

C&C CONSULTING ENGINEERS, LLC

1380 Soldiers Field Road, Boston, MA 02135

BRIDGE ENGINEERING

DESIGN

INSPECTION

LOAD CAPACITY RATING

STRUCTURAL ENGINEERING

DESIGN

ANALYSIS

INDEPENDENT REVIEW

CIVIL ENGINEERING

ROADWAYS

DRAINAGE

UTILITIES

SITework

TRAFFIC ENGINEERING

SIGNALIZATION

TRAFFIC ANALYSES

MPT DESIGN

PEDESTRIAN PROTECTION

LAND SURVEYING

EXISTING CONDITIONS

PROPERTY LINES

EASEMENTS

LAYOUTS

CONSTRUCTION CONTROL



Our History

In September 2000, the Boston operations of Hayden-Wegman were purchased and reorganized to become C&C Consulting Engineers, LLC (C&C). Since then we have grown tremendously over the years and our client list now includes all statewide infrastructure agencies in Massachusetts including the MassDOT, MBTA, Massport, MWRA, BWSC, City of Boston, and DCAMM. We also serve a number of federal agencies including the Food and Drug Administration, US Department of State, Massachusetts Air National Guard, and the US Army Corps of Engineers.

C&C is certified as a Disadvantaged Business Enterprise (DBE) and/or Minority-Owned Business Enterprise (MBE) in the Commonwealth of Massachusetts and the states of Connecticut, Maine, Vermont, New Hampshire, and New York. C&C is also certified as a Small and Local Business by the City of Boston.

C&C
CONSULTING ENGINEERS, LLC



Bridge inspection, load rating, and evaluation have been at the core of our expertise since our inception.

C&C inspection teams have completed hundreds of routine, special, and fracture critical inspections of bridges throughout Massachusetts, Rhode Island, and Maine. Client agencies include MassDOT, MBTA, RIDOT, MaineDOT, and the US Army Corps of Engineers. Inspection Team Leaders maintain federal certification of NHI training for "Safety Inspection of In-Service Bridges". C&C staffing levels allow simultaneous deployment of multiple teams.

C&C engineering teams have also performed numerous load capacity ratings for MassDOT, MBTA, RIDOT, and ConnDOT. Ratings include vehicular and transit loadings as necessary, and employ the latest software supplemented with manual methods when required.

Bridge Engineering

C&C bridge engineers have provided preliminary and final design of bridges, and supportive construction phase services, in Massachusetts, Rhode Island and Connecticut and Maine. We have also performed independent design reviews or value engineering for Massachusetts and the US Army Corps of Engineers.

Bridge types designed for our clients include continuous or simple spans of welded steel box girders, welded steel plate girders, steel rolled stringers, precast concrete beams, a concrete arch and cast-in-place concrete slabs.

One example of our bridge design expertise is shown in the picture below, the Quincy Approach spans for the Fore River Bridge, a Design-Build project for MassDOT. As subconsultant to the Design-Build team, C&C was responsible as the Engineer of Record for this three span continuous (164'-195'-161') design of the welded plate girders on curved alignment. We also designed the complex welded box girder supporting the approach at the lift pier.

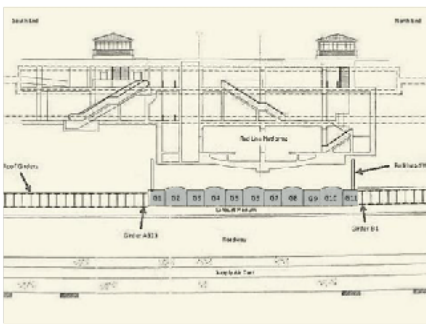




Tunnels are a special subset of structure types, typically classified as “heavy civil” or “horizontal construction”.

C&C has an extensive list of safety inspections, including transit and vehicular tunnels. C&C-led team inspections include the Silver (above), Red, Orange, Blue, and Green Lines for MBTA, and the Metropolitan Highway System Tunnels for MassDOT.

Another interesting project was our in-service inspection and evaluation of water leaks at the Red Line Underpinning of the MBTA South Station for MassDOT (below). This project leveraged our President Po-Shang Chen’s intimate personal familiarity with this tunnel, the deepest point of the CAT Program.



Structural Engineering

Structural engineers comprise the majority of our technical staff, from our President to new hires. The structural engineering services we provide include design for new construction/renovation, construction phase administration, independent review, inspection, investigation, and value engineering. Structure types range from tunnels to low-rise buildings.

Recent projects include:

- Structural design of reroofing and fall protection review for Marlborough District Courthouse, Marlborough, MA for DCAMM.
- Independent structural review of MBTA renovation of the Orange Line Maintenance Facility at Wellington.
- Value engineering review of the new MBTA Upper Busway Curved Canopy roof at Forest Hills.
- Design ‘translation’ of Fenway Center air rights foundation design into AASHTO and MassDOT criteria (below).





The coordination and design of utility relocations and protection is a major activity for C&C civil engineers.

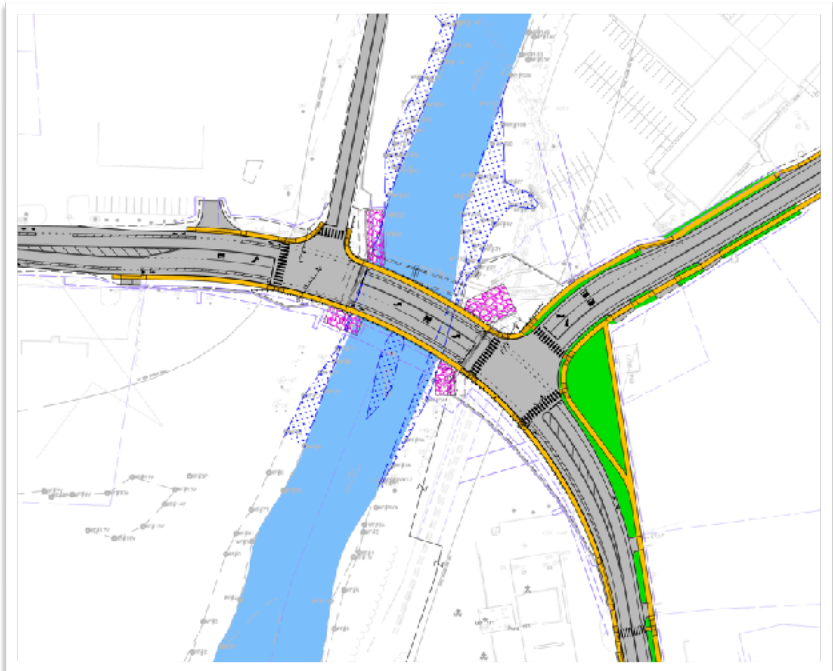
One ongoing project represented by the graphic above is the design of major accessibility improvements to MBTA's Symphony Station on the Green Line. This project involves the design of four new elevators, platform modifications, and lobby renovations. C&C's role for utility relocations required extensive Subsurface Utility Exploration (SUE) to confirm the location of the multitude of sensitive utilities. The construction project will require major excavations necessitating the protection/relocation of obstructing utilities, and phased construction under this very heavily traveled intersection between Symphony Hall and Horticultural Hall. C&C also provided topographic survey, land acquisition services, and traffic mitigation design.

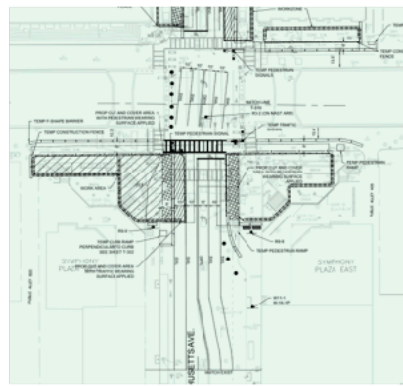
Civil Engineering

The expertise of C&C civil engineers covers a diverse skillset, from roadway design, to drainage and sitework design, and the coordination, investigation, design of utility services.

One ongoing project that exemplifies the full range of this expertise the final design and construction phase services for the replacement of the Southwick Road Bridge over the Little River in Westfield, MA depicted in the graphic below.

C&C bridge engineers designed the new welded box girder structure while C&C civil engineers designed the vertical and horizontal realignment of Southwick Road (State Route 10) to mitigate the sharp curvature of the roadway. This project design for MassDOT required modification and integration of signalization for two local road intersections framing the bridge, extensive coordination of drainage, water, power and communications utilities, accommodation of future bike path planning by the City, together with development of easements, land takings, and a new State Highway Layout. The project is in construction, and C&C is providing construction phase services.





The Maintenance and Protection of Traffic (MPT) operations is a critical concern for most projects in the urban environment.

Our current MBTA Symphony Station project featured on our Civil Engineering page requires major relocations of critical underground utility lines at the very heavily traveled intersection of Massachusetts Avenue and Huntington Avenue, between Symphony Hall and Horticultural Hall. These utilities, as well as the improvements to the transit station, cannot be accessed without careful planning to maintain continuous traffic operations.

The graphic shown above is one segment of one phase of the MPT plan designed by C&C to accommodate Massachusetts Avenue traffic between secant-pile-supported excavations with "cut and cover" decking to facilitate traffic circulation around the construction site.

Traffic Engineering

C&C has extensive experience with the analysis of traffic patterns, design of mitigation measures to improve traffic operations, and design of complex integrated signalization.

For one demanding project, C&C prepared the Functional Design Report to comply with the requirements for traffic capacity analysis in support of the major rehabilitation of the Longfellow Bridge between Boston and Cambridge. This historic multimodal transportation link carries vehicular, bicycle, and pedestrian traffic, in addition to two MBTA Red Line transit tracks.

The Functional Design Report concentrated on the capacity and level of service on all project roadways and approaches during the multiple construction phases. C&C analyzed four alternatives for construction phasing and their effects on the Charles Circle intersection. Shown in the aerial photo below, Charles Circle is located at the east end of the Longfellow Bridge with multiple turning movements, and is under the Charles/MGH MBTA Red Line Station.





C&C survey crews have performed countless existing conditions surveys. These include corridor surveys for roadways/rail/tunnels, site surveys for building facilities or heavy civil works, or special engineering surveys of bridges.

For one project, C&C was contracted to prepare a survey basemap along Route 2 from the Route 2/2A intersection in Greenfield to the French King Bridge over the Connecticut River at the Erving Town Line, a total of 4.1 miles. Detail policemen, safety cones and signage were necessary throughout the site as safety precautions due to heavy traffic along Route 2.

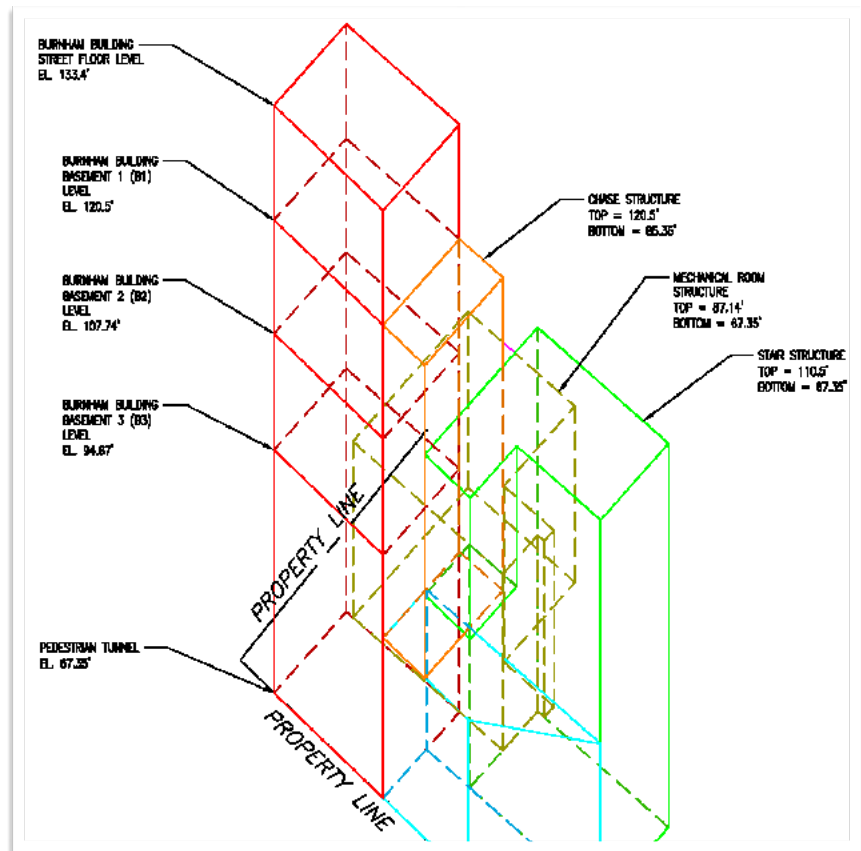
Another project included topographic, property line, and bridge detail survey of 11 bridges spanning over the MassTurnpike, from Harrison Avenue to Beacon Street. Survey coverage included the 800-foot length of local roads, and included the rail corridor details such as track elevations under each bridge. The prime consultant utilized the base plan and survey to develop their study of rehabilitation options for each of the bridges.

Land Surveying

The development of property lines, easements and their modification by land takings requires a high order of expertise. Adding the third dimension of depth multiplies the necessary technical proficiency.

One of C&C's projects for the MBTA was to support the Redundant Elevators Program. At each transit station, a closed traverse was established at the surface level and descended as much as three levels below grade to the lowest portions of each station. On each level, accurate horizontal and vertical temporary benchmarks were established to set the floor elevation and horizontal placement of each level. Once the traverse survey had been checked and balanced, a detailed survey was conducted specifically in the areas of each floor where the proposed elevators were to be constructed.

During the project design phase, C&C then developed volumetric (3D) easement and land taking plans to accommodate the subgrade space requirements for the new elevator shafts and walkways, as depicted below.





Po-Shang Chen, PhD, PE, is the co-founder and President of C&C Consulting Engineers, LLC, and recipient of the BSCES 2022 Engineer of the Year award.

Dr. Chen has over 40 years of technical and management experience for structural design projects and construction phase services. He has contributed to many notable transportation projects in Boston and abroad. Prior to forming C&C Consulting Engineers, LLC in September 2000, he had served as a Senior Project Manager and Chief Structural Engineer for several national firms with offices in Boston. He supervised and coordinated the design of underground tunnels, bridges, cofferdams, high-rise buildings, hospitals, parking garages and arena structures.

He also serves as an instructor in graduate level structural engineering courses at Tufts University's College of Engineering.

Certifications

CITY OF BOSTON - Small Business Enterprise and Small Local Business Enterprise

MASSACHUSETTS SUPPLIER DIVERSITY OFFICE - MBE

MASSACHUSETTS UNIFIED CERTIFICATION PROGRAM - DBE

RHODE ISLAND OFFICE OF DIVERSITY, EQUITY AND OPPORTUNITY - DBE & MBE

NEW HAMPSHIRE DOT - DBE

MAINE DOT - DBE

NEW YORK STATE UNIFIED CERTIFICATION PROGRAM - DBE

MASSACHUSETTS DOT PREQUALIFICATIONS:

- Complex Bridge Design/Rating
- Intermediate Bridge Design/Rating
- Basic Bridge Design/Rating
- NBIS Bridge Inspection
- Intermediate Roadway Design
- Basic Roadway Design
- Traffic Operations Studies and Design
- Construction Oversight
- Layout Document Preparation
- Total Station AutoCAD Base Plan Services
- Engineering Field Survey