

## Kansas Underground Salt Museum

Hutchinson, Kansas, USA

The Hutchinson salt mine is an active salt mine in the United States with an underground museum open to the public. Ground freezing ensured dry and stable excavation of the new elevator shaft.



### The project

The Hutchinson Salt Company (formerly Carey Salt) is no stranger to the innovative uses of abandoned portions of its active Hutchinson mine in Reno County, Kansas. Under a lease agreement, converted caverns deep below the surface have provided safe, environmentally stable, underground storage facilities for sensitive information and assets since 1959. More recently, the Reno County Historical Society presented a unique Hutchinson mine use—the Kansas Underground Salt Museum (now Strataca), where visitors are transported 650 feet underground via an elevator.

### The challenge

Ground freezing was the owner's method of choice to stabilize more than 135 feet of sand and unstable mudstone overburden to ensure a completely dry and stable elevator shaft excavation.

## The solution

The 4.5-inch diameter, closed-ended steel freeze pipes were installed through the overburden around the proposed shaft perimeter and extended through weathered mudstone into the underlying shale to ensure that the freeze continued down into competent rock. Quality control measures prior to and during freezing operations included borehole surveying to confirm accurate alignment; installation of a central pressure relief well; instrumentation to confirm adequate frozen ground propagation; and piezometers installed outside of the freeze perimeter to measure groundwater levels and gradients. The temporary frozen wall, a minimum of six feet in thickness, was formed by circulating calcium chloride brine chilled to -25° F. Closure was achieved 28 days after ground freezing was initiated. The nominal 14-foot diameter shaft was excavated by Thyssen Mining, and the 2-foot thick permanent concrete liner placed.

## Project facts

### Owner(s)

The Hutchinson Salt Company

### Keller business unit(s)

Keller

### Main contractor(s)

Thyssen Mining

### Solutions

Support of excavation

Groundwater control and dewatering

### Markets

Mining

Tunnels and shafts

### Techniques

Ground freezing

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