



By Peter J. Mitterdorfer

Roadheaders continue to play an important role in tunnel excavation as is case with the Washington Dulles Airport Expansion program, which has been ongoing for several years, culminating in the construction of the underground Advanced People Mover (APM).

After completion of the Pedestrian Walkback Tunnel and the West Utility Tunnel, both constructed by Kiewit Construction Co., Washington Dulles Airport is continuing its expansion with the construction of the main tunnels required for the completion of the highly anticipated underground transportation system.

With an annual growth rate at Dulles Airport consistently among the highest in the country, the Metropolitan Washington Airports Authority (MWAA) is striving to implement an Airport Train System (ATS) that will be able to handle more airline passengers and transport them more efficiently between terminals than the current "Mobile Loungers."

The Airport Expansion Program commenced in the mid 1990s and includes many other projects aside from tunnels and stations, but for the purpose of this article we only concentrate on the excavation of tunnels, specifically focusing on the use of roadheaders. Four particular projects are therefore of particular interest:

- People Walkback Tunnel
- West Utility Tunnel
- West APM Tunnel and Stations
- East APM Tunnel and Stations

The first tunnel constructed, the Pedestrian Walkback, was a New Austrian Tunneling Method (NATM) design that is 42 ft wide, 28 ft high and 765 ft long and linked the main terminal to concourse B. This tunnel was constructed by Kiewit utilizing an AM75-M roadheader as the means for the majority of the excavation work. The AM75-M roadheader is a

robust, well proven and reliable machine with an operating weight of approximately 60 tons. Kiewit successfully completed this project in 2002 and the tunnel entered into service in 2004.

The contract for the second tunnel, the West Utility Tunnel, again a NATM design, was also awarded to Kiewit. This tunnel is 1,035 ft long, 17 ft high at the crown and 21 ft wide. Based on their positive experience with the AM75-M roadheader in the Pedestrian Walkback Tunnel, Kiewit again chose a roadheader, specifically a rebuilt and custom fitted Antraquip supplied AM 75-M, to perform the excavation of the tunnel.

This powerful tunneling machine with a 270-hp, electricaly driven transverse cutterhead, excavated the predominantly mudstone, siltstone and sandstone formation and achieved relatively high rates of production. The average advance rate within the West Utility Tunnel in material that had an unconfined compressive strength of up to 15,000 psi, was 8 to 10 ft per day. The tunnel was completed in late 2005 — ahead of schedule.

The next part of the project was the construction of the West APM tunnel and its stations. This project was awarded to Clark/Shea JV and was carried out by Clark's subsidiary, Atkinson Construction, which has extensive expertise with NATM tunnels. This project consisted of 1,881 ft of NATM twin tunnels and approximately 1,608 ft of twin cut-and-cover tunnels that could be built in areas where open-cut construction would not interfere with the ongoing activities at the airport.

Antraquip Corp., Hagerstown, Md., one of the leading manufacturers of roadheaders and tunnel support systems, was chosen to supply two rebuilt, improved and custom fitted roadheaders, Model AM 75-M, for the 15 ft, 11 in. top heading and one rebuilt AM50-M for excavation of the inverts. In addition, Atkinson used one of Antraquip's rock grinding

(cutting) attachments, mounted on a Caterpillar (CAT) 416 loader for small scaling work within the tunnels.

The cut-and-cover tunnels along with the West APM stations and other related projects, some performed by other contractors, were excavated with a combination of drill and blast, custom fitted trenching machines, hydraulic hammers and Antraquip's specialized (roadheader type) hydraulic rock cutting attachments.

These specialized hydraulic rock grinding/cutting attachments, which for the referenced projects were mounted on excavator models CAT 345, CAT 330 and CAT 325, have become increasingly popular for exact scaling and profiling but simply cannot replace the mass production that can be achieved by roadheaders. The excavation of these tunnels and stations was completed by Atkinson in the early summer of 2006.

The final stage of construction for the underground Airport Train System involved the completion of the East APM tunnel and stations. This section of the project was awarded to Atkinson/Clark/Shea JV and consisted of 880 ft of twin NATM tunnels, 4,987 ft of TBM twin tunnels and a 14,087-ft cut-and-cover tunnel.

For the NATM portion, as with the APM west tunnels, Atkinson put to use the one of the Antraquip supplied AM 75-M and the AM 50-M roadheaders. The NATM tunnels, which have the same dimension as the APM West Tunnels, were excavated with an average advance rate of 6 to 10 ft per day. Two Lovat machines drove the 20 ft TBM tunnels that eventually connected with the NATM tunnels in a 175-ft long, 50-ft deep shaft. From there the NATM tunnels were extended to connect at the airport's main terminal stations. All of the tunnel excavation was successfully completed in September 2006.



Specialized hydraulic rock grinding/cutting attachments (pictured) have become increasingly popular for exact scaling and profiling, but still fall short of the mass production that can be achieved by roadheaders.

This project at Washington Dulles Airport is just one example of the important role that roadheaders have in the North American tunnel industry today. As technology and quality control continue to improve, roadheaders are becoming ever more powerful and reliable. Roadheaders continue to offer contractors a versatile, dependable option to excavate tunnels which in this case may contribute to MWAA realizing its goal of commencing operation of its Automated Train System by 2009.

Peter J. Mitterndorfer is director of sales for Antraquip Corp., based in Hagerstown, Md.