Canada

STRABAG Inc.

STRABAG
TEAMS WORK.

Building Construction Project

McArthurGlen Designer Outlet Vancouver Airport

McArthurGlen, Europe´s leading owner, developer and manager of designer outlets and Vancouver Airport Authority awarded the construction of the first Designer Outlet Center in North America to STRABAG Inc. Toronto. This Design & Build project is situated in Vancouver, more specifically on the northeast corner of Sea Island near Vancouver International Airport (YVR). McArthurGlen Designer Outlet Vancouver Airport calculated the construction of more than 699,000 ft² (376,736 ft² gross leasable area) in a prime location on YVR land for more than CAD 100 million.

STRABAG has excelled around the world in building some of the most intricate and innovative projects, including similar luxury designer outlet centers in Europe.

While reinforcing Vancouver International Airport‘s role in the economic development of British Columbia and Canada – more than 1000 new jobs were created – the project is environmentally compatible with the local area and integrates foot and cycling paths that match the existing regional trail networks of Sea Island.

1 Restauraunt and Fountain Plaza under construction/ **2** Block H framing and North Street/ **3** Main Entrance
4 Luxury plaza feat. the art peace “SEI”

Tunnel Projects

Niagara Tunnel Project

The Niagara Tunnel Project involved the excavation of a 14,4 m diameter water diversion tunnel, 10,1 km in length, up to a depth of 140 m below the surface. The tunnel intake is located in the bed of the Niagara River, 1,5 km upstream from Niagara Falls. It was excavated using an open gripper type hard rock tunnel boring machine and temporarily supported with rock bolts and shotcrete. The final lining of the tunnel included a waterproofing membrane and 60 cm thick cast-in-place concrete lining. It was prestressed by injecting annular grout behind the waterproofing layer and compressing the lining ring.

The geology in the project area consists of layers of horizontally bedded sedimentary rocks, including dolostones, dolomitic limestones, sandstones and shale. Over 60 % of the tunnel alignment passes through the Queenston Shale, a mudstone with compressive strengths ranging from 7-120 MPa.

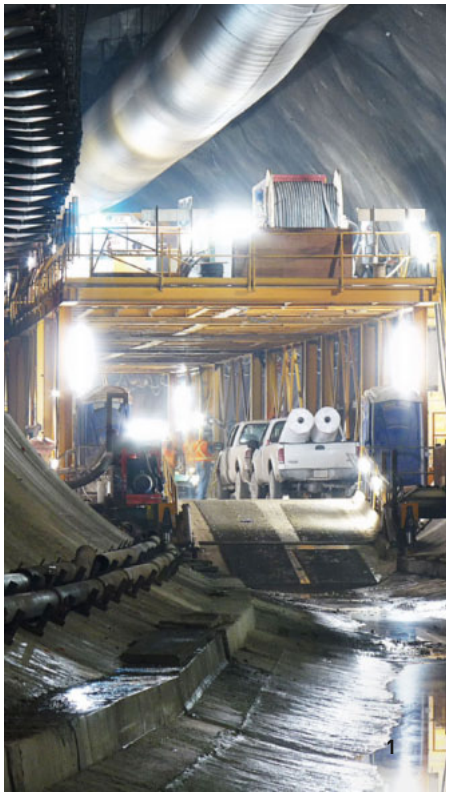
These extremely difficult geological conditions prevented standard tunnelling with what still is one of the largest hard rock TBMs in the world. Special technical measures, alterations to the TBM, and innovative solutions had to be found to continue work.

The construction of the tunnel liner included the placement of over 300.000 m³ of cast-in-place concrete and the placement of 10 million liters of annular grout. The annular grouting system was placed in two passes, the first pass provided contact between the final lining and the primary support liner and the second pass achieved prestressing of the concrete ring as a form of reinforcing the final lining.

The good cooperation and working relationship between the client (Ontario Power Generation), owner's representative and STRABAG served as foundation for the very successful conclusion of the billion dollar project from the point of view of all involved.

The Niagara Tunnel Project – our project of the century that began operations in spring of 2013 – has been chosen as the 2013 Canadian Project of the Year by the Tunnelling Association of Canada (TAC).

1 Niagara Tunnel Invert carrier / **2** 2013 Canadian Project of the Year Award / **3** "Big Becky" cutter head



Southeast Collector (SeC) Trunk Sewer

The new Southeast Collector (SeC) Trunk Sewer is a 15 km long sewer that will carry untreated sewage from York Region to a treatment plant in Durham Region in the southern part of the City of Pickering. The tunnel will also serve as a critical backup for the exiting sewer line. The sewer is excavated using four Earth Pressure Balance (EPB) tunnel boring machines, with a diameter 3.6 m. The sewer is lined with precast concrete segments and has a final inside diameter of 3.0 m. The depth of the sewer is between 5 and 40 m below ground surface. As part of the sewer system, the project includes the construction of 16 shafts, some of which are to be constructed using sealed methods in order to avoid the lowering of the groundwater table. Shaft excavation and support methods include secant pile walls, slurry walls, and lining with shotcrete (NATM). The diameter of the shafts ranges from 5 and 15 m, with depths ranging between 10 and 50 m below the surface. The final shaft structures are lined with cast-in-place concrete.

In addition to the shafts, other associated facilities are included:

- Corrosion Control Facility
- Diversion Chamber
- Odor Control Facility
- Meter Facility
- Maintenance Chambers

Mid-Halton Outfall Tunnel

The Mid-Halton Outfall Tunnel project centers on the excavation of two deep shafts and a 6.3 km rock-bored tunnel that is designed to carry treated effluent water from the Waste Water Treatment Plant (WWTP) into Lake Ontario. The Mid-Halton Wastewater Treatment Plant, located in Oakville, Ontario, is part of the densely populated and rapidly growing Greater Toronto Area. In order to meet increased demand and continue to protect the water of Lake Ontario, it became necessary to increase the plant's capacity. The Mid-Halton Outfall Tunnel will consist of two reaches: The onshore reach will span 4.1 km from a shaft at the WWTP (63 m in depth) to an intermediate shaft at Coronation Park (54 m in depth). While another 2.2 km reach will be built offshore and extends from the Coronation Park shaft to the tunnel terminus beneath Lake Ontario. The final 300 m of the offshore reach will be finished with a diffuser array (18 tunnel risers with diffuser port caps). A tunnel boring machine with an excavation diameter of 3.6 m will mainly drill through layers of shale and limestone.

The tunnel will be finished with a cast in place concrete lining that is to have a minimum internal diameter of 2.6. Additionally, a micro-hydro facility will be installed within the WWTP shaft as part of the shaft permanent works. Construction has begun in mid-July 2014 and is expected to be completed within 39 months. The approx. contract volume is CAD 79 million.

1 Finished tunnel (Precast elements)
2 Mid-Halton TBM "Peggie"
3 Tunnel excavation with road header

STRABAG Canada Inc.

Company Description

STRABAG Inc. is a fully owned subsidiary of STABAG SE and has been operating in the North American market from 2005 specifically in Canada and has executed/ is executing the projects described herein.

STRABAG Inc. in Canada has the full support of its parent company STRABAG SE in Europe, and can rely on all resources and services, which include financials, equipment, personnel technical knowledge, engineering and a vast experience in international tunneling from all branch offices and subsidiaries e.g. STRABAG AG Austria, STRABAG AG Germany, Ed. Zublin AG, Baystag GmbH and others.

STRABAG SE is one of the World‘s leading construction groups. With approximately 73,000 employees, STRABAG generated an output volume of approximately CAD $20.5 billion in 2014. From its core markets in Austria and Germany, STRABAG, via its numerous subsidiaries, is present in all countries of Eastern and South-East Europe, in selected markets in Western Europe, the Arabian Peninsula, as well as North America, Chile, Africa, China and India.

STRABAG‘s activities are as complex as the challenges facing the company and the demands placed upon it. STRABAG‘s lines of business form a range of services which covers the entire value-added chain in the construction industry: Transportation Infrastructures; Building Construction & Civil Engineering; and International & Special Divisions.

The International & Special Divisions includes the area of tunneling which comprises the construction of road and railway and utility tunnels as well as underground galleries and caverns. In this field STRABAG possess leading know-how that allows us to operate some of the world‘s largest construction sites.

In addition, ground engineering, project development, property and facility management as well as PPP projects are executed in this division.

STRABAG is one of the most highly renowned tunnel builders worldwide, with many years of experience in projects on all continents.

1 SEC Shaft 13 connection tunnel/ **2** Niagara Tunnel breakthrough 2011

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