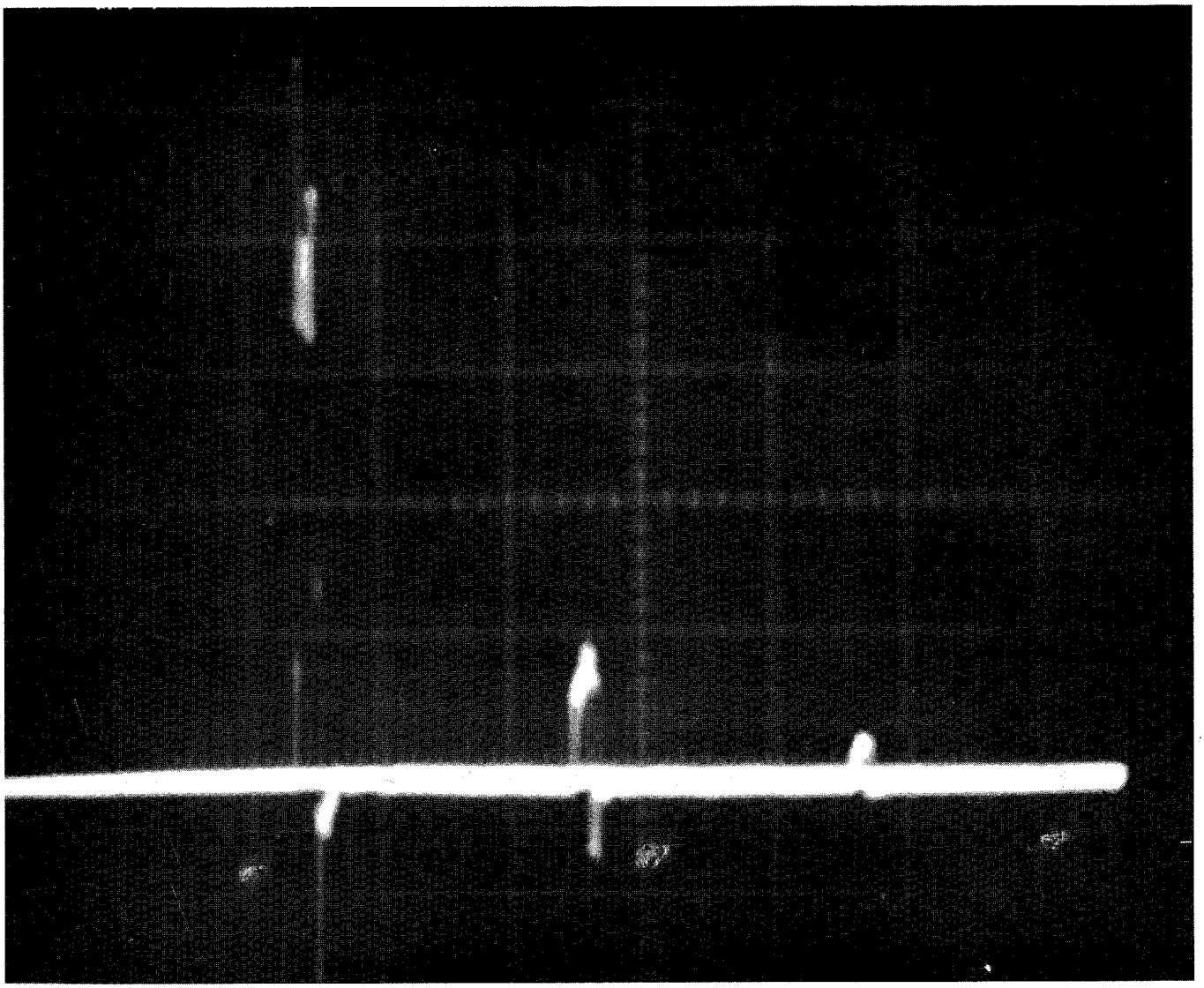
national accelerator laboratory FERMILAB-NAL-059

MONTHLY REPORT OF ACTIVITIES

June 31, 1971



THREE TURNS IN THE MAIN RING

Operated by Universities Research Association Inc. Under Contract with the United States Atomic Energy Commission

FORTHCOMING MEETINGS AT THE LABORATORY

Photon Subcommittee of Program Advisory Committee	July 23
Bubble-Chamber Subcommittee of Program Advisory Committee	August 2
Program Advisory Committee	August 7-13 (at Aspen West)

THE COVER: The cover is an oscilloscope trace of beam from a detector at Station F39. Three separate turns are visible at intervals of 20 microseconds.

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MONTHLY REPORT OF ACTIVITIES

F. T. Cole

June 31, 1971

Abstract: This report summarizes the activities of the National Accelerator Laboratory in June, 1971.

Main Accelerator

A 7-GeV proton beam has been injected and made to execute 8 turns around the main ring. The cover photograph is an oscilloscope trace taken when three turns first appeared.

The first turn was observed at 6:40 a.m. on the morning of June 31. During the day, the pulsed injection kicker, which is necessary to get more than one turn, was put into operation. The multi-turn beam was observed during the next night's operation.

It can be seen that there is a large beam loss per turn. This loss is not yet understood, but an inadvertent kink in a straight-section beam pipe was discovered afterwards that obscured nearly all the aperture. This and the high pressure in the vacuum chamber at the time might provide an explanation.

The rf system was standing by, but the lifetime of the coasting turns was not sufficient for any tests. Five complete rf systems have been installed and two were operating.

Although we failed to accelerate a beam in the main accelerator, it was gratifying that all systems were installed and more-or-less operational. The immediate goal now is to accelerate a beam, extract it, "light up" the neutrino production target and then to observe a neutrino event.

We continue to have difficulty with main-ring magnet failures. Although the magnets have been "high potted" to 2.5 kV in the factory, in the tunnel some of them have developed a low resistance to ground, presumably caused by the extreme moisture that has condensed on the coils. This has caused some 50 magnets to fail.

In the design, it was planned to operate with the tunnel and magnets at quite a high temperature (90° F) to avoid water condensation and absorption. But the tunnel was covered with frozen earth early last winter and, as a result, was cold inside. This spring, warm, humid air was brought in by the ventilating system and water condensed on the cold magnet surfaces and was absorbed in. When the moisture finds a crack in the epoxy insulation, then a low resistance, in some cases a spark, results. As much as a quart of water can be removed from a wet magnet by vacuum pumping and cold trapping.

The magnets are being vacuum-impregnated with epoxy. All magnets will be removed from the main ring on a rotational basis for this modification. There are approximately 100 spare magnets that can be manipulated so as to maintain a complete ring at all times.

By now the tunnel has been largely warmed up and dried out.

Beam Switchyard

The extraction system is now installed and ready to operate during the next main-accelerator operational tests. The beam lines to the main beam dump are complete. Approximately one-fourth of the magnets have been installed in the Meson Laboratory proton beam line. It is expected that the beam line to the Neutrino Laboratory target will be complete and under vacuum in July.

Superconducting Magnets

The 50-cm superconducting solenoid for the NAL monopole experiment (#76), shown in Fig. 1, has been energized to its design field of 80 kilogauss.

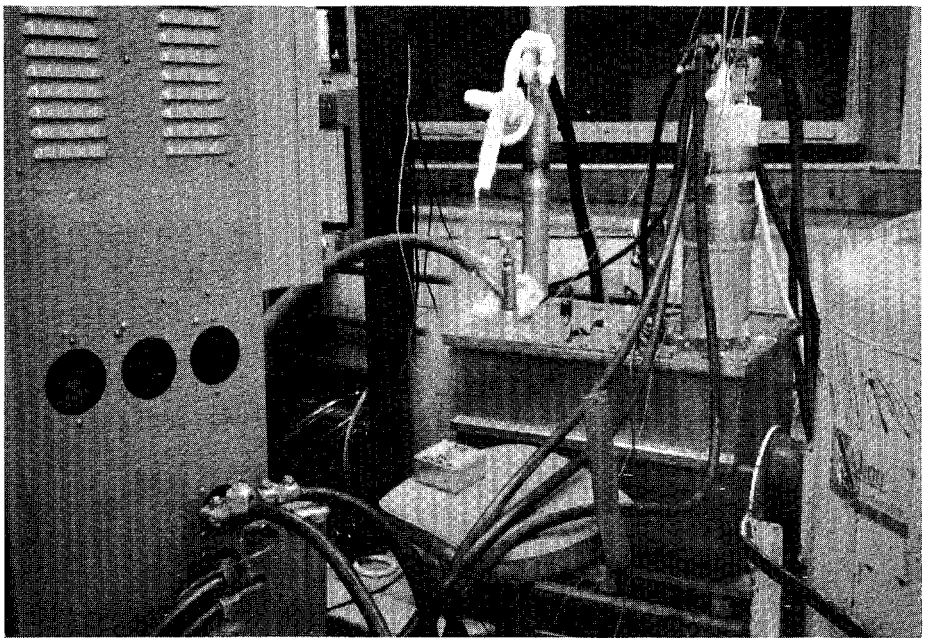


Fig. 1. Superconducting solenoid for the NAL monopole experiment.

Appointments

Richard Orr has been appointed Acting Section Leader of the Meson Laboratory section. Timothy Toohig has been appointed Acting Section Leader of the Neutrino Laboratory Section. Lincoln Read has been appointed Section Leader of the newly formed Proton Laboratory Section.

Construction

1. Meson Laboratory. In the first phase, the target area, which is 78% complete, the earth shielding is being placed over the target section, as can be seen at the right of Fig. 2. In the second phase (secondary-beam lines), which is 80% complete, more service buildings have been completed and

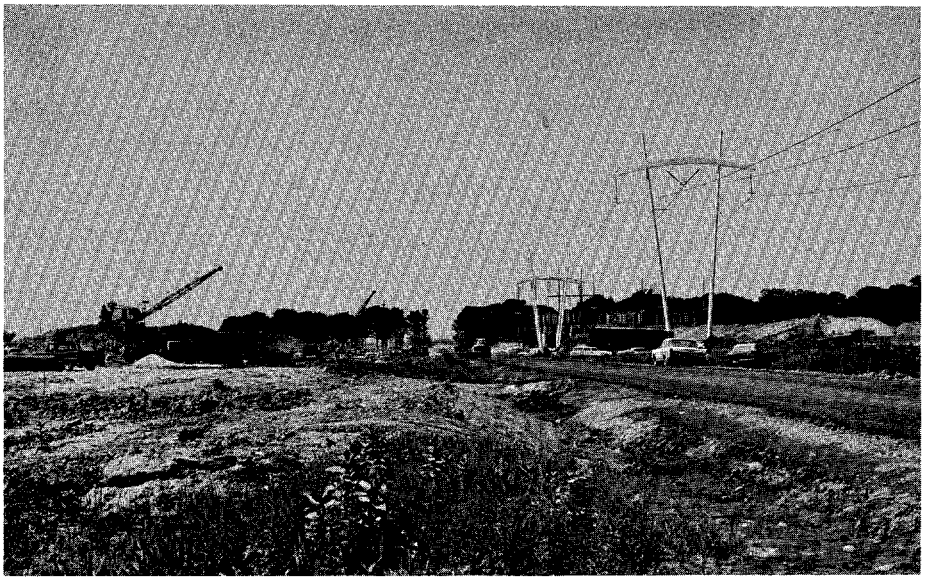


Fig. 2. The Meson and Neutrino Laboratory target areas. The Meson Laboratory is at the right, beyond the power line.

occupied by the Laboratory for component installation. Figure 3 shows the interior of the beam tunnel, and Fig. 4 is an aerial view of the entire Meson Laboratory.

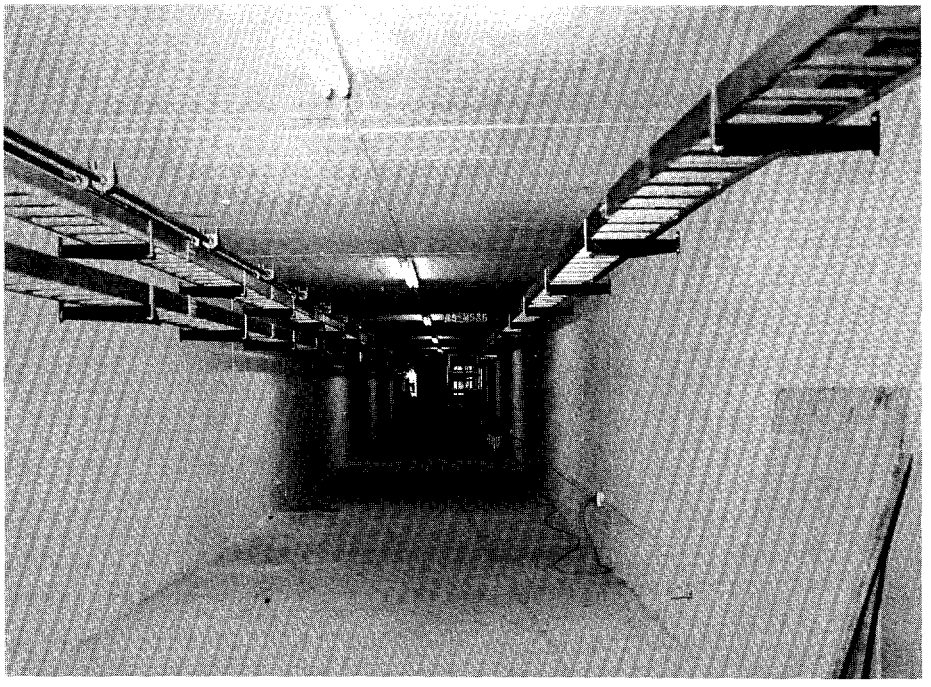


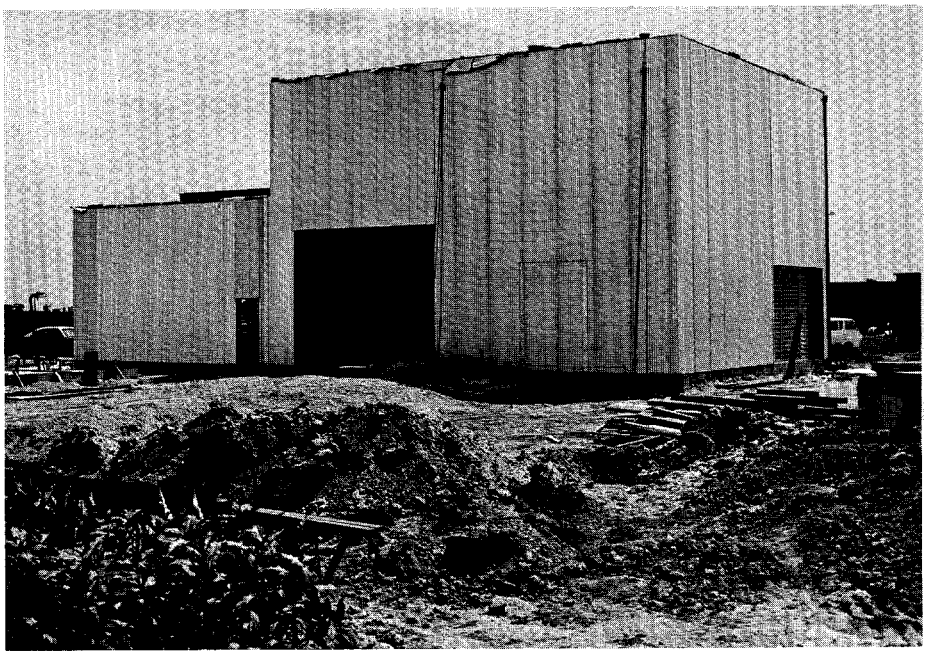
Fig. 3. Interior of a Meson Laboratory beam tunnel.

Fig. 4. The Meson Laboratory from the air. The target area is at the left.

2. Neutrino Laboratory. Earth shielding is being backfilled over the target and meson-decay sections, as seen at the left in Fig. 2. This first phase (the target area and decay region) is 92% complete. At the far end, Building D has been occupied by the 30-inch bubble-chamber group. Figure 5 shows Building D in its present state. Figure 6 is an aerial photograph of the Neutrino Laboratory taken a few weeks earlier. This phase is 48% complete. The third phase, the beam lines between the decay region and the end, is 25% complete. Pipes for the muon and hadron beams are being installed, as seen in Fig. 7.

3. Proton Switchyard. The contract is 95% complete. The beam dump is covered, as can be seen in Fig. 8.

4. New Contracts. The first phase of the Proton Laboratory, the third of the experimental areas, has been awarded to the Schless Construction Co. of



5. Fig. 5. Building D at the far end of the Neutrino Laboratory.

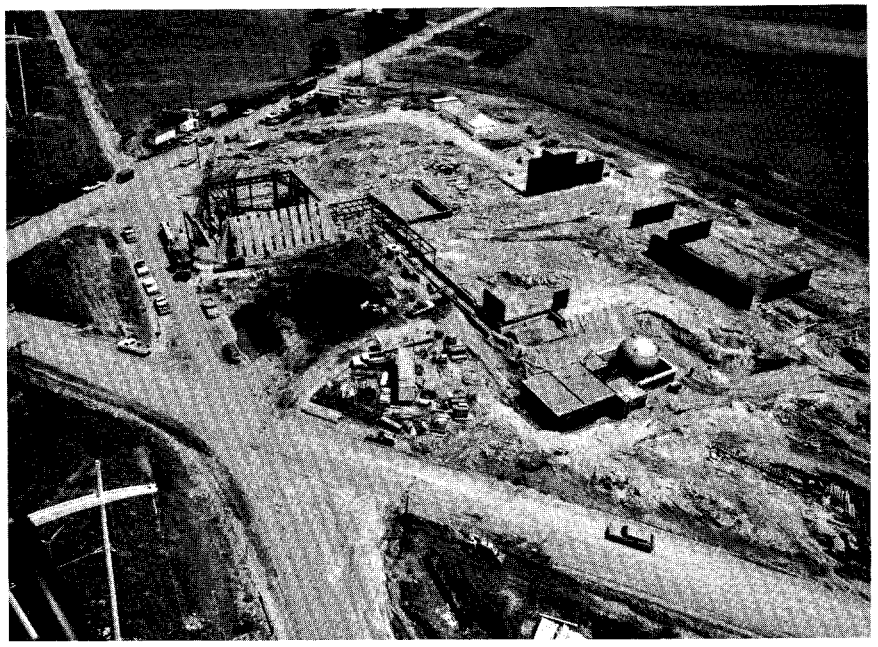


Fig. 6. The Neutrino Laboratory. The building with sloping walls is Building A, the Assembly Building. The bubble-chamber vacuum tank can be seen in the foundation of Building B, the Bubble-Chamber building. Above it are Building C, the Counter Building, and Building D, the 30-inch Chamber Building.

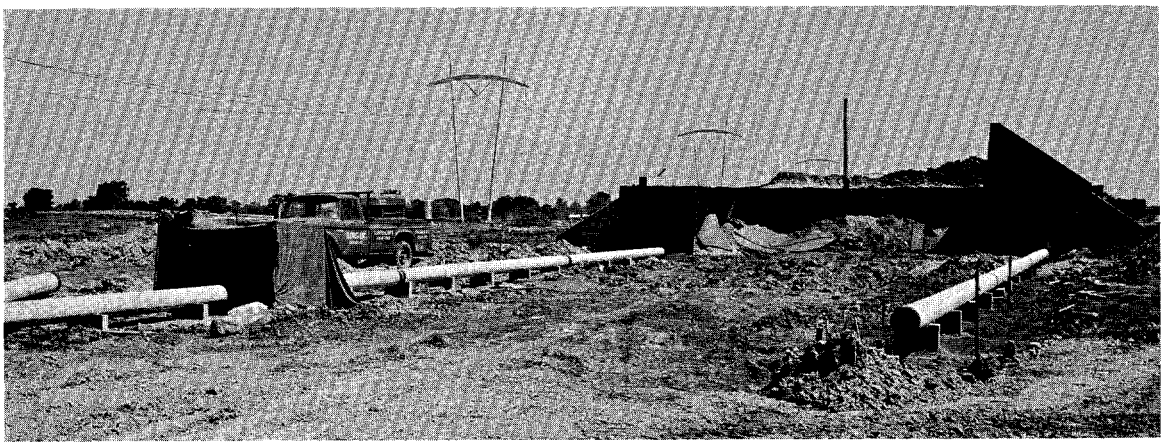


Fig. 7. Beam pipes being installed in the Neutrino Laboratory, just north of Batavia Road. The muon beam is at the left, the hadron beam at the right.

Fig. 8. Looking back along the beam line toward the Injection Area. In the foreground is an access hatch. Beyond the trees, the excavation is completely filled. Just visible through the trees is the access house above the beam dump.

Batavia. This phase covers proton-beam enclosures and utilities to extend the present proton switchyard across Road B, to a point near the electrical substation. The contract is for approximately $620,000.

The second phase of the Central Laboratory, which will carry the structural work through the seventh floor, has been awarded to the Corbetta Co. The contract is for approximately $4.5 M. It is planned that contracts for later phases will be let soon.

Figure 9 is an aerial view of the Injection Area.

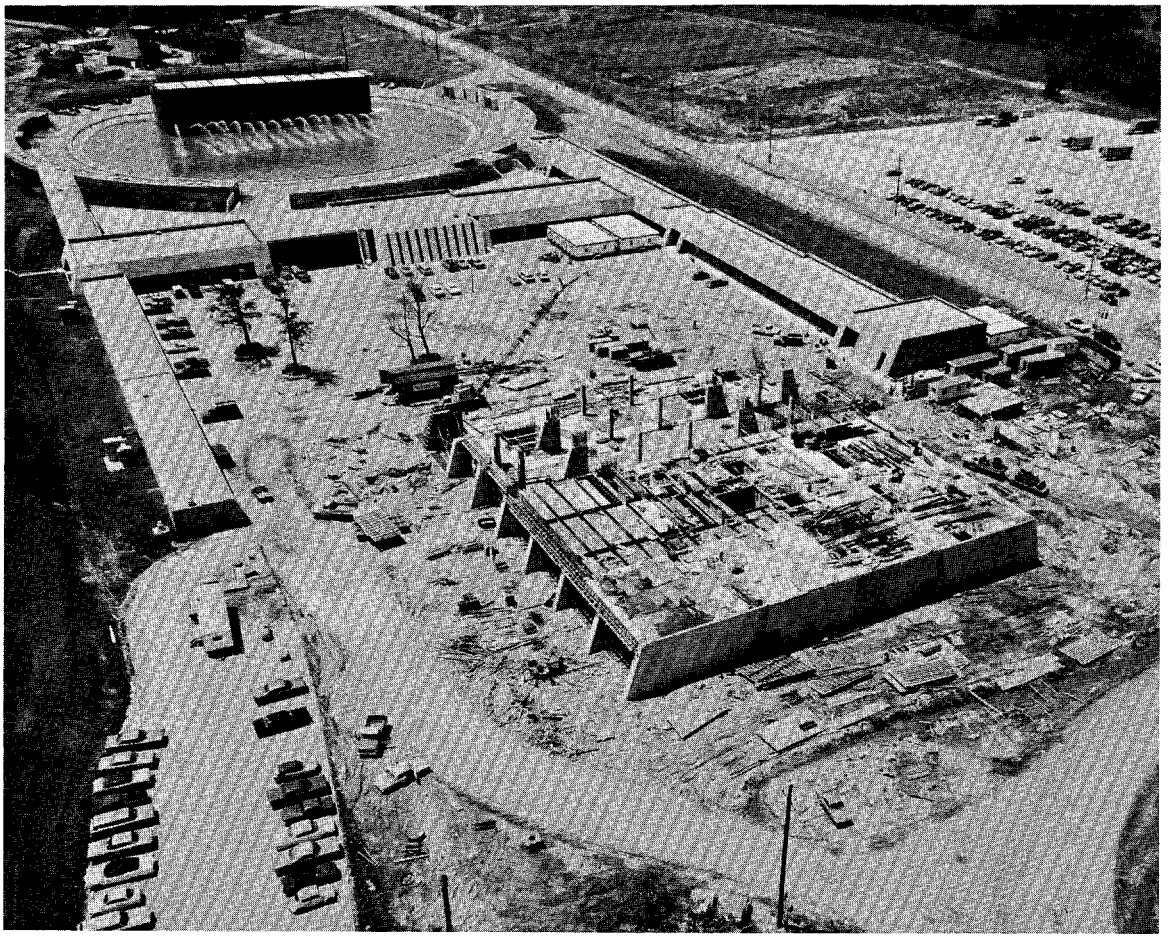


Fig. 9. A recent aerial view of the Injection Area. The Central Laboratory is in the foreground. The water sprays in the Booster pond are part of the accelerator cooling system.