



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO THE REQUEST FOR APPROVAL OF ASME CODE CASE N-416-1  
FOR

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY, ET AL.

PERRY NUCLEAR POWER PLANT, UNIT NO. 1

DOCKET NO. 50-440

1.0 INTRODUCTION

The Technical Specifications for the Perry Nuclear Power Plant, Unit No. 1, state that the inservice inspection and testing of the American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 components shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable Addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Part 50.55a(a)(3) of Title 10 of Code of Federal Regulations states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulties without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval, and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) on the date 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable edition of Section XI of the ASME Code for the Perry Nuclear Power Plant, Unit No. 1, 10-year inservice inspection (ISI) interval is the 1983 Edition with summer 1983 Addenda. The components (including supports) may meet the requirements set forth in subsequent editions and addenda of the ASME Code, incorporated by reference in 10 CFR 50.55a(b) subject to the limitations and modifications listed therein and subject to Commission approval.

By letter dated October 31, 1994, The Cleveland Electric Illuminating Company (licensee) requested approval for the implementation of the alternative rules of ASME Section XI Code Case N-416-1 dated February 15, 1994, entitled

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"Alternative Pressure Test Requirement for Welded Repairs or Installation of Replacement Items by Welding Class 1, 2, and 3, Section XI, Division 1," pursuant to 10 CFR 50.55a(a)(3) to be applied to the inservice inspection (ISI) program for the Perry Nuclear Power Plant, Unit No. 1.

## 2.0 EVALUATION

### CODE CASE N-416-1 ALTERNATIVE PRESSURE TEST REQUIREMENT FOR WELDED REPAIRS OR INSTALLATION OF REPLACEMENT ITEMS BY WELDING CLASS 1, 2, and 3 - SECTION XI, DIVISION 1

#### Component Identification

ASME Class 1, 2, and 3 Piping Systems

#### ASME Code Section XI Interval Requirements

The 1983 Edition through summer 1983 Addenda, Section XI, IWA-4700(a) requires that a system hydrostatic test be performed in accordance with IWA-5000 after repairs by welding on the pressure retaining boundary.

#### Licensee's Basis for Request

The licensee provided the following in support of its request:

Endorsement of ASME Code Case N-498, "Alternative Rules for 10-Year Hydrostatic Pressure Testing for Class 1 and 2 Systems, Section XI, Division 1" by NRC in Regulatory Guide 1.147 has eliminated the requirement to perform the 10-year hydrostatic tests for ASME Class 1 and 2 systems, except for those hydrostatic tests which were deferred pursuant to ASME Code Case N-416. The approval of ASME Code Case N-416-1 will eliminate the need to perform any unnecessary hydrostatic tests during the next refueling outage (fifth refueling outage) and subsequent outages, and will result in substantial cost savings and reduced radiation exposure over the life of PNPP [Perry Nuclear Power Plant]. The approval of this request is in accordance with 10 CFR 50.55a(a)(3), because compliance with the specified IWA-4000 requirements would result in hardship and unusual difficulty without a compensating increase in the level of quality and safety. The alternative system leakage test and inspection requirements specified by ASME Code Case N-416-1 would provide an acceptable level of quality and safety.

#### Proposed Alternative Examination

The licensee proposes to apply Code Case N-416-1 as alternative rules for welded repairs or installation of replacement items by welding in Class 1, 2, and 3 piping.

### Evaluation

In lieu of hydrostatic pressure testing for welded repairs or installation of replacement items by welding, Code Case N-416-1 requires a visual examination (VT-2) be performed in conjunction with a system leakage testing using the 1992 Edition of Section XI, in accordance with paragraph IWA-5000, at nominal operating pressure and temperature. This Code Case also specifies that NDE of the welds be performed in accordance with the applicable Subsection of the 1992 Edition of Section III.

The 1989 Edition of Sections XI and III are the latest editions referenced in 10 CFR 50.55a. The staff has compared the system pressure test requirements of the 1992 Edition of Section XI to the requirements of IWA-5000 of the 1989 Edition of Section XI. In summary, the 1992 Edition imposes a more uniform set of system pressure test requirements for Code Class 1, 2, and 3 systems. The terminology associated with the system pressure test requirements for all three Code Classes has been clarified and streamlined. The test frequency and test pressure conditions associated with these tests has not been changed. The hold times for these tests has either remained unchanged or increased. The corrective actions with respect to removal of bolts from leaking bolted connections has been relaxed in the 1992 Edition, but use of this change has been accepted by the staff in previous safety evaluations. The post-welded repair non-destructive examination (NDE) requirements of the 1992 Edition of Section III, remain the same as the requirements of the 1989 Edition of Section III. Therefore, the staff finds this aspect of Code Case N-416-1 to be acceptable.

Hardships are generally encountered with the performance of hydrostatic testing performed in accordance with the Code. For example, since hydrostatic test pressure would be higher than nominal operating pressure, hydrostatic pressure testing frequently requires significant effort to set up and perform. The need to use special equipment, such as temporary attachment of test pumps and gages, and the need for individual valve lineups can cause the testing to be on a critical path.

Piping components are designed for a number of loadings that would be postulated to occur under the various modes of plant operation. Hydrostatic testing only subjects the piping components to a small increase in pressure over the design pressure, and therefore, does not present a significant challenge to pressure boundary integrity. Accordingly, hydrostatic pressure testing is primarily regarded as a means to enhance leakage detection during the examination of components under pressure, rather than solely as a measure to determine the structural integrity of the components.

The industry indicates that experience has demonstrated that leaks are not being discovered as a result of hydrostatic test pressures propagating a preexisting flaw through wall. They indicate that, when leaks are found, in most cases they are found when the system is at normal operating pressure. This is largely due to the fact that hydrostatic pressure testing is required only upon installation, and then once every 10-year inspection interval, while system leakage tests at nominal operating pressures are conducted a minimum of

once each refueling outage for Class 1 systems and each 40-month inspection period for Class 2 and 3 systems. In addition, leaks may be identified by plant operators during system walkdowns, which may be conducted as often as once a shift.

Following the performance of welding, the code requires volumetric examination of repairs or replacements in Code Class 1 and 2, but only requires a surface examination of the final weld pass in Code Class 3 piping components. There are no ongoing NDE requirements for Code Class 3 components, except for visual examination for leaks in conjunction with the 10-year hydrostatic tests and the periodic pressure tests.

Considering the NDE performed on Code Class 1 and 2 systems and considering that the hydrostatic pressure tests rarely result in pressure boundary leaks that would not occur during system leakage tests, the staff believes that increased assurance of the integrity of Class 1 and 2 welds is not commensurate with the burden of performing hydrostatic testing. However, considering the nature of NDE requirements for Code Class 3 components, the staff does not believe that eliminating the hydrostatic pressure testing and only performing system pressure testing is an acceptable alternative to hydrostatic testing, unless additional surface examinations are performed on the root pass layer of butt and socket welds on the pressure retaining boundary of Class 3 components, when the surface examination method is used in accordance with Section III.

### 3.0 CONCLUSION

With the above provision applied to Code Class 3 components, the staff concludes that compliance with the Code hydrostatic testing requirements for welded repairs or replacements of Code Class 1, 2, and 3 components would result in hardships without a compensating increase in the level of quality and safety. Accordingly, the licensee's proposed alternative to use Code Case N-416-1 is authorized for the Perry Nuclear Power Plant, Unit No. 1, pursuant to 10 CFR 50.55a(a)(3)(ii) provided additional surface examinations are performed on the root pass layer of butt and socket welds on the pressure retaining boundary of Class 3 components, when the surface examination method is used in accordance with Section III. Use of Code Case N-416-1, with provision as noted above, is authorized until such time as the Code Case is published in a future revision of Regulatory Guide 1.147. At that time, if the licensee intends to continue to implement this Code Case, the licensee is to follow all provisions in Code Case N-416-1, with limitations issued in Regulatory Guide 1.147, if any.

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Date: February 10, 1995