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50-352

April 19, 1983

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Limerick Generating Station, Units 1 and 2
Request for Information from the Power
Systems Branch

Reference: Meeting between Auxiliary Systems Branch and
Philadelphia Electric Company on March 30, 1983

File: GOVT 1-1 NRC)

Dear Mr. Schwencer:

The attached documents are draft question response changes and draft text changes to the FSAR resulting from the discussions with Mr. John Ridgely, Auxiliary Systems Branch reviewer, at the referenced meeting.

The attached changes will be formally incorporated into the FSAR revision scheduled for May, 1983.

Sincerely,

Eugene J. Bradley

B001

JTR/gra/Z-1

cc: See Attached Service List


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PDR ADOCK 05000352
A PDR

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QUESTION 410.13 (Section 3.5.2)

The FSAR states that all safety-related structures, systems and components as listed in Table 3.2-1 were reviewed for missile protection yet only those items listed in Table 3.5-7 were provided protection. Discuss why only the items listed in FSAR Table 3.5-7 are required to be tornado missile protected in terms of safe shutdown of the plant.

RESPONSE

Attached

DRAFT

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## Question 410.13 - RESPONSE

All safety related structures, systems, and components listed in Table 3.2-1 were reviewed for adequacy against tornado generated missiles listed in Table 3.5-4. These safety related ~~items~~ ~~facilities~~ structures, systems and components are either designed to resist tornado missiles in accordance with Reference 3.5-6, or are protected by these tornado resistant enclosures. The enclosures designed to resist tornado missiles and the corresponding systems and components protected by these tornado resistant enclosures are listed in Table 3.3-2. Limerick is in conformance with Regulatory Guide 1.117, Tornado Design Classification, regarding structures, systems and components to be designed for or protected from tornado missiles, except as discussed in Section 3.5.1.4.

In addition, all safety related structures, systems, and components were reviewed for adequacy against externally generated missiles discussed in Section 3.5.1 (e.g. railroad explosion and aircraft accident). The safety related facilities are either designed to resist the externally generated missiles in accordance with Reference 3.5-6, or are protected by these missile resistant barriers. The barriers designed to resist externally generated missiles and the corresponding systems and components protected by these missile barriers are listed in Table 3.5-7.

QUESTION 410.15 (Section 3.5.2)

FSAR Table 3.5-7 indicates the emergency service water and RHR service water piping is missile protected by virtue of being buried. Provide drawings which show the physical routing of the piping, the distance from the top of the pipe to grade, and the burial details and discuss the criteria utilized for determining that this amount of protection is adequate.

RESPONSE

The emergency service water and RHR service water piping located within the yard area are installed underground with adequate cover for missile protection.

The physical routing of the piping and typical profiles showing soil cover and installation details are shown in Figure 2.5-37. The cementitious backfill for pipe bedding is shown in Figure 2.5-37, Sheet 1, detail 3. This backfill was used predominantly for Category I piping to provide additional missile protection. The properties of cementitious backfill are defined in Section 2.5.4.5.4.

A detailed assessment of soil cover for Category I yard piping shows a minimum depth of 4 feet, with most soil coverings exceeding 6 feet. The 4-foot depth was found to be adequate for tornado missiles (Table 3.5-4) in accordance with the criteria set forth in "Depth Predication for Earth-Penetrating Projectiles", Soil Mechanics and Foundation Division, ASCE, P. 6558, May 1969. Figure 2.5-37 Sheet 1 has been revised to show the 4-foot minimum depth dimension of soil cover for Category I yard piping.

410.15

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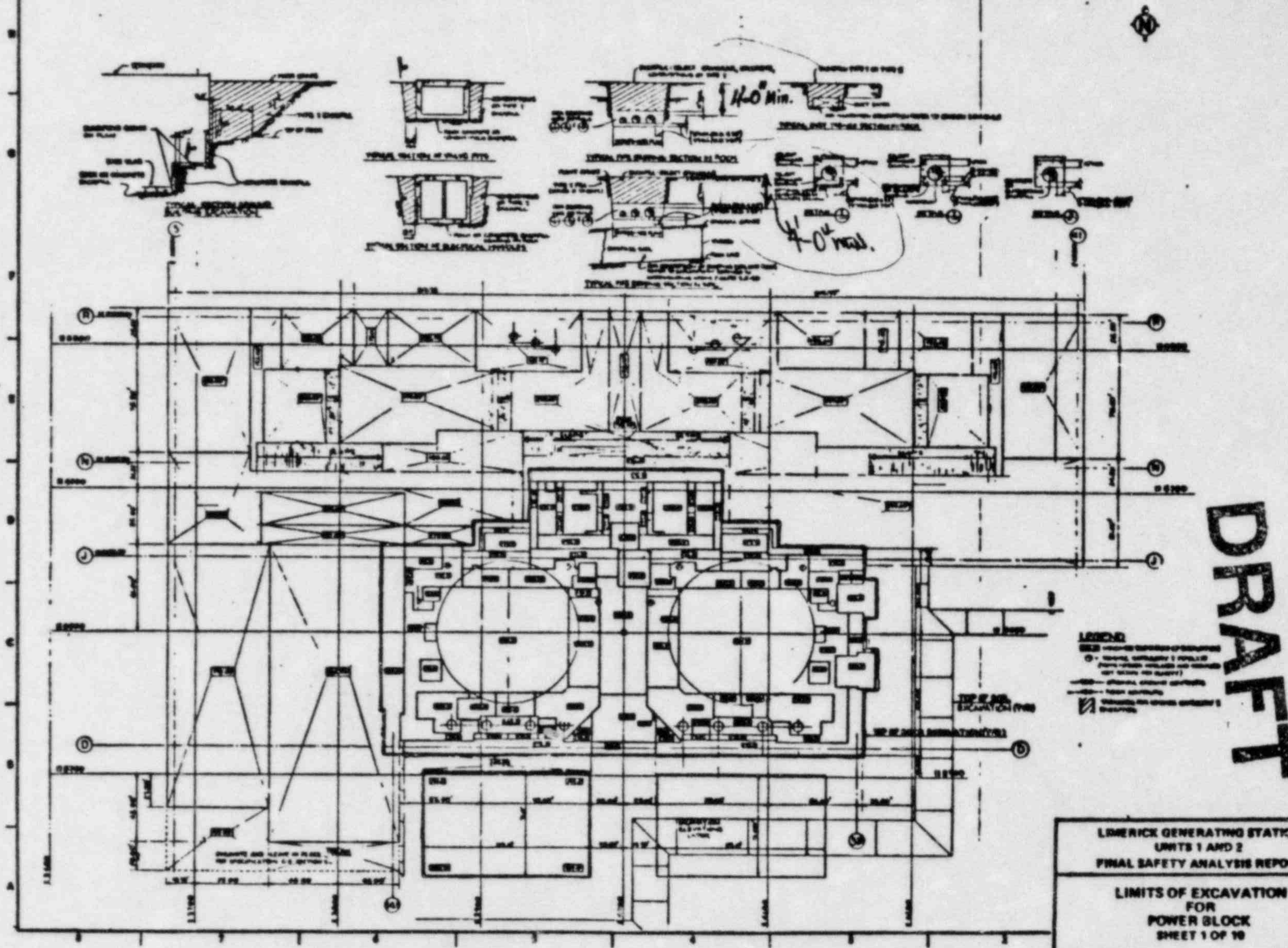


LIMERICK GENERATING STATION
UNITS 1 AND 2
FINAL SAFETY ANALYSIS REPORT

LIMITS OF EXCAVATION
FOR
POWER BLOCK
SHEET 1 OF 10

FIGURE 2.5.37

REV. 12, 10/82

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QUESTION 410.29 (Section 9.1.1)

Specify the maximum uplift force of the auxiliary hoist of the reactor enclosure crane. If this force is greater than 4000 pounds, (the design maximum uplift force of the racks) describe the method(s) that will be employed to limit the force to less than 4000 pounds so that possible damage to the racks will be prevented.

RESPONSE

The auxiliary hoist of the reactor enclosure crane has a maximum uplift force in excess of 4000 pounds. However, the auxiliary hoist is not used for fuel handling; ~~this function is~~ performed by the hoists on the refueling platform. The hoists have an uplift limit of 1200 pounds or less; therefore, possible damage to the racks is precluded.

except for placement of new fuel in the New fuel inspection stand and fuel prep machine.

Other fuel handling operations are

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LGS FSAR

QUESTION 410.39 (Section 9.1.3)

FSAR Figure 9.1-3 shows valve number 1007 as a 10" seismic Category I, normally open, manual isolation valve. This valve is connected to the non-seismic Category I spent fuel pool cooling system. In order to maintain cooling of the spent fuel pool following a seismic event, it appears necessary to manually close valve 1007 and open valve 1006. Provide a discussion of the environmental conditions associated with the pipe break in the nonseismic Category I line with respect to personnel access to close valve 1007 and open valve 1006 (to the RHR), the effect of internal flooding until the pipe is isolated and the effect on pool cooling during the time necessary to accomplish the valve operations.

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Response

As discussed in Section 9.1.3.6, the RHR System may be used for cooling should the Fuel Pool Cooling System be unavailable. Connection of the RHR system requires:

- installation of an RHR system spool piece
- manual closure of normally open valve 1007,
- manual opening of normally closed valves 1006, 1024A+B
- adjustment of fuel pool overflow wiers

The RHR supply and return lines and their associated valves are located in the fuel pool cooling pump and heat exchanger room at El. 283'0" in the Reactor Enclosure.

The normal positions of the above valves provides isolation of the safety-grade, Seismic Category I RHR System from the FPC+C System. The portion of the FPC+C System downstream of valve 1007 is designed to Seismic Category I criteria (designated Seismic Category IIA per Section 3.2.1) and would not be expected to fail due to a seismic event.

Should normal fuel pool cooling be lost as a result of a pipe break in the Seismic IIA portion of the system, the quantity of water released would be limited to the inventory of the pool above the overflow wiers, the skimmer surge tanks, and the pump

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suction piping. The flood height and environmental conditions resulting from this break would not prevent personnel access which is required to take the manual actions ~~required to isolate~~ described above.

The maximum temperature (150°F) and pressure (31 psig) of the water in the line are not high enough to significantly affect the temperature, pressure, or humidity conditions in the room (the room is open at the top to the reactor enclosure access area at El. 283'-0"). The released fluid would not be highly radioactive. The maximum flood height in the room resulting from this break is conservatively calculated to be about one foot. However, if the floor drains are assumed to be operable, the flood height would be much lower, and the water would drain out of the room at approximately the same rate as it flows from the break.

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<u>QUESTION 410.41</u> (Section 9.1.3)

Assuming a moderate energy leakage crack in the common spent fuel pool cooling pump discharge line with the reactor at full power, provide the time required to re-initiate cooling via the RHR cooling system and the maximum spent fuel pool water temperature attained during that time. Verify that the reactor will be in cold shutdown prior to dedication of the RHR to cool the spent fuel.

<u>RESPONSE</u>

place the reactor in cold

As stated in Section 9.1.3.2.3, administrative controls prevent the use of the RHR system intertie to cool the spent fuel pool unless the associated reactor is shutdown. As discussed in Section 9.1.3.6, if the fuel pool heat exchangers are not available, the water in the spent fuel pool could start boiling before cooling can be re-initiated via the RHR system. This conservatively assumes that it would take 20 hours to shut-down ~~the reactor~~, realign valves, adjust the spent fuel pool weir, and install the interconnecting piping between the RHR system and the fuel pool cooling system (Section 5.4.7.1.1). If boiling does occur and the RHR intertie is not available, makeup water will be supplied to the pool as described in Section 9.1.3.2.3.

DRAFT

QUESTION 410.43 (Section 9.1.4)

The FSAR states t' ~ is a "removable stop that jams the hoist cable against some part of the platform structure to prevent hoisting on the refueling platform telescoping grapple." For this two-blocking event, verify that should a fuel bundle drop (load drop) occur as a result, the effects will be less than for the design basis fuel drop accident.

RESPONSE NOT TO BE DELETED

The stop jams the auxiliary hoist cable so that the hoist cannot be raised above a certain pre-set distance. The stop has nothing to do with the telescoping grapple that is specifically designed for fuel handling.

# Revised Response to 410.43

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~~There are~~ two auxiliary hoists ~~mounted~~ on the refueling platform are not intended for fuel handling. The "main trolley auxiliary hoist" and the "monorail auxiliary hoist" are each provided with a geared rotary limit switch which provides normal up and down limit stops. In addition, a stop block ~~mounted~~ fastened to the hoist cable will operate a safety limit switch should the normal up limit fail. If the motor is not stopped by either up limit, the stop block will jam ~~at~~ against the hoist ~~structure~~ and trip the motor on 1) ~~hoist jam indication~~ The Dillon force switch sensing of a jam (load > 1000 pounds), or 2) stalling of the hoist motor. In either event, ~~then~~ there will be no resulting impact load on the cable, since the block stops against the energy absorbing portion of the ~~structure~~ hoist (ie – spring loaded plate or pivoted sheave arm).

Each cable is inspected by procedure prior to every refueling outage.

DRAFT

QUESTION 410.49 (Section 9.2.2)

Assuming the loss of either loop A and loop B of the emergency service water system, verify that the redundant loop can provide adequate cooling for both units.

RESPONSE

SRP 9.2.2, paragraph II.3.b, requires sufficient component redundancy so that safety functions can be performed assuming a single active component failure coincident with the loss of offsite power.

This is addressed in Section 9.2.2.1.d. The design basis for the Emergency Service Water System is that no single active failure coincident with loss of offsite power can cause the loss of either loop A or loop B. Table 9.2-4 has been changed to clarify this.

Although not specifically included in the ESW system design basis, the cooling provided by a single ESW loop is sufficient to safely shutdown both units at all times with the exception of the first ten minutes of a postulated DBA LOCA. During this time, three RHR pumps may be required on the LOCA unit for flooding (LPCI mode). The RHR pumps are arranged so that only two can be cooled by each ESW loop.

DRAFT

QUESTION 410.51 (Section 9.2.2)

Provide the design and the minimum ESW system heat transfer rate and flow requirements, by component, for normal plant operation and accidents. Specify the designed allowable component operational degradation (e.g., pump leakage) and describe the procedures that will be followed to detect and correct these conditions when they become excessive.

RESPONSE

The ESW system is not required for normal plant operation except during testing of the standby diesel generators. Table 9.2-3 provides the flow rates required for components in both ESW loops during a loss of offsite power condition or a design basis accident. Table 9.2-3 has been changed to provide the heat transfer rates by component. The heat transfer rates for essential components do not vary. The fouling factor for each component is typically 0.002 hr ft² °F/Btu.

Credible pump leakage rates (each) would be of no consequence because the flow rate of ~~the~~ pumps is approximately 6400 gpm. As stated in Section 9.2.2.2, a significant difference between the ~~inlet~~ (common pump discharge flow) and ~~outlet~~ (the return) flow ~~in~~ (from) each ESW loop is recorded and annunciated in the control room. This differential flow is indicative of ESW loop leakage, other than pump leakage, and provides the operator with indication of system degradation. The instrumentation is shown on Figure 9.2-2 Sheet 1.

¶ If the lead cooler in any pump compartment degrades to the point that room temperatures exceed desired levels, the redundant cooler will automatically start. In the event that both coolers degrade to the point that the compartments cannot be effectively cooled, high compartment temperature will be annunciated in the control room. Operator corrective actions could entail cooler repair, switching to the use of ECCS equipment located in another compartment, and/or opening compartment doors to facilitate cooling by natural circulation.

DRAFT

**QUESTION 410.54 (Section 9.2.2)**

The FSAR is not clear with respect to the protection of the emergency service water system from natural phenomena. Verify that the spray pond pumphouse, which houses the emergency service water pumps, provides protection against the effects of tornadoes and tornado generated missiles.

**RESPONSE**

THE EMERGENCY SERVICE WATER PUMPS ARE PROTECTED BY THE PUMP HOUSE STRUCTURE AS (TORNADO RESISTANT) ENCLOSURE AGAINST THE EFFECTS OF TORNADOES AND TORNADO MISSILES IDENTIFIED IN SECTIONS 3.3 AND 3.5 RESPECTIVELY.

THE TORNADO WIND LOADING IS CONSIDERED IN COMBINATION WITH OTHER LOADS IN THE DESIGN OF THE SPRAY POND PUMP HOUSE STRUCTURE AS LISTED IN TABLE 3.8-10. IN ADDITION, THE PUMP HOUSE STRUCTURE IS DESIGNED TO RESIST TORNADO MISSILES IN ACCORDANCE WITH THE PROCEDURES DETAILED IN REFERENCE 3.5-6.

DRAFT

QUESTION 410.58 (Section 9.2.2)

We require in accordance with GDC 64 and SRP Section 9.2.2 that the emergency service water system have the capability to detect and control leakage of radioactive material contamination into and out of the system. Commit to provide such a leakage control and detection system and provide a revised FSAR figure(s) to show the radiation monitors and the one manual and the one one manual and one automatic isolation valve in series per line, as per the Standard Review Plan.

RESPONSE

Leakage of radioactive material is detected via radiation monitoring systems in the discharge of each RHR heat exchanger and in the combined ESW/RHRSW system return lines as shown on Figure 9.2-3 and described in Section 9.2.2.2. Section 9.2.2.2 has been changed to provide information on leakage control capacity. These leakage control provisions satisfy the requirements of GDC 64 and SRP Section 9.2.2.

INSERT A

(A)

The radioactive fluid interfaces for the ESW and RHRSW systems are given below:

| ESW (Figure 9.2-2) | RHRSW (Figures 9.2-3 & 5.4-13) |
|---|---|
| RHR Pump Seal Coolers | RHR Heat Exchanger |

Should the RHR heat exchanger develop a leak to RHRSW, the radiation monitor on the discharge of the heat exchanger will alarm ~~and~~ as will the monitor in the combined ESW/RHRSW ~~to~~ return lines. The affected heat exchanger will be automatically isolated ~~and~~ the other placed in service.

If ~~the~~ an RHR pump seal cooler develops a leak, the monitor in the combined ESW/RHRSW return will alarm. The affected cooler is determined by valving out one cooler at a time.

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QUESTION 410.70 (Section 9.2.6)

Provide the basis for concluding that the design temperature for the ESW and RHRSW will not be exceeded using only tornado and tornado missile protected structures, systems and components.

RESPONSE

ATTACHED

410.70

Response

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As described in Section 9.2.6, the Ultimate Heat Sink for LGS is an excavated spray pond with a surface area of 9.6 acres. Four spray networks, each having 50% capacity for shutdown of two units, are provided.

Details of the spray pond excavation and finished grading are shown in Figures 3.8-55, 56, 57. The general arrangement of the spray pond, spray networks, and spray pond pump structure is shown in Figure 9.2-6. The layout of the spray networks is shown in Figure 9.2-7.

As discussed in Section 3.5.1.4, all essential structures, systems, and components related to the ESW system, RHRSW system, and the UHS are protected from the effects of tornadoes and tornado missiles. Protection of the spray networks is provided by location of the network piping and sprays below the surrounding grade and by physical separation of the networks: a) In all but the spillway area, the surrounding grade is in excess of El. 260' while the top of the sprays are at El. 258' and the spray network piping is between El. 253' 0.5" and El. 256'8". b) The closest branches of adjacent spray networks are separated by 65 feet. c) The supply piping to adjacent networks is separated by 215 feet. d) The networks are located at a minimum distance of 72 feet from the edge of the pond.

The use of elevational differences and physical separation to provide protection of the spray pond networks from tornado missiles is justified by the following considerations:

1) Only two spray networks are required for the safe shutdown of both units.

2) The only active failure which can compromise the operability of a spray network is failure of its supply valve (HV-57-032A, B, C, or D). These valves may be manually operated to isolate damaged networks, or to initiate the use of undamaged networks, if their controls or motors are inoperable.

3) The physical arrangement of the spray networks precludes the possibility that large missiles can damage more than one spray network due to trajectory considerations. Multiple missiles of sufficient energy and distribution to substantially damage multiple networks are unlikely.

4) The loss of some sprays in a network does not result in substantial loss of heat removal capability for the entire network (each network contains 240 spray nozzles).

5) The design thermal performance of the spray pond is based on extremely conservative design values of initial pond temperature and meteorology as described in Section 9.2.6.4. For all expected conditions, the margin in thermal performance would be considerably greater than the 10% margin demonstrated under design conditions.

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6) Interconnections are provided which allow the use of the cooling towers as a heat sink for ESW and RHRSW systems. Such operation may be initiated from the control room or locally by manual operation.

7) The loss of more than two spray networks and the coincident loss of the cooling towers due to tornado missiles is unlikely due to physical separation of the cooling towers and the spray pond. The cooling towers are located approximately 600 feet from the nearest portion of a spray network.

8) Tornado missiles are an insignificant contributor to plant risk, because of the low frequency of occurrence of tornadoes in this region (EROL Section 2.3.1.2.2) and the low likelihood of damaging missiles were one to occur.

9) Plant procedures will address the various contingent actions available to the operators to deal with degraded UHS conditions.

10) Substantial time is available for corrective operator actions.

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QUESTION 410.72 (Section 9.3.1)

Verify the availability of the 7 day instrument air supply after a safe shutdown earthquake which fails all non-seismic Category I air piping (which includes all 1" JDD-106 air lines). Consider the resultant loss of offsite power and the single failure of valve 1024E.

RESPONSE

Two seismic Category I air supplies have been provided to assure the long-term operability of the ADS valves. One air supply serves three ADS valves, the other serves the remaining two. These air supplies have been designed to remain operable following a loss of offsite power. Each is provided with an external connection which may be used to provide pneumatic pressure for periods beyond 7 days. Redundant automatic valves are provided to isolate the seismic Category I portions of the system from the non-seismic Category I portions. These two air supplies are physically separated such that no single failure can prevent the required long-term operation of the ADS valves.

Figure 9.3-2 has been revised to correctly show the connections of Seismic Category I and IIA lines.

GAS SYSTEM
13

CHANGES

-12 FOR CLARITY PER PLB-

NN. WITH 3/4" VALVE NO.
D 110 UPSTREAM OF VALVE
R TELECON FROM FIELD
2.

RECT DRAFTING ERRORS.

4 TO NOTE-8.

2A TO PSLL-122A &
ROM SHOP TO STOP.

NOTE-5 TO NOTE-9.

OF 3 TO TYP. OF 3.

TE-12" TO APPLICABLE
VES

52A&B TO PISL-152A&B
) AS PANEL MOUNTED IN
ON PANELS C640 & C641
).

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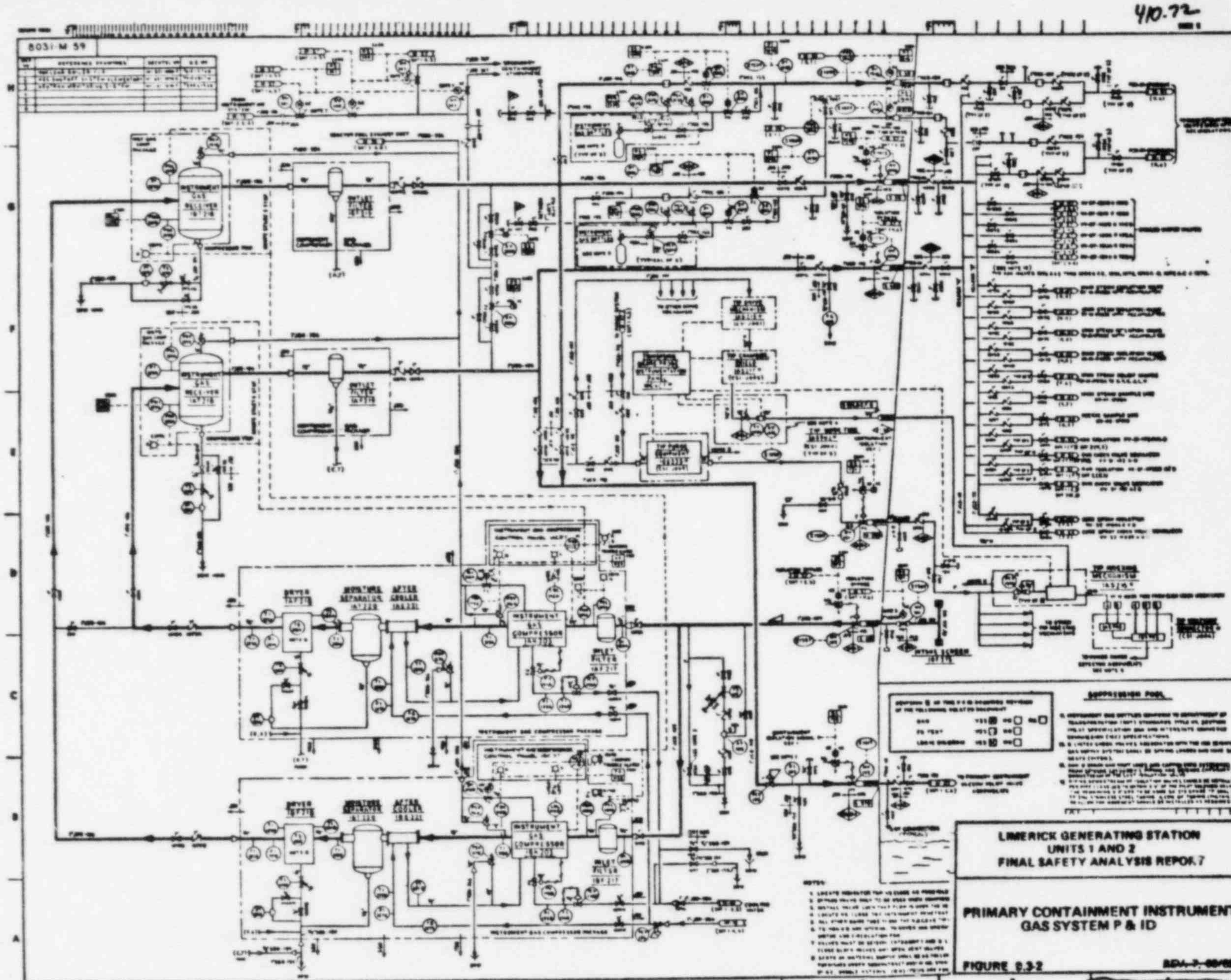
410.72




M-59 Rev 13

QUESTION 410.74 (Section 9.3.1)

Provide a discussion of the maintenance and periodic testing program for each instrument air system to assure compliance with the requirements of ANSI MC11.1-1976. Specify the maximum time between testing of the compressed air system in the discussion.

RESPONSE

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ATTACHED

**RESPONSE**

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Limerick is in compliance with the requirements of ANSI MC11.1-1976 as discussed in the response to Question 410.73.

The Primary Containment Instrument Gas system is shown on Figure 9.3-2. The refrigerated dryers located downstream of the moisture separators cool the gas to a dew point of 34°F at 105 psig. The outlet filter is a coalescing type designed to remove 99.99% of all particles (oil, ~~and~~ water vapor and solids) 0.03 micron in diameter and larger. ① Periodic monitoring of the dryer outlet temperature will assure proper air quality.

The Instrument Air system is shown on Figure 9.3-1. In addition to supplying instrument air to various plant equipment, this system also serves as a backup to the Primary Containment Instrument Gas system. The Instrument Air system is provided with dessicant dryers which dry the gas to a -40°F dew point at 105 psig and filters which remove 100% of all particles larger than 0.9 micron in diameter. The filters will be switched to the parallel set of filters every six months and the elements will be replaced yearly. The need for dessicant replacement is indicated when the local visual moisture indicating gel turns from blue to pink. In addition, excessive dryer outlet moisture is alarmed both locally and in the main control room. The Instrument Air system will be tested once each refueling cycle to verify air quality compliance with ANSI MC11.1-1976.

① All piping and equipment downstream of these filters is Copper, Bronze, or Stainless Steel.

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QUESTION 410.81 (Section 9.4.1)

Provide a drawing which shows the details of the tornado missile protection for each air intake and exhaust structure.

RESPONSE

Figure 9.4-12 has been added to show the Tornado missile protection for the control structure exhaust. Missile protection for the diesel generator enclosure air intake and exhaust are shown on Figures 1.2-35 and 1.2-36. Missile protection of the diesel combustion air exhaust is described in Section 9.5.8.3

For the control structure air intake (Figure 1.2-27) and for the spray pond pump structure air intakes and exhausts (Figures 1.2-37 and 1.2-39), missile protection is provided by virtue of the building design.

Table 3.5-8 gives minimum dimensions of missile barriers.

DRAFT



QUESTION 410.85 (Section 9.4.6, 9.4.7)

(a) Assuming the outside air temperature is at its maximum value of 106°F, verify that diesel generators will not fail at full load. Specify the maximum temperature in the diesel generator cell.

(b) Assuming the outside air temperature is at its maximum value of 106°F verify that no emergency or residual heat removal service water pump will fail. Specify the maximum temperature in the spray pond pump room.

RESPONSE

The design basis for the outdoor air temperature used in designing the HVAC systems for the spray pond pumphouse and for the diesel generator enclosure is in accordance with the 1977 ASHRAE Fundamentals, Volume 1, Chapter 23. The use of ASHRAE is consistent with the practices used by other plants in the nuclear industry. Table 1 of Chapter 23 of the 1977 ASHRAE Fundamentals shows that the highest 1% design dry-bulb temperature for the areas around Limerick is 94°F. A design outside air temperature of 95°F was conservatively used for Limerick, which corresponds to a maximum internal room temperature of 115°F for both items a) and b) above. The diesel generators and emergency and residual heat removal service water pumps were qualified to operate at this design room temperature throughout their normal operating lives and any accident conditions.

The 1% design dry-bulb temperatures provided in ASHRAE represent values that have been equalled or exceeded for 1% of the total hours during the summer months of June through September.

In a normal summer, there would be less than 30 hours at or above this value. Even when the design value is exceeded, it would not normally be exceeded by a large amount. The data from Limerick Weather Station 1 (Table 2.3.2-52) shows that the maximum temperature was 96.2°F for the period between January 1972 through December 1976. The use of 106°F, the maximum temperature recorded in Philadelphia over the last century, does not represent a realistic design basis.

The few hours a year in which the room temperature might exceed 115°F due to an outside air temperature between ~~greater than~~ 95°F and 106°F would not adversely affect the operation of ~~the subject components~~ the safety-related equipment in the diesel compartments or the spray pond pumphouse.

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QUESTION 410.89 (Section 10.3)

Verify that the structure which contains the main steam piping up to the main stop valves, is seismic Category I. Furthermore, verify that no non-seismic Category I piping or appurtenances are located above the main steam piping and associated valves which could damage the main steam piping and appurtenances during a safe shutdown earthquake.

RESPONSE

The main steam piping is seismic Category I up to the main stop valves. The main steam lines, up to and including the second isolation valves, are located in a seismic Category I structure. The remainder of the main steam piping, up to the stop valves, is located in the turbine enclosure, which is seismic Category II. However, as described in Sections 3.8.4.1.8 and 10.3.3, those portions of the turbine enclosure that support the main steam lines are designed so that the main steam lines and their supports maintain their integrity under the seismic loading resulting from the SSE.

IN ADDITION, ALL NON-SEISMIC CATEGORY I SYSTEMS AND COMPONENTS IN THE VICINITY OF THE MAIN STEAM LINES ARE DESIGNED AS SEISMIC CATEGORY IIA, AS DISCUSSED IN SECTION 3.2.1

THEREFORE NO NON SEISMIC CATEGORY I STRUCTURES, SYSTEMS OR COMPONENTS IN THE VICINITY OF THE MAIN STEAM LINES WILL DAMAGE THE MAIN STEAM LINE DURING A SAFE SHUTDOWN EARTHQUAKE.