AMENDMENT 4 TO RESAR-SP/90 PDA MODULE 13
AUXILIARY SYSTEMS

WEC
P.O. Box 355
Pittsburgh, PA 15230

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INSTRUCTION SHEET

Place pages 440-1 and 430-1 to 430-2 (Questions/Responses) after Amendment 3 (Page 280-7), in the Questions/Answers section to Module 13.

Replace current page ix/x with revised page ix/x.

Replace current page 9.1-27/9.1-28 with revised page 9.1-27/9.1-28.

Replace current pages 9.4-25/9.4-26 through 9.4-33/9.4-34 with revised pages 9.4-25/9.4-26 through 9.4-34.

The following Question/Response was formally transmitted in Addendum 3 to RESAR-SP/90 PDA in Westinghouse letter NS-NRC-88-3338, dated May 13, 1988.

440.249 (Module 13)
Provide the interface requirements for the following systems:

a. Essential Service Water System (ESWS) (Page 9.2-3) Specify the interface requirements for the Class 1E power supplies for the ESWS.

b. Ultimate Heat Sink (UHS) (Page 9.2-17)
Specify the interface requirements for the UHS. Consideration should be given to compliance of the interface requirements with GDC 1, 2, 3, and 4.

c. Compressed Air System (Page 9.3-1)
Specify the interface requirements for the safety-related air accumulators that are to supply safety-related air operated valves.

RESPONSE:

The design basis information for the essential service water system (ESWS) and the ultimate heat sink, as contained in RESAR-SP/90 PDA Module 13, "Auxiliary Systems," adequately define interface requirements for the PDA review. These bases will be updated as part of the FDA submittal at which time any specific comments will be addressed.

The W SP/90 compressed air system has no safety function (page 9.3-1 of Module 13). No safety related air accumulators are needed since there are no safety related air operated valves that are required to be actuated to other than their failed (no-air) position.

The following Questions/Responses were formally transmitted in Addendum 4 to RESAR-SP/90 PDA in Westinghouse letter NS-NRC-88-3341, dated May 13, 1988.

430.2 (3.4.1.2) (Mod. 7) Discuss any periodic tests or surveillance performed to assure that the emergency floor drainage system is capable of preventing unacceptable water accumulation in safety-related equipment areas.

RESPONSE:

Subsection 9.3.3 of RESAR-SP/90 PDA Module 13, "Auxiliary Systems" describes the "Equipment and Floor Drainage Systems." A major safety design basis of the EFDS is to ensure prevention of water accumulation in areas which house safety related equipment. At the FDA inservice inspection and tests will be detailed to assure that the EFDS will function under the full range of design transients. The plant specific Technical Specifications will include surveillance requirements to provide maximum assurance that the system will function to prevent flood damage to safety-related systems and components.

430.16 (6.2.5) (Mod. 10 Section 6.2.5.2.2 of RESAR SP-90 indicates that the containment hydrogen purge system would be addressed in Sections 6.2.2 and 9.4.6. However, this system has not been discussed in the above sections. Therefore, provide a discussion of the containment hydrogen purge system in accordance with the guidelines of Regulatory Guide 1.7.

RESPONSE:

Section 6.2.5 of RESAR-SP/90 PDA Module 10, "Containment Systems," will be modified to remove any reference to a containment "hydrogen" purge system. Electric hydrogen recombiners (Subsection 6.2.5.1.1 of Module 10) and hydrogen igniters (current Subsection 6.2.5.1.3 of Module 10) are provided to control the buildup of hydrogen in the containment. The containment purge system, as described in Subsection 9.4.6 of RESAR-SP/90 PDA Module 13, "Auxiliary Systems," functions during normal shutdowns and refueling outages to maintain a suitable atmosphere for personnel access to containment, and is not intended for use during post-accident conditions. Additionally, Subsection 9.4.6 has been modified to include a containment operating purge system to adjust containment pressure as required.

430.19
(6.4)
(Mod. 13)

The proposed control room habitability system appears to satisfy licensing criteria for a single unit. However, for a two unit site, the control room habitability system must meet the requirements of GDC 5 when the control room envelope is shared between both units. Verify that a shared control room ventilation system for a two unit site will ensure control room insulation or emergency operation on demand assuming a single active failure when one unit is down for refueling/maintenance (such as diesel generator overhaul) while the other unit is operating. Otherwise, provide an interface criterion which specifies a separate control room and control room ventilation system for each unit.

RESPONSE:

The Westinghouse SP/90 design is for one-unit only, therefore the concerns expressed here are not applicable. If a two-unit site were to be developed, there would be no shared control room, nor would there be any sharing of the control room ventilation systems.

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The elevation and arrangement drawings of the fuel handling facilities are provided by figures in Subsection 1.2.2 of RESAR-SP/90 PDA Module 3, "Introduction and Site."

9.1.4.2.1 Fuel Handling Description

The fuel handling equipment is designed to handle the spent fuel assemblies underwater from the time they leave the reactor vessel until they are placed in a container for shipment from the site. Underwater transfer of spent fuel assemblies provides an effective, economic, and transparent radiation shield, as well as a reliable cooling medium for removal of decay heat. The boric acid concentration in the water is sufficient to preclude criticality.

The associated fuel handling structures may be generally divided into two areas: the refueling cavity and refueling canal, which are flooded only during plant shutdown for refueling, and the fuel pools, which are kept full of water and are always accessible to operating personnel. The refueling canal and the fuel storage area are connected by the fuel transfer tube which is fitted with a quick opening hatch on the canal end and a valve on the fuel storage area end. The hatch is in place except during refueling to ensure containment integrity. Fuel is carried through the tube on an underwater transfer car.

Fuel is moved between the reactor vessel and the FTS by the refueling machine. The FTS is used to move up to two (2) fuel assemblies between the containment building and the fuel handling building. After a fuel assembly is placed in the fuel container, the lifting arm pivots the fuel assembly to the horizontal position for passage through the fuel transfer tube. After the transfer car transports the fuel assembly through the transfer tube, the lifting arm at that end of the tube pivots the assembly to a vertical position so that the assembly can be lifted out of the fuel container.

In the fuel handling building, fuel assemblies are moved about by the fuel handling machine. Initially, a short tool is used to handle new fuel assemblies, but the new fuel elevator must be used to lower the assembly to a depth at which the fuel handling machine can place the new fuel assemblies
4 into or out of the spent fuel storage racks.

Decay heat, generated by the spent fuel assemblies in the fuel pools, is removed by the spent fuel pool cooling and cleanup system. After a sufficient decay period, the spent fuel assemblies are removed from the fuel racks and loaded into a spent fuel shipping cask for removal from the site.

9.1.4.2.2 Refueling Procedure

New fuel assemblies received for refueling are removed one at a time from the shipping container and moved into the new fuel assembly inspection area utilizing the cask handling crane. After inspection, the accepted new fuel assemblies are stored in the new fuel storage racks. For the initial core load, some new fuel assemblies may be stored in the spent fuel pool.

The refueling operation follows a detailed procedure which provides safe and efficient refueling. Prior to initiating the refueling operation, the reactor coolant system (RCS) is borated and cooled down to refueling shutdown conditions as specified in the Technical Specifications. Criticality protection for refueling operations, including a requirement for daily checks of boron concentration, is also specified in the Technical Specifications. The following significant points are ensured by the refueling procedure:

a. The refueling water and the reactor coolant contain approximately 2500 ppm boron. This concentration is sufficient to keep the core 5 percent $\Delta k/k$ subcritical during the refueling operations.

b. The water level in the refueling cavity is high enough to keep the radiation levels within acceptable limits when the fuel assemblies are being removed from the core.

heat removal function. This function of the containment cooling and ventilation system is addressed in Subsection 6.2.2 of RESAR-SP/90 Module 1, "Primary Side Safeguards System."

The containment recirculation cooling system functions during normal plant operation to maintain a suitable ambient temperature for equipment located within the containment.

The control rod drive mechanism (CRDM) cooling system functions during normal plant operation to maintain a suitable air temperature around the rod drive mechanisms.

The containment purge system functions during extended shutdowns and refueling outages to maintain a suitable atmosphere for personnel access to containment.

The containment operating purge system functions during power operation to adjust containment pressure as required. 4

The containment air cleanup system operates before and during personnel entries to reduce airborne radioactivity.

The digital rod position indication (DRPI) room cooling system functions during normal plant operation to maintain a temperature in the DRPI room suitable for the affected electronic equipment.

9.4.6.1 Design Bases

9.4.6.1.1 Safety Design Bases

SAFETY DESIGN BASIS ONE - The containment purge isolation valves shall maintain primary containment integrity during a postulated loss-of-coolant accident (GDC-54 and GDC-56).

SAFETY DESIGN BASIS TWO - The containment purge exhaust system shall mitigate the radiological consequences of a postulated fueling handling accident inside containment. Dose at the site boundary shall not exceed values of 10CFR Part 100. (Standard Review Plan 15.7.4)

9.4.6.1.2 Power Generation Design Bases

POWER GENERATION DESIGN BASIS ONE - The containment recirculation cooling system is designed to maintain the average containment air temperature between 90°F and 120°F during normal plant operation with three of four cooling units operating and one in standby.

POWER GENERATION DESIGN BASIS TWO - The CRDM cooling system is designed to limit the normal air temperature exiting the CRDM shroud to approximately 170°F during normal operation with two of three cooling units operating and one in standby.

POWER GENERATION DESIGN BASIS THREE - The containment purge system shall maintain the average containment air temperature between 60°F and 90°F during extended shutdowns or refueling outages.

POWER GENERATION DESIGN BASIS FOUR - The containment air cleanup unit is designed to reduce the containment airborne concentrations to approximately seven maximum permissible concentrations (MPC) to permit personnel access.

POWER GENERATION DESIGN BASIS FIVE - The reactor compartment cooling fans, in conjunction with the containment recirculation cooling system, shall maintain the concrete temperature around the reactor vessel supports and reactor vessel nozzles at or below 150°F.

POWER GENERATION DESIGN BASIS SIX - The steam generator and pressurizer compartment cooling fans, in conjunction with the containment recirculation cooling system, shall maintain the average compartment temperatures at or below 130°.

POWER GENERATION DESIGN BASIS SEVEN - A containment operating purge system shall be provided to allow containment pressure to be maintained within the limits established by the Technical Specifications. 4

9.4.6.2 System Description

9.4.6.2.1 General Description

The flow diagram for the containment cooling and ventilation system is shown in Figure 9.4-11.

The containment recirculation cooling system consists of four large cooling units, each with cooling coils and a recirculation fan for heat removal. The system provides continuous air recirculation and cooling for all major areas inside containment. Heat energy is transferred to the component cooling water system through heat exchange coils located in the recirculation cooling units. The cooled air is delivered to the lower floors of the containment by the containment recirculation fans. Further distribution of air to the various compartments is accomplished with individual distribution fans. The air absorbs heat as it rises through the compartments, and is returned to the cooling units to complete the recirculation cycle. Distribution fans include the following:

a. Steam generator and pressurizer compartment cooling fans - Redundant fans are provided for each steam generator compartment and the pressurizer compartment to maintain compartment temperatures within design limits. The fans draw in cool air discharged from the containment recirculation cooling units, and deliver it to the individual compartments. As the air picks up heat from the components and hot surfaces, a natural stack effect is created that assists the circulation provided by the distribution fans.

b. Reactor compartment cooling fans - Redundant fans are provided for the reactor compartment to maintain the compartment temperature within design limits. The fans draw in cool air discharged from the containment recirculation units, and deliver it to the compartment beneath the reactor vessel. The air is forced up through the annular space between the vessel insulation and the primary shield wall. The air flows across the reactor vessel supports and continues through the hot and cold leg penetrations in the primary shield wall.

4

c. Heat exchanger compartment cooling fans - Individual distribution fans are provided for each of the four RHR heat exchanger rooms. Redundant fans are provided for the regenerative heat exchanger compartment. Redundant fans are also provided for the letdown heat exchanger compartment. Cool air from the lower levels of the containment is drawn through these heat exchanger compartments to maintain temperatures within design limits.

d. Dome supply system - Redundant distribution fans are provided to deliver air to the containment dome area. Air is drawn from the operating floor and discharged near the dome to limit heat buildup and stratification.

The CRDM cooling system consists of three cooling units, each with cooling coils and fan for removal of heat from the rod drive mechanisms. Ambient containment air is drawn across the drive mechanisms and down into the cooling shroud on the reactor head. The heated air exits the shroud and is ducted to the inlet of the cooling units. Heat energy is transferred to the component cooling water system through heat exchange coils. The cooled air passes through the fan and is returned to the containment atmosphere at or near ambient temperature.

The containment purge system supplies ventilation air to the containment during extended shutdown conditions or refueling outages. Air is tempered or conditioned as required in the supply unit, and is delivered to the containment through a penetration assembly and butterfly type isolation valves. This ventilation air helps to provide an atmosphere suitable for personnel access by maintaining temperature control and reducing airborne radioactivity. Air is exhausted through a similar penetration with butterfly type isolation valves. The exhaust air passes through particulate and iodine filters prior to discharge to the unit vent.

The containment operating purge system is utilized intermittently during power operation to adjust containment pressure as required. The system contains separate supply and exhaust portions. 4

The containment air cleanup system consists of two filtration units, each with particulate filters, carbon filters and centrifugal fans. The units circulate a portion of the containment atmosphere for cleanup prior to and during a personnel entry into containment. They also serve to reduce airborne activity prior to making a routine atmospheric release of containment air.

The digital rod position indication room (DRPI) cooling system maintains a suitable room temperature during normal operation for proper operation of electronic components. Redundant cooling units served from a non-essential header of the essential chilled water system recirculate room air to maintain the desired temperature.

9.4.6.2.2 Component Description

The containment recirculation cooling system consists of four 33 percent capacity recirculation cooling units, each connected to an associated recirculation fan. The containment recirculation cooling units are located on the operating floor level, and consist of a structural steel framework supporting deministers and cooling coils mounted on three vertical faces. Air enters the housing through the deministers and cooling coils and exits through a duct connection in the base of the unit. The recirculation fans are located beneath the cooling unit on the elevation below the operating floor, and are oriented for vertical downblast discharge. The fans are of the direct-driven vane axial type, with two-speed electric drive motor. The fan is connected to the recirculation cooling unit by a straight section of removable ductwork. Vane-axial distribution fans are provided throughout the containment to maintain air circulation in the individual compartments.

The CRDM cooling system consists of three 50 percent capacity cooling units, each with associated 50 percent capacity fan. The cooling units and fans are located on the operating floor level. The cooling units consist of a roughing filter, component cooling water cooling coil, and structural housing. Air from the CRDM cooling shroud is ducted into the cooling unit through redundant shutoff dampers. The direct drive centrifugal fans discharge the cooled air to the containment atmosphere.

The containment purge supply system consists of two 50 percent supply units, two 50 percent cooling units, and two 50 percent purge supply fans. The supply units contain filters and heating coils to temper the outside air as required. The cooling units contain cooling coils served by a non-essential header of the essential chilled water system for conditioning by the outside air as required. Supply fans are of the direct-drive centrifugal type Dampers are provided to control the rate of air being admitted to the containment. The containment purge exhaust system consists of two 50 percent capacity filter trains and two 50 percent capacity exhaust fans. The filter trains contain particulate filters and carbon filters for mitigation of a postulated fuel-handling accident inside containment. Exhaust fans are of the direct-drive centrifugal type. Dampers are provided to control the rate of air being exhausted from the containment. All equipment is located in the reactor external building.

4 The containment operating purge supply system consists of one 100% supply unit, one 100% supply fan and associated valves; the exhaust system consists of one 100% filter train; one 100% exhaust fan and associated valves. Fans are of the direct-drive centrifugal type; the exhaust filter train contains particulate and charcoal filters. Containment isolation valves are of the motor-operated gate type and are automatically isolated as described in

Section 6.2.4 "Containment Isolation System" of RESAR-SP/90 PDA Module 10 "Containment Systems." 4

The containment air cleanup system consists of two 50 percent capacity filter trains and two 50 percent capacity exhaust fans. The filter trains contain particulate and carbon filters. The fans are of the direct-drive centrifugal type. All equipment is located inside the containment. 4

The DRPI room cooling system consists of one 100 percent capacity cooling unit and two 100 percent capacity circulation fans. The cooling unit contains roughing filters and cooling coil served by a non-essential header of the essential chilled water system. Fans are of the direct-drive centrifugal type.

9.4.6.2.3 System Operation

The containment recirculation system, under normal operating conditions, provides continuous air recirculation and cooling to maintain the atmosphere inside containment below the design temperature of 120°F. Three of four units are normally operated with one in standby. During a loss of off-site power, two of the four units will operate to prevent extreme temperature excursions.

The CRDM cooling system operates under normal plant conditions to maintain the control rod drive mechanism within design temperature limits. Two of three fans are normally operated with one in standby. During loss of off-site power, two units will operate to maintain cooling of the drive mechanisms.

The containment purge system is manually initiated during a maintenance outage or refueling operation to provide a suitable environment within containment.

The containment purge system will not be operated during power operation. Either one or both air-handling trains may be operated depending on the desired purging rate. Indication of high radioactivity levels in the exhaust duct will automatically isolate the butterfly-type containment isolation valves.

The containment operating purge system is manually initiated during power
4 operation. Supply and exhaust systems may be operated independently or in
conjunction with each other as required by containment conditions.

The containment air cleanup system is used during normal plant operating conditions and during shutdowns to control fission products inside containment. When monitors or sampling indicate high airborne contamination levels, the operator manually selects the number of units that are activated. These cleanup units will be normally run prior to allowing personnel to access containment.

The DRPI room cooling system is used during normal plant operation to provide cooling for the affected electronics. One of two 100 percent capacity centrifugal supply fans is operated.

9.4.6.3 Codes and Standards

Equipment and materials utilized in the containment cooling and ventilation system conform to the requirements and recommendations of the codes and standards listed below:

a. Fan ratings conform to standards set by the Air Moving and Conditioning Association (AMCA).

b. Ventilation ductwork conforms to applicable standards of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

c. Fan motors conform to applicable standards of the National Electric Manufacturers Association (NEMA) and IEEE.

d. Water-cooling and heating coil ratings conform to standards of the Air Conditioning and Refrigeration Institute (ARI). Component cooling water pressure boundary components are constructed in accordance with ASME B&PV Code, Section III, Class 3.

e. Applicable components and controls conform to the requirements of Underwriter's Laboratories (UL) and NEMA.

f. High-efficiency particulate air (HEPA) filters and carbon adsorbers conform to ORNL-NSIC-65, "Design, Construction, and Testing of High-Efficiency Air Filtration Systems for Nuclear Applications."

g. Containment isolation valves conform to the requirements of ASME B&PV Code, Section III, Class 2.

9.4.6.4 Safety Evaluation

Safety evaluations are numbered to correspond with safety design bases of Subsection 9.4.6.1.

SAFETY EVALUATION ONE - Redundant containment isolation valves are designed, constructed, and tested in accordance with ASME Section III, Class 2. The valves will be leak-tested periodically to verify acceptability of seal leakage. Valves are designed to fail closed in the event of loss of power or loss of instrument air.

SAFETY EVALUATION TWO - The containment purge exhaust filter train will be designed to meet Regulatory Guide 1.52. Ductwork from the containment penetration to the filter train will be low-leakage design, but not Seismic Category I. Fans will be powered from a reliable non-1E power source.

9.4.6.5 Inspection and Testing Requirements

Performance characteristics of the containment cooling and ventilation system will be verified through qualification testing of essential components as follows:

a. One of four containment recirculation fans is tested in accordance with AMCA standards to assure fan characteristics performance curves. All other fans are rated in accordance with AMCA standards.

b. Heating and cooling coils will be leak-tested with air, or hydrostatically, to insure integrity. Coils are rated in accordance with ARI standards.

c. HEPA filters are manufactured and tested prior to installation in accordance with NIL-F-51068. HEPA filters in the containment purge exhaust system will be periodically tested to verify removal efficiency. Carbon adsorbers will be periodically tested to verify required removal efficiency based on the dose assessment.

d. Ductwork is fabricated, installed, leak-tested, and balanced in accordance with SMACNA.

Major components located outside containment are accessible during normal plant operation for inspection, maintenance, and periodic testing. Components located inside containment are accessible during plant shutdown. Operational testing will be performed prior to initial startup.

Actuation, timing, and leakage of containment purge isolation valves will be periodically tested.

9.4.6.6 Instrumentation Application

Sufficient instrumentation is included with the system to assure satisfactory operation. All fans are operable from the control room, which is provided fan-running lights and fan-trip alarms. Differential pressure sensors are provided across each filter and carbon absorber unit to indicate the amount of filter loading. Local temperature indication is provided on all heating and cooling coils, and high vibration alarms are provided on all fans inside containment. Alarms are also provided to indicate low fan flow rates. Dewpoint is recorded, and temperature is indicated in containment.

9.4.7 Diesel Generator Building Ventilation System

The diesel generator building ventilation system is designed to provide a suitable environment for operation of the diesel generators and related equipment.

9.4.7.1 Design Bases

SAFETY DESIGN BASIS ONE - The diesel generator building ventilation system shall maintain the building temperature between 40°F and 120°F with the diesel operating.

SAFETY DESIGN BASIS TWO - The diesel generator building ventilation system shall perform its heat removal function assuming a single failure of an active component. Each ventilation train shall be capable of receiving electrical power from its associated diesel generator.

SAFETY DESIGN BASIS THREE - The diesel generator building ventilation system shall remain functional following a safe shutdown earthquake, and shall withstand the effects of appropriate natural phenomena such as tornadoes, hurricanes, and floods (GDC-2).

SAFETY DESIGN BASIS FOUR - Redundant trains of the diesel generator building ventilation system shall be physically separated and protected from the effects of missiles, pipe whip, and jet forces (GDC-4).

9.4.7.2 System Description

9.4.7.2.1 General Description

The diesel building ventilation system is shown schematically in Figure 9.4-12. This system consists of supply and exhaust fans with associated ductwork, dampers, and controls of each of the two diesel rooms. Heat energy from the diesel engine and other sources is absorbed by the ventilation supply air and discharged to the building exterior by the exhaust fans.