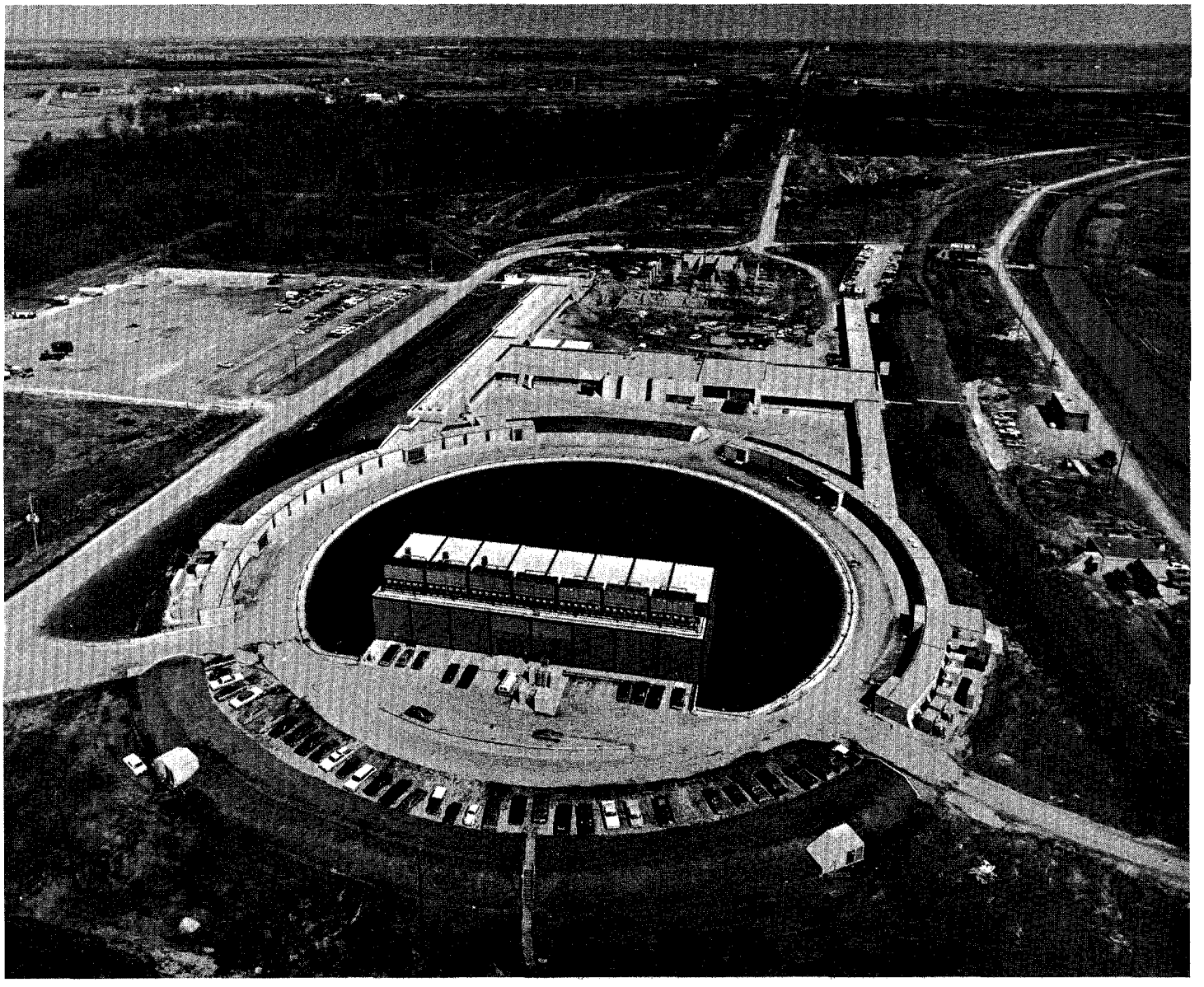
national accelerator laboratory

FERMILAB-NAL-056

MONTHLY REPORT OF ACTIVITIES

March 31, 1971



THE INJECTION AREA

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

FORTHCOMING MEETINGS AT THE LABORATORY

Physics Advisory Committee	April 2
Annual NAL Users Meeting	April 30-May 1
Program Advisory Committee	May 14-15

THE COVER: An aerial photograph of the Injection Area. The view looks northeast. The Main Ring is at the right, with cooling ponds, the Ring Road, service buildings, vehicle access, and the covered ring all visible. The Booster and Utility Plant are in the foreground, the Transfer Gallery, Cross Gallery, and Linac Building beyond, with the construction of the Central Laboratory enclosed in the "U". At the upper right, the Industrial Buildings can be seen. (Photo by Tony Frelo of NAL.)

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MONTHLY REPORT OF ACTIVITIES

F. T. Cole

March 31, 1971

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

Main Accelerator

1. Injection Studies. Beam was successfully brought to the end of Sector A (one-sixth of the ring) at 5:40 a.m. on March 17. A current of 1 milliampere of 1-GeV beam was injected and approximately one-fourth of this was detected in a Faraday cup at Station B0, approximately 3,400 feet from injection. A number of correction magnets were exercised during this operation, in addition to the main magnet power supply. Figure 1 shows the signals from radiation monitors along Sector A.

2. Production and Installation. Production of inner bending-magnet coils for the Main Ring has been completed. More coils will be produced for external-beam magnets.

A total of 201 magnets was assembled in March. There are now 800 magnets (out of a total of approximately 1010 needed) installed in the tunnel. The power and water bus systems and cable trays are complete at the tunnel level. Approximately half of the power-supply modules have been tested.

All parts of the Sector A vacuum system has now been operated. An average pressure of 2×10^{-7} torr, (design pressure is 5×10^{-7} torr), was reached.

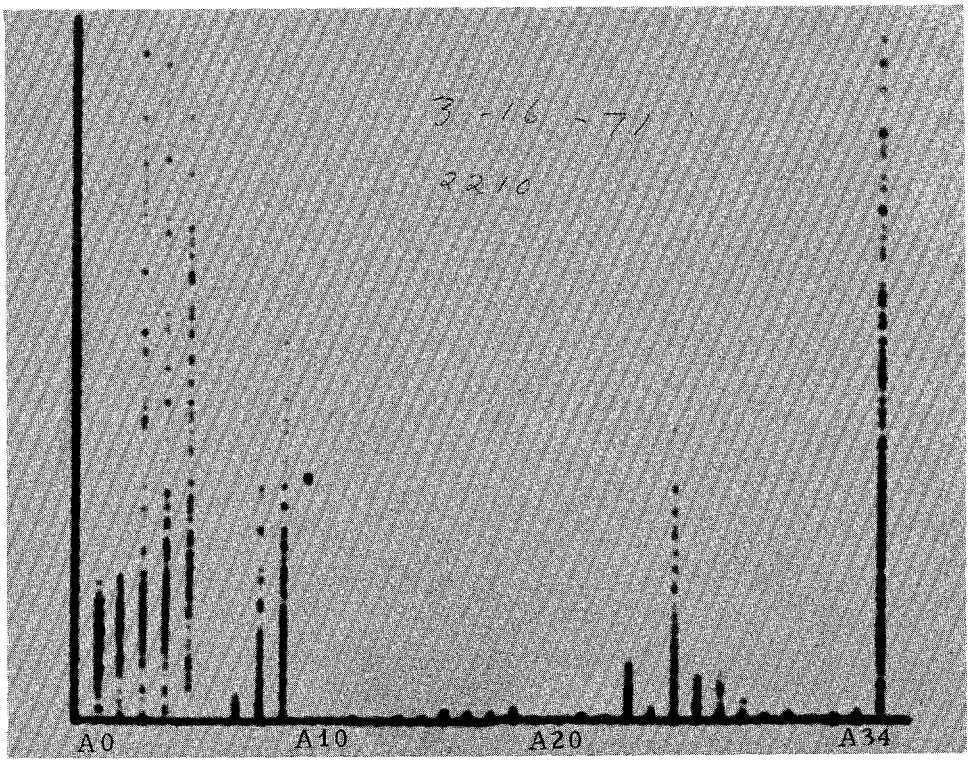

Fig. 1. Radiation monitor signals along Sector A. The vertical scale is arbitrary; we have labelled the horizontal scale with station markers, which are 100 feet apart.

Booster

The Booster operated for a good part of March as a 1-GeV injector. Since completion of the main-ring injection studies, tests have been carried out to bring beam-controlled rf acceleration and multiturn injection into operation. Tests of the magnet power supply at 8 GeV are now in progress.

Linac

The linac operated mostly during March as an injector. A short trial run at high intensity was carried out to obtain design data for the amplitude and phase control systems. A beam current of 100 milliamperes was recorded, but there was no time for measurements of beam properties.

The electrical-noise problems that have plagued the 200-MeV

emittance-measuring equipment have been identified as resonances in the probe assemblies that were excited by the rf structure of the beam, and filters have been added to cure the problem.

Radio Frequency

Installation of the Booster East Gallery high-power and control equipment has been completed. In the next operation period, in April, we expect to accelerate beam to 8 GeV, the full Booster energy.

The first Main-Accelerator rf cavity has been installed in the tunnel. While main-ring cavities are being delivered, some modifications of the ferrite mode-damping system are being made.

Beam Transfer

1. 8-GeV Transfer. The Booster extraction and Main-Ring injection systems were tested during the March operation. The tests indicated that the extraction efficiency is very close to 100%.

2. 500-GeV Extraction. The two Lambertson septum magnets used to pitch the beam up vertically have been assembled. Figures 2 and 3 show one of these magnets. Several other types of magnets for the extraction system have also been completed. The electrostatic wire septum has been completed and is being installed in the Transfer Hall.

3. Main-Ring Beam Dump. The 500-GeV beam dump shell has been set in position in the external proton beam line and concrete is being placed. Figure 4 shows this shell in its final location.

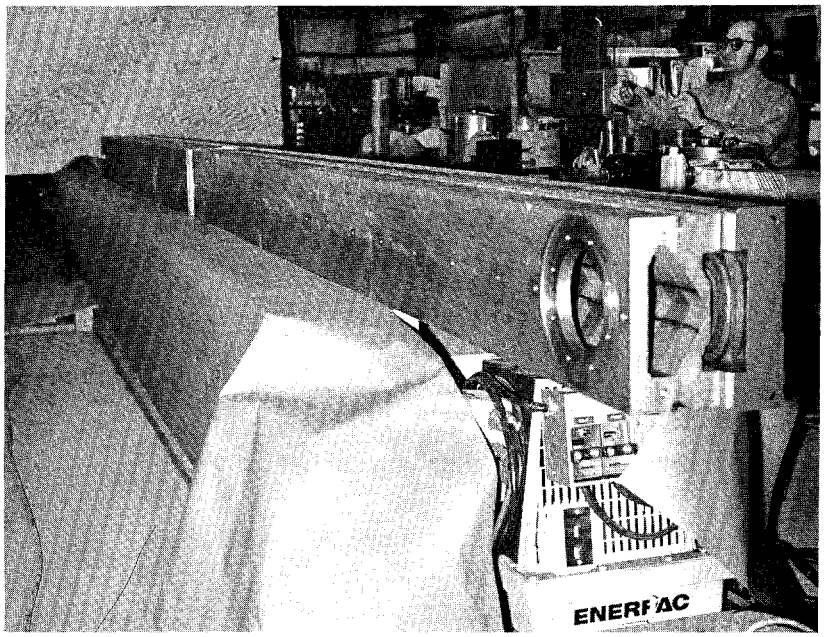

Fig. 2. A Lambertson septum magnet before installation of its stainless-steel vacuum skin.

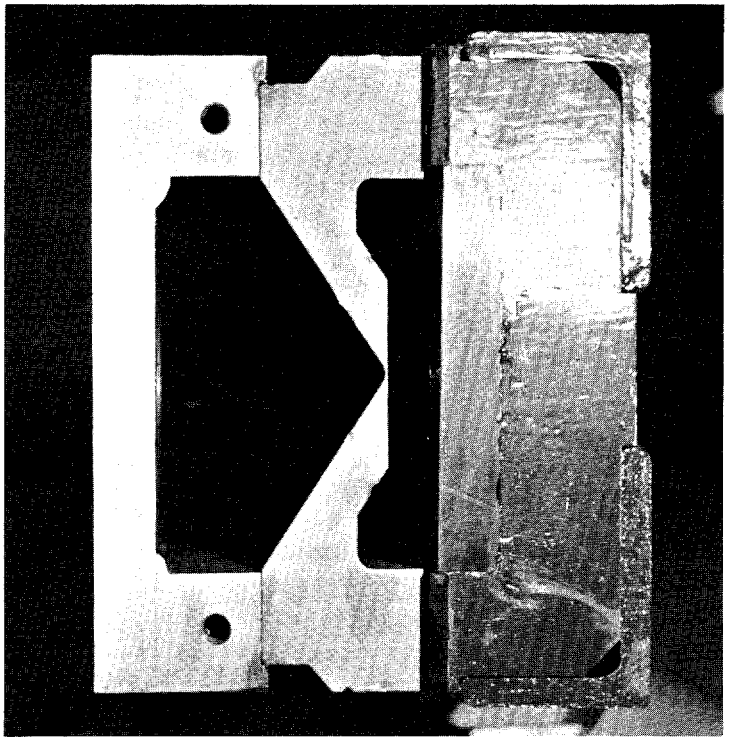

Fig. 3. Close-up of a Lambertson septum. The Main-Ring beam passes through the triangular aperture; the extracted beam passes through the 5/8-inch gap on the other side of the iron septum.

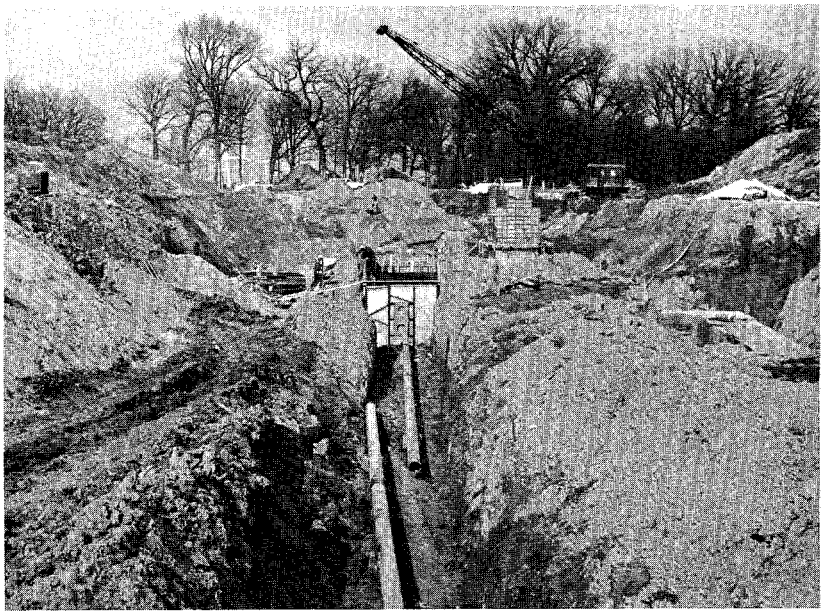

Fig. 4. Shell of the Main-Ring beam dump in place. This view is looking from the accelerator; the substation and power line can be seen at upper left. Beam pipe is being installed in the foreground and an access tunnel can be seen to the right.

Bubble Chamber

Figure 5 is an aerial view of the 15-foot bubble-chamber site. The mating surfaces of the vacuum tank are being machined in the field.

Fig. 5. Progress on the 15-foot bubble chamber as seen from the air.

Figure 6 is a closer view of this work.

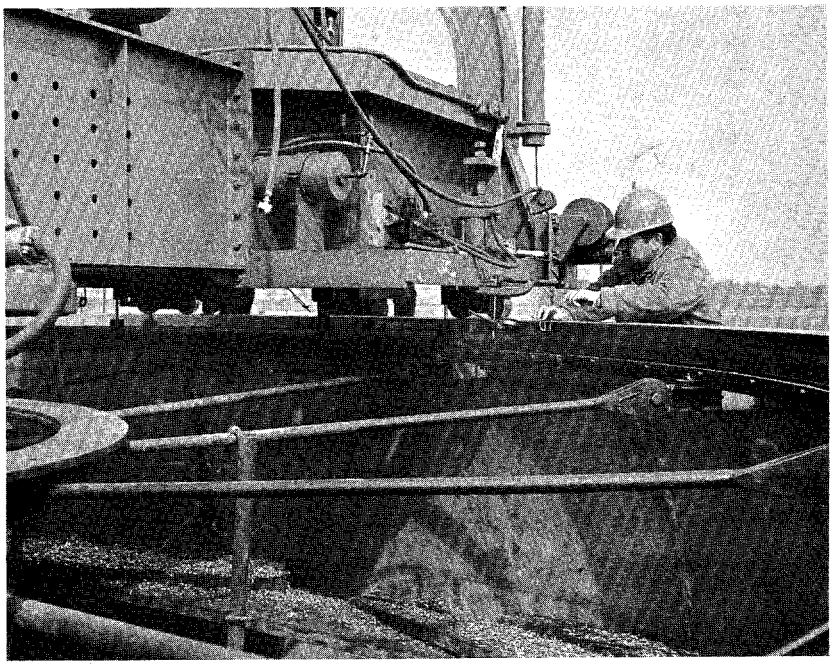

Fig. 6. Field machining on the vacuum tank of the 15-foot bubble chamber.

Construction

1. Neutrino Laboratory. Work on the first phase, the target area, is 20% complete. In Fig. 7, we can see structural work on this area. Approximately

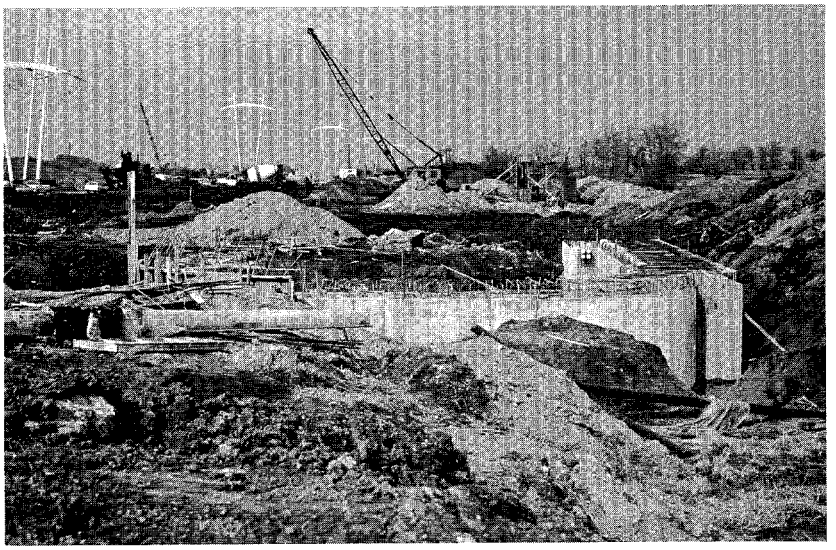

Fig. 7. Work on the Neutrino Laboratory. The curved access tunnel is an entrance to the target area. This photograph was taken looking north from Road B.

60 feet of wall has been built and the railroad track started. In the second phase, out by the bubble chamber, all caisson work has been completed. This contract is 6% complete.

2. Meson Laboratory. Work on the first phase, the target area, is 37% complete. As we can see in Fig. 8, there is considerable structural work

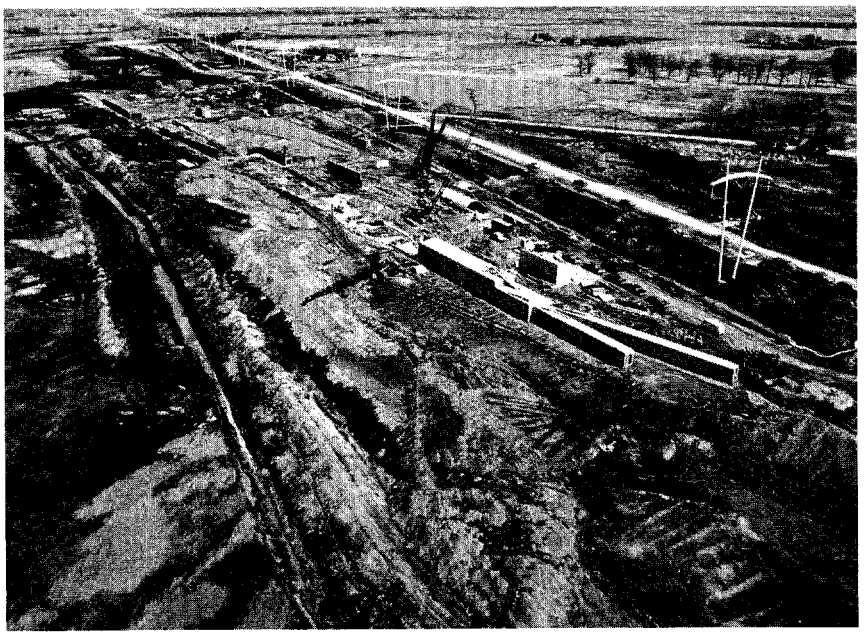

Fig. 8. An aerial view of the Meson Laboratory. The target will be just beyond the Y-shaped tunnel at the right; secondary-beam line construction can also be seen.

completed on what is called the "front-end enclosure," just upstream of the target. In the second phase, which carries the work from the target area to the detector building, slabs for several of the secondary-beam lines are being placed. This contract is 28% complete.

3. Proton Beam Line. As we saw in Fig. 4, the beam-dump shell is in place. Forming work on the beam pipe and access tunnels has now moved north of the temporary road, as shown in Fig. 9. The entire contract is 76% complete.

Fig. 9. The Proton Beam Line. Road A (parallel to the beam line) is in the foreground. Road B, which crosses Road A at the Substation, is at top left, and Road D, the "Village Expressway," is at top right. The road at the extreme right is the temporary bypass joining Roads D and A. The main-ring beam dump, shown in Fig. 4, is just to the right, or upstream. One can also see the care being taken to avoid damage to trees.

4. Central Laboratory. Basement work has been completed, except for the floor slab, and all interior columns of the first phase are completed. The work on this first phase is shown in Fig. 10 and is 48% complete.

5. Industrial Building. The roof and siding have been completed and the contractor is thawing the ground inside in order to place the floor slab.

6. New Contracts. Notice to proceed has been issued to the Geo. D. Hardin Co. for utility-distribution systems in the experimental areas. The value of this contract is $274,000. Notice to proceed has been issued to the Miller-Davis Co. for the third phase of the Neutrino Laboratory. The engineering

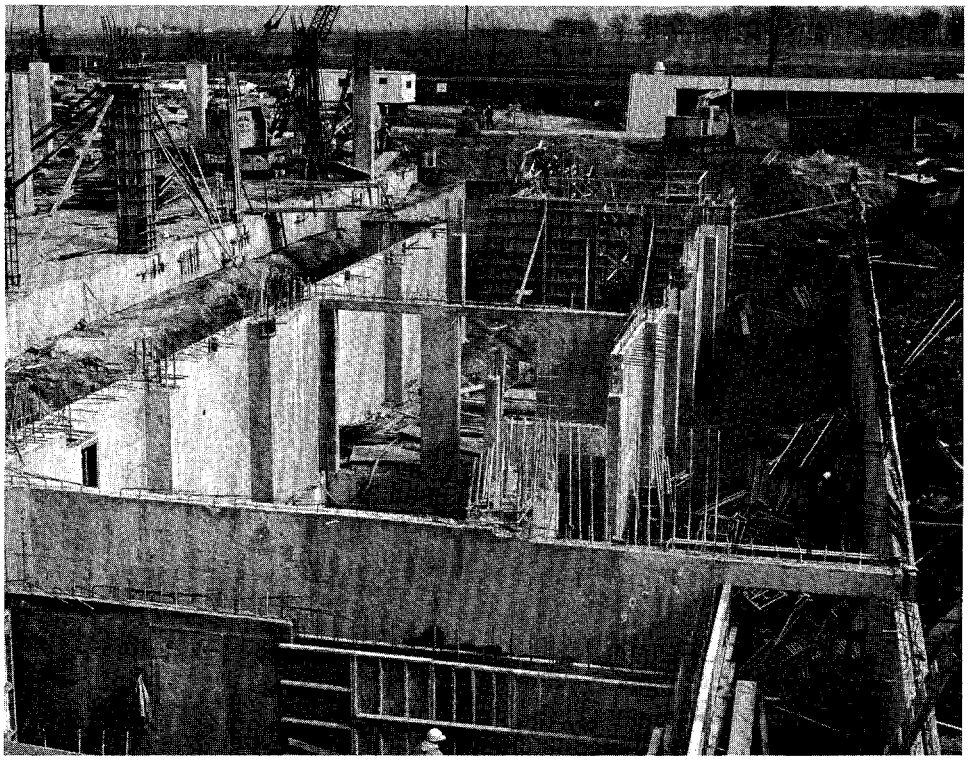

Fig. 10. Work on the Central Laboratory. The basement is at the right, the ground floor at the left. The Transfer Gallery and Main Ring are beyond.

estimate was $3,214,000. The low bid by Miller-Davis was $2,327,000. This contract will cover construction of the area between the target (first phase) and the detectors (second phase).