

Grand Central Case Study

Rebuilding an engineering marvel

We must rehabilitate vital and aging components of the Grand Central Train Shed and Park Avenue Tunnel and Viaduct, which make up the cornerstone of Metro-North operations, to promote a longer lifespan and reliable service for decades to come.

Grand Central Terminal platforms

A once-in-a-generation rehabilitation

Ever taken a Metro-North train into Grand Central Terminal? If so, you've walked through one of New York's most iconic buildings. But did you know that just beyond the building is an engineering wonder that's just as impressive?

A network of underground tunnels, structures, and overhead bridges stretches approximately four miles and encompasses 75 acres, with 44 train platforms and 67 tracks for moving trains in and out of the terminal. Built more than a century ago, this collection of critical, connected infrastructure formed the Grand Central Artery, which helps approximately 200,000 Metro-North riders reach their destinations each weekday.

But most of this infrastructure was built for demands of a different era. Sections originally designed to hold up horse-drawn carriages now provide structural support for Park Avenue, its cross streets and sidewalks, and 24 high-rise buildings.

The structures have held up remarkably well, under pressures they were never meant to withstand. But now the Grand Central Artery—consisting of the Grand Central Train Shed, the Park Avenue Tunnel, and Park Avenue Viaduct—is finally showing its age. Deterioration is outpacing our attempts to fix it. Without more comprehensive, aggressive intervention, this could lead to failures resulting in suspension of Metro-North service into Manhattan.

It is time to give the Grand Central Train Shed, Park Avenue Tunnel, and Park Avenue Viaduct the once-in-a-generation overhaul they need.

Grand Central Train Shed

Constructed over 110 years ago, the Grand Central Train Shed is the underground complex where trains entering the terminal are sorted to passenger platforms—just above the roof of the Grand Central Train Shed is Park Avenue and surrounding side streets.

Water infiltration from street level has led to pervasive rust and deterioration in the roof and structural support system, and the weight of trucks driving over the top of the Grand Central Train Shed along Park Avenue has compounded its damage. Corrosion and deterioration have outpaced the MTA's ongoing targeted repairs since the 1990s.

To adequately address the needs, we must replace the existing roof structure with a new one that has a 100-year service life and a state-of-the-art waterproofing system to minimize and delay future corrosion. Without this kind of comprehensive intervention, the structure could fail, forcing a suspension of all Metro-North service into Manhattan.



Metro-North trains on the viaduct north of Grand Central Terminal

All Metro-North trains use the pictured Park Avenue Viaduct, as well as the Park Avenue Tunnel and the Grand Central Train Shed to deliver passengers to Grand Central Terminal

➤ Park Avenue Tunnel

After leaving Grand Central Terminal, trains pass through the Park Avenue Tunnel, a two-mile stretch running from 57th to 97th Street. This tunnel is also over a century old and needs updating to meet modern-day safety standards.

We have a comprehensive plan to improve it, including new emergency exits, better lighting, and a modern fire protection system, including upgrading our ventilation system.

Grand Central Case Study

Park Avenue Viaduct

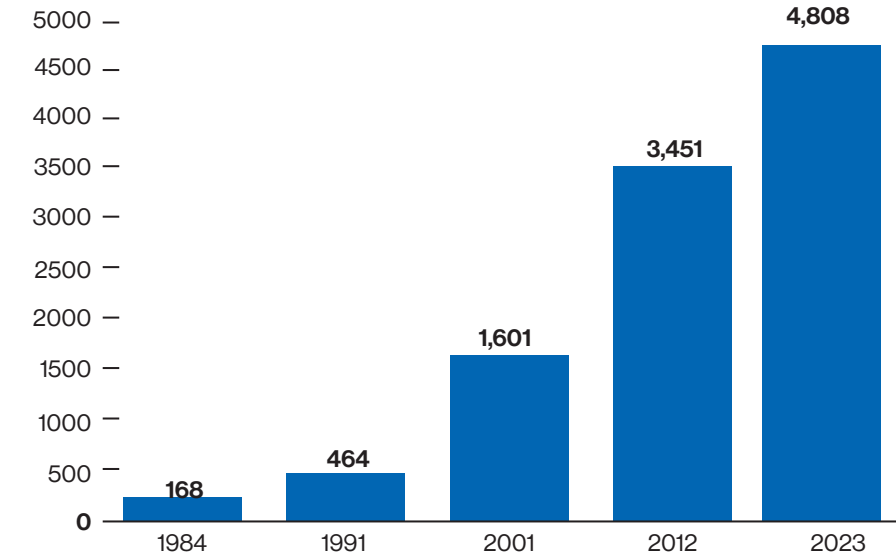
The Park Avenue Tunnel then opens up onto the Park Avenue Viaduct, the approximately 1.7 mile-long elevated structure that carries 98% of all Metro-North trains to and from Grand Central Terminal each day. All Metro-North trains traveling along the Hudson, Harlem, and New Haven lines must travel on it to serve the Harlem-125 St Station and Grand Central Terminal, making it a single point of failure for the operation. Without it, Metro-North would not be able to provide service to Manhattan for riders from the Bronx, Westchester, Putnam, and Dutchess counties, or the state of Connecticut.

Over half of the viaduct was built in the 1890s, and it now carries considerably more trains each day than it was designed to support. Targeted repairs are not sufficient to address the extent of the structural deterioration; maintenance costs are increasing each year.

Half of the segments of the viaduct's elevated steel structure running between E 110 Street and the Harlem River Lift Bridge are over 100 years old, necessitating regular maintenance and costly repairs.

We plan to replace or rehabilitate major segments of the Park Avenue Viaduct, with Phase 1 already underway from E 115 Street to E 123 Street.

Total defects by inspection year



Repair needs have proliferated in the 21st century

✓ **Maintain** the safety of the railroad and the public.

✓ **Support** local economy during construction.

✓ **Ensure** train service to and from Harlem-125 St Station and Grand Central, serving local residents and businesses.

✓ **Reduce** viaduct noise and vibration levels.

✓ **Replace** aging infrastructure and improve rail service reliability.

✓ **Improve** pedestrian safety on top of the viaduct.

We can modernize our infrastructure for faster, more reliable service sooner

By adopting a comprehensive approach and aligning with current industry design practices, we're setting the stage for key improvements that are vital to the Metro-North rail system. These upgrades will make train service safer, faster, and more efficient for the thousands who rely on access to Grand Central Terminal and New York City every day.

We're also utilizing innovative implementation strategies designed to cut down on construction time and minimize disruptions. For example, our Grand Central Train Shed replacement plan aims to finish 15-20 years ahead of schedule, saving both time and money while speeding up the use of more dependable infrastructure.

Tackling the needs of these three major, interconnected structures—the Grand Central Train Shed, Park Avenue Tunnel, and Park Avenue Viaduct—in a coordinated manner helps minimize service disruptions and secures the infrastructure for a more reliable system for years to come.