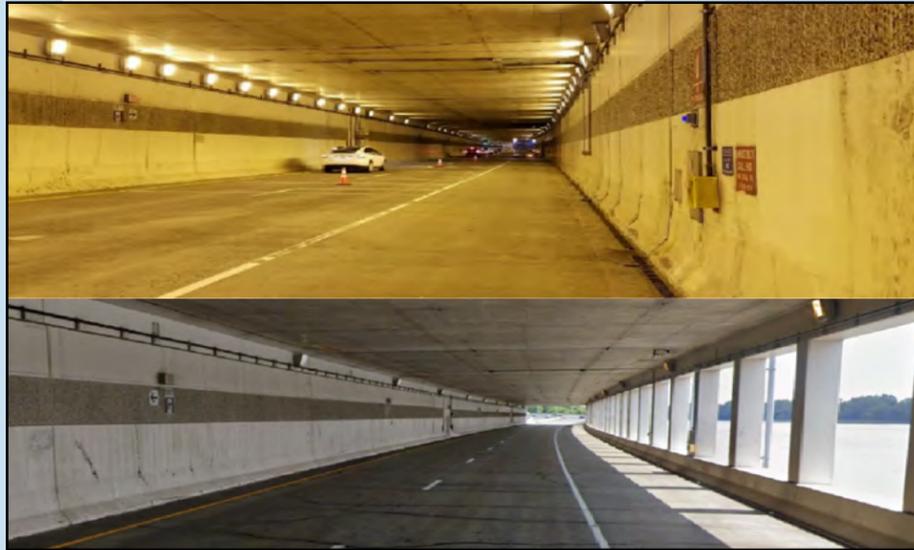


**General View of Route 29 Tunnel  
Northbound (Top) & Southbound (Bottom) Portals**



The NJ Route 29 Tunnel Northbound Roadway (top image) and Southbound Roadway (bottom image). The Northbound Roadway is full enclosed, while the Southbound Roadway consists of spandrel beams on columns on the west end of the portal, allowing a view of the Delaware River.

**Route 29 Tunnel Aerial Map  
(Trenton, NJ)**



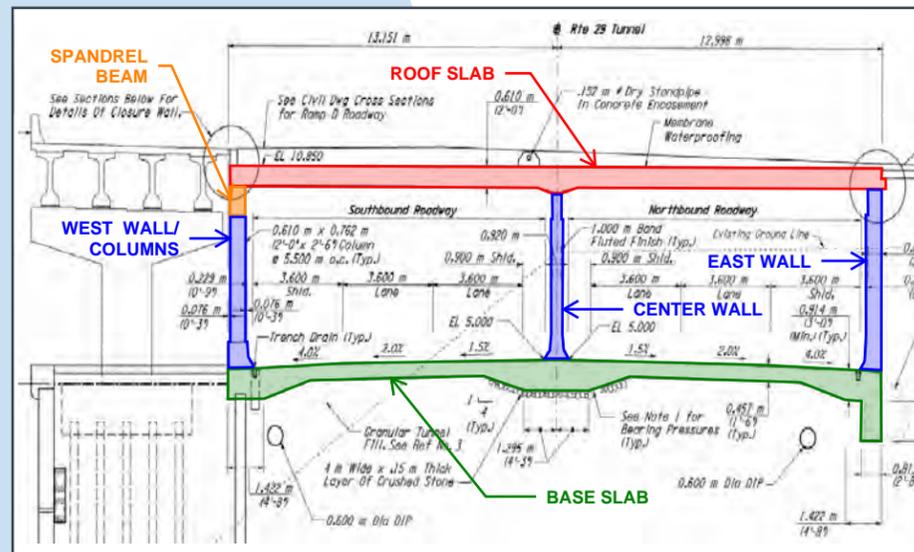
The NJ Route 29 Tunnel is located along John Fitch Way between the Riverview Cemetery and Arm & Hammer Park in Trenton, New Jersey. Access from the Southbound Roadway to Lalar Street is provided through the Ramp D Bridge, which crosses over the tunnel and subjects the frame to live load.

**South Riverwalk Park & Lamberton Street Crossing Located  
Above the Route 29 Tunnel**



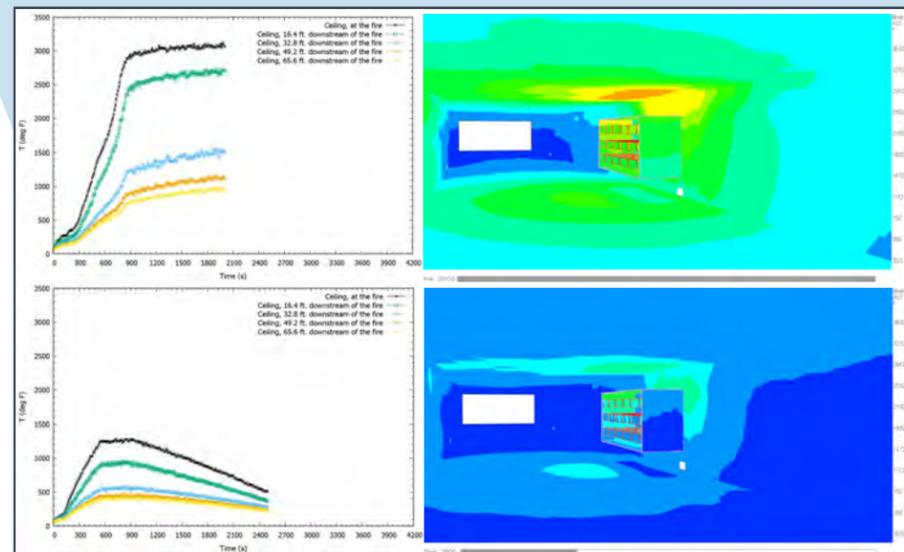
Access to the scenic South Riverwalk Park (top image) is provided by the Ramp D Bridge (bottom image) to the Lamberton Street and Lalar Street intersection. Pedestrian and vehicular live loading were considered for the analysis and load rating.

**Tunnel Cross-Section Critical Members**



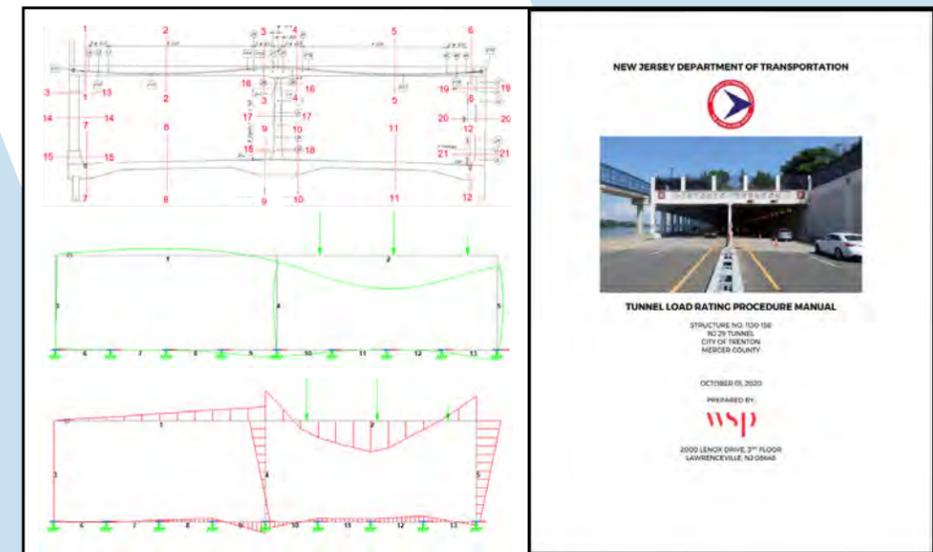
The tunnel cross section (image above) taken from the as-built plans identifies the structural members of interest for the load rating and the fire analysis.

**Tunnel Bus & Truck Fire Simulation**



Structural durability was assessed with different design fires. A truck fire was modeled in the tunnel (top right image) and adiabatic surface temperature (top left image) was measured at intervals downstream of the fire. A bus fire (bottom right image) was modeled in the tunnel and adiabatic surface temperature (bottom left image) was measured at intervals downstream of the fire. Adiabatic surface temperature was used to determine the change in structural capacity of the tunnel components.

**Tunnel Baseline Load Rating Analysis & Procedure Manual**



WSP performed the baseline tunnel load rating and developed the NJDOT Tunnel Load Rating procedure manual. Members were analyzed for bending, shear and axial forces at selected critical section locations (top left image). Live load force effects were evaluated using a 2D STAAD model, with vehicular loading assessed for both parallel and perpendicular application to the tunnel span.

