

LS LAKE SHORE MINING EQUIPMENT INC.
AN OLDENBURG GROUP COMPANY

February 1993

Mysora S. Nataraja
U.S. Nuclear Regulatory Commission
OWFN 4-H-3, 1555 Rockville Pike
Rockville, MD 20852
U.S.A.

Dear Mysora S. Nataraja;

In this the second in our series of information circulars, we are addressing the issue of corrosion in rock bolts.

Historically rock bolt applications have been classified as either permanent or temporary, consequently only cement or resin grouted bolts were considered for longer term applications while all others were deemed suitable for short term use.

Now a substantial body of evidence has been assembled from many applications and rock types that question the validity of these assumptions. Two papers which specifically address this question are Helfrich and Finkel¹ and Foghalin². The results of these investigations has shown that grouting may even increase the rate of corrosion in rock bolts.

Investigative overcoring of bolts has proven that a large percentage the bars are not fully encased in the grouting medium. This can be due to the bars laying against the side of the hole as well as cavities in the medium that leave whole sections of the bars exposed. The problem is augmented further in that most grouted bars are not tensioned when installed and become load bearing only when rock movements occur. These movements usually result in the formation of cracks within the rock as well as the grout itself, allowing for the direct ingress of water borne corrosives to attack the bar.

In resolution of this problem Atlas Copco has worked closely with a leading producer of protective coatings to develop a paint that is resistant to the types of corrosive substances found in mining and underground engineering situations. This coating is applied to SWELLE[®] bolts through a dipping process and completely covers the surface. Upon installation a protective barrier is formed between the steel bolt and the rock isolating it from any corrosive agents that may be present. Coated SWELLE[®] is being used to economically replace grouted bar in more and more applications.

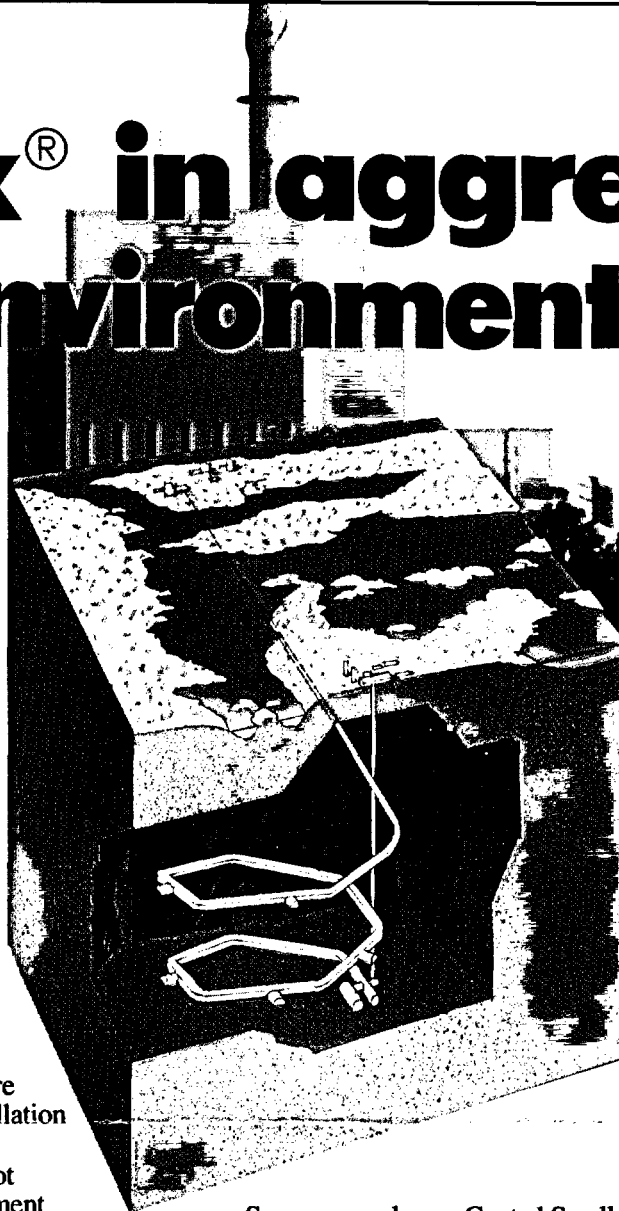
For further information regarding this and other SWELLE[®] products contact your Lake Shore Mining Equipment Inc. representative. In the March literature we will address the concept of the "Perfect Rock Bolt" through the use of comparative tests preformed on commonly available rock bolts against set criteria.

Yours sincerely,
Lake Shore Mining Equipment Inc.


Ross S. Tilson
Sales Engineer - Ground Support
RT/mw encl.

1. Hans Helfrich & Menachem Finkel, BeFo 246:1/89, Swedish Rock Engineering Research Foundation, "The Durability of Rock Bolts - investigation at the sandstone mine at Kvarntorp".
2. Mats Foghelin, Swedish Corrosion Institute, 53 - 435; "Assessment of corrosion risk to corrosion protected Swellex rock bolts in underground coal storage facility beneath the Varten heating plant in Stockholm".

Swellex[®] in aggressive environment



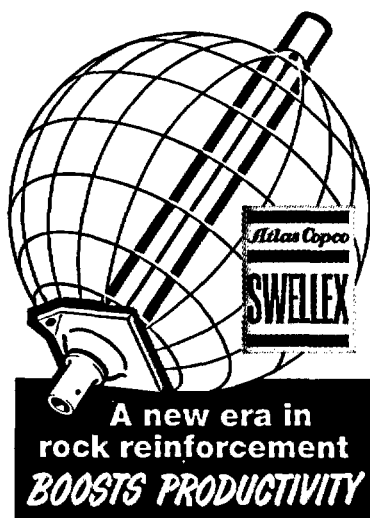
Swellex, the simplest, fastest and most reliable rock and ground reinforcement system, continues to gain worldwide acceptance. For very sound reasons:

- Immediate full-column support
- Instant full load-bearing capacity
- High tolerance to variations in bore hole diameter gives superior installation quality
- Quality of bolt installation does not depend on operator skill or judgement
- Bolt insensitive to blast vibrations
- Standard length up to 8 meters, and special length up to 12 meters
- Installation procedure unaffected by bolt length
- Bolt adapts to hole irregularities and grips along its entire length
- Swellex rock bolts are available in corrosion protected versions called Coated Swellex
- Equally suitable for both manual and mechanized bolt installation
- The fastest, simplest and most reliable rock supporting technology available.

The Hard Rock Laboratory now under construction at the Oskarshamn nuclear power station on the south-east coast of Sweden. Report available.

Some examples on Coated Swellex applications in different ground conditions:

Clay, shale marl	COGEMAR, rehabilitation of old tunnels, Italy
Chalk	TML Channel Tunnel, crossover, France
Limestone	Cons Ferica, railway tunnel Caporosso, Italy
Limestone	Cogefar, Ravedis dam, slope stabilization, Italy
Granite	Skanska, coal storage, Värtan, Sweden
Granite	SIAB, rock laboratory, Äspö, Sweden
Hard rock	Falconbridge Fraser Mine, Ontario, Canada
Granite-gneis	Horga Tunnel, hydroelectric project, Norway
Hard rock	Dillingham Construction, dam tunnel, North Vancouver, Canada



Contact Atlas Copco for our complete Swellex reference list and on-the-job reports through your local Atlas Copco representative, or Atlas Copco Tunnelling and Mining AB, Rock Bolts, S-105 23 Stockholm, Sweden. Phone +46 8 743 80 00
Telefax +46 8 642 01 28 Telex 14090 copco s.

Atlas Copco

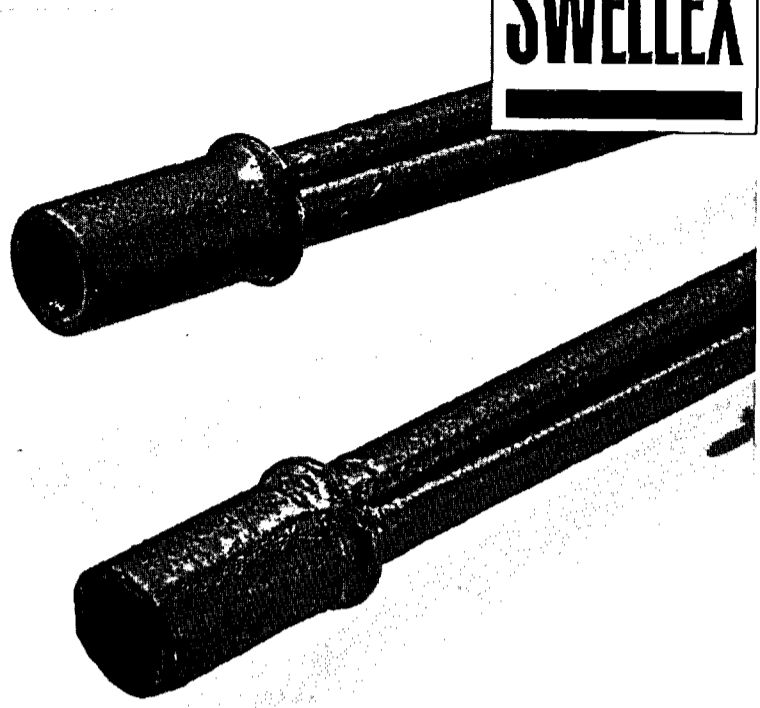
Specifications

Swellex rock bolts — Coated Swellex



Most conventional rock bolts are not resistant to corrosive environments. To solve this problem in mining and tunneling applications, Atlas Copco has developed corrosion-resistant Swellex versions — the coated Swellex/coated Super-Swellex. The special coating consists of a single-component, physically curing paint on a base of bitumen-modified rubber, specially developed for corrosion protection in underground conditions. In addition to fulfilling the demands for maximum protection against corrosion, this version also works in acid environments and offers all the original Swellex benefits:

- very fast and comfortable installation
- immediate support
- guaranteed function*



Applications

Coated Swellex/coated Super-Swellex rock bolts are recommended for long term rock support in tunnelling, civil engineering and mining applications where corrosive environments can be expected.

Technical data of compound

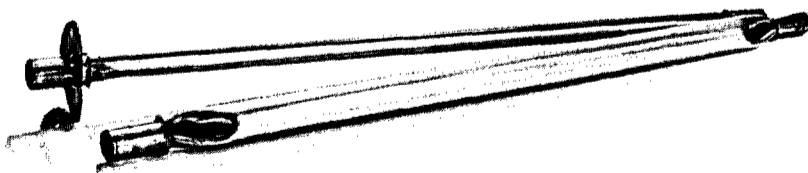
Name of compound	Safe Coat 839
Dry content	42% by volume
Density	1.10 g/cc
Viscosity	86 KU
Solvent	White
Colour	Dark grey
Binders	Bitumen modified cyclized rubber
Pigment	Zinc phosphate and other active zinc combinations

For mechanical data, see specifications for Standard Swellex or Super-Swellex.

* When pump stops at pre-set pressure the quality of bolt and installation is verified.

Installation equipment

- **Manual installation**
Pneumatic Swellex pump, A660, complete with installation.
- **Mechanized installation**
Hydraulic Swellex pump, HSP 301, for mounting on hydraulic drilling or bolting rigs.
Electric Swellex pump, ESP 30, for mounting on drilling or bolting rigs.



Interested in our swell idea? Your Atlas Copco representative will be pleased to further outline the Swellex advantages. If you would like more information, just give us a call.

MCT No. 9851 1618 01a

Subject to alterations without prior notice.