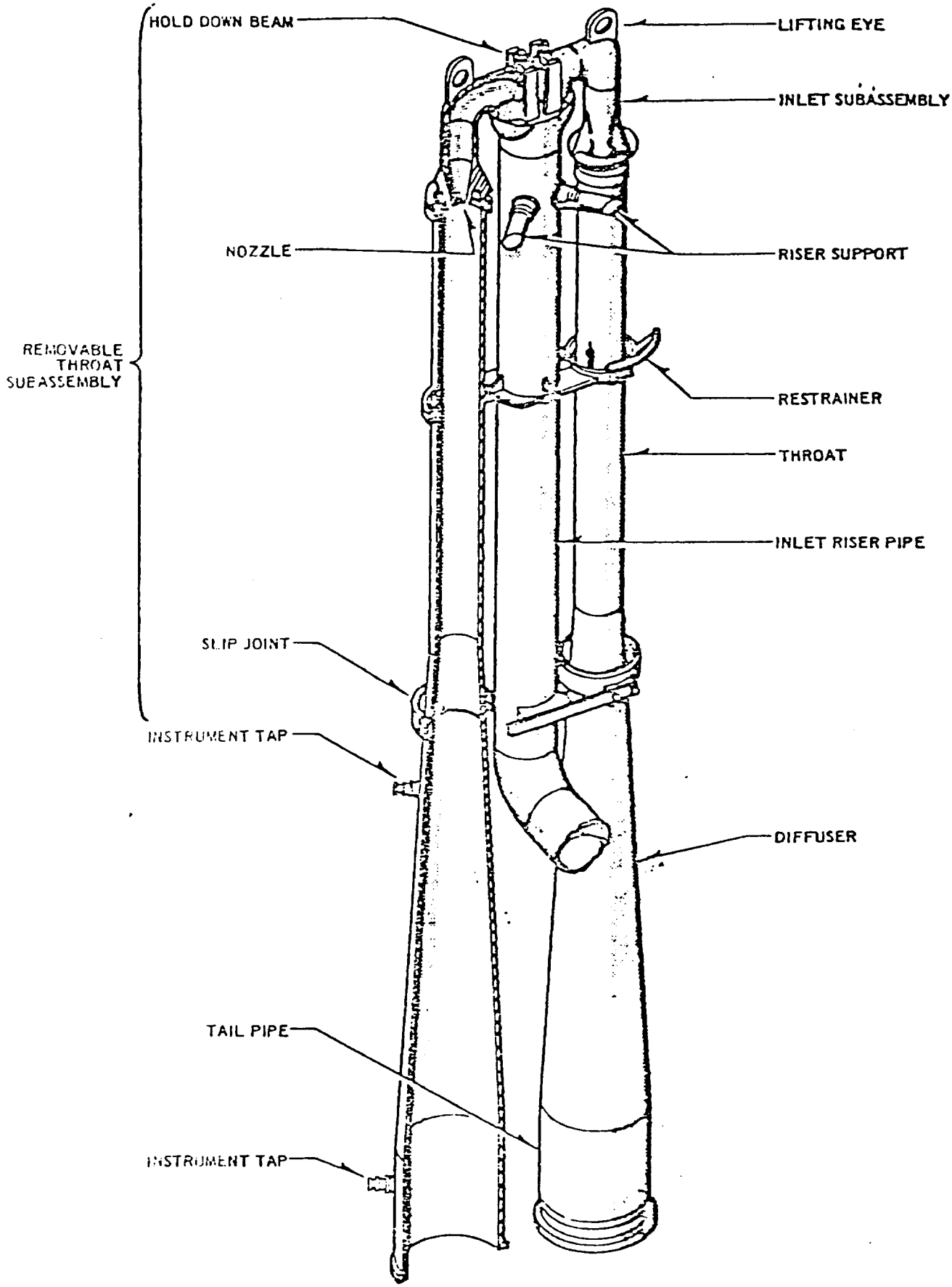
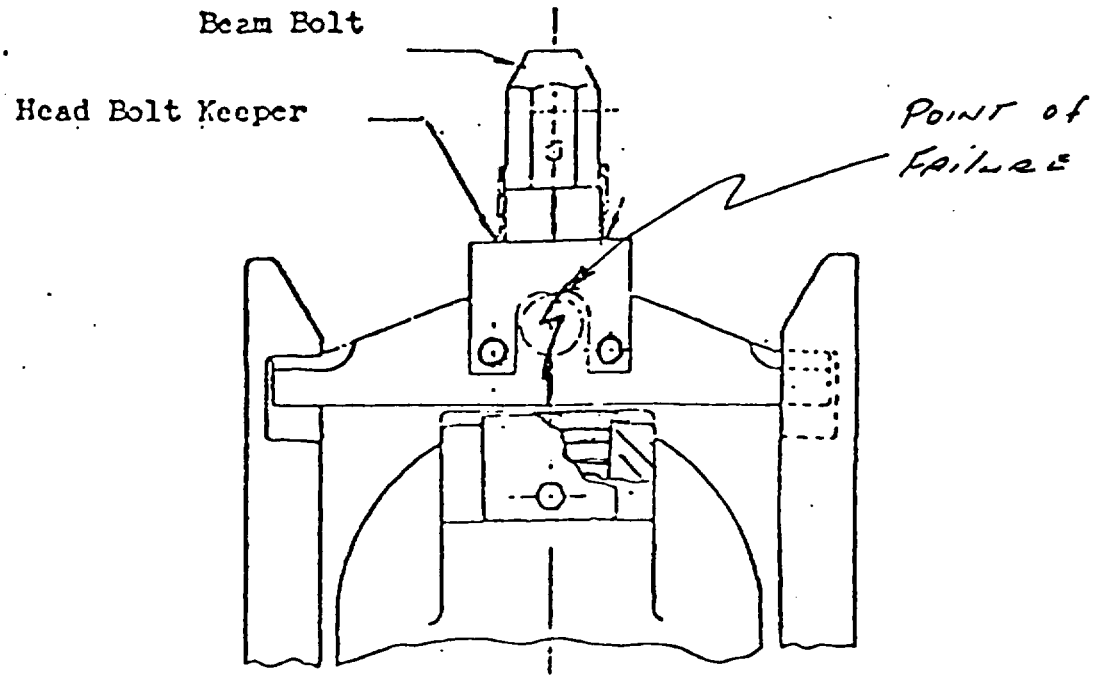

HOLD DOWN BEAM
LIFTING EYE
INLET SUBASSEMBLY
NOZZLE
RISER SUPPORT
REMOVABLE THROAT SUBASSEMBLY
RESTRAINER
THROAT
INLET RISER PIPE
SLIP JOINT
INSTRUMENT TAP
DIFFUSER
TAIL PIPE
INSTRUMENT TAP

FIG. 1



Jet Pump Beam Details

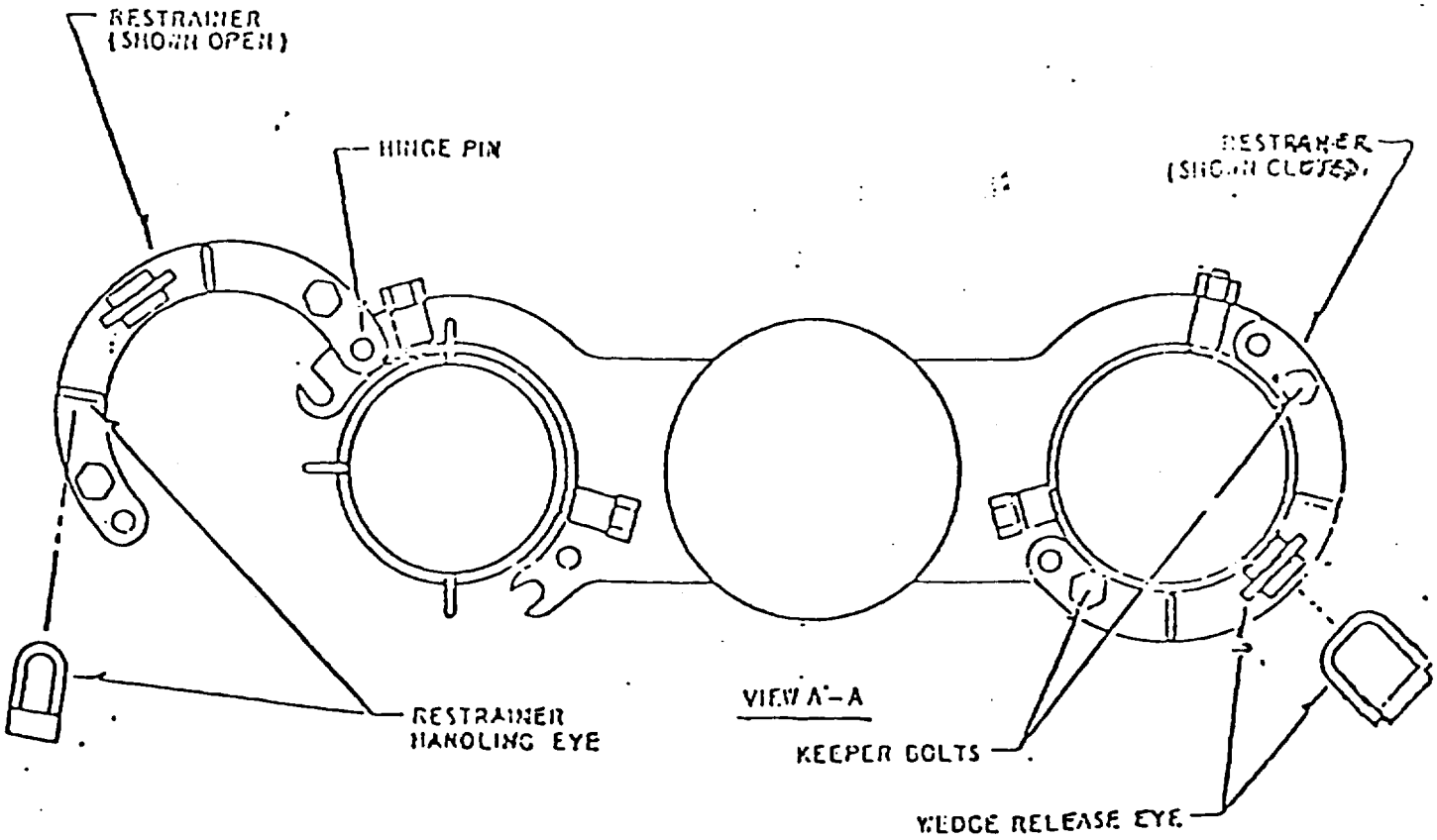


Fig. 2

IE Bulletin No. 80-07
April 4, 1980

Enclosure

RECENTLY ISSUED
IE BULLETINS

Bulletin No.	Subject	Date Issued	Issued To
79-03A	Longitudinal Weld Defects In ASME SA-312 Type 304 Stainless Steel Pipe	4/4/80	All power reactor facilities with an OL or CP
80-06	Engineered Safety Feature (ESF) Reset Controls	3/13/80	All power reactor facilities with an OL
80-05	Vacuum Condition Resulting In Damage To Chemical Volume Control System (CVCS) Holdup Tanks	3/10/80	All PWR power reactor facilities holding OLs and to those with a CP
79-01B	Environmental Qualification of Class IE Equipment	2/29/80	All power reactor facilities with an OL
80-04	Analysis of a PWR Main Steam Line Break With Continued Feedwater Addition	2/8/80	All PWR reactor facilities holding OLs and to those nearing licensing
80-03	Loss of Charcoal From Standard Type II, 2 Inch, Tray Adsorber Cells	2/6/80	All holders of Power Reactor OLs and CPs
80-02	Inadequate Quality Assurance for Nuclear	1/21/80	All BWR licenses with a CP or OL
80-01	Operability of ADS Valve Pneumatic Supply	1/11/80	All BWR power reactor facilities with and OL
79-01B	Environmental Qualification of Class IE Equipment	1/14/80	All power reactor facilities with an OL
79-28	Possible Malfunction of Namco Model EA 180 Limit Switches at Elevated Temperatures	12/7/79	All power reactor facilities with an OL or a CP