PLANT SYSTEMS

3/4.7.3 COMPONENT COOLING WATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.3.1 At least two independent component cooling water (CCW) trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With only one CCW train OPERABLE, restore the other train to OPERABLE status within 72 hours or be in COLD SHUTDOWN within the next 36 hours.

SURVEILLANCE REQUIREMENTS

4.7.3.1 The CCW System shall be demonstrated OPERABLE:

a. At least once per 31 days by verifying that each valve (manual, power operated or automatic) servicing safety related equipment that is not locked, sealed, or otherwise secured in position, is in its correct position.

b. By verifying that each CCW pump is OPERABLE when tested pursuant to Specification 4.0.5.

c. At least once per 18 months, during shutdown, by verifying that each automatic valve servicing safety related equipment, except those valves in Specification 4.7.3.1.d, actuates to its correct position on a Containment isolation signal.

d. At least once per 18 months, during shutdown, by verifying that valves MO-3294, MO-3296, MO-3300, and MO-3320 actuate to their correct position on:

   1. A Containment isolation signal coincident with a low CCW surge tank level, and

   2. A high-high Containment pressure signal.

e. By verifying that each power operated (excluding automatic) valve is OPERABLE when tested pursuant to Specification 4.0.5.

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PLANT SYSTEMS

COMPONENT COOLING WATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.3.2 At least one component cooling water (CCW) train capable of supplying cooling water to equipment needed in MODES 5 and 6 shall be OPERABLE.

APPLICABILITY: MODES 5 and 6.

ACTION:

With less than the required number of CCW trains OPERABLE, declare supported equipment inoperable.

SURVEILLANCE REQUIREMENTS

4.7.3.2 At least one CCW train shall be demonstrated OPERABLE by verifying that necessary components (the portion necessary to support equipment which is required to be OPERABLE in the applicable MODES above) are OPERABLE when tested pursuant to Specification 4.0.5.

PLANT SYSTEMS

BASES

3/4.7.3 COMPONENT COOLING WATER SYSTEM

The OPERABILITY of the CCW System ensures that sufficient cooling capacity is available for continued operation of safety-related equipment during normal and accident conditions. The redundant cooling capacity of this system, assuming a single failure, is consistent with the assumptions used in the accident analyses.

3/4.7.4 SERVICE WATER SYSTEM

The OPERABILITY of the service water system ensures that sufficient cooling capacity is available for continued operation of safety related equipment during normal and accident conditions. The redundant cooling capacity of this system, assuming a single failure, is consistent with the assumptions used in the accident conditions within acceptable limits.

3/4.7.5 ULTIMATE HEAT SINK

The Columbia River is the ultimate heat sink and ensures that sufficient cooling capacity is available to either 1) provide normal cooldown of the facility, or 2) to mitigate the effects of accident conditions within acceptable limits.

The limitations on cooling tower basin minimum water level and maximum temperature are based on providing an adequate (approximately 100 hours) cooling water supply to safety related equipment in the event the normal water supply from the intake structure is lost. The required amount of water is adequate to provide normal cooldown of the facility until makeup flow from the Columbia River to the cooling tower basin can be restored.

PLANT SYSTEMS

3/4.7.3 COMPONENT COOLING WATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.3.1 At least two independent component cooling water (CCW) ~~loops~~ trains shall be OPERABLE ~~with one train isolated from Seismic Category II loads. The spare CCW pump shall be OPERABLE.~~ 141

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

~~With the spare pump inoperable, restore the spare pump to OPERABLE status within 72 hours or be in COLD SHUTDOWN within the next 36 hours.~~

With only one CCW train and spare pump OPERABLE, restore the other train to OPERABLE status within 72 hours or be in COLD SHUTDOWN within the next 36 hours. 141

SURVEILLANCE REQUIREMENTS

4.7.3.1 The CCW System shall be demonstrated OPERABLE: 141

a. At least once per 31 days by verifying that each valve (manual, power operated or automatic) servicing safety related equipment that is not locked, sealed, or otherwise secured in position, is in its correct position.

b. By verifying that each CCW pump is OPERABLE when tested pursuant to Specification 4.0.5.

c. At least once per 18 months, during shutdown, by verifying that each automatic valve servicing safety related equipment, except those valves in Specification 4.7.3.1.d, actuates to its correct position on a Containment isolation signal.

d. At least once per 18 months, during shutdown, by verifying that valves MO-3294, MO-3296, MO-3300, and MO-3320 actuate to their correct position on:

1. A Containment isolation signal coincident with a low CCW surge tank level, and

2. A high-high Containment pressure signal.

e. By verifying that each power operated (excluding automatic) valve is OPERABLE when tested pursuant to Specification 4.0.5.

~~f. At least once per 31 days by verifying that either CV-3304 and CV-3288, or CV-3303 and CV-3287, are closed.~~ 141

~~g. At least once per 92 days by verifying that power can be supplied to the spare CCW pump from both buses.~~

COMPONENT COOLING WATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.3.2 At least ~~two~~ one component cooling water (CCW) trains capable of supplying cooling water to equipment needed in MODES 5 and 6, ~~or at least one train and the spare CCW pump,~~ shall be OPERABLE. 141

APPLICABILITY: MODES 5 and 6.

ACTION:

With less than the required number of CCW trains OPERABLE, declare supported equipment inoperable.

~~With only one CCW train OPERABLE and the spare pump inoperable, declare supported equipment inoperable.~~ 141

SURVEILLANCE REQUIREMENTS

4.7.3.2 At least ~~two~~ one CCW trains ~~or one train and the spare CCW pump,~~ shall be demonstrated OPERABLE by verifying that necessary components (the portion necessary to support equipment which is required to be OPERABLE in the applicable MODES above) are OPERABLE when tested pursuant to Specification 4.0.5. 141

3/4.7.3 COMPONENT COOLING WATER SYSTEM

The OPERABILITY of the CCW System ensures that sufficient cooling capacity is available for continued operation of safety-related equipment during normal and accident conditions. The redundant cooling capacity of this system, assuming a single failure, is consistent with the assumptions used in the accident analyses.

The OPERABILITY of the CCW System with one train isolated from Seismic Category II loads ensures that sufficient cooling capacity is available for continued operation of safety-related equipment following a seismic event. The OPERABILITY of the spare CCW pump ensures the availability of a CCW loop even with a single-failure concurrent with a seismic event.

Operation in Modes 1 through 4 is permitted with one CCW train inoperable for up to 72 hours provided the spare CCW pump is OPERABLE. During this 72-hour time period, the OPERABLE CCW train should not be isolated from Seismic Category II loads to ensure a continuous supply of CCW cooling to the reactor coolant pumps. The spare CCW pump is considered OPERABLE provided Surveillance Requirements 4.7.3.1.b and 4.7.3.1.g have been met. 141

3/4.7.4 SERVICE WATER SYSTEM

The OPERABILITY of the service water system ensures that sufficient cooling capacity is available for continued operation of safety related equipment during normal and accident conditions. The redundant cooling capacity of this system, assuming a single failure, is consistent with the assumptions used in the accident conditions within acceptable limits.

3/4.7.5 ULTIMATE HEAT SINK

The Columbia River is the ultimate heat sink and ensures that sufficient cooling capacity is available to either 1) provide normal cooldown of the facility, or 2) to mitigate the effects of accident conditions within acceptable limits.

The limitations on cooling tower basin minimum water level and maximum temperature are based on providing an adequate (approximately 100 hours) cooling water supply to safety related equipment in the event the normal water supply from the intake structure is lost. The required amount of water is adequate to provide normal cooldown of the facility until makeup flow from the Columbia River to the cooling tower basin can be restored.

SEISMIC UPGRADE OF THE SEISMIC CATEGORY II (SC II) PORTION OF THE COMPONENT COOLING WATER (CCW) SYSTEM

OBJECTIVE

The SC II portion of the CCW system was seismically upgraded to ensure that the structural integrity of the piping supports, equipment nozzles, equipment anchorages, and the associated system pressure boundary is maintained for seismic events, including a safe shutdown earthquake (SSE). Although the SC II portion of the CCW system has been upgraded to ensure pressure boundary integrity, it is not required to remain functional following an SSE since the components served by the SC II portion of the system are not essential for safe shutdown of the Plant. For this reason, the system will retain the SC II designation.

SYSTEM DESCRIPTION

The CCW system provides heat removal from safety-related and non-safety-related components during normal operation, shutdown and cooldown of the reactor, and from safety-related components after any accident leading to an emergency shutdown. In addition, the CCW system provides a monitored, intermediate barrier between the reactor coolant system (RCS) and the heat sink provided by the service water system (SWS). The portion of the system that supplies cooling water to engineered safety feature (ESF) equipment is safety-related and complies with the appropriate regulatory requirements with regard to design, equipment qualification, redundancy, and separation.

The CCW system consists of two Seismic Category I (SC I) flow paths, each of which serves a single train of identical ESF equipment and a common SC II, nonsafety-related flow path. Each train of CCW has SC I air-operated, interface isolation valves to provide automatic isolation of the SC I portion of the system from the SC II portion of the system upon receipt of a safety injection signal (SIS), or a low CCW surge tank level signal. One purpose of this automatic isolation capability is to ensure that the failure of SC II equipment and components (including piping) does not adversely affect the operation of the ESF equipment essential to safe shutdown of the Plant.

During the Nuclear Regulatory Commission's Safety System Functional Inspection conducted during August 1986, it was determined that in the event of a full-area rupture of the SC II piping, due to a seismic event, the automatic interface isolation valves may not close fast enough to prevent blowdown of the safety-related portion of the two CCW trains. Based on this finding, the SC II portion of the CCW system was upgraded to meet the basic requirements provided in the objective above. The following paragraphs provide the description of the upgrade and the criteria used in analyzing the system to ensure the objective was met.

SEISMIC CATEGORY II UPGRADE

General Description

All large bore piping, small bore piping, and equipment in the SC II portion of the CCW system was seismically analyzed or evaluated up to, and including, that portion of the system designated as SC Ix. The SC Ix designation is used to describe that portion of the system piping downstream of the SC I interface isolation valve up to, and including, the first anchor or the first three supports in each direction analyzed, designed, and constructed to SC I requirements. The SC Ix design does not meet all the criteria for designation of SC I, but ensures the capability of the interface isolation valves to perform their isolation function and maintain the integrity of the SC I portion of the system during a seismic event. The upgrade of the CCW system to ensure the integrity of the pressure boundary does not change the system's quality group or SC II designation.

The analysis for the seismic upgrade of the CCW system was performed by the Trojan architect/engineer in accordance with the American National Standards Institute (ANSI) Power Piping Code B31.1 for piping and the American Institute for Steel Construction (AISC) Code for supports. These are the design basis codes for this portion of the CCW system. Based on the results of the analysis, piping and equipment supports were modified or added to prevent rupture of the pressure boundary at points of high stress as determined by the criteria below.

Piping Analysis Criteria

The SC II CCW piping was divided into two categories for analysis. The first category is large bore piping which consists of that piping with diameters greater than or equal to 2-1/2 inches. The second category is small bore piping less than or equal to 2 inches in diameter.

The calculated stresses and loads for the large bore piping were combined as shown in Table 1. Only primary stresses were considered in the analysis since the design operating temperature for the CCW system is 200°F and secondary stresses need not be considered for system operating conditions less than 300°F.

To ensure CCW system pressure boundary integrity following an SSE, the calculated piping stresses were maintained below the primary stress limits determined by the following equations:

1. $\frac{P_D D_O}{4t_n} + \frac{.75i(M_A + M_B)}{Z} \leq 1.5\ S_y$ (except for tees and branch connections)

2. $B_1 \frac{P_D D_O}{2t_n} + B_2 \frac{(M_A + M_B)}{Z} \leq 2.0\ S_y$ (for tees and branch connections)

where,

B_1 and B_2 are component stress indices,
D_O is the outside diameter of the pipe,
M_A is the resultant moment loading on the cross section due to sustained loads,
M_B is the maximum of all upset, emergency, or faulted occasional loading conditions,
P_D is the design pressure stress,
Sy is the material yield strength,
t_n is the section modulas of the pipe.

The above equations and terms are as defined by the piping codes.

Detailed seismic analyses were not performed for small bore piping due to the inherent resistance of small bore piping to earthquake conditions as documented in NUREG/CR-1665, "Equipment Response At The El Centro Steam Plant During The October 15, 1979 Imperial Valley Earthquake", and data from testing conducted by ANCO Engineering as reported in the American Society of Mechanical Engineering (ASME) Papers 82-WA/PVP-4 and 83-PVP-34. To ensure applicability of the test data to Trojan piping systems, the following criteria were established:

1. Weight spans will be less than or equal to the spans in Table 2.

2. Piping flexibility was reviewed to assure that thermal expansion, thermal anchor movements, and seismic anchor movements do not result in a stress range greater than the limits defined by equations (1) and (2) above.

3. Lateral restraints were located adjacent to valves with large eccentric masses.

4. The Trojan response spectra applicable to the piping system was compared to the spectra used for the small bore seismic testing.

Pipe Support Analysis

In conjunction with the CCW piping stress analysis and evaluations, the piping supports were analyzed using the loading combinations in Table 3. Calculated stresses were maintained below the faulted allowable limits defined by the codes. Snubbers and anchor bolts were also evaluated for seismic loadings.

Based on the results of the piping and support analysis, several supports were removed, modified, or added to ensure system and structural integrity will be maintained under SSE loadings. Although the supports have been evaluated and/or modified to ensure their integrity under SSE loadings, no material upgrades were made, and the supports remain designated as SC II.

Equipment Analysis

Equipment supplied by the SC II CCW system piping was evaluated to ensure system pressure boundary integrity under SSE conditions. Specifically, nozzle and support evaluations were performed for the spent fuel pool cooling water heat exchangers, the boric acid evaporator and gas stripper packages, the primary sampling panel, and the waste gas compressor skids. The radwaste evaporator package, which is no longer in use, was isolated by cutting the CCW supply and return lines and abandoning the package in place. A detailed seismic analysis was not performed due to the inherent resistance of these types of components to seismic damage as documented in NUREG/CR-1665.

The equipment nozzles for which detailed piping analyses have been performed were analyzed for stresses utilizing a BijLaard analysis.

The equipment supports were evaluated by combining SSE loads, nozzle loads, and dead loads transmitted by all components connected to the supports. The maximum stress limits used for the evaluation are $0.9F_y$ for bending and tension stresses, and $0.5F_y$ for shear stresses, where F_y is the material yield strength.

Although equipment supports were modified to ensure system integrity based on the evaluation results, the equipment designation remains as SC II.

Instrumentation Evaluation

Small bore piping and cantilever beam methodologies were used to evaluate instrumentation lines. Instrumentation lines were determined to be rigid and therefore requiring no additional supports if the seismic induced frequency of the instrument line was greater than 33 Hz, using the cantilever beam methodology. The instrumentation evaluations demonstrated that although the instrumentation may fail, there will be no adverse affect on the system pressure boundary. Instrumentation associated with the SC II portion of the CCW system is not essential for safe shutdown.

TABLE 1

STRESS COMBINATIONS FOR LARGE BORE COMPONENT COOLING WATER (CCW) PIPING

Service Condition	Design Loading Combinations
1. Normal	P_D + DW
2. Upset	P_O + DW + OBE P_O + DW + RVC P_O + DW + FV P_O + DW + RVO + OBE
3. Emergency	P_O + DW + OBE + RVC* P_O + DW + OBE + FV*
4. Faulted	P_O + DW + SSE + RVC* or RVO or FV* P_O + DW + DE

P_D - Design Pressure
P_O - Operating Pressure Stress
DW - Piping Dead Weight Stress
SSE - Safe Shutdown Earthquake Stress
OBE - Operating Basis Earthquake Stress
FV - Fast Valve Closure Stress
RVC - Relief Valve Actuation Stress - Closed System (transient)
RVO - Relief Valve Action Stress - Open System (sustained)
DE - Dynamic Events Stress Associated with the Faulted Condition

*May be combined with OBE and SSE by square root of the sum of the squares (SRSS) method.

TABLE 2

WEIGHT SPANS FOR SMALL BORE
COMPONENT COOLING WATER (CCW) PIPING

Weight spans for HBD-34 piping, to the ANSI B31.1 criteria of 1,500 psi stress and 0.1-inch deflection:

Nominal Pipe Size	Weight Span
3/4 in.	6-ft 11 in.
1 in.	7-ft 10 in.
1-1/2 in.	9-ft 11 in.
2 in.	11-ft 2 in.

TABLE 3

COMPONENT COOLING WATER (CCW)
PIPE SUPPORT LOAD COMBINATIONS

Service Condition	Nuclear Class 2, 3, and Balance of Plant (BOP)
Normal	$T_N + W$
Upset	$T_U + W + OBE^{\dagger} + RVO$
	$T_U + W + FV$ or RVC
Emergency	$T_U + W + OBE^{\dagger} + FV^{(1)}$ or $RVC^{(1)}$
Faulted	$T_F + W + SSE^{\dagger\dagger} + FV^{(1)}$ or $RVC^{(1)}$ or RVO
	$T_F + W + DE$
Hydro	W_H

(1) May be combined with OBE or SSE by SRSS.

T_N = Maximum Normal Operating Thermal Load

T_U = Maximum Normal or Upset Thermal Load

T_F = Maximum Normal, Upset, or Faulted Thermal Load

W = Normal Dead Weight Load

W_H = Hydro Test Load

$\dagger OBE = \sqrt{(OBE_{Inertial})^2 + (SAM_{OBE})^2}$

$\dagger\dagger SSE = \sqrt{(SSE_{Inertial})^2 + (SAM_{SSE})^2}$

SAM = Seismic Anchor Movement

RVO = Relief Valve Thrust (Open System)

RVC = Relief Valve Transient (Closed System)

FV = Fast Valve Actuation Transient

DE = Dynamic Events Associated with Faulted Condition

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
PORTLAND GENERAL ELECTRIC COMPANY,	)	Docket 50-344
THE CITY OF EUGENE, OREGON, AND	)	Operating License NPF-1
PACIFIC POWER & LIGHT COMPANY	)	
	)	
(TROJAN NUCLEAR PLANT)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of License Change Application 178, to the Operating License for Trojan Nuclear Plant, dated November 13, 1989, have been served on the following by hand delivery or by deposit in the United States mail, first class, this 13th day of November 1989:

Mr. David Stewart-Smith
State of Oregon
Department of Energy
625 Marion St NE
Salem OR 97310

Mr. Michael J. Sykes
Chairman of County Commissioners
Columbia County Courthouse
St. Helens OR 97051

S. A. Bauer, Manager
Nuclear Regulation Branch
Nuclear Safety & Regulation

Subscribed and sworn to before me this 13th day of November 1989.

Notary Public of Oregon

My Commission Expires: August 9, 1991