

FERMILAB NEWS

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E-516 CHAMBERS--SIZABLE ACHIEVEMENTS IN INGENUITY

No pun intended, but the drift chambers built for Experiment 516 are a sizable achievement both in dimension and technical ingenuity.

First of all, they are the largest ever constructed at Fermilab and are among the largest built anywhere, according to David Bintinger, a research associate with the Physics Section and the scientist responsible for their construction. The chambers were designed by Bintinger and Ken Stanfield. (An historic drift chamber can be seen on the 15th floor of the Central Laboratory where an exhibit tells about the discovery of the upsilon at Fermilab. The chamber standing next to the exhibit was used in the experiment.)

The drift chambers built by the Physics Department team in the Central Laboratory catacombs were, it's fair to say, gigantic compared to their predecessors at Fermilab. In the first group of nine, each plane had an active area of 10 by 4-1/2 feet; each plane in the next group of nine had an active area 9 by 4-1/2 feet.

Then, with production techniques running smoothly, came the final three planes--each a colossal 16 by 8 feet. Work on those 21 planes, which ended last month (December), had been going on for about a year. They now have been installed in the Tagged Photon Laboratory. The experiment--which will look at decay modes of charmed particles--is running in a test mode.

"When we started, nothing existed," said Bintinger. Frank Pearsall, Physics Department senior technician, led the team that built the chambers. (Team members can be seen in the photograph on this page. Involved at an earlier stage was Jon R. Blomquist.) They developed from scratch accurate and reproducible procedures that could readily be followed during construction of large drift chambers. It was an achievement they are proud of and one that other experiments can now apply.



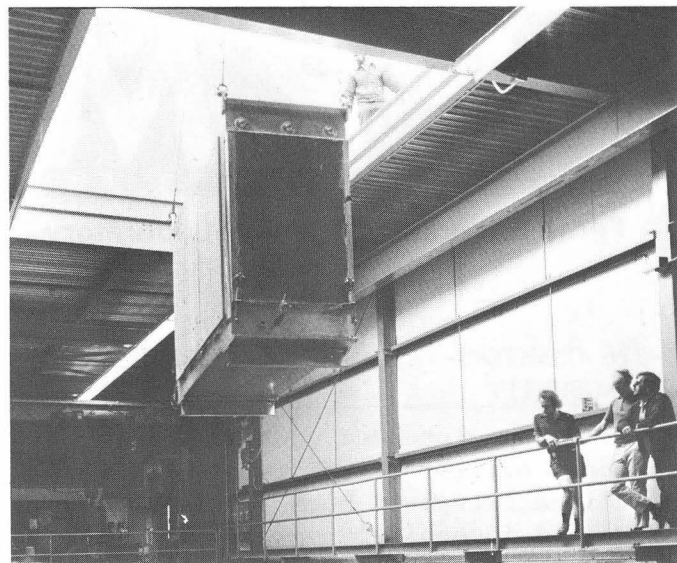
...Their hard work done for the moment, members of the drift chamber team stand before one of their products. From the left, they are Sue Hillard, Frank Pearsall, Mary Rothengass, Sharon Strecker, Greg Sellberg, Sherry Harrold, Rob Hurt, Jim Schellpfeffer and Alan Siegel. All are technicians and laboratory assistants, except Pearsall, who is the head technician; Hurt, mechanical draftsman-designer; and Schellpfeffer, electrical draftsman-designer. The photograph was taken in the Tagged Photon Laboratory, the site of the experiment. Not shown are Mike Armstrong, John Korienek and Yolanda Sekol...

Drasko Jovanovic, head of the Physics Department, said he is impressed: the drift chambers have been built more or less in time and with a high standard of precision. "This activity sprang up because of a need by experimenters for large, precise drift chambers," he said. "Bintinger, the tech-

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...Mary Rothengass looks at the screen to make sure she's soldering a wire in the correct position...



...An assembled drift chamber is lowered through the roof of the Tagged Photon Laboratory. The chamber was too large to get into the building by traditional means. Tom Nash (second from right), spokesman for E-516, observes the action...

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nicians and laboratory assistants certainly deserve credit for a truly remarkable accomplishment."

(Researchers with Experiment 537 recently built large drift chambers using the same facilities and procedures developed for E-516. Tentative plans call for the construction of large drift chambers that will be used in Experiment 605.)

The second part of this story is an equally remarkable one. It deals with that precision Jovanovic mentioned and with Carl Lindenmeyer, designer in the Physics Section. He designed the drift chambers and dipped into his reservoir of ingenuity to come up with a first for Fermilab--a closed circuit television system that greatly magnifies a small work area. It was very helpful for the success scored in constructing the chambers. Here's why.

The heart of drift chambers are (1) wires that sense particles hurtling past them and (2) field wires that carry the high voltages that make the chambers work the way they are supposed to. The sense wires in the E-516 chambers are made out of gold-plated tungsten. They are one mil thick (one thousandth of an inch). That's nearly invisible to the unaided eye. The field wires are drawn from a copper-beryllium alloy and are silver coated. They are three

mils thick. That's also nearly invisible to the naked eye.

By the time the technicians and laboratory assistants had finished with the 21 drift chambers, they had laid approximately 10,000 wires, each one positioned on specially-made circuit boards to an accuracy of one mil (0.001 inch). The accurate positioning of the wires across the active area of a drift chamber is absolutely crucial. That's how experimenters tell where decay particles are in three-dimensional space, and their momentum.

The first wire in one of those giant drift chambers had to be within plus or minus one mil from the last wire, 16 feet away, for example. How was this to be accomplished, taking into account human frailty being what it is?

Each wire initially was positioned and held in place across the drift chamber by screw carriages (similar to the kind found on machine shop lathes) with digital read-outs. Technicians then soldered the wires onto long circuit boards, some as long as 12 feet. But in the process of soldering, a technician could easily displace the wire more than one thousandth of an inch, thus exceeding the desired parameter. The wire had to be precisely soldered into position. An impossible task for a technician using only the unaided eye.

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HOW A DRIFT CHAMBER WORKS

Basically, a drift chamber contains two kinds of wires, usually alternating in a plane and running in the up-down direction. One type is the sense wire. It detects particles that pass near it. The other type is the field shaping wire. It carries a high voltage.

The electric field created by the field wires is strong. The thinner the wire, the stronger the field. That's why wires only a few mils or less in diameter are used. (One mil equals one thousandth of an inch.)

Each sense wire is surrounded by four field wires, and consequently it is in the middle of a carefully shaped electric field. The wires are bathed in an exotic gas mixture. Experiment 516 uses an argon-ethane gas.

When a secondary particle passes through the planes, it leaves a trail of electrons. These electrons cause an avalanche of charged particles in the high field around the sense wire. These particles flow toward the sense wire which records them as a pulse of electricity.

By recording the arrival time of the pulse to a few billionth of a second with sophisticated electronics, the distance from the wire where the hit occurred can be determined. This time is known as the drift time--that's how the chamber gets its name. The drift time helps scientists determine the particle's path and location in three-dimensional space.

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Enter the Lindenmeyer system to greatly magnify that soldering area. By looking at a cathode ray tube (similar to a television picture), a technician sees a magnified picture of the wire. On each side of the wire are markings (on the screen) that define the one-mil boundaries. The slightest movement is easily seen on the screen. As long as the wire stays within these boundaries, the technician knows he has correctly soldered the wire in place.

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VANPOOLING AT FERMILAB COMING OF AGE

Vanpooling--that newest way of economically getting to and from work--is attracting the attention of Fermilab employees.

Two brochures telling what vanpooling is and its economics are available now at the Public Information Office, CL1-W. Vanpooling is a tidy way of driving through the energy crunch without putting a dent in the pocketbook, says one of the brochures, which also is filled with statistics that show estimated costs and savings. Basically, an employee purchases a van and provides rides at a fee to other employees. Over a period of time, the van owner gets his investment back and the riders find they are paying considerably less each day commuting to and from work and, also important, they are all cutting down on the consumption of gasoline.

The Department of Energy is enthusiastic about vanpooling and its potential. Universities Research Association, which operates Fermilab, also is enthusiastic and has agreed to support a pilot plan of up to four vans, guaranteeing no down payment loans to lending agencies, reported John Colson, head of Support Services Section. Details about loans are being worked out with the Argonne Credit Union and should be completed soon, he added.

Persons who are interested in becoming driver-owners and who are willing to recruit seven to 12 riders, should contact Carol Weissert, Ext. 3470, for more information. The brochures also are available in the Support Services Office, CL6-W.

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REMINDER ABOUT GOODFIELD TALK

Dr. June Goodfield, author and faculty member of Rockefeller University, will speak tomorrow (Friday) at 8:30 p.m. in the Central Laboratory auditorium.

Her talk--"Science and Human Values"--is free and open to the public, but admission is by ticket only. Her appearance here is presented as part of the Science and Human Values Lecture Series sponsored by Fermilab and the Illinois Humanities Council.

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PINE STREET TRAFFIC LIGHT--
A SAGA OF DETERMINATION

Fermilab has been vigorously trying to get a traffic light installed at the Pine Street entrance.

Such a light, Fermilab officials believe, will improve traffic safety there. That's why John Paulk, head of Site Services; John McCook, Director's Office, and Bud Stanley, Batavia alderman, have been working hard on this project. Even Leon Lederman, Fermilab director, expressed his concern as recently as last month (December) in a letter to Batavia Mayor Archie Bentz.

In that letter, Lederman told of the Laboratory's appreciation for Batavia's support for the light as well as his own "dismay and strong disappointment" at a recent turn of events that seemed to pull the traffic light out of the grasp of the many people who had worked persistently to get it.

That recent event came in November 1979 when the County Superintendent of Highways office withheld approval on plans and specifications for installing a traffic light saying the intersection did not meet certain criteria. That position was subsequently supported by the Transportation Committee of the Kane County Board. This came as a surprise to the Laboratory since that same committee last May had unanimously voted approval of a traffic light. The Laboratory had even offered to pay for the light.

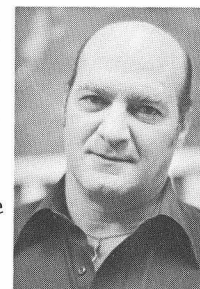
For many months, Fermilab officials have been in contact with city, county and state officials. Negotiations have been intricate, sensitive, and at times encouraging and frustrating, reported Paulk. The Site Services head said Fermilab is fully aware of the traffic hazards at the Pine Street entrance and has been doing its best to get something done. "If we prevent even one injury, it will have been worth it to us," said Paulk.

At the moment, however, the Laboratory is pondering what, if anything, can be done to counter the latest ruling by the county. Just what the Laboratory's next move will be is not clear now, said Paulk.

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BARNSTORMERS ELECT 1980 OFFICERS

Tony Frelo, head of the Fermilab Photography Unit, was elected president of the Fermilab Barnstormers, a radio-controlled model plane club.



Also elected to serve terms for 1980 are Elbert Smith, vice president; Rich Mahler, treasurer; and Jim Zagel, secretary. ...Frelo...

The Barnstormers meet the second Wednesday of each month in the conference room on the west side of the Central Laboratory's first floor. Frelo invited individuals with similar interests to drop in at any meeting.

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NALREC SPONSORS BASKETBALL TRIP

For those sports fans who never can get enough basketball, take a look at what NALREC is putting together.

The organization is sponsoring an evening with the Chicago Bulls and the Boston Celtics Jan. 29. A bus will leave the Central Laboratory at 6:15 p.m. The \$12 price for each fare includes transportation to and from the game, admission ticket, and sandwiches and beverages on the bus.

For tickets contact Pat Yost, Ext. 3124 or Sharon Koteles, Ext. 3232.

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CREDIT UNION DELCARES UNPRECEDENTED RETURN

A proud Argonne Credit Union has reported the common share dividend for the fourth quarter of 1979 at 6-3/4% plus 1/4% added bonus. A total of 7%.

This is an unprecedented return for common shares accounts, said Cindy A. Gould, manager of the Credit Union branch at Fermilab. It certainly beats any interest rate offered by banks or savings and loan associations on their passbook accounts, she added. A new service the Credit Union will be offering soon is the sale of American Express traveler's checks and money orders.

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