ATTACHMENT 2

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TECHNICAL EVALUATION REPORT
PUMP AND VALVE INSERVICE TESTING PROGRAM
BRAIDWOOD STATION, UNITS 1 AND 2

Docket Nos. 50-456 and 457

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ABSTRACT

This EG&G Idaho, Inc., report presents the results of our evaluation of the Braidwood Station, Units 1 and 2, Inservice Testing Program for pumps and valves whose function is safety-related.

FOREWORD

This report is supplied as part of the "Review of Pump and Valve Inservice Testing Programs for Operating Reactors (III)" program being conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Mechanical Engineering Branch, by EG&G Idaho, Inc., Regulatory and Technical Assistance Unit.

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BRAIDWOOD STATION, UNITS 1 AND 2

1. INTRODUCTION

Contained herein is a technical evaluation of the pump and valve inservice testing (IST) program submitted by Commonwealth Edison Company for its Braidwood Station, Units 1 and 2.

The IST program review for the Braidwood Station, Units 1 and 2, was performed in conjunction with the review of Byron Station, Units 1 and 2, due to great similarities of the four plants and their associated IST programs. By a letter dated November 4, 1982, Commonwealth Edison Company submitted an IST Program for Byron Station, Units 1 and 2, and Braidwood Station, Unit 1. A working meeting with Commonwealth Edison Company and Braidwood Station representatives was conducted July 8 and 9, 1986 and October 27, 1988. Conference calls were held on December 24, 1986, July 9, 1987, and December 12, 1986.

The Braidwood Station, Units 1 and 2, IST Program for pumps and valves, Revision 4, as revised by Commonwealth Edison Company and attached to S. C. Hunsader letter to NRC, dated January 31, 1989, was reviewed to verify compliance of proposed tests of pumps and valves whose function is safety-related with the requirements of the ASME Boiler and Pressure Vessel Code (the Code), Section XI, 1983 Edition. The starting dates for the first IST intervals for Units 1 and 2 are July 29, 1988 and October 17, 1988, respectively. Any IST program revisions subsequent to those noted above are not addressed in this technical evaluation report (TER). Program changes involving additional or revised relief requests should be submitted to NRC under separate cover in order to receive prompt attention, but should not be implemented prior to review and approval by NRC. Other IST program revisions should follow the guidance in Generic Letter No. 89-04, "Guidance on Developing Acceptable Inservice Testing Programs."

In its submittal, Commonwealth Edison Company has requested relief from the ASME Code testing requirements for specific pumps and valves; and

the basis for the requests have been evaluated individually against the requirements of 10 CFR 50.55a. This review was performed utilizing the acceptance criteria of the Standard Review Plan, Section 3.9.6, the Draft Regulatory Guide and Value/Impact Statement titled "Identification of Valves for Inclusion in Inservice Testing Programs", and Generic Letter No. 89-04, "Guidance on Developing Acceptable Inservice Testing Programs." The IST Program testing requirements apply only to component testing (i.e., pumps and valves) and are not intended to provide the basis to change the licensee's current Technical Specifications for system test requirements.

Section 2 of this report presents a discussion of the scope of this review.

Section 3 of this report presents the Braidwood Station, Units 1 and 2, relief requests and EG&G's evaluations and conclusions regarding these requests for the pump testing program. Similar information is presented in Section 4 for the valve testing program.

This TER, including all relief requests and component identification numbers, is applicable to Units 1 and 2. The Unit 2 designator has been placed in parentheses to minimize repetition, i.e., 1(2)SI8815.

Category A, B, and C valves that meet the requirements of the ASME Code, Section XI, and are not exercised quarterly are addressed in Appendix A.

A listing of P&IDs and Figures used for this review is contained in Appendix B.

Inconsistencies and omissions in the licensee's program noted during the course of this review are listed in Appendix C. The licensee should resolve these items in accordance with the evaluations, conclusions, and guidelines presented in this report.

2. SCOPE

The EG&G Idaho review of the Commonwealth Edison Company, Braidwood Station inservice testing (IST) program for pumps and valves was begun in 1984 in conjunction with that of the Byron Station, Units 1 and 2, IST program. The program initially examined was Revision 2, dated November 11, 1982, which identified the licensee's proposed testing of safety related pumps and valves in the plant systems listed in Appendix B.

The licensee's proposed IST program was reviewed by locating and highlighting the components on the appropriate system P&IDs and determining the function of the components in the system. Then the proposed testing was evaluated to determine if it was in compliance with the ASME Code, Section XI, requirements. During the course of this review, questions and comments were made relative to unclear or potential problem areas in the program. These were transmitted to the licensee in the form of a request for additional information (RAI), which served as the agenda for the working meeting between the licensee, the NRC, and the EG&G reviewers.

Each pump and valve relief request was individually evaluated to determine if the licensee had demonstrated that (1) the Code requirements are impractical for the identified system components, (2) the proposed alternate testing provides an acceptable level of safety and quality, or (3) compliance would result in hardship or unusual difficulties without a compensating increase in the level of safety. Where the licensee's technical basis or alternate testing was insufficient or unclear, the licensee was requested to clarify the relief request. The system P&ID was also examined to determine whether the instrumentation necessary to make the identified measurements is available. If, based on the unavailability of adequate instrumentation or the reviewers experience and system knowledge, it was determined that the measurements identified in the licensee's IST program may not be possible or practical, a clarification was requested from the licensee.

For pumps, it was verified that each of the seven inservice test quantities of Table IWP-3100-1 was indicated to be measured or observed.

For those test quantities that were not being measured or observed quarterly in accordance with the Code, it was verified that a request for relief from the Code requirements had been submitted. If testing was not being performed in accordance with the Code and a relief request had not been submitted, the licensee was requested to explain the inconsistency in the RAI.

The review of the proposed testing of valves verified that all appropriate ASME Code testing for each valve is performed as required. The proposal was evaluated to determine if valves, judged to be active Category A, B, and/or C (other than safety and relief valves), would be exercised quarterly in accordance with IWV-3410 or -3520. If any active safety-related valve is not full-stroke exercised quarterly as required, then the licensee's justification for the deviation, either in the form of a cold shutdown justification or a relief request, was examined to determine its accuracy and adequacy. The proposed alternate testing was also evaluated to determine if all testing was being performed that could reasonably be performed on each valve to bring its testing as close to compliance with the Code requirements as practical.

For valves with remote position indication, the reviewer confirmed that the valve remote position indication is identified to be verified in accordance with IWV-3300. The reviewer verified that the licensee had assigned limiting values of full-stroke times for all power operated valves in the IST program, as required by IWV-3413. For valves having a fail-safe actuator, the reviewer confirmed that the valve's fail-safe actuator is identified to be tested in accordance with IWV-3415.

Each check valve was evaluated to determine if the proposed testing would verify its ability to perform its safety function(s). Extensive system knowledge and experience with other similar facilities is employed to determine whether the proposed tests would full-stroke the check valve disks open or verify their reverse flow closure capability. If there was any doubt about the adequacy of the identified testing, questions were included in the RAI.

Further evaluation was performed on all valves in the program to determine that the identified testing could practically and safely be conducted as described. If the licensee's ability to perform the testing was in doubt, a question was formulated to alert the licensee to the suspected problem.

Safety-related safety valves and relief valves, excluding those that perform only a thermal relief function, were confirmed to be included in the IST program and tested in accordance with IWV-3510. Safety-related explosively actuated valves were verified to be included in the IST program and tested in accordance with IWV-3610.

Once all the components in the licensee's IST program had been identified on the P&IDs and evaluated as described above, the P&IDs were examined closely by at least two trained and experienced reviewers to identify any additional pumps or valves that may perform a safety function which were not included in the licensee's program. The licensee was asked to reconcile any components that were identified by this process which were not included in the IST program. Also, the list of systems included in the licensee's program was compared to a system list in the Draft Regulatory Guide and Value/Impact Statement titled, "Identification of Valves for Inclusion in Inservice Testing Programs". Systems that appear in the Draft Regulatory Guide list but not in the licensee's program were evaluated and, if appropriate, questions were added to the RAI.

Additionally, if the reviewers suspected a specific or a general aspect of the licensee's IST program based on their past experiences, questions were included in the RAI to clarify those areas of doubt. Some questions were included for the purpose of allowing the reviewers to make conclusive statements in this TER.

At the completion of the review, the RAI was transmitted to the licensee. These questions were later used as the agenda for the combined

working meeting with the licensee on July 8 and 9, 1986. At the meeting, each question and comment was discussed in detail and resolved as follows:

a. The licensee agreed to make the necessary IST program corrections or changes to satisfy the concerns of the NRC and their reviewers.

b. The licensee provided additional information or clarification about their IST program that satisfied the concerns of the NRC and their reviewers, and no program change is required.

c. The item remained open for the licensee to investigate further and propose a solution to the NRC.

d. The item remained open for further investigation by the NRC.

e. The item remained open for further investigation and discussion by both the NRC and the licensee.

The licensee responded to the RAI, conference calls, and the working meeting discussions in their revised program resubmittals dated September 30, 1986, August 31, 1987, and January 31, 1989. The program changes were identified and evaluated to determine whether they were acceptable and if not, they contributed to the items that remained open from the meeting.

This TER is based on information contained in the submittals, and on information obtained during the working meeting and conference calls which took place during the review process.

3. PUMP TESTING PROGRAM

The Braidwood Station, Units 1 and 2, IST program submitted by the Commonwealth Edison Company was examined to verify that all pumps that are included are subjected to the periodic tests required by the ASME Code, Section XI, 1983 Edition, except for those pumps identified below for which specific relief from testing has been requested and is summarized in Appendix C. Each Commonwealth Edison Company basis for requesting relief from the pump testing requirements and the reviewers' evaluation of that request is summarized below.

3.1 Diesel Generating System

3.1.1 Relief Request

The licensee has requested relief from the Section XI, Paragraph IWP-3100, requirement to measure differential pressure for the diesel generator fuel oil transfer pumps, 1(2)D001PA, 1(2)D001PB, 1(2)D001PC, and 1(2)D001PD, and proposed to evaluate these pumps using pump discharge pressure.

3.1.1.1 Licensee's Basis for Requesting Relief. These pumps are positive displacement Diesel Oil Transfer Pumps. The pump differential pressure is not a factor affecting pump performance, but rather dependant only on the inlet pressure to the pump. As the pump discharge pressure is constant, and the inlet pressure varies with tank level, the differential pressure is not a valid operational parameter. Using pump discharge pressure in lieu of pump differential pressure will provide meaningful pump performance data for evaluation of operational readiness of the Diesel Oil Transfer Pumps.

Alternative Testing: Pump discharge pressure for positive displacement pumps is a valid operational parameter. This will be used to evaluate the Diesel Oil Transfer Pumps performance.

3.1.1.2 Evaluation. These diesel oil transfer pumps are positive displacement type. Their outlet pressure is dependant on the pressure of the system into which they are pumping and is not affected significantly by either inlet pressure (provided adequate NPSH exists) or flowrate. For these pumps, differential pressure and flowrate are not dependant variables as they are for centrifugal type pumps. Differential pressure is not a meaningful parameter in determining whether hydraulic degradation is occurring. Measurement of discharge pressure in lieu of differential pressure provides adequate information for evaluation of the hydraulic condition of these positive displacement pumps and presents a reasonable alternative to the Code requirements.

Based on the determination that the licensee's proposed alternative is essentially equivalent to the Code requirements, relief should be granted as requested.

3.2 All Systems

3.2.1 Relief Request

The licensee has requested relief from the Section XI, Paragraph IWP-4120, requirement to measure pump vibration in units of displacement and proposed to evaluate all pumps in the IST program utilizing measurements of pump vibration in units of velocity as described below.

3.2.1.1 Licensee's Basis for Requesting Relief. The measurement of pump vibration is required so that developing problems can be detected and repairs initiated prior to a pump becoming inoperable. Measurement of vibration only in displacement quantities does not take into account frequency which is also an important factor in determining the severity of the vibration.

The ASME Code minimum standards require measurement of the vibration amplitude in mils (displacement). Braidwood Station proposes an alternate program of measuring vibration velocity (inches per second) which is more

comprehensive than that required by Section XI. This technique is an industry-accepted method which is much more meaningful and sensitive to small changes that are indicative of developing mechanical problems. These velocity measurements detect not only high amplitude vibration, that indicate a major mechanical problem such as misalignment or unbalance, but also the equally harmful low amplitude, high frequency vibration due to bearing wear that usually goes undetected by simple displacement measurements.

Alternative Testing: The allowable ranges of vibration and their associated action levels will be patterned after the guidelines established in ANSI/ASME OM-6 Draft 8, Table 6100-1 and Figure 6100-1. These ranges will be used to assess equipment operational readiness for all components.

The acceptable performance range will be $\leq$ 2.5 times the reference value, not to exceed .325 inches per second. The alert range, at which time the testing frequency would be doubled, will be > 2.5 to 6 times the reference value, not to exceed .70 inches per second. Any vibrating velocity greater than 6 times the reference value or greater than .70 inches per second will require corrective actions to be performed on the affected component.

Vibration measurements for all pumps will be obtained and recorded in velocity, inches per second, and will be broadband unfiltered peak measurements. The monitored locations for vibration analysis will be marked so as to permit subsequent duplication in both location and plane.

The frequency response range of the vibration transducers and their readout system shall be capable of frequency responses from one-third minimum pump shaft rotational speed to at least one thousand hertz.

The vertical line shaft pumps in the program will have vibration measurements taken on the upper motor bearing housing in three orthogonal directions, one of which is the axial direction.

Measurements of vibration in mils displacement are not sensitive to small changes that are indicative of developing mechanical problems. Therefore, the proposed alternate method of measuring vibration amplitude in inches/second provides added assurance of the continued operation of the pumps.

3.2.1.2 Evaluation. Utilizing vibration velocity measurements rather than vibration displacement measurements has been demonstrated to provide better indication of pump degradation. The ANSI/ASME OMa-1988, Part 6, guidelines for measuring vibration velocity and determining the allowable ranges and action levels are acceptable to NRC as an alternative to the requirements of Section XI (for vibration measurements in units of displacement) provided the licensee complies with all of the Part-6 vibration measurement requirements except those for which specific relief has been requested and granted.

The licensee's proposal differs from that presented in OM-6 and is not described completely, for example; there is no discussion regarding how vibration measurements will be taken on centrifugal pumps. The licensee's proposal is incomplete and differs from the vibration measurement programs previously found acceptable to the NRC. These differences have not been technically justified to show this proposal will provide adequate assurance of pump operational readiness. Therefore, the licensee's proposal may not give adequate assurance of operational readiness nor provide a reasonable alternative to the Code requirements. The pump vibration measurement program provided in ANSI/ASME OMa-1988, Part 6, has been found acceptable by NRC and gives an acceptable level of quality and safety and provides a reasonable alternative to the Code requirements.

Since the licensee's proposed alternate testing method may not provide a reasonable alternative to the Code requirements, relief should be granted provided the licensee performs pump vibration testing utilizing all the applicable criteria in ANSI/ASME OMa-1988, Part 6.

3.2.2 Relief Request

The licensee has requested relief from the Section XI, Paragraph IWP-3100, requirement to measure bearing temperature anually for the following pumps:

OCC01P	Component Cooling Pump
1(2)CC01PA and B	Component Cooling Pumps
1(2)DO01PA, B, C, and D	Diesel Oil Transfer Pumps
1(2)CS01PA and B	Containment Spray Pumps
1(2)RH01PA and B	Residual Heat Removal Pumps
OW001PA and B	Control Room Chilled Water Pumps

3.2.2.1 Licensee's Basis for Requesting Relief. These pumps' bearings are not provided with permanent temperature detectors or thermal wells. Therefore, gathering data on bearing temperature is impractical. The only temperature measurements possible are from the bearing housing. To detect high bearing temperature at the bearing housing would require that the bearings in question be seriously degraded. Measurement of housing temperature on these pumps does not provide information on bearing condition or degradation. For example, the bearings on the diesel oil transfer pumps (1DO01PA through D and 2DO01PA through D) are cooled by the fluid pumped. Therefore, any heat generated by degraded bearings is carried away by the cooling fluid and would not be directly measured at the bearing housing.

No direct alternate test is proposed for bearing temperatures. However, measurement of hydraulic parameters and vibration readings do provide a more positive method of monitoring pump condition and bearing degradation. By measuring pump hydraulic parameters and vibration velocity, (as described in PR-1), pump operability and the trending of mechanical degradation is assured. Also, since these parameters (i.e., hydraulic parameters and vibration) are measured quarterly, the pump mechanical condition will be more accurately determined than would be possible by measuring bearing temperature on a yearly basis.

3.2.2.2 Evaluation. It is impractical to take annual bearing temperature measurements for these pumps. There are no installed temperature detectors and measurement of bearing housing temperature is subject to a variety of environmental factors which challenge the predictability of the measurement. Temperature measurements taken from the pump bearing housing may be more indicative of the ambient temperature of the pump's environment than of the bearing's condition and not provide a significant contribution to determination of pump operability. Also, the Code specifically exempts temperature measurement for pump bearings in the main flow path (i.e., the service water and diesel fuel oil transfer pumps), therefore, annual temperature measurements for these pumps is not necessary.

Additionally, the licensee has elected to use measurement of vibration in units of velocity rather than displacement amplitude. Vibration measurements in units of velocity are more sensitive to small changes in pump performance which can be indicative of developing mechanical problems. Utilizing the more predictive measurement of vibration velocity amplitude quarterly and deleting annual bearing temperature measurements will not adversely affect the determination of pump operational readiness and provides a reasonable alternative to the Code requirements. The licensee's proposed alternative provides adequate assurance of operational readiness and a reasonable alternative to the Code requirments.

Based on the determination the Code requirements are impracticable the licensee's proposed alternative testing provides a reasonable alternative to the Code requirements and considereing the burden on the licensee if the Code requirements were imposed, relief should be granted as requested.

3.2.3 Relief Request

The licensee has requested relief from the instrument full-scale range requirement of Section XI, Paragraph IWP-4120, and proposed to utilize ultrasonic flowmeters whose accuracy is consistent independent of range (and

which may exceed the range requirements specified in the Code) for the following pumps:

Pump Identification	Function
0CC01P	Component Cooling Pump
1(2)CC01PA and B	Component Cooling Pumps
1(2)D001PA, B, C, and D	Diesel Oil Transfer Pumps
1(2)SX01PA and B	Essential Service Water Pumps

3.2.3.1 Licensee's Basis for Requesting Relief. The full scale range of ultrasonic flowmeters, used to collect Section XI flow data, exceed three times the reference value.

Ultrasonic flowmeters provide an accurate means of measuring flowrate. They utilize a digital display whose accuracy is independent of the full-scale range. The ultrasonic flowmeter is well within the requirements of IWP-4110 and 4120, which refer to an instrument accuracy of ± 2% of full-scale for an instrument with a range of one and one-half to three times the reference value. The following examples will illustrate this point. The component cooling pumps (0CC01P, 1CC01PA, and 1CC01PB) have a reference value of approximately 4500 gpm. Using the Code requirements, an instrument with a full-scale range of 13,500 gpm (3 x 4500 gpm), the acceptable instrument accuracy is ± 270 gpm (.02 x 13,500 gpm). Using the ultrasonic flowmeter, with an accuracy of ± 3% of the indicated reading, provides an instrument accuracy of ± 135 gpm (.03 x 4500 gpm).

The diesel oil transfer pumps (1D001PA-D) have a reference value of approximately 25 gpm. Using the Code requirements, an instrument with a full-scale of 75 gpm (3 x 25 gpm) the acceptable instrument accuracy is ± 1.5 gpm (.02 x 75 gpm). Using the ultrasonic flowmeter with an accuracy of ± 3% of indicated reading will provide an instrument accuracy of ± 0.75 gpm (.03 x 25 gpm).

Use of an ultrasonic flowmeter, with totalizer and integrator feature, instead of other instruments allowed by IWP-4110 and 4120, will provide more precise and accurate flow measurements.

Alternative Testing: Ultrasonic flowmeters, with digital readouts and totalizer features will be utilized to obtain Section XI flow data.

3.2.3.2 Evaluation. The Code requires an instrument accuracy of ± 2% of full-scale range for the instrument used to measure flowrate and that its full-scale range be three times the reference value or less. The licensee has proposed to utilize ultrasonic flowmeters with an accuracy of ± 3% of the indicated reading, independent of full-scale range (which may exceed three times the reference value), which can provide measurements within the "Acceptable Instrument Accuracy" requirements allowed by Table IWP-4110-1. Therefore, the licensee's proposed alternative is essentially equivalent to the Code requirements and should provide reasonable assurance of component operational readiness and a reasonable alternative to the Code requirements. It would be burdensome to require the licensee to install new flow rate instrumentation and it may not provide better indication accuracy or a commensurate increase in safety.

A wide variation in flow rates may be encountered during pump testing and it can be advantageous to have a flow meter with accuracy independent of range, as well as an expanded range. Installation of flow rate instrumentation that meets the Code requirements (full-scale equals three times the reference value) may not be as accurate as the instrumentation the licensee has proposed to utilize. For instance the Code would allow use of a meter with a full-scale range of 300 gpm, which is accurate to ± 6 gpm, for a pump with a reference flow rate equal to 100 gpm. A reading on the ultrasonic flowmeter would indicate 100 gpm with an accuracy of ± 3 gpm. Therefore, the licensee's proposal to utilize flowrate instrumentation with an accuracy, independent of range, of ± 3% is essentially equivalent to the Code requirements and should give adequate assurance of operational readiness and provide a reasonable alternative to the Code requirements.

Based on the determination the licensee's proposed alternative provides a reasonable alternative to the Code requirements and considering the burden on the licensee if the Code requirements were imposed, relief should be granted as requested.

4. VALVE TESTING PROGRAM

The Braidwood Station, Units 1 and 2, IST program submitted by the Commonwealth Edison Company was examined to verify that all valves that are included in the program are subjected to the periodic tests required by the ASME Code, Section XI, 1983 Edition, and the NRC positions and guidelines. The reviewers found that, except as noted in Appendix C or where specific relief from testing has been requested, these valves are tested to the Code requirements and the NRC positions and guidelines. Each Commonwealth Edison Company basis for requesting relief from the valve testing requirements and the reviewer's evaluation of that request is summarized below and grouped according to the system and valve Category.

4.1 Containment Spray System

4.1.1 Category A/C Valves

4.1.1.1 Relief Request. The licensee has requested relief from exercising the containment spray (CS) ring header check valves, 1(2)CS008A and B, in accordance with the requirements of Section XI, Paragraph IWV-3521, and proposed to verify valve operability utilizing either full-flow or by disassembly and inspection each refueling outage.

4.1.1.1.1 Licensee's Basis for Requesting Relief--The full flow testing of these check valves during periods of cold shutdown, using the CS pumps, would fill the Reactor Refueling cavity with contaminated water from the Refueling Water Storage Tank. The filling of this cavity, via temporarily installed large bore piping connected at spool piece hookups, would by necessity require the removal of the reactor vessel head so as to preclude equipment damage from borated water.

Currently, full flow recirculation flow paths do not exist from the discharge at the CS pumps through the afore noted check valves to the Refueling Water Storage Tank. The addition of such flow paths would require extensive plant modifications to existing plant designs, to and include penetrating unit containment integrity.

These valves cannot be full flow tested during unit operation as water from the CS pumps would be discharged through the CS ring headers causing undesirable effects on system components inside containment.

Partial stroking of the 1/2CS008A, B valves using air does not provide an adequate assurance of valve operability and may be detrimental for the following reasons:

a). There is no correlation between air flow and angle of disc movement.

b). Venting and draining the appropriate piping quarterly may cause deposition of boric acid residue which could in turn promote binding of the check valve internals.

Alternate Testing The 1(2)CS008A and B valves will be either full-flow tested, or dismantled to demonstrate operability each refueling outage. This alternative will adequately maintain the system in a state of operational readiness, while not sacrificing the safety of the plant, by testing the valves as often as safely possible.

4.1.1.1.2 Evaluation--Check valves 1(2)CS008A and B are containment isolation valves in the supply lines to the containment spray headers. It is impractical to full-stroke exercise these check valves quarterly during power operation or during cold shutdowns without making significant system modifications, including reconfiguring 10" diameter piping sections utilizing spoolpieces, since flow through these valves would spray into the containment and could damage equipment. Provisions exist to verify the full-stroke capability of these valves with flow utilizing piping spoolpiece hookups and the containment spray pumps during cold shutdowns. However, this is a very complicated and time consuming procedure and would result in flooding the reactor refueling cavity, which would be burdensome to the licensee and is impractical to perform each cold shutdown.

The licensee has proposed to full-stroke exercise valves 1(2)CS008A and B open by either disassembly and inspection or full flow test each

refueling outage. The Minutes of the Public Meetings on Generic Letter 89-04 state that disassembly and inspection should be used only when full flow testing is impractical. Whereas it presents difficulties to full-stroke exercise these valves with flow each refueling outage, this is obviously not impractical. These valves are located inside containment in a section of dry pipe and are not exposed to many of the mechanisms that typically cause check valve degradation such as those associated with unstable flow, improper water chemistry, etc. These and other considerations may suitably justify an extension of the test frequency for the full flow test from each refueling outage to some longer interval.

Based on the determination that it is impractical to test these valves in accordance with the Code frequency requirements, and considering the licensee's proposed alternative, and the burden on the licensee if the Code requirements were imposed, relief should be granted provided the licensee full-stroke exercises these valves with flow each refueling outage in accordance with GL 89-04, Attachment 1, Position 1.

4.1.2 Category C Valves

4.1.2.1 Relief Request. The licensee has requested relief from exercising the containment spray (CS) NaOH additive check valves, 1(2)CS020A and B, in accordance with the requirements of Section XI, Paragraph IWV-3521, and proposed to verify valve operability utilizing either full-flow or by disassembly and inspection each refueling outage.

4.1.2.1.1 Licensee's Basis for Requesting Relief--These check valves in the spray additive system cannot be stroked without introducing NaOH into the CS system.

Alternate Testing These valves will be dismantled each refueling outage in order to demonstrate operability. In addition to this, they will be full flow tested once every five years, per Braidwood Technical Specifications. The full flow test may be performed in lieu of dismantling

the valves, if desired. This alternative will adequately maintain the system in a state of operational readiness, while not sacrificing the safety of the plant, by testing the valves as often as is safely possible.

4.1.2.1.2 Evaluation--It is impractical to either full- or part-stroke exercise valves 1(2)CS020A and B quarterly during power operation or cold shutdown since flow through these valves would result in the introduction of NaOH into the CS system. NaOH is a highly caustic, extremely corrosive chemical, which poses a serious threat to personnel and equipment. Full-flow exercising of these valves can be performed by special test, however, this requires special test hook-ups and necessitates flushing the system. This presents a safety hazard to operating personnel and would be burdensome for the licensee to perform during cold shutdowns.

The licensee has proposed to full-stroke exercise these valves each refueling outage by either disassembly and inspection of check valve internals or by system full-flow testing. However, the Minutes of the Public Meetings on Generic Letter 89-04 state that disassembly and inspection should be used only when full flow testing is impractical. Whereas it presents difficulties to full-stroke exercise these valves with flow each refueling outage, this is obviously not impractical. Full-stroke exercising these valves open each refueling outage with flow should give reasonable assurance of operational readiness and provides a reasonable alternative to the Code frequency requirements.

Based on the determination that it is impractical to test these valves in accordance with the Code frequency requirements, and considering the licensee's proposed alternative, and the burden on the licensee if the Code requirements were imposed, relief should be granted provided the licensee full-stroke exercises these valves with flow each refueling outage in accordance with GL 89-04, Attachment 1, Position 1.

4.1.2.2 Relief Request. The licensee has requested relief from exercising the containment spray (CS) pump discharge check valves, 1(2)CS003A and B, in accordance with the requirements of Section XI,

IWV-3521, and proposed to verify valve operability by part-stroke exercising these valves quarterly and by disassembly and inspection or full-flow testing each refueling outage.

4.1.2.2.1 Licensee's Basis for Requesting Relief--The full flow testing of these check valves during periods of cold shutdown, using the CS pumps, would fill the Reactor Refueling cavity with contaminated water from the Refueling Water Storage Tank. The filling of this cavity, via temporarily installed large bore piping connected at spool piece hookups, would by necessity require the removal of the reactor vessel head so as to preclude equipment damage from borated water.

Currently, full flow recirculation flow paths do not exist from the discharge at the CS pumps through the afore noted check valves to the Refueling Water Storage Tank. The addition of such flow paths would require extensive plant modifications to existing plant designs, to and include penetrating unit containment integrity.

These valves cannot be full flow tested during unit operation as water from the CS pumps would be discharged through the CS ring headers causing undesirable effects on system components inside containment.

Alternate Testing: Valves 1(2)CS003A and B will be partial stroke tested during the quarterly pump surveillance and full flow tested, or dismantled, to demonstrate operability, each refueling outage. This alternative will adequately maintain the system in a state of operational readiness, while not sacrificing the safety of the plant, by testing these valves as often as safely possible.

4.1.2.2.2 Evaluation--Valves 1(2)CS003A and B are containment spray pump discharge checks in the supply lines to the containment spray headers. It is impractical to full-stroke exercise these check valves with flow quarterly during operation or during cold shutdowns because full-flow through these valves would result in spraying into the containment vessel and could cause equipment damage. Provisions exist to verify the

full-stroke capability of these valves with flow utilizing piping spoolpiece hook-ups and the containment spray pumps, however, this would be very time consuming and result in flooding the reactor refueling cavity, which would likely result in a delay in the return to power operation and be burdensome to the licensee. A test line is used during quarterly pump testing and allows a significant part-stroke exercise of these valves with flow.

The licensee has proposed to perform a part-stroke exercise of these check valves quarterly during pump surveillance testing, utilizing the recirculation flow path, and further, to perform a full flow test or valve disassembly and inspection each refueling outage. However, disassembly and inspection should be used only when full flow testing is impractical. If the valve disk is contacting the back stop (full-stroking) during the quarterly exercise, even temporarily, and this can be confirmed using non-intrusive diagnostic techniques (e.g., ultrasonics, acoustics) this might be employed to verify full-stroke exercising. Full-stroke exercising these valves open at least each refueling outage with flow gives reasonable assurance of operational readiness and provides a reasonable alternative to the Code frequency requirements.

Based on the determination that it is impractical to test these valves in accordance with the Code frequency requirements, and considering the licensee's proposed alternative, and the burden on the licensee if the Code requirements were imposed, relief should be granted provided the licensee full-stroke exercises these valves with flow each refueling outage or demonstrates that quarterly exercising verifies the full-stroke capability of these valves using positive non-intrusive diagnostic techniques.

4.2 Safety Injection System

4.2.1 Category A/C Valves

4.2.1.1 Relief Request. The licensee has requested relief from exercising the accumulator discharge check valves, 1(2)SI8948A-D and 1(2)SI8956A-D, in accordance with the requirements of Section XI, Paragraph

IWV-3521, and proposed to full-stroke exercise these valves at least each refueling outage by discharging into the reactor vessel and during cold shutdowns, if not performed during the last nine months, by providing a surge volume in the pressurizer, 'burping the valves', and noting a change in pressurizer level.

4.2.1.1.1 Licensee's Basis for Requesting Relief--The accumulator check valves cannot be tested during unit operation due to the pressure differential between the accumulators (650 psig) and the reactor coolant system (2235 psig). Full-stroke exercising of these valves could occur only with a rapid depressurization of the reactor coolant system.

Alternate Testing: Braidwood Station Technical Specifications require leak testing to be performed on these valves if the unit is in cold shutdown and if such leak rate testing has not been performed within nine months. Therefore, Braidwood Station will full stroke exercise (Ct) these valves on the same schedule. This will be accomplished by providing a surge volume in the pressurizer and "burping" the accumulator discharge valves. As a minimum, the accumulators will be discharged into the reactor vessel during refueling outages to perform full stroke exercise (Ct) of these valves. Positive verification of valve operability will be by noting a change in accumulator level.

Stroke exercising the check valves on the same schedule as their required Technical Specification leak rate testing will adequately maintain the system in a state of operational readiness without causing unnecessary personnel radiation exposure.

4.2.1.1.2 Evaluation--It is impractical to full- or part-stroke exercise the accumulator discharge check valves 1(2)SI8948A-D and 1(2)SI8956A-D quarterly during power operation since the reactor coolant system (RCS) pressure is much higher than accumulator pressure and flow through these valves cannot be established. Valves 1(2)SI8948A-D can be at least part-stroke exercised during cold shutdown by "burping" the accumulator discharge isolation valves into a surge volume in the RCS pressurizer. However, some positive method must be used to verify flow rate through these valves, such as timing the rate of accumulator level decrease.

The reviewer believes that a full-stroke exercise of these valves can be achieved during refueling outages by rapidly discharging the accumulators into the depressurized RCS with an adequate surge volume available (i.e., with the reactor vessel head removed); flow rate can be calculated by timing the decrease in accumulator level. NRC Information Notice No. 89-67: Loss of Residual Heat Removal Caused by Accumulator Nitrogen, addresses potential problems that could result from full-stroke exercising these valves with accumulator discharge flow. This notice should be reviewed for its applicability to Braidwood Station.

The NRC staff positions on exercising of check valves are provided in Attachment 1 of NRC GL 89-04. This is an extremely high flow rate for these accumulator discharge check valves (>10,000 gpm) and the reviewer believes this would be difficult to achieve (especially during cold shutdowns). However, if the licensee is able to demonstrate that this flow is passed through these valves then this would constitute a full-stroke. Alternatively, the licensee may be able to demonstrate a full-stroke exercise of these valves, at a lower flow rate, by the use of non-intrusive diagnostic techniques. The licensee's proposal, to full-stroke exercise these valves during cold shutdowns, if not performed within the last nine months, and during refueling outages, provided this testing verifies the actual full-stroke capability of these valves in accordance with the NRC staff's position described above would provide adequate assurance of operational readiness and a reasonable alternative to the Code requirements.

Based on the impracticality of complying with the Code requirements, and considering the licensee's proposed testing frequency, relief should be granted from the Code frequency requirements provided the licensee full-stroke exercises these valves in accordance with the NRC staff positions on exercising check valves in Attachment 1, of Generic Letter No. 89-04.

4.2.1.2 Relief Request. The licensee has requested relief from exercising the following valves in accordance with the frequency requirements of Section XI, Paragraphs IWV-3411 and 3521, and proposed to

full-stroke exercise these valves with flow during refueling outages with the reactor vessel head removed.

Valve Identification	Function
1(2)SI8819A-D	Cold leg safety injection check valves.
1(2)SI8905A-D	Hot leg safety injection check valves.
1(2)SI8949A-D	Hot leg safety injection check valves.

4.2.1.2.1 Licensee's Basis for Requesting Relief--Braidwood Station Technical Specifications require all Safety Injection pumps and all but one Charging Pump to be inoperable during Modes 4, 5, and 6, except when the reactor vessel head is removed. This requirement minimizes the possibility of low temperature overpressurization of the Reactor Coolant System. Therefore, check valves 1(2)SI8819A-D, 1(2)SI8905A-D, and 1(2)SI8949A-D, cannot be full stroke exercised during routine Mode 5 cold shutdowns as required by IWV-3412 and IWV 3522.

In addition to the stroke test exercise used to verify operational readiness of these check valves, the act of such stroking causes the necessity for Technical Specification required leak rate testing of these valves prior to unit criticality. This testing, in conjunction with the stroke exercising of these check valves, adds approximately one week to the duration of any outage and additional radiation exposure to workers who must connect flowmeters and differential pressure gauges directly to pipes containing radioactive fluids.

Alternate Testing: Braidwood Station's Technical Specifications require leak rate testing to be performed on these valves if the unit is in cold shutdown and if such leak rate testing has not been performed within nine months. Stroke exercising of check valves 1(2)SI8819A-D, 1(2)SI8905A-D, and 1(2)SI8949A-D, can only be performed in mode 6 with the reactor vessel head removed. Full stroke exercising of these check valves will be performed as plant conditions allow, but at a minimum frequency of once each refueling outage. Valves 1(2)SI8819A-D, 1(2)SI8905A-D, and 1(2)SI8949A-D can not be stroked during cold shutdown without exceeding Technical Specification limiting condition for operation (LCO 3/4.5.3) since

stroking these valves requires starting an SI pump. Stroke exercising check valves 1(2)SI8819A-D, 1(2)SI8905A-D, and 1(2)SI8949A-D, at least once per reactor refueling will insure compliance with Braidwood Station Technical Specifications and minimize the possibility of low temperature overpressurization of the reactor Coolant System.

4.2.1.2.2 Evaluation--Valves 1(2)SI8819A-D, 1(2)SI8905A-D, and 1(2)SI8949A-D, cannot be full-stroke exercised with flow quarterly because the shutoff head of the SI pumps is below RCS operating pressure and flow cannot be established. It is impractical to demonstrate the full-stroke capability of these valves during cold shutdowns, utilizing flow, since this could pose the risk of low temperature overpressurization of the reactor coolant system. These valves receive their flow from high pressure sources and should be full-stroke exercised utilizing flow only when a sufficient surge volume is available (i.e., when the reactor vessel head is removed). Cooldown and depressurization of the reactor coolant system and removal of the reactor vessel head solely to facilitate full-stroke exercising these valves at cold shutdown (due to low temperature overpressurization concerns) would be extremely time consuming, difficult, and burdensome to the licensee. The licensee's proposal to full-stroke exercise these valves during refueling outages with the reactor vessel head removed should give reasonable assurance of operational readiness and presents a reasonable alternative to the Code requirements.

Based on the impracticability of complying with the Code test frequency requirements, the licensee's proposed testing frequency, and considering the burden on the licensee if the Code requirements were imposed, relief should be granted as requested.

4.2.1.3 Relief Request. The licensee has requested relief from exercising the following valves in accordance with the requirements of Section XI, Paragraph IWV-3522, and proposed to full-stroke exercise these valves during cold shutdowns if greater than nine months have passed since the last test.

Valve Identification	Function
1(2)CV8481A and B	Centrifugal pump discharge check valves
1(2)CV8546	Centrifugal charging pumps' suction check valve from the refueling water storage tank
1(2)SI8815	Charging pump discharge to cold leg check valve
1(2)SI8841A and B	Hot leg safety injection check valves
1(2)SI8900A-D	Charging safety injection check valves

4.2.1.3.1 Licensee's Basis for Requesting Relief--The full-stroke exercising of check valves not stroked quarterly is required to be performed during cold shutdowns. However, the stroking of check valves 1(2)SI8815, 1(2)SI8900A-D, and 1(2)SI8841A-B, associated with the emergency core cooling system, during cold shutdowns, will induce thermal stresses on their respective reactor vessel nozzles as the reactor coolant system (maintained approximately 180 F) is injected with water from the refueling water storage tank (maintained approximately 65 F). This also applies to the stroking of check valves 1(2)CV8546 and 1(2)CV8481A and B because the full stroke of these check valves causes stroking of the 1(2)SI8815 and 1(2)SI8900A-D located in the full flow path.

In addition to the stroke test exercise used to verify operational readiness of these check valves, the act of such stroking causes the necessity for Technical Specification required leak rate testing of these valves prior to unit criticality. This testing, in conjunction with the stroke exercising of these check valves, adds approximately one week to the duration of any outage and additional radiation exposure to workers who must connect flowmeters and differential pressure gauges directly to pipes containing radioactive fluids.

Stroke exercising the 1(2)SI8815, 1(2)SI8900A-D, and 1(2)SI8841A and B check valves on the same schedule as their required Technical Specification leak rate testing, as plant conditions allow, will adequately maintain the system in a state of operational readiness without creating additional undue hardship.

Alternate Testing: Braidwood Station's Technical Specifications require leak rate testing to be performed on these valves if the unit is in

cold shutdown and if such leak rate testing has not been performed within nine months. Therefore, Braidwood Station will stroke exercise check valves 1(2)SI8815, 1(2)SI8900A-D, and 1(2)SI8841A and B on the same schedule. To prevent unnecessary stroking of check valves 1(2)SI8815 and 1(2)SI8900A-D, check valves 1(2)CV8546 and 1(2)CV8481A and B will be stroke exercised on the same schedule as check valves 1(2)SI8815, 1(2)SI8900A-D, and 1(2)SI8841A and B.

4.2.1.3.2 Evaluation--Valves 1(2)SI8815, 1(2)SI8841A and B, and 1(2)SI8900A-D, are reactor coolant system pressure boundary isolation valves in the ECCS injection system lines. Valve 1(2)CV8546 is the combined suction check valve for the centrifugal charging pumps from the refueling water storage tank. Valves 1(2)CV8481A and B are discharge check valves for the centrifugal charging pumps and receive a part-stroke exercise quarterly during operation. The act of opening valves 1(2)SI8815, 1(2)SI8841A and B, and 1(2)SI8900A-D invokes a leak rate test per Braidwood Station Technical Specifications. It is impractical to full-stroke exercise charging system check valves 1(2)CV8546 and 1(2)CV8481A and B each cold shutdown since this would result in opening valves 1(2)SI8815 and 1(2)SI8900A-D, which are located in the full-flow path and would require a leak test prior to returning the plant to power. It is impractical to full- or part-stroke exercise these valves, with the exception of valves 1(2)CV8481A and B which receive part-stroke exercising, quarterly during power operations as this would result in charging cold water through the reactor vessel injection nozzles causing thermal stresses in addition to possible reactivity addition and resultant power fluctuations.

Full-stroke exercising all these valves during each cold shutdown would be burdensome since it would require the leak testing of valves 1(2)SI8815 and 1(2)SI8900A-D at each cold shutdown and result in additional radiation exposure to workers connecting and disconnecting the leak testing equipment.

The licensee has proposed to part-stroke exercise valves 1(2)CV8481A and B quarterly, in the valve tables section of their IST program. The licensee has also proposed to full-stroke exercise these valves at the same frequency as valves 1(2)SI8815 and 1(2)SI8900A-D are leak tested, per plant Technical Specifications, and at each refueling outage. This testing and frequency should provide reasonable assurance of operational

readiness and provides a reasonable alternative to the Code requirements.

Based on the impracticability of complying with the Code frequency requirements and considering the burden on the licensee if the Code requirements are imposed and the licensee's proposed alternative test frequency, relief should be granted from the Code requirements as requested.

4.2.2 Category B Valves

4.2.2.1 Relief Request. The licensee has requested relief from exercising the containment sump outlet isolation valves, 1(2)SI8811A and B, in accordance with the requirements of Section XI, Paragraph IWV-3412, and proposed to full-stroke exercise these valves each refueling outage.

4.2.2.1.1 Licensee's Basis for Requesting Relief--The full-stroke exercising of valves not stroked quarterly is required to be performed during cold shutdowns. However, the stroking of the Containment Sump Outlet Isolation Valves, 1(2)SI8811A and B, requires the suction of the Residual Heat Removal pumps to be drained, thus rendering one train of the system inoperable.

For Cold Shutdown operations with the Reactor Coolant Loops filled and one train of Residual Heat Removal declared inoperable, Braidwood Station's Technical Specifications require two steam generators with secondary side narrow range water level greater than 41% (Unit 1) and greater than 18% (Unit 2). However, if the cold shutdown condition was necessitated by a problem requiring draining of the secondary side of the Steam Generators (i.e. tube leaks), Braidwood Station's Technical Specification 3.4.1.4.1 would preclude such testing of the containment sump outlet isolation valves until such time as the affected steam generators had been refilled.

For Cold Shutdown operations with the Reactor Coolant Loops not filled (i.e. drained down to support Reactor Vessel Incore Seal Table, Loop Stop Valve, Reactor Coolant Pump and Seal Maintenance or primary leakage),

Braidwood Station's Technical Specification 3.4.1.4.2 would preclude the testing of the Containment Sump Outlet Isolation Valves as it mandates that "two residual heat removal (RHR) loops shall be operable and at least one RHR loop shall be in operation.

The full-stroke testing of the 1(2)SI8811A and B valves; in conjunction with system draining, refilling and venting of each train, accounts for an additional six days (3 days per train) of scheduling requirements and increased radiation dose to operators and radiological control personnel. Processing of thousands of gallons of contaminated water and subsequent required liquid effluent discharges would also result from the draining, refilling and venting of the RHR system. This time duration required to perform the surveillance testing of the Containment Sump Outlet Isolation Valves during Cold Shutdown activities, could, as a result, cause a violation of the action requirements for Braidwood Station's Technical Specifications 3.4.1.4.1 and 3.4.1.4.2. The violations would occur since these action statements require (as noted in their respective foot note sections) the return of the inoperable residual heat removal loop to service within 2 hours, if such loop was removed for surveillance testing provided the other RHR Loop is operable and in operation.

In addition, NRC Generic Letter 88-17, Loss of Decay Heat Removal, highlights the consequences of a loss of RH during reduced Reactor Coolant System inventory (below three feet below the reactor vessel flange). If the operating RH pump is lost due to air entrainment, and the other train is inoperable for the stroke test, then the "operable" train must be vented to restore decay heat removal. Under worst conditions, boiling in the core would occur in approximately 10 minutes, the core would be uncovered in approximately 30 minutes, and fuel damage would occur in approximately 1 hour.

Given the apparent disparity between the Technical Specification time requirements for an inoperable RHR Loop return to service (2 hours) and the time required to perform surveillance stroke testing of the Containment Sump Outlet Isolation valves (3 days) during Cold Shutdown, the proposed

alternate testing frequency of refueling outage periodicity will adequately maintain the system in a state of operational readiness, while not imposing undue hardships or sacrificing the safety of the plant.

Alternate Testing: Braidwood Station will full stroke exercise the Containment Sump Outlet Isolation Valves, 1(2)SI8811A and B, during refueling outages vice cold shutdown.

4.2.2.1.2 Evaluation--Valves 1(2)SI8811A and B are 24" motor operated valves in the common suction line to the RHR and containment spray pumps, which is also supplied by the refueling water storage tank (RWST). Opening these valves would result in the diversion of RWST water into the containment sump, therefore, exercising these valves requires isolating the RWST and draining the common suction line to prevent flooding the containment sump. Performing this testing at cold shutdowns would be burdensome to the licensee since this renders the RHR system inoperable, is time consuming, and creates large amounts of liquid radioactive waste, which must be processed. Additionally since this testing is quite time consuming it may result in delay in the return to power, which would be burdensome to the licensee. For these reasons, it is impractical to exercise these valves quarterly during power operation or cold shutdowns. Exercising and stroke timing these valves during each refueling outage should give adequate assurance of operational readiness and provide a reasonable alternative to the Code requirements.

Based on the determination the Code requirements are impractical and since the licensee's proposed testing frequency provides a reasonable alternative to the Code requirements and considering the burden on the licensee if the Code requirements were imposed, relief should be granted as requested.

4.2.3 Category C Valves

4.2.3.1 Relief Request. The licensee has requested relief from exercising the safety injection pump discharge check valves, 1(2)SI8922A and B, in accordance with the requirements of Section XI,

Paragraph IWV-3521, and proposed to full-stroke exercise these valves with flow during refueling outages.

4.2.3.1.1 Licensee's Basis for Requesting Relief--These check valves cannot be full flow (full-stroke) tested during operation as the shutoff head of the Safety Injection pump is lower than the reactor coolant system (RCS) pressure. Performance of this test with the RCS depressurized, but intact, could lead to inadvertent overpressurization of the system. The alternate method of protecting against overpressurization by partially draining the RCS to provide a surge volume is not considered a safe practice due to concerns of maintaining adequate water level above the reactor core.

Alternate Testing These valves will be full-stroke tested during refueling outages. This alternative will adequately maintain the system in a state of operational readiness, while not acrificing the safety of the plant, by testing the valves as often as safely possible.

4.2.3.1.2 Evaluation--It is impractical to full- or part-stroke exercise valves 1(2)SI8922A and B during power operation since RCS pressure is above the shutoff head of these pumps and flow cannot be established through them. A full- or part-stroke exercise of these valves during cold shutdown would risk low temperature overpressurization of the RCS and is, therefore, not practical. Cooldown and depressurization of the reactor coolant system and removal of the reactor vessel head solely to facilitate full-stroke exercising these valves at cold shutdown (due to low temperature overpressurization concerns) would be time consuming, difficult, and extremely burdensome to the licensee. Full-stroke exercising these valves utilizing system flow during refueling outages when an adequate surge volume exists (i.e., when the reactor vessel head is removed) gives reasonable assurance of operational readiness and provides a reasonable alternative to the Code requirements.

Based on the impracticability of complying with the Code requirements, the burden on the licensee if the Code requirements were imposed, and considering the proposed testing frequency, relief should be granted as requested.

4.2.3.2 Relief Request. The licensee has requested relief from exercising the safety injection pump suction check valves, 1(2)SI8926, in accordance with the requirements of Section XI, Paragraph IWV-3521, and proposed to part-stroke exercise these valves quarterly and to full-stroke exercise these valves during refueling outages.

4.2.3.2.1 Licensee's Basis for Requesting Relief--Full-stroke exercising of the Safety Injection (SI) pump suction check valves cannot be demonstrated during unit operation as the reactor coolant system pressure prevents the pumps from reaching full flow injection conditions. Performance of this test with the reactor coolant system depressurized, but intact could lead to an inadvertent overpressurization of the system. The alternate method of protecting against overpressurization by partial draining of the reactor coolant system (RCS) to provide a surge volume is not considered a safe practice due to concerns of maintaining adequate water level above the reactor core.

Alternative Testing: The 1(2)SI8926 valves will be partial-stroke tested during periodic inservice tests with the SI pumps in the recirculation mode. Full-stroke exercising for these valves will be done during refueling outages as a minimum, but no more frequently than once per quarter. This alternative will adequately maintain the system in a state of operational readiness, while not sacrificing the safety of the plant, by testing the valves as often as safely possible.

4.2.3.2.2 Evaluation--These valves can be part-stroke exercised with flow quarterly utilizing the recirculation flow path during safety injection pump testing. It is impractical to full-stroke exercise valves 1(2)SI8926 during power operation since RCS pressure is above the shutoff head of the SI pumps and the recirculation line will not pass the flow required to full-stroke exercise these valves. Full-stroke exercising these valves is also impractical during cold shutdown because passing the necessary flow would require a large surge volume, and could cause low temperature overpressurization of the RCS. Cooldown and depressurization of the reactor coolant system and removal of the reactor vessel head solely to

facilitate full-stroke exercising these valves at cold shutdown (due to low temperature overpressurization concerns) would be time consuming, difficult, and extremely burdensome to the licensee. Part-stroke exercising these valves quarterly and full-stroke exercising these valves during refueling outages, when an adequate surge volume exists for the RCS (i.e., when the reactor vessel head is removed) gives adequate assurance of operational readiness and provides a reasonable alternative to the Code requirements.

Based on the impracticability of complying with the Code requirements, the burden on the licensee if the Code requirements were imposed, and considering the proposed testing and frequency, relief should be granted as requested.

4.3 Component Cooling System

4.3.1 Category A Valves

4.3.1.1 Relief Request. The licensee has requested relief from exercising the following valves in accordance with the requirements of Section XI, Paragraph IWV-3411, and proposed to full-stroke exercise these valves during refueling outages and during cold shutdowns when the reactor coolant pumps are not in operation.

Valve Identification	Function
1(2)CC685	Component cooling supply to reactor coolant pumps
1(2)CC9413A	Component cooling return from reactor coolant pumps
1(2)CC9414	Component cooling supply to reactor coolant pumps
1(2)CC9416	Component cooling supply to reactor coolant pumps
1(2)CC9438	Component cooling supply to reactor coolant pumps

4.3.1.1.1 Licensee's Basis for Requesting Relief--Component cooling water flow to the reactor coolant pumps is required at all times while the pumps are in operation and for an extended period of time while in cold shutdown. Failure of one of these valves in a closed position during an exercise test would result in a loss of cooling flow to the pumps and eventual pump damage and/or trip.

Alternate Testing: These valves will be exercised during cold shutdown, provided all of the reactor coolant pumps are not in operation. This testing period will be each refueling outage as a minimum, but no more frequently than once per quarter. This alternative will adequately maintain the system in a state of operational readiness, while not sacrificing the safety of the plant, by testing the valves as often as safely possible.

4.3.1.1.2 Evaluation--These valves provide cooling water flow to the reactor coolant pumps. It is impractical to exercise these valves quarterly during operations, or during cold shutdowns when the reactor coolant pumps are in operation, since failure of one of these valves in the closed position could result in pump damage. The licensee's proposal, to exercise these valves during cold shutdowns when all the reactor coolant pumps are stopped and during refueling outages, gives reasonable assurance of operational readiness and provides a reasonable alternative to the Code requirements.

Based on the determination that the Code requirements are impractical, the burden on the licensee if the Code requirements are imposed, and the licensee's proposed alternate testing frequency, relief should be granted as requested.

4.3.2 Category A/C Valves

4.3.2.1 Relief Request. The licensee has requested relief from exercising valves 1(2)CC9486, component cooling return from reactor coolant pump checks, closed in accordance with the requirements of Section XI, Paragraph IWV-3521, and proposed to full-stroke exercise these valves closed during refueling outages during seat leakage testing per IWV-3420.

4.3.2.1.1 Licensee's Basis for Requesting Relief--Component cooling water flow to the reactor coolant pumps is required at all times while the pumps are in operation and for an extended period of time while in cold shutdown. Failure of one of these valves in a closed position during an exercise test would result in a loss of cooling flow to the pumps and eventual pump damage and/or trip.

Alternate Testing Check valves 1(2)CC9486 will be stroke tested (Ct) closed on the same frequency as the seat leakage test per IWV-3420. This frequency is at least once per two years, to be performed during refueling outages. Stroke exercising check valves 1(2)CC9486 on the same schedule as their leak rate testing will adequately maintain the system in a state of operational readiness without causing unnecessary personnel radiation exposure or possible damage to the Reactor Coolant Pumps.

4.3.2.1.2 Evaluation--This check valve is in the component cooling water supply to the reactor coolant pumps inside the containment. Verification of the reverse flow closure for this valve requires a pressure source on the downstream side of this valve, and some test configuration to detect leakage through the valve (i.e., leak testing per IWV-3420). Performance of this test necessitates stopping the reactor coolant pumps and shutting off their cooling flow, making test connections inside containment, isolating sections of piping, etc., this testing is very time consuming and would likely result in delay in the return to power operation. This would be very burdensome to the licensee to perform during cold shutdowns. The licensee's proposal to verify valve closure capability during leak testing per IWV-3420 or Appendix J at least once every two years provides adequate assurance of operational readiness and a reasonable alternative to the Code requirements.

Based on the impracticability of complying with the Code requirements, the burden on the licensee if the Code requirements were imposed, and the licensee's proposed testing frequency, relief should be granted as requested.

4.4 Chemical and Volume Control System

4.4.1 Category A Valves

4.4.1.1 Relief Request. The licensee has requested relief from exercising valves 1(2)CV8100 and 1(2)CV8112, reactor coolant pump seal water returns, in accordance with the frequency requirements of Section XI,

Paragraph IWV-3411, and proposed to full-stroke exercise these valves during cold shutdowns when the reactor coolant pumps are not in operation and during refueling outages.

4.4.1.1.1 Licensee's Basis for Requesting Relief--These valves cannot be tested during unit operation as seal water flow to the reactor coolant pumps is required at all times while the pumps are in operation. Failure of one of these valves in the closed position during an exercise test would result in seal water return flow being diverted to the pressurizer relief tank (PRT) by lifting a relief valve upstream of the isolation valves.

Alternate Testing: These valves will be exercise tested during cold shutdown, providing all reactor coolant pumps are not in operation. This testing period will be each refueling outage as a minimum, but no more frequently than once per quarter. This alternative will adequately maintain the system in a state of operational readiness, while not sacrificing the safety of the plant, by testing the valves as often as safely possible.

4.4.1.1.2 Evaluation--Valves 1(2)CV8100 and 1(2)CV8112 are containment isolation valves in the return line from the reactor coolant pump seals. It is impractical to exercise these valves quarterly during reactor coolant pump operation as failure of one of these valves in the closed position would result in forcing the system relief valve, 1(2)CV8121, to open diverting seal water flow to the PRT generating large quantities of liquid radwaste. This would be burdensome to the licensee. Additionally, it is not practical to secure flow to the reactor coolant pump seals at any time during operation since this could result in damage to the seals from overheating or contamination by foreign material. The licensee's proposal to full-stroke exercising these valves during cold shutdowns, provided that the reactor coolant pumps are not in operation, and during refueling outages, provides a reasonable alternative to the Code requirements.

Based on the impracticability of complying with the Code requirements, the burden on the licensee if the Code requirements were imposed, and considering the licensee's proposed alternate testing frequency, relief should be granted as requested.

4.5 Instrument Air System

4.5.1 Category A Valves

4.5.1.1 Relief Request. The licensee has requested relief from exercising valves 1(2)IA065 and 1(2)IA066, instrument air containment isolation valves, in accordance with the frequency requirements of Section XI, Paragraph IWV-3411, and proposed to full-stroke exercise these valves during refueling outages.

4.5.1.1.1 Licensee's Basis for Requesting Relief--Stroke testing of these valves during plant operation or cold shutdown would, by design, isolate the air operated instruments and valves inside the containment building. The full-stroke exercising of the instrument air containment isolation valves during unit power operations or cold shutdowns, introduces the possibility of causing major operating perturbations and/or personnel safety concerns should these valves fail to re-open during testing activities. The failure of these valves in the closed position, as a result of testing activities during plant operation or cold shutdown, would isolate the air operated instruments and valves inside the containment building thus resulting in one or more of the following scenarios:

A) Loss of pressurizer Pressure Control

The pressurizer spray valves 1(2)RY455B & C and the pressurizer auxiliary spray valve 1(2)CV8145 would fail closed and not be available for pressurizer pressure control.

B) Loss of Chemical Volume Control System Let Down Flow (both normal and excess) and Charging Flow -

The loss of instrument air would cause a disruption in the unit letdown flow paths resulting in pressurizer level increases. Such valves as the letdown orifice containment outlet header isolation valve 1(2)CV8160, the letdown line isolation valves 1(2)CV459 and 1(2)CV460, the letdown orifice outlet isolation valves 1(2)CV8149A, B, and C, the

excess letdown heat exchanger inlet isolation valves 1(2)CV8153A and B, and the regen heat exchanger letdown inlet isolation valves 1(2)CV8389A and B would go to their fail closed positions. Additionally, the ability to normally make up reactor coolant inventory and adjust the reactor chemical shim (i.e., normal boration/dilution) would also be lost as the regenerative heat exchanger inlet isolation valves 1(2)CV8324A and B would fail to their respective closed positions.

C) Loss of Component Cooling to Containment Penetrations -

The loss of instrument air supply would cause the penetration cooling supply flow control valve 1(2)CC053 to go to its fail closed position. The loss of penetration cooling would result in elevated temperature being imposed on the penetrations being supported by the component cooling system.

D) Loss of Personnel Breathing Air -

The loss of instrument air supply to the service air downstream isolation valve 1(2)SA033 would cause this valve to go to is (sic) fail closed position. This loss of service air in the containment building would eliminate the normal source of supplied breathing air needed to support numerous maintenance and component inspection activities in a contaminated radiological environment.

Alternate Testing These valves will be exercised during refueling outages. This testing period will be each refueling outage as a minimum, but no more frequently than once per quarter.

4.5.1.1.2 Evaluation--Exercising valves 1(2)IA063 and 1(2)IA066 quarterly during power operation is impractical because the loss of instrument air could seriously disrupt normal pressurizer pressure control valve operations by causing a loss of operating air to several control valves and possibly result in a reactor trip. Exercising these valves during cold shutdowns would cause the service air downstream isolation valve

to fail closed and would disrupt the supply of breathing air to workers in containment. Further, loss of instrument air to containment would inhibit the performance of shutdown maintenance activities and inspections and would be burdensome to the licensee. Therefore, testing these valves quarterly during power operations or cold shutdowns is not practical. The licensee's proposal to test these valves during refueling outages should provide adequate assurance of their operational readiness and provides a reasonable alternative to the Code requirements.

Based on the impracticability of complying with the Code requirements, the burden on the licensee if the Code requirements were imposed, and considering the licensee's proposed alternate testing frequency, relief should be granted as requested.

4.6 Diesel Generating System

4.6.1 Category B&C Valves

4.6.1.1 Relief Request. The licensee has requested relief from testing valves 1(2)DG5182A-D, 1(2)DG5183A-D, 1(2)DG5184A-D, and 1(2)DG5185A-D, diesel generator air start valves, in accordance with the requirements of Section XI, Paragraphs IWV-3412, 3413(b), 3417, and 3522, and proposed to verify valve operability during performance of the monthly diesel generator operability surveillance.

The licensee has provided in addition to their basis the following discussion: "These valves are not within the scope of ASME Code, Section XI, Subsection IWV requirements. However, the requirements for stroke timing and trending of the valves associated with the diesel air start system are being mandated by the NRC as an augmented testing requirement pursuant to 10 CFR 50.55(a)(g). Therefore, valves associated with the diesel air start system shall be exercised to the position required to fulfill their function during plant operation per IWV-3412 and -3522. Additionally, the stroke testing of power operated valves shall be measured to the nearest second and such stroke times trended to document continued valve operational readiness per IWV-3413(b) and -3417".

4.6.1.1.1 Licensee's Basis for Requesting Relief--The monthly diesel generator testing program, outlined in Braidwood Station's Technical Specifications and implemented by station operating procedures, exceeds the intent of the quarterly valve testing program which would be required by ASME Code, Section XI. Additionally, the stroke timing of solenoid operated valves associated with the Diesel Air Start System is impractical due to the fast actuation of these valves.

Alternate Testing: The performance of Braidwood Station's diesel generator operability monthly surveillance will verify the operational readiness of the valves associated with the Diesel Air Start System. This surveillance testing will require the recording of the air pressures contained in both trains A and B of the Diesel Generator Air Start receiver tanks both before and immediately after diesel generator start. By the comparison of these values between trains, the satisfactory operation of the power operated and self-actuated check valves associated with the Diesel Air Start System can be adequately demonstrated.

Proper valve operation will be demonstrated on a monthly basis by the verification of diesel generator air start capability. Such verification will compare the air pressures contained in the receiver tanks both before and after the diesel generator start, thus verifying the operability of the air start control valves. The proposed testing methodology at the increased frequency satisfies the intent of the Section XI requirements without posing undue hardships or difficulties.

4.6.1.1.2 Evaluation--Due to the short stroke times and the system application of these solenoid operated valves, it is impractical to obtain a direct stroke time measurement without significant system design changes. These valves function to admit starting air to the emergency diesel generators and the failure of one of these valves to open in a timely manner would be indicated by a pressure imbalance between the starting air receivers, and possibly, an increase in diesel generator start time. Further, the Braidwood Station emergency diesel generators are tested monthly rather than quarterly. The licensee's proposal to verify valve

operability, by comparison of the air pressures inside the starting air receivers before and immediately after diesel start each month, should furnish timely indication should degradation of these valves occur and provides a reasonable alternative to the Code requirements.

Based on the impracticability of the Code requirements, the burden on the licensee if the Code requirements were imposed, and the licensee's proposed alternate testing method and increased testing frequency, relief should be granted as requested.

4.7 Essential Service Water System

4.7.1 Category B Valves

4.7.1.1 Relief Request. The licensee has requested relief from testing valves 1(2)SX101A, service water valves from the auxiliary feedwater pump lube oil coolers, in accordance with the requirements of Section XI, Paragraphs IWV-3413 and 3417, and proposed to verify valve operability during quarterly auxiliary feedwater pump surveillance testing.

4.7.1.1.1 Licensee's Basis for Requesting Relief--1(2)SX101A are the essential service water outlet isolation valves for the motor driven auxiliary feedwater pump lube oil coolers. These valves are completely encapsulated per design and do not have local or remote position indicators which could be used to time the valve stroke. These valves will be stroke exercised to their required safety position each quarter during the applicable motor driven auxiliary feedwater pump ASME surveillance. These pumps are also tested monthly for proper equipment operation per Technical Specification requirements. This testing will adequately maintain the systems in a state of operational readiness, while not sacrificing the safety of the plant.

Alternate Testing: 1(2)SX101A will be verified to open during each quarterly surveillance of the motor driven auxiliary feedwater pumps. No stroke timing or trending will be performed.

4.7.1.1.2 Evaluation--These valves are encapsulated and are not equipped with local or remote position indication. The valve stems cannot be directly observed to determine valve position or to measure the valve full-stroke times. System modifications would be necessary to directly measure the stroke times of these valves and would be expensive and burdensome to the licensee. These valves may be verified open by monitoring lube oil temperatures when the auxiliary feedwater pump is running, but, stroke timing these valves using conventional techniques is very difficult. However, some method of stroke timing these valves is necessary for determining their operational readiness.

The licensee should actively pursue an alternate method for stroke time testing these valves. Methods employing magnetics, accoustics, ultrasonics, or other technologies should be investigated for their suitability. The licensee's proposal to verify that the valves are stroking quarterly during pump surveillance tests should be acceptable on an interim basis, but, it does not adequately evaluate the valve condition and does not present a reasonable long term alternative to the Code requirements.

Based on the determination that complying with the Code requirements is impractical and considering the licensee's proposal, relief should be granted for an interim period of six months while the licensee develops a method of measuring the stroke times of these valves.

4.8 All Systems

4.8.1 Category A Valves

4.8.1.1 Relief Request. The licensee has requested relief from seat leakage measurements for all Unit 1(2) containment isolation valves in accordance with the requirements of Section XI, Paragraph IWV-3420, and proposed to seat leakage test these valves in accordance with the requirements of 10 CFR 50, Appendix J and evaluate the results and perform corrective action per Section XI, Paragraphs IWV-3426 and -3427(a).

4.8.1.1.1 Licensee's Basis for Requesting Relief--Primary containment isolation valves will be seat leak tested in accordance with 10 CFR 50, Appendix J. For these valves, Section XI testing requirements are essentially equivalent to those of Appendix J. No additional information concerning valve testing would be gained by performing separate tests to both Section XI and Appendix J. Therefore, overall plant safety is not affected.

Alternate Testing Primary containment isolation valves will be seat leak tested in accordance with the Appendix J requirements of 10 CFR 50. The results of such leak rate measurements shall be analyzed and corrected, as necessary in accordance with the guidelines set forth in ASME Code Section XI, Subsection IWV, Paragraphs IWV-3426 and IWV-3427(a).

4.8.1.1.2 Evaluation--The licensee's proposal complies with the NRC staff's position on testing containment isolation valves in NRC GL 89-04, Attachment 1, Position 10 and provides an acceptable alternative to the Code requirements, therefore, relief is granted as requested.

4.8.2 Rapid Acting Valves

4.8.2.1 Relief Request. The licensee has requested relief from comparison of stroke times for the following listed valves in accordance with the requirements of Section XI, Paragraph IWV-3417(a), and proposed a fast-acting stroke time limit of 2 seconds; upon exceeding 2 seconds, the testing frequency shall be increased to monthly until corrective action is taken, or the valve strokes in two seconds or less, further, no trending of stroke times will be performed.

Valve Identification	Valve Identification
1(2)MS018A-D	1(2)RE9159A and B
1(2)PS228A and B	1(2)RE9160A and B
1(2)PS229A and B	1(2)RF026
1(2)PS230A and B	1(2)RF027
1(2)RC014A-D	1(2)RY8033
1(2)RE9157	

4.8.2.1.1 Licensee's Basis for Requesting Relief--Minor timing inaccuracies, with small stroke times can lead to substantial increases (percent wise) in stroke times. For example, a valve with a stroke time of 1 second in an initial test, and 1.6 seconds in the subsequent test, has experienced an apparent 60% increase in stroke time. If the accuracy requirements of IWV-3413(b) are utilized, it could be argued that stroke times between 1 and 2 seconds could constitute as much as a 100% increase in stroke time when, in fact, only a 0.2 second increase occurred. For instance, if the initial time was 1.4 seconds, (measured to the nearest second is 1.0 second) and if the next time is then 1.6 seconds, (measured to the nearest second is 2.0 seconds) the percent increase is 100%.

Alternate Testing Fast-acting valves will be defined as those valves that normally stroke in 2 seconds or less. No trending of stroke times will be required and upon exceeding 2 seconds the test frequency shall be increased to monthly and trending of stroke times shall begin, until corrective action is taken, or the stroke time returns to less than or equal to 2 seconds. Upon exceeding the maximum stroke time listed in the Valve Program Tables for the above listed valves, corrective action shall be taken immediately in accordance with IWV-3417(b).

For short stroke times, the trending requirements are too stringent for the accuracies specified in the Code. The alternative specified will adequately maintain the system in a state of operational readiness, while not imposing undue hardship or sacrificing the safety of the plant.

4.8.2.1.2 Evaluation--The Code requires comparison of power operated valve stroke times from test to test. Further, the Code requires that stroke times be measured to the nearest second for valves with stroke times less than 10 seconds. For valves with short stroke times, rounding the stroke time to the nearest second and comparing this to the previous measurement may not be practical. NRC Generic Letter No. 89-04 addresses these concerns and provides the staff position on rapid-acting valves in Attachment 1, Position 6, Stroke Time Measurements for Rapid-Acting Valves. This position provides an acceptable alternative to the Code requirements, however, the licensee's proposal differs from this position.

For valves with normal stroke times less than or equal to two seconds the licensee has proposed that upon exceeding the 2 second limit; the testing frequency will be increased to monthly and valve stroke times will be trended until the stroke time returns to less than or equal to 2 seconds or corrective action is taken. Further, these valves would be declared inoperable only if the stroke times listed in the IST program are exceeded. The stroke time limits listed in the IST program for these valves may be as high as 10 seconds. Allowing a valve that normally strokes in 2 seconds or less to degrade to the point where its stroke time exceeds 10 seconds, prior to declaring the valve inoperable and taking corrective action, is not acceptable as an alternative to the Code requirements.

Also, increasing the valve test frequency, to once a month, and trending the stroke times for these rapid-acting valves after their stroke times exceed 2 seconds does not provide a reasonable alternative to the Code requirements since it does not adequately address the cause of the change in stroke time. This is particularly significant if the valves normally stroke in much less than one second.

The licensee's proposed alternative does not provide a reasonable alternative to the Code requirements. However, relief should be granted from the requirements of Section XI, Paragraph IWV-3417(a) provided the licensee complies with the requirements of the NRC staff position on rapid-acting valves in Generic Letter No. 89-04, Attachment 1, Position 6 "Stroke Time Measurements for Rapid-Acting Valves."

APPENDIX A

APPENDIX A

VALVES TESTED DURING COLD SHUTDOWN

When a valve exercising test is not practical to perfrom during plant operations, the ASME Code, Section XI, allows the test to be performed during cold shutdowns. The following are Category A, B, and C valves that meet the exercising requirements of the Code and are not full-stroke exercised every three months during plant operation. These valves are specifically identified by the owner in accordance with Paragraphs IWV-3412 and 3522 and are full-stroke exercised during cold shutdowns and refueling outages. All valves in this Appendix have been evaluated and the reviewer agrees with the licensee that testing these valves during power operation is not possible due to the valve type, location, or system design. These valves should not be full-stroke exercised during power operations. These valves are listed below and grouped according to the system in which they are located.

1. MAIN STEAM SYSTEM

1.1 Category B Valves

The closure of the main steam isolation valves, 1(2)MS001A-D, during unit operation would result in a reactor trip and safety injection actuation. To avoid this transient, these valves will be part-stroke exercised every three months and full-stroke exercised during cold shutdowns per IWV-3412.

2. CHEMICAL AND VOLUME CONTROL SYSTEM

2.1 Category A and B Valves

Closure of letdown and makeup valves 1(2)CV112 B, C, 1(2)CV8105, 1(2)CV8106, 1(2)CV8152, and 1(2)CV8160, during normal unit operation would cause a loss of charging flow which would result in a reactor coolant inventory transient, and possibly, a subsequent reactor trip. These valves will be full-stroke exercised during cold shutdown as required by IWV-3412.

2.2 Category B and C Valves

The testing of any emergency boration flow path valves during unit operation is not practical. Stroke testing the boric acid injection isolation valves, 1(2)CV8104, and check valves, 1(2)CV8442, the refueling water storage tank (RWST) to chemical and volume control (CV) pump suction check valves, 1(2)CV8546, the residual heat (RH) to CV pump suction isolation valves, 1(2)CV8804A, or the RWST to CV pump suction isolation valves, 1(2)CV112D and E, could result in over-boration of the reactor coolant system (RCS), resulting in a cooldown transient. Aligning the system in this configuration, even for a short duration, is therefore, unacceptable. These valves will be full-stroke exercised during cold shutdowns in accordance with IWV-3412 and 3522.

3. MAIN FEEDWATER SYSTEM

3.1 Category B Valves

Main feedwater isolation valves, 1(2)FW009A-D, cannot be exercised quarterly during power operation as feedwater flow would be terminated and could cause a reactor trip. These valves will be part-stroke exercised during power operation and full-stroke exercised during cold shutdown as required by IWV-3412.

Valves 1(2)FW039A-D, main feedwater to auxiliary feedwater isolation valves, cannot be stroke exercised during unit operation as closure of these valves would result in termination of the waterhammer prevention feedwater flow. This would result in undesirable affects on the steam generators. These valves will be full-stroke exercised during cold shutdown as required by IWV-3412.

4. RESIDUAL HEAT REMOVAL SYSTEM

4.1 Category A Valves

Valves 1(2)RH8701A, B, 1(2)RH8702A, and B are the isolation boundary between the residual heat removal (RHR) pumps and the RCS. Opening one of

these valves during unit operation will leave only one valve isolating RHR from the high RCS pressure, placing the plant in an undesirable condition. These valves will be full-stroke exercised during cold shutdown per IWV-3412.

4.2 Category C Valves

The residual heat removal pump discharge check valves, 1(2)RH8730A and B, cannot be full-stroke exercised during unit operation since the residual heat removal pumps cannot overcome the high RCS pressure to establish flow. These check valves will be part-stroke exercised quarterly and full-stroke exercised during cold shutdowns in accordance with IWV-3522.

5. REACTOR COOLANT SYSTEM

5.1 Category B Valves

The reactor pressure vessel vent valves, 1(2)RC014A-D, cannot be stroke exercised during unit operation as they provide a pressure boundary between the reactor coolant system and containment atmosphere. Failure of one of these valves in the open position would result in leaving only one valve as the high pressure boundary. These valves will be full-stroke exercised when the RCS pressure is at a minimum during cold shutdown per IWV-3412.

6. PRIMARY CONTAINMENT PURGE SUPPLY SYSTEM

6.1 Category A Valves

The primary containment purge supply and exhaust valves, 1(2)VQ001A and B and 1(2)VQ002A and B, cannot be exercised and stroke timed during unit operation. These 48 inch valves are the only isolation points between the containment atmosphere and the environment. Stroke exercising these valves at any time other than mode 5 or 6 would be a violation of the Byron Technical Specifications. These valves will be full-stroke exercised during cold shutdown in accordance with IWV-3412.

7. AUXILIARY FEEDWATER SYSTEM

7.1 Category C Valves

The auxiliary feedwater check valves, 1(2)AF001A and B, 1(2)AF003A and B, 1(2)AF014A-H, and 1(2)AF029A and B, cannot be full-stroke exercised during unit operation, as this would induce potentially damaging thermal stresses in the upper feedwater nozzle piping. The 1(2)AF001A and B, and 1(2)AF003A and B, valves will be part-stroke exercised during operation, and all valves will be full-stroke exercised during cold shutdown in accordance with IWV-3522.

8. SAFETY INJECTION SYSTEM

8.1 Category B Valves

The high head injection isolation valves, 1(2)SI8801A and B, cannot be full-stroke exercised during unit operation. These valves isolate the charging system from cold leg injection. Opening them during operation would enable charging flow to pass directly into the RCS, bypassing the regenerative heat exchanger. The temperature difference of the charging flow and the RCS could result in damaging thermal stresses to the cold leg nozzles as well as causing a reactivity change which would, in turn, cause a plant transient. These valves will be full-stroke exercised during cold shutdown in accordance with IWV-3412.

The safety injection system SVAG (spurious valve action group) valves, 1(2)SI8802A and B, 1(2)SI8806, 1(2)SI8809A and B, 1(2)SI8813, 1(2)SI8835, and 1(2)SI8840, cannot be full- or part-stroke exercised during unit operation. These valves are required by the Technical Specifications to be de-energized in their proper positions during unit operation. Stroking them would be a violation of the Technical Specifications as well as defeating the de-energized SVAG valve principle. These valves will be full-stroke exercised during cold shutdown in accordance with IWV-3412.

8.2 Category C Valves

Check valves 1(2)SI8818A thru D, RHR cold leg injection checks and 1(2)SI8958A and B, RWST to RHR pump suction checks, cannot be full-stroke exercised during operation as the the RHR pumps discharge pressure is significantly below that of the RCS operating pressure and flow cannot be established. These valves will be full-stroke exercised during cold shutdowns in accordance with IWV-3522.

APPENDIX B

APPENDIX B

The ISI Boundary Drawings listed below were used during the course of this review.

System	Drawing No.	Revision
Main Feedwater	M-36-1	Y
Auxiliary Feedwater	M-37	AA
Essential Service Water	M-42-1	Y
Essential Service Water	M-42-3	AB
Essential Service Water	M-42-5	T
Containment Spray	M-46	AD
Offgas-System Hydrogen Recombiners	M-47-2	M
Waste Disposal Steam Generator Blowdown	M-48-5	U
Waste Disposal Steam Generator Blowdown	M-48-6	W
Make-up Demineralizer	M-49-1	U
Diesel Fuel oil	M-50-1	AC
Fire Protection (Category-1)	M-52-1	N
Service Air	M-54-2	N
Instrument Air	M-55-2	T
Diagram of Reactor Coolant Loop-1	M-60-1	AD
Diagram of Reactor Coolant	M-60-5	V
Diagram of Reactor Coolant	M-60-6	T
Safety Injection	M-61-1	AE
Safety Injection	M-61-2	Z
Safety Injection	M-61-3	V
Safety Injection	M-61-4	U
Safety Injection	M-61-5	L
Safety Injection	M-61-6	U
Residual Heat Removal	M-62	AF
Fuel Pool Cooling and Clean-up	M-63	AK
Chemical and Volume Control and Boron Thermal Regeneration	M-64-1	Y

System	Drawing No.	Revision
Chemical and Volume Control and Boron Thermal Regeneration	M-64-2	Y
Chemical and Volume Control and Boron Thermal Regeneration	M-64-3	AE
Chemical and Volume Control and Boron Thermal Regeneration	M-64-4	AG
Chemical and Volume Control and Boron Thermal Regeneration	M-64-5	AB
Boric Acid Processing	M-65-5	AG
Component Cooling	M-66-1	AA
Component Cooling	M-66-2	W
Component Cooling	M-66-3	AB
Process Sampling (Primary and Secondary)	M-68-1	Y
Reactor Building and Containment Equipment Drains and Vents to Radwaste	M-70-1	S
Process Radiation Monitoring	M-78-6	R
Process Radiation Monitoring	M-78-10	L
Integrated Leak Rate Test	M-105-1	N
Integrated Leak Rate Test	M-105-3	C
Control Room Chilled Water System (WO)	M-118-1	T
Containment Chilled Water System (WO)	M-118-5	S

APPENDIX C

APPENDIX C

IST PROGRAM ANOMALIES IDENTIFIED DURING THE REVIEW

Inconsistencies and omissions in the licensee's program noted during the course of this review are summarized below. The licensee should resolve these items in accordance with the evaluations, conclusions, and guidelines presented in this report.

1. The licensee has proposed in pump relief request PR-1 to utilize pump vibration velocity measurements, taken as described in the IST program rather than vibration displacement measurements as required by IWV-4120 (see TER section 3.2.1). However, their proposal does not thoroughly describe how this testing will be performed, for example; there is no reference as to how measurements will be taken on centrifugal pumps. Also, the licensee's proposal differs from vibration measurement programs previously found acceptable to NRC. Relief should be granted from the Code requirements provided the licensee performs pump vibration testing in accordance with all the applicable requirements of ANSI/ASME OMa-1988, Part-6.

2. The boric acid transfer pumps are not included in the Braidwood Station IST program. This is an OPEN ITEM for the NRC.

3. Valve relief request VR-4 (see TER section 4.1.1.1) proposes to verify the full-stroke open capability of the containment spray ring header check valves, 1(2)CS008A and B, by disassembly and inspection or a full-flow test during refueling outages. Since full flow testing is not impractical for these valves the licensee should full flow test these valves each refueling outage in accordance with Generic Letter No. 89-04, Attachment 1, Position 1.

4. Valve relief request VR-4 (see TER section 4.1.2.2) proposes to part-stroke exercise the containment spray pump discharge check valves, 1(2)CS003A and B, quarterly and to verify their full-stroke open capability by disassembly and inspection or a full-flow test during refueling outages. Since full flow testing is not impractical for

these valves the licensee should full flow test these valves each refueling outage in accordance with Generic Letter No. 89-04, Attachment 1, Position 1.

5. Valve relief request VR-5 (see TER section 4.2.1.1) proposes to exercise the accumulator discharge check valves, 1(2)SI8948A-D and 1(2)SI8956A-D, at least each refueling outage by discharging into the reactor vessel and during cold shutdowns, if not performed during the last nine months, by providing a surge volume in the pressurizer, 'burping the valves,' and noting a change in pressurizer level. Relief should be granted from the Code frequency requirements provided the licensee full-stroke exercises these valves in accordance with Generic Letter No. 89-04, Attachment 1, Position 1, at their proposed frequency.

6. Valve relief request VR-12 (see TER section 4.8.2.1) addresses fast-acting (rapid-acting) valves (i.e., valves that normally operate in 2 seconds or less), however, the IST program valve list identifies maximum stroke times for these valves of from 2 to 10 seconds. The licensee's proposal to assign a fast-acting limit of 2 seconds and upon exceeding this limit to increase the test frequency to monthly and to trend the stroke times is not in accordance with NRC Generic Letter No. 89-04 and does not provide a reasonable alternative to the Code requirements. Relief should be granted from the Section XI, Paragraph IWV-3417(a), requirements provided the licensee complies with NRC staff Position 6, on Rapid-acting valves in NRC Generic Letter No. 89-04, Attachment 1.

7. Valve relief request VR-17 (see TER section 4.7.1.1) requests relief from stroke time testing the service water valves from the auxiliary feedwater pump lube oil coolers, 1(2)SX101A, and proposes to verify valve operability during quarterly auxiliary feedwater pump surveillance testing. An alternate method of stroke timing these valves is necessary for determining their operational readiness and should be actively pursued. Methods employing magnetics, accoustics, ultrasonics, or other technologies should be investigated for their

suitability. The licensee's proposal to verify the valves are stroking quarterly during pump surveillance tests should be acceptable on an interim basis, but, it does not adequately evaluate the valve condition and does not present a reasonable long term alternative to the Code requirements. Therefore, relief should be granted for an interim period of six months while the licensee develops a method of measuring the stroke times of these valves.

8. The licensee has included the power operated relief valves (PORVs) in their IST program as Category B valves and proposed to exercise these valves quarterly. Since these valves have shown a high probability of sticking open and are not needed for overpressure protection during power operation, routine exercising during power operation may not be practical. The PORVs should be exercised prior to achieving the condition, which requires them to be operable and the exercising frequency should be on the approach to the cold shutdown condition and prior to the time when these valves are required to be operable for low temperature overpressurization protection. The licensee should consider whether the test frequency for these valves should be adjusted.