



Mueser Rutledge
Consulting Engineers



The Russia Wharf Complex (above left) is comprised of historic buildings in a waterfront area of Boston. The graphic shows how the tunnel was constructed below the buildings, which were occupied during construction. Above is the underpinning system in August 2000.

MBTA South Boston Transitway Tunnel under Russia Wharf

Boston, MA

Foundation Engineering Services:

- Performed site investigations to inspect foundations and load test timber piles supporting historic buildings
- Design of underpinning to support facades and columns for continuously occupied structures
- Planned a laboratory test program for frozen soil testing
- Design of ground freezing system for stabilization and temporary support of the buildings
- Reviewed design of the tunnel being constructed using NATM Methods
- Designed the re-support of existing building foundations above the new tunnel in one of the buildings
- Continuous evaluation of settlement and the impact of construction on the historic structures

To connect downtown Boston with South Boston, a mile-long Massachusetts Bay Transportation Authority (MBTA) transitway tunnel was constructed. The tunnel's most challenging segment was the 400 foot-long section which passes below Russia Wharf, a complex of three 100-year-old occupied commercial buildings. The tunnel segment runs diagonally beneath two of the buildings—the Russia Building and the Graphic Arts Building—and adjacent to the Tufts Building. To minimize damage and allow the buildings to remain occupied during construction, engineers devised an unusual plan never attempted in the United States. This plan combined NATM tunneling, permanent and temporary underpinning, and the most extensive use of ground freezing ever used in the United States. Mueser Rutledge Consulting Engineers (MRCE) served as the prime foundation consultant for design of the tunnel segment. To accomplish this challenging project, MRCE performed a complex field investigation, exposed and analyzed the building foundations, and load tested the existing timber piles. Underpinning for building facades and columns was designed for limited headroom, and a laboratory program for frozen soil testing was conducted. Ground freezing temporarily supported the Graphic Arts building and prevented groundwater infiltration during construction. Permanent underpinning of the Russia Building's facades and interior columns permitted the timber piles in the tunnel alignment to be cut, while temporary underpinning supported the corner of the Tufts Building. A binocular tunnel configuration, constructed using a sequential excavation method (NATM), reduced the building area above that would be impacted and minimized building damage. As mining progressed, cut piles were supported within the tunnel initial lining. The affects of ground freezing and thawing and the impact of tunnel construction on the existing buildings were monitored carefully and adjustments made during construction using a system of jacks to lift and lower columns in the buildings. Tunnel construction was completed and ground thaw started in May 2004. MRCE won the 2005 ACEC New York State Diamond and National Engineering Excellence Award for this project.

Completion Date: 2004

Owner: MBTA Massachusetts Bay Transportation Authority