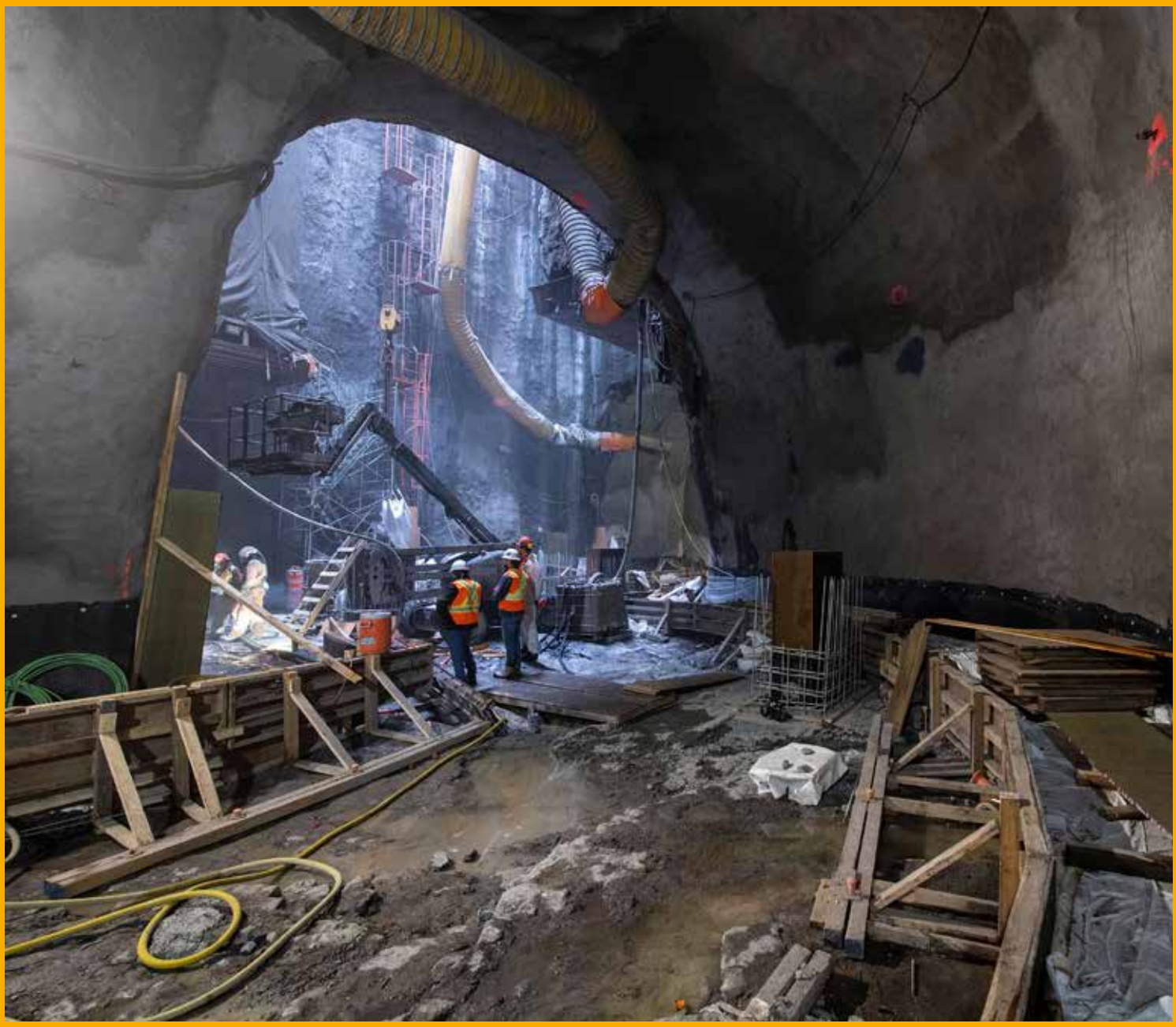

SIKA AT WORK
NEW VENTILATION TUNNELS IN MONTREAL METRO

SIKA-KING AT THE MONTREAL METRO, CANADA

BUILDING TRUST

NEW VENTILATION TUNNELS IN MONTREAL METRO

INTRODUCTION

The Montreal Metro operated by the "Société de transport de Montréal" (STM) was inaugurated in 1966. It is an entirely underground system that spans over 72 km and consists of 4 lines serving 68 stations. Each station has its own unique architecture and design, giving it an element of flare compared to other North American subway systems.

Since 2004, the STM has been investing in refurbishing the infrastructure of the underground metro. Tunnels are being repaired, new trains are replacing the older ones, elevators are being added to improve accessibility, electrical structures are being replaced, and the old ventilation system is being replaced in order to meet today's standards.

PROJECT DESCRIPTION

One of the major elements in the STM's refurbishment program is the replacement of the 53-year old ventilation system. The existing ventilation stations have reached the end of their service life and are being replaced by new, quieter, more efficient ones that meets the new safety standards and complies with the City of Montreal noise bylaws. There is a ventilation station located between every metro stop for a total of 88 over the network. A mechanical ventilation station is a large structure equipped with powerful fans designed to extract hot air from the metro network through inlets fitted with air vents. Ventilation stations built for the original metro network extract around 60,000 cubic feet of air per minute, while the new ventilation systems extract around 240,000 cubic feet per minute. Huge noise suppressors mitigate the noise from these fans to ensure quiet for residents living close to a ventilation station.

Construction of the majority of the new ventilation stations consists of the following phases:

- Excavation of a shaft from ground level to metro level
- Excavation in the rock bed by micro-blasting and road headers
- Application of steel lattice girders and shotcrete for initial ground support
- Installation of a membrane to ensure water tightness
- Installation of mechanical and electrical equipment, and construction of station's external structure on ground level

During the excavation by micro-blasting and road headers, an initial support system is installed acting as an outer lining designed to stabilize the rock. This initial support system consists of shotcrete and steel lattice archways

PROJECT REQUIREMENTS

The lining of excavation to be provided by a 135mm thick structural shotcrete steel fiber reinforced with 7d flexural strengths of 320 J at 40mm deflection (ASTM C1550), early compressive strength >0.6 MPa at 1 hour. A 38mm thick smooth finishing layer of shotcrete without fibers is required for the application of a waterproofing membrane.

SIKA-KING SOLUTION

Since 2017, Sika-King has supplied the shotcrete on all 5 ventilation station projects; Bishop, Towers, Fullum, Alexandre-DeSève and Mont-Royal, and will continue to supply future ventilation replacement projects until all 88 are completed. The shotcrete supplied on these projects is a dry-mix in pre-packaged bulk tote bags, applied using Sika Aliva® AL-252 spraying machines. The product used for the 135 mm structural layer is King MS-D3 X STC, containing pre-mixed steel fiber and accelerator. This mixture was specially formulated for this project to meet the specified mechanical requirements. The product used for the surface smoothing layer was King MS-D1, a standard shotcrete mixture without accelerator or fiber.

KING BUILDING TRUST Sika®

METRO VENTILATION TUNNELS

The contractors opted for prepackaged dry-mix instead of ready-mix shotcrete in order to eliminate lost waiting time for trucks to arrive and allowed them to work on their own schedule. Due to the varying daily schedule of shotcrete operations, timing the delivery of ready-mix trucks is challenging, especially for projects located in high traffic areas of the city. Prepackaged bags stored on site removed this problem from the equation and allowed the contractor to work on their own schedule with no lost waiting time.

SIKA-KING PRODUCTS

Aliva® AL-252
King MS-D3 X STC
King MS-D1

PROJECT PARTICIPANTS

Project Type: Ventilation shafts and tunnels for Montreal Metro
Contractors: Pomerleau
Sorel Construction
Beton Projeté M.A.H.
DeMathieu Bard
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