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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION RELATED TO REQUESTS FOR RELIEF FROM INSERVICE TESTING REQUIREMENTS CAROLINA POWER AND LIGHT COMPANY BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2 DOCKET NOS. 50-325, AND 50-324

INTRODUCTION

This report provides a safety evaluation of the Brunswick Steam Electric Plant, Unit Nos. 1 and 2 (Brunswick Units 1 & 2) program for inservice testing (IST) of pumps and valves, and, in particular, an evaluation of the licensee's requests for relief from regulatory requirements applicable to the subject program. The Code of Federal Regulations [10 CFR 50.55a(g)] requires that inservice testing of ASME Code Class 1, 2, and 3 pumps and valves be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable addenda. 10 CFR 50.55a(g)(6)(i) authorizes the Commission to grant relief from code requirements for testing upon determining that the requirements are impractical. It also authorizes imposition of alternate requirements and augmenting requirements upon making the necessary determination.

The IST Program for Pumps and Valves for Brunswick Units 1 and 2 consists of Section III of the licensee's engineering procedure ENP-16 entitled "Procedure For Administrative Control of Inservice Inspection Activities". Revision 013 of this document and associated relief requests that are addressed in this report were submitted to the Commission by letter dated October 12, 1983. The program was prepared to comply with ASME Section XI, 1977 edition with addenda through Summer 1978 (the Code), which is the applicable code required by 10 CFR 50.55a(g).

In its evaluation of the licensee's relief requests, described below, the staff determined that certain of the requests should be granted, others conditionally granted, and still other denied. A summary tabulation of these evaluations is provided in Attachment 1. Based on its evaluations, the staff concludes that the indicated reliefs thus granted will not endanger life or property or the common defense and security of the public. In its evaluation of the licensee's program, the staff identified apparent deficiencies in the scope of the valve program. These are listed in Sections B.1, and C.2. The staff notified the licensee of these perceived deficiencies by letter dated February 10, 1984. In its response of March 29, 1984, the licensee committed to add the designated pumps and valves to the second ten-year ISI program that will be submitted for staff review later in 1984.

Requirements and interpretations considered applicable to the licensee's program and used in the staff's evaluation include the following:

(1) Code requirements referred to above, and
(2) Positions and interpretations described in the evaluations below.

Final Safety Analysis Reports for Brunswick Units 1 and 2 and selected piping drawings (listed in Attachment 2) were the primary sources of plant specific information utilized in this evaluation. Additional pertinent information was obtained during an inspection conducted at the Brunswick site July 25-29, 1983, (documented in NRC Inspection Report 325, 324/83-27).

EVALUATION

A. GENERAL

It is the staff's position that the licensee's IST program must include all pumps and valves important to safety (i.e., pumps and valves required to shut down the plant to cold shutdown, maintain the plant in cold or hot shutdown condition, or mitigate the consequence of an accident) and that they must be tested in accordance with the appropriate Code requirements unless relief is granted. The licensee's program was evaluated for inclusion of all such pumps, valves, and testing. As described in Sections B.1 and C.1 below, the program was found to be incomplete on the basis of staff criteria.

It is the licensee's responsibility, where relief is requested, to provide an adequate basis for granting relief. The staff found that some of the licensee's relief requests were not adequately justified. In such cases, the staff has either not approved the licensee's request or has granted conditional relief. This action does not preclude the licensee from developing more satisfactory bases and submitting revised requests.

B. PUMP TESTING PROGRAM AND RELIEF REQUEST

1. Program

The pump portion of the IST program was reviewed to verify that all pumps important to safety are included in the program and are subjected to the testing required by the Code. Our review indicates that the licensee has not included all pumps important to safety in its program. An apparent omission noted by the staff is the fuel oil transfer pumps. The staff advised the licensee of its position by letter dated February 10, 1984. The licensee, in its letter dated March 29, 1984 informed the staff that the Emergency Fuel Oil Transfer Pumps will be incorporated into the next revision (i.e., the second ten-year program) of the IST program. This revision is currently projected to be completed in July 1984.

For pumps already included in the licensee's program the staff's review found that all required testing is in compliance with requirements except where relief from testing was requested.

2. General Request for Relief

a. Relief Request

The licensee has requested relief from the Code's requirement (IWP-3400) that all pumps be tested each month during normal plant operation. The pumps identified for relief are listed below and compose the entire listing of pumps in the Brunswick IST program:

Nuclear Service Water Pumps A & B
Conventional Service Water Pumps A, B, & C
Service Water Lubrication Water Pumps A & B
Core Spray Pumps A & B
Residual Heat Removal Pumps A, B, C, & D
Residual Heat Removal Service Water Booster Pumps A, B, C, & D
High Pressure Coolant Injection Pumps-Main & Booster
Standby Liquid Control Pump A & B
Standby Gas Treatment Blower A & B
Reactor Core Isolating Cooling Pumps C001 & 2

The licensee proposes to test these pumps quarterly.

Licensee's Basis for Requesting Relief

The 1980 edition of Section XI has extended the required test interval in IWP-3400 to once every three months. An analysis of monthly pump test data from this site and other operating plants has not shown any significant changes in performance. Based on operating history and extension of the test interval to three months in later code editions, monthly testing would not significantly increase plant safety.

Evaluation

We agree with the licensee's basis and approve the requested relief. We conclude that the alternate testing frequency will provide adequate assurance of the pumps' operability.

b. Relief Request

The licensee has requested relief for all of the pumps in its IST program from the requirement of IWP-3300 to measure bearing temperatures at least once per year. The licensee proposes to eliminate this test.

Licensee's Basis for Requesting Relief

The referenced edition (77S78) of the code requires bearing temperature to be recorded annually. It has been demonstrated by experience that bearing temperature rise occurs only minutes prior to bearing failure. Therefore, the detection of possible bearing failure by a yearly temperature measurement is extremely unlikely. It requires at least an hour of pump operation to achieve stable bearing temperatures. The small probability of detecting bearing failure by temperature measurement does not justify the additional pump operating time required to obtain the measurements.

Evaluation

The staff agrees that a yearly measurement of bearing temperature has little value and does not warrant operation of a pump for the time required to reach a stable temperature. We approve the licensee's request to eliminate this test. Inasmuch as the only other Code test available to monitor the mechanical operation of a pump is vibration measurements, the licensee shall emphasize proper vibration testing at all test points available to establish pump operation "signatures". We recommend that the licensee review the possibility of measuring vibration velocity as well as vibration amplitude as a means of maximizing the value of this test.

3. Specific Request for Relief

a. Relief Requested

The licensee has requested specific relief for Standby Liquid Control Pumps A & B from the requirement of IWP-3500 that each pump be run for five minutes under stable conditions before making measurements or observations of the parameters required by IWP-3100 (Table IWP-3100-1). The licensee proposes to perform tests, during refueling, with the duration of the test to be determined by the volume of the Test Tank.

Licensees' Basis for Requesting Relief

Two different pump tests are performed on the Standby Liquid Control pumps. The quarterly test recirculates water from the Test Tank through the pumps and back to the Test Tank. The five-minute test requirement is observed during this quarterly test. The second test is performed at refueling when water is pumped from the Test Tank into the Reactor Coolant System. Because there is no installed instrumentation to directly measure flow rate, the decrease in Test Tank level during injection is used to calculated flow rate. The volume of the Test Tank is insufficient to provide water for more than two minutes of pump operation. These are positive displacement type pumps and do not

require a specified operating time to reach stable operating conditions.

Evaluation

The Standby Liquid Control Pumps provide a method of shutting down the reactor without use of control rods. The licensee plans to operate these pumps for a minimum of five minutes during quarterly tests which consist of cycling fluid to and from the Test Tank. During refueling outages the pump forward-flow test consists of pumping fluid from the Test Tank into the reactor. Because of the small capacity of the Test Tank the refueling test cannot continue for five minutes. During the site visit on July 25-29, 1983, the licensee agreed to consider performing a cyclic test for at least five minutes before realigning the Standby Liquid Control (SLC) valves (including the firing of one of the two explosive SLC valves) for the forward-flow test, thereby meeting the Code's criterion for pump warm-up. We conditionally approve the requested relief on the basis that the operability of the pump will be demonstrated during the quarterly cyclic tests and the licensee has committed to exploring procedures to increase the warm-up time for the refueling forward-flow test.

b. Relief Requested

The licensee has also requested specific relief for Standby Liquid Control Pumps A & B from the requirement of IWP-3100 to measure flow during each IST test. The license proposes to measure flow rate at refueling outages.

Licensee's Basis for Requesting Relief

Forward flow verification can only be performed by firing one of the Squib valves and injecting water, using the SLC pumps, into the Reactor Coolant System. This would require realignment from the Standby Liquid Control Tank to the Test Tank which disables the system. Standby Liquid Control must be operable and aligned to the Control Tank during normal operation and refueling operations including core alterations.

Evaluation

We agree with the licensee's basis and approve the requested relief. Although the licensee will operate the two SLC pumps every three months in a cyclic test that uses the water from the Test Tank (see General Request B.1.a), a true flow test against the hydraulic head of the Reactor Coolant System can only be performed when the reactor is shut down. Such a test is scheduled, per Technical Specification 4.1.5(c), when one of the explosive Squib valves are fired. Flow rate will be measured during this period (~2 minutes) by measuring the change in level

of water in the Test Tank. These tests are considered to meet the intent of the Code.

c. Relief Requested

The licensee has also requested specific relief for the two SLC pumps from the requirement of IWP-3100 to measure pump inlet pressure (Pi) and differential pressure (ΔP) across the pump and proposes to measure only pump discharge pressure (Pd) during the quarterly tests.

Licensee's Basis for Requesting Relief

There is no installed instrumentation to measure inlet pressure. Measurement of inlet pressure on a positive displacement pump is not a significant test parameter. The measurement of discharge pressure provides more meaningful information to assess pump condition.

Evaluation

We agree with the licensee's basis and approve the requested relief. Suction for the quarterly test is taken from a Test Tank of relatively small volume (~200 gallons). The height of water in this tank is equivalent to Pi and does not vary significantly during a cyclic test. Therefore, the ΔP is essentially equal to Pd for the positive displacement pumps. The licensee should assure, in the relevant Periodic Test procedure, that an adequate head of water in the Test Tank is maintained during the pump test.

d. Relief Requested

The licensee has requested specific relief from the requirements of IWP-3100 to measure inlet and differential pressure for the Standby Gas Treatment Blowers A and B and proposes to substitute the requirements of ANSI Standard N510.

Licensee's Basis for Requesting Relief

There is no installed instrumentation to measure inlet or discharge pressure for a blower. These pressures remain close to atmospheric (within inches of water) and are insignificant. The important parameter for the blower is the ability to move the air through the filter train. ANSI Standard N510 gives test requirements for filtration systems to assure that the blower is capable of performing its function.

Evaluation

We agree with the licensee's basis. It is the staff's position that, while it is important to verify the operability of blowers that are in systems important to safety, blowers cannot be tested to the criteria required for pumps in Section XI of the Code. ANSI/ASME Standard N510-1980, "Testing of Nuclear Air Cleaning Systems" defines the test programs and surveillance procedures for high-efficiency air-cleaning systems. We believe that acceptable operation of Standby Gas Treatment Blowers A and B can be based on acceptable test results of the Air-Cleaning Unit. We recommend that the licensee consider performing vibration measurements as a means of testing the mechanical operation of these blowers.

C. VALVE TESTING PROGRAM AND RELIEF REQUESTS

1. General Considerations

The following Code requirements, staff positions and staff interpretations of requirements for IST valves are listed because of their particular applicability to the evaluation described herein.

a. Valve Test Frequency Requirements

Subsection IWV-3412 of the Code (which discusses full-stroke and part-stroke testing) requires that Code Category A and B valves be exercised once every three months, with the exceptions as defined in IWV-3412(a). IWV-3413 requires the owner to specify the full-stroke time of each power-operated Category A and B valve and to check the time whenever the valve is full-stroke exercised.

IWV-3521 requires that Code Category C check valves be exercised once every three months, with the exceptions as defined in IWV-3522.

In the above exceptions for Category A, B and C valves, the Code permits the valves to be tested at cold shutdowns where:

(1) It is not practical to exercise the valves to the position required to fulfill their function, or to the partial position, during power operation.

(2) It is not practical to observe the operation of the valves (with fail-safe actuators) upon loss of actuator power.

The Code doesn't require regular testing for valves that are normally locked or sealed in position. It is the staff's position that operational checks, with appropriate record entries, shall be made to record the position of such valves before operations are performed and after operations are completed. These checks shall also verify that each valve is locked or sealed.

b. Passive Power-Operated Valves

It is the staff's position that power-operated valves which are not required to change position for any accident condition of the plant are exempted from the exercising requirements of the Code. However, their positions must be verified quarterly and each time the valves are cycled.

c. Testing of Normally Open Check Valves

Requirements for testing normally open check valves are stated in IWV-3522(a) as follows:

> "Check valves shall be exercised to the position required to fulfill their function... Valves that are normally open during plant operation and whose function is to prevent reversed flow, shall be tested in a manner that proves that the disk travels to the seat promptly on cessation or reversal of flow. Confirmation that the disk is on its seat shall be by visual observation, by an electrical signal initiated by a position indicating device, by the observation of appropriate pressure indications in the system, or by other positive means."

A test that verifies closure of normally open check valves through reversal of flow and measurement of leakage through the valve is acceptable to the staff.

Normally open check valves may have two functions important to safety - to close under certain conditions and to open under others. When this is the case, the exercising test must verify movement to the positions necessary to satisfy both of these functions. Verification of opening for such valves must be accomplished as if the valves were normally closed - by positive means, as noted in d below.

d. Testing of Normally Closed Check Valves

Requirements for testing normally closed check valves are stated in IWV-3522(b), in part, as follows:

> "Check valves shall be exercised to the position required to fullfill their function... Valves that are normally closed during plant operation and whose function is to open on reversal of pressure differential, shall be tested by proving that the disk moves promptly away from the seat when the closing pressure differential is removed and flow through the valve is initiated, or when a mechanical opening force is applied to the disk. Confirmation that the disk moves away from the seat shall be by visual observation, by electrical

signal initiated by a position indicating device, by observation of substantially free flow through the valve as indicated by appropriate pressure indications in the system, or by other positive means. This test may be made with or without flow through the valve."

The staff considers that these requirements may be met if any of the following four methods are used as confirmation:

(1) By demonstrating that the valve can pass the maximum-accident design flow which has been taken credit for in FSAR analyses.

(2) By showing that, for the measured flow, the pressure loss through the valve is such that the valve could only be fully open.

(3) By using a mechanical exerciser which can be observed to move through a full stroke.

(4) By partial disassembly of the valve and manually moving the disk through a full stroke.

Normally closed check valves may have two functions important to safety - to open under certain conditions and to close under others. When this is the case, the exercising test must verify movement to the positions necessary to satisfy both of these functions. Verification of closure for such valves must be accomplished as if the valves were normally open - by positive means, as noted in c above.

e. Leak Rate Testing of Category A Valves By Means of Differential Pressure

IWV-3423 requires that valve seat leakage tests shall be made with the pressure differential in the same direction as will be applied when the valve is performing its function, with certain specified exceptions. When an isolation valve cannot be tested in the required manner (i.e., the conservative direction), because of the configuration of the system, the staff considers the intent of the Code to be met by pressurizing the valve in the non-conservative direction, if a redundant containment isolation valve is leak tested in the correct direction. Wher the system does not have a redundant containment isolation valve (i.e., does not meet Criterion 56 of Appendix A of 10 CFR 50) the single isolation valve is required to be leak tested from the correct direction. For containment isolation valves, correct pressurization direction may be obtained during integrated leak tests.

f. Stroke Times for Category A and B Power-Operated Valves

IWV-3413(a) requires the licensee to specify limiting values of full-stroke times for power-operated valves. These limiting values must be verified each time the valves are full-stroke tested and they must be trended as specified in IWV-3413(c). The limiting values of full-stroke time specified for these valves must assure that all design safety analysis requirements are met and that unacceptable valve degradation or other detrimental conditions, such as overtight packing, does not exist.

For fast acting valves, such as solenoid valves and air-pilot operators, the staff considers two seconds a suitable maximum stroke time. The absence of indicator lights will not normally be considered an adequate basis for relief from stroke timing.

g. Deviations in Leak Test Mediums

IWV-3425 requires that the test medium be specified by the owner. Where leakage rate is to be determined using a different test medium than the service medium, IWV-3423(e) requires that the determination compensate for the test medium difference. Where the licensee proposes to leak test a valve with a different medium than the service medium, as for example in proposing to test pressure isolation valves (PIVs) with air when their service medium is water, the licensee must use a proven correlation between the two mediums for the subject conditions.

h. Valve Testing at Cold Shutdowns

The staff considers the following conditions to apply to inservice testing valves at cold shutdown:

(1) It is understood that the licensee is to commence testing as soon as the cold shutdown condition is achieved but not later than 48 hours after shutdown, and continue until complete or the plant is ready to return to power.

(2) Completion of all valve testing is not a prerequisite to return to power.

(3) Any testing not completed at one cold shutdown should be performed during any subsequent cold shutdowns that may occur before refueling to meet the Code-specified testing frequency.

For planned cold shutdowns, where the licensee will complete all the valves identified in his IST program for testing in the cold shutdown mode, the licensee need not begin testing within the specified 48 hours.

i. Leak Test Requirements for Containment Isolation Valves (CIVs)

All CIVs are required to be classified as Category A or AC. It is the staff's position that the Category A valve leak-rate test requirements of IWV-3421 thru IWV-3424 are met by 10 CFR 50 Appendix J requirements for CIVs. Relief from Sections IWV-3421 thru IWV-3424 for CIVs doesn't present a safety problem since the requirements of IWV-3421 thru IWV-3424 are met by Appendix J testing. The requirements of IWV-3426 and IWV-3427 must still be met.

It is the staff's position that when Appendix J, Type C, testing is used in meeting the IWV-3420 requirements for CIVs, and the test is made between two or more valves, the test result obtained must be considered to apply separately to each of the involved valves. As required by IWV-3426, a maximum permissible leakage rate must be specified for each valve and used to determine valve leak-tight integrity. The permissible leakage rate for a valve shall be determined and specified on a basis that assures that the sealing function of the valve has not been excessively degraded. The intent of this requirement is not met by simply using the Appendix J, Type C, test limit of 60% L_a for each individual valve.

The licensee shall comply with the requirements of IWV-3426 and IWV-3427 for all Code Category A and AC valves until relief is granted.

j. Application of Appendix J Review to the IST Program

The Appendix J review for this plant is a completely separate review from the IST program review. However, with regard to valves subjected to Type C tests, the determinations made by that review are directly applicable to the IST program. Should the Appendix J program be amended, the licensee is required to amend the IST program accordingly.

k. Leak Testing of Valves Which Perform a Pressure Isolation Function

There are several safety systems connected to the reactor coolant pressure boundary that have design pressures that are below the reactor coolant system operating pressure. It is required that there be redundant isolation valves forming the interface between these high and low pressure systems to prevent the low pressure systems from being subjected to pressures which exceed their design limits. In this role, the valves are performing a pressure isolation function.

The redundant isolation provided by these valves regarding their pressure isolation function is important. It is considered necessary to provide assurance that the condition of each of these

The redundant isolation provided by these valves regarding their pressure isolation function is important. It is considered necessary to provide assurance that the condition of each of these valves is adequate to maintain this redundant isolation and system integrity.

From a review of the ISI Program the staff finds that the licensee has elected to leak test pressure-isolation valves to verify integrity. It is the staff's position that, when leak-rate testing is used to verify the integrity of pressure isolation valves, the leakage limits selected by the licensee must assure that valve sealing function has not excessively degraded. The staff does not consider it acceptable to consider relief valve capacity in setting pressure isolation valve leakage limits. The staff recommends a leakage limit for pressure isolation valves of 0.5 gpm per nominal inch of valve size with a maximum leakage rate of 5 gpm.

2. Program

The valve portion of the IST program was examined to verify that all valves important to safety are included in the program and are subject to the testing required by the Code.

The following valves and systems, which apparently should be considered important to safety, were not included in the program:

SYSTEMS

- Fuel Oil Transfer System

VALVES

- Diesel Generator Air Start valves

In discussions with the staff, the licensee indicated that their basis for identifying systems for inclusion in their program was ASME Section XI and its referenced basis for classification of components; i.e., Regulatory Guide 1.26. The licensee has interpreted this guidance provided by Regulatory Guide 1.26 as not requiring systems that contain oil. The staff considers this interpretation too narrow and requires that the licensee address all systems important to safety in its program for inservice testing pumps and valves. This may result in inclusion of systems that contain oil.

By letter dated February 10, 1984, the staff requested that the licensee justify the omission of these valves or revise the IST program to include them. In response, by letter of March 29, 1984, the

licensee informed the staff that the Fuel Oil Transfer System valves and the diesel generator air-start valves will be incorporated into the next revision (i.e., the second ten-year IST program) of the IST program. This program is currently expected to be completed in July 1984.

3. General Requests for Relief

a. Relief Request

The licensee has requested relief for all safety-related, power-operated valves from the requirements of IWV-3413(b) to measure stroke time to the nearest second or 10% of the maximum allowable stroke time, whichever is less, whenever the valves are full-stroke tested. The licensee proposes to measure the stroke time of all of these valves to the nearest second.

Licensee's Basis for the Requesting Relief

For valves with stroke times less than 10 seconds this would require measuring stroke times to within a fraction of a second. Valve timing is performed using a stopwatch either by directly observing valve movement or by observing remote position indicators. Neither method can be relied upon to yield results with accuracy of less than a second.

Evaluation

As stated in Section C.1.F, it is the staff's position that there are two limiting values of stroke time; i.e., the maximum permissible time for the system to go open for injection or closed for isolation and the criteria by which a change in stroke time from the previous test differs from the change (increase) allowed by the Code. Stroke timing is a valuable means for determining unacceptable valve degradation or other detrimental conditions, such as overtight packing. We consider a change in stroke time of less than one second to be insignificant in fulfilling both purposes of this test. We, therefore, approve the licensee's proposal to measure stroke time to the nearest second.

b. Relief Request

The licensee has requested relief for the valves listed below from the requirement of IWV-3300. This section of the Code requires that valves with remote position indicators, which during plant operation are inaccessible for direct observation, shall be visually observed at least as frequently as scheduled refueling

outages. At least one observation shall be made every 2 years to verify that remote valve indications accurately reflect valve operation. The licensee proposes to verify valve open indication/open position (energized) by normal system parameters during operation and to verify the valve shut indication/shut position (deenergized) by Appendix J leak testing during refueling outages.

Valves affected by this general request are the following:

Valve	Size (in)	Valve	Size (in)	Valve	Size (in)
E41-PV1218D	1.0	CAC-PV1200B	1.0	CAC-SV1213A*	1.0
E41-PV1219D	1.0	CAC-PV1205E	1.0	CAC-PV1225B	1.25
E41-PV1220D	1.0	CAC-PV1209A	1.0	CAC-PV1225C	2.0
E41-PV1221D	1.0	CAC-PV1209B	1.0	CAC-PV1227A	1.0
E11-F037A	0.75	CAC-PV1209D	1 0	CAC-PV1227B	1.0
E11-F037B	0.75	CAC-PV1211E	1.25	CAC-PV1227C	1.0
E11-F037C	0.75	CAC-PV1211E	1.0	CAC-PV1227E	1.0
E11-F037D	0.75	CAC-PV1215E	1.0	CAC-PV1231B	1.0
E11-F043A	0.75	CAC-PV1218C	2.0	IA-PV1204B	0.75
E11-F043B	0.75	CAC-PV1219B	0.75	IA-PV1204C	0.75
E11-F043C	0.75	CAC-PV1219C	0.75	TIP V1,V2,V3,V4	0.38
E11-F043D	0.75	CAC-SV4409-1*	0.5	CAC-SV1218A*	1.0
RXS-SV4186	0.5	CAC-SV4409-3*	0.5	CAC-SV4409-2*	0.5
RXS-SV4187	0.5	CAC-SV4410-1*	0.5	CAC-SV-4409-4*	0.5
RXS-SV4188	1.0	CAC-SV4410-3*	0.5	CAC-SV34410-2*	0.5
RXS-SV4189	1.0	CAC-SV4540*	0.5	CAC-SV4410-4*	0.5
RXS-SV4192	0.5	CAC-PV1220C**	2.0	CAC-SV4541*	0.5

*Unit No. 1 only
**Unit No. 2 only

Licensee's Basis for Requesting Relief

These valves will require disassembly of actuator components to verify operation. Additionally, each valve has minimal stroke time (less than one second) and stem travel. The accurate visual verification of valve operation is not possible due to the minimal stem travel and short stroke period. This visual observation would not contribute significantly to the assurance of safe and proper valve operation.

Evaluation

We agree with the licensee that visual testing of these small valves is not a practical method for verifying that a change in indicator light unequivocally confirms a change in valve position. However, it is the staff's position that a positive correlation must be achieved so as to negate false indications;

e.g., from valve-stem separation or faulty electric circuits. We approve the licensee's proposal to use system parameters (flow, temperature, pressure) that are affected by the valve position as a means to verify the open indicator light and to leak test during each refueling to verify the closed indicator light. This schedule meets the intent of the Code and is acceptable.

c. Relief Request

The licensee has requested relief for the safety-related solenoid valves listed below from the requirement of IWV-3300 to verify remote valve position indication and from the requirements of IWV-3410 (i.e., subsections IWV-3411 through IWV-3417) to test operability, stroke time, and fail-safe actuation. The licensee proposes that these valves be verified to open by normal system parameters during operation and verified to close during Appendix J leak testing at refueling outages.

Valves affected by this general exception:

CAC-SV1259-1**, CAC-SV1263-1**, CAC-SV1218A**,
CAC-SV1259-2**, CAC-SV1263-2**, CAC-SV1213A**,
CAC-SV1259-3**, CAC-SV1263-3**, TIP Nitrogen Solenoid valves,
CAC-SV1259-4**, CAC-SV1263-4**

**Unit No. 2 only

Licensee's Basis for Requesting Relief

Solenoid valves that are included in the ISI valve test program were incorporated due to their upgrading to containment isolation valves. Solenoid valves were never designed to meet other test requirements of the valve program (with exception of Category A requirements). The general installation/design features make it impossible to perform the following valve periodic tests: Exercising, stroke-time, fail-safe, and valve-position indicator verification, and a code exception is requested.

Evaluation

It is the staff's position that all valves that are important to safety shall be tested to the extent that provides an acceptable level of assurance that the valves will operate if and when called upon. Experience has shown that the opening-closing action of a solenoid can degrade through reaction of the valve's polymeric seals with trace amounts of oil in the air actuating medium. As a minimum, we consider that these valves should have stroke and fail-safe tests performed. Acoustical techniques with a stethoscope have been used for this type of test. We, therefore, do not approve the licensee's request for relief and we require that additional consideration be given to assuring the operability of

solenoid valves by means other than full-open and full-closed positions.

4. Specific Requests for Relief

a. Control Rod Drive System

(1) Relief Request

The licensee has requested specific relief for Category B valves C11-CV126 and C11-CV127 (Control Rod Drive Scram-Inlet and Exhaust) and for Category C valve C11-114 (Control Rod Drive-Scram Discharge Header Check) from the requirements of IWV-3411 to exercise these valves once every three months and from the requirement of IWV-3415 to verify the valves' fail-safe actuation. The licensee proposes to perform these tests by an alternative procedure.

Licensee's Basis for Requesting Relief

These valves operate in coincidence to rapidly insert control rods. Valves will be tested in accordance with plant Technical Specification 4.1.3.2. This requires testing of all control rods prior to thermal power exceeding 40% of rated thermal power following core alterations or after a reactor shutdown exceeding 120 days. Also, 10% of the control rods will be tested, on a rotating basis, at least once per 120 days of operation.

Evaluation

Valves C11-CV126 and C11-CV127 are small (0.5-inch and 0.75-inch) regulating valves that provide inlet and exhaust flow of drive water for each of 137 Control Rod Drive (CRD) units. We consider it impractical to test each of these CRD units (i.e., valves and fail-safe actuators) every three months, by scramming all control rods, to meet the required frequency of the Code. The licensee has demonstrated that these valves are exercised at least once per fuel cycle and 10% are tested each 120 days. In addition, all 137 CRD units are actuated if the reactor trips from power since all control rods are scrammed. We consider that these tests will provide an acceptable level of verification of operability of these small (≤1") valves. We, therefore, approve the licensee's request for relief.

(2) Relief Request

The licensee has also requested relief for Category B valves C11-CV126 and C11-CV127 from the requirement of IWV-3413 to measure the stroke time of these CRD Scram valves. The

licensee proposes to substitute the timing of the total scram function as a measurement of the operability of these valves.

Licensee's Basis for Requesting Relief

Same as in Section 4.a.1 above

Evaluation

The Brunswick Technical Specifications (3.1.3.2) limit to 7 seconds the maximum scram insertion time of each control rod from the fully withdrawn position, with time zero based on the time when the scram pilot-valve solenoids are deenergized. In addition, Technical Specification 3.1.3.3 sets limits for the average scram insertion times of all OPERABLE control rods from any of four fully or partially withdrawn positions. Since these scram times include the stroke times of both the inlet and exhaust CRD Scram valves, we agree that measurement of scram time, on frequencies approved in Section 4.a.1, will be an acceptable alternative for measuring the stroke time of each of the valves in the 137 CRD Units.

b. HPCI

(1) Relief Request

The licensee has requested specific relief for Category B valves E41-V8 and E41-V9 (HPCI Turbine Stop and Control valves respectively) from the requirement of IWV-3413(b) to measure stroke time quarterly.

Licensee's Basis for Requesting Relief

These 10-inch gate valves regulate steam to the HPCI turbine. Operability of these valves is adequately demonstrated by turbine operation. Valve position is steam line pressure dependent, and therefore will not repeatedly throttle to the same position. During turbine operation, these valves move in response to control signals.

Evaluation

We agree with the licensee's basis that the safety-related action required of these valves is that they open to the extent required to pass the design flow of steam to the HPCI turbine. Therefore, if the HPCI turbine and pump operate satisfactorily then these valves must also be operable. However, as discussed in Section C.1.f and C.3.a of this Safety Evaluation, the staff considers stroke timing to have another beneficial purposes, i.e., to identify degradation of

the valve. Therefore, relief from the Code's requirement is not given, and the licensee shall stroke time these two valves quarterly and trend the results to monitor detrimental changes.

(2) Relief Request

The licensee has requested specific relief for Category B valve E41-F006 (HPCI System Inlet to Feedwater System - Isolation) from the requirement of IWV-3411 to exercise this valve once every three months and proposes to perform this test during cold shutdown.

Licensee's Basis for Requesting Relief

This valve cannot be opened with normal operating Reactor Coolant System pressure differential across the valve. Valve design precludes the valve being opened until cold shutdown when the pressure differential across the valve is low enough to allow valve operation.

Evaluation

This 14" gate valve isolates the HPCI discharge line from the Feedwater System and is normally closed so as to provide containment and pressure isolation. The valve cannot be opened during normal operation; therefore, we approve the requested relief as provided by the Code.

c. Core Spray

Relief Request

The licensee has requested specific relief for Category C valves E21-F006A and E21-F006B (Core Spray Injection - Check) from the quarterly exercising frequency required by IWV-3521 and proposes to test these valves during refueling outages.

Licensee's Basis for Requesting Relief

The only way to verify forward flow through these valves is to inject water from the Core Spray System through the valves into the reactor. Using this method during normal operation is not practical, as the Reactor Coolant System pressure is higher than the operating (or design) pressure of the Core Spray System. This would also be inserting condensate water into the reactor vessel, which is undesirable during other than refueling outages.

Evaluation

These 10-inch, normally closed, check valves are the inboard of three valves in each Core Spray Injection loop. The licensee performs special leak tests on these valves but does not take credit for their containment isolation capability because they are located inside Containment and are backed up by two Category A valves. Credit is taken for each valve, however, as a pressure isolation boundary. The licensee has demonstrated that it is impractical to verify that the valves pass design flow while the plant is operating. It is also not possible to visually inspect the operation of these valves during plant operation. Therefore, we approve the licensee's proposal to perform forward flow tests during refueling outages.

d. Residual Heat Removal System

(1) Relief Request

The licensee has requested specific relief for Category C valves E11-F050A and E11-F050B (LPCI Injection Check) from the test frequency required by IWV-3521 and proposes to exercise these valves at cold shutdown.

Licensee's Basis for Requesting Relief

The only way to verify forward flow through these check valve is to inject water from the Residual Heat Removal System through the valves into the Reactor Coolant System. This cannot be accomplished during normal operation when the Reactor Coolant System pressure is much greater than the Residual Heat Removal System operating pressure.

Evaluation

These 24-inch, normally closed, check valves are in the same configuration and have the same function in the LPCI loops that valves E21-F006A&B do in the Core Spray System (see Section C.4.c above). The licensee's justification for relief is the same for all four valves. We approve the requested relief.

(2) Relief Request

The licensee has requested specific relief for Category A valves E11-F008 and E11-F009 (RCS Shutdown Suction Isolation), E11-F022 and E11-F023 (Reactor Head Spray Injection Isolation), and E11-F020 A&B (RHR Pump Suction-Torus Isolation) from the quarterly testing frequency requirement of IWV-3411 and proposes to exercise these valves at cold shutdown.

Licensee's Basis for Requesting Relief

These valves are interlocked to Reactor Coolant System pressure to prevent opening during normal operation. Exercising during normal operation could lead to extensive damage to the low pressure Residual Heat Removal System.

Evaluation

All of these valves have containment isolation functions because they communicate directly with either the Reactor Recirculation System (F008 and F009, 20-inch gate valves), the containment atmosphere (F022 and F023, 4-inch gate and globe valves), or the Suppression Pool (F020A and B, 24-inch gate valve). The licensee takes credit for the head of water in the Torus as the redundant isolation boundary for the Suppression Pool (FSAR, Section 7.3.2). These valves also act as pressure isolation valves for the low-pressure portions of the RHR system. The licensee has demonstrated that these valves are interlocked with RCS pressure to maintain this pressure boundary. We agree that these valves should not be exercised while the plant is operating and we approve the requested relief and alternative testing frequency.

(3) Relief Request

The licensee has requested specific relief for Category B valves E11-F004A, B, C, and D (LPCI Suction from Torus) and E11-F006A, B, C, and D (RCS Suction-Isolation) from the test frequency requirement of IWV-3411 and proposes to test these valves at cold shutdown.

Licensee's Basis for Requesting Relief

To test these valves at power would place the plant in a limited condition for operability. The purpose of valve testing is not to put the plant in a restricted operating condition.

Evaluation

Valves F004 A, B, C, and D are 20-inch gate valves that are normally open during plant operation and provide suction for the 4 RHR pumps from the Suppression Pool; i.e., for the Low Pressure Core Injection (LPCI) mode of operation. Closure of any of these valves would isolate one LPCI pump and, per Technical Specification 3.5.3.2, place the plant under a Limiting Condition of Operation. Although the licensee would have 7 days to restore the inoperable LPCI subsystem, an IST test should not restrict the plant's operation.

Valves F006 A, B, C, and D are 20-inch gate valves that provide suction to the 4 RHR pumps from the Reactor Coolant System during normal plant shutdown. The licensee advised the staff that plant operating procedures do not allow these normally closed valves to be opened, during plant operation, while valves F004 A thru D are open. The plant's Operating Procedures also do not allow the LPCI system to operate through the F006 valves. Because of these limitations, the F006 valves cannot be tested during plant operation nor can they be substituted for the F004 in the LPCI valve lineup while the F004 valves are tested. Consequently, we agree with the licensee's basis and approve the requested relief.

e. Standby Liquid Control System

Relief Request

The licensee has requested specific relief for Category AC valves C41-F006 and C41-F007 (SLC Injection) from the quarterly exercising requirements of IWV-3521 and proposes to test these valves during refueling outages.

Licensee's Basis for Requesting Relief

Forward flow verification can only be performed by firing one of the explosively actuated Squib valves and injecting water, using the pumps, into the Reactor Coolant System. This procedure would require realignment from the Standby Liquid Control Tank to the Test Tank which disables the system. Standby Liquid Control must be operable and aligned to the Control Tank during normal operation and refueling for operations involving core alterations.

Evaluation

These two 1.5" check valves provide containment isolation for the SLC system. Valve C41-F007 is located inside containment. We agree with the licensee's basis. Because of the plant's design, these valves cannot be exercised by flow from the SLC except when the flow path from the SLC pump, through these check valves to the Reactor Coolant System, is open. This valve lineup can be achieved only during a refueling outage when one of the outboard explosive valves is opened. The Brunswick Technical Specifications (4.1.5(c)) requires this test every 18 months, at which time forward flow verification through the two check valves will be made. We approve the licensee's alternative and grant the requested relief.

f. Reactor Coolant Recirculation

(1) Relief Request

The licensee has requested specific relief for Category B valves B32-F031A, F031B, F032A, and F032B (Reactor Coolant Recirculation Loop-Isolation) from the testing frequency requirement of IWV-3411 and proposes to exercise these valves and measure stroke time at cold shutdown.

Licensee's Basis for Requesting Relief

These valves cannot be closed during power operations because isolating a loop will trip the reactor. Valve design precludes partial stroking. Technical Specifications require stroking at cold shutdown.

Evaluation

Valves B32-F031A and B are 28" gate valves that provide discharge flow from the Reactor Coolant Recirculation pumps to the reactor. Valves B32-F032A and B are 4-inch valves in bypass lines around valves B32-F031A and B. All of these valves are inside containment. The licensee has demonstrated that these normally open valves cannot be closed during plant operation without affecting the flow of coolant into the reactor. Since these valves cannot be part-stroked, we approve the licensee's request to test these valves during cold shutdown as allowed by the Code.

(2) Relief Request

The licensee has requested specific relief for Category A valves B32-V22 and B32-V30 (Reactor Recirculation Pump Seal and Cooling Water - Containment Isolation) from the requirement of IWV-3411 for quarterly testing and proposes to exercise these valves at cold shutdown.

Licensee's Basis for Requesting Relief

These 0.75-inch valves are in the inlet lines which provide seal and cooling water to the Reactor Recirculation Pumps. Seal and cooling water are required during plant operation. If either valve were to fail in the closed position during exercising, extensive damage could occur to the associated Reactor Recirculation Pump. Valve design precludes part-stroke exercising.

Evaluation

We agree with the licensee's basis and approve the requested relief. The Reactor Recirculation Pumps should not be isolated from their seal and cooling water while the plant is at power. Since the valves cannot be partially stroked we approve the licensee's alternative plan to full-stroke these valves during cold shutdown.

g. Nuclear Steam Supply

(1) Relief Request

The licensee has requested specific relief for Category A valves B21-F022A, B, C, and D and B21-F028A, B, C, and D (Main Steam Isolation) from the test frequency requirements of IWV-3411 and IWV-3415 and proposes to part-stroke these valves every three months and to perform full-stroke, fail-safe, and stroke-timing tests at cold shutdown.

Licensee's Basis for Requesting Relief

Full-stroke exercising results in loss of steam flow from one main steam line to the turbine. These valve are designed for part-stroke exercising with full flow during plant operation.

Evaluation

The Code (IWV-3412) provides the relief sought for these 24-inch valves. We agree with the licensee's basis and approve the alternative proposal to part-stroke these MSIVs every three months and full-stroke them at cold shutdown.

(2) Relief Request

The licensee has requested specific relief for Category AC valves B21-F032A and B (Feedwater Inlet Isolation) from the testing frequency requirement of IWV-3411 and proposes to exercise these valves at cold shutdown.

Licensee's Basis for Requesting Relief

Full-stroke exercising during pla[illegible]eration would require stopping one loop of feedwater fl[illegible]his could result in a reactor scram. Valve control logi[illegible] valve design precludes partial stroke exercising.

Evaluation

These 18-inch feedwater isolation valves are normally-open, motor-operated check valves with flow through them during normal plant operation. We agree with the licensee's basis that full-stroke exercising of either valve, while the plant is operating, would cause a feedwater transient that would result in a reactor scram. It is the staff's position that IST tests should not be performed under such conditions; therefore, we approve the licensee's request and alternative test schedule.

h. Noninterruptible Instrument Air

Relief Request

The licensee has requested specific relief for Category A (Noninterruptible Instrument Air to Primary Containment-Isolation) valves RNA-V101, RNA-V103, IA-PV1204B, and IA-PV1204C from the testing frequency requirement of IWV-3411 and proposes to exercise all of these valves and to observe operation of the fail-safe mechanism of valves IA-PV1204B and C at cold shutdown.

Licensee's Basis for Requesting Relief

Instrument air supplies various components in the primary containment which are essential for normal operation. Loss of instrument air during normal operation could result in a reactor scram or a forced shutdown. Valve design precludes part-stroke exercising.

Evaluation

Valves RNA-V101 and RNA-V103 are 2-inch gate valves and valves IA-PV-1204B and IA-PV-1204C are 0.75-inch globe valves. We agree with the licensee's basis that it is impractical to exercise these valves during plant operation and approve the proposed alternative testing frequency.

i. Service Water

Relief Request

The licensee has requested specific relief for Category C valves SW-V200, SW-V201, SW-V204, and SW-V205 (SW Lubricating Water Pumps Suction) from the operability requirements of IWV-3412 and proposes to use an alternative procedure until plant modifications are completed so that proper testing can be performed.

Licensee's Basis for Requesting Relief

System design does not allow a system lineup to supply a suction from each individual supply source. Therefore, individual exercising of each valve cannot be verified.

Evaluation

Each Brunswick Unit has five Service Water pumps that are provided with lubricating water by two lubricating water pumps. Each lubricating water pump takes suction from four lines, each of which contain one of these valves and all of which are tied togetner. Under the present system configuration, forward flow can be verified only through valves SW-V200 and SW-V201 because these valves have block valves that may be closed to vary the total flow. The operability of valves SW-V204 and SW-V205 cannot be tested because the two lines are intertied with one another and with valves SW-V200 and SW-201. The licensee is currently modifying the system so that each valve may be tested individually. Contingent on this modification being completed in the near future we approve the use of the partial test of only SW-V200 and SW-V201.

j. Containment Atmospheric Monitoring

Relief Request

The licensee has requested specific relief for the following Category A valves (Containment Atmospheric Monitoring-Isolation) from the testing frequency requirement of IWV-3411 and proposes to exercise these valves at cold shutdown.

CAC-PV1211E**, CAC-PV1218C, CAC-PV1220C**, CAC-PV1225B**, CAC-PV1225C, CAC-PV3439**, CAC-PV3440**, CAC-PV3441**, and CAC-PV3442**

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Licensee's Basis for Requesting Relief

To test these valves at power would place the plant in a limited condition for operability. The purpose of valve testing is not to put the plant in a restricted operating condition.

Evaluation

Valves PV1218C and PV1220C are 2-inch gate valves that provide flow for the Torus Level Monitor. The other valves are 1.25-inch gate valves that supply sample flow for monitoring the Containment Atmosphere. These valves are in return lines that are common to more than one monitor. The basis for the licensee's request for

relief is that closure of valves in these loops would isolate more than one monitor and thereby put the plant in a Limiting Condition of Operation (LCO) because there would be less than the number of operable channel required by Technical Specifications for monitoring Torus level or containment atmosphere. We approve the licensee's request to perform these tests during cold shutdown so that the plant will not be placed under an LCO during the test.

k. Primary Containment Isolation Check Valves

Relief Request

The licensee has requested specific relief for Category AC valves B32-V24 and B32-V32 (Reactor Coolant Recirculation), B21-F010A and B (Nuclear Steam Supply), C11-F083 (Scram Discharge Volume), and G31-F039 (Reactor Water Cleanup) from the testing frequency requirements of IWV-3521 and proposes to exercise these valves at refueling.

Licensee's Basis for Requesting Relief

The only way to verify reverse flow closure is by leak testing during Appendix J, Type C leak tests.

Evaluation

Valves B32-V24 and B32-V32 are 0.75" check valves (inside containment) that provide containment isolation for the Control Rod Drive (CRD) water injection line to the Recirculation Pump seals. Valves B21-F010A & B are 18" check valves (inside containment) that provide containment isolation for the two feedwater lines. Valve G31-F039 is a 4" check valve (outside containment) that provides containment isolation for the return line of the Reactor Water Cleanup System. Valve C11-F083 no longer exists in the Scram Discharge line (per telephone conversation with licensee on August 19, 1991). All of these check valves are normally open and cannot be exercised to their closed position while the plant is operating. The licensee proposes to use various procedures to test these valves for closure (their isolation position) by performing reverse flow tests during the Appendix J leak tests. As discussed in Section C.1.c, this alternative is acceptable and we approve the requested relief.

ATTACHMENT 1

SUMMARY OF PUMPS AND VALVES FOR WHICH RELIEF REQUESTS
ARE APPROVED, CONDITIONALLY APPROVED, OR DENIED

TABLE A - SUMMARY TABULATION OF PUMP RELIEF REQUEST EVALUATIONS

Relief Request References			Evaluation		
Pumps	Program Section	SER Section	Denied	Approved	Conditionally Approved
All	Section F.1.a	Section B.2.a		X	
All	Section F.1.b	Section B.2.b		X	
Standby Liquid Control A&B	Section F.1.c	Section B.3.a		X	
	Section F.1.d	Section B.3.b		X	
	Section F.1.e	Section B.3.c		X	
Standby Gas Treatment Blowers A&B	Section F.1.f	Section B.3.d		X	

ATTACHMENT 1

SUMMARY OF PUMPS AND VALVES FOR WHICH RELIEF REQUESTS
ARE APPROVED, CONDITIONALLY APPROVED, OR DENIED

TABLE B.1 - SUMMARY OF GENERAL VALVE RELIEF REQUESTS EVALUATIONS

General Category of Valves	Program Section	SER Section	Evaluation		
			Denied	Granted	Conditionally Granted
All	H.1.a	C.3.a		X	
51 Valves with Minimal Stroke Time	H.1.c	C.3.b		X	
Solenoid Valves	H.1.d	C.3.c	X		

ATTACHMENT 1

SUMMARY OF PUMPS AND VALVES FOR WHICH RELIEF REQUESTS
ARE APPROVED, CONDITIONALLY APPROVED, OR DENIED

TABLE B.2 - SUMMARY TABULATION OF SPECIFIC VALVE RELIEF REQUEST EVALUATIONS

Valves	Program/Section	SER Section	Denied	Approved	Conditionally Approved
Control Rod Scram	H.2.a	C.4.a.1		X	
		C.4.a.2		X	
High Pressure Core Injection	H.2.c	C.4.b.1	X		
	H.2.d	C.4.b.2		X	
Core Spray	H.2.c	C.4.c		X	
Residual Heat Removal	H.2.f	C.4.d.1		X	
	H.2.m	C.4.d.2		X	
	H.2.q	C.4.d.3		X	
Standby Liquid Control	H.2.g	C.4.e		X	
Reactor Recirculation	H.2.h	C.4.f.1		X	
	H.2.j	C.4.f.2		X	
Nuclear Steam Supply	H.2.k	C.4.g.1		X	
	H.2.l	C.4.g.2		X	
Noninterruptible Air	H.2.n	C.4.h		X	
Service Water	H.2.o	C.4.i			X
Containment Atmospheric Monitoring	H.2.p	C.4.j		X	
Primary Containment Isolation	H.2.i.	C.4.k		X	

ATTACHMENT 2

P&IDs USED IN THE STAFF'S REVIEW

Unit	System	Drawing Number
1	Service Water	9527-D-20041
1	Containment Atmospheric Control	25015
1	Control Rod Drive Hydraulic	25016
1	Control Rod Drive Hydraulic	25017
1	Reactor Coolant Recirculation	25018
1	Nuclear Steam Supply	25021
2	High Pressure Core Injection	2523
2	Core Spray	2524
1	Residual Heat Removal	25025
1	Residual Heat Removal	25026
1	Reactor Water Cleanup	25027
2	Reactor Core Isolation Cooling	2529
2	Service Water - Reactor Building	2537
2	Closed Cooling Water	2538
1	Service Air	25042
1	Drywell Drain	25045
1	Standby Liquid Control	25047
1	Reactor Coolant Recirculation	25048
2	Torus Drain and Keep Fill Charging	2698
1	Instrument Air Supply - Reactor Building	70029
1	Instrument Air Supply - Noninterruptible	70077
1	Containment Atmosphere - Monitoring	72018