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Foundation Specialty Contractor



East Coast Slurry Company is a Specialty Foundation Contractor, located in Stoughton, Massachusetts. Since our founding in 2003, we have been a premier contractor in the design and installation of specialty deep foundations. We offer practical, cost effective solutions throughout the northeast, when deep foundations are needed. We pride ourselves in being innovators and problem solvers and we believe in fostering a team approach with our clients and the project consultants, so that all the parties work together for the achievement of common goals.

Our areas of expertise include the construction of reinforced concrete slurry walls, SPTC slurry walls, slurry load bearing elements, slurry trench cut-off walls, and drilled shafts. Collectively, our staff has many decades of experience in the field of specialty deep foundations.

East Coast Slurry's success is founded on building strong client relationships and by finding innovative foundation solutions. Our goal has always been and will always be to give our clients the best the industry has to offer, in terms of safety in the work place, state of the art technology, equipment, quality control, cost control, and timely completion. Our knowledge of subsurface conditions in the northeast enables East Coast Slurry to provide aggressive cost proposals and completion schedules, even for the most technically challenging sites.

Completed projects include a variety of applications, from 2,100 linear feet of temporary earth support with four levels of tiebacks for Harvard University to a hazardous waste containment barrier on an old waterfront manufacturing site, from circular self supporting slurry wall access shafts for a TBM tunneling project to drilled shaft foundations for a national infectious disease laboratory. We have also completed numerous deep slurry wall foundation projects for five or more levels of underground parking and research facilities, using top down construction methods. Our clients will attest to the quality of our work.

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Foundation Specialty Contractor

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Turner Construction Company
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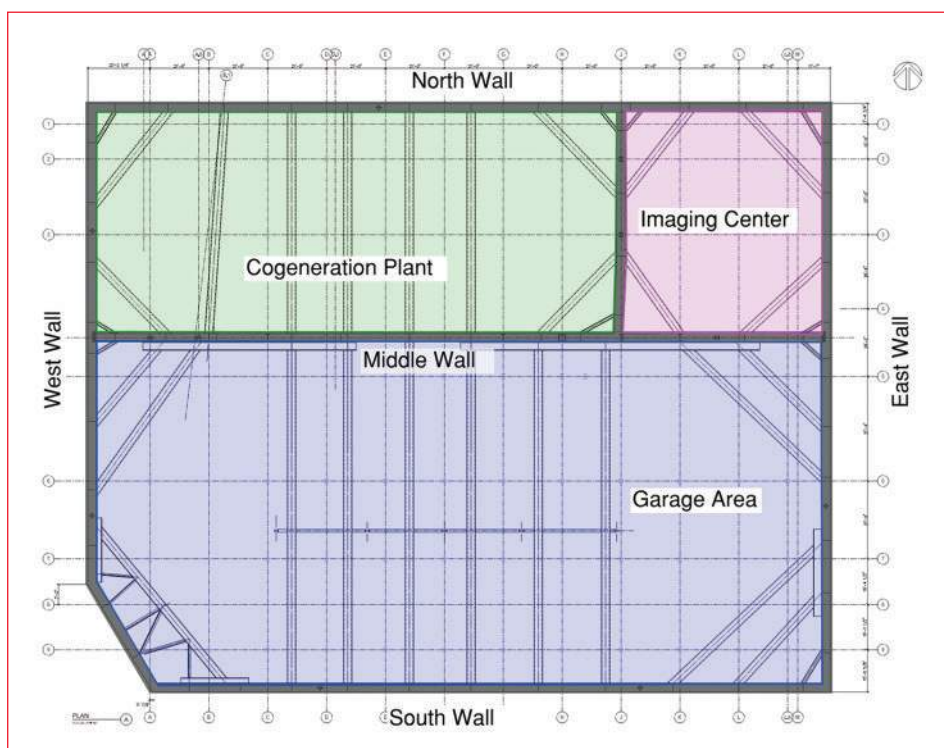
Slurry Wall Design with Soil Structure Interaction

Brigham Building for the Future (BBF) is located in the Brigham and Women's Longwood Medical Campus of Boston. Once completed, the building will serve as a biomedical research center and clinical facility with the goal of being the most technologically advanced facility in the country.

The building is 11 stories and will feature a roof garden. The below-grade portion of the building has a footprint of 265 ft by 210 ft (80.7 m by 64 m) and is divided into three areas: a six story garage, a cogeneration plant and an imaging center. BBF was designed and is being constructed

to achieve LEED Gold certification and will have high efficiency and improved sustainability as a medical facility. The ground breaking was in May 2013. Below grade construction was completed in April 2014 and the entire building will be finished in late 2016.

The garage area has the largest footprint: 265 ft (80.7 m) wide and 125 ft (38.1 m) long. The lowest floor of the garage is located approximately 70 ft (21.3 m) below grade. The cogeneration plant (cogen) is about 190 ft (57.9 m) wide, 85 ft (25.9 m) long and 50 ft (15.2 m) deep. The imaging center is the smallest of the three areas at 75 ft by 85 ft (22.9 m by 25.9 m) and 22 ft (6.7 m) deep. The areas are separated and bounded by 3 ft (0.9 m) thick slurry walls.



Plan view of BBF below grade building and temporary bracing layout

Wall Loading

The perimeter and inner slurry walls were designed to support column loads from the above grade structures, lateral soil pressures and earthquake loads according to the building's permanent condition requirements. However, the contractor was required to design the temporary bracing and the reinforcement for the slurry walls to resist construction stage loadings.

AUTHORS

Meeok Kim, P.E., Ph.D., and Gordon Chen, P.E., Thornton Tomasetti, and Nino Catalano, P.E., East Coast Slurry Company

During the construction phase, the slurry wall with a temporary bracing system served as part of the support of excavation (SOE) system. The successive excavation and bracing installation and below grade structure construction, including footings, basement floors and ramps, and bracing removal produced a considerably different structural demand for the slurry walls compared to the permanent condition. In addition, the sequential excavation and construction of the three different areas added other variables for the assessment and design of the system.

Finite element analysis was used to evaluate the stress and performance of the slurry walls and of the temporary bracing as a SOE system. Staged analysis was used to understand and predict the complicated behavior of the system caused by the sequence of excavation and construction in each area.

Project Site

The site was previously occupied by Massachusetts Mental Health Center buildings until early 2011, and was used as a paved parking lot before the inauguration of BBF construction. The north and south sides of the site are abutted respectively by Brigham and Women's Hospital Shapiro Center, a 10-story building, and Roxbury Tenants of Harvard Tower, a complex consisting of 10- to 13-story buildings.

From subsurface explorations conducted at the site from 2005 to 2013, it was seen that the thickness of the fill significantly varies from 3 to 24 ft (0.9 to 7.3 m). Organic deposits encountered below the fill are not present in the whole area but appear in the western part of the site. Marine deposits beneath the fill or organic deposits consist of soft to hard sandy clay and/or medium dense to very dense silty sand. Glaciofluvial deposits,

Slightly- to highly-weathered bedrock is located 79 to 91 ft (24.1 to 27.7 m) below the ground surface. The ground water table was observed to be between 8 and 21 ft (2.4 and 6.4 m) below ground surface.

Design Challenges

Although the subsurface exploration did not indicate the existence of problematic or difficult soil for the excavation, several challenges were encountered during the design phase. The biggest challenge was to develop a thorough understanding of the effect of the nearly concurrent sequence of excavation and construction on the structural behavior of each of the three areas of the building. In addition, the sequence of construction of the below grade structures, including foundations, columns and slabs, and removal of the temporary bracing in different areas and at different times, had to be carefully evaluated for the design. The excavation depths were up to 76 ft (23.2 m) for the garage, including the excavations for the spread footings, 58 ft (17.7 m) in the cogen area and 28 ft (8.5 m) in the imaging area.

The proposed up-up construction added another difficulty. Up-up construction is a relatively new term in the industry. It describes the simultaneous construction of below grade and above grade structures by erecting the structural columns as soon as the excavation and footings are completed, which reduces

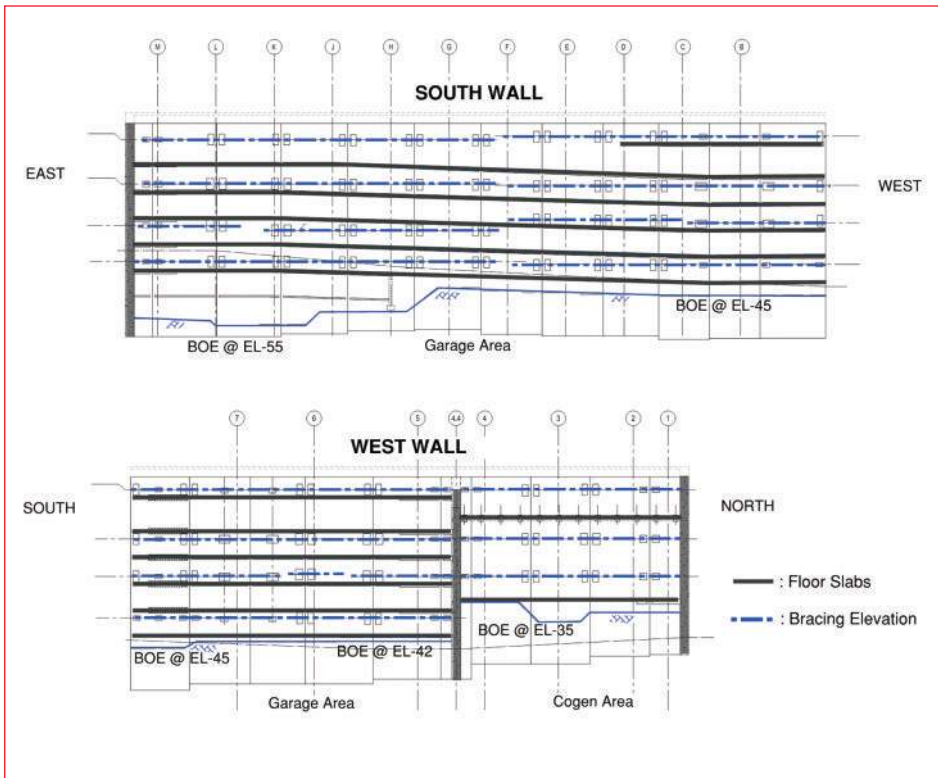


Subsurface profile of BBF site

Stratum	Top of Stratum
Fill	Grade Level (EL 22 to EL 26)
Organic Deposits	EL 9 to EL 14
Marine Deposits	EL 0 to EL 22
Glaciofluvial	EL -15 to EL 10
Glacial Till	EL -45 to EL -24
Bedrock	EL -69 to EL -54

found below the Marine deposits, consist of medium dense to very dense sand with gravel and frequent cobbles. The Glaciofluvial exhibits high Standard Penetration Test (SPT)-N values, from 6 to 100. Glacial Till, composed of very dense sandy silt with gravel, was encountered below the Glaciofluvial deposit and above the bedrock. SPT-N values in this deposit were consistently close to or over 100.





Elevation views of south and west wall with temporary bracing system

construction time significantly. However, the method requires that the bracing members of the SOE system be positioned to not interfere with the structural column installation. The method also requires expedited construction of the spread footings over the entire area for columns to be placed quickly.

The SOE system for BBF had to be cost effective and efficient to execute in the field

with proper redundancy and an adequate safety factor to resist possible unknown variables during excavation and construction. These design challenges were met by a thorough understanding of soil-structure interaction as well as anticipating how different areas of excavation would affect each other during the construction processes.

System Layout

The foundation design team collaborated to produce a four-level bracing system for the 76 ft (23.2 m) excavation of the parking garage area and a three-level bracing system for the 58 ft (17.7 m) excavation of the cogen area. The 28 ft (8.5 m) excavation of the imaging center area was designed with one level of bracing.

The bracing layout for the three areas was coordinated to allow the axial force of the struts to pass through the intermediate walls between the garage, cogen and imaging areas. This facilitated minimal impact on the middle slurry wall. It also eliminated or reduced the need for external and internal wale beams, thus allowing for lighter steel sections and less reinforcement in the slurry wall. The coordination of the bracing system between three areas also

included selecting strut elevations to eliminate additional shear forces in the slurry wall.

Excavation and Construction Sequence

To meet construction sequence requirements, the imaging center area was used as an excavation equipment working platform for the garage and cogen area excavations, and therefore was excavated last.

The subgrade excavation was set 2 ft (0.6 m) below the center line of each bracing level. A detailed construction sequence follows:

1. Garage: Excavate to subgrade and install bracing up to 2nd level
2. Cogen: Excavate to subgrade and install bracing up to 2nd level
 - Garage: Excavate to subgrade and install bracing up to 4th level
3. Cogen: Excavate to subgrade and install 3rd level bracing and excavate to BOE
 - Garage: Excavate to BOE
 - Imaging: Install Load Bearing Elements (LBEs)
4. Garage and Cogen: Install footings and columns
 - Imaging: Excavate and install bracing and columns
5. Cogen and Imaging: Install slab on grade
 - Garage: Install slab on grade and six floors
6. Garage: Remove 4th level bracing
7. Install ground floor in cogen and imaging
8. Garage: Install 4th and 5th floors and remove 3rd level bracing
9. Garage: Install 3rd and 2nd floors except ramps in the middle
10. Install 2nd floor in garage, cogen and imaging areas
11. Garage: Remove 2nd level bracing and install the middle ramps for 2nd and 3rd floors
 - Cogen: Remove 2nd and 3rd level bracing
12. Install level 1 floor and remove 1st level bracing in all areas

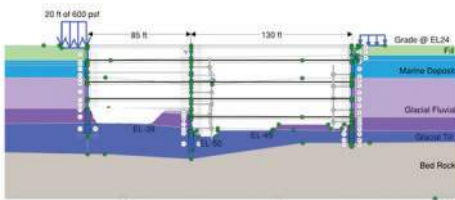
Preparing for slurry wall installation



Analysis and Design

The two-dimensional finite element program, Plaxis, was used to simulate the differential excavation and bracing installation sequences between areas and their coupled behaviors. Also, the finite element model (FEM) was set up to allow the authors to evaluate how the soil and the structural system interacted during the excavation and construction phases. The FEM indicated that the soil-structure interaction was often governed by nonlinear material behavior of the soils with respect to the structure's flexural and axial stiffness. A hardening soil model was employed to represent the soils. This was based on accumulated experience, and comparison between predicted and field measurements of past projects and their back analyses along with existing literature.

Plaxis numerical model for garage and cogen excavation



Stratum	γ pcf	ϕ degree	C_u psf	E_{50}^{ref} ksf
Fill	120	31	-	300
Marine Deposits	120	33	-	500
Glaciofluvial	125	36	-	800
Glacial Till	135	38	100	1100

Input Parameters of Hardening Soil Model

When the wall of the excavation support system is a reinforced concrete diaphragm wall (slurry wall), the realistic presentation of the wall can be crucial to predict the lateral displacement and structural demand. The main reason is that the stiffness of the wall diminishes as the wall experiences deformation due to cracks that develop on the tension side. The stiffness of the wall is one of the main variables that affect the soil movement, which in turn, affects the lateral pressure on the wall. Overestimation of the slurry wall stiffness could result in higher bending moments and underestimation of lateral displacement. Conversely, underestimation of the slurry wall stiffness will produce smaller bending moments and larger displacements when it is associated with soil deformation and stresses. Similar attention should be paid to the estimation of strut stiffness, since the reaction and section size of the bracing system is coupled. Therefore, iterative analyses were conducted to estimate the correct stiffness for struts and slurry walls in the final numerical analyses. Stages of the analysis were performed based on the excavation and construction sequences.

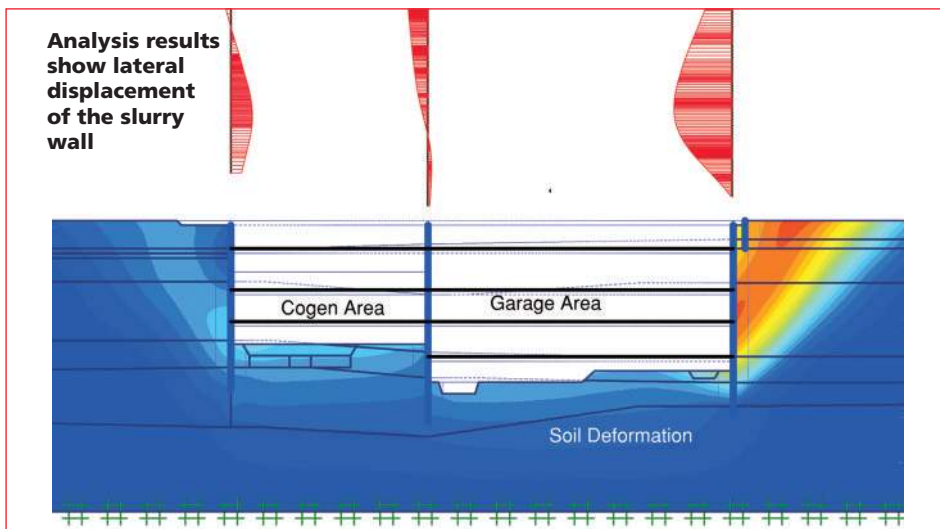
The lateral movement of the middle wall through the excavation stages demonstrated the interaction of adjacent excavations. The middle wall initially deformed toward the garage area, similar to the south wall, prior to the excavation in the cogen area, and started to move back to the cogen area as the excavation in the cogen area progressed. The lateral



displacement of the south wall is affected not only by the soil movement behind the wall but also by the excavation of the cogen area. The envelopes of slurry wall and bracing system structural responses throughout the staged analysis provided maximum bending moment, shear, and axial force for the slurry wall reinforcement design and the bracing system design.

Comparison with Monitoring Data

A comparison was made between predicted and actual wall displacements of the south and north walls when excavation was completed to subgrade EL. -40 and EL. -30 respectively. The field measurements over a period of time clearly showed how the south wall moved toward the excavation, while the north wall moved away. Overall, the predicted displacements were in good agreement with the field measurements. However, some differences between the numerical prediction and the actual wall movement were observed, especially at the top and bottom portion of the walls.





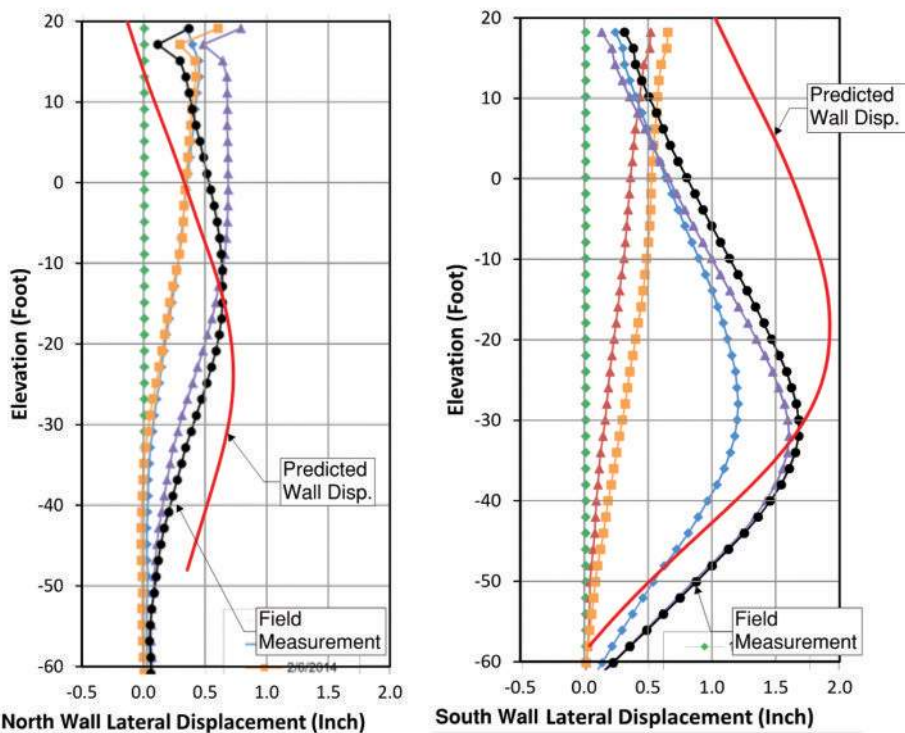
Footing installation in the braced excavation

One of the main reasons for the discrepancy between the numerical model section location and field measurement location is that in the numerical model, slurry wall depth and soil strata were averaged out for certain segments. However, in the field, the final depths of the panels were adjusted based on the actual glacial till/bed rock elevations. Another reason is the variation of mass excavation sequences between what was assumed and actually occurred in the field. Also, the difference in surcharge loads between the field and design assumptions could have contributed to the discrepancy. For example, the surcharge loads in the field vary from about 0 to 600 psf (0 to 0.9 KPa) depending on the construction activity while the loads for the design were assumed to be constant 250 or 600 psf (0.4 to 0.9 KPa). Lastly, the engineering interpretation of soil properties including stiffness and the numerical presentation of soil behavior cannot exactly reflect the soil's actual response to the construction activities.

Concluding Remarks

The employment of a finite element computer model which analyzes the soil-structure interaction was proven to be a necessary tool to evaluate soil and structural behavior in the design of a complex underground structure. Representative simulation and realistic evaluation of the slurry wall as a support of excavation system helped the designers to understand the complicated structural response to the soil movement. The numerical simulation of staged excavations, combined with observation of field monitoring data, confirmed the coupled behavior of adjacent excavations and interaction between soil and structures. A close agreement between the predicted wall displacements and actual measurements indicated satisfactory accuracy of the analysis. However, the design team recognizes a need for improvements in order to produce more accurate simulations, especially in soil and slurry wall stiffness estimation. Back analyses closely following actual excavation/ construction sequences and calibrated material inputs for soil and structure may be helpful for future analysis and design practice.

Comparison of predicted lateral displacement and measurement



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Digging Deep For Research

Work on 100-foot-deep slurry wall sets stage for construction of Life Science center

BY PAUL FOURNIER

Workers are excavating an 80-foot to 100-foot-deep slurry wall in Boston's Longwood Medical Area to set the stage for construction of the Center For Life Science, the city's largest medical research building.

Under the construction management of Danvers, Mass.-based William A. Berry & Son, contractor East Coast Slurry is building the perimeter wall that is essential to the use of the up/down construction method planned for the facility.

This method calls for the simultaneous erection of the 18-story above-grade tower and the construction of six stories of underground parking structure.

For the slurry wall excavation, East Coast Slurry is using two large cranes – a 90-ton Sennebogen Bauer and a Manitowoc 666 – each equipped with 12-ton clamshell buckets designed especially for digging narrow, deep trenches. As the digging proceeds, the Stoughton, Mass., contractor injects bentonite clay slurry into the trench to prevent the sides of the 3-foot-wide trench from caving in. The contractor is building about 900 linear feet of the deep wall.

While the trench is being excavated, another contractor, Regis Steel Corp. of Braintree, Mass., is fabricating the sectional steel rebar cages for the concrete wall. Ready mix is tremied into trench sections measuring about 15-feet long. An end-stop, or bulkhead, and the previously placed section of wall serve as end forms as the concrete is pumped into the bottom of the trench. Ready mix displaces the slurry, which is collected and recycled through a Derrick de-sanding machine to remove soil particles picked up from the trench. About 40,000 gallons of slurry are contained in each 15-foot-wide trench section.

A Mantis hydraulic crane assists the Liebherr lattice boom crane to pick and tip rebar cages, then the Liebherr lowers the cages into the trench.

Once the wall is built, excavation will proceed for the parking garage, one story at a time. As each level is dug, the floor is built, effectively bracing the walls and creating a shear diaphragm, and digging continues for the next level.

Prior to work on the slurry wall, 8-foot-diameter concrete caissons were



East Coast Slurry operates a Derrick de-sanding machine during construction of slurry wall at new Center for Life Science tower in Boston.



With Manitowoc 666 excavator in background, worker observes operation of air-lift pipe for recycling slurry from 100-foot-deep trench.



HUB Foundation's Liebherr is principal crane for lowering giant rebar cages into trench.

drilled and poured around the site. Hub Foundation Co. of Harvard, Mass., is responsible for drilling and pouring concrete for a total of 53 caissons. Forty-three caissons will provide support for columns and floor slabs inside the building, while 10 caissons are to support structures outside the perimeter foundation wall.

Work began on the Center for Life Science in the fall of 2004, when crews demolished a four-story school building and ripped up parking lot pavements. Contractors A.J. Welch and J.C. Higgins installed underground utilities, while A.A. Will is responsible for general earthmoving at the site.

The new Life Science building will be the tallest in the Longwood Medical area, topping out at 298 feet. It will contain 18 occupied floors, three mechanical and support floors, and 5-1/2 floors of underground parking for 300 cars. A steel frame and 3-1/4-inch lightweight concrete on 3-inch metal deck form the basic structure, while interior columns will be placed on a 33-foot grid. Forming

the core will be eight high-speed passenger elevators and three high-speed service elevators.

According to Tony McCann, Berry's project superintendent, the shell and core of the building will be ready to receive tenants in the fall of 2007.

Owned by Lyme Properties LLC/ Scottish Widows Investment Partnership, the Center for Life Science Boston will offer more than 700,000 square feet of research and office space, including a multi-story winter garden on Blackfan Street. Architect Tsoi/Kobus & Associates Inc. designed the building to include numerous energy efficient and environmentally advanced features that make the facility eligible for a Leadership in Energy and Environmental Design (LEED) rating.

Designed to meet the needs of life science companies for flexibility and adaptability, the new research building will have floor plates engineered for 100-psi floor loads and will be configured to accommodate an efficient

11-foot lab module with floor-to-ceiling clearances of up to 15 feet 5 inches.

Located in the heart of the Longwood Medical Area, the new tower joins other world-class research institutions, including Beth Israel Deaconess Medical Center, which will occupy approximately 50 percent of the new facility's space. In addition, Dana-Farber Cancer Institute recently signed a lease for approximately 50,000 square feet in the new facility. Other well-known medical facilities in the immediate area are Children's Hospital's Karp Family Research Laboratories, the New Research Building at Harvard Medical School and Merck's Scolnick Research Center.

Occupying roughly 14 acres, Longwood Medical Area has 21 institutions that employ more than 50,000 scientists, physicians, staff, and students. It is the showcase of the city's overall life science community, which has over 80,000 science employees – 30,000 of them employed in 300 biotechnology companies. About 5,000 life scientists work in the community – the largest

Digging Deep

per capita concentration of such professionals in the United States.



Twelve-ton bucket, wielded by Sennebogen Bauer crane, dwarfs worker as it is lowered into slurry trench.

Calling attention to this unique gathering of life science talent, Boston Mayor Thomas M. Menino remarked at the July 26, 2005 official groundbreaking ceremonies:

“The Center for Life Science Boston reinforces Boston’s reputation as the world leader for life science re-

search and development. This amazing facility is yet another example of the Longwood Medical Area’s commitment to explore new frontiers in world-class research and medical discoveries, cure life-threatening disease and improve the lives of persons everywhere.” ■



Above: Boston Mayor Thomas M. Menino indicates architect’s rendering at official groundbreaking ceremonies for 18-story medical research building.

Below: While a Cat excavator works in background, Regis Steel Corp. crew fabricates huge rebar cages.



74 Middlesex Avenue, Somerville, MA Slurry Wall Foundation and Slurry Subgrade Struts



Guide Wall Construction



Flying the Cage

Location: Somerville, MA
Owner: Greystar
Completion Date: April, 2022
General Contractor: Consigli Construction Company

Vital Statistics:

Project Value: \$8,300,000.00
Wall Type: 36" Reinforced Concrete Wall with Slurry Subgrade Struts
Wall Area: 67,000 S.F.
Max. Excavated Depth: 63'

Description: 74 Middlesex is positioned at the edge of the new Assembly Square community near Assembly Station on the MBTA's Orange Line. This life science office and lab building included a 3½ level basement with an excavated depth of 48' below subgrade. Numerous utilities and existing structures were present around the site, including a 36" MWRA water line, a 9' x 12' storm drain, and an Interstate 93 exit ramp. Allowable lateral movements around the site were restricted to ½". High voltage overhead lines were also within close proximity to the proposed foundation. East Coast Slurry worked with the design team to design a 36" slurry wall with 2 levels of internal bracing plus a level of subgrade slurry struts to meet these stringent design requirements.



"Y" Panel Reinforcing Cage



Tremie Concrete Placement

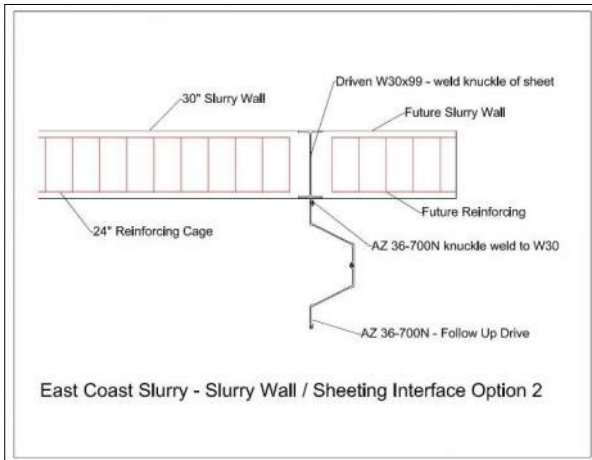
Parcel L5, Boston, MA Slurry Wall Foundation



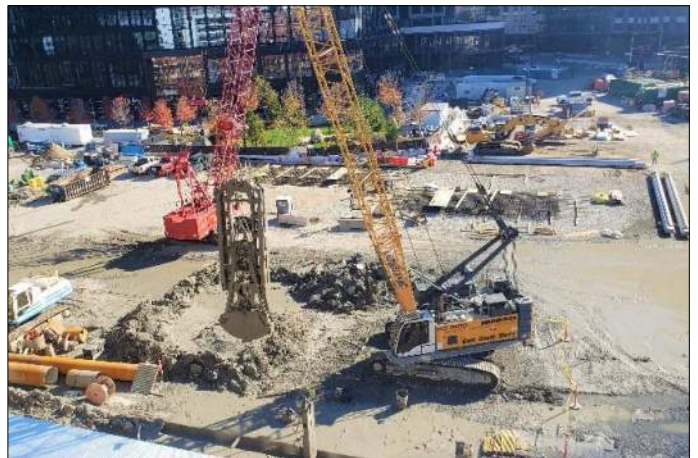
Permanent Slurry Wall on 2 Sides Braced to Temporary Sheeting

Location: Boston, MA
Owner: WS Development
Completion Date: November, 2021
General Contractor: Turner Construction Company
Vital Statistics:
Project Value: \$3,400,000.00
Wall Type: 30" Reinforced Concrete Wall
Wall Area: 31,000 S.F.
Max. Excavated Depth: 58'

Description: Parcel L5 in South Boston's Seaport District originally consisted of tidal flats which were filled in the late 1800s with materials dredged from Boston Harbor. An 18 story mixed use building 3 levels of below grade parking was constructed in these poor soil conditions. This was the second of four interconnected buildings to be developed on this Boston city block. A permanent perimeter slurry wall was constructed on two sides of the site with temporary sheeting on the remaining sides, to allow for below ground connection to the future buildings. The temporary sheets were tied into the slurry wall with the used of embedded steel beams in the slurry wall.



Sheeting to Slurry Wall Tie-In Detail



Production Work

Cambridge Crossing Parcel U, Cambridge, MA Slurry Wall Foundation



Exposed Slurry Wall Excavated to Subgrade

Location: Cambridge, MA
Owner: DivcoWest Real Estate Investments
Completion Date: April, 2021
General Contractor: John Moriarty and Associates

Vital Statistics:
Project Value: \$4,600,000.00
Wall Type: 36" Reinforced Concrete Wall
Wall Area: 42,000 S.F.
Max. Excavated Depth: 59'

Description: Part of the Cambridge Crossing development, this 3½ level basement, 47' in depth, was constructed adjacent to Cambridge's Gilmore Bridge and two other new research buildings. A deep layer of fill and organics, up to 30' in depth, and a variety of manmade obstructions, including strand tiebacks, belled caissons, granite blocks, and timber piles required careful clamshell excavation.



Various Obstructions Encountered During Slurry Wall Excavation

101 Cambridge Park Drive, Cambridge, MA

Slurry Wall Foundation and Subgrade Slurry Bracing Struts



Three Level Basement "Bottomed Out"

Location: Cambridge, MA
Owner: King Street Properties
Completion Date: April, 2021
General Contractor: Consigli Construction Company

Vital Statistics:

Project Value: \$5,600,000.00
Wall Type: 36" Reinforced Concrete Wall and Slurry Struts
Wall Area: 47,000 S.F.
Max. Excavated Depth: 50'

Description: A new life science building was constructed adjacent to Cambridge's Alewife Train Station, in close proximity to three other new research buildings. Plans called for a three level basement to be constructed in "weight of rod" clay with very low shear strengths. A perimeter slurry wall with unreinforced concrete slurry struts below subgrade, acting as an additional level of temporary bracing, was built to meet strict project lateral movement and settlement criteria.



'Y' Panel Reinforcing Cage



Slurry Wall Excavation in "WOR" Clay

730 Main Street Garage, Cambridge, MA Slurry Wall Foundation and LBEs



Slurry Wall Construction

Soft Clay and Glacial Outwash

Location: Cambridge, MA
Owner: MITIMCO
Completion Date: November, 2020
General Contractor: Consigli Construction Company
Vital Statistics:
Project Value: \$7,200,000.00
Wall Type: 30" Reinforced Concrete Wall and LBEs
Wall Area: 63,000 S.F.
Max. Excavated Depth: 120'

Description: As part of M.I.T.'s redevelopment plans in Cambridge, two existing concrete framed buildings built in 1910 were partially demolished and renovated. A four level underground garage, 46' in depth, was constructed within 18" of the partially demolished building. As a result, an up down construction sequence was used to minimize ground movement during construction. Twenty four interior LBEs with permanent embedded garage support columns were constructed and founded in very dense glacial outwash.



18" from Existing Building



Cage Splice "Over the Hole"



LBE Column

150 Seaport Boulevard, South Boston Slurry Wall Foundation



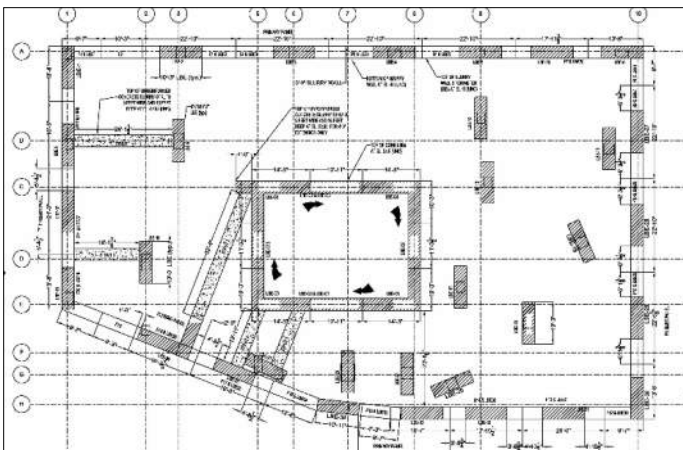
**Slurry Wall Construction with Hydromill
Rigged for 200' Depth (inset)**



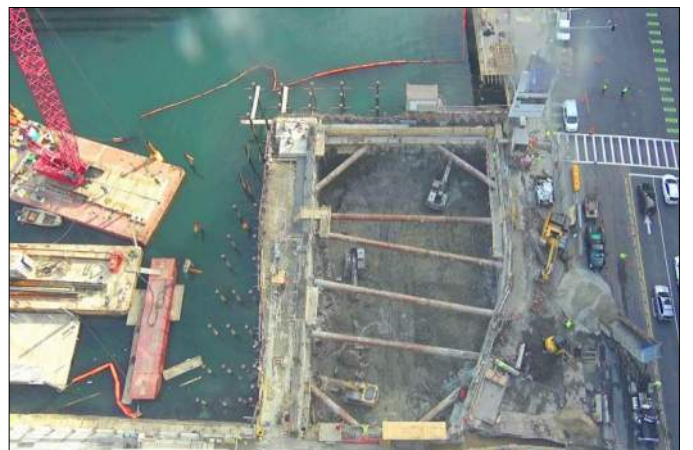
Barge Based Rebar Fabrication

Location: Boston, MA
Owner: Cronin Development
Completion Date: August, 2020
General Contractor: John Moriarty and Associates
Vital Statistics:
Project Value: \$11,000,000.00
Wall Type: 36" Reinforced Concrete Wall, LBEs, Slurry Struts
Wall Area: 80,000 S.F.
Max. Excavated Depth: 180'

Description: Constructed at the former sites of the Atlantic Beer Garden and Whiskey Priest venues, this unique 22 story waterfront property includes 3 levels of underground valet parking. Total excavated depth to subgrade was 52'. The tower is supported by a perimeter slurry wall with "legs" extending into bedrock, as well as interior LBEs and core wall, also founded in bedrock. The design required a 14 foot floor to floor height for car stackers, impacting the slurry wall and bracing design. Unreinforced concrete "slurry struts" were also constructed to brace the perimeter wall against the core wall, thereby minimizing horizontal and vertical movements outside the site.



Slurry Wall, LBE, Slurry Strut Configuration



Braced Slurry Wall on Boston Harbor

Commonwealth Building, Boston Slurry Wall Foundation and Internal Bracing



Completed Slurry Wall

Location: Boston, MA
Owner: Related Beal
Completion Date: March, 2020
General Contractor: Related Beal

Vital Statistics:

Project Value: \$4,300,000.00
Wall Type: 30" Reinforced Concrete Wall
Wall Area: 25,000 S.F.
Max. Excavated Depth: 58'

Description: This two level basement was constructed as part of an eight story office/retail structure on Commonwealth Avenue, adjacent to the building supporting the historic CITGO sign near Fenway Park. A slurry wall was selected for this site due to close proximity of an old 12" water line, fiber optic cables, and high voltage electric lines. The site was previously occupied by multiple structures founded on timber piles and belled caissons. Near surface foundations were removed prior to slurry wall construction however slurry wall excavation did encounter remnants of these foundations. Two levels of interior bracing were used to keep wall movements within allowable limits.



Clamshell Excavation



End Stop Placement



Reinforcing Cage Placement

Winthrop Square, Boston Slurry Wall and LBE Foundations



Clamshell and Hydromill Excavation

Location: Boston, MA
Owner: Millennium Partners
Completion Date: December, 2019
General Contractor: Suffolk Construction Company

Vital Statistics:

Project Value: \$20,000,000.00
Wall Type: 36" and 48" Reinforced Concrete Wall and 63 LBEs
Wall Area: 140,000 S.F.
Max. Excavated Depth: 172'

Description:

A 690' tower with five levels of underground was built on this challenging downtown site with high rise buildings abutting the site on three sides. A new perimeter slurry wall was constructed within three feet of the abutter foundations, with strict project vibration and wall movement criteria. The building was constructed using top down methods, involving construction of 63 interior LBEs to support the core walls and interior column loads. Heavily loaded columns required LBE bedrock embedments of up to 100' in highly variable bedrock conditions.



Core Wall LBE Columns Being Installed



Exposed Columns at Basement Level 4

Seaport Parcel L4, South Boston Slurry Wall Foundation and Internal Bracing



Slurry Wall Construction

Location: Boston, MA
Owner: WS Development
Completion Date: May, 2019
General Contractor: Turner Construction Company
Vital Statistics:
Project Value: \$3,400,000.00
Wall Type: 30" Reinforced Concrete Wall
Wall Area: 30,000 S.F.
Max. Excavated Depth: 58'

Description: This large parcel in South Boston is being developed in four phases. The first phase, Parcel L4, will be home to Amazon.com when complete. To allow for future abutting property development, two sides of the L4 foundation were constructed with a slurry wall acting as the permanent basement foundation. The other two sides were constructed with steel sheeting to allow for future construction. Allowable wall movements were quite restrictive in order to protect other recently constructed abutting buildings. An innovative, cost effective 3 level bracing system was used to keep wall movements within these limits.



Three Levels of Bracing

Harrison Albany Block Slurry Wall Foundation and Internal Bracing



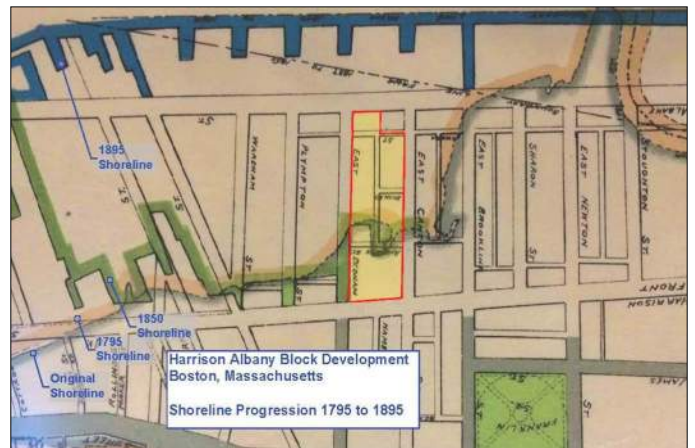
Two Full Production Crews

Location: Boston, MA
Owner: Legatt McCall Properties
Completion Date: November, 2016
General Contractor: Suffolk Construction Company
Vital Statistics:
 Project Value: \$7,100,000.00
 Wall Type: 30" Reinforced Concrete Wall
 Wall Area: 54,000 S.F.
 Max. Excavated Depth: 46'

Description: Boston Harbor's original shoreline crossed this 3 acre site until it was filled in starting in the 1850's. The earliest structure on the site was Urann's Wharf, which held the city stables. Two new residential midrise towers were constructed on this block long city parcel, within a single deep foundation. A reinforced slurry wall, braced with a single level of internal cross lot bracing was chosen as the temporary earth support system due to a potentially unstable layer of fill and organic soils, thirty feet in depth. Slurry wall panel excavation proceeded with caution to ensure there would be no unexpected ground loss during wall construction.

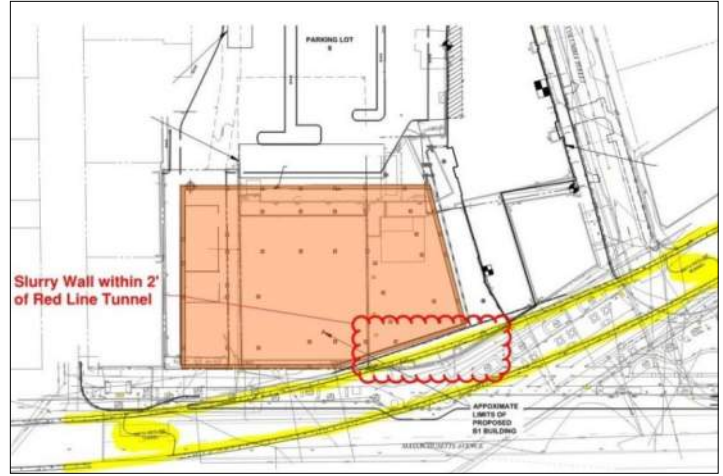


Braced Excavation



Original Shoreline Crossing the Site

Mass+Main Slurry Wall Foundation and Bracing



Panel Excavation Adjacent to Red Line Tunnel

Location: Cambridge, MA
Owner: Watermark Central Venture LLC
Completion Date: January, 2018
General Contractor: John Moriarty and Associates
Vital Statistics:
Project Value: \$3,500,000.00
Wall Type: 30" Reinforced Concrete Wall
Wall Area: 24,400 S.F.
Max. Excavated Depth: 66'

Description:

This site was in close proximity to the MBTA Red Line tunnel, built in the early 1900's, and several other abutting buildings. A stiff impervious excavation support system was necessary to control lateral movements during general excavation. An internally braced concrete diaphragm wall was constructed to provide temporary earth support and to serve as the permanent foundation wall. The slurry wall was designed as a load-bearing wall supporting vertical exterior wall and column loads through a combination of structural shear connection between the slurry wall and the footing/mat foundation, and on skin friction from the portion of the slurry wall extending below the bottom of the mat.

A future storm water storage tank and 63" diameter pipe was planned to cross below the MBTA Red Line Tunnel in Massachusetts Avenue at a depth of 50 ft below street grade and parallel to the east side slurry wall. The slurry wall panels in this area were extended to 5 feet below the invert of the future pipe to mitigate potential impacts on the newly constructed building.



Braced Excavation



Mass and Main in 1910

145 Broadway Slurry Wall Foundation and LBEs



Slurry Wall Production



Hydromill Sotress Plant

Location: Cambridge, MA
Owner: Boston Properties
Completion Date: November, 2017
General Contractor: Turner Construction Company
Vital Statistics:
Project Value: \$10,360,000.00
Wall Type: 36" Reinforced Concrete Wall and 22 LBEs
Wall Area: 90,200 S.F.
Max. Excavated Depth: 120'

Description: Located near Kendall Square in Cambridge, MA, 145 Broadway is the new headquarters for Akamai Technologies, a web services provider. The building is 19 stories and 250 feet tall, with a 5-story 374 space below grade parking garage. Construction subgrade was 55' below street grade. The project was constructed using an "up-down" construction procedure. The building structural elements were supported on a combination of a reinforced concrete diaphragm (slurry) wall, and deep reinforced concrete Load Bearing Elements (LBEs) installed from current site grades through the overburden soils and into the underlying bedrock. After construction of the ground floor slab and B1 slab was complete, construction of the superstructure proceeded, supported on the completed LBE foundation elements. Construction of the remaining below-grade parking levels, B2 through B5, continued below.



Excavation to B1 Level with Exposed LBE Columns

LBE Column Being Set During Slurry Wall Construction (inset)

399 Congress Street Slurry Wall Foundation



The "Sausage" Lot with Adjacent Ramp D



Slurry Wall Excavation

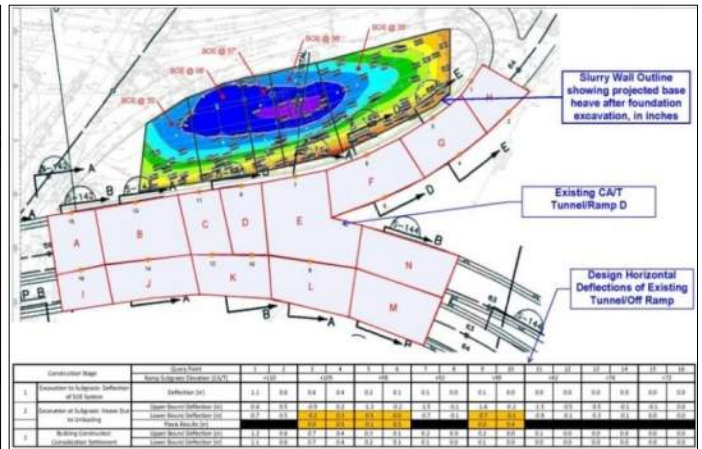
Location: Boston, MA
Owner: Boston Properties
Completion Date: November, 2017
General Contractor: John Moriarty and Associates
Vital Statistics:
Project Value: \$3,750,000.00
Wall Type: 30" Reinforced Concrete Wall
Wall Area: 38,500 S.F.
Max. Excavated Depth: 50'

Description: A 22-story residential tower with three (3) levels of below grade parking was constructed on this narrow South Boston site, appropriately named the "sausage lot". Due to the close proximity of the adjacent Central Artery Ramp D, a 30" internally braced slurry wall was constructed to mitigate construction vibration concerns and excavation related ground movement. An existing temporary earth retention system was left in place from construction of Ramp D, consisting of a tied back soil mix wall and steel sheeting. Slurry wall excavation took place through the previously detensioned tiebacks and within two feet of the Ramp D structure.

Basal heave of over consolidated marine clay deposits during mass excavation was also a design concern, estimated to heave in the range of 2 to 2-1/2 inches. The Ramp D structure was also anticipated to heave due to the adjacent excavation in the range from about 1/8 to 1/2-inch. The foundation was constructed without incident.



Braced Slurry Wall



Predicted Base Heave & Lateral Movements

The Boston Garden Slurry Wall Foundation, LBEs, and Drilled Shafts



A Productive Morning on Causeway Street



Working through Hockey Season

Location: Boston, MA
Owner: Boston Properties
Completion Date: November, 2016
General Contractor: John Moriarty and Associates
Vital Statistics:
Project Value: \$12,200,000.00
Wall Type: 48" Reinforced Concrete Wall, LBEs, and 4' Dia. Drilled Shafts
Wall Area: 46,000 S.F.
Max. Excavated Depth: 110'

Description: The former site of the old Boston Garden sat vacant for 18 years before this massive complex called "The Hub on Broadway" became a reality. Located in front of the existing TD Garden and North Station, the development includes an underground grocery store, a 15-screen movie theater, four levels of underground parking, and a 38-story mixed use tower with 1.5 million square feet of residential, office, and hotel space. The site was a former tidal inlet and included docks and piers until it was filled in the early 1800s. Due to the 60 foot deep foundation excavation and close proximity to the MBTA Green Line Tunnel and the North Station Garage, a 48" slurry wall was constructed on two sides of the site, tying into the existing garage and Green Line foundation walls on the other two sides. LBEs and drilled shafts were constructed between the adjacent MBTA Orange and Green Lines to support building column loads above the train tunnels. Fifty feet of fill and soft organic soils combined with many timber pile remnants from the old Garden made digging conditions difficult.



Original Garden Being Demolished in 1998



Exposed Slurry Wall with Remnants of Timber Piles from Original Garden

Pier 4 Phase Two Slurry Wall Foundation, LBEs, and Internal Bracing



Original Anthony's Pier 4 Restaurant in 1975

Slurry Plant Mobilization/Anthony's Demolition

Location: Boston, MA
Owner: New England Development
Completion Date: July, 2016
General Contractor: Turner Construction Company
Vital Statistics:
Project Value: \$8,800,000.00
Wall Type: 30" Reinforced Concrete Wall, LBEs
Wall Area: 65,000 S.F.
Max. Excavated Depth: 125'

Description: Anthony's Famous Pier 4 Restaurant once welcomed celebrities like Liz Taylor and Frank Sinatra. As part of South Boston's revitalization, a \$500 million development project overlooking Boston Harbor is taking its place, featuring a thirteen-story office building, a nine-story residential building, and a three level underground parking garage. Much of the site was submerged until the late 1800's when the pier was formed with dredged fill and organic soils. Due to the poor soil conditions and immediate proximity to the harbor, a braced slurry wall was chosen as the permanent foundation wall. Due to site access restrictions and delays in obtaining demolition permits for Anthony's, the slurry wall was constructed in two phases, with a cement bentonite cutoff wall installed across the middle of the site, allowing an early start for mass excavation and bracing for the first phase. Deep load bearing elements (LBEs) were also constructed in lieu of spread footings to support some of the interior columns where soil conditions at subgrade were extremely poor.



Start of Mass Excavation with Slurry Wall Still Under Construction

100 Binney Street Slurry Wall Foundation and Internal Bracing



Slurry Wall Under Construction



Braced Slurry Wall

Location: Cambridge, MA
Owner: Alexandria Real Estate
Completion Date: November, 2015
General Contractor: John Moriarty and Associates
Vital Statistics:
Project Value: \$8,451,000.00
Wall Type: 30" Reinforced Concrete Wall
Wall Area: 67,400 S.F.
Max. Excavated Depth: 80'

Description:

Bristol Myer Squibb chose 100 Binney Street in Cambridge to locate its state of the art scientific research facility. The site is part of Alexandria Center at Kendall Square, a 1.7 million square foot science and technology campus within the burgeoning Bio-Medical community in the Kendall Square area of Cambridge. A perimeter slurry wall was installed through the marine deposits and into the glacial till, acting both as the permanent wall and as a groundwater cutoff. Jet grouting was conducted in a portion of the site to stabilize DNAPL impacted soils and to help to mitigate DNAPL-related odors during excavation. The three level basement was braced during construction with cross lot and corner bracing, using embedded horizontal walers within the slurry wall.



Clamshelling through Boston Blue Clay



Completion of Bracing/Mass Excavation

MIT.nano Slurry Wall Foundation, LBEs and Internal Bracing



Slurry Wall Near Existing Buildings

Building Frame Assembled through Bracing

Location:	Cambridge, MA
Owner:	Massachusetts Institute of Technology
Completion Date:	October, 2015
General Contractor:	Turner Construction Company
Vital Statistics:	
Project Value:	\$4,800,000.00
Wall Type:	30" Reinforced Concrete Wall
Wall Area:	31,000 S.F.
Max. Excavated Depth:	51'

Description:

A \$350 million building developed by M.I.T. provides additional space on campus for nanotechnology research, allowing scientists access to cutting-edge tools to manipulate matter at the smallest scales. The building, dubbed "MIT.nano," is located at the heart of the campus near the university's iconic Great Dome. There was very limited access to the construction site — only three access roads, each with limited headroom — so planning for foundation construction and delivery vehicles presented a host of logistical challenges, almost like building a tall ship inside a bottle. Slurry wall panel excavation through a deep layer of unstable organic soils required special attention. Foundation elements (LBEs) for two tower crane supports were also required on this challenging project.

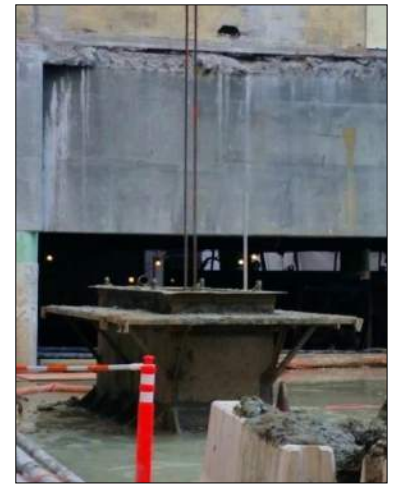


Tower Crane LBE Reinforcement

888 Boylston Street LBE and Drilled Minipile Foundations



Clamshelling Overburden Soils



5' Steel Guidewall

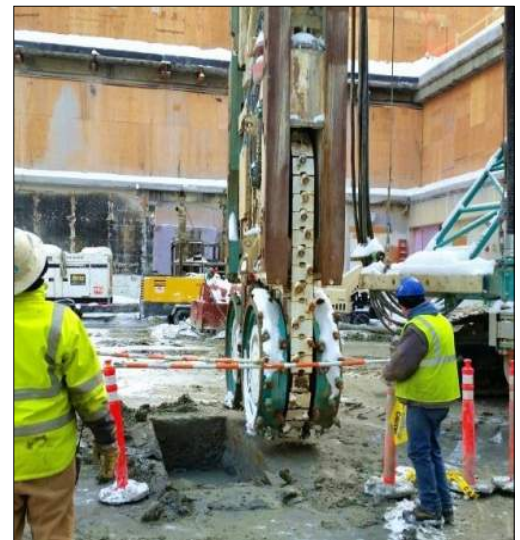
Location: Boston, MA
Owner: BP Prucenter Acquisition, LLC
Completion Date: March, 2015
General Contractor: Turner Construction Company
Vital Statistics:
 Project Value: \$6,500,000.00
 LBEs: Total of thirty one 2.5' x 9.25' and 3' x 10.25' LBEs
 LBE Area: 47,400 S.F.
 Max. Excavated Depth: 157'

Description:

Foundation column loads for this mixed use tower ranged from 200 kips to 11,000 kips, requiring a mix of drilled minipiles (DMPs) and load bearing elements (LBEs) with bedrock embedments of up to 14' in hard rock. Foundation elements were constructed from an existing mat foundation 15' below street grade. A thick layer of fill and poorly graded sand combined with a high water table made digging conditions particularly challenging. Pretrenching was performed to replace the unstable near surface soils with engineered fill and a 5' steel guide wall was fabricated to maintain the slurry level above the high groundwater table. An historic amount of snow fall during construction made this project one to remember.



Excavation with Clamshell and Hydromill



Excavation through Existing Mat

50+60 Binney Street Slurry Wall and LBE Foundations



Wall Reinforcing Cage



LBE Column Installation



Location: Cambridge, MA
Owner: Alexandria Real Estate
Completion Date: March, 2015
General Contractor: Turner Construction Company
Vital Statistics:

Project Value: \$13,100,000.00
Wall Type: 36" Reinforced Concrete Wall
LBEs: Total of 51 LBEs, 3' x 10'
Wall Area: 90,500 S.F.
Max. Excavated Depth: 110', including 15' embedment in bedrock'

Description:

The 50+60 Binney Street project was the latest addition to the burgeoning Bio-Medical community in the Kendall Square area of Cambridge. The installed perimeter slurry wall and LBEs created a six level basement utilizing top down construction methods. Fifty one load bearing elements with embedded columns were installed as part of the process. The basement was then excavated to a depth of 75' below street grade.



Working Late Hours



Exposed Slurry Wall and LBE Column

Nashua Street Residences Drilled Shafts and LBEs



Drilled Shaft and LBE Construction

Location: Boston, MA
Owner: Avalon Bay Communities
Completion Date: August, 2014
Vital Statistics:
 Project Value: \$2,100,000.00
 Drilled Shafts: Total of seven 4' and 5' Diameter Shafts
 Max. Shaft Depth: 130' with 24' Deep Rock Sockets
 Wall Type: 30" Reinforced Concrete Slurry Wall LBE Panels

Project Description:

The foundations for this high rise residential tower were built to the outer limits of the site property lines. Abutting structures included a 9' x 12' storm drain and the existing Boston Garden Parking Garage foundation. Drilled shafts and LBEs were chosen to prevent undermining of the storm drain and to limit vibrations at the abutting buildings. Drilled shafts at the building core contained embedded built up column sections to support the superstructure.



Drill Rig



Shaft Reinforcing Cages

Brigham Building for the Future



Slurry Wall and LBE Foundations

Location: Boston, MA
Owner: Brigham and Women's Hospital
Completion Date: November, 2013
General Contractor: Suffolk Construction Company

Vital Statistics:

Project Value: \$11,000,000.00
Wall Type: 36" Reinforced Concrete Wall
LBEs: 2.5' LBEs
Wall Area: 88,500 S.F.
Max. Excavated Depth: 95'

Description:

The new Brigham Building for the Future medical facility included a six level underground parking garage on one side of the site and a two basement level cogeneration plant and imaging area on the other side. A full perimeter slurry wall was installed as well as an intermediate slurry wall dividing the two sides. The deep portion of the wall was installed through dense glacial till and keyed into conglomerate bedrock, requiring the use of a Casagrande FD100 hydromill. Depth to subgrade on the garage side was fifty feet, requiring four levels of cross lot and corner bracing during mass excavation.



Reinforcing Steel Placement



Sotress Desanding Plant

45 Stuart Street Slurry Wall and Drilled Shafts



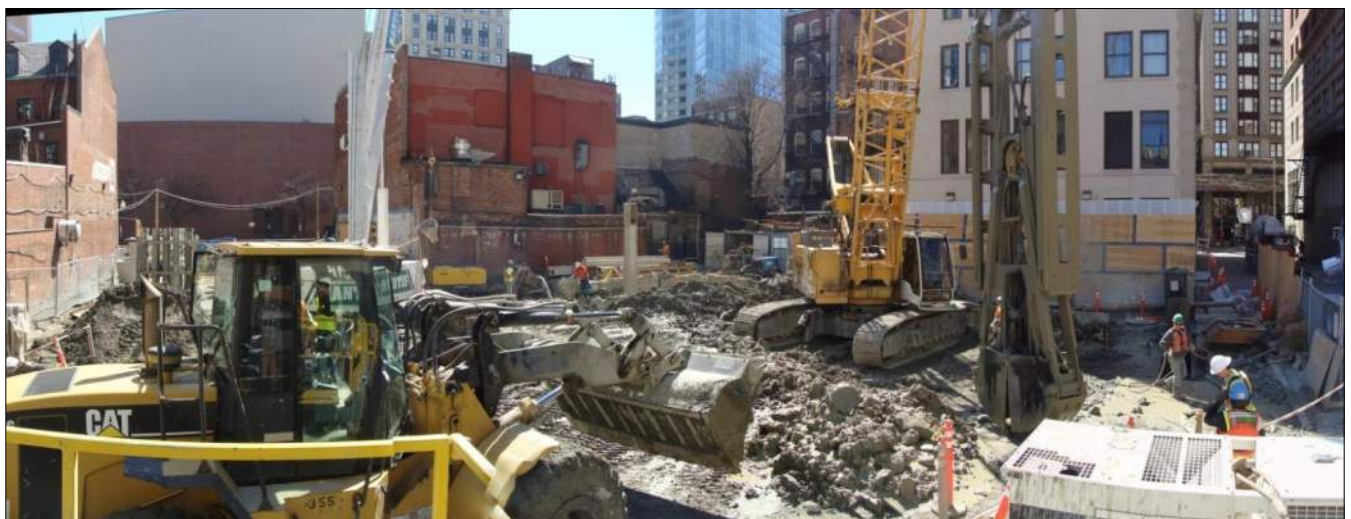
Drilled Shaft Construction

Location: Boston, MA
Owner: Avalon Bay Communities
Completion Date: September, 2013
Vital Statistics:

Project Value: \$7,000,000.00
Wall Type: 30" Reinforced Concrete Slurry Wall and Drilled Shafts
Wall Area: 25,000 S.F.
Drilled Shafts: Total of forty three 3', 3.5', 4', and 5' Diameter Shafts
Max. Shaft Depth: 140' with 18' Deep Rock Sockets

Project Description:

The foundation for this high rise residential tower was originally planned as a C.I.P. reinforced concrete structure to be constructed inside a sheeted excavation. The new tower was to be built to the outer limits of the site property lines. Abutting structures included a major underground electrical vault and a four story brick building, built in 1844, housing the second oldest restaurant in Boston. A slurry wall and drilled shaft alternate was chosen to prevent undermining of and vibration damage to the abutting buildings. Drilled shafts at the building core contained embedded columns to support the superstructure.



Slurry Wall Construction under Tight Site Conditions

Pier 4 Slurry Wall Foundation and Internal Bracing

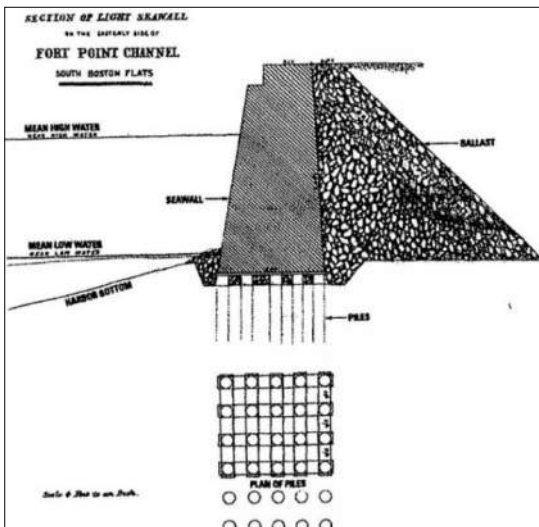


Mass Excavation Inside Braced Slurry Wall On Boston's Waterfront

Location: Boston, MA
Owner: THC/UDR Seaport Development Venture
Completion Date: July, 2013
General Contractor: John Moriarty and Associates
Vital Statistics:
Project Value: \$5,500,000.00
Wall Type: 30" Reinforced Concrete Wall
Wall Area: 39,700 S.F.
Max. Excavated Depth: 55'

Description:

The foundation for this residential tower on South Boston's Fan Pier waterfront included a three level underground parking garage. Buried granite seawalls supported on timber piles, built in the 1870's, were known to exist along the proposed foundation alignment. For this reason slurry wall was chosen for support of excavation and permanent perimeter wall. Granite blocks were removed by clamshell during slurry wall excavation. Two levels of internal bracing were installed to brace the slurry wall during mass excavation. Upon completion of mass excavation and mat slab construction, the lower level bracing system was removed and selected cross lot braces were removed from the upper level, in the building core area, and replaced with rakers to allow construction of the cast in place concrete building core.



Detail of Original Seawall



Seawall Blocks Removed During Slurry Wall Excavation

Millenium Place Drilled Shaft Foundations



Hydraulic Rotary Drill Rigs in Action

Location: Boston, MA
Owner: Millenium Partners
Completion Date: January, 2012
General Contractor: Suffolk Construction Company

Vital Statistics:

Project Value: \$727,000.00
Drilled Shaft Diameter: 3.5'
Shaft Depth: 104'

Project Description:

East Coast Slurry Company installed twelve drilled shaft foundations for a 15 story residential building in Boston's Downtown Crossing area. The shafts were socketed ten feet into argillite bedrock and were located within a few feet of the MBTA's Orange Line subway. Obstructions from the original Orange Line earth support system were encountered during drilling, but were successfully penetrated. Drilling into the bedrock was performed with a combination of bullet auger and core barrel.



Bullet Auger



Core Barrel

157 Berkeley Street Slurry Wall and LBE Foundations



Slurry Wall Construction

Location:	Boston, MA
Owner:	Liberty Mutual Insurance Company
Completion Date:	August, 2011
General Contractor:	Turner Construction Company
Vital Statistics:	
Project Value:	\$13,000,000
Wall Type:	36" Reinforced Concrete Wall
LBEs:	3' and 4' X 10' LBEs (total of 36)
Wall Area:	95,000 S.F.
Max. Excavated Depth:	140'

Description:

The new Liberty Mutual tower included a five level underground parking garage. East Coast Slurry Company was contracted to install the perimeter slurry wall and 36 LBEs as part of a top down construction sequence. The LBEs penetrated up to 25' into the argillite bedrock, requiring a hydromill to excavate the rock. East Coast's Casagrande FD 100 mill mounted on a C900 carrier had no problem with the task. Belled caisson foundations from the previous building needed to be removed at depths of 50 feet prior to slurry wall construction. A rotary drill rig was used to core through these existing foundations.



Coring thru Belled Caissons



Casagrande FD100



Sotres Desanding Unit

Marriott Marquis Convention Center Hotel Slurry Wall and Drilled Shafts



Three Clamshell Rigs and Hydromill



Drilled Shaft Construction

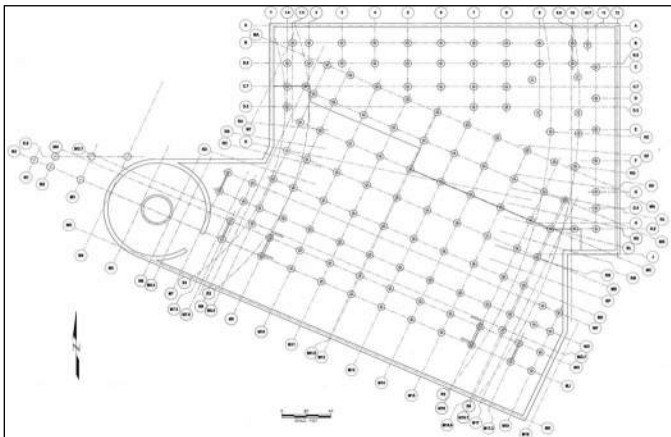
Location: Washington, D.C.
Owner: Marriott International
Completion Date: October, 2011
General Contractor: Hensel Phelps Construction Company

Vital Statistics:

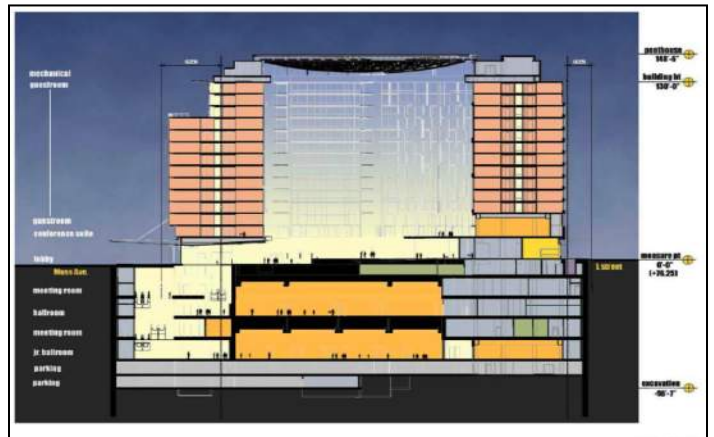
Project Value: \$22,000,000
Wall Type: 36" and 42" Reinforced Concrete Slurry Wall and 145 Drilled Shafts
Wall Area: 171,000 S.F.
Max. Depth: 126'

Project Description:

The 1,200 room Washington Marriott Marquis is located adjacent to the DC Convention Center. A six level underground structure includes three large ballrooms, 53,000 square feet of meeting rooms and two lower levels of parking accessible from a circular ramp located at the western end of the site. The project was constructed using up down construction methods, one of the first such projects in the Washington D.C. area. A perimeter slurry wall was constructed using three clamshell rigs and a hydromill. The mill was used to excavate through very dense sand and gravel. 145 drilled shafts, five to seven feet in diameter, with embedded columns were then installed, using four 90 ton hydraulic rotary drill rigs. East Coast Slurry performed this project in joint venture with TREVIICOS Corporation.



Foundation Plan



Building Section

Massachusetts Water Resources Authority North Dorchester Bay CSO Pump Station



**Unbraced Slurry Wall Earth Support System For Future 60' Deep Pump Station.
Minipiles Will Provide Foundation Support for the CIP Pump Station.**

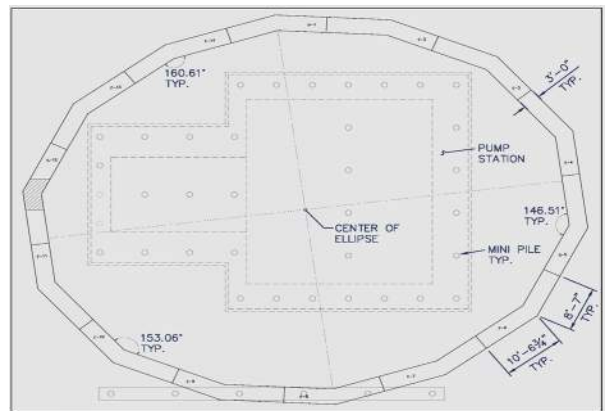
Location: South Boston, MA
Owner: MWRA
Completion Date: March, 2010
General Contractor: Walsh Northeast
Vital Statistics:
Project Value: \$2,180,000.00
Wall Type: 36" Reinforced Concrete Slurry Wall
Wall Area: 24,650 S.F.
Max. Excavated Depth: 97'

Project Description:

The CSO Pump Station required a 60' deep excavation in soft soils. In order to facilitate the construction of the complex reinforced concrete structure of the Pump Station, it was desirable to have an un-braced lateral support of excavation. Easement restrictions would not accommodate a circular slurry wall and therefore the support of excavation was achieved with an elliptical slurry wall. Because of the same restrictions, the main axes of the ellipse had to be skewed with respect to those of the pump station. Tensile stresses at the inner face of the slurry wall that were expected to develop along the flat side of the ellipse, at the higher elevations, required the installation of welded stitching plates across selected panel joints.



Shaft Excavation



Slurry Wall Panel Layout

Mass General Hospital Building for the Third Century Slurry Wall, LBES, and Drilled Shafts



Wall Construction with Two Clamshell Rigs and a Hydromill

Location: Boston, MA
Owner: Mass General Hospital
Completion Date: January, 2009
General Contractor: Turner Construction Company

Vital Statistics:

Project Value: \$11,500,000
Wall Type: 30" Reinforced Concrete Slurry Wall and LBES
Wall Area: 81,000 S.F.
LBE Area: 41,000 S.F.
Max. Depth: 128'

Project Description:

A total of 80,000 SF of slurry wall, 24 LBES, and 32 drilled shafts were installed for this major expansion of Mass General Hospital's main hospital facility. The underground portion of the facility contains operating rooms, radiology and other patient care services. The LBES were used to facilitate top down construction. Timber piles and tapered Raymond piles were encountered during wall excavation however through careful monitoring of the trench excavation, wall verticality and alignment were maintained. A hydromill was used to penetrate hard till and argillite bedrock formations. An embedded vinyl waterstop was installed at panel joints to ensure a watertight perimeter wall installation.



Cutter wheels



Heavily Reinforced Cage



Embedded Waterstop

Russia Wharf Development Slurry Wall and Drilled Shafts



Exposed Slurry Wall and Top Down Columns



Top Down Construction Sequence

Location: Boston, MA
Owner: Boston Properties
Completion Date: September, 2008
General Contractor: John Moriarty and Associates

Vital Statistics:

Project Value: \$11,000,000.00
Wall Type: 36" Reinforced Concrete Wall
Wall Area: 68,000 S.F.
Wall Depth: 85'
Drilled Shafts: Total of 40 shafts with diameters ranging from 4' to 9'
Max. Depth: 165'

Project Description:

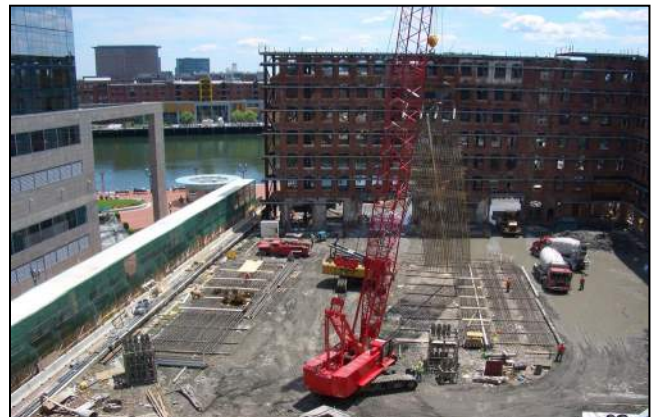
The City of Boston required that the seven story brick façade of the original buildings constructed at this site in 1897 be saved and incorporated into this new 33 story mixed use high rise structure along Boston's historic Fort Point Channel waterfront. The perimeter slurry wall foundation was installed within inches of the braced façade and actually crossed under the façade return walls at several locations. Structural columns, 107' in length and weighing up to 55 tons, were shipped and installed in one piece in the drilled shafts, as part of the top down construction system chosen for this project.



Pretrenching Underneath the Building Façade



Slurry Wall Reinforcement



Harvard University Allston Science Center Slurry Wall, SPTC Wall, Slurry Trench, and Tieback Construction



Completed Slurry Wall Acting As Temporary Earth Support System

Location: Allston, MA
Owner: Harvard University
Completion Date: January, 2008
General Contractor: Turner Construction Company

Vital Statistics:
Project Value: \$22,000,000
Wall Type: 30" and 36" SPTC and Reinforced Concrete Wall, and Cement Bentonite Slurry Trench Cutoff
Wall Area: 145,000 S.F.
Wall Depth: 70'

Project Description:

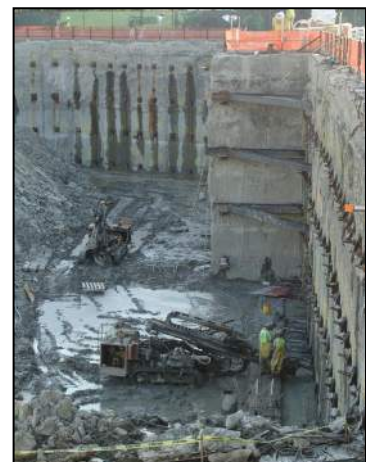
The Harvard Allston Science Center consists of mostly underground research facilities over a footprint of nearly six acres and a depth equivalent to a four level garage and four buildings with classrooms, offices, and other research space, all surrounded by state of the art landscaping. A slurry wall was selected as the temporary earth support system because of its stiffness, in order to limit the lateral movement of the support system and possible damage to nearby utilities. Approximately 2,100 L.F. of wall was installed and supported with 1,600 tiebacks, distributed along four rows. A cement bentonite slurry trench was constructed across the middle of the site to allow mass excavation to commence prior to completion of the main slurry wall, thereby accelerating the aggressive construction schedule.



Wall Construction with 6 Cranes



C-B Slurry Trench



Tieback Installation

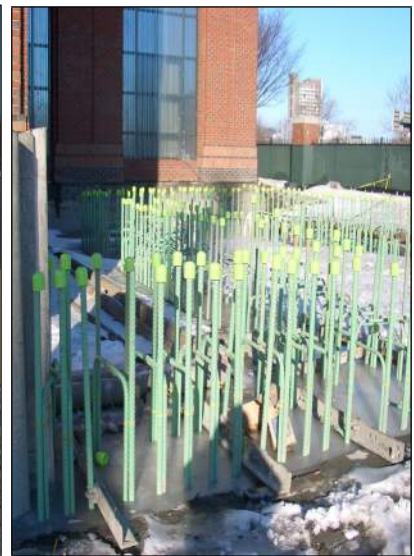
Genzyme Corporation Slurry Wall



Panel Excavation



Epoxy Reinforcing Steel



Numerous Corner Panels

Location: Allston, MA
Owner: Genzyme Corporation
Completion Date: November, 2007
General Contractor: Turner Construction Company
Vital Statistics:

Project Value: \$4,700,000.00
Wall Type: 36" Reinforced Concrete Slurry Wall
Wall Area: 39,300 S.F.
Max. Wall Depth: 59'

Project Description:

Pharmaceutical company, Genzyme Corporation, needed additional manufacturing space at their facility along the Charles River in Allston. A slurry wall foundation was chosen to deal with high groundwater, soil contamination, and wall movement issues. This uniquely configured site contained sixteen corner panels. Embedded waterstops were installed at panel joints as an added level of waterproofing protection.



Endstop with waterstop



Waterstop Detail



Installed Waterstop

Two Financial Center SPTC Slurry Wall



Concrete Pour with Five Tremie Pipes

Location: Boston, MA
Owner: Lincoln Property
Completion Date: December, 2007
General Contractor: Suffolk Construction Company
Vital Statistics:
 Project Value: \$3,800,000.00
 Wall Type: 36" SPTC Slurry Wall
 Wall Area: 28,300 S.F.
 Wall Depth: 60'

Project Description:

A very tight site with existing buildings inches away from the new foundation made an internally braced "soldier pile tremie concrete" slurry wall the foundation of choice for this project. The internal bracing for this 4 level basement had to be installed on an incline to avoid conflict with the continuously sloping cast in place floor slabs. This project was completed as a package with A.A. Will Corporation, providing a "seamless" scope of work for the general contractor and owner.



Soldier Pile Preparation

Installed Soldier Piles

Braced Slurry Wall

The Clarendon Slurry Wall and Drilled Shafts



Slurry Wall Construction



Reinforcing Cage with "Legs"

Location: Boston, MA
Owner: The Beal Companies
Completion Date: October, 2007
General Contractor: Bovis Lend Lease
Vital Statistics:
Project Value: \$9,600,000.00
Wall Type: 36" Reinforced Concrete Wall
Wall Area: 55,000 S.F.
Max. Wall Depth: 135'
Drilled Shafts: 4', 5', and 6' Diameter Shafts with a maximum depth of 145'.

Description:

The Clarendon is a 32 story mixed use building located in Boston's Back Bay neighborhood. Parking for this high rise building is provided by a five level underground garage constructed using slurry wall technology. Fifty six drilled shafts with embedded steel columns were installed to facilitate a top down construction sequence. The shaft diameters ranged from 4' to 6' with rock sockets of up to 24'. Details of the embedded column installation sequence are shown below. East Coast Slurry participated in a LEED Certified program (Leadership in Energy and Environmental Design), as part of our commitment to make a positive impact on public health and the environment.

EMBEDDED COLUMN DETAILS



**Column
Shear Studs**



**Lifting Head
Splice**



**Column Setting
Frame**



**Installed
Columns**



**Exposed
Column**

Massachusetts Water Resources Authority North Dorchester Bay CSO Storage Tunnel Access Shafts



Main Access Shaft Slurry Wall Construction at Boston's Marine Terminal

Location: South Boston, MA
Owner: MWRA
Completion Date: March, 2007
General Contractor: Shank/Balfour Beatty/Barletta Engineering JV
Vital Statistics:
 Project Value: \$3,585,000.00
 Wall Type: 30" and 36" Reinforced Concrete Slurry Walls
 Wall Area: 27,100 S.F.
 Max. Excavated Depth: 130'

Project Description:

A new 17' diameter CSO Storage Tunnel, 2 miles in length, along Dorchester Bay in South Boston and a future pumping station are part of Boston's Inner Harbor clean up program. The TBM used to excavate the tunnel required a 50' diameter access shaft and a 34' diameter retrieval shaft. Slurry walls, constructed as a decagon and an octagon respectively, were used as the outer shells of the shafts, to provide an un-braced lateral earth support system and were installed in soft ground conditions. The slurry wall for the main access shaft was keyed into the underlying Argillite rock formation.



Tunnel Break Out at Access Shaft



TBM Break In at Retrieval Shaft

Simmons College School of Management & New Main Quad Slurry Wall and LBEs



Slurry Wall Construction

Location:	Boston, MA
Owner:	Simmons College
Completion Date:	November, 2006
General Contractor:	Payton Construction Company
Vital Statistics:	
Project Value:	\$9,500,000
Wall Type:	36" Reinforced Concrete Wall
LBEs:	3' X 9.2' LBEs (total of 26)
Wall Area:	120,000 S.F.
Max. Excavated Depth:	170'

Description:

The new Simmons College School of Management building occupies a good portion of an existing at grade parking lot. A five level underground parking garage was planned to compensate for the lost parking space and to accommodate the additional space needed because of the new building. East Coast Slurry Company was contracted to install the perimeter slurry wall and 26 LBEs as part of a top down construction sequence. The LBEs penetrated up to 25' of bedrock, requiring a hydromill to excavate the rock.



LBE Pretrenching



**Mill Cutting Rock
for LBEs**



**LBE Column
Placement**



**Column Connection
to Reinforcing Cage**

Boston University Medical Center Building F Drilled Shaft Foundations



Drilled Shaft Construction

Location: South End, Boston MA
Owner: Boston University
Completion Date: September, 2006
General Contractor: Turner/McCarthy

Vital Statistics:
Project Value: \$2,300,000.00
Shaft Diameters: 3' and 4'
Shaft Depth: 160'

Project Description:

This federally funded research facility was the next significant addition to Boston University's growing South End Medical Center complex. A total of fifty 3' and 4' shafts were constructed to depths in excess of 160'. Drilling conditions included 30' penetrations into weathered argillite with diabase intrusions.



Drill Rig



Stockpiled Drill Spoils for Disposal

Harvard University Northwest Labs Slurry Wall and LBE Construction



Placement of Soldier Piles Laced in Pairs

Location: Cambridge, MA
Owner: Harvard University
Completion Date: December, 2005
General Contractor: Bond Brothers
Vital Statistics:
 Project Value: \$15,000,000
 Wall Type: 36" SPTC and Reinforced Concrete Wall
 3' X 10' Load Bearing Elements (total of 101)
 Wall Area: 190,000 S.F.
 Wall Depth: 83'

Project Description:

This project is one of the largest privately owned slurry wall foundation projects to have been constructed in New England in several years and was done in joint venture with TREVIICOS Corporation. This facility will contain 4 underground levels of laboratory space. Excavation through dense glacial till deposits with cobbles and boulders was completed with specialty clamshell buckets weighing approximately 14 tons each.



Clamshell Bucket



Top of SPTC Wall

Blackfan Research Center Slurry Wall and Drilled Shaft Construction



Familiar Skyline



Clamshell Bucket

Location: Boston, MA
Owner: Lyme Properties
Completion Date: June, 2006
General Contractor: William A. Berry & Son, Inc.
Vital Statistics:
 Project Value: \$9,000,000
 Wall Type: 36" Reinforced Concrete Wall
 Wall Area: 75,000 S.F.
 Max. Wall Depth: 105'
 Drilled Shafts: 3', 8', and 10' Diameter Shafts

Project Description:

This medical research facility is part of the Longwood Medical Center community alongside Beth Israel Hospital, Dana Farber Cancer Institute, and Deaconess Hospital. The slurry wall foundation provides 5 levels of underground parking. The owner required early building occupancy and, thus, top down construction techniques were needed to shave precious months off the building schedule. 8' and 10' diameter drilled shafts with embedded steel columns were installed within the slurry wall perimeter to support building column loads of up to 9,500 kips.



Panel Desanding



Reinforcing Steel Placement

Biogen IDEC Pharmaceutical Research Slurry Wall and LBEs



Basement Under Construction



Superstructure Going Up

Location:	Cambridge, MA
Owner:	Biogen IDEC
Completion Date:	April, 2005
General Contractor:	SKANSKA USA
Vital Statistics:	
Project Value:	\$2,500,000.00
Wall Type:	30" Reinforced Concrete Wall, Load Bearing Elements and Drilled Shafts
Wall Area:	30,000 S.F.
Wall Depth:	55'

Project Description:

This pharmaceutical research support facility was constructed using top down construction. The basement and superstructure were constructed simultaneously as shown above. Dense till, gravel, and occasional boulders were encountered during slurry wall excavation. Examples are shown below. The foundation package was performed jointly by East Coast Slurry Company and A.A. Will Corporation.



Clamshell Bucket Digging Glacial Till



Boulder found within the Glacial Till

500 Atlantic Avenue Drilled Shaft Foundations



**Drilling of Shaft Near
Central Artery Vent Building**



**Placement of
Shaft Reinforcement**



**Placement of
Embedded Column**

Location: Boston, MA
Owner: Intell Boston Harbour, LLC
Completion Date: August, 2004
General Contractor: Bovis Lend Lease
Vital Statistics:
Project Value: \$1,500,000.00
Drilled Shaft Diameters: 4' and 6'
Shaft Depth: 90'

Project Description:

East Coast Slurry Company and A.A. Will Corporation teamed up to complete this foundation project for a 22 story mixed use building along Boston's waterfront. Forty eight drilled shafts were installed by East Coast Slurry. Drilled shafts containing embedded steel columns were used as part of the time saving "top down" construction method. A.A. Will performed the top down mass excavation. Difficult site conditions were encountered due to existing wooden pile foundations which were installed as part of the old waterfront wharves.

Harvard Laboratory for Interface Science and Engineering Slurry Wall Foundation with Bracing



Slurry Wall Supports Adjacent Buildings

Location:	Cambridge, MA
Owner:	Harvard University
Completion Date:	July, 2005
General Contractor:	Turner Construction Company
Vital Statistics:	
Project Value:	\$4,600,000.00
Wall Type	30" Reinforced Concrete Slurry Wall and Drilled Shafts
Wall Area:	45,500 S.F.
Wall Depth:	53'

Project Description:

Harvard University's Capital Improvements Program continued with this Life Science Research facility. This 3 level underground research facility was braced with a combination of tiebacks and corner bracing. Due to limited onsite space, a crane platform was constructed to bear on the slurry wall and drilled shafts. The platform is used for concrete placement as shown in the bottom left photo and also for part of the steel erection work.



Wall & Shafts Support Concrete Pump



Mass Excavation

Emerson College Piano Row Residence Hall Slurry Wall, Bracing, and Mass Excavation



Braced Slurry Wall

Location: Boston, MA
Owner: Emerson College
Completion Date: June, 2005
General Contractor: Macomber Builders
Vital Statistics:
Project Value: \$3,650,000.00
Wall Type: 24", 30", and 36" SPTC Slurry Wall and Load Bearing Elements
Wall Area: 47,600 S.F.
Wall Depth: 88'

Project Description:

Emerson College decided to build student housing in downtown Boston along Boston Common's Piano Row retail area. Space was at a premium in this congested urban setting. The building provides housing and an underground full size basketball court. East Coast Slurry Company teamed with A.A. Will Corporation to provide a complete foundation.



Tight Site Conditions

345 Thames Street Slurry Trench Cutoff Wall



Trench Excavation

Location: Bristol, RI
Owner: Stone Harbour Development
Completion Date: February, 2004
General Contractor: Stonestreet Associates
Vital Statistics:
 Project Value: \$400,000
 Wall Type: 36" Soil Bentonite
 Wall Area: 24,000 S.F.
 Wall Depth: 30'

Project Description:

A new residential condominium on Bristol, Rhode Island's waterfront was constructed on an old industrial site which contained contaminated soils. East Coast Slurry Company was chosen to install a slurry trench barrier wall to prevent ground contaminants from migrating into the surrounding water table and ultimately into Bristol Harbor.



Backfill Mixing Plant



Completed Trench

Harvard Biological Research Institute Slurry Wall Foundation



Tremie Concrete Placement

Location: Cambridge, MA
Owner: Harvard University
Completion Date: January, 2004
General Contractor: SKANSKA USA

Vital Statistics:
Project Value: \$4,500,000
Wall Type: 30" SPTC Slurry Wall and Load Bearing Elements
Wall Area: 50,000 S.F.
Wall Depth: 52'

Project Description:

This facility, built entirely underground, provides much needed research space at Harvard University. A campus quadrangle with a volleyball court is all that can be seen at the ground surface. Slurry wall and LBE construction allowed this work to take place with vital college facilities in operation on all four sides of the site, including an Egyptian antiquities museum, which imposed very strict movement and vibration criteria during construction. East Coast Slurry Company was able to complete the job without causing any problem for the surrounding facilities.



Slurry Wall Excavation in Progress



Exposed Wall and LBE Columns