

Standard Muck Lifter - Tunneling Conveyor Engineering

Description

Industry: Tunneling | **Service:** Conveyor Engineering & Analysis

The Challenge

Tunneling projects vary widely in duration - from less than a year to several years - and any muck lifting system must be able to relocate and adapt to successive tunneling sites. The engineering challenge was to develop a standard, modular high-angle muck lifting conveyor system capable of handling varied shaft depths, relocating between sites, and accommodating the logistical demands of TBM (tunnel boring machine) launch and production phases.

The Solution

The Standard Muck Lifter-1 (SML1) was engineered as a modular extension of the Sandwich Belt high-angle conveyor principle, optimized specifically for tunneling applications. The system consists of a tail/loading/transition station followed by an extendable/contractible elevating structure, terminating at a combined head/drive/take-up/discharge station.

Head Station

All mechanical and electrical equipment is housed at the head station on the surface. The head station also serves as the primary structural support for the vertical lift structure, which hangs from it and carries the upper end of the tail station.

Tail Station

The tail section requires only a single, simple support point on the shaft floor. Despite its elegance and simplicity, it incorporates two alternate loading points: a main loading point onto the bottom belt, and an alternate point onto the return of the top belt. The second loading point accommodates the temporary discharge location of the trailing conveyor during the initial tunnel development phase for TBM launch.

Configuration Flexibility

The tail and head modules may be arranged in either a C-profile or S-profile configuration. Vertical lift range for the C configuration is 17.0 to 40.5 meters; for the S configuration, 19.6 to 39.7 meters. Belt and drive specifications are matched to the actual lift required at each installation - 3-ply 330 PIW belts for lifts up to 31.4 meters, 4-ply 440 PIW belts for higher lifts; drive power scaled from 255 kW up to 290 kW depending on lift height.

Design Basis

- Material: Tunnel muck, 1.6 t/m³ (100 PCF), 150 mm (5.9") minus
- Conveying rate: 800 t/h (882 STPH)
- Conveying angle: 90 degrees (vertical)
- Belt width: 1,400 mm (55.1")
- Belt speed: 3 m/s (591 FPM)
- Lift range: 17,072 to 40,536 mm (56.0 to 133.0 ft)
- Drives: Top belt and bottom belt, 55 to 90 kW (74 to 121 HP) each

Proven in the Field - Paris Metro Expansion

The SML1 was originally developed for the Paris Metro Expansion and its many TBM tunneling sites. The system was successfully proven at two TBM launch sites on Metro Line 15 TC2 - designated P1 at Lot OA802 and P2 at Lot OA813. Both systems used an S-profile, differing in elevation by 1,676 mm. P1 had a vertical lift of 24,647 mm; P2 a lift of 26,323 mm. Both used 3-ply 330 PIW belts and 75 kW drives. P2 utilized the alternate top-belt loading point during initial TBM tunnel development, then switched to main bottom-belt loading once production began. Both systems completed their muck-elevating duties and are available for adaptation to future sites.

Contact DSE to discuss conveyor engineering for your tunneling project.

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Date Created

April 20, 2026

Author

marcdossantos