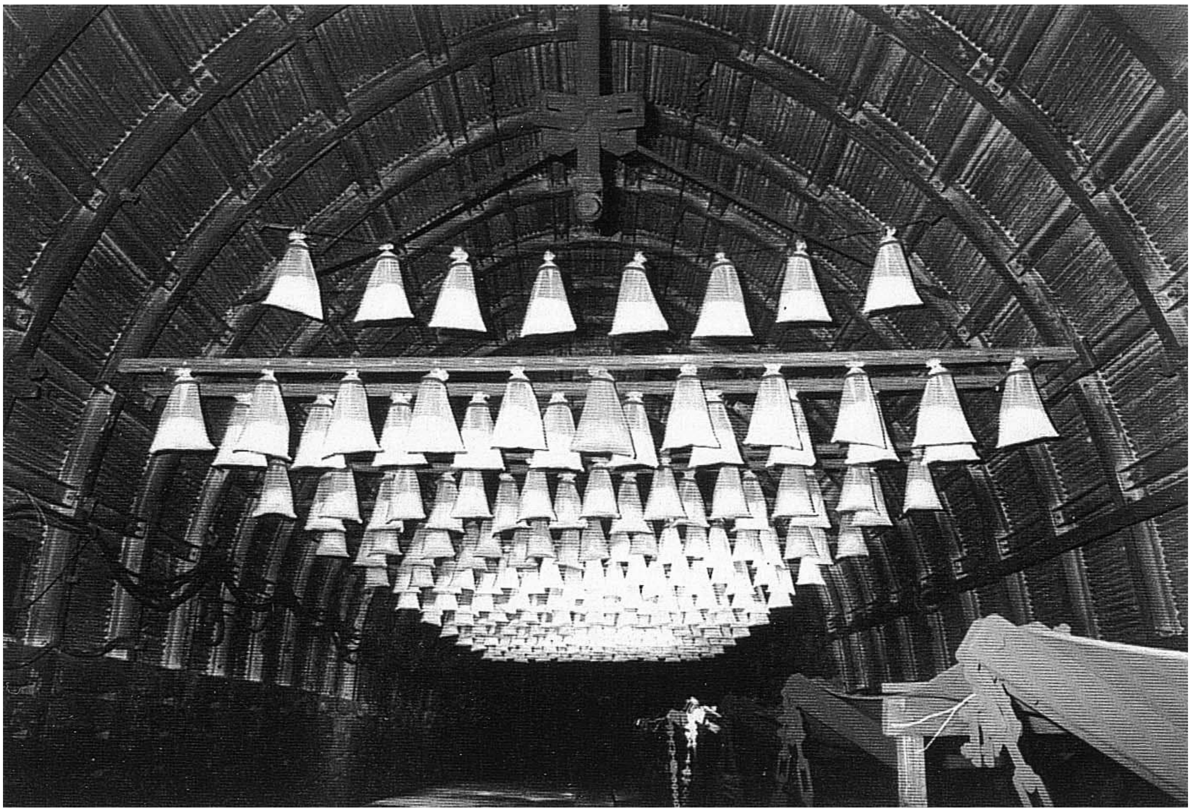
SkillPro
Services Pty Ltd

Supplementary Information Related to Use of SkillPro-CSIR Bagged Barriers in Underground Coal Mines In Queensland

December 2021



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Disclaimer

This document is intended to assist in the use of the SkillPro-CSIR bagged barrier system of stone dust explosion barriers. SkillPro, its agents and its employees will not be held responsible for damages arising from inappropriate use of the product or errors or omissions in this document. It is the sole responsibility of the customer to ensure that any explosion barriers are designed, constructed, installed, and maintained in a satisfactory manner and in accordance with any relevant legislation.

If there is any doubt in relation to the application of this document, independent professional advice should be sought. SkillPro may from time to time, make amendments to this document after consideration of, better knowledge of explosion protection from research it or others carries out, or in response to industry requirements.

This document is current as of the date shown on the cover page.

Further, this document should not be applied to any explosion barrier product other than that supplied by SkillPro Services or its agents and which carry the SkillPro Services logo.

Introduction

SkillPro Services Pty Ltd (SkillPro) supplies the components (bag, hook ring) for the construction of bagged stone dust explosion barriers for use in Queensland and New South Wales underground coal mines. Becker Mining Australia fills and assembles the components for supply to underground coal mines for the construction of coal dust explosion barriers. The bagged stone dust coal barrier concept was originally developed by CSIR of South Africa and introduced to Australia mines under licence by SkillPro. SkillPro continues to work with CSIR on the improvement of the product.

Description of the SkillPro-CSIR Bagged Barrier

The bagged barrier explosion suppression system consists of an array of translucent plastic bags, containing stone dust, suspended in rows using specially designed hangers (hooks) across the width of a coal mine road, installed in accordance with relevant legislation and advice such as found in Recognised Standard 21.

Unless specifically ordered, all supplies of the SkillPro bag and hook are of the latest ‘short” specification. In recent times, the hook was strengthened by increasing its thickness above the disc coupled with a change to a stronger plastic used in moulding the hook/ring combination. The shortening came about in response to a request from industry for increase clearance under barriers for equipment. This required extensive large-scale testing in South Africa and presentation of comparative explosion suppression test results to the NSW inspectorate before acceptance in NSW. The full test program and results have been provided to the Queensland Mines Inspectorate.

The changes to strengthen the hook were initiated after substandard installation, causing hooks to sometimes break along belt conveyors.

None of these changes affect the use of the SkillPro components in constructing an explosion barrier.

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becker

MINING SYSTEMS

Bag Supplied by;

SkillPro Services Pty Ltd

Examples of Acceptable SkillPro–CSIR Bagged Barrier Logos

Barrier Design Parameters

For all information on barrier design parameters Queensland operators are directed to Queensland Recognised Standard 21 – Explosion Barriers December 2021.

SkillPro wishes to convey the following advice:

SkillPro brings to the attention of its customers, that values like 100kg/m3 or even 200kg/m3 do not always provide a zero-risk situation. For example, the research work by Cybulski and covering hundreds of Test explosions indicates that even 200kg/m3 may be insufficient for every possible scenario. Please refer to the Suppression Graph at the end of the document.

Simplistically, it is believed that the most significant influence on the required amount of dust is the distance from the point of initiation. Other possible influencing factors could include, but may not be limited to:-

- The path the explosion takes
- The degree of confinement along that path
- Significant obstacles along the path
- The strength of the initiating explosion
- The presence of other airborne fuels like combustible gas
- The TIC of any roadway dust that is mobilized by the initiating explosion

All such factors should be considered in a holistic risk analysis of any intended barrier design

Hanging Bags

Since inception, the incorrect hanging of bags has led to barriers that are costly to repair or barriers that will not work as intended. SkillPro has devised a training presentation on the correct bag hanging procedure. Clients using SkillPro bags can access this presentation by contacting the address listed below.

SShuttleworth@SkillPro.au

Protection of Roadways with Obstructions

Where the bagged barrier is used to provide explosion protection in a conveyor belt roadway, it may be prudent to install additional stone dust bags suspended on the conveyor belt structure to provide **additional** protection against passage of an explosion under or between the belts. This could take the form of one bag on either side of the belt structure for each row of bags suspended in the roadway. For this instance, the hooks can be directly attached to the structure if a suitable hanging point is available, but the bag should be free-hanging and not in contact with any part of the conveyor belt, otherwise a suitable hanger with static strength of greater than 30kg can be used.

For suspended belt structure, wherever there is clearance to do so, additional bags could be hung underneath the belt structure to further reduce propagation risk. This should take the form of one bag per metre of belt width for each row of bags in the roadway. If there is insufficient clearance to suspend a bag, there can be no confidence in a bag simply placed on the road below the belt.

The same comments apply whenever a ventilation duct or large pipe suspended above the ground is installed i.e., one bag suspended under the vent duct/pipe for each row of bags in the roadway. Provided the bag and hook remain free-hanging and able to swing under explosion pressures, then any reasonable hanging arrangement should be acceptable.

There is no direct research data showing the need or otherwise for additional protection around a longwall monorail system or a single pipe, that penetrates the barrier.

High Workings Installations (above 3.5m)

Refer to RS21.

"Non-Compliant" and "special" Installations

There will almost certainly be circumstances in a mine that are not adequately covered by guidance such as given in RS21. It is impossible to anticipate every mine layout and configuration in which a bagged explosion barrier may be placed.

Examples where special risk analysis might be needed include:

- When a longwall panel approaches completion and is close to the main headings,
- A single-entry development over about 100m,
- Initial drivage of long face installation roads or single entry drivage

Filling of Bags

It should be noted that the bagged barrier system is in part reliant upon the proper filling of the stone dust bags that together form an explosion barrier. The individual bags are intended to hold 6 kg of stone dust although the exact amount is not critical so long as due consideration is given to this in calculating the final barrier design. The bag and hook are not designed to hold more than 6kg.

Broken Bags and Hooks

To preserve the integrity of the explosion barrier against situations where some bags and hooks are inadvertently damaged, it is envisaged each mine will either have a plan to replace them or install additional bags during construction While in many situations the life of the bagged barrier components may not be of significance, especially in an underground mine, it is expected that the component lives will be effectively indefinite. Some units have been suspended on the surface in South Africa for periods of more than two years, with little sign of degradation.

In its original guidelines, SkillPro identified barrier designs that gave a small margin for error with bag numbers and therefore mass.
All such matters have been removed from this updated Guideline

Re-Using Product

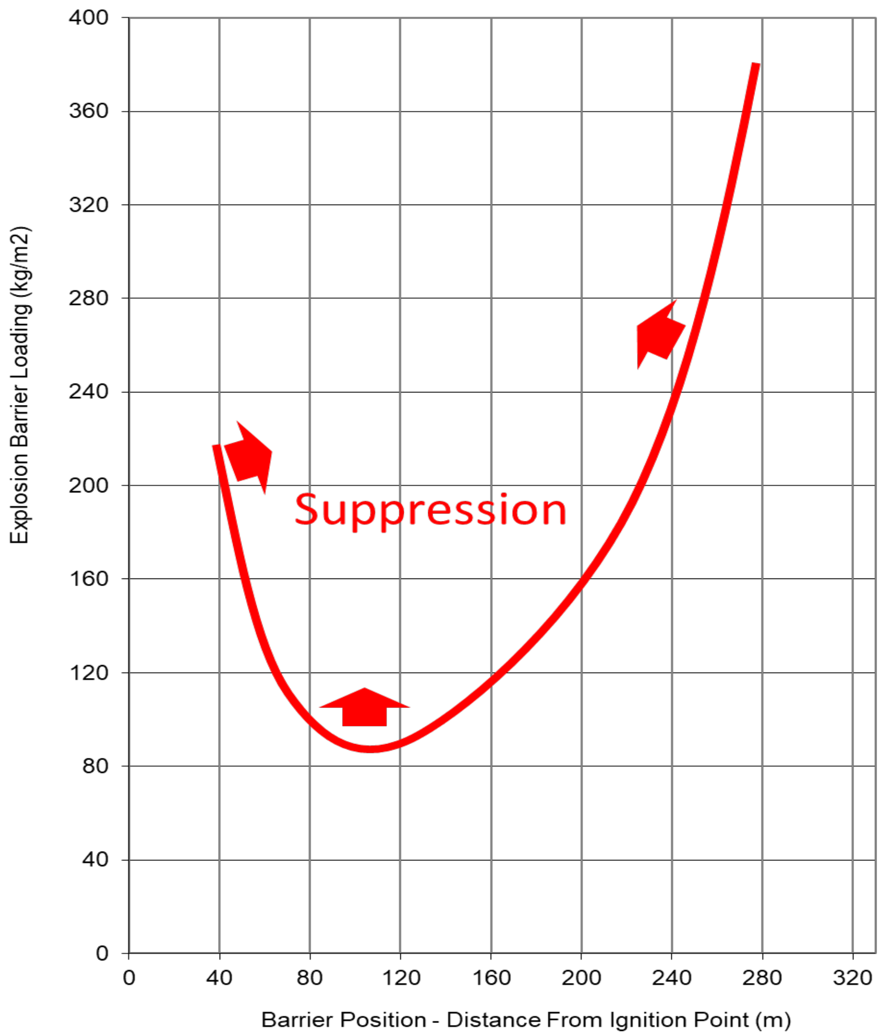
There is no research data to support or refute the re-use of bags and/or hooks.

Environmental Concerns

The SkillPro barrier bags and hooks are made of Polyethylene and Acrylonitrile Butadiene Styrene respectively and as such, are not biodegradable. Any SDS pertaining to Polyethylene and Acrylonitrile Butadiene Styrene can be accessed for information relating to specific properties.

Consumer Feedback

Comments on any aspect of this document should be submitted in writing to:-
SShuttleworth@Skillpro.au



400
360
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200
160
120
80
40
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0
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80
120
160
200
240
280
320
Explosion Barrier Loading (kg/m2)
Barrier Position - Distance From Ignition Point (m)
Suppression