

Miners about to be rescued



33 miners have been trapped since August 5 in a gold and copper mine near Copiapó in the Atacama Desert of Chile. The miners are 2,041 feet underground. It took 17 days before rescuers, drilling holes about the width of a grapefruit, located the miners and realized that there were survivors. Since then food, water, medicine, and messages have been traveling down the tiny drill holes.

Now, after more than two months, they are about to be lifted to the surface one by one. Experts from the United States and Chile have been drilling larger shafts to raise the men out of their chamber. A US–Chilean mining company has drilled a wide diameter shaft (28-inches wide) using drilling equipment made in Pennsylvania. NASA was brought in to suggest mental and emotional support for men trapped for such a long period in a confined space.

1. In miles, how far down are the miners trapped?
2. If a 28-inch wide hole has been dug to rescue the miners, how much ore was removed from the shaft (figure out the amount in cubic feet)?

The collapse happened just as the men were gathered for lunch in a refuge - a space about 12 feet by 12 feet (four meters by four meters) with a fortified ceiling nearly 15 feet (4.5 meters) high that normally doubles as a dining room in the lower reaches of the mine. Any sooner or later, and some of the miners probably would have been crushed.

3. What was the volume of that chamber in cubic feet?

When the dust finally settled about five days after the collapse, the miners could see that they were trapped in a large open space, about 1,200 feet (360 meters) long, that ran up a corkscrew-shaped shaft to another workshop about 2,000 feet (600 meters) underground. The space had several mining vehicles with battery and engine power, a chemical toilet and industrial water, which together with their meager emergency food supply enabled them to survive with no help from the outside world for their first 17 days.

Now, tubes pump at least 100 liters (106 quarts) of water a day and about 114 cubic meters (4,024 cubic feet) of fresh air an hour into the mine. That enables the miners to take showers and slightly reduces the sweltering heat down below.

<http://www.washingtonpost.com/wp-dyn/content/article/2010/09/27/AR2010092702020.html>

The wider diameter shaft has loose rock for the uppermost 33 feet. So it has been decided to add a metal casing to the top 315 feet (96 meters) of the shaft. The plan is to insert 16 steel tubes, each 6 meters (about 20 feet) long into the tunnel that was drilled down to the miners' cavern.

4. What is the lateral surface area of that entire tube length?

Chilean naval engineers based on a NASA created design have built an escape capsule. The capsule is called Phoenix (a phoenix was a mythical bird that lived for five or six centuries and then burned itself up to rise from the ashes as a renewed birth for another cycle of living).

The Phoenix capsule has spring-loaded wheels that press against the hole's walls and can be lowered into the shaft via a winch. The trapped miners will be brought up one by one.



Keep listening to the news to find out how the rescue is progressing.