



## Ventilation critical to DUNE success

Air flows down the Yates and Ross shafts and is pulled through specific areas underground by two air shafts: Number 5 Shaft and the Oro Hondo. With the Deep Underground Neutrino Experiment (DUNE) just on the horizon, the reliability of the Oro Hondo ventilation system, in particular, is critical.

A direct drive, variable-frequency fan powered by a 3000 horsepower synchronous motor (it currently draws less than 400 hp), the Oro Hondo was built in 1986. Since then, it has undergone repairs and had parts replaced as needed and, in 2010, underwent a significant rebuild as Sanford Lab prepared to install the first physics experiments on the 4850 Level.

Deterioration of the shaft can inhibit airflow, so it was critical to understand the integrity of the wall rock, said Bryce Pietzyk, underground access director. However, because there is no conveyance in the shaft, Pietzyk turned to experts to find a way to get “eyes on” the rock from the surface to the current muck pile elevation. A special scanning method, developed by Professional Mapping Services, Firmatek and Mine Vision Systems, was lowered into the shaft to collect data on ground conditions.

“We learned a lot from the baseline scan, and



Photo by Matt Kapust

things look good right now,” Pietzyk said. “But we’ll need to do more scans over time to really understand locations of zones where rock wall conditions have deteriorated.” Additional scans will help create a more complete picture of the conditions of the shaft.

Ventilation surveys helped Sanford Lab engineers determine that while the fan was operating well, the drive system is obsolete and unreliable, and the motor and bearings require preventive maintenance before Long-Baseline Neutrino Facility (LBNF) starts major construction. Tests also revealed minor corrosion in the ducting, which will be sandblasted and coated to slow further corrosion.

“But, overall, the entire system is much more efficient than we anticipated,” said Allan Stratman, engineering director.

Finally, to improve air flow, a borehole needs to be raised from the 4850 to the 3650 Level and improve-

Above: The Oro Hondo shaft exhaust fan is essential to controlling airflow underground. Below: A laser scanner was lowered into the shaft to map its integrity.



Photo by Scott Thayer  
Mine Vision Systems

ments made to 31 exhaust, an existing ventilation path. It’s all part of the plans for the LBNF, which will power DUNE.

Scientists working on DUNE hope to answer questions about the role neutrinos play in the universe, learn more about the formation of neutron stars and black holes and, quite possibly, figure out just how much mass these

elusive particles have.

A neutrino beam will be sent from Fermilab near Chicago, Ill., 800 miles through the earth to Sanford Lab in Lead, S.D. Although no tunnel is required for the neutrino beam, huge caverns must be excavated to house four massive liquid argon detectors on the 4850 Level of Sanford Lab. Nearly 800,000 tons of rock will be excavated. Proper ventilation is critical when doing construction underground. And that’s why the Oro Hondo is so important to the success of DUNE.

“This is the only shaft that can provide enough ventilation for the amount of excavation LBNF requires and to remove heat from the DUNE caverns during operations,” said Joshua Willhite, deputy project manager for the LBNF Far Site (Sanford Lab) Conventional Facilities. “The fan has to be highly reliable to reduce risk.”