



# SIKA AT WORK

## KIRUNA MINE, SWEDEN

IRON ORE EXTRACTION UNDER CHALLENGING CONDITIONS

BUILDING TRUST



# IRON ORE EXTRACTION UNDER CHALLENGING CONDITIONS

## PROJECT DESCRIPTION

With an ore body 4 km long, 80 m thick and reaching a depth of 2 km, LKAB's Kiruna is the world's largest, most modern underground iron ore mine. Since exploitation began at the site over 100 years ago, LKAB has produced over 950 million tons of ore, yet only one third of the ore body has been extracted.

The extraction-process requires large amounts of sprayed concrete to secure the mine development. Since 2008 Sika is the main supplier for admixtures and underground construction technologies at Kiruna. Located in Swedish Lapland, north of the arctic circle, the challenges in terms of logistics, admixture storage and concrete production are manifold. Sika, together with its partner LKAB took on the challenge many years ago and today the LKAB operations are a show piece of best mining practice for many, large, block cave projects all around the world.

## EFFICIENCY IS KEY

Kiruna is one of the largest, underground sub-level cave operations on the globe. Ore is extracted by the exploitation of gravity to get the ore to fall in the draw points of the development drifts for subsequent haulage by train and truck to the crushing and hoisting infrastructure. Fast mine-cycle times are key to maintain high productivity and ore throughput rates. Hence, an efficient in-cycle shotcrete set-up is required to install a fast, primary support of the newly opened drifts and stopes, providing fast re-entry times into the freshly blasted and secured perimeters.

A reliable supply of consumeables such as the Sika Sigunit® the Sika plasticizers and retarders as well as a range of other products are absolutely critical to keep this operation going on a daily basis and to secure the large throughput rates of the concrete batch plants on surface.

## PROJECT REQUIREMENTS

Sprayed concrete must have

- Early strength of 4 MPa at 4h (Hilti method)
- 28 days strength > 40 MPa
- A maximum dosage of accelerator of 10%
- A product stability of minimum six months
- Open time > 4h
- Energy absorption according to ASTM 1550-05 of 490 J

## SIKA SOLUTION

Sika's world leading Sigunit® and ViscoCrete® technology is among the key elements for the shotcrete and concrete works at Kiruna. Special SCC designs for shaft and ore pass linings were tailored for the specific needs of the ore handling infrastructure and together with LKAB, we developed an easy to handle retardation system for the Atlas cable bolters. Sika not only offers products which meet all the requirements, but also provides continuous customer support on site for shotcrete production and application. Sika works closely together with the customer, performs experiments on-site, supports the testing and implementation of new technologies and is exploring innovations with the aim of continuous operational improvements.



### SELECTION OF SIKA PRODUCTS

- Sika® ViscoCrete® EVO 36S Superplastcizer (HRWR)
- SikaTard®-932 Consistency stabilizer
- SikaAer®-S Air entrainer
- Sika® Retarder Retarder
- Sika® Retarder P42 Grout retarder for cable bolts
- SikaRapid®-1 Concrete accelerator
- Sikaflex®-11FC i-cure Sealing
- Sigunit®-L2712 AF Shotcrete accelerator
- Sika® Crackstop®, 12 mm Fibers
- Sika® FastMix® 225 HRWR (powder)
- Sika® Intrapast®-A Expansion aid
- Sika® Antifreeze®-S Anti-freeze
- Sika® NeatCrete Concrete remover
- Sika® Control®-50 Shrinkage reducer
- Sikalastic®-841 ST Protective coating
- Sikaquick®-506 Repair mortar

### PROJECT PARTICIPANTS

Owner: Luossavaara-Kiirunavaara Aktiebolag (LKAB)

Engineer: LKAB

Contractor: LKAB Berg & Betong AB

Sika Organization: Sika Sweden SE

- 1 Front: Spraying process underground using mobile piston pump spray units
- 2 View towards the old Kiruna pit where today a large surface cave develops
- 3 Concrete ready for spraying
- 4 Surface batch plants for sprayed concrete and other concrete applications
- 5 Early strength testing of the sprayed concrete
- 6 Back: Iron ore in form of fines and pellets is transported by rail to the ports of Narvik in Norway and Luleå, Sweden



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# KIRUNA MINE, SWEDEN



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Our most current General Sales Conditions shall apply. Please consult the most current local Product Data Sheet prior to any use.



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