



MÉTRO

The Montreal métro
a source of pride



Setting the pace in Montreal since 1966

The Montreal métro is still the pride and joy of Montrealers, more than 35 years after it was first inaugurated on October 14, 1966. Fast, pleasant and environmentally-friendly, the métro played a crucial role in the city's recent evolution. Its arrival contributed widely to the expansion of downtown Montreal, particularly along De Maisonneuve Boulevard, pieced together when the initial network was built. The métro also accelerated development of the "indoor city," a widespread underground network accessible year-round.

Montrealers waited a long time for their métro, for more than half a century in fact. From 1910 to 1960, several underground transit projects were considered, without success. The Depression of the 1930s, the belated municipalization of public transportation, as well as excessive caution by certain elected officials delayed its arrival. It was only in 1961, with the support of Mayor Jean Drapeau and Lucien Saulnier, that the project finally materialized. Its undertaking was entrusted to the City and its *Bureau du métro*, headed by chief engineer Lucien L'Allier. In no time, the basic principles that would forge the métro's reputation were set forth: the first métro to use only rubber tires, along an entirely underground network, featuring a unique architectural concept for each station.

Construction began May 23, 1962, along Berri St., south of Jarry St. Three lines were planned: an east-west line, Line 1 – Green; a north-south line, Line 2 – Orange; and a line under Mount Royal, Line 3. In 1963, plans for Line 3 were set aside in favor of a new one running below the Saint-Lawrence River: Line 4 – Yellow, that would provide access to the 1967 Expo site. When construction was at its peak, nearly 5000 workers labored throughout the huge worksite. To avoid hindering commercial activity and circulation along the city's busy streets, construction was mostly carried out under adjacent, parallel streets. General euphoria greeted the opening of the first twenty stations on October 14, 1966; six more stations were completed in the following months. The Yellow line, launched March 31, 1967, was in large part responsible for Expo 67's resounding success, with more than 50 million entries on site.

Cover page photo

Sculpture by Michel Dernuet inside Georges-Vanier station.
(Michel E. Tremblay - STM)

On October 14, 1971, five years to the day after its initial inauguration, work began on the métro's extensions. Construction was awarded to the Montreal Urban Community and the *Bureau de transport métropolitain*, headed by Gérard Gascon. The Préfontaine – Honoré-Beaugrand section, on the Green line, was completed in June 1976, just in time for the Olympic Games held that summer, while the Lionel-Groulx – Angrignon section, in the west end, was opened to the public in September 1978. On the Orange line, between Lucien-L'Allier and Côte-Vertu, work was carried out over a longer period of time, ending in 1986. Finally, a new transversal line, the 5 – Blue line, gradually became operational between 1986 and 1988. With its extensions completed, the network now consisted of 65 stations spread out over 65 km of track, with 61 km dedicated to public transit.

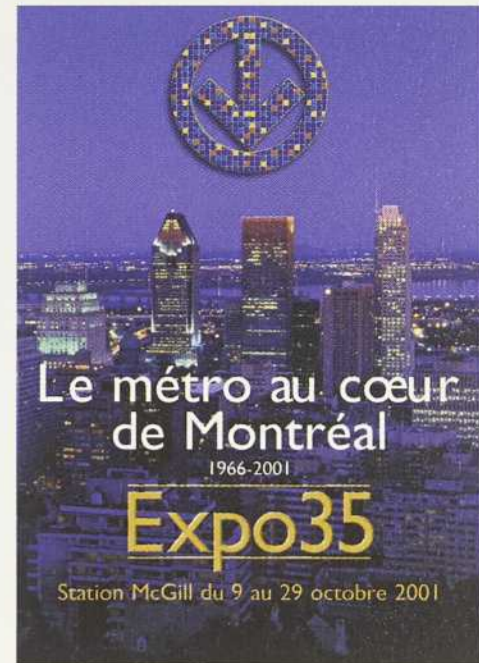
For more than 35 years, the métro has been an integral part of Montreal life. Used extensively during Expo 67, the 1976 Olympic Games and the 1984 visit by Pope John Paul II, the métro was centre stage during the "snowstorm of the century" in 1971, the famous ice storm of 1998, and many other events. Clearly, without its métro, Montreal would not be the same, especially in winter! Operated by the Société de transport de Montréal (STM), the métro is an efficient means of transportation, and this brochure outlines its main features and characteristics.



A map of the current network.



MR-63 métro cars at the Youville workshops.
(STM archives)



The métro's inauguration ceremonies,
with Mayor Jean Drapeau
in the background.
(City of Montreal – Documents and Archives)



Angrignon station under construction.
(STM archives)



Laurier station a few months before opening.
(City of Montreal – Documents and Archives)



The métro's nerve centre

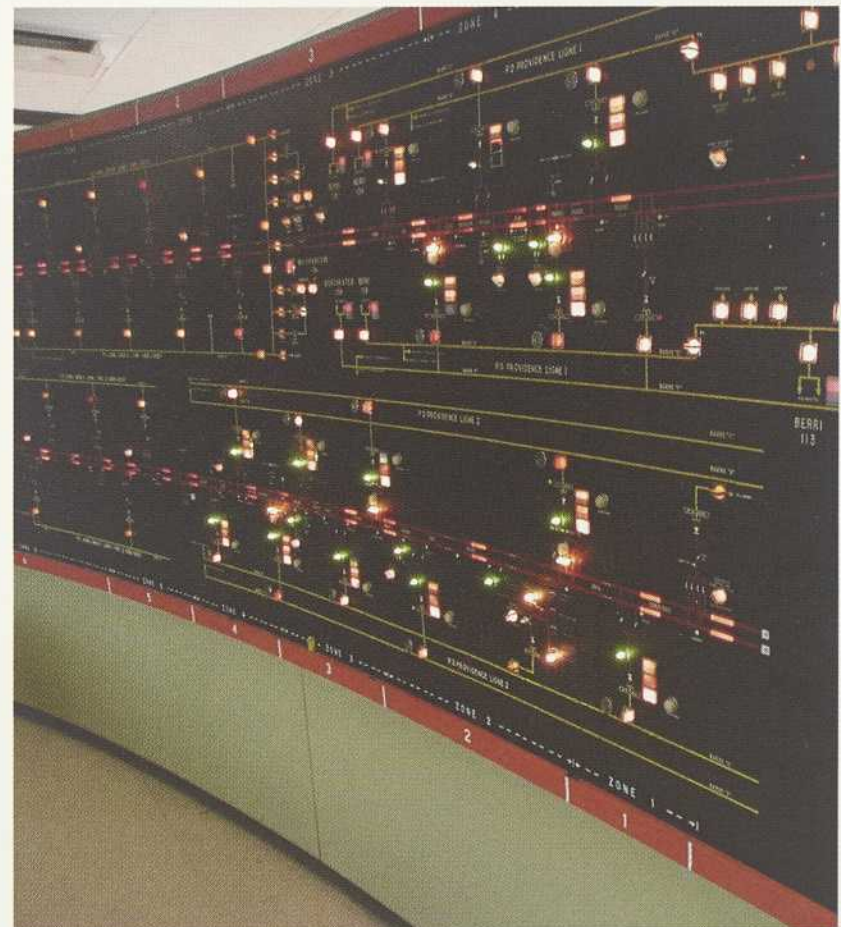
All information relating to the underground network's activities converge on the métro's Control Centre. There, a sophisticated computer system monitors the flow of trains in real time, the distribution of electrical power, the supervision of stationary equipment, as well as communications throughout the network. Implemented in the mid-80s, the computer system currently in use is the third since 1966. Day and night, highly specialized staff maintain a smoothly running system, programmed to handle 2400 fire intervention strategies.

The Control Centre team is formed of five groups: chief controllers, who oversee and coordinate all operations; Metro Communications Centre (CCM) officers, who broadcast transit user information and coordinate interventions during incidents; Surveillance Operations Centre (COS) dispatch officers, who coordinate the presence of métro officers and constables throughout the network; Power Control and Measurement (PCM) controllers, responsible for power distribution and stationary equipment supervision; and finally, Central Command and Control (PCC) traffic controllers, who monitor and regulate train operations throughout the system. In the underground network, train operators, terminus supervisors and operations supervisors maintain open channels with the Control Centre.

With an annual energy consumption of 290 million kWh (equal to 10 500 electrically heated homes), the Montreal métro is among Hydro-Québec's best customers. Six district power stations (Providence, Dickson, Lionel-Groulx, Snowdon, Saint-Michel and Legendre), 57 rectifier stations, 145 distribution substations, 110 km of traction power lines, 262 km of high voltage feeder lines and 18 inverters provide power for trains and stationary equipment, including 537 pumps and 82 ventilation units spread throughout the system. During the famous ice storm of January 1998, the métro was completely stopped for only 102 minutes.

At night, when the trains stop running, STM track crews oversee tunnel maintenance. And there is no shortage of work: 300 km of track and guide rails, 50 000 rolling parts, 190 switching gear, and 120 000 guide rail insulators that must constantly be kept in running order. To carry out that work, maintenance crews have 83 vehicles at their disposal, including 25 locotracors, 2 triage motorcars, 1 dust collector train, 1 switch broom, 50 platform cars and 4 aspirators. When day breaks and the first transit users are about to arrive, maintenance crews return their machinery to the Youville, Viau or Duvernay docking centres. The latter's facilities are located near Lionel-Groulx station, between the Green and Orange lines' connecting tracks.

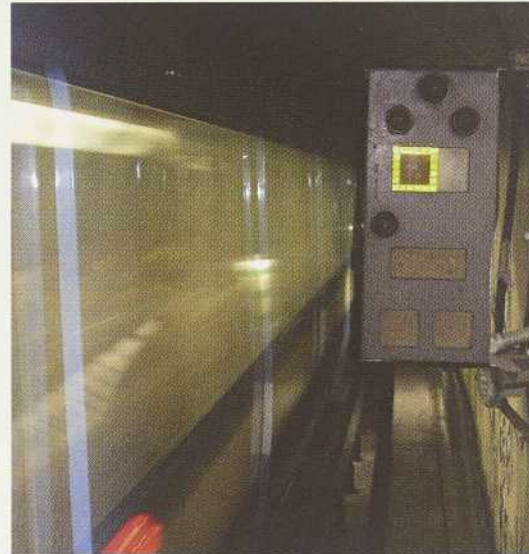
Truly the métro's nerve centre, the Control Centre strives to provide transit users with an efficient, timely and safe service. When a delay occurs at some point in the network, the Centre's computers identify the source of the disruption and regulate the waiting time at stations for other trains running on the same line. The network's public address system and the visual display boards inside the MR-73 train cars keep commuters informed of any major service delays. In case of emergency, transit users can communicate with the Control Centre at all times by using the red telephones found on all métro platforms.



PCM Visual Display Board.
(Michel E. Tremblay - STM)



PCC traffic controller before a visual display board pinpointing the flow of trains.
(Michel E. Tremblay - STM)



Tunnel wayside signalling.
(Michel E. Tremblay - STM)



Two STM surveillance officers inside Berri-UQAM station.
(Michel E. Tremblay - STM)



Ventilation units inside tunnel.
(STM Archives)



Each train platform holds at least one emergency telephone linked directly to the Control Centre.
(Michel E. Tremblay - STM)



A métro running on rubber tires

In the early 1960s, when the Montreal métro's initial network was being planned, engineers were searching for a system that could provide economical transit service to the city's central areas. They opted for a small-gauge métro running on rubber tires, similar to the one introduced in Paris a few years earlier. Their choice surprised observers, but it was fully justified. A small-gauge métro (2.5 m instead of 3.15 m) allowed for the construction of a double track inside a single tunnel measuring 7.1 m by 4.9 m, a less-expensive alternative to conventional tunnels. As for the rubber tires, capable of handling sharp inclines (up to 6.5%), they were perfectly suited to the city's rugged landscape. Most of the tunnels linking the stations are bowl-shaped, allowing trains to save on power when getting underway and braking, by the simple effect of gravity.

Still, rubber tire operations were unsuited to Québec winters, and an entirely underground network had to be built as a result. The installation of a special track, consisting of a conventional railway track of standard width (1.43 m), two reinforced concrete runways, and two lateral guide rails, also became necessary. The guide rails not only keep the trains on track, they provide 750-volt traction power to the motor cars. The high-voltage current is returned through the conventional railway track, which is used as a guide during track switching manoeuvres or when a support tire loses pressure.

The Montreal métro's rolling stock consists of 759 train cars: 336 MR-63 cars built by Canadian Vickers during the 1960s, and 423 MR-73 cars later built by Bombardier during the 1970s. Each train set consists of three units of three cars, two motor cars flanking a trailer car, and each motor car is supplied by four electric engines. A train set can consist of one, two or three units, according to operational requirements. A nine-car train has an overall length of 152.4 m, has 36 lateral double doors on each side, weighs 325 tons, and can carry up to 1260 commuters, including 360 seated. Maximum speed is 72 km/h; braking action is mainly rheostatic on MR-63 cars, and dynamic on the MR-73 model. At night, they are housed in three garages (Angrignon, Beaugrand and Saint-Charles), and in a few back-station terminals.

The work of métro operators has certainly evolved since 1966. In the beginning, each train was manned by two operators: one at the front to manually run the train, the other at the back to perform door closings. The introduction of auto-piloting in 1976 brought about the gradual conversion to single operator trains throughout the network, except on the Yellow line, where such a measure was not deemed cost-effective by the STM. Among other advantages, auto-piloting provided accurate control of train speed, duration of station stops, and back-station manoeuvres. Nevertheless, operators are always on the alert, as the slightest anomaly can have them using the emergency brake or switching to manual override, with PCC approval. Operators are also called upon to quickly troubleshoot their train should something fail. To that end, the 286 métro operators have all received over 40 days of theoretical and practical training.

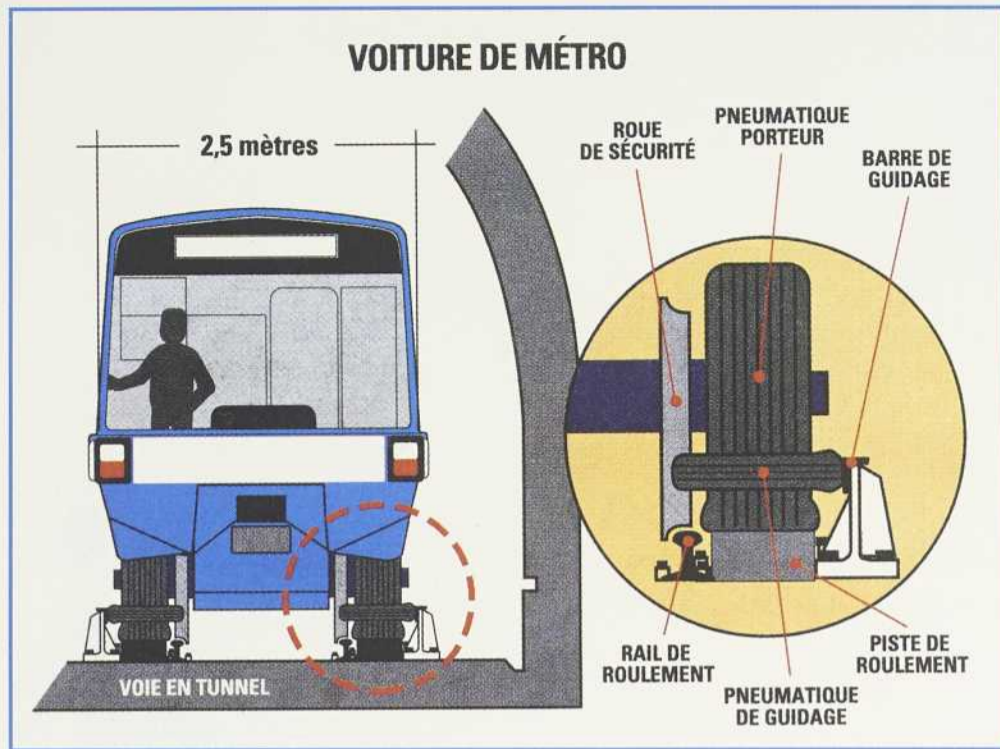
Over 400 STM employees handle minor maintenance, including vehicle inspection, performance measurements, tire inspection and replacement, and car interior cleaning, as well as perform major maintenance, such as welding, painting, and magnetic particle detection, on all 759 métro cars. Tire inspection (6000 support tires and 6000 smaller-sized steering tires) is of particular concern. The Youville workshops, north of Crémazie station, carry out both minor maintenance on the MR-73s and major maintenance on all vehicles. Minor maintenance on the MR-63s is handled at the Beaugrand shop, next to the station bearing the same name.



*Train pulling out of Jean-Talon station.
(Michel E. Tremblay - STM)*



Major maintenance on a métro car inside Youville workshops.
(STM Archives)



Métro car control panel.
(STM Archives)



Track maintenance carried out at night by métro trackmen.
(STM Archives)



Inside an MR-63 car.
(Michel E. Tremblay - STM)



Unique, colorful stations

Most of the 65 stations were excavated out of the rock bed in open-air trenches. Charlevoix is the deepest station at 29.6 m, while Angrignon and Longueuil are the most shallow, only 4.3 m below the surface. The average distance between stations is 920 m; Berri-UQAM and Jean-Drapeau are the furthest apart (2.5 km), while Peel and McGill are the closest, with only 440 m separating them. At least 3.8 m wide, train platforms are all 152.4 m long, except at Saint-Michel station, where the platform was only two-thirds completed so a control booth for train departures could be added. Four stations serve as transfer points: Berri-UQAM, Lionel-Groulx, Snowdon and Jean-Talon. The latter three stations as well as Charlevoix and De l'Église feature multilevel train platforms.

The métro's infrastructure includes 290 escalators, 2 moving sidewalks, 681 turnstiles, and 275 automatic bus transfer distribution units. Equipment is basically the same from one station to the next with respect to fare collection booths, directional signs, network maps, firefighting tools, emergency bays, lighting, public address speakers, media supports, payphones and newsstands, but the stations bear little resemblance to each other, as they were all designed by different architects. Still, wherever possible, they all favored wide open spaces, natural ventilation and lighting, making it easier for commuters to orient themselves, while creating a pleasant travel environment. Building materials such as granite, brick and ceramic tile were chosen for their durability and easy care.

The Montreal métro is also an authentic art gallery. Dozens of murals, lead glass panels and sculptures of all shapes and colors have been installed inside most stations for the enjoyment of all transit users. Although installed after the stations were opened, the artwork featured in the initial network was funded by patrons. Later, as the métro was being extended, artwork became the fruit of a close collaboration between artist and architect, and its cost was included in each station's overall budget. Several renowned Québec artists contributed to the métro's art gallery: Robert LaPalme, Jean-Paul Mousseau, Marcelle Ferron, Charles Daudelin, Frédéric Back, Jordi Bonet, Jacques de Tonnancour and Pierre Granche, to name but a few.

Stations are accessed either through an STM entryway or directly from street-level public buildings. The network's two busiest stations, Berri-UQAM and McGill, are the main gateways to the "indoor city," a vast underground pedestrian network used daily by over half a million people. More than 30 km of corridors provide access to shopping concourses, cinemas and theaters, as well as several office buildings. Without a doubt, this underground network, sheltered from the elements, is particularly appreciated during Québec's characteristically long winters. The métro is also fully integrated with the STM's bus network, and allows for fast and easy transfers to and from buses and commuter trains operated by other transit authorities in the metropolitan area.

Over 400 employees staff the fare sales and collection booths, while 150 janitors attend to station cleanliness. In addition, 160 surveillance officers maintain public order throughout the system. An entire team ready to inform transit users and intervene whenever the need arises.



*Lead glass by Marcelle Ferron at Champ-de-Mars station.
(Jean-René Archambault – STM)*



*Suspended sculpture by Pierre Granche at Namur station.
(Jean-René Archambault - STM)*



*Mural by Peter Gnass at LaSalle station.
(Michel E. Tremblay - STM)*



*Murals by Maurice Savoie by the entrance to Complexe Les Ailes, a cornerstone of the underground city.
(Michel E. Tremblay - STM)*



*Natural light shaft at Outremont station.
(Michel E. Tremblay - STM)*



*Lead glass mural by Frédéric Back at Place-des-Arts station.
(Jean-René Archambault - STM)*



Impressive statistics

On any given weekday, the Montreal métro provides an average of 700 000 trips. Since it opened in 1966, it has carried over six billion passengers, equal to the world's population. During that same period, its trains have travelled about 1.8 billion kilometers, twelve times the distance from Earth to the Sun. Its reliability is remarkable: in 2001, nearly 98% of commuters reached their destination on time. According to the American Public Transportation Association (APTA), the Montreal métro is one of the safest in North America. And, in spite of its aging rolling stock, the STM takes pride in averaging the lowest single-trip operating costs on the continent.



Each year, tens of thousands of Formula One fans transit through Jean-Drapeau station during the Canadian Grand Prix. (Michel E. Tremblay - STM)



The métro provides fast and easy access to the Olympic Stadium for major events such as the 2001 Grey Cup football game. (Michel E. Tremblay - STM)

Line Comparison Chart

Green Line	Orange Line	Yellow Line	Blue Line	Network
• Total operational length				
22.1 km	24.8 km	4.25 km	9.7 km	60.85 km
• Number of stations				
27	28	3	12	65
• Number of transfer stations				
2	4	1	2	4
• Average distance between stations				
850 m	919 m	2 125 m	882 m	922 m
• Average trip duration				
38 min	40 min	5 min	15 min	—
• Rush hour operating speed				
34 km/h	36 km/h	51 km/h	37 km/h	—
• Minimum interval				
2 min 50	2 min 50	4 min 30	3 min 45	—
• Number of trains operating during rush hour				
28	28	4	11	71
• Number of train cars operating during rush hour				
252	252	36	66	606
• 2001 ridership (millions of entries)				
98.1	89.1	8.3	19.1	214.6
• Train car-kilometers travelled in 2001 (millions)				
24.0	26.6	3.4	4.0	58.0

A promising future

Montreal's métro may seem quite young compared to the subways of London, Paris or New York, it is nevertheless showing signs of aging, and its future must be ensured. In the 1990s, major work was carried out, notably the renovation of the MR-63 train cars, the repairs to several tunnel sections, and the undertaking of the Réno-Station programme. Crucial work still awaits, with the permanent replacement of all MR-63 cars, the next phase of the Réno-Station programme, and the extensive Réno-Systèmes programme, which calls for the repair or replacement of all major stationary equipment and systems directly related to operations.

Furthermore, the network is about to be extended for the first time since the end of the 1980s. Entirely funded by the Québec government, construction work to prolong the Orange line towards Laval began in March 2002 and should be completed by 2006. Three new stations – Cartier, De la Concorde and Montmorency – and 5.2 km of tunnel will be added to the Orange line, north of Henri-Bourassa. Studies are currently underway for additional extensions south and east, along the Yellow and Blue lines.

The next few years are crucial to the future of Montreal's métro. Several major system components will be upgraded, starting with the full automation of its fare collection equipment by the end of 2004. Once everything is completed, Montrealers will have even more reason to be proud of their métro !



*On March 18, 2002, officials launched construction work to extend the métro to Laval.
(Michel E. Tremblay - STM)*



*De la Concorde station under construction.
(Agence métropolitaine de transport)*



Back cover photos

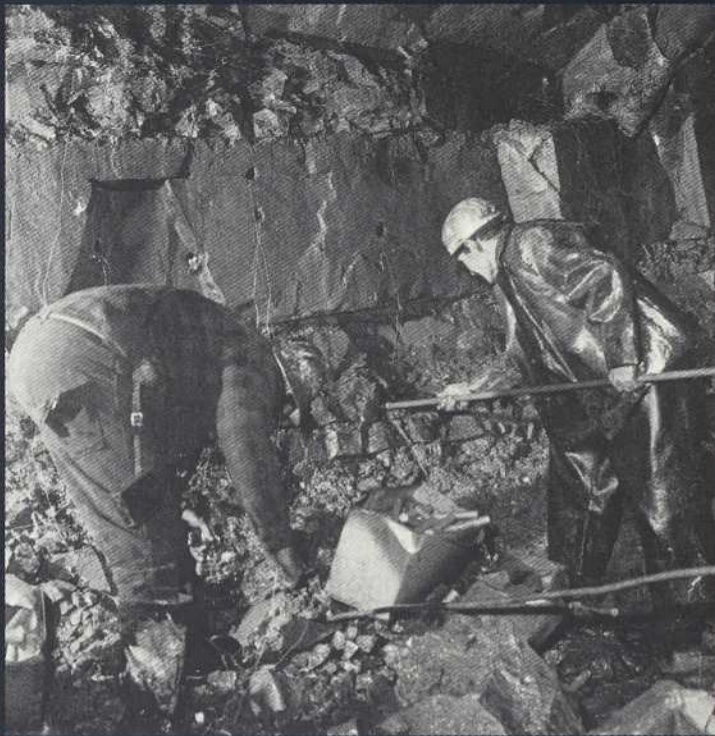
1. *Dynamite crews at work during construction of initial network.
(City of Montreal – Documents and Archives)*
2. *Lead glass and sculpture by Marcelle Ferron at Vendôme station.
(Jean-René Archambault - STM)*
3. *Part of the entryway to Frontenac station.
(Michel E. Tremblay - STM)*
4. *Honoré-Beaugrand, the Green line's terminus station.
(STM Archives)*



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