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FINAL

SYSTEM DESCRIPTION
(Index No. 28B)

CORE FLOODING SYSTEM
(B&R Dwg. No. 2034, Rev. 16)

JERSEY CENTRAL POWER & LIGHT COMPANY

THREE MILE ISLAND NUCLEAR STATION

UNIT NO. 2

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CORE FLOODING SYSTEM

1.0 INTRODUCTION

1.1 System Function

The Core Flooding System provides an engineered safety features function to preclude core meltdown in the event of a major loss of coolant accident. Protection against core meltdown is provided by flooding the core with borated water which is stored within two tanks located inside the Reactor Building. Release of the stored water to the reactor core is independent of actuation signals, electric power supplies, or operator action. The flooding water is released by action of check valves in the outlet line from the tanks which are normally held closed by reactor coolant system pressure, but open when the coolant system pressure is reduced below that pressure which is being maintained in the flooding tanks by a static overpressure of nitrogen gas. The loss of reactor coolant system pressure resulting from a system piping failure, therefore, directly causes initiation of core flooding.

The combined contents of both flooding tanks are sufficient to prevent core meltdown, including the case where the entire volume of the vessel has escaped, and the overpressure in the tanks and size of the flooding lines are sufficient to ensure reflooding within 25 seconds after the loss of coolant accident (LOCA).

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1.2 Summary Description of System (Ref. B&R Dwg. No. 2034, Rev. 16)

The Core Flooding System is composed of two tanks, each connected to one of two nozzles which penetrates the reactor vessel above the core zone. Each of the tanks and its related equipment function as an independent circuit, however, both circuits are required for the system to meet its design requirements. Core flooding is initiated when a loss of coolant accident reduces the reactor coolant pressure to approximately 600 psig, at which point the force of the nitrogen overpressure plus the static head in the tanks is sufficient to overcome the closing force exerted by the reactor coolant pressure against the two check valves in each flooding line.

The core flooding tanks are located within the Reactor Building, outside of the secondary shield, at an elevation of 305'-0". Each tank contains approximately 7000 gallons of borated water at a minimum concentration of 2,270 ppm boron and pressurized with nitrogen gas to 600 (± ~~15~~ 25) psig. The outlet from each tank connects to one of two flooding nozzles located in diametrical opposition of the reactor vessel. The flooding line between each tank and the reactor vessel is fitted with one electric motor operated stop valve and two check valves in series. The stop valves, which are remotely operable from the Control Room, serve to permit isolation of the flooding tanks when the Reactor Coolant System is depressurized for normal reactor shutdowns. The check valves, which close with reactor pressure, prevent the reactor coolant from entering the flooding tanks during normal reactor operation, and allow core flooding when the coolant pressure decreases as a result of a LOCA.

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The system is provided with sampling and bleed capabilities from either tank, as well as controlled venting to the gaseous radwaste disposal system during reactor operation, or to the Reactor Building atmosphere when the tanks are depressurized for a shutdown. Remotely controlled electric motor operated valves in attendant piping provide for these functions except that venting of the tanks to the Reactor Building requires local manipulation of the atmospheric vent valves. There are three Reactor Building penetrations associated with the system; a common sampling/bleed line, and a line to each tank for the addition of nitrogen and makeup solution.

A relief valve discharging to the Reactor Building atmosphere is fitted to each tank to prevent overpressurization.

The level and pressure in each tank is remotely monitored in the Control Room and annunciation of alarm conditions is provided.

The core flooding nozzles also serve as the return point for flow from the Decay Heat Removal System. Each circuit of the Decay Heat Removal System connects to a flooding line between the two check valves. The decay heat return lines are each provided with a check valve to prevent back flow into the Decay Heat Removal System.

1.3 System Design Requirements

The Core Flooding System is designed to inject sufficient borated water into the reactor core within an adequate period of time to prevent gross damage to the fuel following a loss of coolant accident. To ensure the adequacy of the system to meet its

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design function, core flooding is initiated as a direct result of the accident, i.e., the loss of pressure in the Reactor Coolant System, due to a piping system rupture, causes the check valves in the flooding lines to open and thereby release the stored borated water in the flooding tanks.

Post LOCA core flooding limits the temperature of the reactor fuel cladding to minimize the zirconium cladding - water reaction and therefore maintains the integrity of the fuel.

In order to verify that the system will limit the cladding temperature to 2300F and the metal-water reaction to less than 1%, analyses were performed with piping ruptures ranging in size from small leaks to the complete severance of a 36 inch ID reactor coolant pipe. The reactor operating conditions assumed for these analyses are as follows:

Reactor coolant system pressure, psig	-	2185
Reactor coolant average temperature, F	-	582
Reactor power level, MWt	-	2772
Reactor coolant system mass, lbs.	-	519,173
Initial Reactor Building temperature, F	-	110
Initial Reactor Building relative humidity, %	-	0
Initial Reactor Building pressure, psig	-	0

Assuming the release of the contents of both core flooding tanks to the reactor vessel, the analyses confirmed that the system will perform in accordance with the design bases for the entire spectrum of possible pipe ruptures. The overpressure in the tanks and the size of the flooding lines are sufficient to insure reflooding of the core within 25 seconds after the loss of coolant accident (LOCA). The response time of the system for

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smaller breaks is entirely dependent upon the size of the rupture since the check valves in the flooding lines will only open when the reactor coolant pressure has decreased to less than the pressure being maintained in the tanks.

The core flooding nozzles are specifically designed to ensure that they can withstand the differential temperatures imposed by the accident conditions, as well as the thermal forces induced by injecting water from the borated water storage tank and by recirculating water from the Reactor Building sump via the Decay Heat Removal System during post accident low pressure injection and from the reactor vessel during reactor cooldown. The core flooding lines between the tanks and the reactor vessel are for the most part routed outside of the secondary shield wall and are therefore protected from missiles originating within these areas. That portion of the lines located between the primary shield and the reactor vessel wall is not subject to missile damage because there are no credible sources of missiles in that area. Between the primary and secondary shields, the lines are provided with missile protection.

Leakage of the check valves which would allow reactor coolant to pass into the flooding tanks has also been evaluated. The check valves used in this system comply with the tightness requirements of the Manufacturers' Standardization Society which limit the permissable leakage to 140 cc/hr. per valve. Since two check valves are provided in series in each flooding line, the potential leakage rated will be less than the stated value. Leakage across the check valves can have three effects:

a) It can cause a temperature increase in the line and core flooding tanks;

b) It can cause a level and resultant pressure increase in the tanks; and,

c) It can cause dilution of the borated water in the flooding tanks.

Leakage at the aforementioned rate causes insignificant changes in any of these parameters. At a leakage rate of 140 cc/hr., the corresponding level increase in the tank is less than 1 inch/month, and the associated temperature and pressure increase is negligible. Assuming a leakage rate 100 times greater than the permissible rate, the level increase in the tank would be approximately 2 inches/day with a corresponding pressure increase of approximately 10 psi. To ensure that no significant temperature increase will occur in the tank, even at the higher leakage rate, that portion of the line between the two check valves and the line to the tanks is left uninsulated to promote convective heat losses to the building atmosphere. Therefore, it can be concluded that check valve leakage rates within the expected limits will have no adverse effects on either the reactor or overall plant operation. The most significant effect on plant operation would be an increase in the sampling frequency for boron concentration in the tanks and an increase in the frequency of bleeding and/or venting the tanks and adding makeup to maintain the minimum boron concentration.

All piping in the system is stainless steel and is classified as Nuclear Piping (symbol N), designed, fabricated, inspected and erected in accordance with ANSI B31.7, Nuclear Power Piping. The core flooding tanks are constructed of carbon steel with stainless steel cladding on the interior and conform to ASME Section III, Class C. The seismic requirements for Class I apply to the entire system including all components located within the Reactor Building.

2.0 DETAILED DESCRIPTION OF SYSTEM

2.1 Components

As has been previously stated, both circuits of the Core Flooding System are necessary for the system to meet the design requirements. Because of the passive nature of the system and components, it is not expected that one circuit of the system will become incapacitated during reactor power operation.

2.1.1 Core Flooding Tanks, CF-T-1A/CF-T-1B

The core flooding tanks (see Table 1) are vertical cylinders, 9'-03 5/8" ID with a vertical straight section of 16'-10", a convex top and bottom, and an overall height of 22'-05". The total volume of a tank is 1410 $ft.^3$. At the normal operating level of approximately 11'-06", the water space volume is 940 $ft.^3$ corresponding to approximately 7000 gals. An 18" manway is provided on the top of each tank for access. The outlet from each tank is a 14" nozzle located in the center of the tank bottom. The tanks are constructed of carbon steel with internal SS cladding and are designed, fabricated, inspected and tested as Class C vessels in accordance with ASME Boiler and Pressure Vessel, Code Section III. The design pressure and temperature are 700 psig and 300F, respectively. The

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tanks are utilized to store borated water at a minimum concentration of 2,270 ppm boron for reactor core flooding following a LOCA.

2.1.2 Major System Valves

Core Flooding Tank Outlet Stop Valve, CF-V1A, CF-V1B

One 2500 psig, 300F, 14 inch, SS, electric motor operated gate valve is provided in each core flooding line. These valves are maintained in the open position at all times during reactor operation but are closed to ensure isolation of the tank when the Reactor Coolant System is intentionally depressurized. Each valve is interlocked with the Reactor Coolant System low pressure instrumentation to alert the operator if the valves have not been closed prior to the coolant system depressurization below 650 psig or if the valves remain closed after the coolant system has been pressurized above 700 psig. Position indication, annunciator alarm and valve control is available in the Control Room on the Coolant Systems Monitoring Panel No. 8. Electrical power to the motor operator for the valves is supplied from motor control centers 2-11EB and 2-21EB, respectively. Valve stroke time is approximately 70 sec.

Core Flooding Tank Outlet Line Check Valves, CF-V4A, CF-V4B and CF-V5A, CF-V5B

One 2500 psig, 300F, 14 inch, SS, check valve (CF-V4A/B) and one 2500 psig, 650F, 14 inch, SS, check valve (CF-V5A/B) are provided in each flooding line to the reactor vessel. These valves close with reactor coolant pressure above 600 psig to

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prevent the coolant from entering the flooding tanks. The valves conform to the Manufacturers' Standardization Society and meet the tightness requirements of MSS-SP-61 "Hydraulic Testing of Steel Valves".

2.1.3 Miscellaneous Valves

One check valve is provided in each of the 1 inch fill and makeup lines to the tanks inside the Reactor Building. The valves, CF-V100A and CF-V100B, are located just downstream of the Reactor Building penetration for each line and serve as internal building isolation valves. Outside of the Reactor Building, a one inch line connects to each core flooding fill lend makeup line for borated water addition, and is provided with manual stop valve CF-V123A/CF-V123B. Upstream of the borated water fill and makeup connection to each tank, a check valve CF-V101A/CF-V101B, is installed to prevent backflow to the one inch nitrogen supply lines. The nitrogen supply line to each tank is fitted with manual stop valve CF-V114A/CF-V114B, which have position indication on Panel 15 in the Control Room.

A one inch vent line is provided from each tank to the Reactor Building vent header leading to the gaseous Radwaste Disposal System and is fitted with an electric motor operated throttle valve. The valves, CF-V3A and CF-V3B, are remotely operable from the Control Room on the Coolant Systems Monitoring Panel No. 8 and provide a means for bleeding excessive gas pressure from the tank. The valves are electrically powered from motor control centers 2-32B and 2-42B, respectively. A manual valve, CF-V117A/B, is provided in each line for vent isolation, if required. From each tank vent downstream of the vent isolation valve, a one inch line, terminating with a blanked flange, is provided for tank depressurization to the Reactor Building during shutdown. A manual throttle valve, CF-V124A/B is installed in each line to control tank depressurization. Similarly, one inch electric motor operated stop valves are provided in the sample and drain line from each tank. These valves, CF-V2A and CF-V2B, electrically powered from the 480V motor control centers 2-32B and 2-42B respectively, are remotely operable from the Control Room on the Coolant Systems Monitoring Panel No. 8. The valves permit sampling or draining from either tank via a common line which penetrates the Reactor Building and leads to the Unit 2 sampling hood in the Unit 1 Chemistry Laboratory or bleed holdup tanks in the Reactor Coolant Radwaste System. The common sampling/drain line is provided with an electric motor operated stop valve CF-V115, powered from motor control center 2-21EA, inside the Reactor Building and an air piston operated valve CF-V144 outside the building for isolation purposes. A signal from the safety features actuation system closes both of these valves within 5 sec. at a building pressure of 4 psig. should the valves be open when a LOCA occurs. The isolation valves are remotely operated from the Control Room, Panel 15, for normal service. They can also be operated locally and have position indication locally and on Panels 13 & 15 in the Control Room.

Double-valved drains to the Reactor Coolant Radwaste Disposal System are provided in each flooding line as well as at the flooding nozzle. The water from these drains is normally collected in a bleed holdup tank in the disposal system.

All of the aforementioned valves are constructed of SS and are designed to withstand the maximum pressure and temperature to which they will be subjected.

2.2 Instruments, Controls, Alarms and Protective Devices

The instrumentation associated with this system (see Table 2) provides redundant measurement and indication of the pressure and level in each of the flooding tanks and permits monitoring of the system during normal and emergency conditions. Valve control swtiches, with position indicators, are also provided for the system's remotely operable valves. System instrumentation display and valve control is provided at the Coolant Systems Monitoring Panel No. 8 in the Control Room. Also, local control and position indication and position indication

Alarm conditions for each parameter are annunciated in the Control Room on Panel Number 8 and indicated by the computer. A listing of the panel mounted annunciators and computer inputs is given in Table 3.

A relief valve which discharges to the Reactor Building atmosphere at 700 psig is installed on each tank to prevent overpressurization from check valve leakage or from excessive addition of makeup solution or nitrogen. The relief valves CF-R1A and CF-R1B, are sized to relieve that quantity of gas displaced by 100 gpm of borated water discharged into the tanks by the makeup pump.

3.0 PRINCIPAL MODES OF OPERATION

3.1 Startup

For startup of the Core Flooding System, the flooding tanks are filled with demineralized water, and after testing the operation of the check valves as discussed in Section 3.4.3, the demineralized water is drained from the tanks and replaced by a 2270 ppm boron solution from the chemical addition system. During the filling operation, the electric motor operated stop valves in the flooding lines are closed and the tanks vented to expel air. When the tanks have been filled to approximately 13' ±.45 11'-06" and the boric acid concentratio verified, nitrogen is introduced into the tanks from the station nitrogen supply system until the tank pressure is 600 (±~~15~~) psig.
±.5

3.2 Normal Operation

The Core Flooding System serves no function during normal plant operations. The normal operating mode for the system is as an engineered safety feature which protects the reactor core from gross fuel cladding failure following a loss of coolant accident. The core flooding is automatically actuated when the reactor pressure, as a result of the accident, falls below the pressure being maintained within the flooding tanks. At this point, the borated water contained in the tanks is released through the two check valves in each of the flooding lines and flows into the reactor vessel through the two diametrically opposite nozzles which penetrate the vessel above the core zone. To prevent inadvertent flooding of the core

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during a planned shutdown, a remotely controlled, electric motor operated stop valve (CF-V1A/CF-V1B) is provided in each flooding line and is closed prior to depressurization below the pressure in the flooding tanks. When plant start-up is in progress, these valves must be opened after the Reactor Coolant System pressure is above the pressure in the flooding tanks. During normal plant operation, these valves are maintained in the open position. An alarmed interlock is provided between these valves and the reactor coolant low pressure instrumentation to alert the operator if a valve is incorrectly positioned at any time.

3.3 Shutdown

The Core Flooding System is essentially a passive system and is generally considered to be in an emergency standby rather than a shutdown condition during plant operation. This readiness is ensured by maintaining a 600 (±~~15~~ ±25) psig nitrogen gas overpressure in the core flooding tanks and by maintaining a boron concentration of at least 2,270 ppm in the flooding water.

The system is considered shutdown when the Reactor Coolant System is depressurized and the flooding line stop valves are closed or the tanks are drained or depressurized.

3.4 Special or Infrequent Operation

3.4.1 Nitrogen, Makeup Water and Boric Acid addition

A single line is provided to each flooding tank for the addition of nitrogen and makeup solution. Each line penetrates the Reactor Building independently; through penetration R-544 to CF-T-1A, and through penetration R-537 to CF-T-1B. A check valve, CF-V100A/CF-V100B, is provided in each line just downstream of the penetration for building isolation. A nitrogen supply line connects to the one inch main addition line to each tank outside of the Reactor Building through manual stop valve CF-V114A/CF-V114B and check valve CF-V101A/CF-V101B. Between the check valve (series V101) and the Reactor Building penetration, a 1 inch makeup line connects from the discharge header of the high pressure injection pumps in the Reactor Coolant Makeup and Purification System. The makeup line from the discharge header branches into two - 1 inch lines each leading to one of the main addition lines. A manual stop valve, MU-V168, is provided in the line near the makeup pump discharge header with another manual stop valve CF-V145/CF-V146, just upstream of the connection to each fill and makeup line.

Boric acid can be added to the core flooding tanks from the Chemical Addition System during power operation, to adjust the boron concentration in the core flooding tanks if required. The point of addition is into the common makeup line to the tanks from the discharge header of the high pressure injection pumps. The core flooding make-up tank pump, CA-P-8,

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discharges through a manual stop valve CA-V175 in the Chemical Addition System providing the driving force for the boric acid addition.

3.4.2 Sampling, Draining and Venting

A single 1 inch line from each flooding tank is provided for both the sampling and draining operations. Each line is fitted with a remotely controlled electric motor operated stop valve CF-V2A/CF-V2B and the two lines (one from each tank) join into a common line which exits the Reactor Building through penetration R-527. A remotely controlled electric motor operated stop valve, CF-V115, is provided inside the Reactor Building and a remotely controlled air piston operated valve, CF-V116, outside the building for isolation purposes. Downstream of the external building isolation valve, the common sample/drain line branches into a 3/8 inch line leading to the Unit 2 sampling hood in the Unit 1 Chemistry Laboratory through manual valve CF-V106 and a 1 inch line leading to the bleed holdup tanks in the Reactor Coolant Liquid Radwaste Disposal System through manual valve CF-V107.

Gaseous sampling for radioactivity is performed by opening the vent valve CF-V3A/B and venting to the gaseous vent header. Through appropriate valving, the nitrogen gas is led to and tested in the Unit 2 gas analyzer.

During normal reactor operation, each core flooding tank can be vented independently to the Reactor Building vent header leading to the gaseous Radwaste Disposal System through remotely controlled electric motor operated stop valve, CF-V3A/CF-V3B. A normally open manual stop valve, CF-V117A/CF-V117B, and a flow limiting orifice, CF-U1A/CF-U1B, is provided in each vent line.

If complete core flooding tank depressurization is required during a shutdown, the nitrogen contents of the tanks can be released directly to the Reactor Building atmosphere. After appropriate sampling to ensure acceptable radioactivity limits, the blank flanges on each core flooding tank atmospheric vent line to the Reactor Building are removed and the atmospheric vent valves, CF-V124A/B opened.

3.4.3 Testing

The Core Flooding System will be tested at refueling periods to demonstrate unimpaired operation of the check valves in the flooding lines. During the shutdown, when the Reactor Coolant System pressure is approximately 200 psig, the overpressure in the flooding tanks is lowered to 40-60 psi below the pressure in the coolant system. The electric motor operated stop valve in the flooding line from the tank to be tested is opened and the flooding tank is slowly re-pressurized with nitrogen until the tank pressure is slightly greater than the Reactor Coolant System pressure. Opening of the flooding line check valves is verified by noting a decrease in the flooding tank level and a corresponding increase in the pressurizer level.

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3.5 Emergency

Operation of the Core Flooding System in an emergency condition is identical to that which has been described under "Normal Operation", Section 3.2 of this system description. Initiation of core flooding occurs automatically as the Reactor Coolant System pressure falls to approximately 600 psig following the LOCA. No actuation signal, electrical power or operator action is required.

4.0 HAZARDS AND PRECAUTIONS

The primary hazard associated with the system is inadvertent flooding at reduced Reactor Coolant System pressure such as during a planned shutdown, or when the coolant system is completely depressurized for refueling or maintenance. Depending upon the extent of Reactor Coolant System depressurization, certain precautions are to be taken to preclude this occurrence. These precautions include: de-energizing and tagging the electric motor operated stop valves in the flooding lines after they have been closed; de-pressurizing the core flooding tanks; and draining the flooding tanks. The extent to which the system is defeated depends upon the situation and must be decided and included in the procedure developed for the specific condition.

Other hazards associated with the system are considered during normal reactor plant operation. These hazards include overpressurization of the flooding tanks during addition of nitrogen, makeup solution, draining the water or venting the gas overpressure from the tank by inadvertently leaving a valve open after sampling, bleeding or venting, and dilution of

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the flooding solution due to check valve leakage. These conditions must be guarded against because of the potential injurious effect to equipment and functional operability of the system. Sufficient instrumentation and alarms have been provided in the system to alert the operator to any hazardous conditions.

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TABLE 1

CORE FLOODING TANKS

Identification	-	CF-T-1A, CF-T-1B
Number installed	-	Two
Vendor	-	Babcock & Wilcox Co.
Manufacturer	-	Stearns-Roger Co.
Volume, cu.ft.	-	1410
Gas space, cu.ft. (at normal level)	-	470
Water space, cu.ft./gals. (at normal level)	-	940/7000
Material	-	CS w/SS clad internally
Overall size	-	9'-3 5/8"ID x 22'-05" high
Design pressure, psig	-	700
Design temperature, F	-	300
Tank location	-	Inside Reactor Building
Insulation	-	None required
Code	-	ASME Blr. & Pres.Vessel, Sect.III Class C
Classification	-	
Code	-	N2
Quality Control	-	1
Seismic	-	I
Cleanliness	-	B

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TABLE 2

INSTRUMENTATION AND CONTROLS*

IDENTIFICATION	DESCRIPTION	FUNCTION	LOCATION	TYPE	INPUT RANGE	OUTPUT RANGE	SET POINT
CF-1-PT1	Pressure Transmitter	Transmits an electrical signal proportional to pressure in core flooding tank CF-T-1A	Valve CF-V111A	Force Balance, Electric	0-800 psig	10-50 ma	N/A
CF-1-PT2	Pressure Transmitter	Transmits an electrical signal proportional to pressure in core flooding tank CF-T-1A	Valve CF-V112A	Force Balance, Electric	0-800 psig	10-50 ma	N/A
CF-1-PT3	Pressure Transmitter	Transmits an electrical signal proportional to pressure in core flooding tank CF-T-1B	Valve CF-V111B	Force Balance, Electric	0-800 psig	10-50 ma	N/A
CF-1-PT4	Pressure Transmitter	Transmits an electrical signal proportional to pressure in core flooding tank CF-T-1B	Valve CF-V112B	Force Balance, Electric	0-800 psig	10-50 ma	N/A
*CF-1-PI1/PI3	Pressure Indicator	Indicates core flooding tank pressure of CF-T-1A and CF-T-1B respectively	Panel B	Dual, Vertical, 5" Electric	±10V DC	0-80(x10) psig	N/A
*CF-1-PI2/PI4	Pressure Indicator	Indicates core flooding tank pressure of CF-T-1A and CF-T-1B respectively	Panel B	Dual, Vertical, 5" Electric	±10V DC	0-80(x10) psig	N/A
CF-1-PS1	Pressure Switch	Provides bistable contact operation with adjustable high and low set points for pressure alarm associated with core flooding tank CF-T-1A	Cable Rm.	Electronic	±10V DC	N/A	615 psig Hi 585 psig Lo
CF-1-PS2	Pressure Switch	Provides bistable contact operation with adjustable high and low set points for pressure alarm associated with core flooding tank CF-T-1A	Cable Rm.	Electronic	±10V DC	N/A	615 psig Hi 585 psig Lo
CF-1-PS3	Pressure Switch	Provides bistable contact operation with adjustable high and low set points for pressure alarm associated with core flooding tank CF-T-1B	Cable Rm.	Electronic	±10V DC	N/A	615 psig Hi 585 psig Lo
CF-1-PS4	Pressure Switch	Provides bistable contact operation with adjustable high and low set points for pressure alarm associated with core flooding tank CF-T-1B	Cable Rm.	Electronic	±10V DC	N/A	615 psig Hi 585 psig Lo
CF-2-LT1	Level Transmitter	Measures differential pressure and transmits an electrical signal proportional to level for indication in tank CF-T-1A	Valves CF-V108A CF-V111A	Differential Pressure Electric	0-14 Ft.	±10V DC	N/A
CF-2-LT2	Level Transmitter	Measures differential pressure and transmits an electrical signal proportional to level for indication in tank CF-T-1A	Valves CF-V109A CF-V111A	Differential Pressure, Electric	0-14 Ft.	±10V DC	N/A

* Instruments converting 10-50 ma to ±10V DC are enclosed in B&W equipment and therefore not numbered and included on instrument list.

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TABLE 1 (Cont'd)

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IDENTIFICATION	DESCRIPTION	FUNCTION	LOCATION	TYPE	INPUT RANGE	OUTPUT RANGE	SET POINT
CF-2-LT3	Level Transmitter	Measures differential pressure and transmits an electrical signal proportional to level for indication in tank CF-T-1B	Valves CF-V10B, CF-V11B	Differential Pressure, Electric	0-14 Ft.	±10V DC	N/A
CF-2-LT4	Level Transmitter	Measures differential pressure and transmits an electrical signal proportional to level for indication in tank CF-T-1B	Valves [illegible]	Differential Pressure, Electric	0-14 Ft.	±10V DC	N/A
CF-2-LI1/LI3	Level Indicator	Indicates core flooding tank CF-T-1A level	Panel B	Dual, vertical, Electric	±10V DC	0-14 Ft	N/A
CF-2-LI2/LI4	Level Indicator	Indicates core flooding tank CF-T-1B level	Panel B	Dual, Vertical, Electric	±10VDC	0-14 Ft.	N/A
CF-2-LS1	Level Switch	Provides bistable contact operation with adjustable high and low set points for level alarm associated with core flooding tank CF-T-1A	Cable Rm.	Electronic	0-15 Ft.	N/A	13.3 Ft. High 12.7 Ft. Low
CF-2-LS2	Level Switch	Provides bistable contact operation with adjustable high and low set points for level alarm associated with core flooding tank CF-T-1A	Cable Rm.	Electronic	0-15 Ft.	N/A	13.3 Ft. High 12.7 Ft. Low
CF-2-LS3	Level Switch	Provides bistable contact operation with adjustable high and low set points for level alarm associated with core flooding tank CF-T-1B	Cable Rm.	Electronic	0-15 Ft.	N/A	13.3 Ft. High 12.7 Ft. Low
CF-2-LS4	Level Switch	Provides bistable contact operation with adjustable low set points for level alarm associated with core flooding tank CF-T-1B	Cable Rm.	Electronic	0-15 Ft.	N/A	13.3 Ft. High 12.7 Ft. Low
CF-V1A-HIS	Valve Switch w/indicator lights	Spare	Panel B	Switch	N/A	N/A	N/A
CF-V1B-HIS	Valve Switch w/indicator lights	Spare	Panel B	Switch	N/A	N/A	N/A
CF-V2A-HIS	Valve Switch w/indicator lights	Provides remote open/close control for core flood tank CF-T-1A sample valve [illegible]	Panel B	Switch	N/A	N/A	N/A
CF-V2B-HIS	Valve Switch w/indicator lights	Provides remote open/close control for core flood tank CF-T-1B sample valve [illegible]	Panel B	Switch	N/A	N/A	N/A

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TABLE 2 (Cont'd)

INSTRUMENTATION AND CONTROLS

IDENTIFICATION	DESCRIPTION	FUNCTION	LOCATION	TYPE	INPUT RANGE	OUTPUT RANGE	SET POINT
CF-V1A-HIS	Valve Switch w/indicator lights	Provides remote open/close control for core flood tank CF-T1A vent valve CF-V1A	Panel 8	Switch	N/A	N/A	N/A
CF-V1B-HIS	Valve Switch w/indicator lights	Provides remote open/close control for core flood tank CF-T1B vent valve CF-V1B	Panel 8	Switch	N/A	N/A	N/A
CF-FHS-1700	Valve Switch	Provides remote open/close control for core flooding tanks combined line valve CF-V115 to sample and bleed hold up tanks (inside containment)	Panel 15	Switch	N/A	N/A	N/A
CF-FHS-1701	Valve Switch	Provides remote open/close control for core flooding tanks combined line to sample and bleed hold up tanks (outside containment)	Panel 15	Switch	N/A	N/A	N/A
CF-FHS-3574	Valve Switch	Provides remote open/close control for core flooding tanks combined line valve CF-V106 to sampling	Panel 329	Switch	N/A	N/A	N/A
CF-KL-3574	Light	Provides open/shut status for valve CF-V106	Panel 8	Indicating Lamp	N/A	N/A	N/A
CF-FHS-3575	Valve Switch	Provides remote open/close control for core flooding tanks combined line valve CF-V107 to bleed hold up tank	Panel 8	Switch	N/A	N/A	N/A
CF-KL-3711	Light	Provides open/shut status for valve CF-V114A	Panel 15	Indicating Lamp	N/A	N/A	N/A
CF-KL-3712	Light	Provides open/shut status for valve CF-V114B	Panel 15	Indicating Lamp	N/A	N/A	N/A
CF-FHS-4082	Valve Switch W/indicator lghts.	Provides remote open/close control for Core Flood Tank CF-T-1A isolation valve CF-V1A	Panel 8	Switch	N/A	N/A	N/A
CF-FHS-4083	Valve Switch W/indicator lghts.	Provides remote open/close control for Core Flood Tank CF-T-1B isolation valve CF-V1B	Panel 8	Switch	N/A	N/A	N/A

N.B. Indicating light I.D. numbers are not provided with valve switches when the lights are located on the same panel as the switches

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By ______ Checked ______ Approved ______
Title ______

TABLE 3

CORE FLOODING SYSTEM PANEL-MOUNTED ANNUNCIATOR AND

COMPUTER INPUT LISTING

Panel Mounted Annunciator Listing

Ident.	Service	Alarm Points High	Alarm Points Low	Alarm Points Units	INPUT SOURCE Ident.	Var. Range	Panel
CF-LA-4553	2A/2B Core Flooding Tank Level Hi/Lo	13.3	12.7		CF-LS-2/4	0-14 Ft.	Coolant Systems Monitoring Panel No. 8 C17
CF-PA-4554	2A/2B Core Flooding Tank Press. Hi/Lo	615	585	PSIG	CF-PS-1,2,3,4	0-800 PSIG	Coolant Systems Monitoring Panel No. 8 A17

Computer Input Listings

Ident.	Measured Variable, Units	Alarm Set Point High	Alarm Set Point Low	Input Source	Var. Range
CF1-PIA	CF tank pressure, psig	615	585	CF1-PT1	0-800 psig
CF1-PIA	CF tank pressure, psig	615	585	CF1-PT2	0-800 psig
CF1-PIA	CF tank pressure, psig	615	585	CF1-PT3	0-800 psig
CF1-PIA	CF tank pressure, psig	615	585	CF1-PT4	0-800 psig
CF2-LIA	CR tank level	12	11	CF2-LT2	0-14 ft.
CF2-LIA	CR tank level	12	11	CF2-LT4	0-14 ft.

Form BR 8002 2A

TMI DOCUMENTS

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