U. S. ATOMIC ENERGY COMMISSION
REGION I
DIVISION OF COMPLIANCE

Report of Inspection

CO Report No. 289/69-1

Licensee: METROPOLITAN EDISON COMPANY
(Three Mile Island Nuclear
Station No. 1)
Provisional Construction Permit
No. CPPR-40

Date of Inspection: January 7, 1969

Date of Previous Inspection: September 18-19, 1968

Inspected By: N. C. Moseley for — 1/29/69
F. S. Cantrell, Reactor Inspector — Date

D. B. Whitesell — 1-29-69
D. E. Whitesell, Reactor Inspector (Constr) — Date

Reviewed By: N. C. Moseley — 1/29/69
N. C. Moseley, Senicr Reactor Inspector — Date

SCOPE

A special announced inspection was made at the 2452 Mwt Pressurized Water Power Reactor under construction on Three Mile Island near Middletown, Pa. The purpose was to inspect the concrete voids uncovered when the forms were removed from the ceiling of the tendon galley. Mr. D. Whitesell, Reactor Inspector (Construction), Region I, accompanied the assigned inspector and wrote portions of this report.

SUMMARY

An inspection of the tendon galley after the void areas had been chipped back to solid concrete, showed that in three areas the void extended up into the concrete more than one inch. These three areas penetrated the concrete from twelve to sixteen inches (Attachment No. 1 and 2). The affected areas were between the tendon bearing plates, and in only one area was the concrete chipped out from behind the bearing plate. The space behind the bearing plate was approximately 1" wide, 3" deep, and 12-15" long. The total void volume, including the chipping, is estimated to be 4-5 cubic feet. The cause of the voids was wood and mud left in the form prior to pouring concrete.

MET-ED and Gilbert Associates, Inc. (GAI) have completed their review and approved the United Engineers and Constructors (UE&C) Repair Procedure. A copy of the Procedure (Attachment No. 3) was sent to Compliance for review. Repairs to the voids around the 170 wire tendon plates will be delayed to permit Compliance review of the Repair Procedure. Repairs around the unused trumpets (90 wire system) will be made as necessary in order to not cause a delay in the schedule.

The Chicago Bridge and Iron (CB&I) welding procedures for the containment liner were reviewed and found to be adequate, except that the quality control procedures were not included. Subsequently, MET-ED reported that CB&I had agreed to provide copies of the quality control procedures to MET-ED and UE&C.

Compliance was given copies of the following Quality Control Procedures:

Structural Concrete (Attachment No. 2)
Site Quality Control Plan
Receiving and Material Control
Storage
Liquid Penetrant Examination
Magnetic Particle Examination
Radiographic Examination
Ultrasonic Examination
Leak Test

1419 234

Region I will evaluate these procedures and will report the evaluation in the next inspection report.

Results of Inspection

A. Persons Contacted

Vernon Steubner, Resident Engineer, MET-ED
B. G. Avers, Manager, Quality Assurance, GPU
Dick Mason, Job Engineer, UE&C
D. A. Godfrey, Structural Engineer, GAI
R. M. Eshbach, Field Quality Control Inspector, GAI
M. B. Prisota, Field Quality Control Engineer, UE&C
Karl Brooks, Welding Inspector, UE&C

B. Concrete

1. On December 16, 1968, Vern Steubner, of MET-ED phoned the assigned inspector to report that some voids had been discovered in the concrete in the ceiling of the tendon access galley. He stated that the voids had been created by dirt and pieces of wood left in the forms. He informed the inspector that the areas had been cleaned and the concrete had been chipped out to clean solid material. The total voids were estimated to be approximately 4-5 cubic feet.

2. The inspectors examined the void areas and found that there was a total of seven (7) areas where dirt and bits of wood had been found. Of the seven areas, four (4) were found to penetrate into the concrete a distance of 1" or less, and could be easily patched.

3. The three remaining areas had been created by pieces of wood and penetrated into the concrete for depths of twelve to sixteen inches (12"-16") and would require repairs. All areas affected were between the tendon bearing plates and at only one place was the concrete chipped out from under the bearing plate and this constituted an area of approximately 1" wide by 3" deep and 12" to 15" long. (Location shown in Attachment No. 1, photographs of void areas in Attachment No. 2.)

4. UE&C has prepared a written procedure for repairing these areas (Attachment No. 4.) The procedure has been approved by GAI and MET-ED.

5. The inspector traced the concrete records for placement in the two worst areas (Section 5 & 6).

   Sections Involved: 3, 4, 5 and 6 (Attachment No. 1)
   Dates of Pours: 9/9, 9/19, 9/16, 9/26
   Height of Pour: 8' 6" continuous pour
   Slumps: 2 3/4" to 4"
   Temperature of Batch: Average 65°F (one batch was used with Temp. of 71°F.

6. The forms were inspected prior to the pour by the testing laboratory inspectors, UE&C Engineers and GAI engineers per QC Procedure No. 1 for Structural Concrete (Attachment No. 3.) During the pour, "slump" and temperature was measured on each batch. Two testing laboratory inspectors were assigned to each pour point. UE&C and GAI engineers were also assigned overall inspection responsibilities for observations of vibrations and overall progress.

7. Pittsburgh Testing Laboratory replaced U. S. Testing Laboratory on October 1, 1969. Insufficient manpower to adequately cover the jobs in progress was reported by MET-ED to be the prime reason for the change in test laboratories.

8. In discussing the probable factors contributing to the cause of these defects, the inspectors learned that a part of the concrete placement was delayed by a rainstorm which occurred after the placement area had been cleared. Also, the areas where wood was found in the concrete occurred at the points where bulkheads had been erected to form the pie shaped placement areas. The wood scraps could have been overlooked due to poor visibility of the area in the vicinity of the high density of steel.

9. Mr. Avers stated that, although all the containment base slab was completed, the incident had alerted them to the need for closer inspection of all contact surfaces immediately prior to and during all future concrete placements, and they had in fact implemented a more stringent inspection program.

10. The inspectors visited the Testing Laboratory constructed on the site by MET-ED and operated by Pittsburgh Testing Laboratory for monitoring the concrete work. The Laboratory is equipped with a steam curing room where the temperature and humidity are monitored with recording instruments. The laboratory also is equipped for making the cylinder break tests and for checking cadweld splices, and verifying the yield and ultimate strength of the rebars.

11. The inspectors observed a portion of the placement of concrete in one of the turbine pedestals and found the area to be protected by canvas wind breakers and several heaters. The forms were insulated and the surface of the fresh concrete protected by approximately two feet (2') of straw.

C. Liner Plate

1. Materials

The mill certificates for the liner plate material was reviewed and found to conform to the materials specified in the PSAR.

2. Welding Procedures

a. Th welding procedures examined were developed by Chicago Bridge & Iron (CB&I) and approved by United Engineers and Constructors (UE&C) as follows:

(1) Procedure 9V was for joining base metals classified as P-1 to P-1 in Table Q11.1 in Section IX of the ASME code by using the shielded metal arc using F-3 electrodes.

(2) Procedure 491 which was for joining P1 to P1 using F4 electrodes.

(3) Procedure 25 which was for joining P1 to P1 using a submerged arc with Linde 29 wire and grade 50 flux.

(4) Procedure 171 which was for joining stainless steel to stainless steel with a shielded metal arc and using E308-16 electrodes.

(5) Procedure 473 which was for joining stainless steel to carbon steel with a shielded metal arc using E309-16 electrodes.

b. Each of the above procedures provided for joint preparation, current characteristics, cleaning, visual inspection, staggering of the start and stop points for multiple passes, repairs of defects, and each procedure was accompanied by a sketch showing the pass sequence.

c. Each welding procedure had been qualified in the flat, vertical, horizontal and overhead positions, and charpy notch tests of the weld metal and heat affected zones had been made all in accordance with Section IX of the ASME Code.

d. An examination of the welder's qualification tests revealed that nine welders had qualified on procedures 9V, 491 and 25 in all positions. No welders had been qualified on procedures 171 and 473.

e. The inspector inquired if CB&I had submitted any written quality control procedures that would be implemented for the control of their field fabrication.

(1) Mr. Avers, of GPU, responded that they had received a copy of a letter from CB&I to UE&C wherein CB&I stated that their intention was to use their Field Engineer and Welding Supervisor to handle the quality control of their field fabrication, and anything more than this would result in an addition to the contract in the amount of twenty-thousand dollars ($20,000.)

(2) Mr. Avers stated that MET-ED's response to the above was with a letter written December 30, 1968 directing U.E&C to obtain a quote from CB&I for written procedures covering radiography, liquid penetrant inspection, ultrasonic inspection, and general installation procedures including the storage and control of electrodes, all in conjunction with GAI specifications SP-5490 and SP-5489.

f. Mr. Steubner phoned January 17, 1969 to report that CB&I had agreed to supply the requested quality control procedures.

D. Plant Piping

1. The purchase specification number 5544 was reviewed and the inspector noted that the specifications covering shop fabrication required the following procedures.

a. Receiving inspection for cleanliness, damage or discrepancies.

b. Stainless steel to be stored separate from carbon steel

c. Welding procedures and qualification tests to be available in shop

d. Welder's qualification tests available in shop for review

e. All welding to be in accordance with Section IX of the ASME Code

f. All fabrication work to conform to Sections I, VIII and IX of the ASME Code as a minimum, unless otherwise noted.

g. Stress relieving and/or heat treating to be by electrical induction, or in a furnace.

2. The specifications contained provisions for 100% radiograph and 100% magnetic particle or dye penetrant inspection of all girth and longitudinal butt welds, seal welds and branch welds 4" and over, and 100% magnetic particle or dye penetrant examination of all fillet welds; under Table N1, defined "as sever nuclear incident" and Table N2, defined as "causing hazard to the plant." The specification further requires the fabricator to have a quality control procedure to control the following:

   (a) Raw Materials - including inspection, identification and certification.

   (b) Purchased Parts - Inspections and tests.

   (c) Fabrication Process - Qualification tests, cleaning tools and fixtures.

   (d) Inspection and Test Equipment - Calibration of instruments and gages.

   (e) Packaging & Shipping - Final inspection, releases and maintenance.

   (f) Control of Changes - Drawings, specification, etc.

   (g) Material Identification - Marking, tagging, and inspection status.

   (h) Disposition of Nonconforming Items - including repairs, rework, retests or identification to prevent inadvertent use.

   (i) Control and Storage of Inspection and Test Records

3. It was not determined as to how the vendor is informed as to whether his work involves a system that falls under Table N1 or N2. This will be pursued on the next visit.

E. Exit Interview

Portions of the exit interview were conducted by phone after the inspectors returned to the Region I office.

1. Concrete

The inspectors stated that they would like to review the repair procedure for the voids in the concrete before the repair work is started. Mr. Steubner stated that he would send a copy of the repair procedure to Compliance as soon as the procedure had been approved by GAI and MET-ED. (The Procedure was received by Region I on January 20, 1969.) He stated that it would not affect the construction schedule to delay the repairs in the vicinity of the 170 wire tendon trumpets while Compliance was reviewing the repair procedure. He stated that MET-ED needs to make repairs in the vicinity of the trumpets that are to be plugged (No. 90 wire tendon system) right away in order to avoid a delay in starting up with the concrete for the containment wall.

On questioning, Mr. Steubner stated that MET-ED and GAI were satisfied that the voids had been adequately investigated and that no further testing was planned on the reactor building mat for the following reasons:

a. The voids found were minor and were explained by the mud and wood found when the forms were removed.

b. Enough chipping has been done around the voids to assure that there is solid concrete.

c. The placement and vibration of the concrete was observed by himself, UE&C and GAI and was deemed adequate.

d. The calculated amount of concrete or more was used in each section which indicated the concrete was adequately compacted.

2. Quality Control Procedures for the Containment Liner

Mr. Avers stated that the CB&I plan for erecting the containment liner referred to procedures for radiography, liquid penetrant inspection, weld rod control, ultrasonic inspection, but did not include the procedures. Mr. Avers showed the inspectors copies of letters between CB&I and UE&C about the above procedures. Mr. Avers stated that MET-ED would get the procedures even if they had to pay extra for them. Mr. Steubner subsequently reported that he attended a meeting with CB&I in Memphis in which they agreed to give MET-ED the procedures.

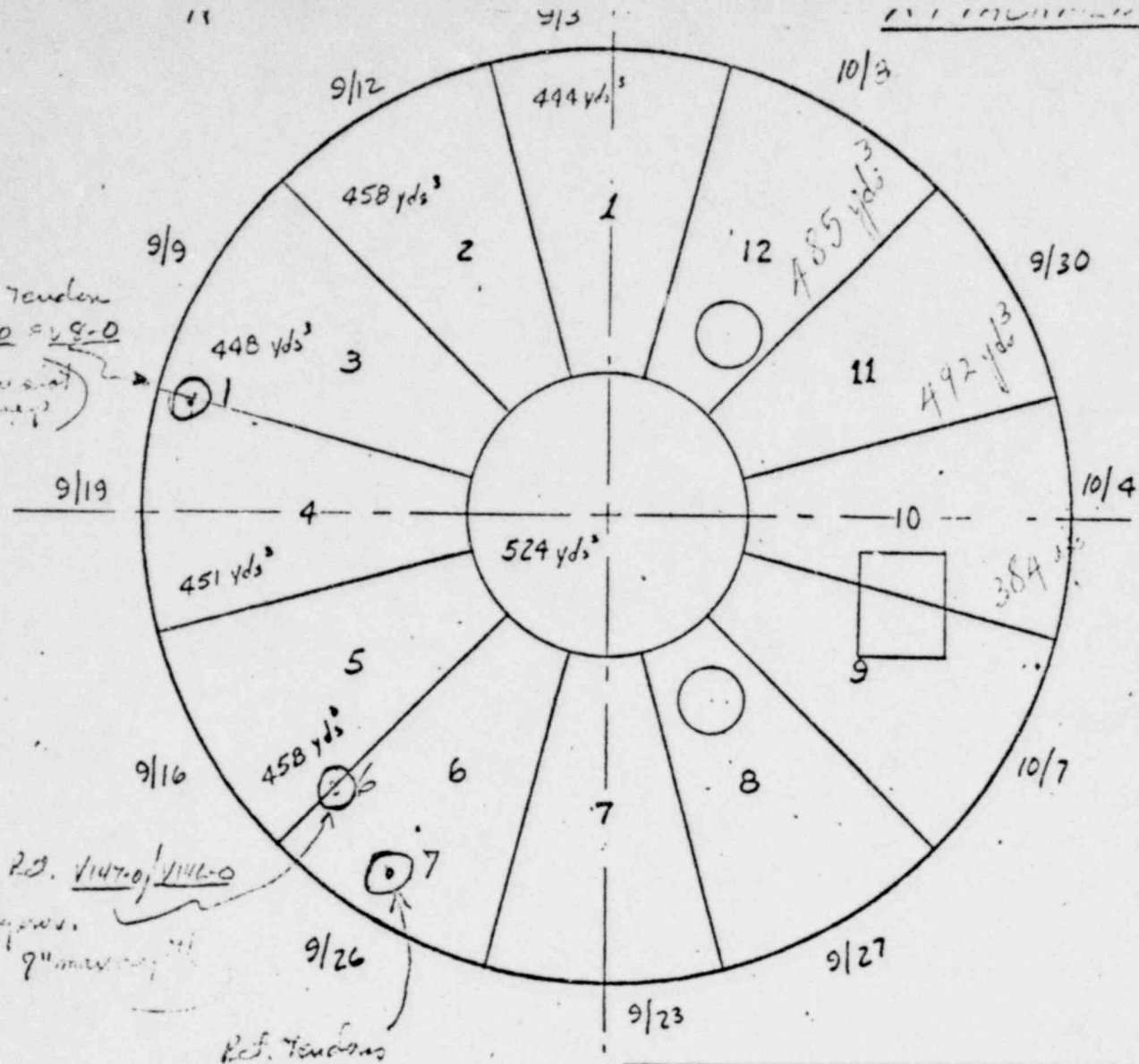
3. Procedures

Mr. Avers and Mr. Steubner gave the inspector copies of the following procedures:

Site Quality Control Plan
Receiving and Material Control
Storage
Liquid Penetrant Examination
Magnetic Particle Examination
Radiographic Examination
Ultrasonic Examination
Leak Test
Structural Concrete

Mr. Avers stated that procedures were available for all work being done at present, and procedures would be available prior to the start of additional work.

Region I will evaluate the above procedures and will report the evaluation in the next inspection report.



1/ POUR DATE SHOWN OUTSIDE CIRCLE (CENTER WAS POURED FIRST)

2/ HEIGHT OF POUR - 8' 6"

3/ ⊙ LOCATION OF VOIDS

4/ TENDONS INVOLVED:
V 7-0 & V8-0
V 147-0 & V 146-0
V 160-0 & V 161-0

REV NO.	DATE	DESCRIPTION	ENGR.	SUP. ENG.
		FIRST ISSUE		

ENGINEER

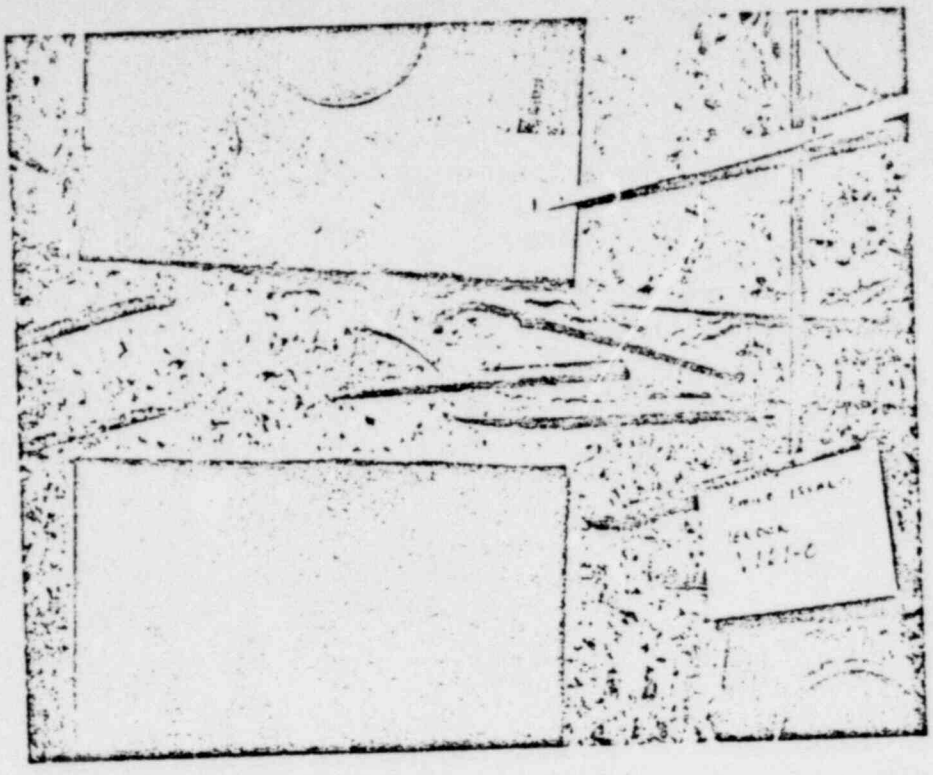
STATE REG. NO.

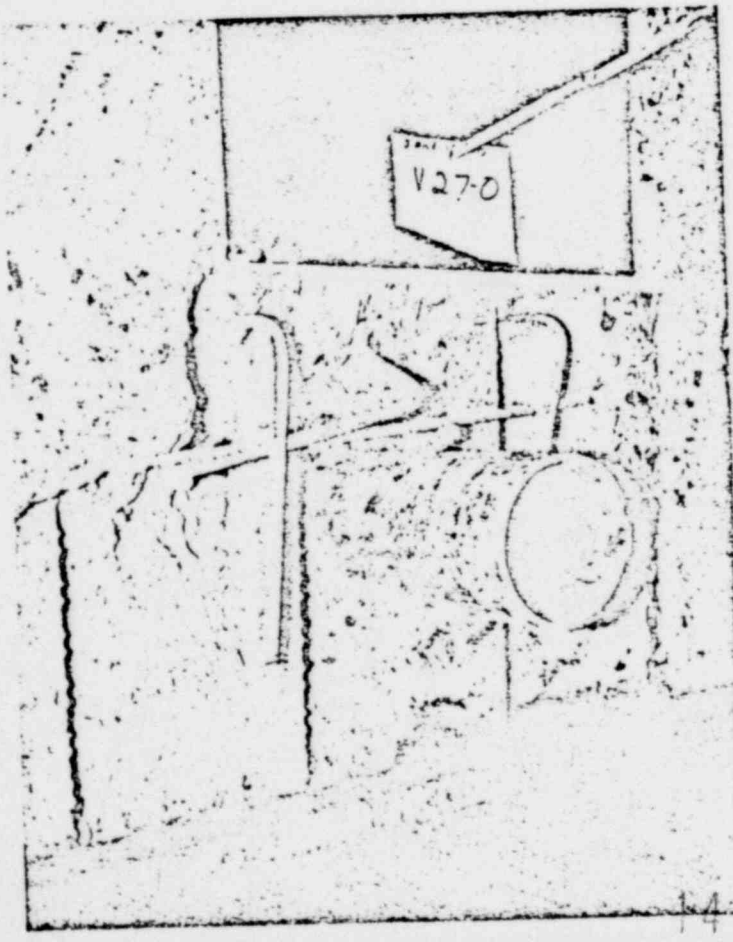
REACTOR BUILDING
MAT POUR
THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1

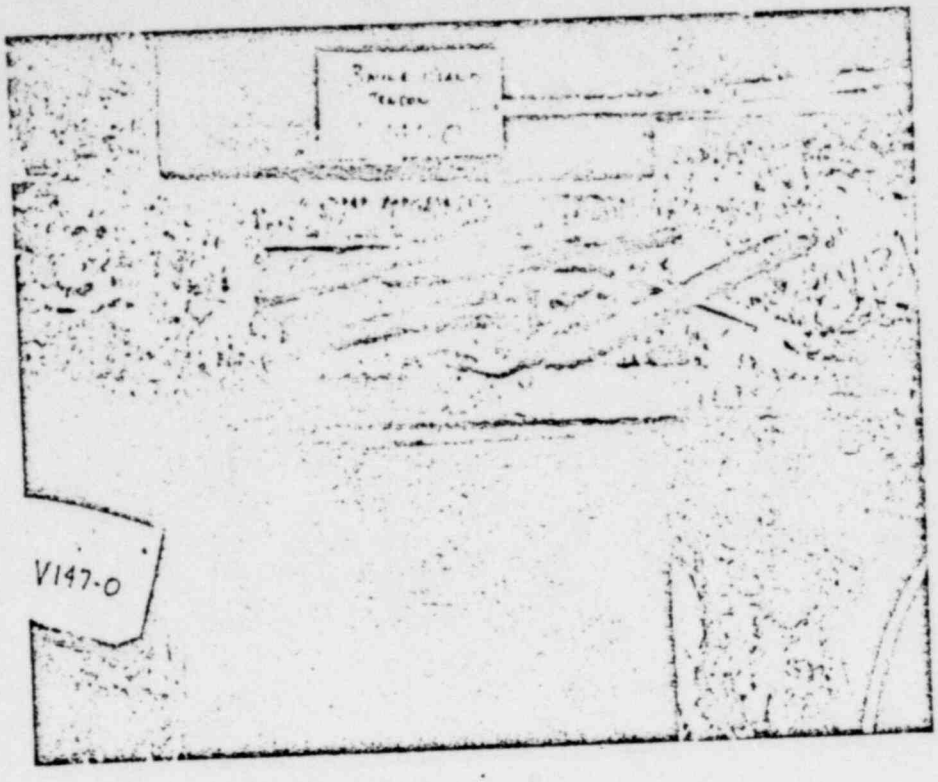
METROPOLITAN EDISON COMPANY

UNITED ENGINEERS & CONSTRUCTORS INC.

9459-FS-4-8




V27-0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