# Southern California Edison Company

P. O. BOX 800 2244 WALNUT GROVE AVENUE ROSEMEAD. CALIFORNIA 91770

M. O. MEDFORD MANAGER, NUCLEAR LICENSING

December 21, 1984

TELEPHONE (818) 302-1749

Director, Office of Nuclear Reactor Regulation Attention: Mr. J. A. Zwolinski, Chief Operating Reactors Branch No. 5 Division of Licensing U. S. Nuclear Regulatory Commission Washington, D.C. 20555

Gentlemen:

Subject: Docket No. 50-206 Environmental Qualification San Onofre Nuclear Generating Station Unit 1

By letter dated July 30, 1984, SCE requested an extension from the March 31, 1985 environmental qualification deadline in accordance with 10 CFR 50.49(g) for fifteen equipment items. The request was approved by the Director of Nuclear Reactor Regulation in his November 26, 1984 letter to SCE. The July 30, 1984 letter indicated that additional equipment items might require an extension from the deadline. The purpose of this letter is to request an extension from the deadline to November 30, 1985 for additional equipment items.

The extension is requested for the following specific equipment items:

A. Transmitters:

 PT425 - Inputs to subcooling monitor
 FT460, 461, 462 - Inputs to steam flow feedwater flow mismatch
 PT1120A, B, C - Inputs to containment isolation
 PT1121A, B, C - Inputs to containment isolation

B. Motor Operated Valves

1. MOV850A, B, C - Safety injection isolation valves

2. MOV866A, B - Recirculation pump discharge valves

C. Pump Motors

GIOS - Auxiliary Feedwater pump motor
 G45A, B - Recirculation pump motors



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### Mr. J. A. Zwolinski

December 21, 1984

## D. Solenoid Valves

- FCV 1115D, E, F Recirculation flow control valves
  SV 28 Containment isolation
  SV 109,111, 113 Containment isolation
  SV 410, 411 Volume Control Tank isolation
  SV 1212-6, 1212-7 Containment isolation
  FY 1202, 1203, 1204 Letdown isolation
  FY 3545, 2546 PORV
  PY 2530, 3531 Block valves
- E. Cable
  - 1. Mil Spec Supply Company teflon insulated cable
  - 2. Rockbestos PVC insulated cable
  - 3. Anaconda Silicon rubber insulated cable
- F. Penetrations
  - 1. Viking

As part of the San Onofre Unit 1 environmental qualification program, efforts were made to develop qualification documentation for the above equipment in accordance with 10 CFR 50.49. Our efforts to develop a qualification package were not successful. In some cases the test data was not applicable or was not adequate for complete qualification; a correlation could not be established between the tested component and the installed component; or, demonstrating operation of the component over its operating time plus margin could not be established.

Justifications for Continued Operation (JCOs) in accordance with 10 CFR 50.49(i) have been provided to the NRC staff for all of the above equipment items by letter dated November 3, 1984. The JCOs for the above equipment are again provided here as Enclosure 1.

Based on the JCOs provided for the above equipment, operation of San Onofre Unit 1 with the above equipment will not pose an undue risk to the health and safety of the public. Since it is not possible to procure qualified replacements by the March 31, 1985 deadline for the above components an extension of the 10 CFR 50.49 deadline is necessary.

If you have any questions regarding this matter, please let me know.

Very truly yours,

m. e. medford

Enclosure

Plant Tag No.: PT-425 Functional Name: Pressure Transmitter Manufacturer: Foxboro Model Number: E11GM

### Functional Description:

This transmitter is located inside containment in the pressurizer instrumentation cabinet. The transmitter monitors pressurizer pressure and provides an input to the Subcooling Monitoring System.

### Qualification Status:

This is a Foxboro E 10 series transmitter which does not have the MCA/RRW modification package; therefore, qualificaiton for inside containment conditions cannot be established. They will be replaced with qualified transmitters.

### Justification for Continued Operation:

The transmitter inputs to one train of the Subcooling Monitor to determine adequate core cooling. This system would only be required for a small break LOCA or a secondary line break in which the reactor coolant is not entirely lost as in a large break LOCA. The environment associated with a small break LOCA or a secondary line break is not as severe as that resulting from a large break LOCA therefore it is possible this transmitter would not fail. In the event the transmitter fails, the opposite train of the Subcooling Monitor, which contains a qualified pressure transmitter, is available.

These reasons form the basis for continued plant operation with this transmitter. This JCO complies with the criteria set forth in 10 CFR 50.49(i) (1) and ensures that SONGS-1 can be safely operated pending replacement of the transmitter.

Plant Tag No.:	FT460, 461, 462
Functional Name:	Flow Transmitters
Manufacturer:	Foxboro
Model Number:	E11DM without MCA/RRW Modifications

These transmitters are located inside containment and monitor steam generator steam flow. They are part of the Reactor Protection System and provide an input which will initiate a reactor trip on a steam flow-feedwater flow mismatch.

### Qualification Status:

These are Foxboro E10 Series transmitters which do not have the MCA/RRW modification package; therefore, qualification for inside containment conditions can not be established. They will be replaced with qualified transmitters.

### Justification for Continued Operation:

The transmitters are located inside containment near a respective steam generator (one transmitter per steam generator). In the event of a steam or feedwater line break, an immediate steam/feedwater flow mismatch would occur resulting in a reactor trip. Consequently, the transmitters would perform their safety function prior to being exposed to the harsh environment. In addition, the immediate environmental change resulting from the break can only affect one transmitter due to the location of each transmitter near one steam generator but remote from the other two steam generators. Therefore, two transmitters will not be simultaneously affected. Thus, if the transmitter in the vicinity of the break did fail due to the environmental conditions resulting from the break, the remaining two transmitters would still generate the necessary trip signal. Once actuated, the safety function will not be interrupted if the transmitters fail. These transmitters are not required for post-accident monitoring. Reactor trip in the event of a secondary line break would also be accomplished by turbine trip or safety injection.

These reasons form the basis for continued plant operation with these transmitters. This JCO complies with the criteria set forth in 10 CFR 50.49(i)(1) and (4) and ensures that SONGS-1 can be safely operated pending replacement of the transmitters.

Plant Tag No.:	PT 1120A, B, C, 1121A, B, C
Functional Name:	Pressure Transmitter
Manufacturer	Foxboro
Model Number	E11GM

These transmitters are located outside containment and monitor containment pressure for the containment isolation signal.

### Qualification Status:

It has been determined that these Foxboro transmitters are E10 series without the MCA/RRW modification. Qualification of the transmitters cannot be established and therefore, they will be replaced with qualified transmitters.

### Justification for Continued Operation:

These transmitters input to the Containment Isolation System by initiating isolation at 1.4 psig containment pressure. Since they are located outside containment they will not be exposed to the harsh containment environment. It is expected the transmitters will perform their safety function in a mild environment. In the event of failure of the transmitters, the initiation of safety injection will also initiate containment isolation. The pressurizer pressure transmitters which initiate safety injection are qualified for inside containment use.

These reasons form the basis for continued plant operation with these transmitters. This JCO complies with the criteria set forth in 10 CFR 50.49(i) (1) and (4) and ensures that SONGS-1 can be safely operated pending replacement of the transmitters.

Plant Tag No.: MOV 850A, B, C Functional Name: Valve Motor Operators Manufacturer: Limitorque Model Number: SMA-1/Class B Motor Insulation

#### Functional Description:

These values are located inside containment and are part of the Safety Injection System. Upon initiation of the safety injection actuation signal, the values will automatically open to allow flow of borated water to the reactor vessel. These values are not required to function thereafter.

### Qualification Status:

There is a lack documentation available to qualify the valve motor operators. They will be replaced with qualified operators.

### Justification for Continued Operation:

Upon initiation of the safety injection signal, the valves are automatically opened and the entire Safety Injection System is operational within 30 seconds. The valve motor operators would have opened the valves prior to being exposed to the extreme environmental conditions following a LOCA. In addition, through field inspection and correspondence with the vendor, it has been determined that the motor insulation material in this equipment is similar to the actuators tested in Limitorque Test Report B-0003. The test specimens were subjected to a 16 day accident environment with temperatures up to 250°F and pressures up to 25 psig. They were also exposed to a total integrated gamma radiation dose of  $2.0 imes 10^7$  Rads. The maximum postulated accident conditions are 291°F and 49.4 psig. Additional testing has been performed by Westinghouse Corporation on generically similar actuators as reported in Westinghouse Test Report WCAP 7410-L. As part of this testing, a class B motor was thermally aged for 100 hours at 311°F. During the subsequent accident environmental testing, the actuator was exposed to temperatures as high as 308°F and pressures as high as 60 psig. This actuator remained functional for eight hours in the post-accident environment, which envelopes the required operating time. These valves are Fail-As-Is, therefore actuator failure subsequent to their initial opening operation will not result in system function degradation nor will the operator be misled since these valves would not move from their open position. Therefore, this fact, in combination with the separate effects testing, provides reasonable assurance that this equipment will perform its safety function as required.

These reasons form the basis for continued plant operation with these operators. This JCO complies with the criteria set forth in 10CFR50.49(i)(2) and (4) and ensures that SONGS-1 can be safely operated pending replacement of the motor operators.

Plant Tag No.: MOV 866A, B Functional Name: Valve Motor Operators Manufacturer: Limitorque Model Number: SMB-000/Class B Motor Insulation

#### Functional Description:

These valve motor operators are located inside containment and are part of the long term Recirculation System. They are on the discharge of the Recirculation Pumps and are opened by the operator to initiate recirculation.

# Qualification Status:

There is a lack of documentation available to qualify these valve motor operators. They will be replaced with qualified operators.

#### Justification for Continued Operation:

As part of the Recirculation System the valves would be required to operate early in the accident following completion of safety injection. Once the values have been opened they do not require further operation. In addition, through field inspection and correspondence with the vendor, it has been determined that the motor insulation mterial in this actuator is similar to the actuators tested in Limitorque Test Report B-0003. The test specimens were subjected to a 16 day accident environment with tempertures up to 250°F and pressures up to 25 psig. They were also exposed to a total integrated gamma radiation dose of 2.0x10<sup>7</sup> Rads. The maximum postulated accident temperature and pressure is 291°F and 49.4 psig. Additional testing performed by Westinghouse (Westinghouse Test Report WCAP 7410-L) demonstrates that this equipment will function at 291°F. As part of this testing a class B motor was thermally aged for 100 hours at 311°F. During the subsequent accident environmental testing, the valve actuator was subjected to temperatures as high as 308°F and pressures as high as 60 psig. This actuator remained functional for eight hours in the post-accident environment which envelopes the required operating time. Therefore this combination of separate effects testing provides reasonable assurance that this equipment will perform its safety function as required.

These reasons form the basis for continued plant operation with these operators. This JCO complies with the criteria set forth in 10CFR50.49(i)(2) and ensures that SONGS-1 can be safely operated pending replacement of the motor operators.

Plant Tag No.:	G10S
Functional Name:	Pump Motor
Manufacturer:	Westinghouse
Model NUmber:	Type ABDP

This pump motor serves the Auxiliary Feedwater Pump and is located outside containment under the Turbine Building. Upon initiation of auxiliary feedwater the auxiliary feedwater pump delivers water to the steam generators.

### Qualification Status:

There is a lack of documentation available to qualify the pump motor. The pump motor will be replaced with a qualified motor.

### Justification for Continued Operation:

Similar Westinghouse motors have been tested under simulated accident conditions as described in Westinghouse Test Report WCAP-8754, Rev.1, This report describes testing, up to  $392^{\circ}$ F, 100% relative humidity, and irradiation to 1.0 x  $10^{8}$  Rads gamma. This motor is located outside containment. All required accident conditions are enveloped by this testing. The original motor was considered to be similar to the motor tested, however, the motor has been rewound. Documentation on the rewind material of the motor is not available and therefore, qualification in accordance with 10 CFR 50.49 is not possible. The rewind material was procured to the original motor specification therefore the Westinghouse testing provides reasonable assurance that the installed motor will perform its safety function.

This JCO complies with the criteria set forth in 10 CFR 50.49(i)(2) and ensures that SONGS 1 can be safely operated pending replacement of the pump motor.

Plant Tag No.: Functional Name: Manufacturer: Model Number: G45A, B Pump Motors Chempump GPS-60L-46H-3T

# Functional Description:

These pump motors are located inside the containment sump. They remove water from the containment sump for long term recirculation and containment spray. The pump motors will be submerged during their post-accident recirculation service.

### Qualification Status:

There is a lack of documentation available to qualify the pump motors. The pump motors will be replaced with qualified motors.

# Justification for Continued Operation:

Chempump has performed some qualification testing on similar equipment as reported in Acton Test Report A-19274, Rev. 4. Motorette testing per IEEE Standard 117 was used since the only electrical components associated with this equipment is the pump motor. In addition, all other nonmetallic materials in this equipment besides the motor were included as part of this test program. The test sequence used is as follows:

Inspection 1. Thermal aging - 1367 hours @ 260°C (500°F) for the motorettes 2. 1369 hours @ 200°C (392°F) for the gaskets and bearings. Voltage Tests 3. Irradiation - 2.0x10<sup>8</sup> Rads gamma 4. 5. Voltage Tests Vibration - 60Hz vibration for one hour 6. Voltage Tests 7. Additional thermal aging - 35 hours @ 260°C (500°F) for the motorettes 8. 274 hours @ 200°C (392°F) for the gaskets. 9. Voltage Tests Inspection 10.

The only serious failure reported by this test program was that the teflon lead wires did not survive irradiation. The lead wires used at SONGS-1 are silicone rubber and therefore would not be affected by this failure mode. Teflon insulated leads are also used on a heat operated, bi-metallic thermal cut-out switch. This temperature switch is no longer part of the equipment circuit so its failure would not affect operability. Teflon flange gaskets were originally supplied on this equipment but they have been changed out with EPDM gaskets. Submergence, elevated pressure and spray are the only accident parameters for which testing was not performed. This motor is of the "canned" Plant Tag No.: G45A, B (Cont.) Functional Name: Pump Motors Manufacturer: Chempump Model Number: GPS-60L-46H-3T

### Justification for Continued Operation (Cont.):

variety type which is inherently designed for submergence. This means the stator and rotor are completely sealed by cylindrical steel welded enclosures. Lead wires from the stator are potted to prevent moisture intrusion. In addition, the stator enclosure is filled with silicone oil that also prevents moisture intrusion. Some of the pumped fluid is diverted through the bearings and the motor cavity, between the stator and rotor enclosures, to provide additional cooling and bearing lubrication. Thus the canned design of the motor along with the normal operational mode demonstrate that the motor is capable of operating while submerged. 392°F is the minimum temperature to which this equipment was tested. This far exceeds the peak accident temperature of 291°F. The postulated peak accident pressure is 49.4 psig. The only components susceptible to this pressure are the steel stator and rotor enclosures. These enclosures have been designed to withstand full pump pressure of 111.0 psig. This provides assurance that the steel enclosures will not collapse due to the 49.4 psig peak pressure spike.

The required radiation dose is 2.6x10<sup>7</sup> Rads Gamma. The gamma radiation requirement is satisfied by radiation testing up to 2.0x10<sup>8</sup> rads gamma. The chemical spray will only contact shell surfaces and some gasket outer surfaces. Degradation of these gaskets will only result in minor leakage. It is not expected that the relatively weak Boric acid/NaOH solution will have a significant effect on this equipment. Therefore, this combination of testing and analysis provides reasonable assurance that this equipment will perform its safety function as required.

These reasons form the basis for continued plant operation with these pump motors. This JCO complies with the criteria set forth in 10CFR50.49(i)(2) and ensures that SONGS-1 can be safely operated pending replacement of the pump motors.

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Plant Tag No.: FCV 1115 D, E, F Functional Name: Flow Control Valve Actuator Assemblies (Solenoid and Positioner) Manufacturer: Honeywell Positioner)/ASCO (Solenoid) Model Number: /8300

#### Functional Description:

These valve actuator assemblies are part of the long term recirculation system and are located outside containment in the Piping Penetration Building. The valves modulate the recirculation flow to the reactor vessel. The valves will be exposed to and required to operate in an increased radiation environment following a LOCA.

### Qualification Status:

Qualification of the Honeywell positioner has been established based on analysis. A lack of documentation is available to qualify the ASCO solenoid valves. They will be replaced with qualified solenoids.

### Justification for Continued Operation:

These flow control values are modulated by the operator in the control room at various times during the course of the accident. Upon initiation of safety injection the solenoid values close the flow control values. Following termination of safety injection the flow control value is modulated by the positioner. In the event of a LOCA, the flow control value would be exposed to an increased radiation environment due to the recirculation fluids. In order to ensure the value was capable of performing its safety function certain non-metallic parts of the value and solenoid were replaced and the positioner was replaced. This effort was identified to the NRC in letters dated April 16, 1981, May 4, 1981 and February 24, 1982. Based on materials analysis the flow control value would be capable of performing its safety function in the post-accident radiation environment.

These values could possibly be exposed to a high temperature steam/water environment in the event of the failure of a steam generator blowdown line. However, in this scenario long term recirculation is not required and the plant would safely shutdown utilizing normal shutdown equipment following a failure of the blowdown line.

These reasons form the basis for continued plant operation with the solenoid and positioner for the flow control valves. This JCO complies with the criteria set forth in 10 CFR 50.49(i)(2) and ensures that SONGS 1 can be safely operated pending replacement of the solenoid valves. Plant Tag No.: SV 28 (CV10) Functional Name: Solenoid Valve Manufacturer: ASCO Model Number: WPLB 8300

#### Functional Description:

This solenoid value is located outside containment on the containment vent line. It is part of the Containment Isolation System, such that, on containment isolation, safety injection or a high radiation signal the solenoid is automatically actuated to close the control value and isolate the vent line.

### Qualification Status:

There is a lack of documentation available to qualify the solenoid valve. It will be replaced with a qualified solenoid.

# Justification for Continued Operation:

This solenoid value is required to actuate and close the control value immediately following LOCA or secondary line break. Once the value has closed it is not required to be reactuated. Since the solenoid value is located outside containment it will not be exposed to a harsh environment when it is required to operate. This solenoid value is designed such that its subsequent failure due to the environmental conditions will not cause its control value to operate, therefore, the system function will not be degraded. As a result, it is expected that this solenoid value will perform its safety function and the vent line will be isolated in the event of a LOCA or secondary line break.

These reasons form the basis for continued plant operation with this solenoid valve. This JCO complies with the criteria set forth in 10 CFR 50.49(i)(4) and (5) and ensures that SONGS 1 can be safely operated pending replacement of the solenoid valve.

Plant Tag No.:	SV 109, 111, 113 (CV103, 105, 107)
Functional Name:	Solenoid Valves.
Manufacturer:	ASCO
Model Number:	WPLB 8300

These solenoid values are located outside containment on isolation values for the sphere sump pump discharge, RCS drain tank discharge and the RCS drain tank vent lines. They are part of the Containment Isolation System, such that, on a containment isolation or safety injection signal the solenoids are automatically actuated to close their respective control value and isolate the lines outside containment.

#### Qualification Status:

There is a lack of documentation available to qualify these solenoid valves. They will be replaced with qualified solenoids.

#### Justification for Continued Operation:

These solenoid values are required to actuate and close their control values immediately following a LOCA or secondary line break. Once the values have closed they are not required to be reactuated. Since the values are located outside containment they will not be exposed to a harsh environment at the time of actuation. These solenoid values are designed such that their subsequent failure due to the environmental conditions will not cause their respective control values to operate, therefore the system function will not be degraded. As a result, it is expected that these solenoid values will perform their safety function and the lines will be isolated in the event of a LOCA or secondary line break.

These reasons form the basis for continued plant operation with these solenoid values. This JCO complies with the basis set forth in 10 CFR 50.49(i)(4) and (5) and ensures that SONGS 1 can be safely operated pending replacement of the solenoid values.

Plant Tag No.:	SV 410, 411 (CV 10, 411)
Functional Name:	Solenoid Valves
Manufacturer:	ASCO
Model Number:	LB 831612

These solenoid values are located outside containment in the Auxiliary Building on control value for the seal water line to the Volume Control Tank. Upon initiation of safety injection the solenoid values are automatically actuated to close their control values and isolate the seal water line to the Volume Control Tank.

#### Qualification Status:

There is a lack of documentation available to qualify these solenoid valves. They will be replaced with qualified solenoids.

### Justification for Continued Operation:

These solenoid values are required to actuate and close their control values immediately following a LOCA or secondary line break. Since the values are located outside in the Auxiliary Building they will not be exposed to a harsh environment at the time of operation. The solenoid values are designed such that their subsequent failure due to the environmental conditions will not cause their control values to operate, therefore the system function will not be degraded. As a result, it is expected these solenoid values will perform their safety function and isolate the line to the Volume Control Tank in the event of a LOCA or secondary line break.

These reasons form the basis for continued plant operation with these solenoid valves. This JCO complies with the criteria set forth in 10 CFR 50.49(i)(4) and (5) and ensures that SONGS 1 can be operated safely pending replacement of the solenoid valves.

Plant Tag No.:	SV 1212-6, 7 (CV146, 147)
Functional Name:	Solenoid Valves
Manufacturer:	ASCO
Model Number:	WPLB 8300

These solenoid values are located inside containment on control values in the sphere air sample and return lines. The solenoid values are part of the Containment Isolation System such that on a containment isolation or safety injection signal the solenoid values are automatically actuated to close their control values and isolate the lines.

#### Qualification Status:

There is a lack of documentation available to qualify these solenoid valves. They will be replaced with qualified solenoids.

#### Justification for Continued Operation:

These solenoid values are required to actuate and close their control values immediately following a LOCA or secondary line break. Once the values have closed they are not required to be reactuated. In the event of a LOCA or secondary line break, the solenoid values would have actuated their respective control values prior to being exposed to the post-accident containment environment. The solenoid values are designed such that their subsequent failure due to the environmental conditions will not cause their respective control values to operate, therefore the system function will not be degraded. In addition, qualified companion isolation values (SV 1212-8, 1212-9) are located outside containment in the lines and would actuate in a nonharsh environment.

These reasons form the basis for continued plant operation with these solenoid valves. This JCO complies with the criteria set forth in 10 CFR 50.49(i)(1), (4) and (5) and ensures that SONGS 1 can be safely operated pending replacement of the solenoid valves.

Plant Tag No.:	FY 1202, 1203, 1204 (CV202, 203, 204)
Functional Name:	Solenoid Valves
Manufacturer:	ASCO
Model Number:	WPLB 8300

These solenoid values are located inside containment on control values in the Reactor Coolant Letdown line. Upon initiation of safety injection the solenoid values are automatically actuated to close their control values and isolate the letdown line inside containment.

#### Qualification Status:

There is a lack of documentation available to qualify these solenoid valves. They will be replaced with qualified solenoid valves.

### Justification for Continued Operation:

These solenoid values are required to actuate and close their control values immediately following a LOCA or secondary line break. Once the values have closed they are not required to be reactuated. In the event of a LOCA or secondary line break, the solenoid values would have actuated their respective control values prior to being exposed to the post-accident environment. The solenoid values are designed such that their subsequent failure due to the environmental conditions will not cause their respective control values to operate, therefore the system function will not be degraded. In addition, the letdown lines are isolated again at the containment penetration by values with qualified Paul Munroe actuators (CV 525, 526) inside and outside containment.

These reasons form the basis for continued plant operation with these solenoid valves. This JCO complies with the criteria set forth in 10 CFR 50.49(i)(1) and (4) and ensures that SONGS 1 can be safely operated pending replacement of the solenoid valves.

Plant Tag No:	PY3545, 2546, 2530, 3531 (CV545, 546	, 530, 531)
Functional Name:	Solenoid Valves	
Manufacturer: -	ASCO	
Model Number:	8316	

These solenoid values are located inside containment on the PORVs and the PORV Block Values.

## Qualification Status

A lack of documentation is available to qualify these solenoid valves. They will be replaced with qualified solenoids.

### Justification for Continued Operation

The PORVs and their respective block valves are not normally required under accident conditions. In the event of failures in other systems, the PORVs are available to remove decay heat. The solenoid valves on the PORVs are designed such that in the event of failure the PORV would remain closed. However, in the event of pressurization of the Reactor Coolant System the Pressurizer Relief Valves would be available to relieve the system.

These reasons form the basis for continued plant operation with these solenoid valves. This JCO complies with the criteria set forth in 10CFR50.49(i)(1) and ensures that SONGS-1 can be safety operated pending replacement of these solenoid valves.

Plant Tag No:No Tag Number AssignedFunctional Name:Instrumentation CableManufacturer:Rockbestos Mil Spec Supply CompanyModel Number:PVC/Teflon Insulation

#### Functional Description

This cable is located inside and outside containment and services certain safety related equipment required for post-accident shutdown.

#### Qualification Status

There is a lack of documentation available to qualify this cable. It will be replaced with qualified cable.

### Justification for Continued Operation

As part of environmental qualification efforts, PVC and Teflon cable located inside containment were identified to the NRC by letter dated April 16, 1981. It was subsequently followed up by a letter dated May 18, 1981, which indicated that an evaluation of the cable, the components served by the cable, the safety function required to be performed, the potential failure mode of the cable and postulated accident scenarios had been performed. The results of the evalution indicated that the safety functions required will be performed and no corrective measures were necessary. These conclusions were primarily based on the following:

#### PVC

Based on industry test results provided in IPCEA S-61-402, NEMA WC5, PVC cable with a continuous allowable temperature rating of 75°C or greater will function in the post-accident environment. Based on available purchase order documentation and evaluation of typical company requirements for cable installation, it is concluded that the PVC cable at San Onofre Unit 1 has a continuous allowable temperature rating of 75°C or greater.

However, based on test results provided in the Sandia Report (SAND-79-092 CK), the cable may experience unacceptable embrittlement when exposed to radiation in excess of 4 x  $10^6$  rads in combination with the post-accident temperatures. In the event of a large break LOCA, components supplied by this cable (i.e., reactor coolant temperature detectors) are required to ensure adequate core cooling. Redundant detectors are available utilizing qualified cable. In the event of a small break LOCA or secondary line break inside containment, the post-accident radiation environment is not expected to exceed 4 x  $10^6$  rads. Therefore, the components supplied by the cable (i.e., reactor coolant temperature detectors and three steam flow transmitters and their power supplies) will perform their safety function in the post accident environment. As mentioned above, the temperature detectors with the PVC cable have redundant detectors utilizing qualified cable. The flow transmitters, as indicated in their JCO, are only required to initiate a reactor trip on steam flow-feedwater flow mismatch early in the accident.

Plant Tag No: No Tag Number Assigned (Cont.) Functional Name: Instrumentation Cable Manufacturer: Rockbestos Mil Spec Supply Company Model Number: PVC/Teflon Insulation

# Justification for Continued Operation (Cont.)

The components served by this cable will perform their required safety function in the harsh environment or other components are available to perform a similar function in the event the components fail.

### Teflon Cable

Radiation testing of teflon has demonstrated 75% retention of tensile properties at 1.2 x  $10^5$  gamma and 75% retention of shear strength at 4.0 x  $10^5$  rads gamma, as reported in EPRI Report No. 2129. Radiation testing of teflon insulated cable has also been performed by Wyle Labs as part of an equipment test program to determine the maximum serviceable radiation dose. Wyle Report No. 43235-1 indicates that the teflon cable insulation remains flexible and usable up to  $10^7$  rads gamma. This cable insulation has a radiation limit of 4 x  $10^6$  rads above which cracking of the insulation occurs. In the event of a large break LOCA, the components supplied by this cable (i.e., three pressurizer level transmitters) are not required to perform a safety function. In the event of a small break LOCA or secondary line break inside containment, the post-accident radiation environment is not expected to exceed 4 x  $10^6$  rads. Therefore, the components will be available for monitoring the RCS level through the pressurizer during a small break LOCA and a secondary line break.

In summary, the components served by this cable will perform their safety function prior to experiencing a harsh environment or other components are available to perform a similar function in the event the components fail. This JCO complies with the criteria set forth in 10 CFR 50.49(i)(1) and (2) and ensures that SONGS 1 can be safely operated pending replacement of this cable.

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Plant Tag No.: N Functional Name: P Manufacturer: A Model Number: S

No Tag Number Assigned Powr and Control Cable Anaconda-Ericsson, Inc. Silicone Rubber Insulation

#### Functional Description:

This cable is utilized in safety related circuits for outside containment. Its function is to provide continuous circuits to safety related equipment required for operation during the accident.

#### Qualification Status:

There is a lack of documentation identified to date to qualify this cable. It will be replaced with qualified cable.

### Justification for Continued Operation:

Through field inspection and correspondence with the vendor, it has been determined that Silicone Rubber is used as the insulation material for the installed control cable. A material and size comparison study was performed to establish an applicable test. It has been determined that Franklin Test Report F-C3125 is applicable to the installed cable.

The test cables were subjected to a seven-day accident environment with temperatures up to  $340^{\circ}$ F and pressures of 100 psig. Although the postulated peak accident temperature ( $352^{\circ}$ F) exceeds the test temperature, a component specific thermal analysis has been performed and it was determined that the peak surface temperature attained due to the required profile is  $307^{\circ}$ F. This is significantly less than the tested peak and the test dwell time at peak is sufficient to ensure thermal saturation of the tested specimen. Throughout the entire test the samples were sprayed with a chemical solution consisting of 2000 ppm solution of boron as boric acid, buffered with sodium hydroxide to a pH of 9.0. The cable samples were also loaded with a current of fourteen (14) amps AC throughout the test. They were also exposed to a total integrated gamma radiation dose of 2.0 x  $10^7$  rads. All required service conditions are enveloped by the test levels. Therefore, this testing provides reasonable assurance that this equipment will perform its safety function as

This JCO complies with the criteria set forth in 10 CFR 50.49(i)(2) and ensures that SONGS 1 can be safely operated pending replacement or qualification of this cable. Plant Tag No.: WPC3, WPC4, EPC2, EPC3, Functional Name: Penetrations Manufacturer: Viking Industries Inc. Model Number: Power and Control Penetrations - 120 VAC

### Functional Description:

The electrical penetration assemblies provide passage of electricial circuits supplying various electrical safety related equipment, through the containment pressure barrier, while maintaining the integrity of the pressure barrier. The penetrations will be exposed and required to function in the post-accident containment environment.

### Qualification Status:

There is a lack of documentation available to qualify these penetrations. They will be replaced with qualified penetrations.

# Justification for Continued Operation:

A similar Viking penetration has been tested by Wyle Laboratories as reported in Wyle Test Report No. 43913-2. This type test subjected the continuously energized penetrations to a LOCA environment of 295°F at 62.7 psia, 100% RH, and chemical spray. The penetration was also exposed to 1.1x10<sup>8</sup> rads gamma. Three of the four connector assemblies functioned throughout the test. One connector assembly however, shorted to ground due to moisture on the external canister surface. A post test inspection of the equipment determined that this failure was due to improper preparation of the test specimen rather than a design deficiency. In addition, the external penetration connections at SONGS-1 are potted with RTV Silicone. This potting would prevent the type of failure that occured during testing. Therefore this penetration testing has demonstrated that the 120V Viking Penetrations are capable of functioning in severe accident environments.

Both the tested and installed penetrations are high voltage power and control penetrations that employ the same basic design principles. These penetrations are comprised of cylindrical canisters hermetically sealed at both the inboard and outboard steel bulkheads. The inboard and outboard bulkheads are identical and individually capable of maintaining a pressure seal. Thus, the pressure integrity of the penetration is maintained by a fully redundant sealing system. Two types of seals are used in these penetrations. Glass is used to seal the cable conductor penetrations. A set of o-rings are used for metal-to-metal sealing of the steel bulkheads to the pipe sleeve.

The only significant differences in the tested and installed penetrations is with some of the non-metallic materials of construction. Two types of cables are used in the installed penetration. One type is a silicone insulated cable Plant Tag No.: WPC3, WPC4, EPC2, EPC3, (Cont.) Functional Name: Penetrations Manufacturer: Viking Industries Inc. Model Number: Power and Control Penetrations - 120 VAC

## Justification for Continued Operation (Cont.):

with a glass braided jacket. This is the same type of cable used in the Wyle test cited above. In addition, a cable with nylon impregnated glass braid insulation and a nylon jacket overall is used. The glass braid insulation is essentially unaffected by the  $291^{\circ}$ F temperature spike and  $2.6\times10^7$  rads Gamma radiation dose. The nylon jacket may soften due to the high accident temperatures. The jacket however is not essential to the operation of the cable. The glass braid cable insulation is essential and will remain functional for the duraton of the accident conditions.

Another material difference between the installed and tested penetrations are the o-ring seals. The tested penetration used silicone o-rings where as the installed penetration has butyl rubber o-rings. Butyl rubber has been tested at temperatures up to  $340^{\circ}$ F and  $4.0x10^7$  rads gamma. Radiation softens butyl rubber at  $4.0x10^7$  rads gamma. The o-rings in the penetration are totally enclosed by the penetration and are only stressed in compression. Therefore the slight softening of the rubber o-rings will not affect the sealing of the penetration. Since the butyl rubber test conditions exceed the postulated accident conditions, these o-rings are satisfactory.

The only other significant difference is the polyurethane potting compound used in the installed penetrations. The polyurethane potting is used internally on both ends of the steel bulkheads for electrical insulation of the cable connections. The polyurethane does not provide any sealing function. Polyurethane has excellent resistance to radiation. Polyurethane retains 80% of its initial tensile strength at  $6.0 \times 10^7$  rads. Although the high temperature resistance of polyurethane is marginal, testing has been performed up to  $300^{\circ}$ F. At this temperature same degradation of mechanical properties occurs. Since there is no mechanical stress on the polyurethane, this potting compound still is capable of providing its electrical insulating function.

All required service conditions for these penetrations are enveloped by testing. Therefore these test results provide reasonable assurance that this equipment will perform its safety-related function as required. This JCO complies with the criteria set forth in 10CFR50.49(i)(2) and ensures that SONGS-1 can be safely operated pending replacement of the penetrations.

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Plant Tag No.:	EPC4, WPC7, WPC9, EPC1, WPC5
Functional Name:	Electrical Penetrations
Manufacturer:	Viking Industries Inc.
Model Number:	Power and Control Penetrations - 480V AC

The electrical penetration assemblies provide passage of electricial circuits supplying various electrical safety related equipment, through the containment pressure barrier, while maintaining the integrity of the pressure barrier. The penetrations will be exposed and required to function in the post-accident containment environment.

### Qualification Status:

There is a lack of documentation available to qualify these penetrations. They will be replaced with qualified penetrations.

# Justification for Continued Operation:

An equivalent Viking penetration has been tested by Wyle Laboratories as reported in Wyle Test Report No. 43913-2. This type test subjected the continuously energized penetrations to a LOCA environment of 295°F at 62.7 psia, 100% RH, and chemical spray. The penetrations were also exposed to 1.1x10<sup>8</sup> rads gamma. Three of the four connector assemblies functioned throughout the test. One connector assembly however, shorted to ground due to moisture on the external canister surface. A post test inspection of the equipment determined that this failure was due to improper preparation of the test specimen rather than a design deficiency. In addition, the external penetration connections at SONGS-1 are potted with RTV Silicone. This potting would prevent the type of failure that occured during testing. Therefore this penetration testing has demonstrated that the 480V Viking Penetrations are capable of functioning in severe accident environments.

The only significant difference between the tested and installed penetrations are in some of the nonmetallic materials of construction. The potting compound used internal to the installed canisters is polyurethane. The polyurethane potting is used on the steel bulkheads on both ends of the canister for electrical insulation of the cable connections and to provide mechanical support during installation. The polyurethane does not provide any pressure sealing function. In addition, the electrical insulation provided by the polyurethane is a secondary insulation, since the primary electrical insulation is provided by heat shrink tubing on the electrical connections. Therefore, the polyurethane insulation is not considered to be essential, but will be analyzed for conservatism. Polyurethane has excellent resistance to radiation. Polyurethane retains 80% of of its initial tensile strength at  $6.0x10^7$  rads. Although the high temperature capability of polyurethane is marginal, testing has been performed up to  $300^\circ$ F. At this temperature

Plant Tag No.:	EPC4, WPC7, WPC9, EPC1, WPC5 (Cont.)
Functional Name:	Electrical Penetrations
Manufacturer:	Viking Industries Inc.
Model Number:	Power and Control Penetrations - 480V AC

# Justification for Continued Operation (Cont.):

some degradation of mechanical properties occurs. Since there is no mechanical stress on the polyurethane, this potting compound still is capable of providing its electrical insulating function as backup to the heat shrink tubing. Therefore this testing and the above analysis provides reasonable assurance that this equipment will perform its safety function as required.

This JCO complies with the criteria set forth in 10 CFR 50.49(i)(2) and ensures that SONGS 1 can be safely operated pending replacement of the penetrations.

Plant Tag No.:	EI3, EI4, WI3, WI4
Functional Name:	Electrical Penetrations
Manufacturer:	Viking Industries Inc.
Model Number:	Instrumentation Penetrations - Thermocouple and Twisted
	Pair Cable

The electrical penetration assemblies provide passage of electricial circuits supplying various electrical safety related equipment, through the containment pressure barrier, while maintaining the integrity of the pressure barrier. The penetrations will be exposed and required to function in the post-accident containment environment.

#### Qualification Status:

There is a lack of documentation available to qualify these penetrations. They will be replaced with qualified penetrations.

### Justification for Continued Operation:

A similar Viking penetration has been tested by Wyle Laboratories as reported in Wyle Test Report No. 43913-2. This type test subjected the continuously energized penetrations to a LOCA environment of 295°F at 62.7 psia, 100% RH, and chemical spray. The canisters had also been exposed to 1.1x10<sup>8</sup> rads gamma. Three of the four connector assemblies functioned throughout the test. One connector assembly however, shorted to ground due to moisture on the external canister surface. A post test inspection of the equipment determined that this failure was due to improper preparation of the test specimen rather than a design deficiency. In addition, the external penetration connections at SONGS-1 are potted with RTV silicone. This potting would prevent the type of failure that occured during testing. Therefore this penetration testing has demonstrated that the Viking Instrumentation Penetrations are capable of functioning in severe accident environments.

The installed penetrations are for instrumentation and are generically equivalent to the tested penetrations which are used for power and control. The same basic design principles are used for both penetrations. These penetrations are comprised of cylindrical canisters hermetically sealed at both the inboard and outboard steel bulkheads. The inboard and outboard bulkheads are identical and individually capable of maintaining a pressure seal. Thus, the pressure integrity of the penetration is maintained by a fully redundant sealing system. Two type of seals are used in these penetrations. Glass is used to seal the cable conductor penetrations. A set of o-rings are used for metal-to-metal sealing of the steel bulkheads to the pipe sleeve.

Plant Tag No.:	EI3, EI4, WI3, WI4 (Cont.)
Functional Name:	Electrical Penetrations
Manufacturer:	Viking Industries Inc.
Model Number:	Instrumentation Penetrations - Thermocouple and Twisted
	Pair Cable

### Justification for Continued Operation (Cont.):

The only significant difference between the tested and installed penetrations are in some of the nonmetallic materials of construction. The potting compound used internal to the installed canisters is polyurethane. The polyurethane potting is used on the steel bulkheads on both ends of the canister for electrical insulation of the cable connections and to provide mechanical support during installation. The polyurethane does not provide any pressure sealing function. In addition, the electrical insulation provided by the polyurethane is a secondary insulation, since the primary electrical insulation is provided by heat shrink tubing on the electrical connections. Therefore, the polyurethane insulation is not considered to be essential, but will be analyzed for conservatism. Polyurethane has excellent resistance to radiation. Polyurethane retains 80% of of its initial tensile strength at 6.0x10<sup>7</sup> rads. Although the high temperature resistance of polyurethane is marginal, testing has been performed up to 300°F. At this temperature the mechanical properties occurs. Since there is no mechanical stress on the polyurethane, this potting compound still is capable of providing its electrical insulating function as backup to the heat shrink tubing. Therefore this testing and the above analysis provides reasonable assurance that this equipment will perform its safety function as required.

The only other significant difference between the tested and installed penetrations are the teflon twisted pair cables. Each conductor is individually insulated with .004 to .007 inch extruded teflon. The conductors are twisted with a maximum lay of 3 inches. The two conductors are shielded with a copper braid shield with a minimum of 95% coverage. the drain wire for the shield is a bare 18 AWG copper wire. Each pair of conductors, drain wire, and shield are clad with a .012 inch extruded teflon jacket. The installed cables are not subject to mechanical stress. In addition, the braided shield will provide mechanical support and hold the insulation intact. Thus, the integrity of the insulation is maintained. It should be noted that the teflon cables are only located inside the penetration. The only harsh accident conditions to which the cable is subjected is radiation and temperature. The high humidity conditions present inside containment during a postulated accident are excluded from the canister interior. Therefore, no failure can occur due to high humidity or moisture. Teflon can easily withstand temperature beyond 340<sup>0F.</sup>

Teflon is susceptible to radiation damage. Radiation testing of teflon has demonstrated 75% retention of tensile properties at 1.2 x  $10^5$  rads gamma and 75% retention of shear strength at 4.0 x  $10^5$  rads gamma as reported in EPRI Report No. 2129. Radiation testing of teflon wires has also been performed by Wyle Laboratories as part of an equipment test program to determine the maximum serviceable radiation dose. Wyle Report No. 43235-1 indicates that the teflon wire insulation remains flexible and usable up to 1 x  $10^7$  rads gamma.

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Plant Tag No.: EI3, EI4, WI3, WI4 (Cont.) Functional Name: Electrical Penetrations Manufacturer: Viking Industries Inc. Model Number: Instrumentation Penetrations - Thermocouple and Twisted Pair Cable

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#### Justification for Continued Operation (Cont.):

The general accident radiation dose utilized inside containment is  $2 \times 10^7$  rads gamma based on the DOR Guidelines. Area specific radiation doses have been calculated for certain areas inside containment. It was determined from this calculation that the accident radiation dose in the area of the penetrations is 6.0 x  $10^5$  rads gamma.

It should also be noted that the instrumentation wires transmit low voltage and low current signals. The effects of an insulation failure and the possibility of an instrumentation short circuit is remote in view of the minimal physical separation required to prevent short circuits at low voltages.

Reasonable assurance exists that this cable will perform its safety related function for the required radiation dose of 6 x  $10^5$  rads gamma and the  $291^{\circ}F$  peak accident temperature.

From a systems stand point the items going through the instrumentation penetrations are as follows. Steam flow transmitters (FT 460, 461, 462) are required to actuate reactor trip on steam flow-feedwater flow mismatch. A JCO has been provided for these items which indicates they will operate immediately or some other system will initiate reactor trip. A pressurizer pressure transmitter which inputs into the subcooling monitor has a redundant train with a transmitter going through a qualified Conax penetration. Pressurizer level transmitters, which initiate reactor trip on high pressurizer level, would only be required to monitor the pressurizer level during a small break LOCA or steam line break. No action is taken or initiated during the accident based on these transmitters. Steam generator level transmitters have redundant transmitters routed through qualified Conax penetrations. The RCS RTDs also have redundant RTDs routed through qualified Conax penterations.

Therefore this combination of testing and analysis provides reasonable assurance that this equipment will perform its safety-related function as required. This JCO complies with the criteria set forth in 10CFR50.49(i)(1) and (2) and ensures that SONGS-1 can be safely operated replacement of the penetrations.