



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

## INSPECTION AND ENFORCEMENT MANUAL

DEPER

TEMPORARY INSTRUCTION 2500/19

SRxB

INSPECTION OF LICENSEE'S ACTIONS TAKEN TO IMPLEMENT  
UNRESOLVED SAFETY ISSUE A-26: REACTOR VESSEL PRESSURE  
TRANSIENT PROTECTION FOR PRESSURIZED WATER REACTORS

### 2500/19-01 PURPOSE

To verify that the pressurized water reactor (PWR) licensees have an effective mitigation system for low-temperature overpressure transient conditions in accordance with their commitments concerning Unresolved Safety Issue (USI) A-26.

### 2500/19-02 OBJECTIVES

To compare the actions of the licensee with its commitments contained in correspondence related to USI A-26 and described in the safety evaluation reports concerning reactor vessel pressure transient protection for PWRs.

### 2500/19-03 RESPONSIBILITIES AND AUTHORITIES

#### 03.01 Director, Plant Performance, DEPER

- a. Coordinate with NRR to obtain specific information and identify items to be inspected.
- b. Coordinate with regions as required to complete the requirements of this temporary instruction (TI).
- c. Conduct a review of the results of the inspections. Determine action to be taken after the completion of the effort directed by this TI.

#### 03.02 Region Management

- a. Coordinate with IE, as needed, to perform the inspection requirements of this TI.
- b. When this inspection effort is completed, the regions are to provide recommendations to IE on what further action should be taken.

Issue Date: 11/14/86

## 2500/19-04 BACKGROUND

A technical issue was identified concerning the safety margin-to-failure for PWRs should they be subject to severe pressure transients while at a relatively low temperature. The majority of the transients that occurred were during startup or shutdown operations when the reactor coolant system (RCS) was in a water-solid condition (i.e., no steam bubble present in the pressurizer to act as a surge volume). During such conditions, the RCS is susceptible to a rapid increase in system pressure through thermal expansion of the RCS water or through injection of water into the systems without adequate relief capacity or discharge flow path to control the pressure increase.

Plants receiving an operating license before March 14, 1978 committed to design reviews, procedure changes, equipment modifications, operator training, and surveillance using a combination of operator personnel and automatic equipment. Plants licensed after this date committed to the same actions, but the system response was to be fully automatic.

This TI is issued for the purpose of performing inspections to verify that licensees implemented their commitments as described in their safety evaluation reports concerning overpressure transient mitigation systems.

## 2500/19-05 BASIC REQUIREMENTS

The items to be verified have been divided into several areas: design, administrative controls and procedures, training and equipment modifications, and surveillance. Appendix I contains additional requirements for those who received their operating license before March 14, 1978 and depend upon operator involvement. Appendix II contains additional requirements for those who received their operating license after March 13, 1978 and use fully automatic systems.

### 05.01 Design

- a. Determine whether there is documentation to show that the overpressure protection system is designed to prevent exceeding the applicable technical specification and 10 CFR 50, Appendix G, limits for the reactor pressure vessel during plant cooldown or startup. For example, does the system keep the pressure in the primary loop below the Appendix G limit when the water in the reactor vessel is below the minimum temperature specified by fracture toughness tests?
- b. Determine whether there are drawings or sketches to show that the pressure protection system is designed to protect the vessel given a single failure in addition to a failure that initiated the pressure transient. Examples are loss of offsite power and loss of normal air supply.
- c. Determine whether there are drawings or sketches to show that the system is not vulnerable to an event that causes a pressure transient and a failure of equipment needed to terminate the transient. Examples are loss of a single power-operated relief valve (PORV), block valve, solenoid, or air supply.

- d. Determine whether there is documentation to show that the set point(s) is supported by plant-specific analysis if the licensee uses a PORV. For example, in the applicable temperature range, is the sum of the low pressure set point and the pressure rise until the PORV fully opens less than the maximum pressure permitted by 10 CFR 50, Appendix G?
- e. Determine whether the licensee's 10 CFR 50.59 evaluation has been prepared.

05.02 Administrative Controls and Procedures

- a. Determine whether procedures exist for the following:
  - 1. to minimize the time in a water-solid condition
  - 2. to minimize the temperature differentials between the steam generators and reactor vessel while in a water-solid condition
  - 3. to restrict the number of high-pressure safety injection charging pumps to no more than one when the reactor coolant system is in the low-temperature overpressure condition
  - 4. to alert operators to the automatic operation of the low-temperature overpressure protection system
- b. Determine whether the plant-installed system is in accordance with the plant license.

05.03 Training and Equipment Modifications

- a. Determine whether all operators have received training concerning RCS low-temperature overpressure event causes, the operation and maintenance of the system that mitigates the events, and the consequences of inadvertent actuation.
- b. Determine whether permanent modifications or procedural changes have been made that result in a system that provides mitigation for RCS low-temperature overpressure events. For example, has the system been modified to disable the pressurizer heaters and unneeded high-pressure injection or charging pumps during cold, water-solid conditions?
- c. Determine whether there is documentation to show that modification to a specific piece of equipment will not result in the equipment being out of its design basis. For example, if the PORV stroke times were changed by modification to the solenoids that control the air pressure on the valve operator diaphragm, were these modifications proper and were they tested?
- d. Determine whether the instrumentation and control system incorporates an alarm with a set point below the maximum allowable pressure for existing temperature conditions to alert the operator of a pressure transient.

05.04 Surveillance

- a. Determine whether the PORV electronics and set points are verified periodically. Determine the date of the most recent measurement of the PORV stroke times and compare the value with the design basis.
- b. Determine whether tests are performed to ensure operability of the system electronics before each cold shutdown.
- c. Determine whether, subsequent to system, valve, or electronics maintenance, tests are performed before declaring the system operational.

2500/19-06 REPORTING REQUIREMENTS

06.01 Regional inspection results shall be transmitted to the Director, DEPER.

06.02 The inspection effort shall be documented in a routine inspection report.

2500/19-07 EXPIRATION

The TI shall remain in effect until December 1, 1987.

2500/19-08 IE CONTACT

Questions regarding this TI should be addressed to Paul Cortland, (301) 492-4175.

2500/19-09 STATISTICAL DATA REPORTING

Record actual time spent to perform the inspection and the time spent on followup items identified in the inspection report against module number 25019.

END

Enclosures:  
Appendix I  
Appendix II

## APPENDIX I

### ADDITIONAL REQUIREMENTS WHEN THE OPERATING LICENSE WAS ISSUED BEFORE MARCH 14, 1978

#### A. PURPOSE

To supplement Temporary Instruction 2500/19 and provide additional items to be verified.

#### B. BACKGROUND

The procedures and modifications necessary to mitigate the low-temperature overpressure transient depended in part on whether the plant had been issued an operating license before March 14, 1978. Plants licensed before that date could use a combination of manual and automatic actions to prevent or mitigate the event. Plants licensed on or after that date had to use fully automatic methods.

#### C. BASIC REQUIREMENTS

1. Design. Determine whether there are drawings or sketches to show that the low-temperature overpressure protection system was designed with redundant actuation controls.
2. Administrative Controls and Procedures
  - a. Determine whether there is a procedure to have the operator manually align the low-temperature overpressure protection system for operation and whether the procedure includes alarms and other verifications.
  - b. If there are procedures for the operator to take action to deenergize equipment, select two of these procedures and verify that they were being followed.
  - c. Determine whether there are procedures for maintaining a low-pressure steam or gas (e.g., nitrogen) bubble during shut-down conditions. Were these procedures followed?
  - d. Determine whether procedures provide for removal of low-temperature overpressure protection on temperature increase such that inadvertent actuation of this system at power is avoided.
3. Training and Equipment Modification

If a backup air supply is used for the PORVs, determine whether there is documentation to show that it is adequate for 10 minutes of operation. For example, is the air pressure in the backup supply still greater than the downstream regulator pressure and the pressure needed to operate the PORV after 10 minutes of operation?

END

## APPENDIX II

### ADDITIONAL REQUIREMENTS WHEN THE OPERATING LICENSE WAS ISSUED AFTER MARCH 13, 1978

#### A. PURPOSE

To supplement Temporary Instruction 2500/19 and provide additional items to be verified.

#### B. BACKGROUND

The procedures and modifications necessary to mitigate the low-temperature overpressure transient depended in part on whether the plant had been issued an operating license before March 14, 1978. Plants licensed before that date could use a combination of manual and automatic actions to prevent or mitigate the event. Plants licensed on or after that date had to use fully automatic methods.

#### C. BASIC REQUIREMENTS

1. Determine whether the systems operate automatically without manual actions to enable or "turn-on" the system or to mitigate the consequences of a potential overpressure event.
2. Determine whether there are drawings or sketches to show that the system was designed with redundant electrical channels.
3. Determine whether there is documentation to show that the system meets Seismic Category I requirements or that an earthquake would not initiate an overpressure transient or conversely actuate the system inadvertently and cause a LOCA.

END

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US NRC  
IE-DIV OF INSPECTION PROGRAMS  
G R KLINGLER  
REACTOR OPERATIONS INSPECTOR  
EWS-346  
WASHINGTON DC 20555