national accelerator laboratory FERMILAB-NAL-058

MONTHLY REPORT OF ACTIVITIES

May 31, 1971

LATEST ADDITION TO THE NAL FAMILY

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

FORTHCOMING MEETINGS AT THE LABORATORY

NAL Users Executive Committee	June 3
Program Advisory Committee	August 7-13 (at Aspen)

THE COVER: On May 29, a heifer was born to one of the Laboratory buffalo, the first such addition we have had. This photograph was taken shortly after the birth. (Photo courtesy of the Aurora Beacon-News.)

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MONTHLY REPORT OF ACTIVITIES

F. T. Cole

May 31, 1971

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

Booster

On May 20, protons were accelerated to the design energy of 8 GeV in the Booster. Achievement of this milestone is an indication that considerable progress has been made in solving the low-level and high-level rf problems mentioned in last month's report. The beam has been small--approximately 10^{10} per pulse at a rate of one pulse per second, to keep down the induced radioactivity.

The Booster was constructed under the direction of Paul Reardon and Roy Billinge.* It was brought into operation under the direction of Helen Edwards. The Booster RF was constructed under the direction of Quentin Kerns.

As of June 1, the Linac, Booster, and 8-GeV beam transport to the Main Ring will be turned over to the Operations Section headed by Donald Young.

The Booster rf system is now operating at close to its design performance. Beam can be accelerated to full energy with 14 of the 16 cavities operating, as predicted. There have been some problems with insulation slipping out of place in the ferrite tuners and a better insulation system is being installed as time permits.

*Roy Billinge, who so ably headed the Booster Section, then the Meson Laboratory Section, has left to join the CERN II 300-GeV project.

Main Accelerator

On May 29, a coasting 7-GeV beam was detected at Station B-21, which is approximately a mile from the injection point. The proton current was measured at Station B-19 to be approximately 0.5 milliamperes, about half of the current injected.

Many of the magnets have insufficient resistance to ground and these are being replaced. The problems in this regard apparently arise because of the dampness of the tunnel, which causes water to condense on the insulation. Magnets are withdrawn from the ring and vacuum-impregnated in a gradual manner so that, because of spare magnets, the ring is always complete. It is now planned that eventually all the magnets will be vacuum-impregnated.

Alignment of the ring is also continuing. Two full radial-position circuits and a vertical-position circuit were completed in May. Some new tooling is being built to speed the work. It appears that the tunnel is gradually stabilizing with regard to its position and that the laser alignment device will permit the implacement of a magnet to an rms accuracy of about 6 mils.

The entire main accelerator is now under rough vacuum (10^{-4} torr). All correction magnets have now been installed. It is expected that several main-accelerator rf cavities will be in operation early in June.

Beam Transfer

All extraction equipment is now installed in the Transfer Hall. Installation of the vertical dipole magnets in the Proton Beam Line, two of which were shown in Fig. 2 of last month's report, has been completed.

Experimental Facilities

Meson Laboratory. The Laboratory has taken occupancy of approximately 25% of the beam-line enclosures and installation of cable trays, power busses, and water piping has begun. A total of 23 dipole magnets and 8 quadrupoles has been completed and measurement is in progress.

The Meson Laboratory target box has arrived and is being installed. It can be seen in Fig. 1.

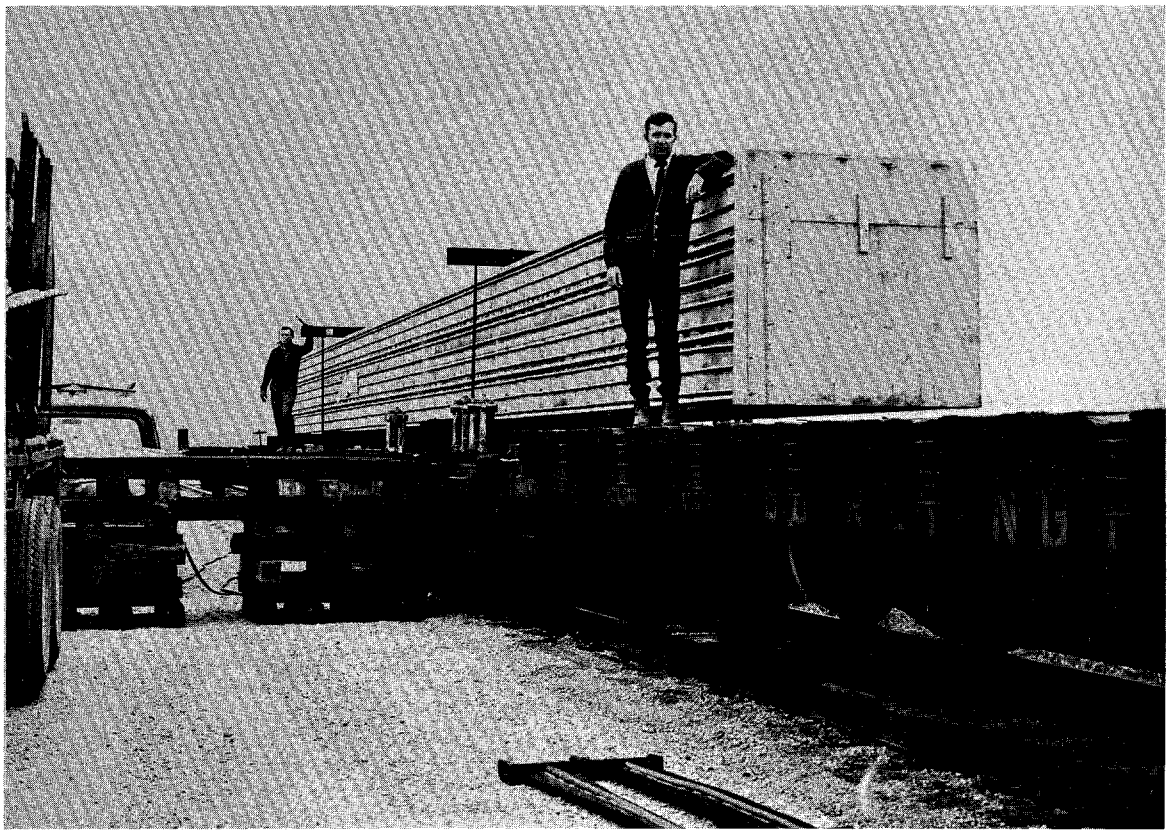

Fig. 1. The Meson-Laboratory target box being unloaded. John Lindberg is in the foreground.

Neutrino Laboratory. Components are being installed for Experiment 21 (an NAL-California Institute of Technology collaboration) partway along the beam line. Figure 2 shows this equipment in place.

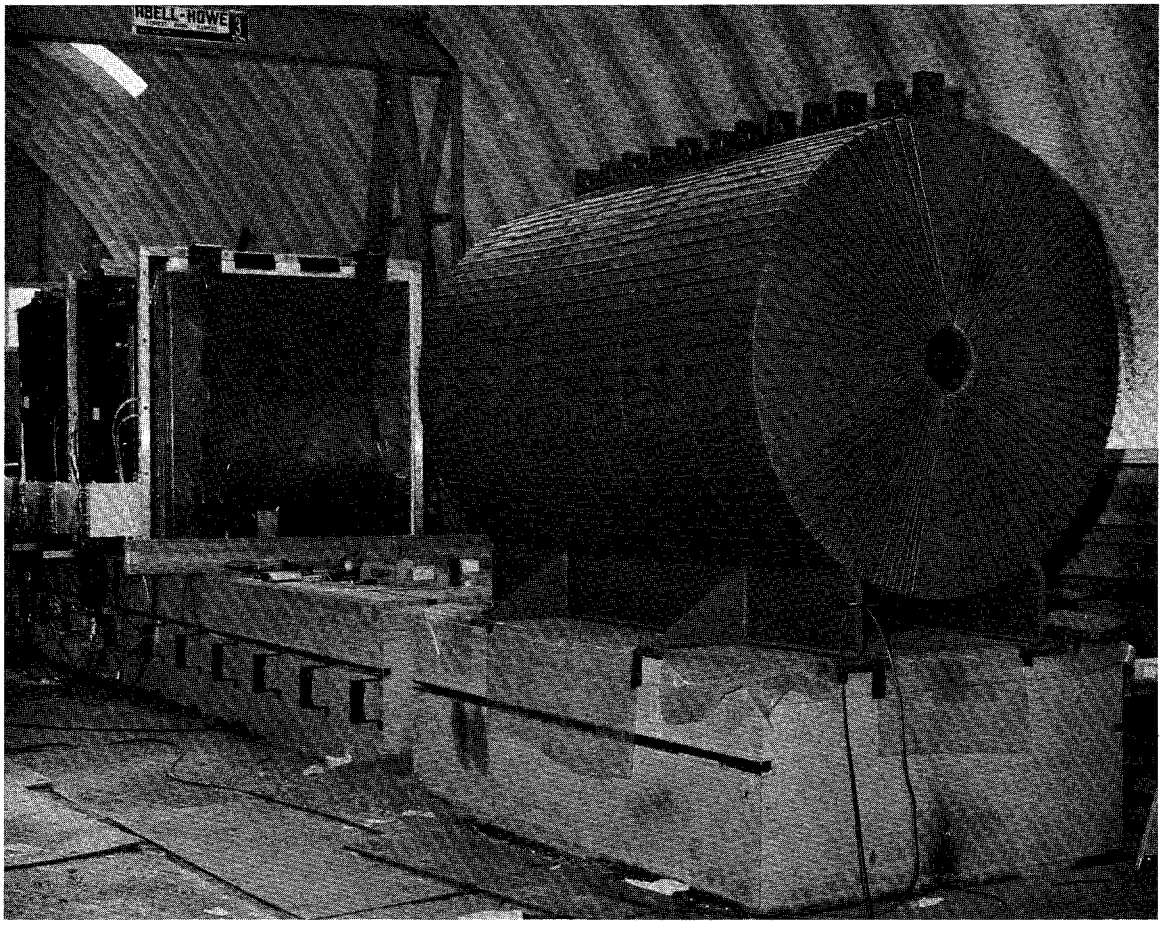

Fig. 2. Equipment for Experiment 21 in place. In the foreground is a magnet; detectors are behind it.

Magnets and power supplies for the beam line have been ordered and delivery will begin in July.

Bubble Chamber. The vacuum tank was moved to its permanent location on its foundation on May 29. Vacuum tests are scheduled to be completed during June. Figure 3 shows the tank in place. The lower portion will not be moved again, so that piping to refrigerators and storage dewars can now be installed.

The inner chamber is being fabricated in Birmingham, Alabama. This work is shown in Fig. 4. It is to be delivered in October.

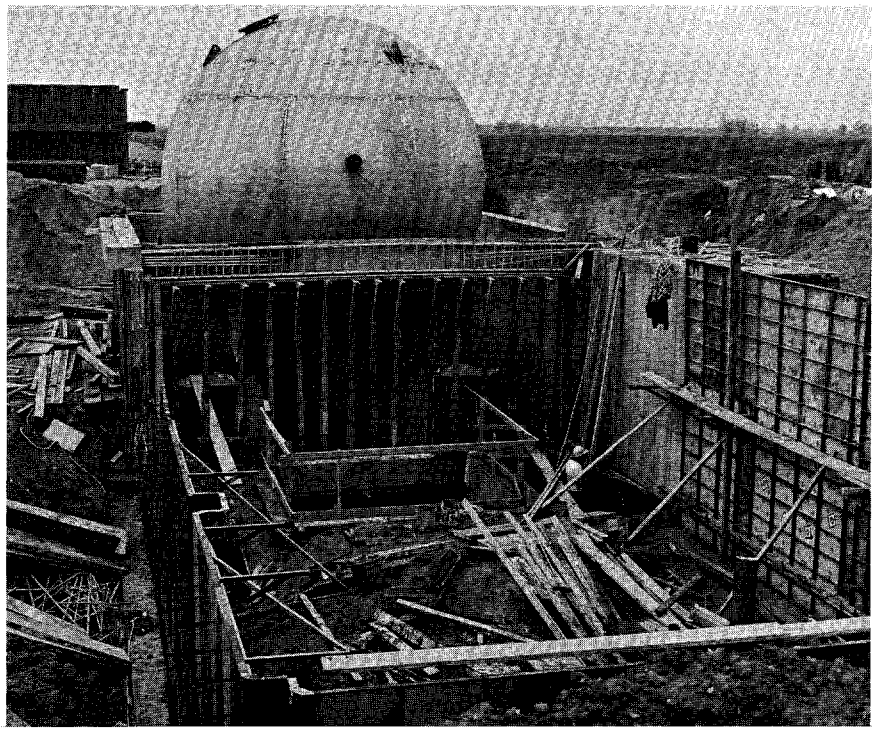

Fig. 3. The bubble-chamber vacuum tank in its final resting place. To the left are sheet-piling side walls for Building D of the Neutrino Laboratory.

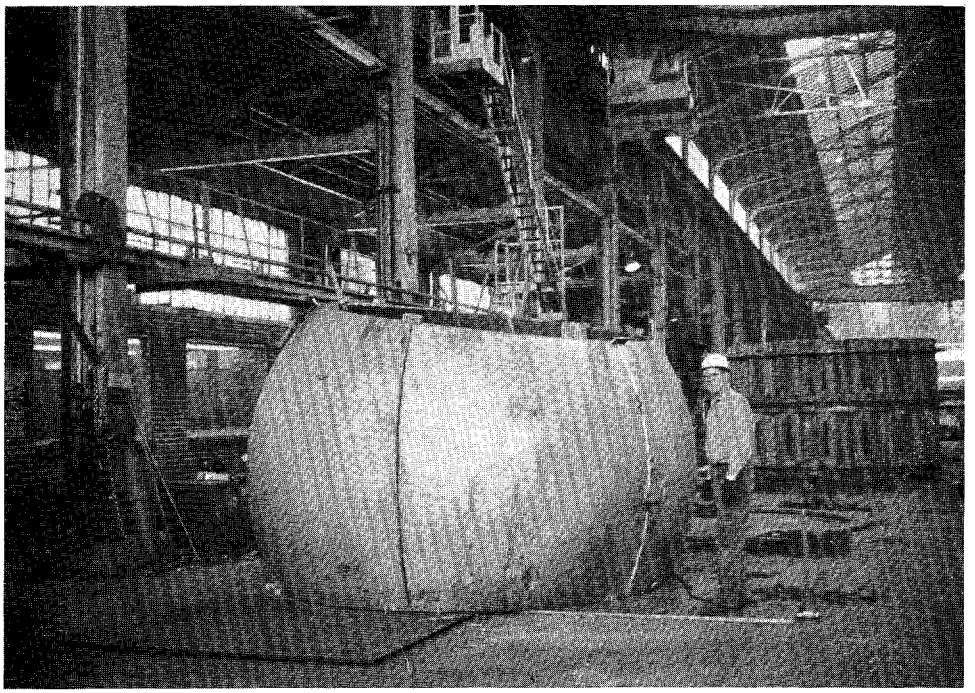

Fig. 4. Fabrication of the inner chamber of the 15-foot bubble chamber.

Superconducting Program. A 35-kilogauss dipole magnet has been energized without incident to 10 kilogauss. The measured field uniformity is well within the 1% design specification.

Construction

External Proton Enclosure. The contract is 88% complete. Figure 5 shows progress on the main beam dump.

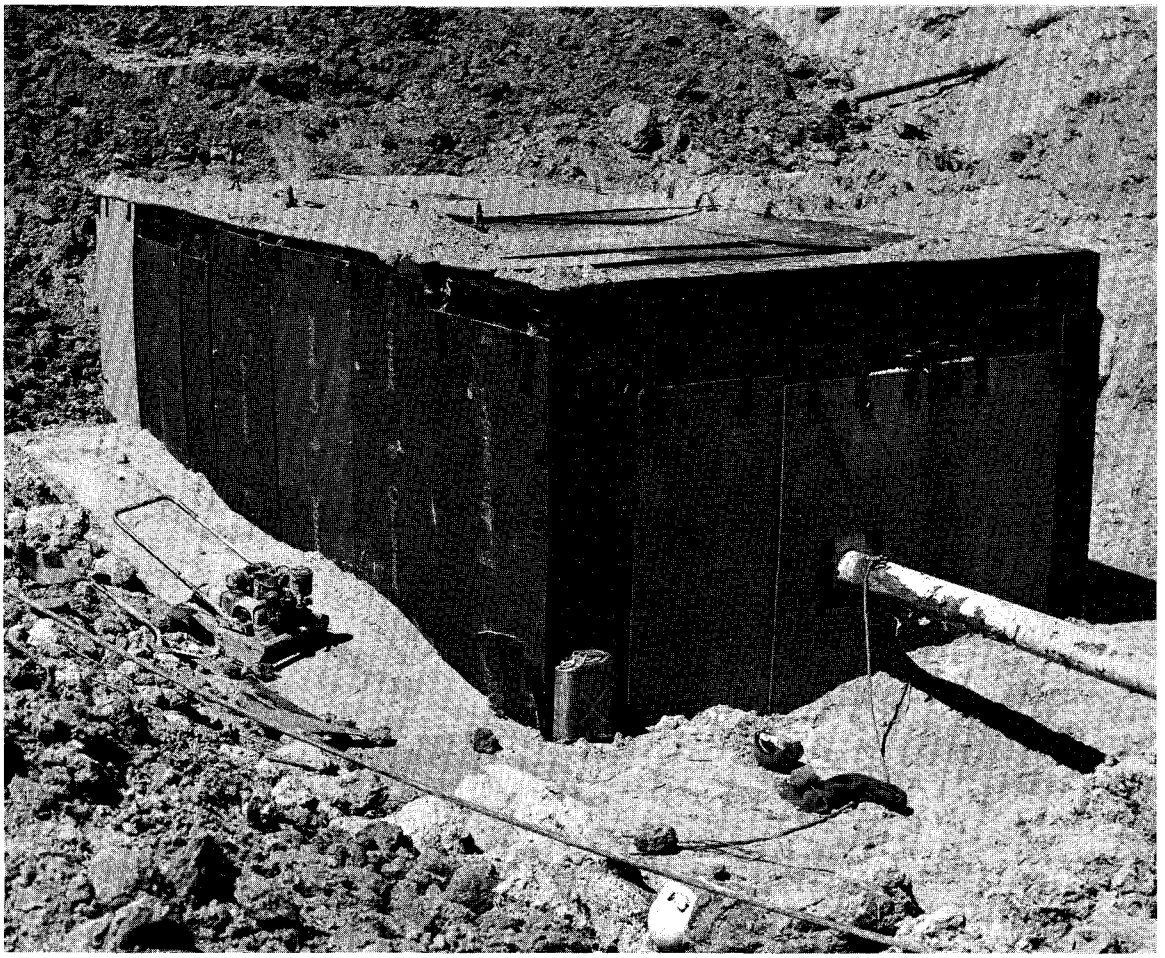

Fig. 5. The main beam dump in the Proton Beam Line.

Meson Laboratory. The target area is shown in Fig. 6. It is 60% complete. The beam-line area up to the detector building is 58% complete.

Fig. 6. A view looking downstream at the Meson Laboratory Target Area.

Neutrino Laboratory. The decay pipe is being installed downstream of the target, as can be seen in Fig. 7. This work is 69% complete. The end area

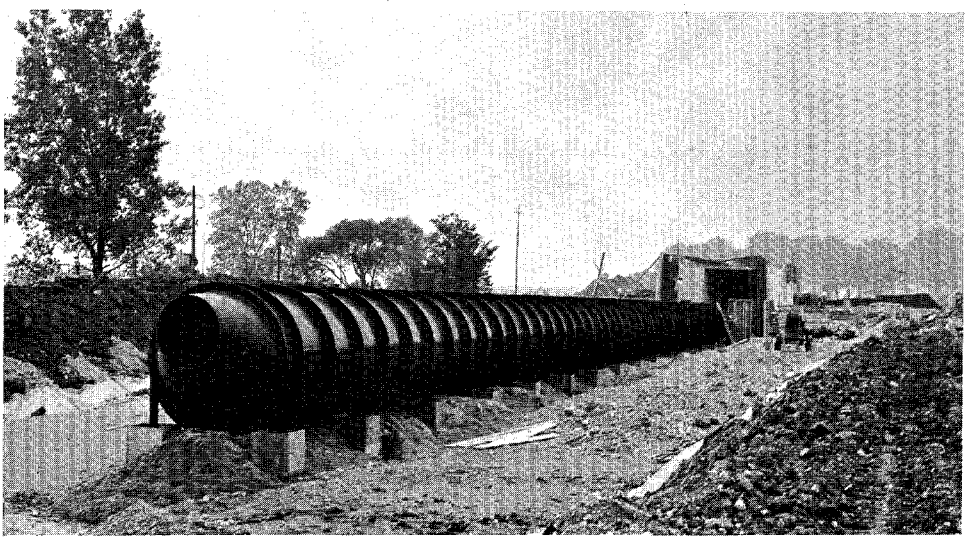

Fig. 7. The meson-decay pipe being installed downstream of the Neutrino Laboratory target.

the site of the bubble chambers, is 29% complete. Figure 3 showed the 15-foot chamber vacuum tank in place in Building B. At the left of that photograph the sheet-piling side walls of Building D can be seen. The 30-inch chamber will be installed in this building. The foundations of Building C, for counter experiments, have also been placed. Figure 8 shows the framing of Building A, the bubble-chamber assembly building. The upper part of this building will

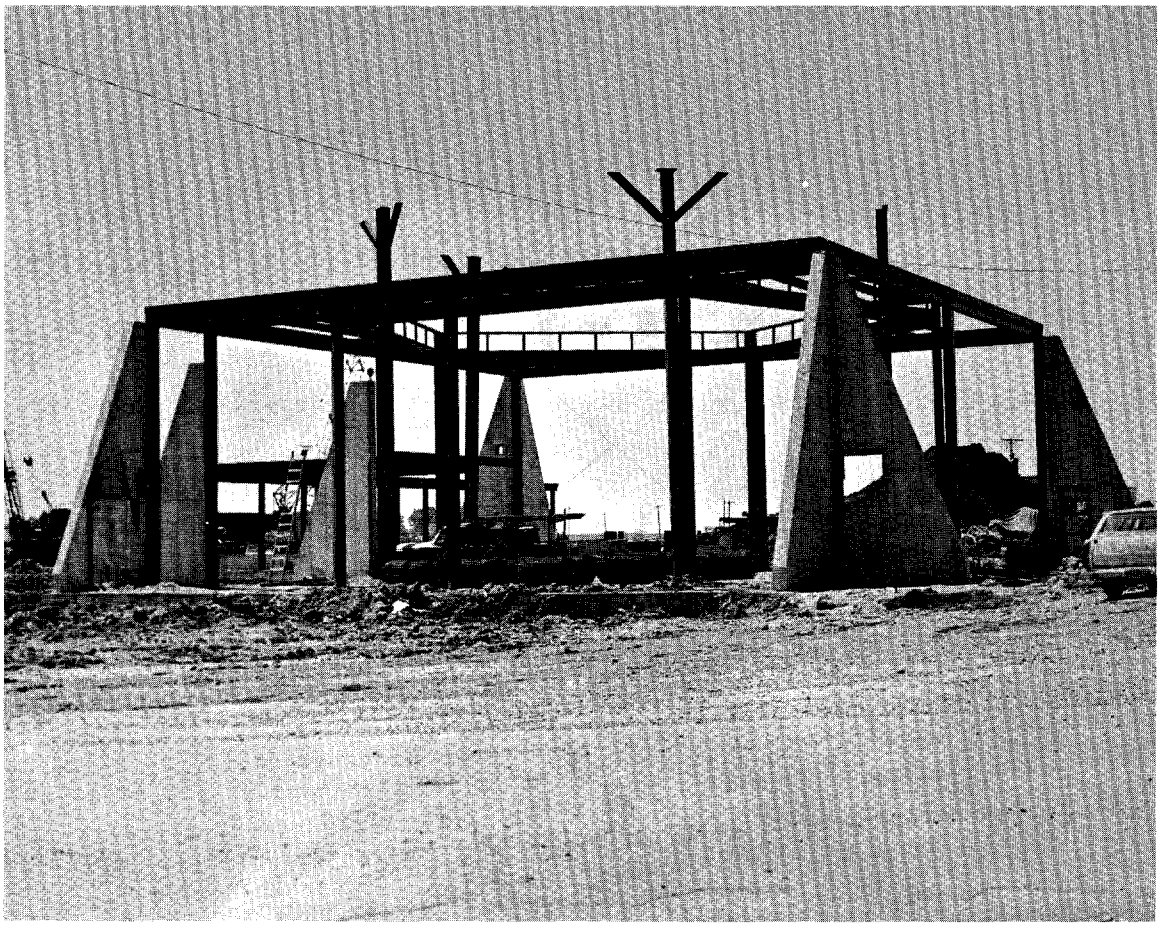

Fig. 8. Frame of the Bubble-Chamber Assembly Building.

be an icosododecahedron constructed of panels made of a sandwich of fiberglass triangles which use reclaimed beverage cans as the separator between the fiberglass sheets. These panels were developed by Robert Sheldon and

Henry Hinterberger of NAL and are being fabricated by the Laboratory. One of them is shown in Fig. 9.

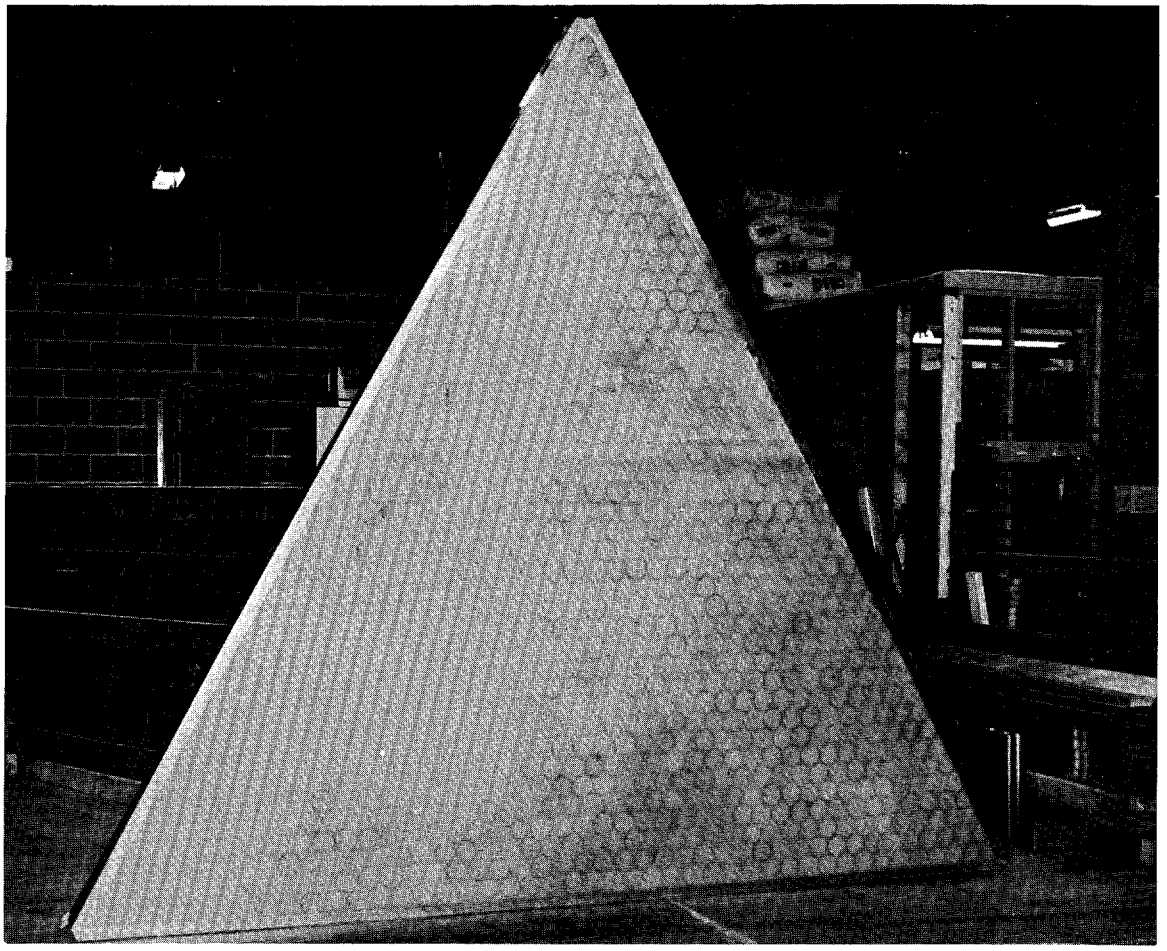

Fig. 9. A completed fiberglass and beverage-can sandwich.

Building D of the Neutrino Laboratory, which is to house the 30-inch bubble chamber, is to be built by the Kaiser-Ducett Co. of Chicago. The value of the contract is approximately $600,000.

Central Laboratory. The ground floor is making progress. In Fig. 10 it is now possible to see the beginning of the columns that will eventually extend all the way up the building. The north (front) wall is now complete.

Fig. 10. Looking north at the Central Laboratory.