THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

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MURRAY R. EDELMAN
VICE PRESIDENT
NUCLEAR

February 12, 1985
PY-CEI/NRR-0164 L

Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Perry Nuclear Power Plant
Docket Nos. 50-440; 50-441
SER Confirmatory Issue (54)
Permanent Dewatering System Testing

Dear Mr. Youngblood:

This letter and its attachments are provided in response to your staff's request for clarification, during a November 19, 1984 site visit, regarding SER Confirmatory Issue (54) on preoperational and periodic testing plans for the porous concrete subsystem of the permanent dewatering system. This letter supplements the information provided in our letter dated September 21, 1984 (PY-CEI/NRR-0114L). The clarifications are from the test procedure and are provided herewith as Attachments 1 and 2. Proposed FSAR changes related to the testing clarifications are provided as Attachment 3.

Based on the analysis reflected in FSAR Section 2.14.1.3.5.2 and summarized in our previous letter, the design capability of the Underdrain System assures that the hydrostatic pressures beneath the building foundations are lower than the design bases. This is due to the fact the available free volume exceeds the volume of water which can be postulated to fill it. Thus, the requirements for a technical specification can be eliminated. Attachment 3 includes proposed FSAR changes to eliminate the technical specification.

We believe these clarifications should enable SER Confirmatory Issue (54) to be resolved. In addition, the SER can be changed to delete the requirement for a technical specification for the plant underdrain system. If you have any questions, please let me know.

Very truly yours,

A. Kaplan for

Murray R. Edelman
Vice President
Nuclear Group

MRE:njc

Attachments

cc: Jay Silberg, Esq.
John Stefano (2)
J. Grobe
S. Brown

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1/1

I. Maintenance and Periodic Testing

Normal routine maintenance will be performed on the mechanical and electrical portions of the system. The manholes and gravity discharge pipes will be inspected quarterly to insure all parts of the system, including the porous piping, are in operating condition. Any blockage in the porous concrete periphery drain pipes will be cleared by mechanical or other suitable means. The following periodic tests will be performed to ensure continuous satisfactory performance of the system:

A. Continuity Test

This test will be performed semiannually for the first five years of operation and annually thereafter. The details of the test are described as follows:

1. Test Objective

To verify that water will build-up and drawdown at the monitoring points and thereby establish that the underdrain system can, in fact, reduce the hydrostatic pressure on building foundations to the desired level.

2. Prerequisites

a. Pump start/stop float switches are calibrated and functioning properly.

b. Set float level switches to Elevation 563 ft. and 564 ft., respectively.

c. Flowmeters are calibrated and functioning properly.

d. Provide piezometer tube extensions to at least elevation 571 ft.

3. Test Procedure

a. Immediately prior to the start of the test, record the building mat piezometers readings.

b. Allow water to rise in system to approximate Elevation 570 ft. Water may be added into system via the manholes to promote water buildup.

c. Record building mat peizometer readings during water build-up phase on a regularly scheduled basis.

d. Upon assurance that water elevation has reached Elevation 570 ft., energize pumps.

e. Record building mat piezometer readings during water drawdown phase on a regularly scheduled basis.

f. Upon assurance that water elevation is at approximately Elevation 564 ft. as measured at the Plant Piezometer, de-energize pumps.

4. Post Test Details

a. Reset pump switch floats per P72 System Design.

b. Testing to be performed biannually, in the spring and fall.

5. Groundwater Inflow Test

This test will be performed semiannually in the spring and fall. The objective of the test is to verify that total inflow of groundwater into the porous concrete underdrain system does not exceed a rate of 80 gpm. The test procedure shall be as follows:

1. Ensure that:

a. Pump start/stop switches are calibrated to Elevations 566 ft. and 567 ft., and functioning properly.

b. Flowmeters are calibrated and functioning properly.

2. Groundwater inflow rates will be determined by flow through flowmeters located at Manholes 20 and 23 per P72 system design description.

3. Immediately prior to start of test, record the flowmeter readings.

4. Continue flowmeter readings on a daily basis for a period not less than one month.

5. After completion of the test, reset pump switch floats per P72 system design criteria.

I. Plant Foundation Underdrain System Preoperational Tests

A. Pump Reliability Test

1. Test Objectives

a. To demonstrate that seven service pumps and two backup underdrain pumps perform within design specifications for capacity and discharge head.

b. To demonstrate that the service and backup underdrain pumps start and stop due to water level changes in their respective manholes and that when the backup pumps start a high ground water level alarm occurs.

c. To demonstrate that the piping is free of obstructions by performing a visual inspection of all gravity drain piping.

2. Prerequisites

a. Individual component tests covered under the Initial Check-Out and Run-In Test are complete and have been approved. (This includes installation verification of pump discharge check valves).

b. Instrument calibration is complete.

c. The Service Water System is capable of supplying water into the underdrain pump manholes.

d. Electrical power is available.

3. Test Procedure

a. Verify that the underdrain service and backup service pumps operate within design specification for capacity and discharge head.

b. All controls, interlocks and alarms (including high ground water) will be verified for proper operation.

B. Functionability Test

1. Test Objectives

To verify that water will flow across the porous concrete mat and therby establish that the underdrain system can, in fact, reduce the hydrostatic pressure on building foundations to the desired level.

2. Prerequisites

a. Set up the water intake and discharge systems as illustrated in Figure 1 (sheet 5 of 6).

b. Install plugs in the 12" porous pipes at the north and south ends.

c. Saturate the porous concrete and Class A fill up to Elevation 570'- 0". The source of the water can be natural inflow of groundwater or service water (P41) from the pump house. This will permit up to a 4'-0" head loss across all portions of the drainage system during testing. Bottom of porous concrete in the Turbine Building is at Elevation 571' -0". By maintaining water level below 570', no water will be introduced into the Turbine Building mat. Saturation to this elevation allows determination of flow capacity of the entire system beneath the Nuclear Island since at that level the weepholes in the east and west manholes should be under water and the porous concrete blanket under the Nuclear Island should be inundated.

d. Permit water to stabilize at Elevations 570' -0" for a period of 48 hours. Begin this stabilizing period as soon as water levels in the manholes and the piezometers are at Elevation 570' -0" or above. During this period, maintain a minimum water level at Elevation 570' -0"

3. Test Procedure

a. Immediately prior to the start of the test, record the building mat piezometer readings.

b. The west side regulating valves and the east side throttling valve should be in the closed position. The east side regulating valves should be fully open.

c. Start east side pumps. These will run continuously during the test.

d. Open throttling valve on the east side to achieve a flow of about 50 gpm when the flow rate stabilizes.

e. Wait for a response on the west side. West side manhole observers should notify the test director when the water in his manhole has dropped approximately 0.1 feet.

f. Open west side regulating valves to provide a total supply of 50 gpm including the ground water seepage which is a variable.

g. Each east side manhole person will adjust his regulating valve setting as directed by the test director until a uniform water level ($\pm$3" between manholes) has stabilized in all east side manholes. The test director will adjust the east side throttling valve so that the east side water level will be at approximately Elevation 566' -0". During adjustments, the water level in east side manholes should not fall below Elevation 565' -0" to ensure mat saturation.

h. When a uniform water level Elevation 566' -0" is achieved on the east side, the regulating valves on the west supply lines should be readjusted to provide a uniform water level in the west side manholes with a combined inflow of 50 gpm. The west side water level cannot be predicted in advance, but it will be higher than Elevation 566' -0" maintained on east side.

i. Until an equilibrium condition is reached, modifications to regulating valve settings on either side will affect the water levels on both side. Adjustments will have to be repeated as advised by the test director until the conditions of Steps g and h are both met and maintained for a minimum of 15 minutes. A series of water level measurements should be made after each valve adjustment. A series of readings is necessary until the system reaches equilibrium or until the test director indicates the need for another valve adjustment in one or more of the manholes.

j. Open the west side regulating valves to give a total inflow of 100 gpm and repeat Steps g through i. the east side throtting valve should be used to maintain the Elevation 566 -0" water level on the east side. Minor readjustment of east side regulating valves may be required to achieve uniformity in east side water levels. Some minor readjustments of the west side valves may also be necessary as described in Step h.

k. Repeat Steps f through h with combined inflow increments of 50 gpm (i.e. 150, 200, etc.) until one of the following occurs.

   1) West side regulating valves are fully open.

   2) East side throttling valves is fully open.

   3) Uniform water level on west side reaches Elevation 570' -0". The final condition should be adjusted as in Steps g through i, and then maintained for a minimum period of 30 minutes.

l. Record final water level measurements in the manholes and piezometers.

m. Record final supply and discharge flow rates.

n. Repeat Steps 2a through 3m for a test with flow in the opposite direction. The water supply and discharge systems should be set up as shown in Figure 2 (sheet 6 of 6) with outflow measured in Manhole 20. Procedural steps will be the same as in the first test, except that references to "east" and "west" should be reversed.

C. Continuity Test

1. Test Objective

To verify that water will build-up and drawdown at the monitoring points and threrby establish that the underdrain system can, in fact, reduce the hydrostatic pressure on building foundations to the desired level.

2. Prerequisites

a. Pump start/stop float switches are calibrated and functioning properly.

b. Set float level switches to Elevation 563 ft. and 564 ft., respectively.

c. Record building mat piezometer readings during water build-up phase on a regularly schedules basis.

d. Upon assurance that water elevation has reached Elevation 570 ft., energize pumps.

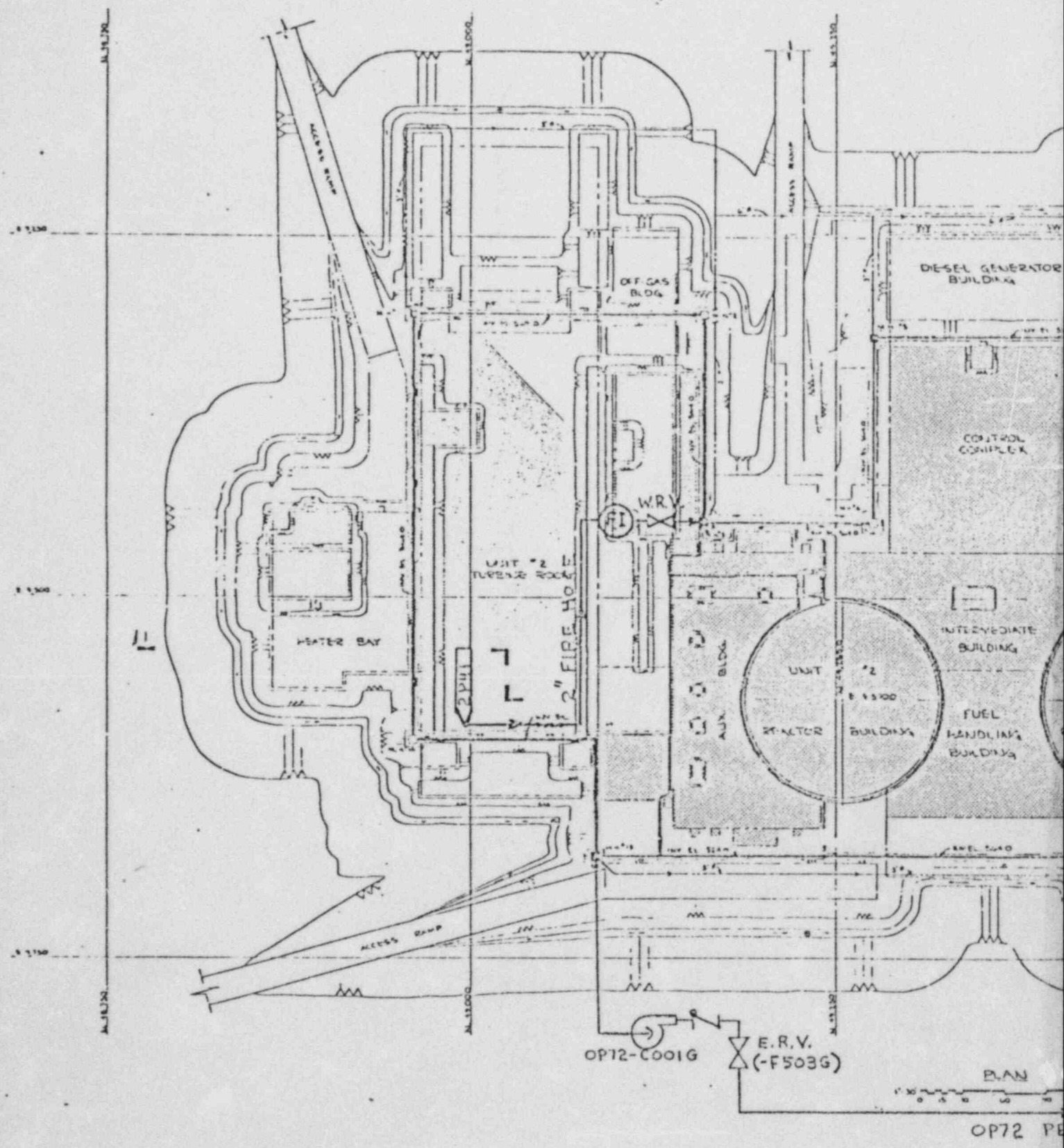
e. Record building mat piezometer readings during water drawdown phase on a regularly scheduled basis.

f. Upon assurance tha the water elevation is approximately Elevation 564 ft. as measured at the Plant Piezometer, de-energize pumps.

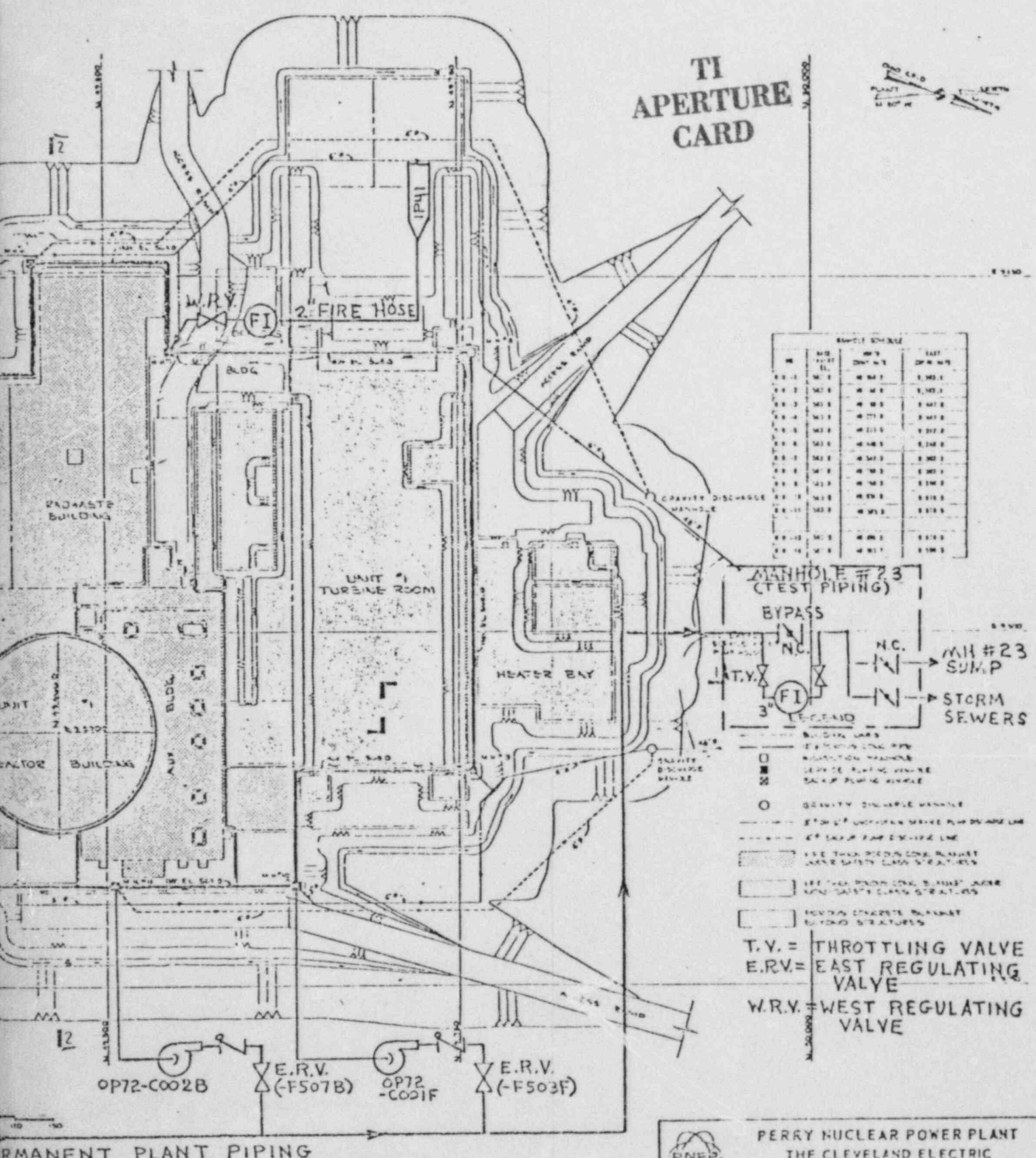
4. Post Test Details

a. Reset pump switch floats per P72 System Design.

b. Testing to be performed biannually, in the spring and fall.



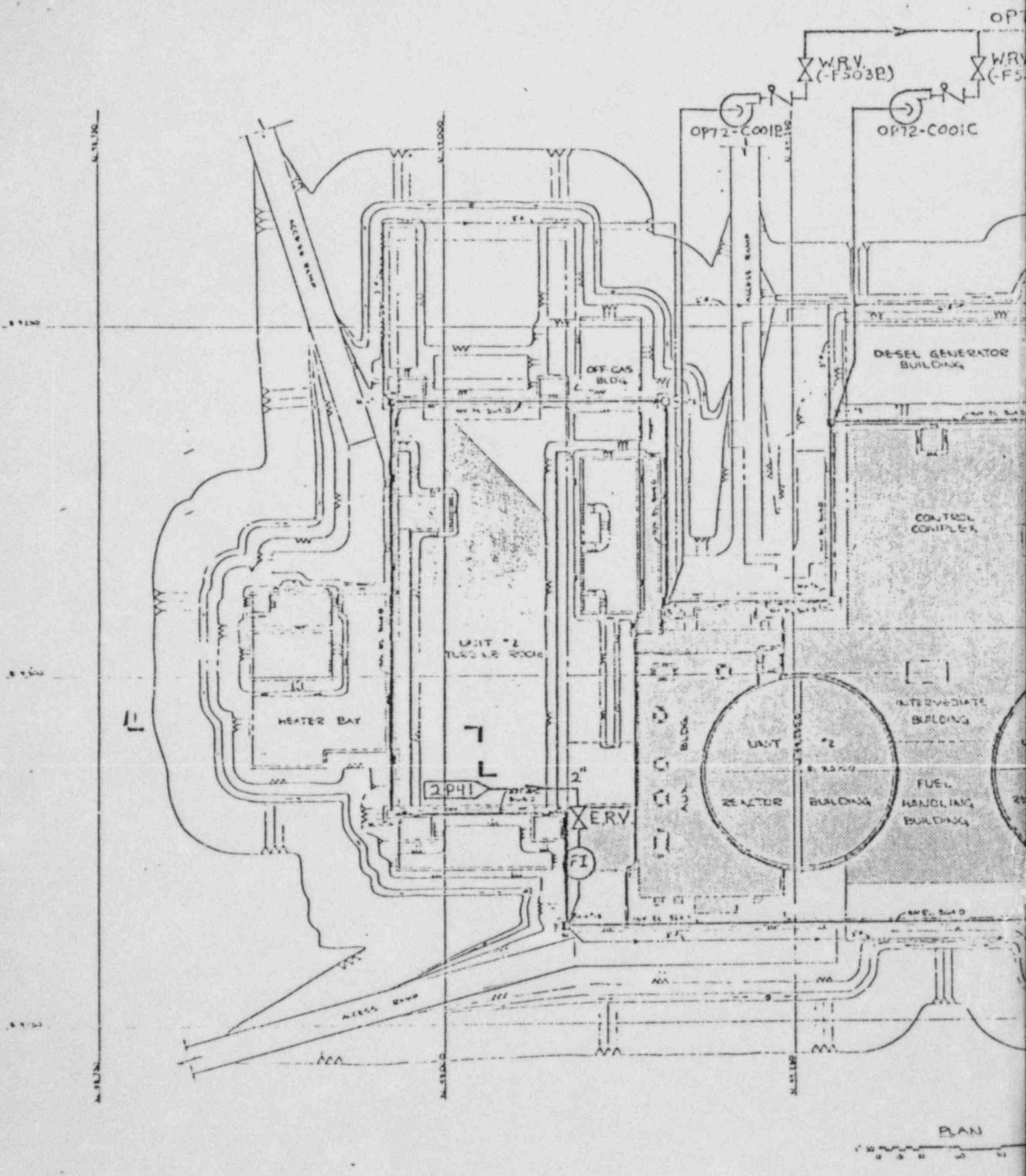
Also Available On Aperture Card



PERRY NUCLEAR POWER PLANT
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

Plot Plan-Porous Concrete Underdrain System

Figure 1



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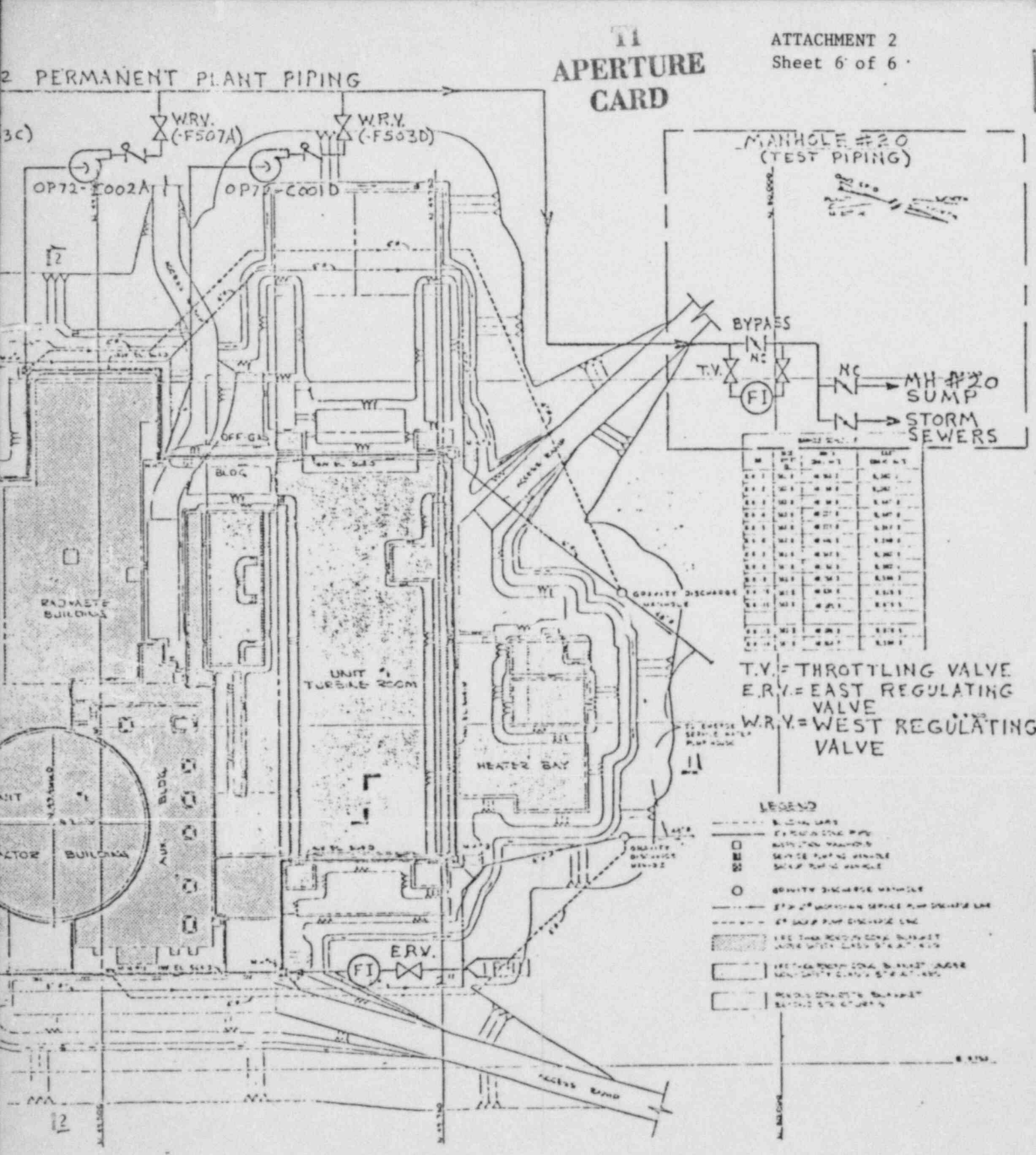

PERRY NUCLEAR POWER PLANT
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Plot Plan-Porous Concrete Underdrain System

Figure 2

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The offsite effects of a hypothetical release, due to a seismic event, of radioactive liquids to the environs is described in Section 15.7.

2.4.13.5.4 Maintenance and Testing

Normal routine maintenance will be performed on the mechanical and electrical portions of the system. The manholes and gravity discharge pipes will be inspected quarterly to insure that all parts of the system, including the porous piping, are in satisfactory operating condition. Any blockage in the porous concrete periphery drain pipes will be cleared by mechanical or other suitable means. The following periodic tests will be performed to ensure continuous satisfactory performance of the system.

A. Continuity Test

This test will be performed semiannually for the first five years of operation and annually thereafter. the objective of the test is to verify that water will build-up and drawdown at the monitoring points, to establish that the underdrain system can reduce the hydrostatic pressure on building foundations to the desired level. The Continuity Test is further described in Section 14.2.12.1.34.

B. Groundwater Inflow Test

This test will be performed semiannually in the spring and fall. The objective of the test is to verify that the total inflow of groundwater into the porous concrete underdrain system does not exceed a rate of 80 gpm.

The test program for the permanent pumped discharge system and porous concrete system is discussed in Chapter 14.

2.4.13.5.5 Safety Evaluation

During the design and licensing process, numerous studies were performed to

evaluate the performance of the underdrain system. The studies which follow are listed below for each reference:

a. Groundwater recovery.

b. Permeability test of porous concrete.

c. Long-term performance of the porous concrete underdrain system

1. Tornados.
2. Earthquakes.
3. PMP (Probable Macimum Precipitation).

Although unlikely, should both the underdrain service pumps and the backup pumps fail, the groundwater level would rise until it reaches the gravity discharge system which is provided to ensure that the groundwater level around the nuclear island never exceeds elevation 590.0'. The gravity discharge system is designed to provide a redundant periphery discharge which incorporates a gravity outfall, having no active components, to handle a 30,000 gpm flow entering the underdrain system on either side of the plant. The design basis for the plant underdrain system is described in Section 2.4.13.5.

a. Porous Concrete Blanket

A 12-inch thickness of porous concrete was selected as the drainage medium under the plant buildings to help dissipate any pressure increase under the foundation. The porous concrete blanket is classified as Seismic Category I, Safety Class 3.

The following design mix for the porous concrete was determined on the basis of a mix suitability program conducted by Herron Testing Laboratories, Inc. of Cleveland, Ohio, under the direction of Gilbert Associates, Inc.:

Water/Cement Ratio:	0.35 by weight
Aggregate/Cement Ratio:	5.0 by weight
Aggregate Size:	No. 4 to 3/8 in. (pea gravel)