

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

February 24, 1992

NRC INFORMATION NOTICE 92-15: FAILURE OF PRIMARY SYSTEM COMPRESSION FITTING

Addressees

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

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to problems that could result from the inadequate installation of compression fittings. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

On November 23, 1991, operators at the Oconee Nuclear Station, Unit 3, detected unidentified leakage of approximately 70 gallons per minute (gpm) from the reactor coolant system (see licensee event report 50-287/91-008). The licensee shut down the reactor in an orderly manner. The licensee observed a maximum leak rate of approximately 130 gpm and found that a total of 87,000 gallons of reactor coolant was discharged to the containment before the reactor coolant system could be depressurized. On November 25, 1991, personnel entered the Unit 3 containment building and determined that the source of the leak was a separated compression fitting on a 3/4-inch diameter instrument line. The instrument line is part of the reactor vessel level indication system (RVLIS). The leak occurred where the line connects to the top of the "A" steam generator hot leg. The tubing separated from the fitting next to a 3/4-inch flow restriction valve.

The licensee inspected the fitting and determined that the probable cause of the tubing separating (or pulling out) was that the nut had not been sufficiently tightened onto the compression fitting. The nut on the fitting appeared to have been tightened approximately 1/2 turn less than was recommended by the fitting manufacturer, the Parker-Hannifin Corporation. The gap between the nut and the fitting was greater than the maximum nominal value furnished by the vendor. The licensee inspected the tubing at the failed fitting and determined that the diameter reduction at that location was much less than the diameter reduction for the tubing in another fitting that had not failed. Based on these inspections the licensee determined that the ferrule

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was not adequately compressed into the tubing. The licensee reconfigured the instrument line and replaced the valve, the 3/4-inch instrument tubing, and the fittings on the hot legs of both steam generators.

The licensee inspected all of the fittings on instrument tubing connected to the Unit 3 primary system. The licensee examined the 264 Parker-Hannifin fittings in the primary system using nominal expected gap values furnished by Parker-Hannifin as an acceptance criteria. However, Parker-Hannifin does not consider the gap to be a critical dimension. The licensee also inspected the 191 Swagelock fittings in the primary system using gap inspection gages furnished by Swagelock. The licensee found that approximately 27 percent of both types of fittings appeared to have gaps outside of the nominal range. The licensee attempted to tighten these fittings to reduce the gaps to the values recommended by the manufacturers. However, a small percentage of the Parker-Hannifin fittings could not be tightened to meet the vendor's nominal gap values. The licensee accepted these fittings as-is based on the judgement of the instrument technicians that the connections could not be tightened further without damaging the tubing or connections, and on an engineering evaluation made after disassembling and inspecting one of the questionable fittings.

### Discussion

This event reemphasizes the importance of making successful connections in instrument tube lines. Fitting nuts on compression fittings must be tightened sufficiently to ensure that the fitting has been adequately seated. According to the licensee, they have previously experienced problems with inadequate assembly of 3/4-inch fittings due to the high torque required to properly seat the fittings. The licensee's modifications to the RVLIS eliminated the use of 3/4-inch fittings on these lines.

While conducting inspections at other facilities, the NRC and licensees have noted other problems with the installation of compression fittings, including the following:

- Interchanging hardware from different manufacturers
- Installing the ferrules backwards in fittings, or omitting the ferrules
- Failing to bottom the tubing on the shoulder of the fitting
- Using tubing that is not cut square or that is burred, scratched, deformed, or contaminated with dirt, oil, or other contaminants
- Failing to adequately tighten the fitting to the finger-tight position before making additional turns from the finger-tight position
- Failing to ensure that the tubing has not moved back out of the fitting when the nut is tightened

These problems indicate that licensees' procedures for installing compression fittings may not provide adequate guidance to avoid improper assembly of the

fittings. Procedures may also fail to address the vendor's installation recommendations, not only for the initial installation of connections, but also for disconnecting and retightening fittings during normal maintenance activities. In addition, personnel who make compression fitting connections may not be adequately trained.

Related Generic Communications

The NRC staff has previously issued Information Notice 84-55 (including Supplement 1), "Seal Table Leaks at PWRs," to address problems associated with compression fitting failures.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

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

Technical contacts: Joseph J. Lenahan, RII  
(404) 331-4190

John R. Fair, NRR  
(301) 504-2759

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED  
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
92-14	Uranium Oxide Fires at Fuel Cycle Facilities	02/21/92	All fuel cycle and uranium fuel research and development licensees.
92-02, Supp. 1	Relap5/Mod3 Computer Code Error Associated with the Conservation of Energy Equation	02/18/92	All holders of OLs or CPs for nuclear power reactors.
92-13	Inadequate Control Over Vehicular Traffic at Nuclear Power Plant Sites	02/18/92	All holders of OLs or CPs for nuclear power reactors.
92-12	Effects of Cable Leakage Currents on Instrument Settings and Indications	02/10/92	All holders of OLs or CPs for nuclear power reactors.
92-11	Soil and Water Contamination at Fuel Cycle Facilities	02/05/92	All uranium fuel fabrication and conversion facilities.
92-10	Brachytherapy Incidents Involving Iridium-192 Wire Used in Endobronchial Treatments	01/31/92	All Nuclear Regulatory Commission (NRC) licensees authorized to use iridium-192 for brachytherapy; manufacturers and distributors of iridium-192 wire for use in brachytherapy.
92-09	Overloading and Subsequent Lock Out of Electrical Buses During Accident Conditions	01/30/92	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License  
CP = Construction Permit

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**\*SEE PREVIOUS CONCURRENCES**

D/DOEA:NRR CERossi 02/11/92	*C/OGCB:DOEA:NRR CHBerlinger 02/13/92	*RPB:ADM TechEd 01/30/92	*D/DET:NRR JERichardson 02/12/92	*C/EMEB:DET:NRR JANorberg 02/11/92
*OGCB/DOEA:NRR*RII AJKugler 01/31/92	*RII JJLenahan 02/06/92	*RII AFGibson 02/06/92	*EMEB:DET:NRR JRFair 02/11/92	*EMEB:DET:NRR TLChan 02/11/92

DOCUMENT NAME: IN 92-15

fittings. These procedures may also fail to address the vendor's installation recommendations, not only for the initial installation of connections, but also the limitations in disconnecting and retightening fittings during normal maintenance activities. In addition, the personnel who make the compression fitting connections may not be adequately trained.

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Document Name: COMPRESSION FITTING IN/2

\*SEE PREVIOUS CONCURRENCES

D/DOEA:NRR	C/OGCB:DOEA-NRR	*RPB:ADM	*D/DET:NRR	C/EMEB:DET:NRR
CERossi	CHBerTinder	TechEd	JERichardson	JANorberg
02/ /92	02/13/92	01/30/92	02/12/92	02/11/92
*OGCB:DOEA:NRR*RII		*RII	*EMEB:DET:NRR	*EMEB:DET:NRR
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