ENCLOSURE 2

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TECHNICAL EVALUATION REPORT
PUMP AND VALVE INSERVICE TESTING PROGRAM
SAN ONOFRE NUCLEAR GENERATING STATION, UNITS 2 AND 3

Docket Nos. 50-361 and 50-362

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ABSTRACT

This EG&G Idaho, Inc. report presents the results of our evaluation of the San Onofre Nuclear Generating Station, Units 2 and 3, Inservice Testing Program for pumps and valves whose function is safety related.

PREFACE

This report is supplied as part of the "Review of Pump and Valve Inservice Testing Programs for Operating Plants (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.

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1. INTRODUCTION

Contained herein is a technical evaluation of the pump and valve inservice testing (IST) program submitted by the Southern California Edison Company (SCE) for their San Onofre Nuclear Generating Station, Units 2 and 3, for the first ten year interval that began on August 18, 1983.

The licensee's IST Programs through Revision 14 for Unit 2 and Revision 9 for Unit 3, dated May 18, 1990, were 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, 1977 Edition through Summer 1979 Addenda. Any IST program revisions subsequent to those noted above are not addressed in this technical evaluation report (TER). Any IST program revisions should follow the guidance of Generic Letter No. 89-04, "Guidance on Developing Acceptable Inservice Testing Programs."

In their IST Program, SCE has requested relief from the ASME Code testing requirements for specific pumps and valves. These requests have been evaluated individually to determine if the criteria in 10 CFR 50.55a for granting relief has indeed been met. 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 the scope of this review.

Section 3 of this report presents the Southern California Edison Company bases for requesting relief from the Section XI requirements for the San Onofre Nuclear Generating Station, Units 2 and 3, pump testing program, and the EG&G reviewer's evaluations and conclusions regarding these requests. Similar information is presented in Section 4 for the valve testing program.

Category A, B, and C valves which are exercised at cold shutdown and refueling outages and meet the requirements of the ASME Code, Section XI, 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 IST 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

EG&G Idaho reviewed the San Onofre Nuclear Generating Station inservice testing (IST) programs for pumps and valves through Revisions 14 and 9, for Units 2 and 3 respectively, dated May 18, 1990. These programs 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 programs were reviewed by locating and highlighting the components on the appropriate system P&IDs and determining their function in the system. Then the licensee's 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 pertaining to unclear or potential problem areas in the licensee's IST 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 clearly demonstrated that compliance with the Code requirements is impractical or presents a hardship without a compensating increase in safety for the identified system components, and to determine if the proposed alternate testing would provide a reasonable indication of component operability. Where the licensee's technical basis or alternate testing was insufficient, 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 it may not be possible or practical to make the measurements identified in the licensee's IST program, a question or comment was generated requesting clarification.

For pumps, it was verified that each of the seven inservice test quantities of Table IWP-3100-1 were 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 individual valve is performed as required. The proposed testing was evaluated to determined if all valves that were judged to be active Category A, B, and/or C, (other than safety and relief valves) are 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 whether it was an acceptable alternative to the Code requirements.

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.

For valves with remote position indication, the reviewer confirmed that the valve remote position indication is 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 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.

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. 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, 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 the RAI.

At the completion of the review, the RAI was transmitted to the licensee. These questions were later used as the agenda for a working meeting with the licensee. 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 and the working meeting discussions and several conference calls with numerous program revisions. The latest resubmittal, revisions 14 and 9, for Units 1 and 2 respectively, dated May 18, 1990 was received and compared to the previous submittals to identify any changes. The changes were evaluated to determine whether they were acceptable and, if not, they were added to the items that remained open.

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 San Onofre Nuclear Generating Station, Units 2 and 3, IST programs submitted by Southern California Edison Company were examined to verify that all pumps that are included in the programs are subjected to the periodic tests required by the ASME Code, Section XI, except for those pumps identified below for which specific relief from testing has been requested and as summarized in Appendix C. Each Southern California Edison Company basis for requesting relief from the pump testing requirements and the EG&G reviewer's evaluation of that request are summarized below.

3.1 General Relief Requests

3.1.1 Frequency of Testing

3.1.1.1 Relief Request. The licensee has requested relief from testing all pumps, except the auxiliary feedwater pumps, monthly in accordance with the requirements of Section XI, Paragraph IWP-3400, and proposed testing identified the pumps once per quarter.

3.1.1.1.1 Licensee's Basis for Requesting Relief--The experience of the industry has shown that the statistical failure rate of these pumps is such that monthly surveillance testing is not justified. The statistics do, however, justify testing on a quarterly basis. Later editions of the Code allow surveillance testing on a quarterly basis.

Inservice testing shall be accomplished on each pump at least once every three months. The exception to this will be the auxiliary feedwater pumps which will be tested monthly per Technical Specification requirements.

3.1.1.1.2 Evaluation--Later editions of the Code allow quarterly versus monthly pump testing to fulfill IST program requirements. Quarterly pump testing should be sufficient to detect degradation and assure the operability of these safety related pumps. The additional expense of monthly pump testing versus quarterly testing would result in a hardship for the licensee that would not yield a compensating increase in the level of quality and safety.

Based on the determination that the proposed testing provides a reasonable assurance of operational readiness , and that compliance with the Code requirements would result in hardship without a compensating increase in safety, relief may be granted as requested.

3.1.2 Fluid Temperature Measurement

3.1.2.1 Relief Request. The licensee has requested relief from the test requirements of Section XI, Paragraph IWP-4320, to measure the temperature of the liquid being pumped for all pumps in the IST program.

3.1.2.1.1 Licensee's Basis for Requesting Relief--Temperature variations of the fluid being pumped at the reference condition are small and do not have a significant impact on pump differential pressure. The Winter 1979 Addenda deleted this requirement.

3.1.2.1.2 Evaluation--The 1977 Edition through Summer 1979 Addenda of Section XI requires fluid temperature measurement of all pumps in the IST program. Measurement of the other pump parameters provide sufficient information to adequately evaluate pump performance for operability and degradation. The measurement of temperature of the fluid being pumped during pump testing would not provide meaningful data regarding pump degradation since temperature variations are small at reference conditions. Later editions of the Code do not include the requirement to measure the temperature of the pumped fluid. Requiring the measurement of fluid temperature would result in hardship for the licensee without a compensating increase in the level of quality and safety.

Based on the determination that measurement of the other required pump parameters provides reasonable assurance of operational readiness, and that compliance with this Code requirement would result in hardship without a compensating increase in safety, relief may be granted as requested.

3.1.3 Corrective Action Requirements

3.1.3.1 Relief Request. The licensee has requested relief from the corrective action requirements of Section XI, Paragraph IWP-3230, regarding

when a pump must be declared inoperable. The licensee has proposed that corrective action be based on the results of analyses performed to determine the cause of the deviation(s).

3.1.3.1.1 Licensee's Basis for Relief--Relief is requested from the requirements of IWP-3230(b) regarding declaring the pump inoperative prior to an analysis of test results.

There are many causes, external of a pump, which can cause deviations from a reference value. Some causes are: changes in fluid density, buss voltage variations, vibration increases caused by other machines in the area of the pump, and test instruments drifting out of calibration. Some means should be allowed for conducting an analysis prior to determining a pump's operability. The analysis should demonstrate that the pump can still perform its intended function.

All test data shall be analyzed, and pump operability status declared within 96 hours after completion of a test. If a deviation in the test parameters fall within the "Required Action Range," pump operability and corrective action will be based on an analysis determining the cause of the deviation(s). If the cause is determined to be external of the pump, the condition shall be analyzed and accounted for. Where it is determined that instrument calibration is required, this will be performed and the test rerun. If the re-test and/or further analysis indicates the pump cannot perform its intended function, the pump will be declared inoperable.

3.1.3.1.2 Evaluation--If values of test quantities fall within the Required Action Range of Table IWP-3100-2, the Code requires the pump to be declared inoperable and not returned to service until the cause of the deviation has been determined and the condition corrected. However, declaring a pump inoperable does not necessarily require repair or replacement of the pump. Paragraph IWP-3230(c) states that corrective action shall be either replacement or repair per IWP-3111, or an analysis to demonstrate that the condition does not impair pump operability and that the pump will still fulfill its function. The Code also allows instruments to be recalibrated and the test rerun. The licensee has proposed that an

analysis be performed before the pump is declared inoperable. However, they have not demonstrated that complying with this Code requirement is impractical or that it presents an undue burden.

Based on the determination that the licensee has not demonstrated that complying with this Code requirement is impractical or presents an undue burden, relief should not be granted.

3.2 Miscellaneous Pump Relief Requests

3.2.1 Pump Instrumentation

3.2.1.1 Relief Request. The licensee has requested relief from the full-scale range requirements of Section XI, Paragraph IWP-4120, for various instruments for the following pumps. The licensee has proposed utilizing existing instrumentation in the pump monitoring program.

Auxiliary feedwater pumps	P140
Component cooling water pumps	P024, P025, P026
Saltwater cooling pumps	P112, P113, P114, P307
Charging pumps	P190, P191, P192

3.2.1.1.1 Licensee's Basis for Requesting Relief--Relief is requested from the full-scale range requirements of IWP-4120 for the steam driven auxiliary feedwater pump flow, component cooling water pump suction pressure, saltwater cooling pump discharge pressure, and charging pump suction pressure and flow.

The combined requirements of IWP-4110 (accuracy within plus or minus 2 percent of full scale for pressure and flow) and IWP-4120 (full scale less than or equal to three times the reference value) result in an overall measurement accuracy within plus or minus 6 percent of the reference value. Existing installed station instruments, listed above, meet the combined requirement for measurement accuracy within plus or minus 6 percent of the respective reference values although they exceed the IWP-4120 range limit alone.

The Section XI, IWP, tests will be performed utilizing the existing installed instruments for the following pump parameters:

Pump	Parameter	Instrument	Reference Value	Instrument Range (Range/Ref)	Accuracy
P140	flow	FI-4720-2 FI-4725-1	300 gpm	0-1000 (3.3)	1.0%
P024 P025 P026	suction pressure	PI-6313 PI-6318 PI-6322	32.5 psi	0-100 (3.1)	0.5%
P112 P113 P114 P307	discharge pressure	PI-6230 PI-6231 PI-6233 PI-6322	31.1 psi	0-160 (5.1) (5.5) (5.4) (4.7)	0.5%
P190 P191 P192	suction pressure	PI-9284 PI-9285 PI-9286	53.0 psi	0-160 (3.0) (3.5) (3.1)	0.5%
P190 P191 P192	flow	FI-0212	42.7 gpm	0-150 (3.5)	1.0%

3.2.1.1.2 Evaluation. The combined requirements of Paragraphs IWP-4110 and 4120 can result in a measurement accuracy of plus or minus 6% of the reference value. The licensee has proposed using the installed station flow and pressure instruments listed above, which have a total measurement accuracy within plus or minus 3.5% of the reference value, for pump testing. These instruments should be sufficient for evaluating the hydraulic condition of these pumps. Therefore, the licensee's proposed alternative should provide an acceptable level of quality and safety and is a reasonable alternative to the Code requirements.

Based on the determination that the proposed alternative provides an acceptable level of quality and safety, relief from the range requirements of Paragraph IWP-4120 may be granted as requested.

3.2.2 Bearing Temperature Measurement

3.2.2.1 Relief Request. The licensee has requested relief from the bearing temperature measurement requirements of Section XI, Paragraph IWP-3100, for the following pumps. The licensee has proposed that the bearing temperature measurement requirements be waived for these pumps since they are submerged and the bearings are inaccessible.

Diesel fuel oil transfer pumps	P093, P094, P095, P096
Saltwater cooling pumps	P112, P113, P114, P307

3.2.2.1.1 Licensee's Basis for Requesting Relief--Relief is requested from the requirement to measure pump bearing temperature for these submerged pumps. The pump bearings are submerged and are inaccessible.

3.2.2.1.2 Evaluation--Instrumentation for the measurement of pump bearing temperature is not installed. Further, these pumps are submerged and inaccessible, therefore, portable temperature instrumentation cannot be utilized to perform this testing. Compliance with this Code requirement could only be achieved after significant system design changes which would be a hardship for the licensee due to the costs involved. Modifications to enable bearing temperature measurements would not provide a compensating increase in quality or safety since an annual temperature measurement would not provide significant data regarding bearing condition. The bearings would have to be seriously degraded before a significant increase in temperature would be seen. It is unlikely that this indication would provide detection of bearing degradation before pump failure without continuous monitoring.

Based on the determination that compliance with this Code requirement would result in hardship without a compensating increase in safety, relief may be granted as requested.

3.2.3 Flow Rate Measurement

3.2.3.1 Relief Request. The licensee has requested relief from the flow measurement requirements of Section XI, Paragraph IWP-3100, for the

following pumps. The licensee has proposed measuring differential pressure while these pumps are operating in a fixed resistance flow path.

Containment spray pumps	P012, P013
Diesel fuel oil transfer pumps	P093, P094, P095, P096
Auxiliary feedwater pumps	P140, P141
Low pressure safety injection pumps	P015, P016

3.2.3.1.1 Licensee's Basis for Requesting Relief--The pumps referenced in this relief request use a test loop which is a fixed resistance system; therefore, only differential pump head will be measured.

Flow instrumentation is not currently installed in the test loops of these systems. Since the piping test loops are fixed resistance piping systems, the pumps are being tested under the same conditions during each inservice test. Therefore, the intent of IWP-3000 is being met, and test results are comparable to reference tests.

3.2.3.1.2 Evaluation--Section XI requires that the resistance of the system be varied until either the measured differential pressure or the measured flow rate equals the corresponding reference value; then, for all values on Table IWP-3100-1 to be measured or observed and recorded. It is impractical to comply with this test method requirement because the test loops used for quarterly inservice testing of these pumps are not equipped with flow rate instrumentation and were designed such that neither differential pressure nor flowrate can be varied. Compliance with the Code method and frequency requirements would be possible only after significant system modifications, which would be burdensome for the licensee due to the costs involved.

The NRC staff has determined that flow rate should be measured and evaluated together with differential pressure, using the acceptance criteria of Table IWP-3100-2, to determine pump hydraulic performance. However, in cases where flow can only be established through a non-instrumented minimum-flow path during quarterly pump testing, and a path exists at cold shutdowns or refueling outages to perform pump testing under full or substantial flow conditions, the staff has determined that the increased

interval is an acceptable alternative to the Code requirements provided that pump differential pressure, flow rate, and bearing vibration measurements are taken during this testing and that quarterly testing also measuring at least pump differential pressure and vibration is continued. This staff position is outlined in Generic Letter No. 89-04, Attachment 1, Item 9.

Flow rate instrumentation is installed in the low pressure injection header, and the licensee should investigate the feasibility of testing the low pressure injection pumps to the Code requirements using this flow path at a reduced frequency. The licensee should investigate the feasibility of testing the containment spray pumps to the Code requirements using the instrumented the discharge header via the shutdown cooling heat exchanger at a reduced frequency.

Flow rate instrumentation is also installed in the auxiliary feedwater headers to the steam generators. The licensee should investigate the use of this flow path for pump testing at a reduced frequency. Calculation of diesel fuel pump flow rate based on the rate of change of the day tank level would be an acceptable alternative to the Code requirements provided the computational method meets the accuracy requirements of IWP-4110, and the licensee should investigate the feasibility of this alternative. If a fully instrumented flow path is not available for testing these pumps at any frequency, the NRC staff position is that flow rate instrumentation which meets the requirements of IWP-4110 and 4120 must be installed in the system.

Based on the determination that compliance with the Code requirements is impractical, and considering the burden on the licensee, relief from the Code pump testing requirements may be granted for the low pressure safety injection and containment spray pumps provided the licensee conforms to the staff position of Generic Letter No. 89-04, Attachment 1, Item 9. The licensee should investigate methods of determining flow rates for the auxiliary feedwater and diesel fuel oil pumps. An interim period is necessary to give the licensee time to complete their investigation, the test procedures, and any necessary system design changes. Imposition of immediate compliance would result in an extended outage which would be a hardship for the licensee due to the costs involved. While the current testing is not

adequate to fully access the hydraulic condition of these pumps, it does demonstrate that the pumps are operable and should provide reasonable assurance of operational readiness in the interim. Therefore, interim relief may be granted for one year or until the next refueling outage, whichever is greater, to continue the current testing methods for the auxiliary feedwater and diesel fuel oil pumps while the licensee investigates the feasibility of acceptable alternatives.

3.3 Charging Pumps

3.3.1 Pump Vibration Measurement

3.3.1.1 Relief Request. The licensee has requested relief from the measurement accuracy and frequency response range requirements of Section XI, Paragraphs IWP-4510 and 4520(b), for the charging pumps in the chemical and volume control system, P190, P191, and P192. The licensee has proposed using the vibration measurement instrumentation which is currently in use and using the vibration velocity acceptance criteria of OM-6 for these low speed pumps.

3.3.1.1.1 Licensee's Basis for Requesting Relief--The charging pumps are run at a speed of 196 rpm. Vibration monitoring equipment readily available cannot meet Code requirement IWP-4520(b) for measurement of displacement (MILS, i.e., thousanths of an inch) due to their band pass filter which deletes vibration input below 350 cycles per minute (350 rpm).

The most appropriate commercially obtainable instrument for velocity vibration measurement is accurate to 10 Hz. It can be used to measure pump vibration velocity and provides the best information on pump condition available.

This deviation from the Code requirements is acceptable because the readings are repeatable and can be compared with past data to detect trends. Additionally, readings can be compared with the acceptance criteria of OM-6 for evaluation of pump test results. To achieve the OM-6 required calibration range for the very low frequency of the charging pumps would dictate use of custom circuitry and equipment that is not readily available.

The calibration range provided by the station instruments and OM-6 requirements are as follows (both a meter/analyzer and pick-up must be used to take readings):

Instruments in use for IST vibration measurements

For the 810 analyzer:

Displacement:	10 - 10,000 Hz ± 2% full scale
Velocity:	15 - 10,000 Hz ± 2% full scale

For the 970 pick-up:

Both displacement and velocity:	10 - 10,000 Hz ± 10% full scale

For the 308 meter:

Both displacement and velocity:	15 - 1000 Hz ± 2% full scale

For the 544 pick-up:

Both displacement and velocity:	15 - 160 Hz ± 5% full scale

IWP tests will be performed with station instruments for the pump parameters discussed above using the requirements of OM-6 for velocity vibration acceptance criteria.

3.3.1.1.2 Evaluation--The licensee has proposed using vibration measurement instrumentation with a lower calibration limit of 10 to 15 Hz (600 to 900 rpm), or about 3 to 4.5 times the rotational speed of the charging pumps, and with a loop measurement accuracy that is less conservative than the Code requirements. Section XI requires a frequency response range from 1/2 minimum speed to at least maximum pump shaft rotational speed with a measurement loop accuracy of ±5%, and OM-6 requires a frequency response range from 1/3 minimum pump shaft rotational speed to 1000 Hz. Pump bearing degradation would generally result in increased amplitudes at frequencies 10 to 100 times the rotational speed of the pump. However, many mechanisms of pump mechanical degradation, such as rotor imbalance, instability, misalignment and mechanical looseness, are evident at frequencies less than 3 times the pump rotational speed. The licensee has stated that vibration measurements obtained using this instrumentation are repeatable. However, the licensee has neither indicated the degree of

repeatability nor stated that measurements will be taken and trended below frequencies of 10 Hz. The licensee has not adequately demonstrated that the procurement of vibration measurement instrumentation that is accurate over a wider frequency range would result in hardship without a compensating increase in safety or quality. Therefore, relief from the Code measurement accuracy and frequency response range requirements should not be granted.

4. VALVE TESTING PROGRAM

The San Onofre Units 2 and 3 IST programs submitted by the Southern California Edison Company were examined to verify that all valves that are included in the programs are subjected to the periodic tests required by the ASME Code, Section XI, 1977 Edition through Summer 1979 Addenda, 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 staff positions and staff approved alternatives of Generic Letter No. 89-04. Each Southern California Edison Company basis for requesting relief from the valve testing requirements and the reviewer's evaluation of that request are summarized below and grouped according to system and valve category. All relief requests and evaluations are applicable to both Units 2 and 3 unless otherwise noted. If valve and/or relief request numbers differ between Units, the numbers for Unit 3 will be stated in parentheses immediately following those for Unit 2.

4.1 General Relief Requests

4.1.1 Cold Shutdown Testing

4.1.1.1 Relief Request. The licensee has requested relief from the cold shutdown testing requirements of Section XI, Paragraph IWV-3412(a), that all Category A, B, and C valves which cannot be exercised during plant operation be full-stroke exercised at cold shutdowns. The licensee has proposed that cold shutdown testing be terminated when the plant is ready to return to power, and that valve testing which is not completed during a cold shutdown be performed during subsequent cold shutdowns.

4.1.1.1.1 Licensee's Basis for Requesting Relief--If a plant cold shutdown is of such short duration that all of the cold shutdown testing cannot be completed as required, then the plant startup can be delayed for this testing. This has not been required of other plants with approved Inservice Testing Programs.

Valve testing at cold shutdown shall commence not later than 48 hours after cold shutdown and continue until required testing is completed or the plant is ready to return to service. Completion of all required valve testing is not a requisite to plant startup. Valve testing which is not completed during a cold shutdown will be performed during subsequent cold shutdowns to meet the Code specified testing requirements. No valve need be tested more often than once every 90 days. For planned cold shutdowns, exception to the 48 hours may be taken, if testing of all the "Cold Shutdown" valves identified in the IST program will be completed before return to power operation.

4.1.1.1.2 Evaluation--Requiring completion of all cold shutdown testing prior to plant restart would be a hardship for the licensee because it could result in costly extensions of cold shutdowns. The NRC staff does not require licensees to complete all testing identified for the cold shutdown frequency prior to startup of the plant from cold shutdown. However, the licensee should comply with the following guidelines for testing components during cold shutdowns:

(a) The licensee is to commence testing as soon as the cold shutdown condition is achieved, but no later than 48 hours after shutdown, and is to continue testing until complete or the plant is ready to return to power.

(b) Any testing not completed during one cold shutdown should be performed during subsequent cold shutdowns starting from the last test performed at the previous cold shutdown.

(c) For planned cold shutdowns, where ample time is available and testing all components identified for the cold shutdown test frequency in the IST program will be accomplished, exceptions to the 48 hours may be taken.

The licensee's relief request conforms to this NRC staff approved alternative and would, therefore, provide reasonable assurance of operational readiness.

Based on the determination that the proposed testing provides reasonable assurance of operational readiness, and that compliance would result in hardship without a compensating increase in safety, relief may be granted as requested.

4.1.2 Rapid-Acting Valves

4.1.2.1 Relief Request. The licensee has requested relief from the stroke time trending and corrective action requirements of Section XI, Paragraph IWV-3417(a) for all power operated valves with stroke times of 5 seconds or less. The licensee has proposed declaring these valves inoperable when their stroke time exceeds their maximum stroke time value.

4.1.2.1.1 Licensee's Basis for Requesting Relief--It has been observed through surveillance testing and corrective action that the repeatability of valve stroke times for valves with short stroke times is sporadic and independent of degradation.

Valves with stroke times of 5 seconds or less with an increase in stroke time of 50% or more shall not have the test frequency increased. However, if a valve stroke time does exceed its maximum stroke time value, it shall be declared inoperable.

4.1.2.1.2 Evaluation--For valves with rapid stroke times, compliance with the stroke time trending and corrective action requirements of the Code is impractical because much of the difference in stroke times from test to test comes from inconsistencies in the operator or timing device. Therefore, compliance with the Code requirements would be burdensome since it would often result in costly maintenance when no degradation has actually occurred. An alternative acceptable to the staff regarding stroke time measurements for rapid-acting valves is explained in detail in Generic Letter 89-04, Attachment 1, Item 6. The licensee has not provided a technical justification for their proposed alternate testing that demonstrates this testing provides a reasonable alternative to the Code requirements, and that degradation will be detected and corrective action taken prior to valve failure. The licensee's proposed test would provide

reasonable assurance of operational readiness if the maximum limiting value of full-stroke time is changed to 2 seconds for all valves designated as "rapid-acting valves" in the licensee's IST program.

Based on the determination that the Code requirements are impractical, and considering the burden on the licensee if Code requirements were imposed, relief may be granted provided the licensee conforms to the NRC staff approved alternative outlined in Generic Letter 89-04, Attachment 1, Item 6.

4.1.3 Comparison of Stroke Time Measurements

4.1.3.1 Relief Request. The licensee has requested relief from the stroke time trending and corrective action requirement of Section XI, Paragraph IWV-3417(a), that stroke time measurements be compared to the previous test times. The licensee has proposed that stroke times be compared to the average stroke time since the last maintenance that could have affected stroke time (or last three stroke times, which ever is greater).

4.1.3.1.1 Licensee's Basis for Requesting Relief--Comparison with the previous test often causes a needless and inappropriate entry into the increased frequency of testing. A onetime test result of low value can often occur immediately after valve maintenance in which, for example, the stem is lubricated. The following test say, after a normal 92 day interval, can then result in a return to the normal valve stroke time. If the difference between these two times is more than that allowed (25% or 50%) the valve will be put in the increased frequency of testing and require corrective action. This happens frequently and causes valves to be the subject of corrective action even when they are functioning properly and normally.

If an increase in stroke time of 25% or more from the average stroke time since the last maintenance that could have affected stroke time (or the last three stroke times, which ever is greater) for valves with stroke times greater than 10 seconds, or 50% or more for valves with stroke times less

than or equal to 10 seconds, is observed, the test frequency shall be increased to once each month until corrective action is taken, at which time the original test frequency shall be resumed. In any case, any abnormality or erratic action shall be reported.

4.1.3.1.2 Evaluation--Using a reference or average value of valve stroke time for comparison of test data versus the previous stroke time is a reasonable alternative to Code requirements. While still being in compliance with the Code, a continual increase in valve stroke time over a long period could result in significant valve degradation without the test frequency being increased or corrective action being taken. This is because the test data is compared only to the previous stroke time and each incremental increase in stroke time could be less than that specified in Paragraph IWV-3417(a). Comparing test results to a reasonably derived reference, or, an average stroke time, insures that such an oversight could not occur, while at the same time eliminating unnecessary corrective action. However, the reference value of stroke time used for comparison of test data should be established when the valve is known to be in good operating condition. The licensee's proposed alternative does not include this provision.

Based on the determination that the proposed alternative would provide an acceptable level of quality and safety if reference values of stroke time are established when the valve is known to be in good operating condition, relief may be granted on the condition that the licensee incorporates this provision into the procedures for establishing reference values for valve stroke times.

4.2 Safety Injection System

4.2.1 Category A/C Valves

4.2.1.1 Relief Request. The licensee has requested relief from the exercising method and frequency requirements of Section XI, Paragraph IWV-3522, for the safety injection tank discharge check valves, 12-040-A-551, 12-041-A-551, 12-042-A-551, and 12-043-A-551. The licensee

has proposed verifying the full-stroke capability of these valves with disassembly and inspection on a sampling basis during refueling outages.

4.2.1.1.1 Licensee's Basis for Requesting Relief--These check valves cannot be exercised during power operation without violating the Technical Specification requirements for safety injection tank pressure and level bands. In addition, these valves cannot be full-stroke exercised except under actual loss of coolant accident conditions, i.e. no flow path available.

Because of its effect on the operability of the associated equipment, performing these tests requires considerable manipulation of plant conditions and imposes significant restrictions on the structure of a refueling outage. Because of the need for draining systems in order to disassemble these valves, performance of these tests generates a significant amount of radioactive liquid waste. Significant radiation exposure is received by personnel performing the tests and significant O&M expenses are incurred for each test. As a consequence, there is a clear advantage in reducing the number of these tests required in each refueling.

These valves will be partially disassembled, inspected, and manually full-stroked at each refueling outage on a rotating basis (one valve per refueling). However, if it is found that the full-stroke capability of the disassembled valve is in question, the other three valves will be similarly disassembled, inspected, and manually full-stroked during the same outage. Photographs of the valve "as found" internals will be taken at each inspection and retained as records, taking note of any abnormalities observed.

4.2.1.1.2 Evaluation--Demonstration of a full-stroke exercise of check valves with flow requires the passage of the maximum required accident flow rate through the valves. The only full-flow test path for exercising these valves is into the RCS. These valves cannot be full- or part-stroke exercised with flow quarterly during power operation because RCS pressure is greater than the pressure of the safety injection tanks. During cold shutdown, a full-stroke exercise cannot be accomplished because it could

lead to a low-temperature overpressurization of the RCS due to the lack of expansion volume necessary to accommodate the large quantity of water which must be discharged into the RCS. Further, this flow path is not equipped with the flow rate instrumentation necessary to verify a full-stroke of these check valves.

The Code required testing could only be performed quarterly after significant system modifications, such as installation of an instrumented full flow test loop for exercising these valves, which would be burdensome for the licensee due to the cost involved. Further, the addition of valves and piping penetrations could result in reduced plant reliability.

The licensee has proposed verifying the full-stroke open capability of these check valves by sample disassembly and inspection. The NRC staff positions regarding check valve disassembly and inspection are explained in detail in Generic Letter No. 89-04, "Guidance on Developing Acceptable Inservice Testing Programs." The minutes on the public meetings on Generic Letter No. 89-04 regarding Position 2, Alternatives to Full Flow Testing of Check Valves, further stipulate that a partial stroke exercise test using flow is expected to be performed after disassembly and inspection is completed but before the valve is returned to service. This post-inspection testing provides a degree of confidence that the disassembled valve has been reassembled properly and that the disk moves freely. The licensee should investigate methods of part-stroke exercising these check valves during cold shutdowns and after reassembly. One of the options the licensee may consider is a reduced flow test using the safety injection accumulators.

The licensee's proposed alternative, combined with a part-stroke exercise test during cold shutdowns and after reassembly, would provide reasonable assurance of operational readiness. However, the NRC staff considers valve disassembly and inspection to be a maintenance procedure with inherent risks which make its use as a routine substitute for testing undesirable when other testing methods are possible. It may be possible to verify that these valves move to their fully open position by use of non-intrusive diagnostic testing techniques during a reduced flow test at least once each refueling outage.

Based on the determination that the Code required testing is impractical, and considering the burden on the licensee if Code requirements were imposed, relief may be granted provided the licensee performs a partial flow test of the disassembled valves before they are returned to service and part-stroke exercises all valves during cold shutdowns. The licensee should actively pursue the use of non-intrusive diagnostic techniques to demonstrate that these valves swing fully open during partial flow testing. If another method is developed to verify the full-stroke capability of these check valves, this relief request should be revised or withdrawn.

4.2.2 Category C Valves

4.2.2.1 Relief Request. The licensee has requested relief from the exercising frequency requirements of Section XI, Paragraph IWV-3522, for the high pressure safety injection pumps suction check valves, 10-006-C-675 and 10-008-C-675. The licensee has proposed part-stroke exercising these valves quarterly and full-stroke exercising them during refueling outages.

4.2.2.1.1 Licensee's Basis for Requesting Relief--These check valves cannot be exercised during power operation as the high pressure safety injection pumps cannot overcome reactor coolant system (RCS) operating pressure. These check valves cannot be exercised during cold shutdown as high pressure safety injection pump flow could result in a low temperature overpressurization of the RCS.

These valves will be full-stroke exercised at each refueling, while using the high pressure safety injection pumps to full the refueling pool canal, and part-stroke exercised quarterly during routine inservice testing of the high pressure safety injection pumps.

4.2.2.1.2 Evaluation--Valves 10-006-C-675 and 10-008-C-675 cannot be full-stroke exercised during power operation since the high pressure safety injection pumps cannot achieve full flow into the RCS at normal operating pressure. These valves cannot be full-stroke exercised during cold shutdowns due to the possibility of an RCS low temperature overpressurization. The Code required testing could only be performed after

significant system modifications, such as installation of an instrumented full flow test loop for exercising these valves, which would be burdensome for the licensee due to the cost involved. The licensee's proposal to part-stroke exercise these valves quarterly and full-stroke exercise them during refueling outages should provide reasonable assurance of operational readiness and is, therefore, an acceptable alternative to the Code requirements.

Based on the determination that compliance with the Code requirements is impractical, that the proposed testing would provide reasonable assurance of operational readiness, and considering the burden on the licensee if Code requirements were imposed, relief may be granted as requested.

4.2.2.2 Relief Request. The licensee has requested relief from the exercising frequency and method requirements of Section XI, Paragraph IWV-3522, for the low pressure safety injection pumps suction check valves, 16-077-C-645, 16-084-C-645, 16-199-C-645. and 16-201-C-645. The licensee has proposed part-stroke exercising these valves quarterly and verifying the full-stroke capability of these check valves with disassembly and inspection on a sampling basis during refueling outages.

4.2.2.2.1 Licensee's Basis for Requesting Relief--These check valves cannot be exercised during power operation as the low pressure safety injection pumps cannot overcome normal RCS pressure. During cold shutdown and refueling the low pressure safety injection pumps are used for shutdown cooling system which bypasses these check valves by taking suction directly from the RCS.

Because of its effect on the operability of the associated equipment, performing these tests requires considerable manipulation of plant conditions and imposes significant restrictions on the structure of a refueling outage. Because of the need for draining systems in order to disassemble the valves, performance of these tests generates a significant amount of radioactive liquid waste. Significant radiation exposure is received by personnel performing the tests and significant O&M expenses are incurred for each test. As a consequence, there is a clear advantage in reducing the number of these tests required in each refueling.

These valves will be partial-stroke exercised during periodic tests of the low pressure system injection pumps during normal operation. Mini-flow tests will be conducted every three months. The valves will be partially disassembled, inspected, and manually full-stroked at each refueling outage on a rotating basis (one valve per refueling). However, if it is found that the full-stroke capability of the disassembled valve is in question, the other three valves will be similarly disassembled, inspected, and manually full-stroked during the same refueling outage. Photographs of the valve "as found" internals will be taken at each inspection and retained as records, taking note of any abnormalities observed.

4.2.2.2.2 Evaluation--These valves cannot be full-stroke exercised during power operation because the low pressure safety injection pumps do not develop sufficient head to overcome normal RCS pressure. These valves cannot be full-stroke exercised during cold shutdown because they are bypassed when the low pressure safety injection pumps are utilized for required shutdown cooling. Compliance with the Code exercising frequency requirements could only be accomplished by significantly redesigning the system, which would be burdensome for the licensee due to the costs involved.

However, the licensee has not explained why these valves cannot be full-stroke exercised with flow at a refueling outage frequency using the currently installed flow instrumentation. Disassembly, together with inspection, to verify full-stroke capability of check valves is an option only where full-stroke exercising cannot practically be performed by flow or by the other positive means allowed by IWV-3522. Part-stroke exercising these valves quarterly and full-stroke exercising them during refueling outages would provide reasonable assurance of operational readiness.

Based on the determination that the Code requirements are impractical, and considering the burden on the licensee if Code requirements were imposed, relief may be granted to part-stroke these valves quarterly provided they are full-stroke exercised with flow during refueling outages. However, since the licensee has not demonstrated that it is impractical to perform a full-stroke exercise with flow at a refueling outage frequency,

relief should not be granted to allow disassembly and inspection on a sampling basis.

4.2.2.3 Relief Request. The licensee has requested relief from the exercising frequency and method requirements of Section XI, Paragraph IWV-3522, for the safety injection and containment spray pumps combined suction check valves from the refueling water tank, 24-001-C-724 and 24-002-C-724. The licensee has proposed verifying the full-stroke capability of these valves with disassembly and inspection on a sampling basis during refueling outages.

4.2.2.3.1 Licensee's Basis for Requesting Relief--These check valves cannot be exercised during power operation as the low pressure safety injection pumps and the high pressure safety injection pumps cannot overcome normal RCS pressure. These check valves cannot be exercised during cold shutdown as the low pressure safety injection pumps are aligned to take suction from the RCS bypassing the refueling water tank.

Because of its effect on the operability of the associated equipment, performing these tests requires considerable manipulation of plant conditions and imposes significant restrictions on the structure of a refueling outage. Because of the need of draining systems in order to disassemble the valve, performance of these tests generates a significant amount of radioactive liquid waste. Significant radiation exposure is received by personnel performing the tests and significant O&M expenses are incurred for each test. As a consequence, there is a clear advantage in reducing the number of these tests required in each refueling.

These valves will be partially disassembled, inspected, and manually full-stroked at each refueling outage on a rotating basis (one valve per refueling). However, if it is found that the full-stroke capability of the disassembled valve is in question, the other valve will be similarly disassembled, inspected, and manually full-stroked during the same outage. Photographs of the valve "as found" internals will be taken at each inspection and retained as records, taking note of any abnormalities observed.

4.2.2.3.2 Evaluation--These valves cannot be full-stroke exercised during power operation due to the inability of the high and low pressure safety injection pumps to overcome normal RCS pressure. Further, the containment spray pumps cannot be utilized at any time to exercise these valves as the only full flow path is through the containment spray nozzles which, if used, would require considerable manpower for cleanup and could result in equipment damage. These valves cannot be full-stroke exercised during cold shutdown using the low pressure safety injection pumps because they are must be aligned to take suction from the RCS to provide shutdown cooling. The high pressure injection pumps cannot be used to exercise these valves during cold shutdown because of concerns regarding low temperature overpressurization of the RCS. The Code required testing could only be performed after significant redesign of the system, such as the addition of an instrumented full flow test line, which would be burdensome for the licensee due to the costs involved.

However, the licensee has not explained why these valves cannot be part-stroke exercised quarterly and full-stroke exercised with flow at a refueling outage frequency using the currently installed flow instrumentation. Disassembly, together with inspection, to verify full-stroke capability of check valves is an option only where full-stroke exercising cannot practically be performed by flow or by the other positive means allowed by IWV-3522. Part-stroke exercising these valves quarterly and full-stroke exercising them during refueling outages would provide reasonable assurance of operational readiness.

Based on the determination that the Code requirements are impractical, and considering the burden on the licensee if Code requirements were imposed, relief may be granted to part-stroke these valves quarterly provided they are full-stroke exercised with flow during refueling outages. However, since the licensee has not demonstrated that it is impractical to perform a full-stroke exercise with flow at a refueling outage frequency, relief to allow disassembly and inspection on a sampling basis should not be granted.

4.2.2.4 Relief Request. The licensee has requested relief from the exercising frequency and method requirements of Section XI,

Paragraph IWV-3522, for the containment sump outlet check valves, 24-003-C-724 and 24-004-C-724. The licensee has proposed verifying the full-stroke capability of these check valves with disassembly and inspection on a sampling basis during refueling outages.

4.2.2.4.1 Licensee's Basis for Requesting Relief--During normal plant operation there is no water in the containment sump, hence no water is available to flow through these check valves. In addition, these valves may not be part-stroke exercised without draining part of the emergency core cooling system piping. These lines must be filled and vented while in Modes 1, 2, and 3.

Because of its effect on the operability of the associated equipment, performing these tests requires considerable manipulation of plant conditions and imposes significant restrictions on the structure of a refueling outage. Because of the need for draining systems in order to disassemble these valves, performance of these tests generates a significant amount of radioactive liquid waste. Significant radiation exposure is received by personnel performing the tests and significant O&M expenses are incurred for each test. As a consequence, there is a clear advantage in reducing the number of these tests required in each refueling.

These valves will be partially disassembled, inspected, and manually full-stroked at each refueling outage on a rotating basis (one valve per refueling). However, if it is found that the full-stroke capability of the disassembled valve is in question, the other valve will be similarly disassembled, inspected, and manually full-stroked during the same outage. Photographs of the valve "as found" internals will be taken at each inspection and retained as records, taking note of any abnormalities observed.

4.2.2.4.2 Evaluation--These valves cannot be full-stroke exercised during power operation and cold shutdown because the source of water for exercising them with flow is the containment sump, which is normally dry. Full- or part-stroke exercising these valves using flow from the containment sumps could cause contamination of the safety injection

systems, the refueling water storage tank, and/or the reactor coolant system with low quality water which could lead to accelerated corrosion and degradation of these systems.

The Code required testing could only be performed after significant system modifications which would be burdensome for the license due to the cost involved.

The licensee has proposed verifying the full-stroke open capability of these check valves by sample disassembly and inspection. The NRC staff positions regarding check valve disassembly and inspection are explained in detail in Generic Letter No. 89-04, "Guidance on Developing Acceptable Inservice Testing Programs." The minutes on the public meetings on Generic Letter No. 89-04 regarding Position 2, Alternatives to Full Flow Testing of Check Valves, further stipulate that a partial stroke exercise test using flow is expected to be performed after disassembly and inspection is completed but before the valve is returned to service. This post-inspection testing provides a degree of confidence that the disassembled valve has been reassembled properly and that the disk moves freely. The licensee should investigate methods of part-stroke exercising these check valves. One of the options the licensee may consider is a part-stroke exercise test using air combined with diagnostic testing to verify disk movement.

An interim period is necessary to give the licensee time to complete their investigation, the test procedures, and any system design changes necessary to perform post-inspection part-stroke exercising. Immediate compliance could result in an extended outage which would be a burden for the licensee due to the costs involved. The licensee's proposed alternative, while not acceptable for the long term, should provide reasonable assurance of operational readiness in the interim since the incidence of improper reassembly should be low. Therefore, based on the determination that compliance with the Code requirements is impractical, and considering the burden on the licensee if the Code requirements were imposed, interim relief may be granted for one year or until the next refueling outage, whichever is greater. In the interim, the licensee may use disassembly and inspection to verify the full-stroke operability of these check valves without an ensuing part-stroke exercise test with flow.

The NRC staff considers valve disassembly and inspection to be a maintenance procedure with inherent risks which make its use as a routine substitute for testing undesirable when other testing methods are possible. It may be possible to verify that these valves move to their fully open position by use of non-intrusive diagnostic testing techniques during a reduced flow test at least once each refueling outage. The licensee should actively pursue the use of non-intrusive diagnostic techniques to demonstrate that these valves swing fully open during partial flow testing. If another method is developed to verify the full-stroke capability of these check valves, this relief request should be revised or withdrawn.

4.3 Containment Spray System

4.3.1 Category A/C Valves

4.3.1.1 Relief Request. The licensee has requested relief from the exercising frequency and method requirements of Section XI, Paragraph IWV-3522, for the inside containment spray header check valves, 8-004-C-406 and 8-006-C-406. The licensee has proposed verifying the full-stroke capability of these check valves with disassembly and inspection on a sampling basis during refueling outages.

4.3.1.1.1 Licensee's Basis for Requesting Relief--These check valves cannot be exercised tested in any plant mode without resulting in a spray down of the containment.

Because of its effect on the operability of the associated equipment, performing these tests requires considerable manipulation of plant conditions and imposes significant restrictions on the structure of a refueling outage. Because of the need for draining systems in order to disassemble these valves, performance of these tests generates a significant amount of radioactive liquid waste. Significant radiation exposure is received by personnel performing the tests and significant O&M expenses are incurred for each test. As a consequence, there is a clear advantage in reducing the number of these tests required in each refueling.

These valves will be partially disassembled, inspected, and manually full-stroked at each refueling outage on a rotating basis (one valve per refueling). However, if it is found that the full-stroke capability of the disassembled valve is in question, the other valve will be similarly disassembled, inspected, and manually full-stroked during the same outage. Photographs of the valve "as found" internals will be taken at each inspection and retained as records, taking note of any abnormalities observed.

4.3.1.1.2 Evaluation--Full-stroke exercising these valves with flow using the containment spray pumps at any time would result in a containment spray down and equipment damage.

The Code required testing could only be performed after significant system modifications which would be burdensome for the license due to the cost involved.

The licensee has proposed verifying the full-stroke open capability of these check valves by sample disassembly and inspection. The NRC staff positions regarding check valve disassembly and inspection are explained in detail in Generic Letter No. 89-04, "Guidance on Developing Acceptable Inservice Testing Programs." The minutes on the public meetings on Generic Letter No. 89-04 regarding Position 2, Alternatives to Full Flow Testing of Check Valves, further stipulate that a partial stroke exercise test using flow is expected to be performed after disassembly and inspection is completed but before the valve is returned to service. This post-inspection testing provides a degree of confidence that the disassembled valve has been reassembled properly and that the disk moves freely. The licensee should investigate methods of part-stroke exercising these check valves. One of the options the licensee may consider is a part-stroke exercise test using air combined with diagnostic testing to verify disk movement.

An interim period is necessary to give the licensee time to complete their investigation, the test procedures, and any system design changes necessary to perform post-inspection part-stroke exercising. Immediate compliance could result in an extended outage which would be a burden for

the licensee due to the costs involved. The licensee's proposed alternative, while not acceptable for the long term, should provide reasonable assurance of operational readiness in the interim since the incidence of improper reassembly should be low. Therefore, based on the determination that compliance with the Code requirements is impractical, and considering the burden on the licensee if the Code requirements were imposed, interim relief may be granted for one year or until the next refueling outage, whichever is greater. In the interim, the licensee may use disassembly and inspection to verify the full-stroke operability of these check valves without an ensuing part-stroke exercise test with flow.

The NRC staff considers valve disassembly and inspection to be a maintenance procedure with inherent risks which make its use as a routine substitute for testing undesirable when other testing methods are possible. It may be possible to verify that these valves move to their fully open position by use of non-intrusive diagnostic testing techniques during a reduced flow test at least once each refueling outage. The licensee should actively pursue the use of non-intrusive diagnostic techniques to demonstrate that these valves swing fully open during partial flow testing. If another method is developed to verify the full-stroke capability of these check valves, this relief request should be revised or withdrawn.

4.4 Chemical and Volume Control System

4.4.1 Category A/C Valves

4.4.1.1 Relief Request. The licensee has requested relief from the exercising frequency requirements of Section XI, Paragraph IWV-3522, for the charging header inside containment isolation check valve, 2-122-C-554. The licensee has proposed verifying valve closure capability at a refueling outage frequency.

4.4.1.1.1 Licensee's Basis for Requesting Relief--Verifying closure of this valve requires a seat leak test (Appendix "J"). Seat leak testing of this valve requires isolation normal charging and draining a portion of the charging line. This would violate Technical Specification 3.1.2.2 which requires two boration flow paths.

This valve will be verified closed during refueling outages while performing Appendix "J" test. Also, this valve will be exercised open quarterly during routine inservice testing of the charging pumps.

4.4.1.1.2 Evaluation--This valve is a containment isolation check valve located inside containment and is, therefore, inaccessible during reactor operation. The only method available to verify valve closure is leak rate testing which would require a containment entry. Testing this valve during cold shutdowns would result in increased radiation doses to plant personnel. Further, this testing would require a significant amount of time for test equipment setup, test performance, and test equipment removal and could result in a delay in the return to power. These delays, and the increased expense and manpower requirements due to testing at a cold shutdown frequency would result in hardship for the licensee due to the costs involved. Further, due to the infrequent occurrence of cold shutdowns of long duration, the extra expense and manpower requirements necessary to perform this testing during cold shutdowns would not yield a significant increase in quality or safety.

The licensee's proposal to verify valve closure capability during leak testing per Appendix J at least once every two years should provide adequate assurance of operational readiness and is, therefore, a reasonable alternative to the Code requirements.

Based on the determination that full-stroke exercising these valves to the closed position quarterly or during cold shutdowns would result in hardship for the licensee without a compensating increase in safety, relief may be granted as requested.

4.5 Main Steam System

4.5.1 Category C Valves

4.5.1.1 Relief Request. The licensee has requested relief from the exercising method and frequency requirements of Section XI, Paragraph IWV-3522, for the turbine driven auxiliary feedwater pump steam supply check

valves, 4-003-D-620 and 4-005-D-620. The licensee has proposed verifying the reverse flow closure capability of these valves using disassembly and inspection on a sampling basis during refueling outages.

4.5.1.1.1 Licensee's Basis for Requesting Relief--These valves cannot be reverse flow tested during normal operation as there is no positive means of verifying that the valve disc travels to the closed position. The noise level in the immediate area of the valves precludes the use of acoustic sensing devices. In addition, the plant design does not provide for a method of verifying that a pressure differential exists across the valve when it is in the closed position.

Because of its effect on the operability of the associated equipment, performing these tests requires considerable manipulation of plant conditions and imposes significant restrictions on the structure of a refueling outage. Because of the need for draining systems in order to disassemble these valves, performance of these tests generates a significant amount of radioactive liquid waste. Significant radiation exposure is received by personnel performing the tests and significant O&M expenses are incurred for each test. As a consequence, there is a clear advantage in reducing the number of these tests required in each refueling.

These valves will be partially disassembled, inspected, and manually full-stroked at each refueling outage on a rotating basis (one valve per refueling). However, if it is found that the full-stroke capability of the disassembled valve is in question, the other valve will be similarly disassembled, inspected, and manually full-stroked during the same outage. Photographs of the valve "as found" internals will be taken at each inspection and retained as records, taking note of any abnormalities observed.

4.5.1.1.2 Evaluation--The Minutes of the Public Meeting on Generic Letter No. 89-04 state that the use of disassembly to verify closure capability may be acceptable depending on whether verification by flow or pressure measurements is practical. With the present system design, verifying the closure of these valves by leak testing or with reverse flow

is not possible. The Code required testing could only be performed after system modifications, such as the addition of test connections to enable leak rate testing, which would be burdensome for the licensee due to the costs involved.

The Minutes of the Public Meeting on Generic Letter No. 89-04 also state that partial-stroke exercise testing with flow is expected to be performed after valve disassembly and inspection is completed, but before returning the valve to service. This post inspection testing provides a degree of confidence that the disassembled valve has been reassembled properly and that the disk moves freely.

The licensee's disassembly and inspection program, combined with a part-stroke exercise test after reassembly, should adequately determine valve condition and provide a reasonable alternative to the Code requirements. Check valve disassembly is a valuable maintenance tool that can provide a great deal of information about a valve's internal condition and, as such, should be performed under the maintenance program at a frequency commensurate with the valve type and service. However, the NRC staff considers valve disassembly and inspection to be a maintenance procedure that is not equivalent to the Code required exercise testing. This procedure has risks which may make its routine use as a substitute for testing undesirable when some other method of testing is possible. The licensee should actively pursue the use of non-intrusive diagnostic techniques such as acoustics or radiography to demonstrate that these valves close when subjected to reverse flow conditions.

Based on the determination that it is impractical to verify the reverse flow closure capability of these valves by leak testing or observation of system parameters, and considering the burden on the licensee if the Code requirements were imposed, relief may be granted provided the licensee part-stroke exercises the valves to the open position with flow after they have been reassembled. The licensee should investigate ways, other than disassembly and inspection, of verifying the reverse flow closure capability of these valves. If another method is developed to verify the reverse flow

closure capability of these check valves, this relief request should be revised or withdrawn.

4.6 Feedwater System

4.6.1 Category C Valves

4.6.1.1 Relief Request. The licensee has requested relief from the exercising method and frequency requirements of Section XI, Paragraph IWV-3522, for the main feedwater supply check valves, 20-036-C-609 and 20-129-C-609. The licensee has proposed verifying the reverse flow closure capability of these valves using disassembly and inspection on a sampling basis during refueling outages.

4.6.1.1.1 Licensee's Basis for Requesting Relief--These valves cannot be reverse flow checked during power operation without isolating main feedwater flow to the steam generators. In addition, the plant design does not provide for a method of verifying that a pressure differential exists across the valve when it is in the closed position.

Because of its effect on the operability of the associated equipment, performing these tests requires considerable manipulation of plant conditions and imposes significant restrictions on the structure of a refueling outage. Because of the need for draining systems in order to disassemble these valves, performance of these tests generates a significant amount of radioactive liquid waste. Significant radiation exposure is received by personnel performing the tests and significant O&M expenses are incurred for each test. As a consequence, there is a clear advantage in reducing the number of these tests required in each refueling.

These valves will be partially disassembled, inspected, and manually full-stroked at each refueling outage on a rotating basis (one valve per refueling). However, if it is found that the full-stroke capability of the disassembled valve is in question, the other valve will be similarly disassembled, inspected, and manually full-stroked during the same outage. Photographs of the valve "as found" internals will be taken at each

inspection and retained as records, taking note of any abnormalities observed.

4.6.1.1.2 Evaluation--The Minutes of the Public Meeting on Generic Letter No. 89-04 state that the use of disassembly to verify closure capability may be acceptable depending on whether verification by flow or pressure measurements is practical. Testing these valves to the closed position quarterly during power operation would require the isolation of main feedwater flow to the steam generators which could result in a reactor trip. There are no test connections installed in this system to enable leak testing of these valves to verify closure. No instrumentation is installed in this system which would enable closure verification of these valves by measuring the differential pressure across the valves. These valves are not equipped with position indication. Compliance with the Code requirements could only be achieved after a significant redesign of the system, which would be burdensome for the licensee due to the costs involved.

The Minutes of the Public Meeting on Generic Letter No. 89-04 also state that partial-stroke exercise testing with flow is expected to be performed after valve disassembly and inspection is completed, but before returning the valve to service. This post inspection testing provides a degree of confidence that the disassembled valve has been reassembled properly and that the disk moves freely.

The licensee's disassembly and inspection program, combined with a part-stroke exercise test of the valves after reassembly, should adequately determine valve condition and provide a reasonable alternative to the Code requirements. Check valve disassembly is a valuable maintenance tool that can provide a great deal of information about a valve's internal condition and, as such, should be performed under the maintenance program at a frequency commensurate with the valve type and service. However, the NRC staff considers valve disassembly and inspection to be a maintenance procedure that is not equivalent to the Code required exercise testing. This procedure has risks which may make its routine use as a substitute for testing undesirable when some other method of testing is possible. The licensee should actively pursue the use of non-intrusive diagnostic

techniques such as acoustics or radiography to demonstrate that these valves close when subjected to reverse flow conditions.

Based on the determination that it is impractical to verify the reverse flow closure capability of these valves by leak testing or observation of system parameters, that the licensee's proposed alternative should provide reasonable assurance that they are capable of performing their safety function in the closed position, and considering the burden on the licensee if the Code requirements were imposed, relief may be granted provided the licensee part-stroke exercises the valves to the open position with flow after they have been reassembled. The licensee should investigate ways, other than disassembly and inspection, of verifying the reverse flow closure capability of these valves. If another method is developed to verify the reverse flow closure capability of these check valves, this relief request should be revised or withdrawn.

4.7 Normal HV and AC System

4.7.1 Category A Valves

4.7.1.1 Relief Request. The licensee has requested relief from the exercising frequency requirements of Section XI, Paragraph IWV-3412 for the containment normal purge supply valves HV-9948 and HV-9949, and the containment normal purge exhaust valves, HV-9950 and HV-9951. The licensee has proposed verifying valve operability by full-stroke exercising these valves during cold shutdown when containment integrity is required and during refueling outages.

4.7.1.1.1 Licensee's Basis for Requesting Relief--The 42 inch containment normal purge supply and exhaust isolation valve are required by Technical Specifications to be sealed closed in Modes 1, 2, 3, and 4. In addition, the valves often remain sealed closed in Mode 5. When sealed closed, the valves are passively performing their safety function (i.e., containment isolation); the valves are only required to perform an active safety function (i.e., purge isolation) if the containment normal purge system is placed in service and containment integrity is also required. The

containment normal purge valves are specifically required to be operable only during heavy lifts over the reactor coolant system (in Mode 5) and during refueling operations (Mode 6).

These valves will be full-stroke exercised during cold shutdown as required to establish containment integrity, and during refueling as required by the Technical Specifications.

4.7.1.1.2 Evaluation--These valves cannot be full-stroke exercised during power operation due to the Technical Specification requirement that they remain closed. These valves are required to be operable only in Mode 6 and during heavy lifts over the reactor coolant system in Mode 5. Otherwise, these valves perform a passive safety function in the closed position. Section XI, Paragraph IWV-3416, states: "For a valve in a system declared inoperable or not required to be operable, the exercising test schedule need not be followed. Within 30 days prior to return of the system to operable status, the valves shall be exercised and the schedule resumed in accordance with the requirements of this Article." The licensee's proposed alternate testing, to full-stroke exercise these valves when the system is placed in service during cold shutdowns and refueling, is not a deviation from Code requirements. Therefore, based on the determination that the licensee's proposed testing is not a deviation from Code requirements, no relief is required.

APPENDIX A
VALVES TESTED DURING COLD SHUTDOWNS

APPENDIX A

VALVES TESTED DURING COLD SHUTDOWNS

The following are Category A, B, C, and A/C valves that meet the exercising requirements of the ASME Code, Section XI, 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 and location or system design. These valves should not be full-stroke exercised during power operation. These valves are listed below and grouped according to the system in which they are located.

1. SAFETY INJECTION SYSTEM

1.1 Category A Valves

The shutdown cooling return valves, HV-9337 and 9339, and shutdown cooling return bypass valves, HV-9377 and 9378, cannot be exercised during power operation due to a Technical Specification required reactor coolant system pressure interlock (>376 psia) which prevents shutdown cooling system overpressurization. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

The safety injection hot leg supply valves, HV-9420 and 9434, cannot be exercised during power operation due to the Technical Specification requirement that power is removed from the valves' operators with the valves closed. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

1.2 Category B Valves

The low pressure safety injection discharge to the shutdown heat exchangers valves, HV-8152 and 8153, cannot be exercised during power

operation because the Technical Specifications require these valves to be locked closed to preclude run-out damage to the low pressure safety injection pumps. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

The low pressure safety injection pumps' shutdown heat exchanger bypass flow control valves, HV-8160 and 8161, and the low pressure injection pumps' miniflow block valves, HV-8162 and 8163, cannot be exercised during power operation. Technical Specifications require these valves to be open with power to the valves' operators removed. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

The safety injection tank discharge valves, HV-9340, 9350, 9360, and 9370, cannot be exercised during power operation due to the Technical Specification requirement that power be removed from the valves' operators with the valves open. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

The safety injection tank vent valves, HV-9345, 9355, 9365, and 9375, cannot be exercised during power operation due to the Technical Specification requirement that power be removed from the valves' operators with the valves closed to preclude inadvertent depressurization of the safety injection tanks. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

The low pressure safety injection pumps' common discharge valve, HV-0396, cannot be exercised during power operation due to the Technical Specification requirement that the valve be closed with power to the valve operator removed. This valve will be full-stroked exercised during cold shutdowns and refueling outages.

1.3 Category C Valves

The shutdown cooling to low pressure safety injection pumps suction check valves, 14-200-C-645 and 14-202-C-645, cannot be exercised during power operation because these valves can be full-stroked exercised only when

the plant is on shutdown cooling. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

The low pressure safety injection pump discharge check valves, 10-024-C-406 and 10-025-C-406, cannot be exercised during power operation because the low pressure safety injection pumps cannot overcome reactor coolant system operating pressure. Aligning the system discharge to the refueling water storage tank would defeat both trains of low pressure injection. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

1.4 Category A/C Valves

The low pressure safety injection header check valves 8-072-A-552, 8-073-A-552, 8-074-A-552, and 8-075-A-552, cannot be exercised during power operation because the low pressure safety injection pumps cannot overcome reactor coolant system operating pressure. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

The combined accumulator discharge/safety injection check valves, 12-027-A-551, 12-029-A-551, 12-031-A-551, and 12-033-A-551, cannot be exercised during power operation. The low pressure safety injection pumps and high pressure safety injection pumps cannot overcome reactor coolant system operating pressure. The tilting disc in these check valves will move to their full open position with approximately 2000 gpm. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

2. CONTAINMENT SPRAY SYSTEM

2.1 Category B Valves

The containment spray to the low pressure safety injection header isolation valves, HV-8150 and 8151, cannot be exercised during power operation due to the Technical Specification requirement that power be removed from the valves' operators with the valves closed. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

The spray chemical addition pump discharge valves, HV-9399 and 9398, cannot be exercised during power operation. Testing these valves would require a system modification which renders one train of chemical addition inoperable, placing the plant in a Technical Specification limiting condition for operation. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

2.2 Category C Valves

The following containment spray pump suction and discharge check valves cannot be exercised during power operation because both trains of low pressure safety injection would have to be disabled. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

8-012-C-406	8-014-C-406	8-029-C-645
8-030-C-645	16-088-C-675	16-087-C-675

3. CHEMICAL AND VOLUME CONTROL SYSTEM

3.1 Category A Valves

The normal charging header isolation valve, HV-9200, cannot be exercised during power operation. This testing would isolate normal charging from the reactor coolant system which would violate Technical Specifications requirements to have two flow paths for boration during power operation. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

The letdown header outside isolation valve, HV-9205, and letdown header inside isolation valve, TV-9267, cannot be exercised during power operation. This testing would result in undesirable thermal stress on the regenerative heat exchanger and the reactor coolant system charging nozzles. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

The pressurizer auxiliary spray isolation valve, 2-130-C-334, cannot be exercised during power operation because this testing would result in

undesirable thermal stress on the pressurizer spray nozzle. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

The reactor coolant pump (RCP) bleed-off isolation valves, HV-9217 and 9218,cannot be exercised during power operation because failure of these valves in the closed position could result in RCP seal damage. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

3.2 Category B Valves

The pressurizer auxiliary spray supply valve, HV-9201, cannot be exercised during power operation because this testing would result in undesirable thermal stress on the pressurizer spray nozzle. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

The regenerative heat exchanger letdown inlet valves, HV-9204 and TV-0221, cannot be exercised during power operation because this testing would result in undesirable thermal stress on the regenerative heat exchanger and the reactor coolant system charging nozzles. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

The volume control tank outlet valve, LV-0227B, the boric acid supply valve to the charging pumps, LV-0227C, and the charging pumps' boric acid suction valves, HV-9235, 9240, and 9247, cannot be exercised during power operation. Any alternate charging pump suction source would adversely affect RCS boron concentration which could result in a plant shutdown. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

The regenerative heat exchanger outlet isolation valves, HV-9202 and 9203, cannot be exercised during power operation because failure in the closed position would negate accident analysis assumptions. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

3.3 Category C Valves

The regenerative heat exchanger outlet check valves, 2-020-A-554 and 2-021-A-554, cannot be exercised during power operation because testing

these valves would require closing valves HV-9202 and 9203 (see section 3.2 above). These valves will be full-stroke exercised during cold shutdowns and refueling outages.

The pressurizer auxiliary spray supply check valve, 2-019-A-554, cannot be exercised during power operation because this testing would result in undesirable thermal stress on the pressurizer spray nozzle. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

The following check valves cannot be exercised during power operation because any alternate charging pump suction source would adversely affect RCS boron concentration which could result in plant shutdown. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Valve	Function
3-082-C-675	Boric acid gravity feed check valve to charging pump suctions
3-083-C-675	Boric acid pumps' discharge check valve
4-015-C-675	Volume control tank outlet check valve
6-052-C-675	Refueling water storage tank gravity feed check valve
3-033-D-675 3-035-D-676	Boric acid makeup pumps discharge check valves

3.4 Category A/C Valves

The pressurizer auxiliary spray check valve, 2-129-C-554, cannot be exercised during power operation because this testing would result in undesirable thermal stresses on the pressurizer spray nozzle. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

4. COMPONENT COOLING WATER SYSTEM

4.1 Category A Valves

The containment supply valves, HV-6211 and 6223, and containment return valves, HV-6216 and 6236, cannot be exercised during power operation.

Failure of these valves in the closed position during testing could result in reactor coolant pump seal damage. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

4.2 Category B Valves

The following component cooling water header crosstie valves and component cooling water outlet valves from the shutdown cooling heat exchangers cannot be exercised during power operation. Exercising these valves would secure cooling water flow to, or direct cooling water flow away from, the reactor coolant pump seals which could result in seal damage. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

HV-6212	HV-6213	HV-6218
HV-6219	HV-6500	HV-6501

4.3 Category C Valves

The component cooling water pump discharge check valves, 28-101-D-725, 28-102-D-725, and 28-103-D-725, cannot be exercised during power operation. This testing would divert component cooling water from the reactor coolant pump seals which could result in seal damage. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

5. HIGH PRESSURE FEEDW[illegible] SYSTEM

5.1 Category B Valves

The main feedwater bypass valves, HV-1105 and 1106, cannot be exercised during power operation because the steam generator level control would be challenged which could result in a reactor trip. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

The main feedwater stop valves, HV-4047 and 4051, and the main feedwater isolation valves, HV-4048 and 4052, cannot be exercised during power operation. This testing would require stopping feedwater flow to the associated steam generator which could cause a plant shutdown. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

6. AUXILIARY FEEDWATER SYSTEM

6.1 Category C Valves

The auxiliary feedwater supply header check valves, 6-124-C-599 and 6-448-C-599, cannot be exercised during power operation. This testing would result in placing unnecessary thermal stresses on the feedwater piping which could result in premature failure of this piping. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

The auxiliary feedwater pump discharge check valves, 6-121-D-598, 6-547-D-598, 6-126-D-598, and 6-532-D-598, cannot be exercised during power operation. This testing would place unnecessary thermal stress on the feedwater piping which could result in premature failure of this piping. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

7. FIRE PROTECTION SYSTEM

7.1 Category A Valves

The firewater header containment supply valve, HV-5686, cannot be exercised during power operation because this testing would activate the fire protection system in the containment. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

8. COMPRESSED AIR SYSTEM

8.1 Category A Valves

The instrument air header containment isolation valve, HV-5388, cannot be exercised during power operation. Failure of this valve in the closed position during testing would isolate instrument air to the containment which could result in a plant shutdown. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

APPENDIX B
P&ID LISTS

APPENDIX B

P&ID LIST (Unit 2)

The P&IDs listed below were used during the course of this review for Unit 2.

System	P&ID	Revision
Reactor Coolant System	40111A-10	10
	40111B-6	6
	40111C-8	8
Safety Injection System	40112A-9	9
	40112B-10	10
	40112C-3	3
	40112D-3	3
	40113A-4	4
	40113B-4	4
Containment Spray System	40114A-5	5
	40114B-6	6
	40114C-4	4
	40114D-5	5
Diesel Fuel Storage System	40116A-3	3
Sump and Drain System	40117A-4	4
	40117B-1	1
	40117C-4	4
Fuel Pool Cooling System	40122A-6	6
	40122B-7	7
	40122C-5	5
Chemical and Volume Control System	40123A-7	7
	40123B-11	11
	40123C-3	3
	40124A-7	7
	40124B-8	8
	40125A-5	5
	40125B-3	3
Component Cooling Water System	40126A-5	5
	40126B-6	6
	40127A-4	4
	40127B-3	3
	40127C-12	12
	40127D-4	4
	40127E-6	6
	40127F-8	8
	40127G-3	3

System	P&ID	Revision
Nuclear Plant Sampling System	40128B-6	6
	40134A-5	5
	40134B-5	5
	40134C-2	2
	40134D-1	1
Reactor Coolant Pump System	40130A-4	4
	40130B-4	4
	40130C-5	5
	40130D-3	3
Coolant Radwaste System	40131A-6	6
	40131B-2	2
	40131C-4	4
	40131D-6	6
	40131E-6	6
Coolant and Boric Acid Recycle System	40133A-1	1
	40133B-4	4
	40133C-5	5
	40133D-3	3
	40133E-4	4
Waste Gas System	40135A-10	10
	40135B-7	7
	40135C-8	8
Miscellaneous Liquid Waste System	40137A-9	9
	40137B-5	5
	40137C-7	7
	40137D-4	4
Nuclear Service Water System	40140A-7	7
	40140B-5	5
Main Steam System	40141A-5	5
	40141B-8	8
	40141C-11	11
	40141D-14	14
	40141E-13	13
	40141F-8	8
Condensate Pump System	40150C-7	7
	40150D-11	11
High Pressure Feedwater System	40156A-4	4
	40156B-6	6
Auxiliary Feedwater System	40160A-11	11
Auxiliary Feedwater Steam Supply System	40160B-5	5

System	P&ID	Revision
Auxiliary Boiler System	40169A-9	9
	40169B-6	6
	40169C-6	6
	40169D-6	6
Containment HVAC System	40170A-6	6
	40170B-3	3
	40170C-3	3
	40171A-9	9
	40171B-3	3
	40171C-7	7
	40171D-0	0
	40172A-3	3
	40172B-4	4
Fire Protection System	40184A-9	9
	40184B-9	9
Compressed Air System	40191A-3	3
	40191B-4	4
	40191C-4	4
	40191D-6	6
	40191E-7	7
Auxiliary Gas System	40192A-3	3
	40192B-4	4
	40192C-6	6

P&ID LIST (Unit 3)

The P&IDs listed below were used during the course of this review for Unit 3.

System	P&ID	Revision
Reactor Coolant System	40111A-6	6
	40111B-4	4
	40111C-5	5
Safety Injection System	40112A-7	7
	40112B-6	6
	40112C-2	2
	40112D-5	5
	40113A-4	4
	40113B-5	5
Containment Spray System	40114A-5	5
	40114B-3	3
	40114C-4	4
	40114D-4	4
Diesel Fuel Storage System	40116A-2	2
Sump and Drain System	40117A-3	3
	40117C-3	3
Fuel Pool Cooling System	40122A-2	2
	40122B-6	6
	40122C-3	3
Chemical and Volume Control System	40123A-2	2
	40123B-5	5
	40123C-3	3
	40124A-7	7
	40124B-4	4
	40125A-3	3
	40125B-2	2
Component Cooling Water System	40126A-3	3
	40126B-3	3
	40127A-3	3
	40127B-3	3
	40127C-8	8
	40127D-3	3
	40127E-5	5
	40127F-7	7

System	P&ID	Revision
Nuclear Plant Sampling System	40134A-3	3
	40134C-1	1
	40134D-0	0
Reactor Coolant Pump System	40130A-7	7
	40130B-7	7
	40130C-6	6
	40130D-7	7
Coolant Radwaste System	40131A-4	4
Coolant and Boric Acid Recycle System	40133-3	3
Nuclear Service Water System	40140B-3	3
Main Steam System	40141A-4	4
	40141B-7	7
	40141C-9	9
	40141D-13	13
	40141E-12	12
	40141F-7	7
Condensate Pump System	40150C-3	3
	40150D-6	6
High Pressure Feedwater System	40156A-4	4
	40156B-8	8
Auxiliary Feedwater System	40160A-5	5
Auxiliary Feedwater Steam Supply System	40160B-6	6
Auxiliary Boiler System	40169C-5	5
Containment HVAC System	40170A-6	6
	40170B-3	3
	40170C-2	2
	40171A-6	6
	40171B-2	2
	40171C-8	8
	40171D-0	0
	40172A-3	3
	40172B-4	4
Fire Protection System	40189A-12	12
	40189B-6	6
Compressed Air System	40191E-6	6
Auxiliary Gas System	40192C-7	7

APPENDIX C
IST PROGRAM ANOMALIES IDENTIFIED DURING THE REVIEW

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. Pump relief request No. 1 requests relief from the corrective action requirements of IWP-3230 regarding when a pump must be declared inoperable. When, during pump testing, the test quantities fall within the Required Action Range of Table IWP-3100-2, the Code requires the pump to be declared inoperable and not returned to service until the cause of the deviation has been determined and the condition corrected. The Code has provisions that allow this corrective action to be an analysis which demonstrates that the condition does not impair pump operability and that the pump will still fulfill its function, or, a recalibration of test instruments and a rerun of the test. The licensee has proposed that an analysis be performed before the pump is declared inoperable. However, the licensee has not demonstrated that complying with this Code requirement is impractical or that it presents an undue burden. Therefore, relief from this Code requirement should not be granted. (Reference Section 3.1.3.1 of this report.)

2. Notes 2 and 3 of Table 1 in the licensee's pump IST program indicate that pump vibration measurements may not be in conformance with the requirements of IWP-4510. If this is the case, a relief request should be submitted for not making vibration measurements near the pump bearings for the diesel fuel transfer and saltwater cooling pumps; otherwise, the wording of Notes 2 and 3 should be clarified to indicate that the requirements of IWP-4510 are being met.

3. Note 5 of Table 1 in the licensee's pump IST program indicates that the inlet pressure is calculated for the diesel fuel transfer and saltwater cooling pumps. The Code states that the inlet pressure should be

measured. The licensee should measure inlet pressure or submit an appropriate relief request.

4. Pump relief request No. 5 requests that the flow rate measurement requirements of Section XI, Paragraph IWP-3100, be waived. The NRC staff has determined that flow rate should be measured and evaluated together with differential pressure, using the acceptance criteria of Table IWP-3100-2, to determine pump hydraulic performance. The staff position regarding pump testing using minimum flow return lines with or without flow measuring devices is outlined in Generic Letter No. 89-04, Attachment 1, Item 9. Flow rate instrumentation is installed in the low pressure safety injection pump injection header and the containment spray pump discharge header via the shutdown cooling heat exchanger. The licensee should investigate the feasibility of testing these pumps to the Code requirements at a reduced frequency. Relief from the Code pump testing requirements may be granted for the low pressure safety injection and containment spray pumps provided the licensee conforms to the staff position of Generic Letter No. 89-04, Attachment 1, Item 9. The licensee should investigate methods of determining flow rates for the auxiliary feedwater and diesel fuel oil pumps. Interim relief may be granted until the next refueling outage to continue the current testing methods for the auxiliary feedwater and diesel fuel oil pumps while the licensee investigates the feasibility of acceptable alternatives. (Refer to section 3.2.3.1 of this report.)

5. Pump relief request No. 8 requests relief from the vibration measurement requirements of Section XI, Paragraph IWP-4500, for the charging pumps. The licensee has proposed using vibration measurement instrumentation with a lower calibration limit of 10 Hz (600 rpm), or about 3 times the rotational speed of the charging pumps. Further, the accuracy of the measurement loop is less conservative than the Code requirements. Many mechanisms of pump mechanical degradation, such as rotor imbalance, instability, misalignment and mechanical looseness, are evident only at frequencies less than 3 times the pump rotational speed. The licensee has stated that vibration measurements obtained using this instrumentation are repeatable. However, the licensee has

neither indicated the degree of repeatability nor stated that measurements will be taken and trended below frequencies of 10 Hz. The licensee has not adequately demonstrated that the procurement of vibration measurement instrumentation that is accurate over a wider frequency range would result in hardship. Therefore, relief from the Code measurement accuracy and frequency response range requirements should not be granted. (Refer to section 3.3.1.1 of this report.)

6. In valve relief requests V-03, V-11, and V-13 the licensee has proposed verifying the full-stroke open capability of the listed check valves using sample disassembly and inspection. The NRC staff positions regarding check valve disassembly and inspection are explained in detail in Generic Letter No. 89-04, "Guidance on Developing Acceptable Inservice Testing Programs." The minutes on the public meetings on Generic Letter No. 89-04 regarding Position 2, Alternatives to Full Flow Testing of Check Valves, further stipulate that a partial stroke exercise test using flow is expected to be performed after disassembly and inspection is completed but before the valve is returned to service. Relief may be granted to disassemble and inspect the safety injection tank discharge check valves, 12-040-A-551, 12-041-A-551, 12-042-A-551, and 12-043-A-551 on a sampling basis provided the licensee performs a partial flow test of the disassembled valves before they are returned to service and part-stroke exercises all these valves during cold shutdowns. The licensee should investigate methods of part-stroke exercising the containment sump outlet check valves, 24-003-C-724 and 24-004-C-724, and the inside containment spray header check valves, 8-004-C-406 and 8-006-C-406. Interim relief may be granted for these valves for one year or until the next refueling outage, whichever is greater, to give the licensee time to complete their investigation, the test procedures, and any system design changes necessary to perform post-inspection part-stroke exercising. In the interim, the licensee may use disassembly and inspection to verify the full-stroke operability of these check valves without an ensuing part-stroke exercise test with flow. In all cases, the licensee should actively pursue the use of non-intrusive diagnostic techniques to demonstrate that these valves swing fully open during partial flow

testing. If another method is developed to verify the full-stroke capability of these check valves, this relief request should be revised or withdrawn. (Reference sections 4.2.1.1, 4.2.2.4, and 4.3.1.1 of this report.)

7. In valve relief requests V-18 and V-20, the licensee has proposed verifying the closure capability of the turbine driven auxiliary feedwater pump steam supply check valves, 4-003-D-620 and 4-005-D-620, and the main feedwater supply check valves, 20-036-C-609 and 20-129-C-609, using disassembly and inspection on a sampling basis during refueling outages. The Minutes of the Public Meeting on Generic Letter No. 89-04 state that the use of disassembly to verify closure capability may be acceptable depending on whether verification by flow or pressure measurements is practical. The Minutes of the Public Meeting on Generic Letter No. 89-04 also state that partial-stroke exercise testing with flow is expected to be performed after valve disassembly and inspection is completed, but before returning the valve to service. Relief may be granted provided the licensee part-stroke exercises the valves to the open position with flow after they have been reassembled. The licensee should actively pursue the use of non-intrusive diagnostic techniques such as acoustics or radiography to demonstrate that these valves close when subjected to reverse flow conditions. If another method is developed to verify the reverse flow closure capability of these check valves, this relief request should be revised or withdrawn. (Refer to sections 4.5.1.1 and 4.6.1.1 of this report.)

8. The reactor coolant system solenoid operated vent valves, HV-0296A, 0296B, 0297A, 0297B, 0298, and 0299 should be included in the Unit 2 and Unit 3 IST programs and tested to the Code requirements.

9. Valve relief request No. 16 requests relief from the trending requirements of IWV-3417(a) for all power operated valves with stroke times of five (5) seconds or less. An alternative acceptable to the staff regarding stroke time measurements for rapid-acting valves is explained in detail in Generic Letter No. 89-04, Attachment 1, Item 6.

Relief may be granted provided the licensee conforms to this NRC staff approved alternative. (Refer to Section 4.1.2.1 of this report.)

10. The licensee has requested that relief be granted to verify the full-stroke operability of the safety injection pump suction check valves, 16-077-C-645, 16-084-C-645, 16-199-C-645, and 16-201-C-645, and the combined suction check valves from the refueling water storage tank to the safety injection and containment spray systems, 24-001-C-724 and 24-002-C-724, by disassembly on a sampling basis at a refueling outage frequency. However, the licensee has not explained why these valves cannot be full-stroke exercised with flow during refueling outages using currently installed flow instrumentation. Disassembly, together with inspection, to verify the full-stroke capability of check valves is an option only where full-stroke exercising cannot practically be performed by flow or the other positive means allowed by IWV-3522. Relief may be granted to part-stroke these valves quarterly provided they are full-stroke exercised with flow during refueling outages. However, since the licensee has not demonstrated that it is impractical to perform a full-stroke exercise with flow at a refueling outage frequency, relief should not be granted to allow disassembly and inspection on a sampling basis. (Refer to sections 4.2.2.2 and 4.2.2.3 of this report.)

11. The licensee has requested that relief be granted to allow full-stroke exercising of the containment normal purge supply valves HV-9948 and HV-9949, and the containment normal purge exhaust valves, HV-9950 and HV-9951, during cold shutdown and refueling outages when containment integrity is required. These valves are required to be operable only in Mode 6 and during heavy lifts over the reactor coolant system in Mode 5. Otherwise, these valves perform a passive safety function in the closed position. Section XI, Paragraph IWV-3416, states: "For a valve in a system declared inoperable or not required to be operable, the exercising test schedule need not be followed. Within 30 days prior to return of the system to operable status, the valves shall be exercised and the schedule resumed in accordance with the requirements of this Article." The licensee's proposed alternate testing, to

full-stroke exercise these valves when the system is placed in service during cold shutdowns and refueling, is not a deviation from Code requirements. Therefore, relief is not required. (Refer to section 4.7.1.2 of this report.)

12. In valve relief request V-23, the licensee has proposed that measured stroke times be compared to the average stroke time since the last maintenance that could have affected the stroke time, or the last three stoke times, which ever is greater. Relief from the stroke time trending and corrective action requirements of IWV-3417(a) may be granted provided the reference value of stroke time used for comparison of test data is established when the valve is known to be in good operating condition. (Refer to section 4.1.3.1 of this report.)

13. Emergency diesel generator air start valves are required to open to provide starting air to the diesels. No emergency diesel generator air start valves are included in the Units 2 and 3 IST programs. If the San Onofre Nuclear Generating Station, Units 2 and 3, diesel generators have valves in their emergency diesel air start systems which perform an active safety function, the licensee should evaluate whether these valves should be included in the IST programs and tested to Code requirements.

14. The cold shutdown justification for reactor coolant system check valve 3-152-A-551 states that the valve will be exercised at cold shutdowns if sufficient volume is available in the pressurizer. If the valve cannot be tested every cold shutdown then a relief request should be submitted. If testing is to be performed every cold shutdown, then the words "sufficient volume available in the pressurizer" should be deleted from the cold shutdown justification.

15. The cold shutdown justification for main steam valves HV-8204 and HV-8205 states that full exercising of these valves is not practical during plant operation. The licensee has provided no justification which demonstrates the impracticality of testing these valves, therefore, these valves should be tested quarterly as required by the Code.

16. The cold shutdown justifications for the following safety injection valves state that the valves will be exercised at cold shutdowns if sufficient volume is available in the pressurizer. If the valves cannot be tested every cold shutdown then a relief request should be submitted. If testing is to be performed every cold shutdown, then the words "sufficient volume available in the pressurizer" should be deleted from the cold shutdown justification.

3-156-A-551	3-157-A-550	3-158-A-550	4-012-C-358
4-015-C-358	4-016-C-358	4-017-C-553	3-018-A-551
3-019-A-551	3-020-A-551	3-021-A-551	3-155-C-551

17. The licensee has provided a technical justification for postponing the exercising of the main steam atmospheric dump valves, HV-8419 and -8421, until cold shutdown. This justification indicates that these valves cannot be exercised during power operation since this would result in a low steam generator pressure indication which would shut the main steam isolation valve and cause a plant shutdown. However, the piping and instrumentation diagram for this system shows in-line manual isolation valves. Closing the associated in-line isolation valve prior to exercising the atmospheric dump should prevent the loss of steam generator inventory and a resulting plant trip. Therefore, the licensee should full-stroke exercise these valves quarterly in accordance with the Code requirements or provide a justification that demonstrates that it is impractical to exercise these valves quarterly.