In December 2016, Judlau Contracting, Inc., a division of OHL North America (OHL NA) successfully completed work on the Metropolitan Transportation Authority’s (MTA) 72nd Street and 63rd Street stations, an integral part of New York’s new Second Avenue Subway line, which expands services on Q & F lines. Work on the two stations, valued at more than $520 million, reinforce OHL’s leadership in the transit infrastructure space and further strengthen the company’s longstanding relationship with the MTA.

The first phase of the Second Avenue Line extends the Q train service by 8.5 miles along Manhattan’s East Side and connects the 63rd Street and Broadway Lines and the new stations at 72nd Street, 86th Street and 96th Street. This project marks the first major expansion of the New York City Subway in more than 60 years.
The Second Avenue Line has even broader significance for the United States, which is facing an infrastructure crisis. While other countries have invested in modern transit systems and infrastructure projects such as high-speed rail, the U.S. has fallen behind. Growing concerns over the safety of the nation’s existing infrastructure have prompted projects such as the new $4 billion Tappan Zee Bridge, which crosses the Hudson River north of New York City, to replace the existing 62 year old bridge, one of the most decrepit in the country. Many Federal, State, and Local officials recognize the urgent need to invest in infrastructure projects and are exploring alternative financing solutions such as Public, Private Partnerships (PPP).

A PROUD DAY FOR THE CITY THAT NEVER SLEEPS

OHL NA joined New York State Governor, Andrew Cuomo, New York City Mayor, Bill De Blasio, the MTA and other officials on the New Year’s Eve inaugural ride on the Second Avenue Subway on December 31st, 2016 followed by a celebration to commemorate this historic milestone. It was a proud moment not only for those involved in the project but for the city and country. Completing the new line was a top priority for Governor Cuomo, who had firmly established the project deadline of December 2016. Despite challenges, the deadline was met and the line was ready to welcome riders.

On January 1st, 2017 New York City Transit (NYCT) inaugurated service for the public, with ridership expected to reach more than 200,000 daily, on the first phase of the line. It was an emotional day for New Yorkers. Longtime residents expressed tears of joy over the opening, many thought this day would never come. After a century of failed efforts the subway finally reached Second Avenue, improving the commutes and lives for hundreds of thousands. The new stations along Second Avenue are Americans with Disabilities Act (ADA) compliant to allow easy subway access for those with disabilities.

A century in the making. The first phase of the line, which provides service from 96th street to 63rd street, is part of the Metropolitan Transportation Authority’s (MTA) efforts to relieve congestion on Manhattan’s densely population Lexington Avenue line by 13 percent, the most crowded in the nation, which carried more than 1.3 million passengers a day. The project also reduces travel times on the upper eastside by an average of 10 minutes.

Plans for the Second Avenue Line date back nearly 100 years to the 1920’s but were stalled during the Great Depression. The project resurfaced in the 1950s and late 1960s but never completed due to ongoing financial challenges. It was not until April 2007 that the state finally broke ground on the first phase of the line.

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A fresh modern look

The new stations, at 96th, 86th, 72nd, and 63rd streets, have been praised by riders for their high ceilings, open feel, cleanliness, modern features, and custom art which decorates the ceramic-tiles throughout the stations. The 72nd Street features Vik Muniz’s “Perfect Strangers,” a series of mosaics that focus on the diverse group of New Yorkers who live and work near the station. Three dozen life sized portraits are scattered throughout the platform and mezzanine levels. Art installation was done by MTA’s Arts for Transit program.

The stations have suspended porcelain ceiling, wall tiles and unique frosted glass light fixtures.
72nd Street station entrance.

The 72nd Street Station, the busiest station on the new Second Avenue line, was the larger of the two projects completed by Judlau valued at more than $300 million.

large arched ceiling creating an open atmosphere that showcases the porcelain and modern stainless steel elements. The inviting look and feel of the new stations have been praised by passengers.

Overcoming challenges. Both the 72nd and 63rd street stations came with the typical design and construction challenges associated with large infrastructure projects. The real challenge was the location, New York’s City’s busy Upper Eastside. Among other things, this environment made site access including material deliveries and removal very challenging. Teams had to create unique methods for deliveries including a customized gantry team to assist steel construction and material handling. Timing was also an issue, the already tight deadline was made even more challenging with multiple design changes. Project teams had to carefully sequence work to ensure they were on schedule.

Judlau relied heavily on online collaboration and project management (OCPM) technology and computer aided collaborative construction. This saved time as there was no longer a need for labor-intensive communication methods between multiple subcontractors.

Platform & mezzanine concrete work. Work inside the structural shell included the platform and the mezzanine deck, built above the platform, to provide the necessary floor space for the station. The mezzanine deck is 16 feet high and spans 64 feet across the cavern and extends nearly 1000 ft, adding approximately 64,000 sq ft of floor space to the structure. In total, the entire mezzanine deck consisted of 20 concrete pours, totaling over 1.3 million pounds of rebar, over 70,000 sq ft of plywood formwork, and over 3,600 cubic yards of concrete.

Building Information Modeling (BIM) used by Judlau and partners and required by the MTA, helped the construction process and increased transparency between project teams.

Work on building the platform structure progressed underneath the mezzanine as sections were completed and stripped moving from the north to south. Additional carpenters worked in tandem with mezzanine deck work to pour the platform in 150ft long sections in two phases, the 12” thick reinforced concrete walls and then the 8” thick two way reinforced concrete deck. This included 12 concrete pours with a total of over 300,000 pounds of rebar and over 1,500 cubic yards of concrete.

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Computer Modeling. Building Information Modeling (BIM) used by Judlau and partners and required by the MTA, helped the construction process and increased transparency between project teams. The BIM’s digital modeling platform shows the functional and physical characteristics of the project. Engineers can follow the methodology of the virtual design and construction enabling multiple disciplines including architectural, structural and mechanical experts to have full insight into project at all times.

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The steel used to support the elevator cabs was designed to meet the aesthetic requirements of Architecturally Exposed Structural Steel (AESS), adding complexity to the welding process. There were four main trusses comprised of built-up steel columns with turnbuckle diagonal members that had to be hydraulically pre-tensioned to carry the hydrostatic lateral pressures on the concrete liner and seismic loading. The massive 65 ft. long trusses were carried over 400 miles by a specialized truck to Manhattan, NY. The trusses were lowered down the elevator shaft via a tandem crane pick. When the truss reached approximately 80 degrees from the horizontal plane, the tailing crane released the load and the main crane took over the entire weight of the 45,000 lb. truss and lowered it into final position. This process took four consecutive days; each truss took one day to allow enough time for the hydraulic tensioning process to begin.

The Design Engineers had specified pre-loading of 150 kips/turnbuckle rod to be applied in the field so that future seismic loads could be safely absorbed by the steel. This required a specific tensioning pattern to be carried out in stages similar to tightening bolt pattern while precisely applying the load. Air-powered hydraulic pumps and high pressure hydraulic hoses were utilized to reach the required loading.

Mechanical components. The station features two fan plants consisting of four large axial fans that make up the Tunnel Station and Smoke Management (TSSM) System. This critical life safety system, installed by Judlau, is designed to supply or exhaust air into the station during both emergency and non-emergency situations. Each fan plant is capable of moving over 120,000 Cubic Feet of air/minute and controlled by a Supervisory Control Cabinet which is operated by NYCT’s Remote Control Center (RCC). The system will work in conjunction with both the Fire Alarm systems (FAS) and Building Management System (BMS).

The TSSM is integrated with the BMS which controls the station’s Heating Ventilation and Air Conditioning (HVAC). The station’s platform, mezzanine and back of house rooms are air conditioned, which is achieved by two separate HVAC chill room plants. This is an added benefit of the modern station.

Electrical systems. The station is powered by four new facility power rooms, energy is fed into the stations by four separate electricity 13.2kV Con Edison feeders connected to transformers. The power is transferred to four strategically placed electrical distribution rooms, two at the 69th Street side and the other two at the 72nd side and Electric Power Rooms which are throughout the lower levels, both mezzanine and platform. Various systems such as HVAC, escalators and elevators, plug into these rooms to provide power to critical equipment vital to keep the station running. The station features a 3000kVA/270kW Uninterruptable Power Service (UPS), a battery system and a rectifier to ensure systems can operate if utility power is down. The Second Avenue stations have a Building Management System (BMS) that integrates across multiple systems utilizing Programmable Logic Controllers (PLC) to share data. The system integration was very complex requiring strong coordination with the MTA and a testing period to ensure the system was interfacing correctly.
Roadwork and utility restoration
Judlau was responsible for removing and replacing approximately 65,000 sq ft of concrete sidewalk, 68,000 sq ft of road base, and 200,000 sq ft of roadway between 64th Street & 74th Street. The team also completed gas and water main work and four sewer house connections as part of the project. To meet the tight deadline, Judlau added man power with crews working round the clock seven days a week. With specialized planning and execution the team was able to complete all road and utility work.

Structural work. The structural work on the project included the excavation and reconfiguration of the platforms and public access points. The station's original upper and lower platforms were converted from a one-sided platform to a center island platform configuration. Judlau constructed four new entrances for additional access along Third Avenue and 63rd Street and made modifications to the existing portions of the northern half of the platforms to prepare for Q train service and southern half for F train service. The company added five new elevators, including two street level ADA accessible elevators, two escalators, a control area, new ancillaries, and open vent structures that connect to the street surface. The ventilation systems and climate controls help the station stay approximately 10 degrees cooler during the summer months.

63rd Street Station Rehabilitation
Unlike the 72nd street station, the 63rd street station included the rehabilitation of the existing F line station that was originally built in the 1970s but never completed and abandoned for more than 40 years. The more than $220 million dollar renovation project was awarded to Judlau in January 2011 and completed in late 2016. The scope of work was similar to that of 72nd street and involved significant underground and surface level construction.

The 63rd street station included the rehabilitation of the existing F line station that was originally built in the 1970s but never completed and abandoned for more than 40 years.
Station finishes. The new 63rd street station features modern, clean finishes which have been praised by riders. Judlau was responsible for constructing and installing the interior walls and rooms, station floor, ceiling and wall treatments.

An additional feature of this project is the state-of-the-art emergency HVAC system and tunnel ventilation equipment which meet the latest fire safety standards. Similar to 72nd street, Judlau installed two integrated fan plants which are designed to operate in the event of an emergency. The team had to carefully sequence the installation and construction of the two fan plants because of spacing limitations. The ventilation system consists of four fans, 25 dampers, four motor control centers, four variable frequency drives and two supervisory control cabinets linked to a SCADA network which connects to the rail control center.

A job well done. The on-time delivery of the 72nd and 63rd street stations is a huge accomplishment for OHL NA and the Judlau team. The success of this monumental project is owed to Judlau’s industry knowhow, commitment to quality and safety and the talented group of individuals who made it all happen. When complete the Second Avenue Subway will include 16 stations and connect 125th street in Upper Manhattan with Hanover Square in Lower Manhattan.