Morgan Street CTA Station: Urban Infill Station Challenges and Solutions

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INTRODUCTION

A 1994 rehabilitation of the then 100 year old Chicago Transit Authority (CTA) Rapid Transit Green Line included plans for a new station at Morgan and Lake Streets to fill a 1.5 mile distance between adjacent stations. The gap was especially problematic given the location’s proximity to the City center, but limited project funding forced the tabling of construction of this new station and two others. As this West Loop area redeveloped, residents and businesses continuously pushed for the construction of this station, and in 1997, the Alderman secured tax increment financing (TIF) funding. The Chicago Department of Transportation (CDOT) later matched the TIF funds with Federal Congestion Mitigation and Air Quality (CMAQ) Program funding to create a $38 million overall project budget, of which $28 million funded construction. TranSystems was the Engineer of Record and Ross Barney Architects the Architect of Record.

While CTA operates this station, CDOT frequently constructs transit capital improvements, and that occurred in this situation. CDOT’s Division of Engineering was the client, but CTA the end user; each agency needed to be satisfied with and approve the design. Soon after the project started, a reconfiguration of CTA rapid transit lines increased the quantity of trains expected to use the proposed station as the new Pink Line overlaid the Green Line tracks in this area.

The Morgan Street station represented the first additional elevated station in Chicago in over 15 years. Other stations were reconstructed and rehabilitated in that period, but the fresh location afforded CDOT the opportunity to break from past, more functional and classic architectural solutions and completely change the vision and course of transit architecture/engineering in the City. The American Council of Engineering Companies agrees, and awarded this project a 2013 Engineering Excellence Award of National Recognition and the American Institute of Architects Chicago bestowed a 2012 Distinguished Building Award, Citation of Merit.

The construction of an infill station in an urban environment creates numerous challenges, and the design team developed solutions to each. This document details these challenges and solutions such that other agencies considering similar projects may benefit from our creativity and learned experience.
SITE SELECTION

Physical Location

Land comes at a high price in any urban area, and the project budget and schedule did not permit the purchase of any additional right-of-way. Complicated Federal land acquisition requirements would have delayed the project two years or more. Fortunately, a wide 80' right-of-way width on Lake Street and the location of the columns supporting the elevated track structure created a large enough zone of parking and sidewalk that could be reallocated to create a station footprint. While highly utilized, the City deemed the parking to be less publically valuable than a transit station.

With that said, driveways permeate this area, and the City directed that changes in site access/driveway relocation would be too impactful to the businesses. Between the right-of-way/travelled way constraints and the driveway locations, a small could be carved out on both the north and south sides of the street – approximately 18’x65’.

Utilities

Later, the team discovered a 36” water main running under the west side of the station buildings. We revised the design such that the foundation could be constructed over and around this main. However, the Chicago Department of Water Management felt that given the age and condition of this main, future maintenance could be significantly complicated if access was restricted in that fashion. As a result, the project included relocation of approximately 225’ of the 36” main including a valve. Two services a few blocks to the north precluded extended main shutoffs, so the cut-ins needed to be carefully orchestrated and staged. A smaller water main and some services were also replaced in conjunction with the project as part of regular infrastructure upgrades as were some telephone and electric ducts.

ARCHITECTURE

1994 Plans and Updated Design Parameters

As mentioned, the 1994 Green Line rehab originally would have constructed a station at this location, similar in appearance and function to the next few stations on the line. Fare collection would occur only on the inbound side and at the platform level; passengers wishing to go outbound would have to enter up stairs on the south side of the station, pay, enter the inbound platform, ascend another staircase, cross a bridge, descend a staircase and arrive at the outbound platform. Rotogates would provide direct exit from the outbound platform.

CDOT, at the inception of this project, determined that this circuitous navigation would not be replicated in our design as a service to outbound riders. In addition, even though passengers could enter on both sides of the station, they would need to be freely able to cross between the platforms on a bridge if desired for transfers; most other stations on this line that have two-sided fare collection do not share this feature.
Ingenuity

The team used these challenges as inspiration for an extremely novel design. The architectural vision espoused a theme of openness, executed both to provide visual clarity, and also to provide tacit indications of safety. Glazing, translucent polycarbonate, and stainless steel perforated panels comprise the primary materials. The exterior is fashioned to evoke the shadows that the elevated track structure casts on the street.

While 18’ does not provide much space, the team convinced the CTA that the width could provide adequate room for fare collection turnstiles given the passenger volumes anticipated. That determination permitted the fare collection to occur on the ground level, thus allowing just two elevators to service all station levels; other stations on the line have three or four – some in the paid and some in the unpaid areas. In addition, no elevated floor and enclosure was necessary for the turnstiles and fare vending. Together, these changes saved over $5 million over generally employed designs at comparable stations.

Furthermore, the team developed a mezzanine level, between the ground floor entry, fare collection/vending, customer assistant kiosk, etc. and the platform level. The south tower houses the electric room, and the north contains the communications, fare/revenue, toilet, and janitor’s rooms. Given the configuration of the buildings, both elevator and stair access could be provided to these spaces.

Another novel solution afforded the use of a MC18 channel section as a combination sign mount and conduit tray at the platform level. The team crafted the station structure to conceal every conduit, downspout, and plumbing pipe in the station, again contributing to the open feel.

In an effort to combat expected graffiti attempts, perforated stainless steel panels sandwich any publically reachable glazing. As such, etching becomes undesirable but transparency can be retained.
STRUCTURE

Superstructure

Initially, it was thought that extending the outbound platform east of the building and the inbound platform to the west would limit the loads on each bent to the point that strengthening of the 1890s structure would not be required. However, ground level conditions – doorways, driveways, and intersections - combined with the exit stair locations required by NFPA 130 would not allow this configuration.

The subsequent concept called for the construction of an auxiliary steel frame structure outside of the existing elevated track structural system. Certain parts of the platform load would bear on the existing bents, but these loads would be limited. Within the limits of the station buildings, the platform would cantilever off the towers. Existing spread footings could be enlarged and construction impacts to rail operations limited.

However, CTA voiced a concern that unless the track and platform rested on the same steel bents, varied live and wind loading conditions could cause excessive differential movement of the structures that could cause the gap between a berthed train and the platform to be too great.

As a result, the team pursued a more traditional design where one bent supported both tracks and platforms. Results of bent steel coupon tests conducted during the 1994 rehab were located and consulted, and it was determined that the bents could carry some additional load. Furthermore, where necessary, they could be lengthened slightly. However, all columns within the platform limits required replacement and foundation strengthening became necessary.

Replacement in place of the columns allowed us to limit the number of additional columns supporting this station; most occur at the new exit stairs. Other station rehabs along the Green Line have many additional columns within the sidewalk area to support added platform level features. The bents, track stringers, and track structure remained in place. Joints to isolate vibrations caused by the trains were added between the platforms/bents and the station buildings.

Foundations

Initially, the team pursued an enlargement of the spread footings to carry additional platform loads. Concerns about constructability and utility impacts eventually caused other systems to be evaluated. Caissons, the most traditional solution in this situation, were considered, but limited site access (the street is covered by the elevated train structure), an inability to bore directly under the column location (the end of the bent prevented it), and cost negated that idea. A micropile strengthening of the existing spread footings with a new cap eventually was chosen as the method. During construction, the contractor redesigned the system. Full removal of the existing footings allowed installation of smaller but different shaped pile caps that accommodated the use of battered micropiles.

Pedestrian/Rider Safety

During the design of this station, tragedy struck at another CTA station when a truck crashed through the front door of the Cermak/Chinatown Red Line causing fatalities. The team reevaluated our design to determine if a similar vehicular impact would cause injury or damage with our design. The location of the station buildings, immediately adjacent to the roadway driving lanes, did appear to put the station in jeopardy. As a result, a very robust reinforced concrete wall protects the roadway side of the station. The locations of the elevated structure columns also provided a degree of protection on the east and west sides of the station building.
In order to keep the project within the allowable budget, to limit the impact to operations, and to limit work outside of the immediate construction zone, the CTA decided that this station could be operated without the typical adjacent track crossover that would be associated with a station.

**Sustainability**

CDOT envisioned this project as the first LEED certified transit station. Unfortunately, the guidelines would not permit the certification of the station even though it would have met the points and prerequisite requirements necessary for at least LEED Silver. Because less than 5% of the project area is conditioned, we could not develop a full application. However sustainable, local materials were specified and sustainable construction practiced. It is expected that this station will operate for 30 years or more without any major maintenance.

**CONCLUSION**

The success of this project led CDOT to pursue the construction of at least two other new elevated stations on the CTA system, also in urbanized areas. Materials and processes chosen for this station have been replicated at both of these other locations.

Competitive bids permitted the award of two alternate bid items, both of which greatly improve the customer experience and durability of the station. The station opened on May 18, 2012, about a month ahead of schedule and 9% under budget.

Said Blair Kamin, the *Chicago Tribune* architecture critic, said the station is, “A new jewel in the West Loop’s crown.” Chicago’s Mayor Rahm Emanuel adds, “Having world class infrastructure [such as the Morgan Street station] is essential to our city’s goals of quality of life and economic opportunity for residents.”