U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 50-54/90-02
70-687/90-04

Docket Nos. 50-54
70-687

License Nos. R-81
SNM-639 Priority 1 Category UHBR

Licensee: Cintichem, Incorporated
P. O. Box 816
Tuxedo, New York 10987

Facility Name: Reactor and Hot Laboratory

Inspection At: Tuxedo, New York

Inspection Conducted: March 21-22 and March 27-28, 1990

Inspectors: Robert J. Bores 4-10-90
R. J. Bores, Chief, Effluents Radiation Protection Section, Facilities Radiological Safety and Safeguards Branch (FRSSB), Division of Radiation Safety and Safeguards (DRSS) Date

J. Carrasco 4-11-90
J. E. Carrasco, Reactor Engineer Materials and Process Section, Engineering Branch, Division of Reactor Safety Date

Approved by: Ronald R. Bellamy April 11, 1990
R. R. Bellamy, Chief, Facilities Radiological Safety and Safeguards Branch, DRSS Date

Inspection Summary: Special Inspection on March 21-22 and March 27-28, 1990 Combined Inspection Report Nos. 50-54/90-02; 70-687/90-04

Areas Inspected: This was a special inspection conducted to review the progress made by the licensee in the identification of leaks in the reactor pool system, the determination of the structural integrity of concrete components and the proposed repair work. The inspectors also reviewed other ongoing work activities including those related to the proposed replacement of a portion of the ventilation duct from the hot cells; retention pond enlargement and plan for interim and final site water control; and the radiological monitoring of ground water contamination. The inspectors also attended a meeting on March 27, 1990 at which the licensee's consultant, Construction Testing Laboratories, Inc. (CTL) presented findings and preliminary recommendations to the licensee relative to repair of the reactor pool systems.

Results: Of the areas inspected, no violations or deviations were identified. The licensee had completed the examination of the concrete components of the reactor pool system and was evaluating the data and proposed repairs.

DETAILS

1.0 Principal Individuals Contacted

1.1 Licensee Representatives

J. Garrett, Manager of Maintenance
K. Guenther, Staff Health Physicist
J. McGovern, Plant Manager
* F. Morse, Manager, Engineering and Technology Sales
* W. Ruzicka, Manager, Nuclear Operations
* T. Vaughn, Manager, Health, Safety and Environmental Affairs

1.2 Licensee Consultants

Construction Testing Laboratories, Inc. (CTL)

P. Kolf, Evaluation Engineer

Structural Preservation Systems, Inc.(SPS)

J. Gallagher, Concrete Repair Contractor
A. Stock, Concrete Repair Contractor

Other individuals were interviewed during the course of the inspection.

* Denotes attendance at NRC exit on March 28, 1990

2.0 Purpose of Inspection

This inspection was conducted to review the status of the licensee's activities relative to the identification and correction of the leaks in the reactor pool system, to review the licensee's plans for the replacement of the underground ventilation duct from the hot cells to the main filter bank, to review the licensee's program for controlling the discharge of run-off and contaminated groundwater from the site, and to review the results of the radiological monitoring of the discharges from the site.

3.0 Reactor Pool System Status

During the inspection of March 21-22, and March 27-28, the inspector followed the licensee's actions for the identification and correction of defects in the gamma pit, the transfer canal and the hold-up tank (HUT).

3.1 Non-destructive Testing Investigation

The inspector reviewed and discussed with the licensee's representatives a draft report prepared by Olson Wright NDT & E,Inc. Olson Wright is the contractor who performed impact echo (IE) testing to evaluate the structural integrity of the gamma pit, the transfer canal and the HUT. These three structures were drained for observation and testing.

The IE tests were performed on a nominal one-foot grid pattern. A total of 5,670 locations were tested in the gamma pit, the hold-up tank, and the transfer canal. The IE results indicated that the concrete was of good quality and was poured properly. The results also indicated that the concrete was structurally sound, with the exception of several isolated locations in which flaws were identified. These flaws included cracks, rock pockets and honeycomb voids. The results of the IE were verified by destructive investigation (taking actual core borings), visual inspection of the areas and acoustical sounding.

The inspector had observed the progress of the non-destructive examination (NDE) examinations at various phases of the process. Based on his observations and the review of the results, the inspector found that the IE technique appeared to be accurate and was acceptable.

3.2 Destructive Testing Investigation

Construction Technology Laboratories,Inc. (CTL) is the licensee's structural concrete consultant. CTL performed onsite visual inspection of the concrete structures, performed radar scans and R-meter surveys to determine location and spacing of rebar, and took test cores of concrete from each surface at flaw indications and at selected sample locations for petrographic and compression analyses. The IE data from Olson Wright were available to CTL for use in core sample selection and structural inspections. The inspector reviewed CTL's "report in progress" and discussed the results with CTL representatives, the licensee's engineering staff, and Structural

Preservation Systems (SPS). SPS had performed some earlier repair work on the concrete structures and may be selected as the contractor to perform the concrete repair work. The CTL preliminary findings and recommendations were reported to the licensee on March 27, 1990 at a meeting also attended by SPS and NRC representatives.

The following information was presented at the meeting.

* All core samples were visually examined to assess their general condition. Nearly all cores exhibited good quality concrete. In addition, no significant corrosion of the steel reinforcement (rebar) was observed.

* Petrographic examinations were performed to evaluate general quality, characteristics, and mechanism of deterioration. The results shows that the cement paste exhibited properties similar to those of high water to cement ratio concrete. These properties are very common for concrete structures exposed to moist environments due to continued cement hydration, which proceeds deeper into the cement grains at decreasing speeds, and which results in increased stiffening and hardening of the mass with time. This attribute prevents cracks due to shrinkage of the concrete as it dries.

* Compressive strength tests, conducted in accordance with ASTM designation C 42-87, were performed on the concrete cores removed during the field investigation. The compressive strength of each of the removed cores exceeded the specified design compressive strength.

* Mechanical yield tests were performed by IFR Engineering (a CTL subconsultant). In these tests, all the rebar samples displayed high yield tensile strength which met the requirements of ASTM A615 grade 40 steel.

3.3 Preliminary Findings Relative to Each Concrete Structure

Gamma pit

Impact Echo testing in conjunction with cores removed from the south wall indicated that the south wall was cast against the bedrock. The lower portion of the north and east walls were cast against concrete backfill, which extended to the bedrock. With this empirical information, CTL performed structural calculations and concluded that the entire gamma pit is structurally adequate to sustain its design loads.

Transfer canal

Combined data from radar scans and meters specifically designed to detect rebar indicated that there is no rebar for an approximately 20-foot length of the canal base slab. Based on this finding, the structural calculations indicated that some repairs are required to prevent the development of hydrostatic pressures below the unreinforced area of the base slab.

CTL also stated that a portion of the outside wall of the transfer canal appeared to be only marginally adequate to withstand the expected loads. An exterior reinforcement was recommended for this portion of the wall.

Hold-up tank (HUT)

The combined data from the IE testing, radar scans, and confirmatory cores indicated that the south, east, and west walls of the HUT were 12-inch thick, reinforced concrete, backfilled with granular material. The facility drawings had indicated that these walls were poured against bedrock. The structural calculations indicate that these walls of the hold-up tank will require significant structural reinforcement in order to withstand a 60-foot hydrostatic head. (It should be noted that the 60-foot water head assumes that the head of water in the storage tank also rests on the HUT, an unusual situation.) The HUT does experience an approximately 35-foot water head during some reactor

shutdowns when the head of the reactor pool rests on the HUT. Calculations indicated that even at a 35-foot water head, the east, south and west are structurally inadequate. The north wall of the HUT was constructed of 3-foot thick, reinforced concrete. CTL calculations indicated that this wall may also require strengthening to meet the potential hydrostatic loading.

Several engineering options were discussed in terms of concepts of repair effort. The licensee and consultants will evaluate these options for repair.

The inspector concluded that the licensee's course of action was appropriate to date and utilized the engineering and construction expertise of the company and qualified consultants. The licensee stated that following the consultant's completion of the report with recommendations the licensee will evaluate and determine which method(s) of repair will be employed. The inspector had no further questions in this area at this time.

4.0 Control of Liquid Discharges from the Site

4.1 Tour of Site and Review of Radioanalytical Results

The inspector toured the site to observe the modifications the licensee had implemented since the previous inspection on February 26, 1990. The inspector noted that the licensee had enlarged the capacity of the onsite retention pond by removing the boulders, small trees and stumps from the area of the retention pond adjacent to the closed outlet culverts (S-1). (See Attachment 1) This area was also deepened. While the licensee had not yet measured the capacity of the modified retention pond, the licensee estimated that the capacity had been increased from about 10,000 gallons to about 100,000 gallons. The inspector noted that leakage through the closed outlet culverts was caught and returned to the retention pond. In addition, seepage from and around the base of the berm of the retention pond at S-1 was returned to the pond. There was no obvious release pathway from the retention pond to the reservoir.

The inspector reviewed selected radioanalytical records since the last inspection for radioactivity levels in

the retention pond (S-12) and in any seepage from the berm (S-1). The inspector noted that the analytical sensitivities for all of the examined records were at least sufficient to detect ten percent of the applicable maximum permissible concentration (MPC). No activity was detected in any of the S-12 or S-1 samples since the last inspection.

The inspector noted that the licensee continued to pump the liquid discharges from storm drain S-3 to a holding tank. The contents of the tank were sampled and analyzed to ensure applicable release requirements were met prior to release to the 001 discharge. The inspector's review of selected records since the previous inspection indicated that no detectable activity was measured at S-3 since March 9, 1990.

Water from sample point S-4 of the storm drain system which had been contaminated as a result of a leaking underground ventilation duct (See Inspection Report 50-54/90-80; 70-687/90-80) from the hot cells, was still being processed through a deionization system. At the time of this inspection, the I-131 activity at S-4 was approximately 1 E-7 microcuries/cc, which is one third of the MPC for I-131 in water. The levels were continuing to decline at approximately the same rate as the half-life for I-131. The inspector noted that the activity measured at S-4 was approximately the same concentration as was measured from the shallow monitoring well (MW-2S) on the hill near Building 2.

The inspector also examined records of tank releases made to the 001 discharge since the previous inspection. All discharges examined met the regulatory requirements and were less than the appropriate MPCs.

Review of the results of the licensee's continuing program for sampling the reservoir (S-13) indicated no detectable activity had been measured. The analytical sensitivity in each case was at least sufficient to detect ten percent of the MPC for I-131.

4.2 Contingency Water Diversion Plan

By letter dated March 16, 1990, Cintichem proposed a contingency plan to divert S-7 storm drainage water

from the retention pond under severe storm conditions, to ensure that the retention pond would not overflow nor breach the berm and flow into the reservoir. The licensee indicated that the full-flow capacity of the discharge line from the retention pond to the 001 discharge point was approximately 700 gallons per minute (gpm). The licensee' consultants have indicated that under severe storm conditions, the 001 discharge line capacity would be inadequate to ensure that the integrity of the retention point wasn't breached due to the collection of water at much higher fill rates than discharge capability. The licensee proposed that in order to prevent the water with highest contamination potential from being released from the retention pond under severe weather conditions, the low contamination-potential water from S-7 be diverted around the retention pond and allowed to flow to the reservoir.

The inspector toured this area of the retention pond and the upstream drainage areas of S-7 to assess the areas involved and the potential for contamination. The inspector observed that the reactor water storage tank (100,000 gallons capacity) was included in this drainage area. At the time of inspection, the tank was approximately 80 percent full. The licensee had also been processing this water to reduce the activity concentration. As of March 27, 1990, the I-131 concentration in this water had been reduced to about 4 E-7 microcuries/cc.

The licensee indicated that no routine surveillance was conducted of the tank or piping to verify system integrity, although a thorough visual inspection had been performed of these components on February 9, 1990.

At the time of inspection on March 27, the inspector determined that the detailed plan for S-7 water diversion had yet to be formulated. Criteria for use of the diversion, the monitoring and surveillance requirements prior to diversion, and the details of how the diversion would be physically implemented were yet to be developed.

The inspector stated that the above information would be needed in order to fully evaluate the merits of the S-7 water diversion proposal. The licensee stated that the above information would be provided.

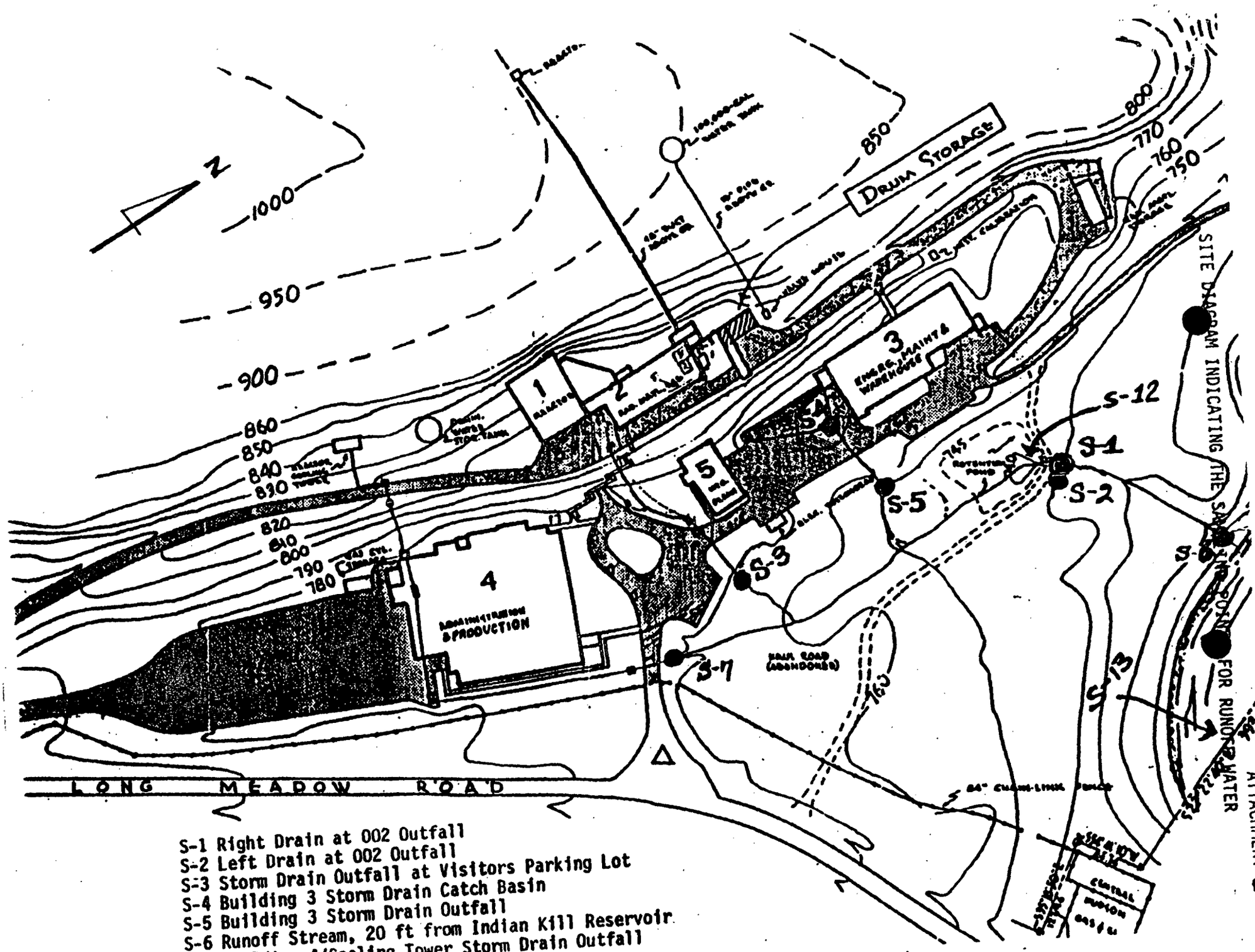
5.0 Status of the Hot Cell to Main Filter Bank Duct Replacement

The inspector reviewed draft drawings of the proposed replacement ventilation duct from the hot cells to the main filter bank. This duct would be constructed of concrete with an imbedded liner and would be built above the hot cells. The inspector discussed with the licensee the locations of the proposed sampling ports. The licensee indicated that the NRC comments would be considered.

The inspector toured the area in which the new duct was to be installed and noted the modifications and clearing activities in those areas. The licensee indicated that construction bids would be sought within the next few weeks for the duct installation.

6.0 Exit Interview

On March 28, 1990, the inspector discussed with the licensee representatives identified in Section 1.1, the scope and findings of this inspection. The inspector stated that additional information was needed with respect to the licensee's plan in response to the NRC Order dated February 13, 1990 and in order to evaluate the licensee's contingency S-7 water diversion proposal. The licensee representatives stated that such information would be developed and provided.



S-1 Right Drain at 002 Outfall
S-2 Left Drain at 002 Outfall
S-3 Storm Drain Outfall at Visitors Parking Lot
S-4 Building 3 Storm Drain Catch Basin
S-5 Building 3 Storm Drain Outfall
S-6 Runoff Stream, 20 ft from Indian Kill Reservoir
S-7 Building 4/Cooling Tower Storm Drain Outfall

S-12 Holding Pond Inside Berm