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Craters Above Salt Caverns

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Abstract

Conditions leading to crater formation above salt caverns are discussed. In most cases, at the end of leaching, the cavern roof had reached the top of the salt formation, allowing direct contact between brine and marl (or argillite) layers that compose the overburden of the salt formation. These layers are prone to weathering when in contact with saturated brine. Stoping takes place, and the cavern roof rises through the overburden. This process may be several years or dozens of years long. In Lorraine salt formations, stoping stops when the rising cavern top reaches a competent layer, the Beaumont Dolomite. Operators then lower cavern-brine pressure to trigger collapse. A rigid cylinder of rock (a "*piston*") drops into the cavern, and a crater whose initial edges are vertical is created. Cavern drop is more abrupt when the cavern top is filled partly with air. The contour of the piston is circular, as a circle is the shape such that the ratio between perimeter and area is minimal. In other cases, for instance in Kansas, the cavern rises until the uppermost keystone bedrock at shallow depth is breached, permitting loose materials to flow into the cavern through a relatively narrow hole at the bottom of the sink hole, as in an *hour glass*.

Key words: Salt caverns, Sinkholes, Subsidence, Craters.