COST ESTIMATE VOLUME 3

JOHN M. TOBIN MONTESSORI SCHOOL

VASSAL LANE UPPER SCHOOL

DHSP CHILDCARE & COMMUNITY SCHOOL

PERKINS EASTMAN

JUNE 26, 2020


R WATKINS

table of contents

VOLUME 1 | Feasibility Study
VOLUME 2 | Educational Specification
VOLUME 3 | Cost Estimate
VOLUME 4a | Appendix
VOLUME 4b | Geotechnical Report
VOLUME 4c | Meeting Minutes

1.0

COST NARRATIVE

Tobin Montessori Vassal Lane Upper School Project
Feasibility Study Cost Narrative

February 14, 2020

Table of Contents

1.0 Project Overview

The Tobin Montessori Vassal Lane Upper Schools Project is a new school building located in Cambridge, MA on a 9.1-acre parcel bounded by Concord Ave to the north, private properties on Alpine Street to the east, and Vassal Lane to the south. To the west is a National Guard Armory and other commercial properties.

The new building will have the capacity to serve up to approximately 336 three year old to 5th grade students in the lower school, 45 Special Start students, 450 sixth through eighth grade students in the upper school, 68 students in the Autism Spectrum Disorder (ASD) program (lower and upper school) and 75 students in the Sheltered English Immersion (SEI) program (upper school) and 80 students in the preschool as well as a robust Community Afterschool program. The campus will serve up to 975 students with approximately 265 faculty and staff members. The current space projection to serve this enrollment calls for approximately 194,000 net square feet and 298,000 gross square feet (1.54 multiplier).

The building is organized into three wings: one three-story wing for the Tobin Montessori School, one four-story wing with one floor for preschool and community school and three floors for the Vassal Lane School, and a wing for shared spaces including the auditorium, dining & kitchen, and gymnasia. The wings are organized around a central "Heart of the School."

There will be one constructed level below grade, which will be somewhat larger than the ground level footprint, and which will contain parking for 100 staff parking spaces, 50 parent/short-term parking spaces, and a drop off lane. Also on this level will be District-wide science storage and shops. This level will be accessed via an elevator and enclosed stair that leads up to the Heart of the School above. Vehicular entrance to the garage is via a single ramp off Vassal Lane with structured walls along either side.

Sitework will include ground-source heat pump wells with manifolds and connections to mechanical systems on the ground floor of the building; the complete remediation, demolition, and removal of the existing building, utilities, foundation, FFE, and other supporting systems and appurtenances; complete demolition of existing site features and replacement with new fields, playgrounds, plantings, et cetra.

1.25-million-gallon stormwater retention tank will be located on this site. The tank may be located below the school building. It will be supplied by gravity from Vassal Lane and Concord Avenue. A pumping station associated with the tank will feed via forced main in the direction of Vassal Lane.

The building is designed for Net Zero Emissions and is pursuing Net Zero Energy and LEED Gold certification. All references to LEED refer to LEED for Schools version 4.1.

2.1 Civil

Feasibility Study DRAFT section 4.2 – Site Utility and Stormwater Narrative dated February 14, 2020

Nitsch Engineering

2 Center Plaza, Suite 430
Boston, MA 02108-1928
T: 617-338-0063
F: 617-338-6472
www.nitscheng.com

4.2 Site Utility and Stormwater Narrative

PROJECT OVERVIEW

The School is located at 197 Vassal Lane within the Fresh Pond area of Cambridge. The parcel is approximately 9.2 acres and includes the School building, an existing parking lot, and a drop-off driveway along Vassal Lane (Figure 1). Callanan Park is in the northern portion of the parcel along Concord Road. The parcel is bounded by Vassal Lane to the south, residential houses on Alpine Street to the east, Concord Avenue to the north, and commercial properties on Fresh Pond Parkway to the west.

Figure 1: Aerial Locus (Google imagery)

The existing subsurface soil profile consists of contaminated fill, estimated seasonal high groundwater approximately three feet below the surface, and bedrock ranging from twenty feet to seventy feet below the surface. The contaminated soils and high groundwater make the site unsuitable for infiltration.

The proposed school building will be constructed in the same location as the existing building along Vassal Lane. Parking for the site will be shifted into a new underground parking garage that will span the entire footprint of the proposed building. The drop-off area will be located to the west of the proposed building with access from Vassal Lane. The fields in Callanan Park will be replaced. A bike path is proposed to the west of the building connecting from Concord Avenue to Vassal Lane.

SITE UTILITIES

Stormwater Management

Existing Stormwater Management

The southern portion of the existing site, including the existing school building roof, parking lots, and driveways, are collected into a closed drainage system and directed to one of several drain lines in Vassal Lane. Currently, it

does not appear as if there are stormwater quantity mitigation measures or quality improvements located within the Tobin School site drainage systems.

The eastern portion of the site runoff is directed to the 54-inch trunk line in the center of Vassal Street. The roof runoff is piped to a 20-inch drain which discharges to a 36-inch drain in Vassal Lane and bypasses to the 54-inch. Both the 54-inch, the 36-inch, and an additional 36-inch drain combine at a drainage vault to the southwest of the existing school. Stormwater runoff in the northern portion within Callanan Park are collected in a series of underdrains and 12-inch pipes that discharge into a 48-inch drainage line in Concord Avenue.

The Vassal Lane and Concord Avenue drainage systems combine at the intersection of Fresh Pond Parkway and Concord Avenue. Stormwater continues in two parallel systems through a series of drainage vaults and box culverts before discharging to an 8-foot by 4-foot box culvert in Wheeler Street and a 60-inch combined wastewater pipe in the Cambridge Park Drive area. The system outlets to a 42-inch and a 66-inch combined wastewater outfall to the Little Brook (Figure 3), a tributary to the Alewife Brook.

Proposed Regional Stormwater Storage Project

The City of Cambridge has identified the Tobin School site as a preferred location for regional stormwater storage to alleviate projected flooding conditions identified through the Cambridge Climate Change Vulnerability Assessment (CCVA). The initial design indicates that stormwater from the drainage mains in Vassal Lane and Concord Avenue will be diverted flow through weir structures in large storm events and flow by gravity to a 1.25-million-gallon stormwater storage tank (Figure 2). Once the storm has passed, the tank will be emptied out and stormwater will be pumped through a force main to a discharge in Vassal Lane. The gravity pipe connections from the Concord Avenue will be a 36-inch service and the gravity service from Vassal Lane will be a 42-inch service. Stubs from the storm drain infrastructure in both Vassal Lane and Concord Avenue have already be constructed. The City has a separate modeling and design team working on the requirements of this system; however, the stormwater storage project will be closely coordinated with the Tobin School project and integrated into the design documents.

According to the City's design consultants, the stormwater storage tank can be either (1) 104-foot diameter by 20 feet deep, or (2) 140 ft long x 60 ft wide x 20 ft deep. For the purposes of this feasibility study, we have assumed that the proposed tank will be rectangular and located underneath the southeastern corner of the building. The tank will need to extend out from underneath the proposed building to allow overhead access to both sides of the tank.

In addition to the stormwater storage tank, the City has also identified an area of surface flooding along Vassal Lane that occurs in high-intensity storm events. The City is proposing to integrate a surface stormwater feature on the Tobin School site to help improve the flooding condition on Vassal Lane. The study identified the need to have approximately 100,000 gallons (13,370 cubic feet) of storage in order to help alleviate the flooding. The project team has identified a space in front of the proposed building along Vassal Lane where stormwater can be directed from Vassal Lane. Nitsch is proposing two bioretention basins that are hydraulically connected but separated by a pedestrian walkway. Stormwater runoff will enter the bioretention basins through curb openings and swales along Vassal Lane. The bioretention basins will total approximately 6,500 square feet and will have approximately 1.5 feet of maximum ponding depth. The bioretention basins will also include subsurface storage to enhance the available volume for storage and meet the 100,000 gallon storage target. Overflow from the bioretention basins will be conveyed by gravity to the stormwater storage tank.

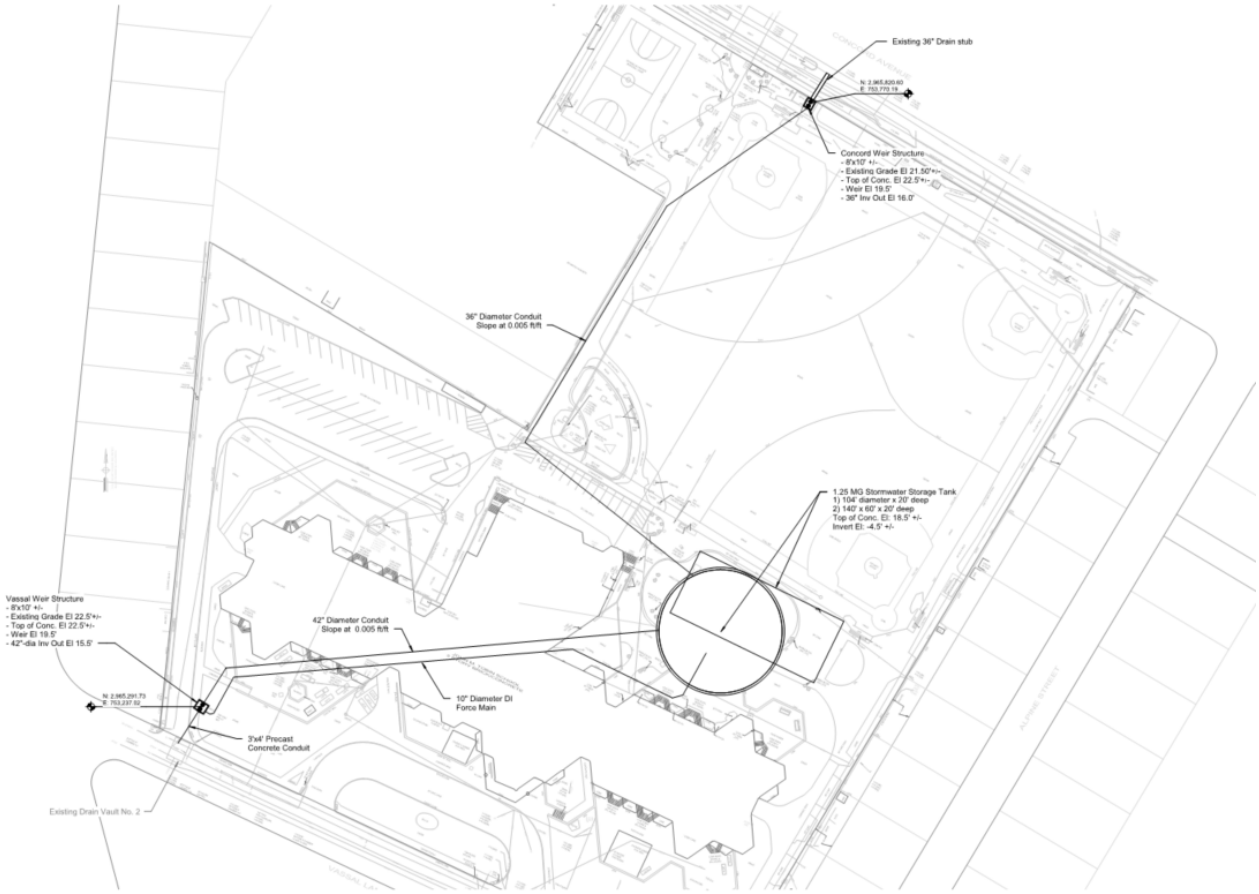


Figure 2: Weir Structure Locations on Vassal Lane and Concord Avenue (prepared by Stantec)

Proposed On-Site Stormwater Management

The City of Cambridge typically has two primary stormwater design requirements under the DPW's Stormwater Control Permit. Projects need to reduce the proposed development peak flow rate from the 25-year storm event to be less than or equal to the peak flow from the 2-year storm event under existing conditions and the total phosphorus loading from the site needs to be reduced by 65% in the proposed condition.

The City has indicated that the Tobin School project does not need to meet the peak rate reduction requirement because of the regional stormwater improvements being integrated into the site design (i.e. the 1.25-million-gallon tank and the 100,000-gallon surface/subsurface storage along Vassal Lane). However, the project will be required to meet the phosphorus reduction requirement, which generally means collecting and treating the first inch of stormwater runoff generated over impervious and pervious surfaces.

The proposed site design results in a net decrease in impervious cover that results in a slight reduction in the phosphorus loading. Although phosphorus loading is being reduced by the change in land cover, additional treatment is required in order to meet the 65% reduction requirement. Because the subsurface conditions are not suitable for infiltration, the project intends to meet the phosphorus reduction requirement by using a combination of green roof, porous pavement, bioretention, StormTech Isolator Rows, and proprietary stormwater treatment devices. For the purposes of this feasibility study, Nitsch is assuming that 10% of the proposed roof can be used as a green roof. The location and treated area for each of this stormwater treatment facilities is provided in the attached Preferred Alternative Stormwater Study Diagram (the Stormwater Diagram).

As shown in the Stormwater Diagram, several proposed landscaped areas have been identified for use as bioretention basins. Stormwater from the adjacent surfaces will runoff overland to the bioretention basins to be treated. A portion of the roof runoff will be directed to a bioretention basin to the northeast of the proposed building. The bioretention basins includes a minimum 24-inch specialized soil media filter to provide solids and nutrient pollutant removal and will be lined to provide separation from groundwater and prevent infiltration. The bioretention basins will have 6" perforated PVC underdrains that will discharge to an onsite closed drainage system that discharges to the 1.25-million-gallon tank. The bioretention basins may need to be lined because of the elevation of groundwater.

The proposed bike path and perimeter around the basketball court are proposed to be constructed from porous asphalt. The porous asphalt will consist of an 18-inch bank-run gravel filter course and 8-inch crushed stone reservoir section to provide phosphorus removal. The reservoir course will have a 4-inch perforated underdrains that will connect to the onsite closed drainage system. The porous asphalt will treat stormwater runoff from itself and from the adjacent areas that slope to it.

For areas of the site where stormwater runoff cannot be captured by a bioretention basin or porous pavement, structural best management practices (BMPs) are proposed. Nitsch is proposing the use of StormTech Isolator Rows and Stormceptor water quality treatment units. The use of Isolator Rows is preferred because they provide a higher level of phosphorus removal but in areas of the site where space is limited, Stormceptors will be used. For purposes of pricing, we are assuming the Stormceptor STC-900 unit will be used. Discharge from these BMPs will be directed to the tank. Refer to the Stormwater Diagram for the locations of these BMPs.

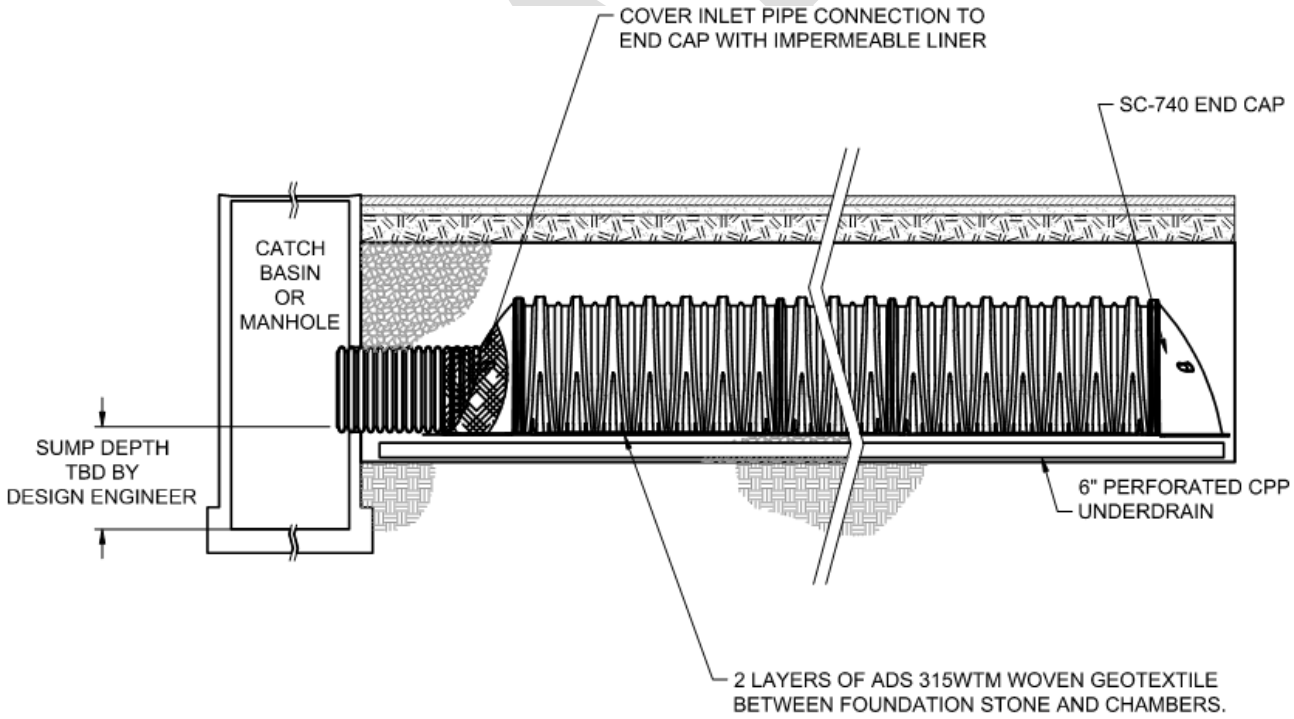


Figure 3: Sample StormTech Isolator Row Detail (for pricing purposes)

If the proposed project requires perimeter foundation drains and underslab drainage to be installed under the lower levels of the proposed building, note that the City of Cambridge does not allow collected groundwater (from underslab drainage and/or perimeter drainage systems) to be discharged to its municipal storm water system. Therefore, any groundwater that is collected in these types of systems will need to be discharged on-site and not

allowed to find its way to the municipal storm drains. Since the soil and groundwater conditions are not suitable for infiltration, rainwater harvesting and reuse will be evaluated to meet this requirement.

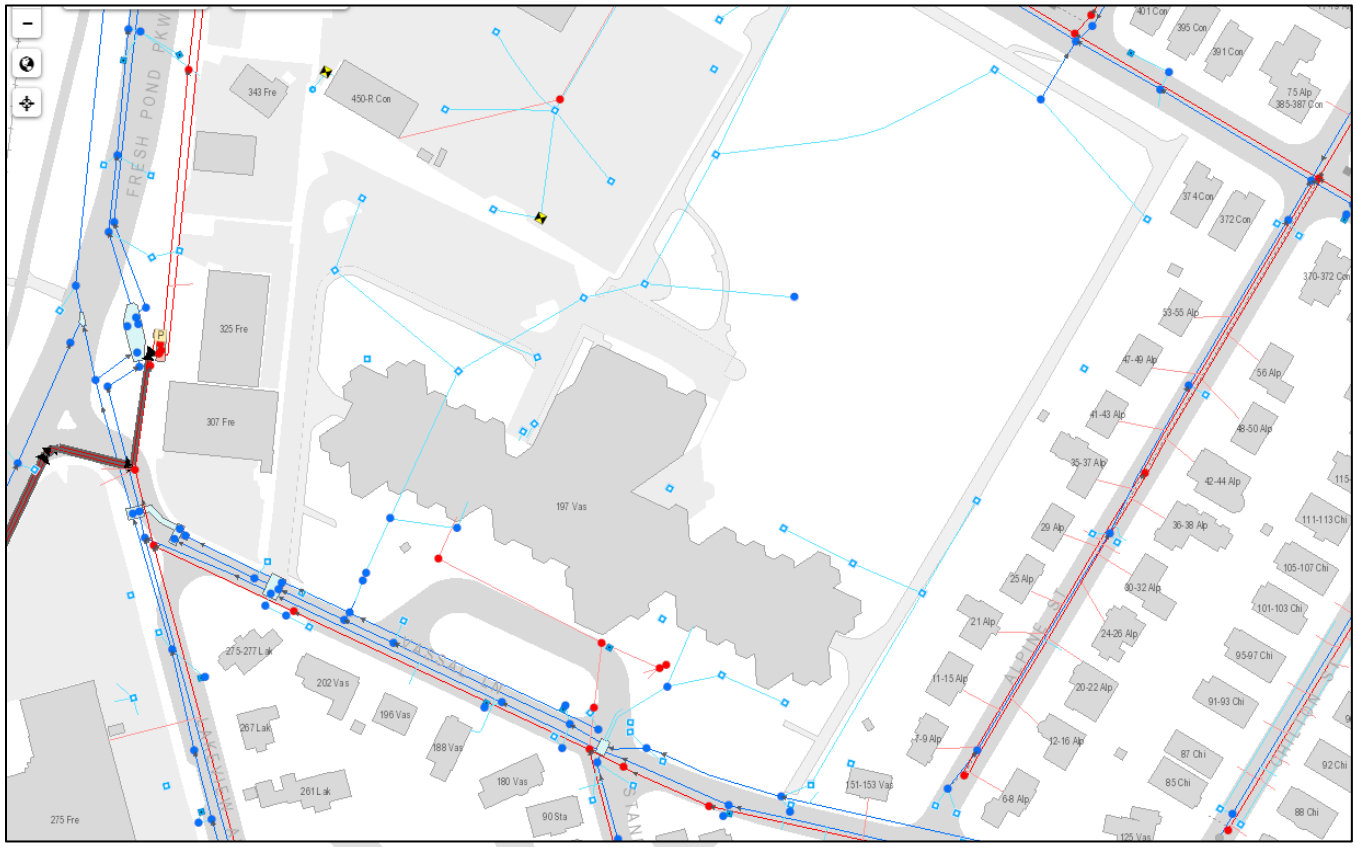


Figure 3: Cambridge GIS – Sewer and Drain at Project Site

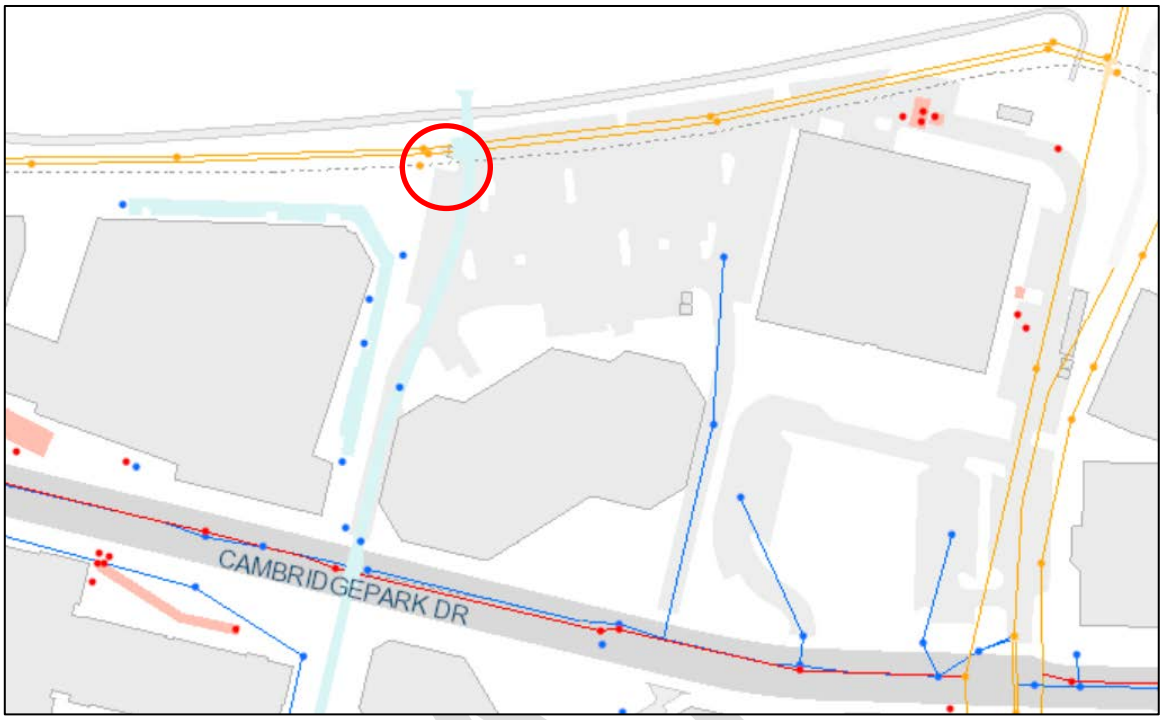


Figure 4: Cambridge GIS – Sewer and Drain Outfalls

Sanitary Sewer

The 8-inch sanitary sewer service for the Tobin School currently exits the building along the south face of the building and connects to the 18-inch sewer main in Vassal Lane (Figure 2). The 18-inch main connects to a "Sewer Flush Vault" which then pumps via a 4-inch force main and an 18-inch overflow pipe to another "Sewer Flush Vault". The sewer flush vault directs sewer flow to a 24-inch pipe which ultimately ends up in the Massachusetts Water Resource Authority's (MWRA) jurisdiction.

The municipal sewer and drain infrastructure in Concord Ave and Vassal Lane were reconstructed within the last five years and are in good condition. Cambridge DPW reported that there are no known issues with the sewer capacity in Concord Ave and Vassal Lane. The City prepared models during the reconstruction process to review capacity. There was infiltration/inflow removal and the system capacity was increased at that time.

The City of Cambridge indicated that the sewer mains in both Concord Avenue and Vassal Lane are in good condition and the project could connect to either system. Because the proposed building is going to be located along Vassal Lane, the sanitary sewer services are proposed to connect to the main in Vassal. Nitsch is anticipating three sanitary sewer service from the building, one from each wing of the building. The cafeteria is located in the northwest corner of the building and will require its own service that will be directed to an external grease trap. Nitsch is anticipating the need for at least two connections the from the site into the main in Vassal Lane.

The City of Cambridge indicated that they are open to allowing the project to reuse some of the existing connections from the site to the main. If the project determines this approach is feasible and desired, the City will require video scoping of the services from the point where they will be reused to the main. This approach may be desirable to avoid constructing utility crossings with the drain mains in Vassal Lane.

As design progresses, the project team will need to determine if the sewer flows from the proposed building increase from existing conditions and if the existing sewer infrastructure can adequately the increase in flow. If sewer flow is increased by more than 15,000 gallons per day, infiltration and inflow (I/I) calculations will be

required for mitigation with the Cambridge Department of Public Works. Title V will be used to determine existing and proposed sewer flows.

Domestic Water and Fire Protection

The domestic water service for the existing school is 8-inch and is fed from the 12-inch main in Concord Avenue (Figure 4). A 6-inch hydrant service branches off the 8-inch domestic. Nitsch Engineering assumes the fire protection system for the existing school building is also serviced from the 8-inch water service. Note that there is also an existing 8-inch water main in Vassal Lane that does not appear to supply the existing school building.

Nitsch Engineering proposes to connect to the existing 8-inch water main Vassal Lane although this will need to be reviewed by the City of Cambridge to confirm the capacity of the existing main is appropriate. The proposed building has a water room located at the northwest corner of the building. The project currently plans to connect a domestic water and fire protection service to the 8-inch main at the southwest corner of the site. The water services will run underneath the drop off area to the west of the school and connect to the water room.

As the design progresses, Nitsch Engineering will coordinate with the MEP Engineers and the Cambridge Water Department. The Cambridge Water Department will need to review and approve water plot plans.

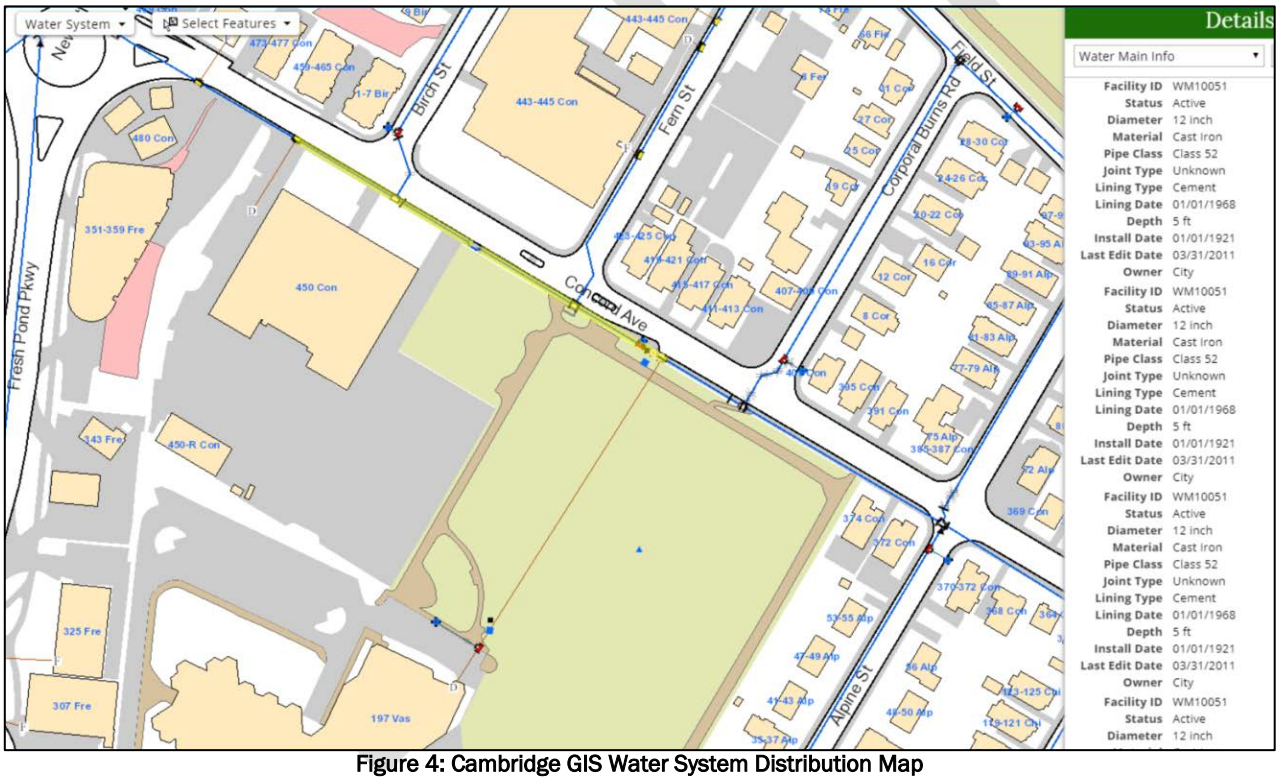


Figure 4: Cambridge GIS Water System Distribution Map

Gas Service

The School is currently serviced by a gas line (size unknown) that connects to the existing 4-inch gas main located in Vassal Lane. The existing gas line connects to the School building in the vicinity of the intersection of Vassal Lane and Standish Street. There is no gas service proposed for the new school building; however, the stormwater tank pump house will require a natural gas service for its backup generator. The generator will be located at the southwest corner of the building near the stormwater tank. The gas service will likely connect to the 4-inch gas main in Vassal Lane.

Site Electrical

The School is currently serviced by multiple electrical services (size unknown) from Vassal Lane. At the westernmost driveway, which serves as access to the parking lot, an underground electrical service extends from a manhole in Vassal Lane into another manhole in the parking lot, before connecting into the western side of the existing school building. Along the eastern parcel boundary, overhead wires extend into the site from the overhead wires located along the south side of Vassal Lane. This electrical connection appears to service lighting located behind the school building. Refer to the Existing Conditions Survey provided as Attachment A for additional information.

The MEP Engineer has indicated the utility companies have determined there is adequate capacity to connect the electrical service for the project to either Vassal Lane or Concord Avenue. Because the building is located along Vassal Lane, the electrical will most likely connect to the existing infrastructure in Vassal. The electrical room for the proposed building is located in the northwest corner of the building. The electrical service is proposed to enter the southwest corner of the site underground and run underneath the drop off area to the northwest corner of the building.

PERMITTING CONSIDERATIONS

Surface Water Supply Protection (310 CMR 22.20)

The Massachusetts Department of Environmental Protection (DEP) ensures the protection of surface waters used as sources of drinking water supply from contamination by regulating land use and activities within critical areas of surface water sources and tributaries and associated surface water bodies to these surface water sources.

Massachusetts GIS indicates that the site is within a Surface Water Protection Zone A and Zone C (Figure 5) and an Outstanding Resource Water Area (Figure 6) due to its proximity to the Fresh Pond. However, based on the site survey and Cambridge GIS information, the majority site runoff is collected in a closed drainage system that discharges to the Alewife Brook, rather than overland and Fresh Pond. Additional coordination with the City of Cambridge will be needed to confirm if the Surface Water Protection Zones and Outstanding Resource Water designation are applicable to the site.

Nitsch Engineering will coordinate with the Cambridge Department of Public Works and/or the Watershed Management Division of the Cambridge Water Department to determine if the Surface Water Protection and the Outstanding Resource Water classifications are applicable. Because the stormwater approach to provide phosphorus treatment requires significant stormwater improvements already, this classification is not anticipated to significantly affect the stormwater design. However, it may require the project to undergo an additional review by the City.

Figure 5: MassGIS Surface Water Protection

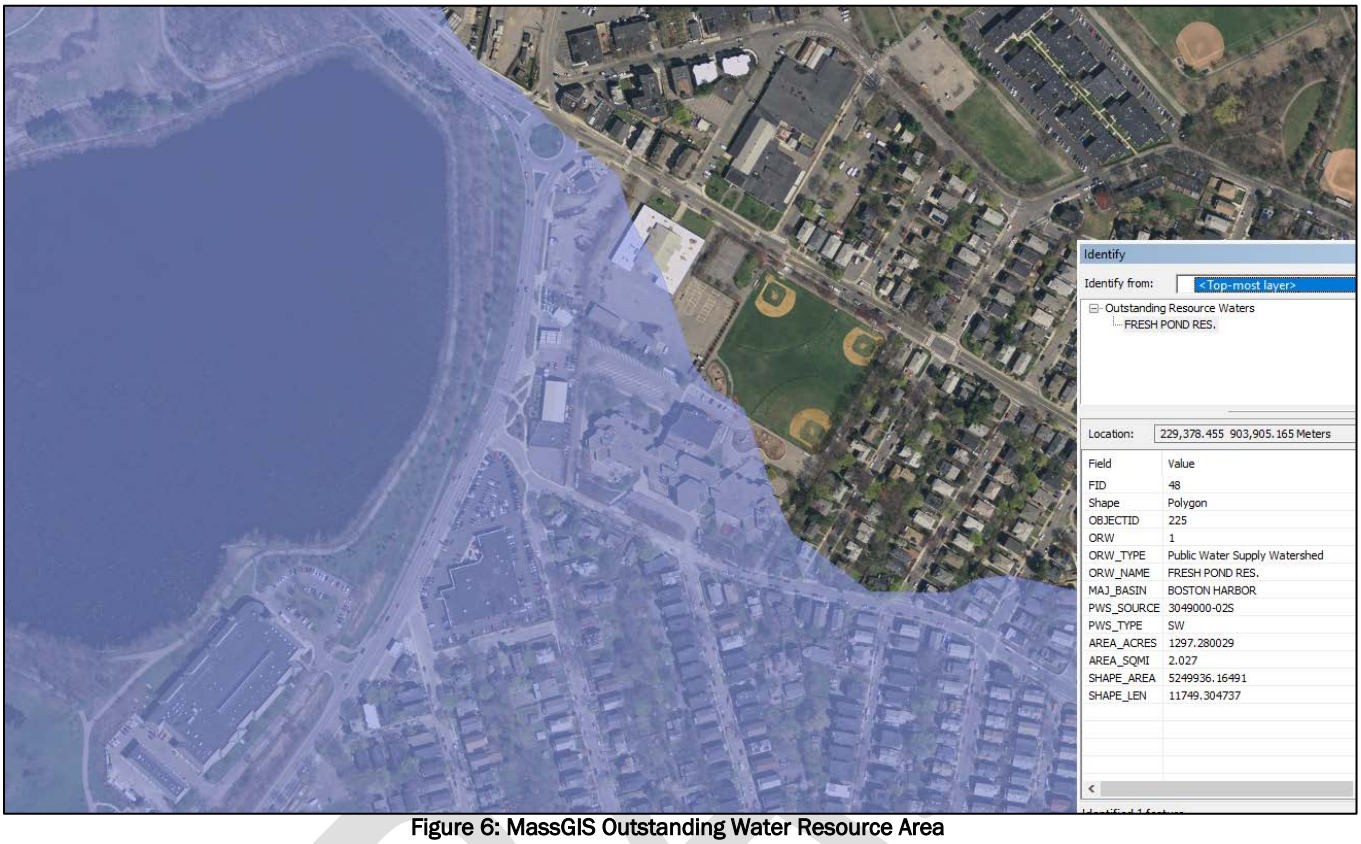


Figure 6: MassGIS Outstanding Water Resource Area

Floodplain - FEMA

Based on the Flood Insurance Rate Map (FIRM), Community Panel Number 25017C 0419E, dated June 4, 2010, it appears that portions of the project site falls within a shaded Zone X. Zone X is described as areas of 0.2% annual chance of flood; areas of 1% annual chance flood with average depths of less than one (1) foot or with the drainage areas less than one (1) square miles; and areas protected by levees from 1% annual chance of flood.

Floodplain - Cambridge Flood Viewer v2.1

The Tobin School site was identified as an area of concern in the Cambridge Flood Viewer 2.1 mapping study.

Nitsch Engineering originally reviewed The City of Cambridge Flood Viewer in August of 2019 and it indicated that the present day 100-year flood elevation on the School parcel is at 23.5 feet, with the anticipated 100-year flood elevation in 2070 up to elevation 22.1 (SLR/SS) and 24.1 feet (Precip.) (Figure 7). Nitsch Engineering understands that the neighborhood flooding issue in the area is the driver of the 1.25-million-gallon stormwater storage tank and the 100,000 gallon surface stormwater feature (potentially proposed as a rain garden).

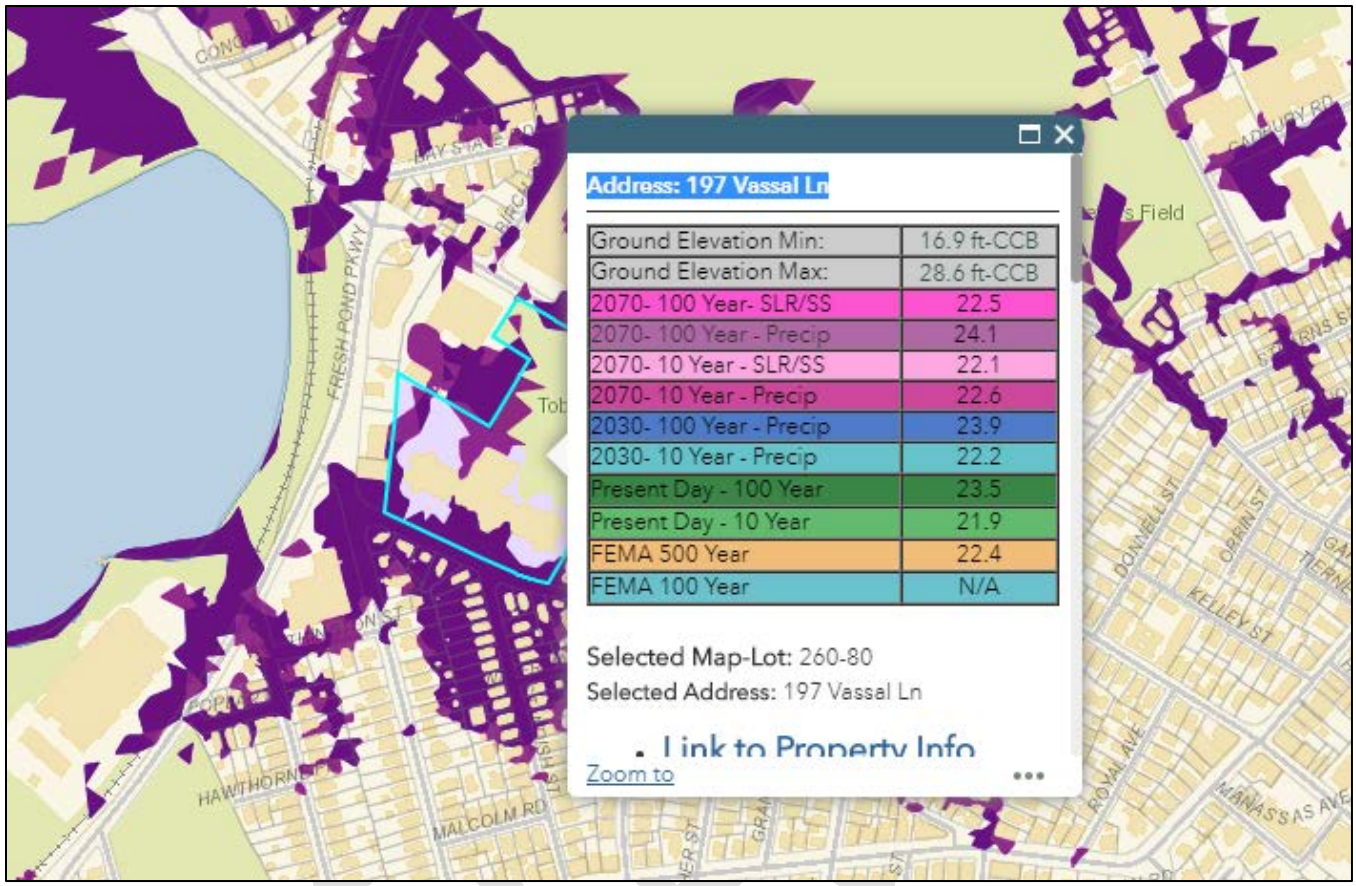


Figure 7: Cambridge Flood Viewer, August 2019

Nitsch Engineering revisited the City of Cambridge Flood Viewer in early 2020 and found that the present day 100-year flood elevation decreased to 22.8 feet and the anticipated 100-year flood elevation increased to 22.6 feet (SLR/SS) and decreased to 23.7 feet (Precip.) (Figure 8). This change should be reviewed with the City of Cambridge as part of the design process to confirm which elevation should be used and what the design standards for these elevations should be.

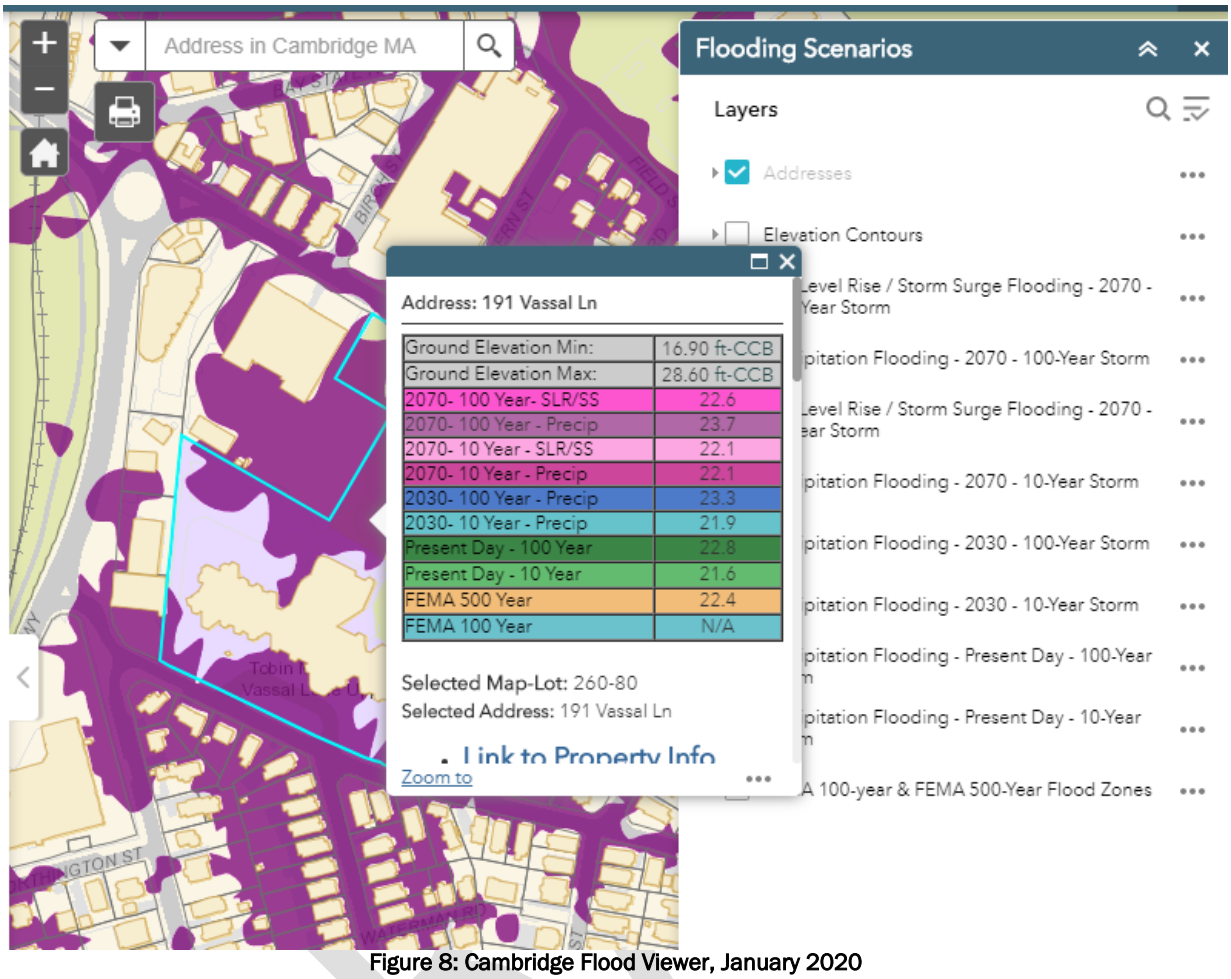


Figure 8: Cambridge Flood Viewer, January 2020

<u>City of Cambridge Stormwater Control Permit</u>
The project is required to obtain a Stormwater Control Permit because it currently exceeds the following standards, as outlined in Section 3.1 of the Wastewater and Stormwater Management Guidance document:

- The project will disturb one (1) or more acres of land;
- The project will exceed 50,000 square feet of Gross Floor Area;
- The project parcel(s) equals or exceeds one (1) acre in size; and
- A Special Permit is required for the project by the Planning Board.

The City of Cambridge requires the peak flow rate associated with the 25-year storm from proposed developments not to exceed the peak flow rate associated with the 2-year storm under existing conditions and 65% of phosphorus is removed from stormwater generated by proposed site redevelopment on an annual basis. As noted previously, the City has indicated that the project can take credit for the City's proposed stormwater improvements and not document compliance with the peak rate reduction requirement. The project will still need to meet the Phosphorus reduction requirement and submit a Stormwater Control Permit application to the City for approval during the design process.

EPA NPDES Construction General Permit

Construction activities that disturb more than one (1) acre are regulated under the United States Environmental Protection Agency's (EPA) National Pollution Discharge Elimination System (NPDES) Construction General Permit Program. In Massachusetts, the EPA issues a NPDES CGP to owners and operators of regulated construction sites. Regulated projects are required to develop and implement stormwater pollution prevention plans in order to obtain permit coverage. The project is anticipated to disturb more than one (1) acre and is anticipated to require this permit.

2.2 Geotechnical Narrative

2.3 Landscape Narrative

Feasibility Study DRAFT section 4.11 – Landscape Design dated February 14, 2020

4.11 Landscape

Existing conditions: Refer to May 2019 Existing Conditions Assessment Report

Overall Proposed Site and Landscape Design

The Tobin Montessori-Vassal Lane Upper Schools with added Community School and Preschool require a significant amount of open space programming. This is confirmed and requested by the community, Cambridge Public Schools Department and Cambridge Department of Health Service Programs. With limited open space in the City of Cambridge, the City is charged with looking at the project from the lens of a building within a park. The importance of open space is outlined in *Envision Cambridge – Alewife District Plan (2018)* which includes specific open space objectives.

Community access, through the site and to the open space elements will be a key component in the design. Access through the site meets a key objective of the intent of the *Envision Cambridge* is to "Better integrate the district with the rest of the city through new walking and biking paths, streets and open spaces."

The preferred option includes multiple outdoor structured play spaces. These spaces meet the needs of a range of age groups for both the school and the community, including: gardens meeting the City Sprouts program and gardens for multiple uses including rain gardens, sensory gardens and habitat gardens. Hard court play areas serve multiple uses including winter activities. Some hard court play areas may double as the bus drop off areas. In these situations, the hard court play would be restricted to vehicles during certain hours of the day. Outdoor greenspace is also a major feature and provides both structured field space and passive open space. All of these varied spaces will provide students and community members with a rich experience.

Pathways for cyclists and pedestrians will be designed to provide open and safe access across the site including connectivity to main building entrances, play spaces and the neighborhood. Pathways will have lighting, wayfinding, seating nooks for rest and viewing of open spaces and landscape.

Play Areas: Play areas will be connected by pathways and simple separation techniques including fencing, landscape and building will allow for a safe outdoor play space with age appropriate play equipment for 3-year old children, Pre-K, elementary and middle school age groups. A key objective for each space is to provide a visually connected, universally designed play area for all needs with easy access for teachers and other parents. Each space will have amenities including seating, tables, wayfinding, and drinking fountains in key locations for the comfort of students, staff and the community.

Play equipment will have both free standing features and functionally linked equipment that can be easily maintained and withstand heavy use. All play apparatus and play spaces will be rich in sensory experiences, imaginary play and gross motor skill development. Ground plane material will include a poured in place surface meeting all critical fall height safety and ADA requirements.

Sensory play may be accomplished by the use of musical instruments, visual and tactile play panels, and native landscape gardens touching on the senses. Small and large group settings

are engrained into the landscape to create a small school feel within a larger school community.

Natural play spaces, or messy gardens, may include a mix of traditional and natural play elements allowing students to decide how they want to play, build, and create.

The preferred option site plan provides specific information and location of materials, amenities and conceptual grading.

2.4 Structural Narrative

4.4 Structural

INTRODUCTION

Foley Buhl Roberts & Associates, Inc. (FBRA) is collaborating with *Perkins Eastman (PE)* in the development of design options for the Tobin Montessori and Vassal Lane Upper Schools project in Cambridge, Massachusetts.

The purpose of this narrative is to summarize the basis of the structural design, describe the primary structural systems and provide preliminary structural quantities to be used in the preparation of the Conceptual Design cost estimate. Outline Structural Specifications have also been included. Proposed new construction will be designed and constructed under the provisions of the Massachusetts State Building Code (780 CMR - 9th Edition, based on the 2015 IBC). This Structural Narrative should be used in conjunction with the Conceptual Design Architectural documents and those of the other disciplines, as well as the FBRA *Existing Conditions Structural Report* dated March 29, 2019.

DESIGN OPTIONS

A number of design options have been studied in recent months; including the following:

Option 1 (Renovation/Addition): Option 1 re-uses the classroom bar of the existing building, but demolishes the Gymnasium/Locker Room wing on the north side of the classroom bar (at the expansion joint), to accommodate the construction of a new, structurally separated, two and three-story addition. Playing fields are located along the east side of the site (Alpine Street).

Option 1A (Replacement v3 - Crossroads): Option 1A demolishes the existing building and constructs a new, three and four-story building (approximately) over the original building footprint. The Vassal Lane School and the Preschool are located at the west end of the classroom bar; the Tobin Montessori School is located at the east end. Shared spaces would are located to the north of the classroom bar, connected by a central "Heart of School" space. Playing fields are located to the north of the new building, along the east side of the site (Alpine Street).

Option 2 (Wings): Option 2 demolishes the existing building and constructs a new, two and three-story building to the north, in the area currently occupied by playing fields. Playing fields are located to the south of the new building, along Vassal Lane.

Option 3 (Pavilions): Option 3 demolishes the existing building and constructs a new, three-story building that overlaps a portion of the original building footprint and extends further to the north. Playing fields are located at the southwest corner of the site.

All options include a Mechanical Penthouse and a below grade parking level for 150 cars. The completed facility will not be designated as a FEMA Emergency Shelter.

The City of Cambridge has chosen Option 1A (Replacement v3 - Crossroads) as the Preferred Option. Structural comments and information that follow in this narrative relate to the **Crossroads** option.

GENERAL STRUCTURAL DESCRIPTION

The proposed, new school (Crossroads option) will be constructed on the site of the existing building. The Tobin School Wing and the Vassal Street Wing will flank a central "Heart of School" space to the southeast and southwest, respectively. Shared spaces (Auditorium, Gymnasium, Dining, etc.) are located to the north of this space. The building will be three and four-stories high, with a basement parking/storage level below the entire building footprint. A 1.25M gallon storm water storage tank will be located below the parking level of the Tobin Wing.

New construction will be steel framed, for reasons of economy, performance, flexibility and speed of construction. Typical floor construction (including Mechanical Penthouse floors) will be a concrete slab on composite steel deck, supported by composite, structural steel beams and girders. Roof forms are typically flat and are pitched for drainage. Roofs will be framed with steel roof deck supported by structural steel beams and girders. A concrete slab on composite steel floor deck will be provided below individual rooftop units, for acoustic purposes. Screens (visual and acoustic) surrounding individual rooftop units will be structured with horizontal and vertical, galvanized HSS (tube) steel members, braced down to the main roof structure. The Gymnasium roof will be framed with acoustical steel deck, supported by structural steel purlins, which span to steel trusses. The Auditorium roof will be similarly structured, with standard, non-acoustical roof deck. The typical roof structure will be designed to support a green or blue roof system and photovoltaic (PV) panels.

New, steel framed construction is assumed to be Type 1B (Noncombustible, Protected). Typical steel floor and roof members (beams, columns and bracing) and steel roof deck (except where the height exceeds 20 feet) require fire protection.

Typical floor and roof steel framing will be surface prepped and be left unpainted, except exposed steel in the Gymnasium, which will receive one shop coat of primer, compatible with the finish paint.

Typical columns will be wide flange sections or hollow steel tubes (HSS). Lateral stability for wind and seismic loads will be provided by steel bracing (various configurations) in each direction.

A pile foundation will be required for all new construction, similar to the existing building. Lowest level slab construction will be a structural concrete slab on grade. Existing foundations will be removed where they overlap with new construction. Existing utilities will be removed and relocated, as required to accommodate the new construction. Temporary lateral earth support and dewatering will be required during construction.

Exterior walls will be a combination of architectural panels and masonry veneer, with a steel stud backup.

An alternate (hybrid) structural scheme, utilizing structural steel, glued laminated timber and cross laminated timber members is also under consideration. A description of this alternate structural scheme will be provided in a separate document.

BASIS OF STRUCTURAL DESIGN

Codes and Design Standards:

Building Code:	Massachusetts Building Code - Ninth Edition (2015 IBC with Massachusetts Amendments).
Concrete:	ACI 318 and ACI 301; listed standards, latest editions.
Masonry:	ACI 530/530.1, latest edition.
Structural Steel:	AISC "Specification for Structural Steel Buildings" and AISC "Code of Standard Practice".
Steel Deck:	Steel Deck Institute (SDI); listed standards, latest editions.

Design Loads/Parameters:

Live Loads:

Auditorium (Fixed Seating):	60 PSF
Classrooms (with partition allowance):	65 PSF
Corridors:	100 PSF
Flexible, Open Plan Areas (Including the Gymnasium):	100 PSF
Stairs:	100 PSF
Mechanical Equipment Rooms and Penthouses:	150 PSF

Snow Loads (Cambridge):

Basic Ground Snow Load:	40 PSF
Flat Roof Design Snow Load:	31 PSF (Plus drifting snow)

Wind Loads (Cambridge):

Basic Wind Speed (Ultimate):	139 MPH

Seismic Parameters:

Short Period Spectral Response Acceleration (S_s):	0.216
1.0 Sec. Spectral Response Acceleration (S_1):	0.069
Seismic Occupancy Category	III
Seismic Design Category:	B (Assumed)
Site Class:	D (Assumed)
Structural System:	Building Frame System
Lateral Load Resisting System:	Concentrically Braced Frames (*Not Specifically Detailed for Seismic Resistance)*
Response Modification Factor (R):	3.0
System Overstrength Factor (Ω_0):	3.0
Deflection Amplification Factor (Cd):	3.0

Foundations:

New construction will be supported on a pile foundation. The most appropriate type of pile and the design pile capacity will be determined by the project Geotechnical Engineer (CDM Smith). The design high water elevation will also be determined by the Geotechnical Engineer. End bearing, steel H-Piles with an allowable capacity of 100 Tons have been assumed in this narrative. The design water table elevation has been assumed to be at the existing grade.

Construction Classification:

New construction will be classified as Type 1B (Noncombustible, Protected), pending confirmation by the Design Team. Typical steel floor and roof members (beams, columns and bracing) and steel roof deck (except where the height exceeds 20 feet) require applied fire protection. All steel framed construction is considered to be *restrained.* No fire walls are required.

Sustainable Design Considerations:

Sustainable design considerations will be incorporated into the building design. Goals of zero - emissions and zero - net energy have been established.

STRUCTURAL SYSTEMS DESCRIPTION AND ESTIMATED QUANTITIES

A SUBSTRUCTURE

A10 Foundations (Refer to CDM Smith Preliminary Letters/Memorandums):

1. Groundwater was encountered 3.0 to 12.0 feet below the existing grade. Groundwater control will be an issue during construction; temporary dewatering will be required. The design groundwater elevation has not been determined at this time. A design water elevation matching the existing grade has been assumed in this narrative.

2. New construction will be supported on a deep pile foundation; the recommended type of pile and the design load capacity has not been determined at this time. End bearing steel H-Piles with a 100 Ton capacity have been assumed in this narrative.

3. Lowest level floor construction will be a structural concrete slab on grade. Parking for approximately 150 cars will be provided below the building. The subgrade parking level slab will need to be waterproofed and designed for hydrostatic uplift. At the (east) Tobin Wing, a 1.25 million gallon, reinforced concrete storm water storage tank will be constructed below the parking level.

4. The site is assumed to be Site Class D, for seismic design. Liquefaction is assumed to not be an issue (Assumptions to be confirmed by the Geotechnical Engineer).

5. The anticipated settlement for new construction should be limited to 1" total and ½" differential.

6. Temporary lateral earth support will be required during construction; particularly at the Tobin Wing, where the storm water storage tank will be located below the parking

Level. The support of excavation system (SOE Wall) shall be designed by a Specialty Engineer, base on a performance specification.

7. A pre-construction survey along with vibration monitoring during construction is recommended.

8. All existing foundations and utilities within the footprint of the new building will be removed.

A1010 Standard Foundations

- Typical, average perimeter grade beams: ***24" wide (including an 8" wide masonry shelf) by 42" deep, with top, bottom, and face longitudinal reinforcing bars and closed stirrups (90.0+/- plf), spanning to pile caps. The outside and inside surfaces of perimeter grade beams will receive membrane waterproofing. The bottom of all perimeter grade beams will be a minimum of 4'- 6" below the exterior finish grade for frost protection. The top of grade beam will typically be constructed flush with the top of pile cap.***

- Typical interior piles (100 Ton pile capacity and 900 SF Tributary Area):

  - 4 - story areas: ***5 piles***

  - 3 - story areas: ***4 piles***

- Typical perimeter piles (100 Ton pile capacity and 450 SF Tributary Area):

  - Auditorium and Gymnasium: ***2 piles***

  - 4 - story areas: ***3 piles***

  - 3 - story areas: ***2 piles***

- Typical intermediate slab support piles: *three (3), 100 Ton pile per 900± square feet* of the lowest level floor slab (parking level). Intermediate slab support piles will need to be designed for tension/uplift, due to buoyancy forces.

- Typical pile caps quantities:

  PC-1: *60 sf formwork, 2.0 cu. yd. concrete, 90 lbs. reinforcing*

  PC-2: *90 sf formwork, 5.0 cu. yd. concrete, 280 lbs. reinforcing*

  PC-3: *105 sf formwork, 6.0 cu. yd. concrete, 380 lbs. reinforcing*

  PC-4: *115 sf formwork, 7.0 cu. yd. concrete, 350 lbs. reinforcing*

  PC-5: *125 sf formwork; 8.0 cu. yd. concrete, 400 lbs. reinforcing*

- Typical piers/pilasters at interior/perimeter columns: *24 inches by 24 inches, reinforced concrete with 50 plf reinforcing.*

- Typical interior grade beams interconnecting piers/pile caps in lateral bracing bays: *2'-0" wide by 3'-6" deep with 90 plf reinforcing. Provide threaded bar terminators at each end of each grade beam. Assume one (1), 30+/- feet long grade beam required for every 2,700 square feet of lowest floor area.*

- Anchor Bolts: *Anchor bolts at column base plates shall conform to ASTM F1554 - Grade 36 and shall be headed type. There will be a minimum of four (4), ¾" diameter anchor bolts at all columns; additional bolts and/or larger diameter bolts will be required at bracing locations.*

A1020 Special Foundations

- Elevator pits: Elevator pit construction will consist of 12" thick, reinforced concrete walls and a 24" thick, reinforced concrete foundation mat (supported by piles), with an integral sump pit. Waterstops will be provided at all construction joints and all interior surfaces of the elevator pit will be waterproofed. Elevator shaft walls will be 100% solid grouted, reinforced CMU construction (8" thick).

A1030 Lowest Level Slabs

- Lowest level floor construction (parking level) will typically be an average, 18" thick, reinforced concrete structural slab on grade with 7.5 psf reinforcing, supported by interior pile caps at columns (plus a single pile mid way between columns and at mid-bay; designed for uplift/tension), and by reinforced concrete grade beams at the building perimeter. Locally thicken the structural slab to 18" deep at each intermediate slab support pile and at perimeter grade beams. The parking level slab will be given a light broom finish. The need for a vapor mitigation system or an engineered barrier is under review; a waterproofing membrane will be required below the slab, wrapping interior and perimeter grade beams and returning up the outside face of the basement foundation walls.

- The storm water storage tank slab (Tobin Wing) will be a 3'- 0" thick, reinforced concrete structural slab on grade with 10.0 psf reinforcing, supported on piles (as described above).

- Temporary dewatering will be required to construct the basement parking level and the storm water storage tank. The dewatering system will need to remain in place until the construction of the building superstructure has been completed.

A20 Below Grade Construction (Parking Level)

A2020 Foundation Walls

- Basement foundation walls at the parking level will be 16" thick, reinforced concrete construction, with reinforcing each face (5.0 psf), supported on piles with a continuous pile cap. All basement foundation walls will be fully waterproofed and bentonite waterstops will be provided at all horizontal and vertical construction joints.

- Foundation walls at the storm water storage tank will be 18" thick, reinforced concrete construction, with reinforcing each face (6.0 psf), supported on the tank bottom slab/mat. All basement tank walls will be fully waterproofed and bentonite waterstops will be provided at all horizontal and vertical construction joints.

B SHELL

B10 Superstructure

Structural Bays/Spans: Typical structural bay size/configuration has not yet been determined; however, it is anticipated that rectangular structural bays will average approximately 900 square feet in area. Long span construction over the Gymnasium and Auditorium spaces varies.

Story Heights: The preliminary story height for the upper levels and the basement parking level is expected to be 14'-0" minimum.

Steel Framing Connections: Type 2 simple framing connections (shear only); double clip angles typically.

Columns: Typical columns will be wide flange steel sections or steel tubes (HSS).

Lateral Force Resisting System: Lateral (wind and seismic) forces will be resisted by steel bracing, for reasons of economy, stiffness, reduced structural depth and smaller column sizes. Bracing members will be square or rectangular HSS sections. Brace configurations may include chevrons, inverted chevrons ("V"), or single diagonals in short bays, as required by structural and architectural considerations.

Expansion (Seismic) Joints: Considering the massing of the Crossroads option, it is likely that three (3) internal expansion/seismic joints will be required.

Fire Protection: As previously noted, new construction is classified at Type 1B Construction (Noncombustible, Protected). Typical steel floor and roof members (beams, columns and bracing) and steel roof deck (except where the height exceeds 20 feet) require fire protection. All steel framed construction is considered to be *restrained.* The new building will be fully sprinklered.

B1010 Floor Construction (First through Fourth Floors)

Upper Floor Construction (including Mechanical Penthouses) consists of a 4½" (minimum) thick, normal weight concrete topping slab with welded wire fabric, on 2" deep, 18 gauge galvanized steel composite steel floor deck (6½" minimum total slab thickness), supported by composite steel beams and girders. Slabs on steel deck will be placed at the required elevation, adding concrete to compensate for the deflection of the (unshored) steel framing (approximately ¾" average, additional concrete in each structural bay). Composite action between the steel beams/girders and the concrete slab on steel deck will be achieved by field welding ¾" diameter, 5" long headed shear connectors to the top flanges. Depressions (approximately 8" deep) will be necessary at coolers in the Kitchen. Elsewhere, depressions will be required at entrance mats, Toilet Rooms, and at the Gymnasium floor. Floor finishing will be coordinated with flooring requirements.

- Welded wire fabric for slabs on composite steel deck: *6x6-W2.9xW2.9.*

- The estimated total weight of structural steel for the structured floor levels of the new construction (including beams, columns, bracing, plates, angles, miscellaneous frames, connections, etc., but excluding entry canopies, loose lintels, PV frames, trellises, etc.) is as follows:

Estimated Weight of Structural Steel: 16.5 PSF

B1020 Roof Construction

Typical Roof Construction consists of a 3" deep, 18 gauge, Type WR, galvanized steel roof deck, supported by wide flange steel beams and girders. As noise and vibration will be a concern where roof top mechanical equipment is located, these sections of the roof will be framed with a 4" (minimum) deep, regular weight concrete topping slab on a 3" deep, 18 gauge, composite type galvanized steel floor deck (7" minimum total slab thickness), supported by composite, wide flange steel beams and girders. Composite action between the steel beams/girders and the concrete slab on steel deck will be achieved by field welding ¾" diameter, 5½" long headed shear connectors to the top flanges. Roof drainage will be achieved by pitching the steel framing to low points at selected interior columns, wherever practical.

Gymnasium and Auditorium Roof Construction consists of a 3" deep, 18/20 gauge, galvanized, cellular acoustic deck, spanning to structural steel beams. Steel beams span to steel trusses (with a sloped top chord). Trusses clear span the Gymnasium floor below and are supported by 12" square, HSS steel columns. Steel framing for the Gymnasium roof will be Architecturally Exposed Structural Steel (A.E.S.S.). The Auditorium roof will be similarly structured (but not A.E.S.S.), with standard, 3" deep. non-acoustical roof deck.

- Welded wire fabric for slabs on composite steel deck: *6x6-W2.9xW2.9.*

- The estimated total weight of structural steel for the various roof areas of the new building (including beams, columns, trusses, bracing, plates, angles, miscellaneous frames, connections, etc., but excluding equipment screens, loose lintels, entry canopies, PV frames, trellises, etc.) is as follows:

Estimated Weight of Structural Steel: 15.5 PSF

B20 Exterior Enclosure

B2010 Exterior Walls

Exterior walls will be a combination of architectural panels and masonry veneer, with a steel stud backup. In areas where a steel stud backup wall system is utilized behind a masonry veneer, framing should be 16 gauge minimum studs, designed for an H/600 deflection limitation (H/360 elsewhere). Vertical slip joints will be provided in the metal stud backup system at each level. Ties to the masonry veneer will be installed at 16" o.c. horizontally and vertically. The estimated structural steel weights noted previously include allowances for horizontal girts, relieving angles, hangers, bracing, etc., as may be required to support and brace the exterior wall system.

OUTLINE STRUCTURAL SPECIFICATIONS

Concrete:

- All concrete shall be normal weight, 4,000 psi at 28 days, except exterior (exposed) concrete (paving) which shall be normal weight, 4,500 psi.

- Portland Cement: ASTM C150, Type I or II.

- Fly Ash: ASTM C618, Class F. Replacement of cement content with fly ash is limited to 20% (by weight). Fly ash is not permitted in exterior, exposed concrete, or in concrete for slabs on grade and slabs on composite steel deck.

- All concrete shall be proportioned with 3/4" maximum aggregate, ASTM C 33, except 3/8" maximum aggregate shall be used at toppings less than 2" thick (e.g. metal pan stairs).

- All reinforcing shall be ASTM A 615 deformed bars, Grade 60.

- All welded wire fabric shall conform to ASTM A 185.

- Reinforcing bars, steel wire, welded wire fabric, and miscellaneous steel accessories shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with Submittal Requirements.

- Concrete products manufactured within 500 miles (by air) of the project site shall be documented in accordance with Submittal Requirements.

- Cure all concrete by moisture retention methods, approved by Architect; curing compounds shall not be used.

Reinforced Concrete Masonry (Elevator Shaft):

- Masonry construction (elevator shaft) shall conform to ACI 530/ASCE 5/TMS 402 "Building Code Requirements for Masonry Structures", latest edition.

- Masonry strength, f'm shall not be less than 1350 psi.

- Requirements for load bearing block strength shall be as required for specified masonry strength (f'm) but shall not be less than 2000 psi on the net area of the block.

- Grout shall conform to ASTM C476, Type Fine, and shall be of strength required for specified masonry strength (f'm) but not less than 3000 psi.

- Mortar for reinforced masonry shall conform to ASTM C 270 Type S and shall be of strength required for specified masonry strength (f'm) but not less than 1800 psi.

- Reinforcing bars shall conform to ASTM A 615 Grade 60 deformed bars. Lap all continuous bars 48 diameters.

- Joint reinforcing shall be 9 gauge ladder type conforming to ASTM A 82. Provide prefabricated corners and tees. Walls shall be reinforced horizontally with joint reinforcing at 16 inches on centers unless otherwise noted.

- Reinforcing bar, steel wire, welded wire fabric, and miscellaneous steel accessories shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with Submittal Requirements.

- Masonry products manufactured within 500 miles (by air) of the project site shall be documented in accordance with Submittal Requirements.

- Elevator shaft walls shall be 100% solid grouted (all cores).

Structural Steel:

- Structural steel shapes shall conform to ASTM A 992, Fy = 50 ksi.

- Steel tubes (HSS) shall conform to ASTM A 500, Grade B, Fy=46 ksi.

- Structural steel plates and bars shall conform to ASTM A 36, Fy = 36 ksi.

- Steel members shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the Submittal Requirements.

- Steel manufactured within 500 miles (by air) of the project site shall be documented in accordance with the Submittal Requirements.

- Anchor Bolts: Anchor bolts at column base plates shall conform to ASTM F1554 – Grade 36 and shall be headed type. Provide a minimum of four (4), ¾" diameter anchor bolts at all columns; additional bolts and/or larger diameter/longer bolts will be required at bracing locations.

- Bolted connections shall be ASTM A 325, Type N (bearing) bolts, except slip-critical bolts shall be used at lateral brace beam connections.

- Shop and field welding shall be AWS D1.1 E70XX electrodes.

- Shear connectors shall be ¾" diameter, 5" or 5½" long, headed Nelson studs conforming to ASTM A 108.

- Surface treatment for typical structural steel: SSPC Surface Preparation No. 3 (Power Tool Cleaning). Structural steel shall be left unpainted. .

- Structural steel for the Gymnasium roofs shall be Architecturally Exposed Structural Steel (A.E.S.S.) and shall meet the requirements of Section 10 of the AISC manual.

- Surface treatment for Architecturally Exposed Structural Steel: SSPC Surface Preparation No. 6 (Commercial Blast Cleaning). Exposed structural steel shall be primed with a premium architectural primer, compatible with the finish paint.

- All exterior, exposed structural steel shall be hot-dip galvanized (e.g. brick relieving angles (as applicable) and steel rooftop equipment supports).

Steel Deck:

- Typical steel roof deck shall be 3" deep, 18 gauge, Type DR, conforming to ASTM A 653, Grade 33 (minimum), galvanized in accordance with ASTM A 653, coating class G-60. Exposed steel roof deck in the Gymnasium shall be 3" deep (18/20 gauge) cellular acoustic deck and shall have a factory applied primer on the exposed bottom surface.

- Steel floor deck shall be 2" deep, 18 gauge, composite type, conforming to ASTM A 653, Grade 33, galvanized in accordance with ASTM A 653, coating class G-60.

- All steel floor deck and roof deck accessories (pour stops, finish strips, closures, etc.) shall be the same finish as the deck; 18 gauge minimum.

- Steel deck shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the Submittal Requirements.

- Steel deck manufactured within 500 miles (by air) of the project site shall be documented in accordance with the Submittal Requirements.

- Provide 14 gauge sump pans at all roof drains.

End of Structural Narrative

2.5 Architectural Narrative

Note: All products listed in the narrative are Basis of Design for pricing purposes only.

ARCHITECTURE – DEMOLITION

1. Hazardous Materials
   Demolition includes abatement and disposal of hazardous building materials. Refer to:
   a. "Hazardous Building Materials Visual Inspection" report by Fuss & O'Neill dated May 2019
   b. "Hazardous Building Materials Opinion of Abatement Costs" letter by Fuss & O'Neill dated October 10, 2019.
2. Building Demolition
   Project includes demolition of existing building including all associated accessories and attachments including but not limited to:
   a. Concrete structure, interior and exterior walls
   b. Interior finishes
   c. MEP/FP systems
   d. Utility connections
3. General: Salvage materials for re-use where possible.
4. Meet or exceed the requirements of LEED Construction Demolition Waste Management credit Option 1, Path 4 or Option 2.

ARCHITECTURE – EXTERIOR

1. General:
   a. Window: Wall Ratio 30% overall, South, North 35%. East, West 20%.
   b. Building envelope to be commissioned via testing of mockups, in place testing and whole-building testing. Contractor to meet performance requirements, modifying work as required based on any failed tests
   c. Mockups:
      i. 10' x 15' exterior wall with window, solar shade
      ii. 10' x 15' exterior wall to curtain wall, solar shade
      iii. Mockups for each exterior finish
   d. Refer to attached diagram for wall and glazing type locations and quantities.
2. Exterior Wall Type 1 – Above Grade Rain Screen Cladding
   a. Location: Levels 2 through 4, occupied floors, plus penthouse
   b. Cementitious panels, TAKTL or Oko Skin by Reider
   c. Panel sizes, varying widths and heights approximately 3'-6" wide and 6" to 18" high. 1.25" panel thickness, face to support.
   d. Panels to be custom colored, three colors, pattern by architect.
   e. Insulation, (2) layers of 3" (6" total thickness) cavity grade mineral fiber insulation with offset joints between thermally broken girt system comprised of fiberglass structural sections.
3. Exterior Wall Type 2 – Above Grade Masonry Wall
   a. Locations: Level 1 opaque walls
   b. Regional stone, random coursed ashlar, 6" deep nominal dimension, stone and mortar color to match on-site wall selected by architect
   c. Stone backs to be sawn, split or dressed to maintain cavity, as required by site conditions.
   d. Stainless steel, 2-piece, thermally isolated masonry anchors
   e. 2" cavity with 2" cavity drainage mat consisting of plastic mesh in dovetail form, above through wall flashing
   f. Prefinished aluminum coping above stone at top of wall where required
   g. Flexible through-wall flashing, preformed weep holes

   h. Grout solid below flashing, continuous at base
   i. Structural plastic setting course continuous at masonry shelf
   j. (2) layers 2" extruded polystyrene insulation.
4. Exterior Wall Type 3 – Below Grade Vertical Waterproofing
   a. Geotextile on polyethylene egg-crate drainage mat
   b. 3" extruded polystyrene foundation insulation
   c. Sheet-applied waterproofing on foundation wall, with manufacturer's primer, and edge and joint sealer/mastic to create continuous air barrier.
   d. Perimeter perforated pipe with free-draining gravel and geotextile wrap
5. Backup for Exterior Walls Above Grade
   a. Continuous air/vapor/moisture barrier, self-adhesive, modified bitumen sheet with manufacturer's primer, and edge and joint sealer/mastic to create continuous air barrier.
   b. Exterior sheathing
   c. 6" cold formed metal framing
   d. Interior painted gypsum wall board
6. "Exterior" Soffit, Garage
   a. Location: Ceiling of Lower Level (garage, etc.)
   b. Suspended gypsum ceiling
   c. Air/moisture/vapor barrier, continuous with sealed penetrations
   d. 5" exterior insulation and finish system – spray foam insulation at penetrations
7. Exterior Soffits, Other
   a. Locations: as needed
   b. Exterior sheathing
   c. Air/vapor/moisture barrier, self-adhesive, modified bitumen sheet with manufacturer's primer, and edge and joint sealer/mastic to create continuous air barrier
   d. Insulation, (2) layers of 3" (6" total thickness) cavity grade mineral fiber insulation with offset joints soffit support.
   e. Solid lumber wood slat ceiling system for exterior applications, complete with backup suspension system
8. Underslab at Lower Level (Occupied Spaces, Parking and Storage Spaces)
   a. Location: Full Lower Level
   b. Concrete slab
   c. Pressure-sensitive, single sided waterproofing
   d. Protection board
   e. 3" rigid insulation
   f. 6" gravel base with 4" perforated underslab drain pipes, 10'-0" on center [if needed]
   g. under-slab drainage gravity fed to through-foundation piping connected to perimeter drain [if needed]
   h. Pump to stormwater treatment facility [if needed]
9. Curtain Wall (Assume 23,000 sf of curtain wall)
   a. Location: Exterior walls of central space, building entrances, exterior stairs, end of corridors,
   b. Thermally broken (Isoweb) aluminum curtainwall with Kynar finish, Efco or equal
   c. For curtainwall in public corridors, dining, gym, power operated window vents within curtainwall, full width, 3 feet high.
   d. Exterior glazing Type 1
10. Windows (Assume 7,500 sf of Window units)

a. Location: within rain screen cladding
b. Thermally broken (Isoweb) aluminum windows, Kynar finish, metallic color, all windows to have operable casement or awning "vents"
c. Frames with 2.5" sight line
d. Window surround, prefinished ¼" thick, 10" deep aluminum surrounds, four sides with welded corner connections.
e. For classrooms and offices, manual roto-crank hardware offset from frame such that insect screen "cricket" doors are not required.
f. For windows in public corridors, dining, gym, power operated window vents.
g. Exterior glazing Type 1

11. Exterior Glazing Type 1, Windows and Curtain Wall
    a. Triple glazed thermal glass
    b. Two low-e coatings, PPG Solarban 60 or equal
    c. Argon filled cavities
    d. Thermal edge
    e. Safety glass as required
12. Exterior Glazing Type 2, Vestibules
    a. Double glazed thermal glass
    b. One low-e coating, PPG Solarban 60 or equal
    c. Argon filled cavity
    d. Thermal edge
    e. Safety glass as required
13. Solar Shades
    a. Type 1: At all windows on south façade 8" deep horizontal extruded aluminum solar shades, 2 per window, full width, custom color
    b. Type 2: At west-facing curtainwall, 2'-0" deep vertical extruded perforated prefinished aluminum solar shades, 2'-6" on center.
    c. Type 3: At south and east facing curtainwall, 1'-6" deep horizontal extruded prefinished aluminum solar shades, at levels 1 through 3, at multiple elevations. Custom color.
14. Louvers and Areaway Grating
    a. Areaway grating for mechanical exhaust of parking, each 12 feet long x 4 feet wide
    b. Prefinished, extruded, stormproof aluminum louvers
15. Exterior Doors
    a. Type 1: Solid Panel, thermally broken, insulated, prefinished aluminum door
    b. Type 2: Vestibules, prefinished aluminum with full glazing panel, double glazed
    a. Aluminum continuous hinges, von Duprin rim type exist devices, keyed removable mullions, LCN closers

16. Roof Type 1: Thermoplastic (TPO)
    a. Location: All low slope roofs
    b. Thermoplastic, fully adhered roof membrane.
    c. ½" Overlayment as required by manufacturer
    d. 8" thick (average) tapered polyisocyanurate insulation in 2 lifts with offset joints.
    e. ½" thick roofing underlayment
    f. Reinforced polyethylene vapor retarder on roof deck
    g. 4" thick x 18" high prefabricated curbs for exhaust fans and heat recovery
17. Roof Type 2: Plaza Deck Base

a. Location: Preschool playground between Preschool and Kitchen/Dining Wing, rooftop classroom between classroom wing and shared wing
b. Structural concrete slab
c. Sloped topping slab
d. liquid applied waterproofing
e. Protection board
f. 8" + tapered extruded polystyrene insulation

18. Roof Type 2A: Plaza Deck with landscaping
    a. Location: see landscape plan & provide 8,000 sf at rooftop classroom
    b. Preformed plastic drain board
    c. Root barrier
    d. Planting medium
    e. Planting
19. Roof Type 2B: Plaza Deck with pavers & provide 1,000 sf at rooftop classroom
    a. Adjustable pedestals
    b. Concrete architectural pavers, 3 colors
20. Roof Type #: Ballasted Photovoltaic Array
    a. Photovoltaic array on roof-top ballasted framing
    b. Roof Type 1 as above
21. Roof Type #: Photovoltaic Canopy
    a. Prefinished, color galvanized, steel framing - thermally broken at roof penetration with structural plastic blocking
    b. Photovoltaic array on PV structural supports

ARCHITECTURE – INTERIOR; *Specify Red-List free materials where possible.*

2. Interior Doors:
    a. Type 1: Wood Doors
        i. Solid core, clear finish quarter sawn white oak doors. Hollow metal frames, fully welded. Types as follows:
        ii. Fire Doors w/ small side lite- stairs 60 minutes.
        iii. Fire doors at assembly spaces- 45 min. rating.
        iv. Solid Doors w/ half lite- typical classrooms, cross-corridors.
        v. Flush doors- electrical/mechanical, IDF, storage, nurse exam, offices, and music rooms.
    b. Type 2: Hollow Metal Doors
        i. Painted Utility Doors not on public corridors
        ii. Fire rated as required
3. Hardware:
    a. Heavy duty butt hinges with Monroe Handle, LCN 4011 series closers
4. Interior Glazing: Assume 7500 sf distributed throughout building.
    a. Location: Academic, administrative lobby and office spaces
    b. Side lights and transoms over doors
    c. Hollow Metal, 1" profile, painted
5. Interior Glass Types:
    a. Interior Glass Type 1 – ¼" clear glass
    b. Interior Glass Type 2 -- ¼" tempered safety glass
    c. Interior Glass Type 2-- ½" laminated safety glass
    d. Interior Glass Type 3 – Applied patterned 3m Fasara film on other glazing types
    e. Interior Glass Type 4– Mirror
    f. Interior Glass Type 5 – Fire rated glass at all rated locations,
6. Window Sills:
    a. Clear finish European Beech interior sills

7. Ceiling:
    a. Type 1: Acoustic Baffle, Armstrong 7.5x46 Soundscape Blades
    b. Type 2: 2x2 ACT, Armstrong #1915 Ultima beveled tegular 9/16" grid
    c. Type 3: Painted Gypsum Drywall
    d. Type 4: Wood Ceiling, Armstrong Woodworks Grille
    e. Type 5: Exposed structure and MEP (GWB ceiling at Rated rooms)
    f. Type 6: 2x2 ACT, Armstrong Ultima #1937 Health Zone
    g. Type 7: Moisture resistant GWB, assume (1) 12x12 access panel per room
    h. Type 8: Acoustic Ceiling Panels: Mechanically fastened, Tectum 23-¾" x 48" panels with square edge Natural finish.
8. Floors:
    a. Type 1: Linoleum Tile w/ pattern, (2 colors); with rubber cove base; Forbo Marmoleum
    b. Type 2: Natural Bamboo with pattern; with wood base – FSC Plyboo
    c. Type 3: Quarry Tile; with Quarry Tile base
    d. Type 4: Terrazzo to Terrazco: mixed with marble, glass, pebble and shell chips, with pattern in (6) colors, with coordinating Terrazzo base
    e. Type 5: Carpet w/ pattern, (2 colors); with rubber cove base; Interface
    f. Type 6: Porcelain Tile 6x6 (3 colors); with ceramic base; Crossville Red-List free Porcelain tile
    g. Type 7: Defender wood flooring by Robbins Sports Floors.
    h. Type 8: Rubber floor; with rubber cove base; LBC Certified Tarkett Rubber floor tile
    i. Type 9: Wood floor to Harlequin Flooring
    j. Type 10: Sealed concrete floor; with rubber cove base
9. Floor Transitions
    a. Typically, Schluter stainless steel edges
10. Entrances:
    a. At all vestibules provide Mats, Inc. "Advanced Track" metal/ carpet/ recessed for full length of vestibule
11. Walls:
    a. Type 1: (1) layer 5/8 gypsum wall board plus (1) layer 5/8" abuse resistant gypsum wall board. Red list free. Painted.
    b. Type 2: (1) layer 5/8 gypsum wall board with 24" x 12" Crossville Red-List free Porcelain tile, (2) colors up to 54" high over 4" base; Same as Type 1 above 54".
    c. Type 3: Same as Type 2 with full coverage acoustical wood panel system above 54"
    d. Type 4: Glazed (pre-faced) architectural concrete masonry block, thermoset on all exposed faces.
    e. Type 5: 2x6 tile (2 colors); Crossville Red-List free Porcelain tile
12. Window Treatment:
    a. Rolling mesh shades (3% open area) at all exterior windows in non-circulation spaces
    b. Roller shades at all interior borrowed lights in classrooms and office spaces.
13. Light Shelves, interior:
    a. All southern-facing clerestory windows
14. Toilet Room Accessories:
    a. Electric hand dryer
    b. Grab bars (2) per HC stall
    c. Mirror

d. Soap dispenser
e. Hook (back of door at each stall)
f. HC shower seat
g. HC shower grab bar
h. Shower curtain rod/hook
i. Mop rack (1) at each janitorial closet
j. HDPE- Floor mounted/overhead braced

15. Signage:
    a. All code required signage
    b. Wayfinding signage
    c. Room signage with removable labels
    d. (12) 3'x5' custom educational display signs
    e. 25' high x 30' wide Photo printed, large scale graphic at auditorium
16. Casework:
    a. Science: Institutional grade- Campbell Rhea white oak base and upper cabinets with gray epoxy countertops
    b. White Oak veneer base and upper cabinets with Corian solid surface countertops
17. Acoustical Wall Treatment:
    a. Type 1: FlizFelt 100% wool design felt in specialty spaces
    b. Type 2: Tectum Fabri-tough wall panels
    c. Type 3: Acoustic Ceiling Panels: Mechanically fastened, Tectum 23-¾" x 48" panels with square edge n Natural finish.
18. Cubbies: clear finish hard wood veneer
19. Furniture: Included. TBD in Schematic Design
20. Guardrails: Suports 48" o.c., edge supported, 48" high above finished floor.
    a. Type 1: Painted bar stock with custom pattern – 20% greater than code. Slab edge mounted. Wood cap. At stairs, 2 handrail heights: 34" and 22" above finished floor/tread.
21. Fire Shutters: Four (4) doors, one per floor. 12'-0" wide by 11'-0" tall. 3 hour fire rating.
22. Elevators: (2) High-efficiency, electric traction. Each with (5) stops.

ARCHITECTURE – INTERIOR INDIVIDUAL SPACES

1. Entry Lobby and Heart of School:
    a. Walls: Type 3
    b. Floors: Type 4
    c. Ceiling: Type: 3
        i. 11'-0" +/- Ceilings
        ii. Gypsum soffit assemblies at corridor entrances
2. Academic Corridors – Including Breakout Space:
    a. Walls: Type 2
    b. Floors: Type: 1
    c. Ceiling: Type: 2
        i. 11'-0" +/- Ceilings
        ii. Gypsum soffit assemblies at breakout space and entrances
    d. Display Cases- Assume 130LF of total amount of wood display case with glass shelves, tack-wall back surface and integral LED lighting
    e. Built-ins- 70 linear feet per wing of built-in wood habitable walls with playful opening and benches
3. Public Corridors:
    a. Walls: Type 2

b. Floors: Type: 1
    i. At tile: Schluter thin edge transition and 4" rubber base
c. Ceiling: Type: 2
    i. 11'-0" +/- Ceilings
    ii. Gypsum soffit assemblies at breakout space and entrances
d. Display Cases- Assume 130LF of total amount of wood display case with glass shelves, tack-wall back surface and fluorescent tube lighting

4. Typical Montessori Classroom (Childrens House, Special Start, Lower Elementary):
    a. Walls: Type 1 painted typical with accent color
    b. Datum – ½" reveal joint at full perimeter
    c. Floors: Type: 2
        i. Circular area rug
    d. Ceiling: Type: 2
    e. 36'-0" marker board with tack strip and flag holder
    f. 20'-0" tack board
    g. HM frames and side lights
    h. Topcat sound reinforcement system
    i. Casework:
        i. At exterior wall carry 18" deep bookcase units entire length of room at 2'-6" height
        ii. At corridor wall carry – (3) wardrobe units with doors, 1 tall unit with shelves and 8' of upper / lower cabinets with sink, microwave and mini-refrigerator
    j. Child-size Bathroom included in classroom – see Typical In-Classroom Single Use Toilets
5. Typical Montessori Classroom (Upper Elementary):
    a. Walls: Type 1
    b. Datum ½" reveal joint at full perimeter
    c. Floors: Type 2
        i. Circular area rug
    d. Ceiling: Type: 2
    e. 36'-0" marker board with tack strip and flag holder – 20'-0" tack board
    f. HM frames and side lights
    g. Topcat sound reinforcement system
    h. Casework:
        i. At exterior wall carry 18" deep bookcase units entire length of room at 2'-6" height
        ii. At corridor wall carry – (3) wardrobe units with doors, 1 tall unit with shelves and 8'-0" of upper / lower cabinets with sink
    i. Child-size Bathroom included in classroom – see Typical In-Classroom Single Use Toilets
6. Typical Kitchenette (Includes Children's House and Afterschool):
    a. Walls: Type 1 with epoxy paint drywall (3) walls, Type 5 on wet wall.
    b. Floors: Type: 3
    c. Ceiling: Type: 6
    d. Casework:
        i. 12'-0" of upper / lower cabinets with sink, oven w/ stovetop, full height refrigerator, microwave, dishwasher
        ii. 6'-0" island serving counter with lower cabinets
7. Typical ASD Classroom:

a. Walls: Type 1
b. Datum ½" reveal joint at full perimeter
c. Floors: Type: 1
d. Ceiling: Type: 2
e. 20'-0" marker board with tack strip and flag holder – 10'-0" tack board
f. HM frames and side lights
g. Topcat sound reinforcement system
h. Wall Pads 20'-0" linear feet plus 20'-0" at Relaxation space
i. Casework:
    i. At exterior wall carry 18" deep bookcase units entire length of room at 2'-6" height
    ii. At corridor wall carry – (3) wardrobe units with doors, 1 tall unit with shelves and 8'-0" of upper / lower cabinets with sink, microwave and mini-refrigerator
j. Child-size Bathroom included in classroom – see Typical In-Classroom Single Use Toilets

8. Typical Life Skills Classroom (Includes Health Classrooms and Food Lab):
    a. Walls: Type 1 with epoxy paint drywall (3) walls, Type 5 on wet wall.
    b. Floor: Type: 1 with Type 3 near kitchenette
    c. Ceiling: Type: 6
    d. 24'-0" marker board with tack strip and flag holder – 10'-0" tack board
    e. HM frames and side lights
    f. Topcat sound reinforcement system
    g. Casework:
        i. 12'-0" of upper / lower cabinets with sink, oven w/ stovetop, ventilation, full height refrigerator, microwave, dishwasher
        ii. At exterior wall carry 18" deep bookcase units entire length of room at 2'-6" height
        iii. At corridor wall carry – (3) wardrobe units with doors, 1 tall unit with shelves
9. Typical Teacher Workroom (Includes OSS Small Group Rooms and Staff Lounge / Lunchroom):
    a. Walls: Type 1
    b. Floors: Type: 1
    c. Ceiling: Type: 2
    d. 25'-0" marker board with tack strip – 10'-0" tack board
    e. Casework:
        i. Carry 1 tall unit with shelves and 8'-0" of upper / lower cabinets with sink, microwave, and mini-refrigerator
10. Typical Upper School Classroom (Grade 6-8, LBLD, World Language):
    a. Walls: Type 1
    b. Datum ½" reveal joint at full perimeter
    c. Floors: Type: 1
    d. Ceiling: Type: 2
    e. (2) 24'-0" marker boards with tack strip and flag holder - (2) 10'-0" tack boards
    f. HM frames and side lights
    g. Topcat sound reinforcement system
    h. Casework:
        i. At exterior wall carry 18" deep bookcase units entire length of room at 2'-6" height

ii. At corridor wall carry – (3) wardrobe units with doors, 1 tall unit with shelves and 8'-0" of upper / lower cabinets with sink

11. Typical Upper School Science Classroom (Grade 6-8):
    a. Same as Typical Upper School Classroom (Grade 6-8) except:
        i. Perimeter casework with upper / lower vented cabinets and outlets
        ii. Additional sinks with drying racks (6 total)
        iii. Emergency eye wash and shower with floor drain
        iv. Microwave, dishwasher and full refrigerator / freezer and full perimeter casework with upper / lower cabinets and outlets in Science Prep room
        v. Ceiling mounted cord reels (6 total)
12. Typical Preschool Classroom (Includes Community Afterschool Classrooms):
    a. Walls: Type 1
    b. Datum ½" reveal joint at full perimeter
    c. Floors: Type: 1
        i. Circular Area Rug
    d. Ceiling: Type: 2
    e. HM frames and side lights
    f. Topcat sound reinforcement system
    g. 20'-0" Tack board
    h. Casework:
        i. At exterior wall carry 18" deep bookcase units entire length of room at 2'-6" height
        ii. At corridor wall carry – (3) wardrobe units with doors, 1 tall unit with shelves and 8' of upper / lower cabinets with sink, microwave and mini-refrigerator
    i. Child-size Bathroom included in classroom – see Typical In-Classroom Single Use Toilets
13. Typical Single Use Toilet (In-Classroom Child-size and Adult-size):
    a. Walls: Type 5
    b. Floors: Type: 6
    c. Ceiling: Type: 7
    d. Preschool, Children's House and Special Start toilet rooms to have built-in changing counter with storage. S/S finish top
14. Typical Boys and Girls Gang Toilets:
    a. Same as Typical Single Use Toilet except:
        i. Phenolic partitions
15. Typical Locker / Shower Room:
    a. Same as Typical Single Use Toilet except:
        i. Shower stall
        ii. Changing stall with phenolic partitions
        iii. (12) Lockers
16. SPED Suites (Soc., Pys., Math, Lit., Ext. Learn):
    a. Walls: Type 1
    b. Floors: Type: 1
    c. Ceiling: Type: 2
    d. Casework:
        i. 1 tall unit with shelves and 8'-0" of upper / lower cabinets with sink in suites
17. Administration, O.S.S. and Guidance Suite (Conference Rooms, Offices):
    a. Walls: Type 1
    b. Floors: Type: 5

c. Ceiling: Type: 2
d. Casework:
    i. 1 tall unit with shelves and 8'-0" of upper / lower cabinets with sink in suites

18. Learning Commons Flexible Instructional Space (Includes Circulation Desk):
    a. Walls: Type 1
    b. Floors: Type: 5
    c. Ceiling: Type: 2
        i. Gypsum soffit assemblies at breakout spaces
        ii. 20% Type: 4
    d. Hollow metal borrowed lights – carry 40 linear feet
    e. (4) 12'-0" marker board with tack strip and – (4) 10'-0" tack board
    f. Casework:
        i. Custom millwork Circulation Desk: 15 linear feet with solid surface top
        ii. Built-in reading nooks: clear finish hard wood veneer with seat and wall padding– assume 50 linear feet
19. Learning Commons Multimedia Studio (Includes Sound Recording Room):
    a. Walls: Type 1
    b. Acoustic wall treatment: Type 3 for 25% of wall surface
    c. Floors: Type: 5
    d. Ceiling: Type: 2
        i. Gypsum soffit assemblies at alcove spaces
    e. (2) 12'-0" marker boards with tack strip and - (2) 10'-0" tack boards
20. STEAM Maker Space:
    a. Similar to Typical Upper School Science Classroom except:
        i. (1) Deep stainless-steel sink with cleanout trap
21. Professional Development Flexible Instructional Space:
    a. Similar to Administration, O.S.S. and Guidance Suite except:
        i. Operable wall partition dividing room
22. Gymnasiums – Including Multi-Purpose and Small Gym:
    a. Walls: Type 4
    b. Floors: Type: 7
    c. Ceiling: Type: 5
        i. Paint exposed acoustic deck structure and MEP components
        ii. Acoustic Deck and Tectum wall treatments (custom color panels)
    d. Acoustical panels: Type xx at 10% of surface area
    e. 240 linear feet Wall Pads
    f. 12'-0" White board
    g. Bleachers – 2 banks w/ 200 seats; Maxam by Hussey Bleacher Company.
    h. Nylon Rolling Divider
    i. Ceiling mounted Scoreboard and Shot Clock
    j. (6) Acrylic, retractable backboards
    k. (2) Adjustable chin-up bar
    l. (6) Ceiling mounted ropes
    m. (2) Volleyball Sleeves
    n. (2) Ceiling mounted de-stratification fans
23. MPR / Aerobics (Includes Gross Motor, Occupational Therapy, Physical Therapy and Fitness):
    a. Walls: Type 4
    b. Floors: Type: 8
    c. Ceiling: Type 5

i. Paint exposed acoustic deck structure and MEP components
ii. Acoustic Deck and Tectum wall treatments (custom color panels)

d. 240 linear feet Wall Pads

24. Dining (Includes Lower and Upper School Dining, and ASD Dining):
    a. Walls: Wainscott on painted Gypsum corridor wall – 24" x 12" porcelain tile, (2) colors, 48" high over 4" base
        i. Acoustic wall treatments
    b. Floors: Type: 1
    c. Ceiling: Type: 1
        i. Painted Gypsum cloud assemblies throughout
    d. Hollow Metal Borrowed Lights
25. Kitchen (Including Servery):
    a. Walls: Type 4
    b. Floors: Type: 3
    c. Ceiling: Type: 6
        i. Gypsum soffit assemblies at Servery
    d. Casework:
        i. 40 linear feet Custom millwork serving line including (3) 8'-0" millwork islands, with solid surface countertop at Servery
26. Auditorium:
    a. Walls: Type 1 with Type 1 acoustical wall treatment
    b. Floors: Type: 5 at seating with Type 8 at circulation paths
    c. Ceiling: Type: 5
        i. Paint exposed acoustic deck structure and MEP components
        ii. Painted Gypsum cloud assemblies throughout
    d. Fixed seating, upholstered (2 colors)
    e. Decorative and acoustic wood wall and ceiling panels such as those by RPG Acoustical or Decoustics
27. Stage (Including Multi-purpose Performance Room):
    a. Walls: Type 4
    b. Floors: Type: 9
    c. Ceiling: Type: 5
        i. Acoustic deck
28. Scene Shop:
    a. Walls: Type 4
    b. Floors: Type: 10
    c. Ceiling: Type: 5
        i. Acoustic deck and wall treatments
    d. HM frames and side lights
    e. Rolling loading door
    f. Casework:
        i. Perimeter casework with upper / lower vented cabinets, and outlets
        ii. Sink with plaster trap
29. Typical Visual Arts Classroom:
    a. Walls: Type 1
    b. Datum ½" reveal joint at full perimeter
    c. Floors: Type 10
        i. Circular area rug
    d. Ceiling: Type: 2
    e. (2) 24'-0" marker boards with tack strip and flag holder - (2) 10'-0" tack boards

f. HM frames and side lights
g. Topcat sound reinforcement system
h. Casework:
    i. Perimeter casework with upper / lower vented cabinets, (4) deep stainless steel sinks, and outlets
    ii. At corridor wall carry – (3) wardrobe units with doors, 1 tall unit with shelves and 8'-0" of upper / lower cabinets with sink
i. Display Cases- Assume 10 linear feet of total amount of wood display case with glass shelves, tack-wall back surface and fluorescent tube lighting

30. Typical Performing Arts Classroom:
    a. Same as Typical Upper School Classroom except:
        i. Fabric wrapped Tectum panels for 35% of room's wall surface
        ii. Instrument Storage
        iii. Music/Choral Risers to Hussey Bleacher Company.
31. Nurse Suite:
    a. Walls: Type 4
    b. Floors: Type: 1
    c. Ceiling: Type: 2
    d. 12'-0" marker board with tack strip and 10'-0" tack board
    e. HM frames and side lights
    f. Casework:
        i. (3) wardrobe units with doors, 1 tall unit with shelves and 8' of upper / lower cabinets with sink, microwave and mini-refrigerator
        ii. 6 linear feet custom millwork reception counter
    g. Bathroom included in suite – see Typical In-Classroom Single Use Toilets
        i. Additional in counter hand sink with eyewash outside of bathroom
32. Custodial, Storage, Electrical, Mechanical (Includes Buildings and Grounds, and District Storage)
    a. Walls: Type 4
    b. Floors: Type: 10
    c. Ceiling: Type: 5
    d. Casework:
        i. 10' of upper / lower cabinets with sink
        ii. Workshop includes mop sink
33. Stairs:
    a. Walls: Type 4
    b. Ceiling: Type: 2
        i. Paint underside of stair assembly and landings
    c. Misc. Metal stair – Guard Rails - 2x3 Tube Steel intermediates, 1x2 Steel bar top and bottom with 2x3 painted steel tube, inset ½ x ½ vertical steel pickets – double handrails both sides 1-1/2" o.d. painted steel handrails
34. Heart of the School Grand Stair. Custom Stair/Stadium seating structure above adjacent occupied areas (Food Lab). Carry 700 sf of area. Stair width 84".
    a. Walls: Type 3
    b. Treads and Risers: Floor Type 2
    c. Railings:
        i. Guardrails: Type 1

Tobin & Vassal Lane Upper Schools

Cambridge, MA

Feasibility Study

Draft for Estimating

For

Perkins Eastman Architects
20 Ashburton Place, Floor 8
Boston, Massachusetts 02108

RFS 18-8795.001

February 14, 2020

Rist-Frost-Shumway Engineering, P.C.
www.rfsengineering.com

Table of Contents

Attachments

Electrical
SKE1
SKE2

4.2 Civil

Site Utilities

Electric Power

The primary electrical power for the new electrical service will be from an overhead high voltage pole line provided by Eversource on Vassal Lane. At the utility pole, the high voltage supply will be routed underground to a Eversource transformer vault located near the kitchen area inside the new building. The new building will be served by two (2) 2000 kVA, 6000A, 480/277V, 3Ø, 4 Wire electrical service. From the transformers a 6000A, 3Ø, 4 Wire bus duct will provide power to a 6000A, 480/277V, 3Ø, 4 Wire Main Switchboard.

Telecommunications

The service entrances will be relocated to a new service entrance room located on the first floor level near the service entrance and kitchen. The service entrance room (a.k.a. "demarc") will be outfitted with grounding and plywood backboards for mounting of entrance cable protection, cabinets, etc. Four (4) 4-inch conduits will be provided from the pole line to the building demarc for telecommunications site utility services inclusive of internet and phone service providers (i.e. Verizon, Comcast, etc.), City of Cambridge network, and any interbuilding fiber optic cables. It is anticipated this will be a mix of copper and fiber optic cables, each suitably sized to support the respective services for the building's user community with spare capacity for future growth. From the building demarc, the site telecommunications services will be extended to the Main Distribution Frame (MDF) for connection to the building telecommunications equipment and network.

4.5 MECHANICAL, ELECTRICAL, PLUMBING AND FIRE PROTECTION

The following sections identify the mechanical, electrical, plumbing and fire protection systems proposed for installation in the Tobin Montessori Vassal Lane School. The proposed systems will meet the requirements of all applicable codes along with the City of Cambridge's desire to minimize energy consumption to reach a goal of creating a net positive energy building. Proposed systems will prioritize the use of energy efficient features to achieve ultra-low energy performance.

MECHANICAL SYSTEMS

Codes and Standards:

Heating, ventilating, and air conditioning (HVAC) systems design for the building will be in accordance with the Massachusetts State Building Code (780 CMR), referenced International Mechanical Code, 2018 International Energy Conservation Code, and other applicable Codes as adopted and amended by the Commonwealth of Massachusetts.

As appropriate, standards, guidelines, and recommendations pertaining to energy efficiency, environmental quality, and building performance, such as those developed by ASHRAE, USGBC, and the USDOE, will be applied to the selection and design of the HVAC systems for the building.

Outdoor Design Conditions:

Summer: 91°F DB/73°F WB

Winter: 0°F DB

Indoor Design Conditions:

Cooling: 75°F DB/50% RH

Heating: 70°F DB

HVAC System Options:

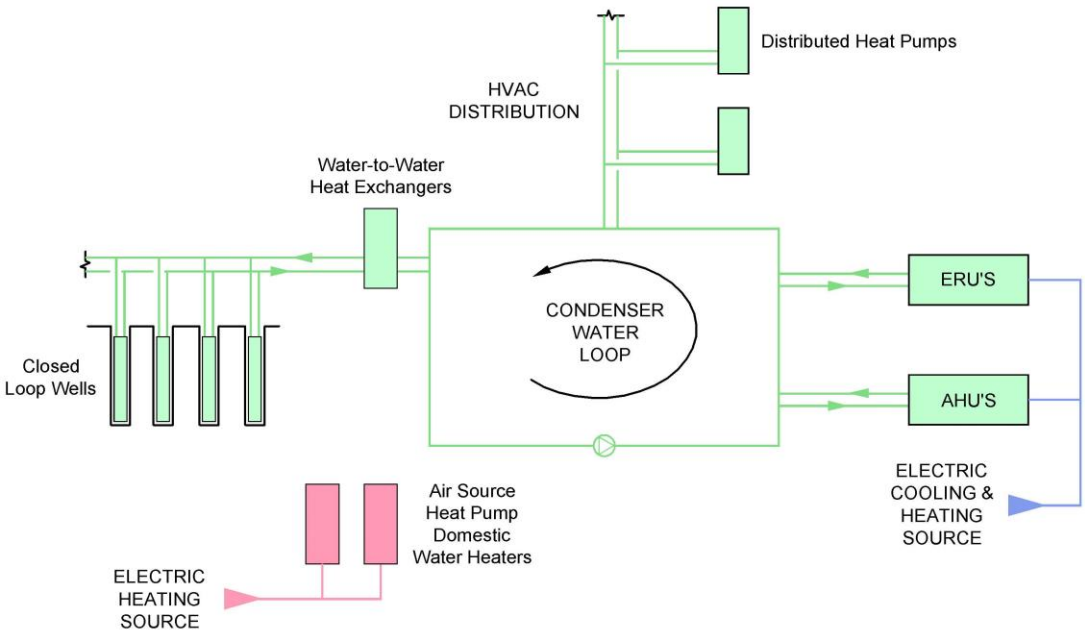
Three (3) options have been analyzed for consideration for the heating and cooling system for the building.

Option #1: Ground-Source Geothermal Heat Pumps

A ground-source geothermal heat pump system will provide primary heating and cooling capacity for the building. It is currently estimated that two hundred (200) wells will be required to meet the heating and cooling load requirements. The estimated well field size is based on an anticipated capacity of 2.5 tons per well.

The geothermal well field system will be closed loop type, circulating a 20% propylene glycol/ water antifreeze solution from the heat pumps through a network of pipes buried below grade. The wells shall be spaced approximately 20 feet on-center. The installation of a test well and live thermal testing will determine actual site characteristics such that the quantity of wells can be confirmed or adjusted.

The geothermal well field system pumps will distribute source water from the well field to plate and frame heat exchangers located in a first floor mechanical room. Two (2) main load side system pumps will be provided to distribute condenser water throughout the building from the mechanical room to distributed water to air heat pumps throughout the building. The pumps will operate in lead/standby, each with a flow capacity of 100% of the peak flow requirement. The estimated size of each pump is 400 GPM. Variable frequency drives will be provided for condenser water flow modulation. Other condenser water system components will include a tangential air separator, expansion tank, chemical pot feeder, and ancillary components.



Option #2: Variable Refrigerant Flow (VRF) Air Source Heat Pumps

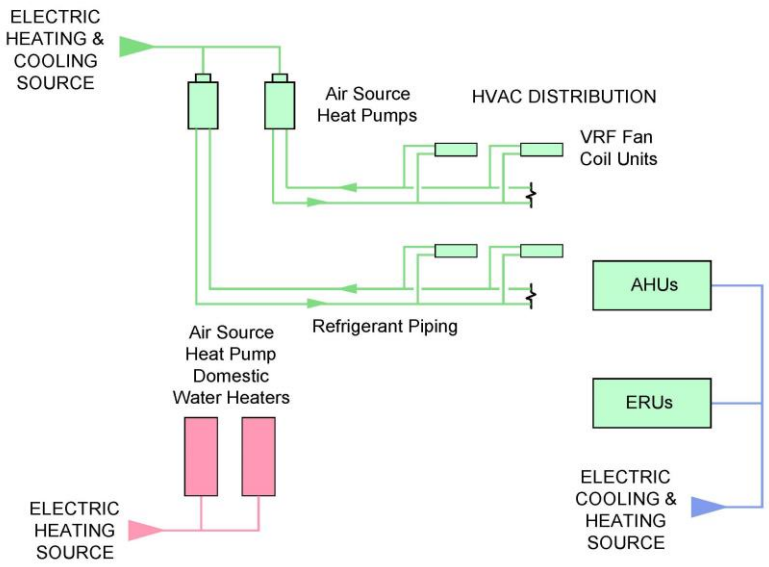
Primary heating and cooling will be provided by variable refrigerant flow (VRF) systems which will use air source heat pumps with variable speed compressors to deliver precise refrigerant flow to meet individual space heating and cooling loads. The systems will consist of distributed indoor terminal fan coil units connected via refrigerant piping to roof mounted heat pump units. The systems will have the ability to simultaneously heat/cool and transfer energy via the refrigerant system to/from different spaces with the balance of energy rejected/absorbed at the heat pumps via the ambient air.

Ceiling cassette type VRF fan coil units will be provided for the classrooms. Ducted concealed type VRF fan coil units will be provided for corridors and other learning spaces.

Total VRF system capacity is estimated to be 450-480 Tons.

Refrigerant tubing will be distributed throughout the building from outdoor condensing units to VRF fan coil units.

Supplemental electric heating will be provided for heating only areas (storage rooms, mechanical rooms, etc.) and at building entries.



Option #3: Ground-Source Geothermal Heat Pump and Variable Refrigerant Flow (VRF) Air Source Heat Pump Hybrid

A ground-source geothermal heat pump system will provide primary heating and cooling capacity for the gymnasium, auditorium, cafeteria and general circulation spaces. It is currently estimated that fifty to sixty (50-60) wells will be required to meet the heating and cooling load requirements. The estimated well field size is based on an anticipated capacity of 2.5 tons per well.

The geothermal well field system will be closed loop type, circulating a 20% propylene glycol/ water antifreeze solution from the heat pumps through a network of pipes buried below grade. The wells shall be spaced approximately 20 feet on-center. The installation of a test well and live thermal testing will determine actual site characteristics such that the quantity of wells can be confirmed or adjusted.

The geothermal well field system pumps will distribute source water from the well field to plate and frame heat exchangers located in a first floor mechanical room. Two (2) main load side system pumps will be provided to distribute condenser water throughout the building from the mechanical room to distributed water to air heat pumps throughout the building. The pumps will operate in lead/standby, each with a flow capacity of 100% of the peak flow requirement. The estimated size of each pump is 150 GPM. Variable frequency drives will be provided for condenser water flow modulation. Other condenser water system components will include a tangential air separator, expansion tank, chemical pot feeder, and ancillary components.

A variable refrigerant flow (VRF) system will provide primary heating and cooling capacity for the academic and office spaces. The VRF system will use air source heat pumps with variable speed compressors to deliver precise refrigerant flow to meet individual space heating and cooling loads. The systems will consist of distributed indoor terminal fan coil units connected via refrigerant piping to

roof mounted heat pump units. The systems will have the ability to simultaneously heat/cool and transfer energy via the refrigerant system to/from different spaces with the balance of energy rejected/absorbed at the heat pumps via the ambient air.

Ceiling cassette type VRF fan coil units will be provided for the classrooms. Ducted concealed type VRF fan coil units will be provided for corridors and other learning spaces.

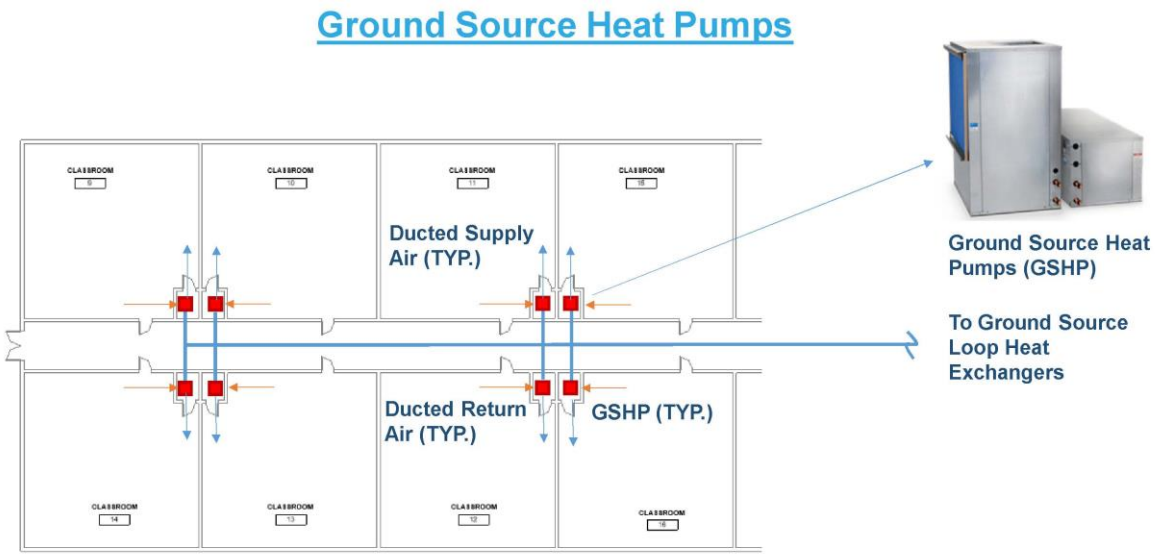
Total VRF system capacity is estimated to be 300–330 Tons.

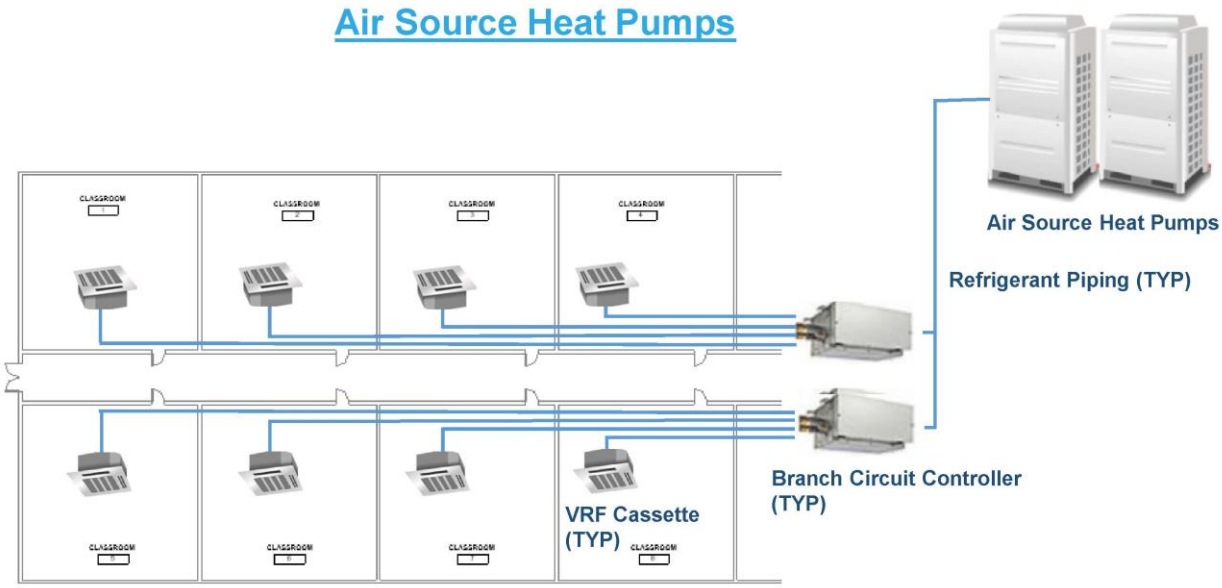
Refrigerant tubing will be distributed throughout the building from outdoor condensing units to VRF fan coil units.

Supplemental electric heating will be provided for heating only areas (storage rooms, mechanical rooms, etc.) and at building entries.

Refer to Option #1 and Option #2 above for system diagrams.

Typical classroom system diagrams:





Proposed HVAC System

HVAC system option #3 - Ground-Source Geothermal Heat Pump and Variable Refrigerant Flow (VRF) Air Source Heat Pump Hybrid is currently being proposed for the building. This option provides high efficiency HVAC equipment and provides a significant reduction to the amount of area on the building site required for the geothermal well field.

Piping Systems:

Condenser water will be distributed throughout the building from the mechanical room to distributed water to air heat pumps throughout the building. Piping 2 inches and smaller will be Type L copper with cast brass or wrought copper solder joint fittings. Piping 2½ inch and larger shall be schedule 40 steel with butt-welded fittings. All piping will be insulated with fiberglass pipe insulation with vapor barrier jacket.

Piping distribution systems will be designed to minimize the required pump energy.

Refrigerant tubing will be distributed throughout the building from outdoor condensing units to VRF fan coil units. Refrigerant piping shall be Type L ACR refrigerant grade copper tubing with insulation with vapor barrier jacket.

Air Handling Systems:

General:

Minimum outside air ventilation rates for all air handling units will be determined in accordance with the above-referenced International Mechanical Code and ASHRAE Standard.

In accordance with the International Energy Conservation Code, the air handling unit equipment described will be designed with air-side economizer capabilities to automatically increase quantities of outside air supplied to the building when outdoor temperature and humidity conditions are favorable in order to reduce or eliminate mechanical cooling requirements.

Primary acoustic treatment for air handling unit noise control will be provided by a combination of sound attenuators and double-wall ductwork.

100% outside air (DOAS) energy recovery units will provide mechanical ventilation for the academic areas, office areas, and general circulation areas.

Independent air handling units will provide heating, ventilation, and air conditioning for the gymnasium, auditorium and cafeteria.

Preliminary air handling unit information is as follows.

AIR HANDLING UNIT	AREA SERVED	APPROX. UNIT CFM	REMARKS
AHU-1	Dining and Kitchen Areas	12,000	Variable air volume, mixed air, heat pump, airside economizer, interlock with kitchen hoods, 40 tons
AHU-2	Auditorium	14,000	Single zone variable air volume, heat pump, airside economizer, carbon dioxide demand control ventilation, 40 tons
AHU-3	Large & Small Gymnasium	10,000	Single zone variable air volume, heat pump, airside economizer, carbon dioxide demand control ventilation, 25 tons
AHU-4	Learning Commons	12,000	Variable air volume, heat pump, airside economizer, 40 tons
ERU-1	Auditorium Support Areas	2,000	Variable air volume, DOAS, energy recovery wheel, heat pump, airside economizer, 5 tons
ERU-2	Visual Arts/Performing Arts	8,000	Variable air volume, DOAS, energy recovery wheel, heat pump, airside economizer, 20 tons
ERU-3	Vassal School Ventilation	9,000	Variable air volume, DOAS, energy recovery wheel, heat pump, airside economizer, 20 tons
ERU-4	Vassal School Ventilation	9,000	Variable air volume, DOAS, energy recovery wheel, heat pump, airside economizer, 20 tons Variable air volume, DOAS, energy recovery wheel, heat pump, airside economizer, 20 tons
ERU-5	Vassal School Ventilation	9,000	Variable air volume, DOAS, energy recovery wheel, heat pump, airside economizer, 20

AIR HANDLING UNIT	AREA SERVED	APPROX. UNIT CFM	REMARKS
			tons
ERU-6	Vassal School Ventilation	9,000	Variable air volume, DOAS, energy recovery wheel, heat pump, airside economizer, 20 tons
ERU-7	Tobin School Ventilation	9,000	Variable air volume, DOAS, energy recovery wheel, heat pump, airside economizer, 20 tons
ERU-8	Tobin School Ventilation	9,000	Variable air volume, DOAS, energy recovery wheel, heat pump, airside economizer, 20 tons
ERU-9	Tobin School Ventilation	9,000	Variable air volume, DOAS, energy recovery wheel, heat pump, airside economizer, 20 tons
ERU-9	Tobin School Ventilation	9,000	Variable air volume, DOAS, energy recovery wheel, heat pump, airside economizer, 20 tons

Kitchen exhaust hoods and exhaust hood fans will employ controls that vary the fan speed in response to heat and smoke production under the hoods.

The kitchen system will include variable air volume exhaust and make-up air strategies that respond to actual kitchen and food preparation activities.

Ductwork:

All ductwork shall be fabricated, sealed, installed, and supported in accordance with SMACNA HVAC Duct Construction Standards. Ductwork shall have a 2-inch (minimum) pressure class rating and sealed in accordance with seal Class A. Ductwork shall be galvanized steel.

Kitchen hood exhaust ductwork will be welded stainless steel; dishwashing exhaust ductwork will be aluminum. Grease hood exhaust ductwork will be fire-rated as required by Code.

Ductwork will be designed to minimize the required fan energy.

Duct Insulation:

Ductwork insulation for ducts that are concealed above ceilings or in duct chases shall be 1½ inch thick, ¾-pound density, fiberglass all-service duct wrap with factory laminated reinforced foil/craft (FSK) vapor retarder facing.

The following ductwork shall be covered:

- All supply air ductwork.

- All outside air ductwork.
- All ductwork located within ten (10) feet of a connection to the building exterior.

Miscellaneous Systems and Equipment:

Miscellaneous Cooling Systems:

Dedicated cooling systems will be provided at the main tel/data room, tel/data closets, and elevator machine rooms. These will consist of packaged high-efficiency "mini-split" type air conditioning systems.

Parking Garage Ventilation System:

Exhaust fans will provide ventilation for the parking garage. The fans will be equipped with variable frequency drive to allow the system to modulate from minimum airflow to maximum airflow. A carbon dioxide and nitrogen dioxide gas detection system will be interlocked with the garage exhaust fans to increase/decrease fan speed as required to maintain the proper air quality within the parking garage.

Kitchen Equipment Heat Recovery System:

The main kitchen refrigeration equipment will be provided with heat recovery capability. The recovered heat will be utilized to preheat domestic hot water.

Building Automation System:

The HVAC automatic temperature control and energy management system will be direct digital control (DDC) type with electric actuation. The system will be designed to allow for flexibility in scheduling of building occupancies. The system will be designed to be integrated into the existing district-wide energy management system. Specific control and energy management approaches will be coordinated with the owner as the design progresses.

A building dashboard with public display flat screen monitor will be provided. Dashboard graphics to display sustainable building features, building energy systems, metering data, etc.

PLUMBING SYSTEMS

Codes and Standards:

The plumbing system will be designed in accordance with the Massachusetts Fuel Gas and Plumbing, 248 CMR, as adopted by the Massachusetts Plumbing Board.

As appropriate, standards, guidelines, and recommendations pertaining to energy efficiency, environmental quality, and building performance, such as those developed by ASHRAE, USGBC,

CHPS, and the USDOE, will be applied to the selection and design of the Plumbing systems for the building.

Domestic Water:

A new municipal water service will be provided to serve the building. A dedicated 6-inch domestic water service will enter the new water service room. The domestic water system will connect to the water service ten (10) feet beyond the building exterior wall. An approved water meter and a duplex backflow preventer will be provided on the domestic water service.

Domestic cold water will be provided to all domestic plumbing fixtures including lavatories, janitors' closets, drinking fountains, HVAC equipment, and exterior hose bibs. All domestic water piped to HVAC equipment will be provided with a reduced pressure backflow prevention device. Backflow preventers will be provided on the cold water and hot water supplies to the lab classroom sinks.

Domestic hot water will be generated by air source heat pump water heaters provided with auxiliary storage. Preliminary water heater sizing results in an air source water heater Model CXA-25 with 2,500 gallons of water storage as manufactured by Colmac. Hot water will be generated to 140° F and piped through a master thermostatic mixing valve to temper the hot water to 120° F for distribution to the domestic plumbing fixtures. 140° F water will be directly piped to the kitchen to supply the pot sinks, pre-rinse sinks and dishwashers. Hot water to the lab classrooms will be maintained after the dedicated hot water backflow preventer with the use of temperature maintenance tape. Waste heat from the kitchen refrigeration equipment will be used to pre-heat the domestic cold water supply to the domestic water heater.

Domestic hot water recirculation and 140° F hot water circulation will be piped back to the water heaters and will be used to maintain domestic hot water temperatures close to points of use in the domestic system.

CxA Modular Series
Air Source Heat Pumps

COLMAC WATERHEAT

Standard Features

- ECM axial fan (plenum fan optional)
- 10 and 15 hp models fit through standard 36" door
- Slide-out tray for servicing refrigeration components
- Industrial PLC controls with touchscreen
- Electronic expansion valve
- 304L stainless steel frame and enclosure
- Double wall 316L stainless steel condenser for potable water heating
- Integrated stainless steel circulator pump
- 140°F - 160°F output temperatures

Plumbing Fixtures:

Plumbing fixtures in public toilet rooms will consist of high-efficiency wall-mounted water closets with dual-flush manual flush valves, low consumption washout urinals, vitreous china wall-hung lavatories with manual metering faucets. Showers will be molded acrylic with pressure balancing mixing valves. Janitors closets will be provided with floor mounted terrazzo mop basins. Dual height stainless steel drinking fountains with integral bottle fillers and chillers will be provided. Floor drains and hose bibs will be included at all public and student toilet rooms. Exterior hose bibs with integral vacuum breakers will be provided along the exterior of the building. Emergency shower and eyewash fixtures will be provided with point-of-use thermostatic mixing valves. Emergency fixtures will be located in all lab classrooms, the Nurses room and the lower level mechanical room.

Plumbing fixtures shall be ADA compliant in all areas requiring barrier free access. Child height fixtures will be provided to serve the preschool.

Sanitary System

The sanitary waste stacks within the building will collect waste from the domestic plumbing fixtures. Waste collected from the domestic plumbing fixtures located in the first floor and above will exit the building by gravity. A duplex sewage ejector will be provided to serve the lower level plumbing

fixtures and will discharge to the municipal sanitary sewer outside the foundation wall. The lab classroom sinks will be provided with point-of-use pH neutralization chip tanks.

Solids interceptors will be provided at the art room and pottery sinks. A sand and oil interceptor will be provided to serve the drains in the lower level parking.

Interior grease interceptors will be provided to collect grease laden waste generated from the kitchen. The waste stream from the outlet of the interior interceptors will be piped independently to an exterior grease interceptor located below grade on the site. The outlet of the exterior interceptor will be piped to the municipal sanitary sewer.

The sanitary drain system will connect to the municipal sanitary sewer and will extend ten (10) feet beyond the building exterior wall. Multiple sanitary sewers exiting the building will be provided.

Storm Drainage

Conventional roof drains will be provided for all flat roof sections. The roof storm drainage will be routed internally through the building and exit the building by gravity. The storm drain will connect to the on-site municipal storm sewer and will extend ten (10) feet beyond the building exterior wall. The secondary overflow roof drain system will consist of scuppers and will discharge directly from the roof level to grade.

A blue-roof is proposed for installation which will include the use of control-flow roof drains to restrict the flow of rain water into the municipal storm sewer. The roof assembly will be coordinated with the structural engineer, architect and shall meet the requirements of the Massachusetts Plumbing Board.

A storm water re-use system is proposed for installation. Storm water collected from the building roof will be piped to a 20,000-gallon exterior storage tank. Duplex pumps will be placed in the exterior tank which will pump storm water into the building. A dedicated storm water piping system will be installed to provide water to all water closets and urinals located in the building along with a feed for site irrigation. Filters and UV sterilizers will be provided in the building mechanical room to treat the water prior to use. The re-use water will be continuously run through a separate 1,000-gallon interior storage tank to prevent stagnation of the treated water. Water distributed through the building will be provided with a dye-injection to alert the user the water is not potable. An expansion tank and 3-way valve will be provided which will allow the system to be back-fed with municipal water in the event the storm water storage tank runs low. A booster pump system will be provided to pressurize the reuse system.

FIRE PROTECTION SYSTEMS

Codes and Standards:

The fire protection systems will be designed and installed as required by the Massachusetts State Building Code, 780 CMR (9th Edition).

Sprinkler/Standpipe Systems

A new 8-inch fire protection main will be connected to the municipal water service. The fire service will connect to the water service ten (10) feet beyond the building exterior wall. A new dedicated double check valve assembly will be provided. The new fire protection main will be installed below grade and will enter the building in the fire service room.

The wet pipe fire protection systems will be classified as Light Hazard in all toilet rooms, administration areas, classrooms and other areas of similar occupancy and will be provided with a density of 0.10 gpm per square foot over 1,500 square feet of design area. The sprinkler system will be classified Ordinary Hazard Group I coverage in mechanical rooms, storage rooms, library stack areas and kitchen service areas and will be provided with a density of 0.15 gpm per square foot over 1,500 square feet of design area. The new sprinkler system will be installed in conformance with NFPA 13, *Installation of Sprinkler Systems*. The sprinkler system will have multiple zones on each floor of the school.

A manual-wet standpipe system will be provided with 2 ½" hose valves in each of the required egress stairwells at the primary landing. The standpipe system will also be located at the auditorium stage as required by the Massachusetts State Building Code. The 1 ½" fire hose valves will be located at each side of the stage and will be provided with enough hose to provide fire protection coverage of the stage area. Standpipes will be designed in conformance with NFPA 14, Installation of Standpipes and Hose Systems.

Two hydrant flow tests we performed on July 22, 2019 by the City of Cambridge Water Department. The test performed on Concord Ave and Corporal Burns Road resulted in a static pressure of 64 psi and a residual pressure of 62 psi while flowing 1,250 gpm. The test performed on Lakeview Ave and Standish Street resulted in a static pressure of 64 psi and a residual pressure of 61 psi while flowing 1,275 gpm. The results of these tests will be used for the hydraulic analysis of the proposed fire protection system.

If it is determined a fire pump is required to serve the automatic sprinkler system, a motor-driven fire pump complying with NFPA 20 - *Standard for the Installation of Stationary Pumps for Fire Protection* will be provided. The system will consist of a fire pump, jockey pump, controllers, automatic transfer switch and all associated piping and alarms.

ELECTRICAL SYSTEMS

Codes and Standards:

Electrical and Telecommunications systems design for the building will be in accordance with the Massachusetts State Building Code, 780 CMR (9th Edition), Massachusetts Electrical Code (527 CMR), Massachusetts Stretch Energy Code, and other applicable Codes as adopted and amended by the Commonwealth of Massachusetts.

As appropriate, standards, guidelines, and recommendations pertaining to energy efficiency, environmental quality, and building performance, such as those developed by ASHRAE, USGBC, and the USDOE, will be applied to the selection and design of the electrical systems for the building.

Power Distribution:

The estimated electrical service size for the new building is 6000A, 480Y/277V, 3Ø, 4 Wire. The main service will configured as twin 3000 ampere services, fed from two (2) utility-owned transformers. The transformers will be located in a 3-hour rated utility transformer vault construction to Eversource standards. From the transformers a 6000A, 3Ø, 4 Wire bus duct will provide power to a 6000A, 480/277V, 3Ø, 4 Wire Main Switchboard located in the new main electrical room. The new main electrical room will be located adjacent to the transformer vault near the kitchen area and will be sized to accommodate electrical distribution equipment including two (2) 3000 ampere, 480/277 volt switchboards. The room will also contain the main solar AC switchboard and 480/277-volt distribution panelboards and three-phase dry-type transformers, which will provide 120/208-volt distribution for the local area and various associated spaces. Refer to *SKE1* for a proposed layout of the transformer vault and main electric room.

Satellite electrical rooms will be located in the auditorium wing, gym wing, Tobin Montessori School wing and Vassal Lane School wing. Each satellite electrical room will accommodate 480/277 volt panelboards, and three-phase dry-type transformers to provide 120/208-volt power to local electrical consuming loads. The rooms will also contain equipment part of the electrical infrastructure supporting the roof solar system. Refer to SKE2 for proposed layout of typical satellite electrical room. Control panels and motor starters for HVAC equipment will be wall mounted in various mechanical spaces, or will be unit-mounted for rooftop equipment.

Dedicated power distribution systems will be provided for specific high density programs, including auditorium, gym, kitchen and similar program spaces. Dedicated panelboards serving science classrooms will be provided and will be located in protected areas adjacent to the spaces and will contain shunt trip main breakers and the science classroom will have multiple emergency push buttons that can be shut off power in case of an emergency situation.

All lighting distribution in the building will be 277-volt, and will be powered from panelboards in the electrical rooms in their respective areas.

The 120/208-volt power will be distributed for receptacle power from the transformers located in the electrical rooms in their respective areas.

The distribution of power in the building will be concealed. All cabling will be copper. For each branch circuit, type EMT conduit will be utilized from the panelboard to an area junction box and Type MC Cable will be used from the last junction box to electrical devices or lighting fixtures. Larger feeders to mechanical equipment will be EMT conduit and copper conductors. No conduits or cable will be exposed in finished areas. Columns, walls, and ceiling plenums will be used for power distribution, where possible.

At least 50% of all 125-volt 20-amp receptacles in all classrooms, offices, conference rooms, printing/copying rooms, break rooms and individual workstations will be automatically controlled per ANSI/ASHRAE/IES standards.

Electrical Energy Monitoring:

Measurement devices will be installed to monitor the electrical energy use for each of the following separately:

a) Total electrical energy
b) HVAC systems
c) Interior Lighting
d) Exterior Lighting
e) General Power and Receptacle circuits.

Emergency Power:

An emergency generator sized at approximately 500 KW, 480Y/277volt, three-phase, four-wire will be provided. The generator will be located outside of the building. The generator will provide emergency power for code required emergency lighting and fire alarm systems. The generator will also provide standby power for building preservation heat which includes boiler(s), hot water distribution pump(s), air handling equipment and the energy management system, select kitchen equipment including the coolers and freezers and other selected electrical loads. See the Proposed Generator Loads table below.

The fuel source for the generator will be #2 biodiesel fuel, which will be stored in a skid-mounted fuel tank with a capacity large enough to provide 96 hours of generator operation. A sound attenuated weatherproof enclosure will be provided. Associated emergency power transfer switches and main emergency electrical distribution systems shall be located in a separate main emergency electrical room in accordance with 2010 NFPA 110. Refer to SKE2 for proposed layout of the main emergency electrical room. Emergency branch circuit panelboards will be located in normal power electrical closets, and distributed throughout the building as required.

Proposed Emergency Generator Loads - 500kW Generator - Life Safety, Security, Building Preservation		
Item No.	Description	kW Load
LIFE SAFETY LOADS		
1	Fire Alarm System	15.0
2	Emergency and Egress Lighting	42.0
3	Generator Support Equipment (Battery Charger, Block Heater, etc.)	8.0
4	Telecommunications Rooms (Telephone/PA systems)	20.0
	Subtotal	85.0
LEGALLY REQUIRED LOADS		
1	ADA Door Operators	10.0
2	Elevators (40HP)	45.0
3	Smoke Dampers	1.5
4	Preaction System (Main Telecom Room)	2.0
	Subtotal	58.5
OPTIONAL STANDBY SYSTEM LOADS		
1	Security Systems Equipment	6.0
2	Telecommunications Rooms Air Conditioning	20.0
3	Select Power and Lighting (Main Elect Room, Main Office, etc.)	30.0
4	Building Preservation Heat: GSHPs, ASHPs, Building Controls, Cabinet Unit Heaters, Prop Unit Heaters (Common areas, Cafeteria, Gymnasium, Locker Rooms	250.0
5	Garage and Exterior Lighting	5.0
	Subtotal	311.0
	Total	454.5

Lighting

In general, the lighting design will be based on the guidelines of the Illumination Engineers Society of North America (IESNA) lighting handbook (latest version). The lighting design will use the recommendations given in this handbook and Energy Star for vertical and horizontal illuminance levels required in a given space. LPD (lighting power density) will be compliant with the Massachusetts Stretch Energy Code and IECC/ASHRAE 90.1-2013 guidelines.

Energy efficient lighting LED fixtures shall be provided throughout the building. LED lighting provides energy savings and long life with minimal maintenance. LED type lighting fixtures provide dimming capabilities.

Exit lights will be LED edge-lit exit signs in the lobby, common and corridor areas, cast aluminum in back of house areas and vandal resistant high-impact in the gymnasium, locker rooms and parking garage areas.

Lighting Control Systems

Automatic lighting control will be provided in spaces required to conform to the Energy Code adopted by the State of Massachusetts. The lighting controls will be occupancy sensors for most applications and timers in specific applications where occupancy sensors are not suitable.

Occupancy sensors will be provided to comply with current energy conservation code requirements. Vacancy sensing will be utilized in classrooms, offices, and conference spaces. Vacancy sensors require on occupant to manually turn ON the lights when light is needed. The sensor will then automatically turn lights OFF. Vacancy sensors ensure the highest level of energy savings since the lights will never automatically turn ON.

Day-lighting controls will be provided for classrooms and common spaces with natural daylight. In these spaces, lighting will be regulated so that illumination in an area will maintain a constant light level. Where there is sufficient natural light in a space, the light fixtures will remain OFF.

The lighting control system will also operate corridors and common areas using astronomical time of day programming. Lights will be switched ON and OFF based upon preset time schedules or astronomical clocks. Occupancy sensors will also be integrated into the design. After hours, the occupancy sensor will turn lights ON and OFF based on occupancy. During occupied hours, lighting levels in the corridors and common areas can be decreased when unoccupied and increased when occupied.

Exterior lighting will be designed using pole and building mounted LED fixtures, providing instant-on, low maintenance and extended life characteristics. Consideration will be given to providing fixtures with integral sensors to allow for automatic reduction of the illumination levels when parking lots and walkways are void of moving vehicles or pedestrians. Astronomical time of day programming will also be used to schedule ON/OFF of exterior fixtures.

The emergency lighting system will be incorporated as part of the normal lighting system and provided with code compliant emergency power from an emergency generator. UL listed 924 transfer devices will be included in the design to allow portions of the normal lighting systems to be powered from the generator upon the loss of utility power.

Fire Alarm:

An addressable-type fire alarm system with liquid crystal display and voice activation system will be provided. The fire alarm system will include duct-mounted smoke detectors, heat and smoke detectors, manual pull-stations and alarm speaker/strobe units. Locations for devices will be in accordance with NFPA and ADA requirements. A connection to the local authority and a central monitoring company will be provided based on the city and school district standards.

Security Systems:

A new integrated access control/intrusion detection system will be provided. The master panel shall be located either in the main distribution frame (MDF) room or an appropriate electrical room with additional subpanels strategically placed throughout the facility as required to meet manufacturer panel-to-station equipment cable distance limitations. For the purpose of operational control, alarm notification, and monitoring overall system status, the systems will connect to primary and secondary external personnel and emergency services as determined and desired by school and city stakeholders.

Access Control System

Main entries and other exterior portals that will be used for entry into the building will be outfitted with proximity card readers and door status monitoring contacts. For exterior doors that are egress only or secured with lock-and-key, door status monitors will be provided. In addition, select interior doors will have card reader access control (e.g. IT/telecom rooms, staff-only areas, high-value equipment use and storage areas, etc.). The determination of portals managed and monitored by the access control system will be determined in consultation with school and city stakeholders during the design phase of the project.

Intrusion Detection System

The door monitoring contacts used by the access control system to determine door status at access controlled portals will feature a second set of connection points for use by the intrusion detection system. If there are additional portals that require monitoring that are not also connected to the access control system, those doors will have contacts provided for connection to the intrusion detection. In addition to door status monitoring, glass break and motion detection devices will be provided throughout the building to monitor areas as determined during the design phase.

Closed Circuit TV System (Surveillance)

A closed circuit television system (CCTV) will be provided for video surveillance. The existing Genetec Omnicast software platform from the existing building may be reused inclusive of necessary licenses upgrades needed to support the new cameras. New color IP based fixed field-of-view and as

appropriate, pan-tilt-zoom (PTZ) cameras will be provided at building entrances, corridors, large group spaces, parking garage, parking lots and select exterior locations as determined in the design development phase of the project. Operating based on a defined coverage schedule and motion detection triggers, cameras will record and store images on a network video recorder (NVR) located in the data center (sized for 30 days of storage).

Telecommunications System:

The telecommunications system will consist of Owner provided network equipment operating on a structured cabling information transport system (ITS), that will support the connection and operation of Owner provided equipment for voice, data, multimedia, and other systems as required. Creating a complete standards compliant technology infrastructure, the ITS will consist of:

- At the center of the ITS, one (1) building Main Distribution Frame (MDF)
- Multiple Intermediate Distribution Frames (IDF's) located throughout the facility.
- Intrabuilding backbone cabling comprised of optical fiber and multi-pair copper cables connecting each of the IDF's to the MDF.
- Connecting the local user community around the MDF and each IDF, category 6 outlets at each workstation with category 6 cables capable of supporting gigabit data speeds.
- Within the MDF and IDF, network racks, category 6 patch panels, fiber enclosures, and associated category 6 and optical fiber patch cables for connection of user ports to rack mounted network equipment.

The distribution of communication cables in accessible ceiling spaces will be in cable tray and J-hooks. Where installed in walls and columns, and in exposed locations, cabling shall be distributed in appropriately sized conduit. The location and configuration of voice and data outlets will be determined during the design development through input from the Architect and Owner.

Given the physical footprint, square footage, and overall layout of the planned structure, IDF's shall be placed in locations around the facility so that installed cable length from rack to workstation outlet does not exceed 295 feet (90m). It is likely that at least one (1) IDF will be required per wing and possibly within a given wing, on more than one level. The actual quantity and location of IDF's will be determined during design development once the architectural and physical attributes of the structure have been defined. In addition to racks and their associated equipment, the MDF and IDF rooms will include cable tray, backboards, grounding systems, and all necessary cable management and distribution accessories.

Supporting wireless data infrastructure, dual category 6 data outlets will be provided for wireless access points (WAP's). The exact location of these outlets will be identified through a comprehensive predictive analysis and resultant heat mapped coverage profile during the design development phase of the project.

Telephone, Public Address and Clock Systems

Voice Communications System

A telephone system will be provided for the building and will be specified to meet the district's current standards. The telephone system will be integrated with the building intercom system. Telephones for administration areas and classrooms will be specified as identified by the school district's IT department. Depending on the preferred technology embraced by the school, the system will either be a traditional analog PBX type or voice over internet protocol (VoIP) transported over the data network.

Public Address System

A distributed public address (PA) system will be deployed throughout the school inclusive of classrooms, staff/administration areas, hallway, auditoriums, bathrooms, gymnasiums, select exterior areas, and any other spaces determined to require PA. The system will be a zoned broadcast communications platform capable of school-wide broadcast or more selective communications to specific areas. Depending on requirements in any given area, the system will be either one-way (outbound) or two-way, providing for bidirectional communications. An intercom system control panel will be located in the main office as coordinated with Architect and Owner. Speakers will include ceiling and wall mount options, with the type determined in coordination with architect and functionality desired by the school. The PA system will integrate with the telephone system and intercom functions will be available through telephone handsets. The intercom system will include a line level input and microphone(s) for announcements.

Master Clock System

A wireless master clock system will be provided to the entire building. The central transmitter will be located in the MDF room and twelve-inch diameter clocks will be located in each classroom, hallways, staff/administration, and other general use areas. In spaces where greater visibility may be required (such as the gymnasium or cafeteria), fifteen-inch diameter clocks will be utilized inclusive of wire guards where necessary for protection from incidental impact. The system will derive time from the atomic clock either via connection to and through the data network or a roof mounted GPS antenna. Time will be reconciled minimum twice per day by signal from the base station, propagated out clock-to-clock through the system. In addition, a wireless tone generator can be provided in any location or classroom where class change notification is desired with such system tied into the school class scheduling software.

Audio/Visual Systems

Distribution raceways, boxes power outlets, data jacks and CATV outlets to support audio/visual systems will be provided as required. This infrastructure will be coordinated with the Architect, Owner, and A/V Design Consultant.

Special Communication Systems

Elevator Lobby Communications System

A two-way communication system will be provided in the elevator lobbies on each floor, required by IBC 1007.8. The communication system will be connected to the emergency power system. The communication system will communicate between each location and a unit at the fire alarm panel or other location approved by the fire department.

First Responder Bidirectional Amplifier System

A Fire Fighter Communication system shall be provided in areas of the structured as determined necessary by RF survey to support first responder radio coverage within the building as required by IBC 907.2.13.2.

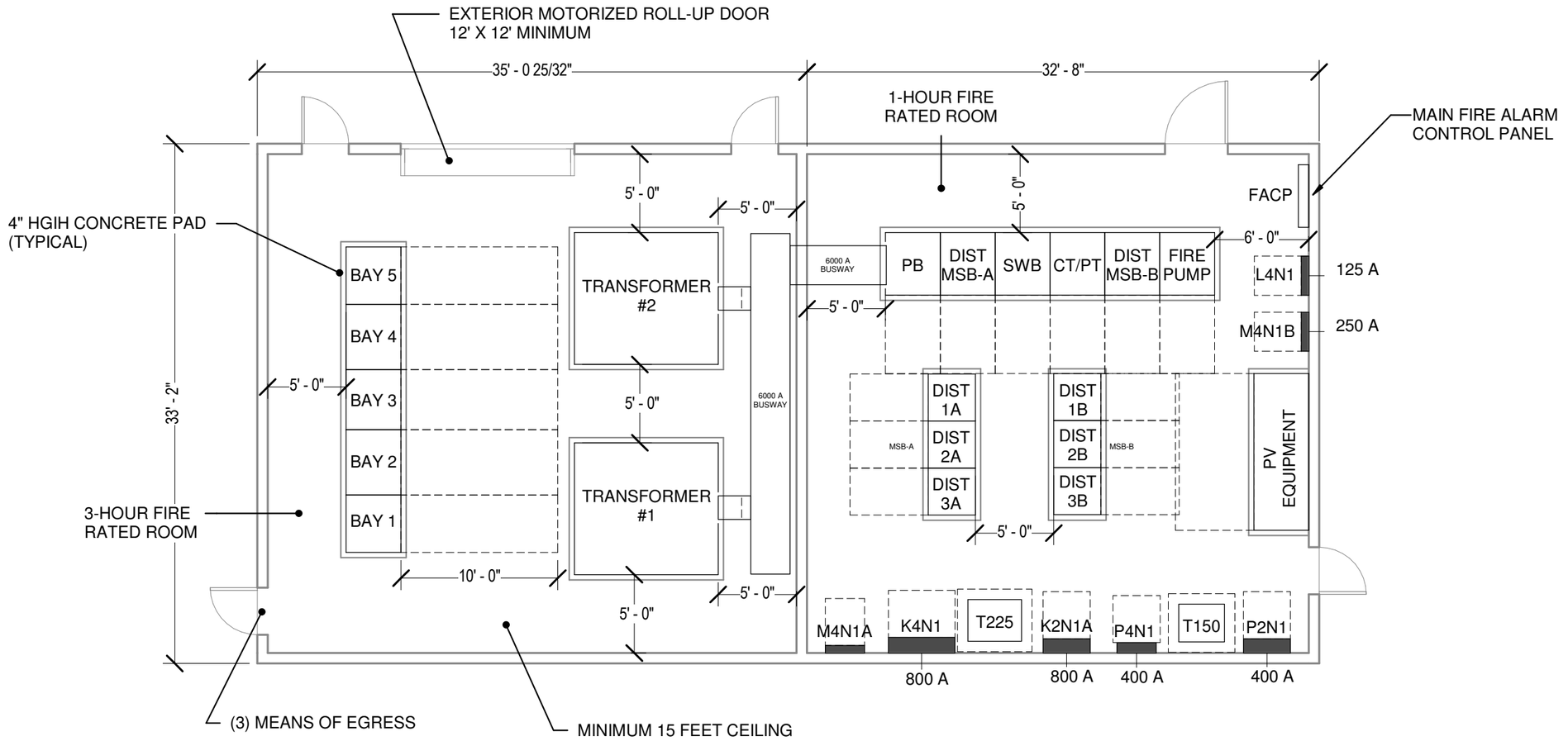
Mass Notification System

If desired, a mass notification system will be deployed to provide communications to the school population over the PA systems as well as remote communications methods such as text and e-mail, to provide messaging to parents and other external groups as desired. This platform can provide a broad spectrum of message transmission ranging from urgent emergency directives to routine notifications such as general event announcements or school closings due to weather.

In-Building Cellular DAS Systems

If deemed necessary and desired by the school, a cellular telephone distributed antenna system (DAS) will be designed to improve communications in areas of the structure that may have poor service. The areas requiring amplification will be determined through predictive analysis of the building once the final (or near final) design is complete and available as a CAD file that can be used by the predictive modeling software tool.

ATTACHMENTS



1 TRANSFORMER VAULT AND MAIN ELECTRICAL ROOM
1/8" = 1'-0"

PANELBOARD LABELING

D = DISTRIBUTION
M = MECHANICAL
L = LIGHTING
P = POWER / RECEPTACLE
K = KITCHEN
B = LAB / CLASSROOM
A= AUDIO
PV = PV SYSTEM

N = NORMAL
E = EMERGENCY
S = STAND-BY

D4N1A

PANEL DESIGNATION
(ON FLOOR)

FLOOR LEVEL LOCATION
1 = FIRST FLOOR
2 = SECOND FLOOR
3 = THIRD FLOOR
4 = FOURTH FLOOR

INDICATES VOLTAGE
2 = 208/120
4 = 480/277

Rist Frost Shumway Engineering, P.C.
NH: 71 Water St
Laconia, NH 03246
P: 603.524.4647
MA: 50 Milk St, 16th Floor
Boston, MA 02109
P: 617.494.1464
ME: 82 Hanover St, Suite 2
Portland, ME 04101
P: 207.761.4647
www.rfsengineering.com

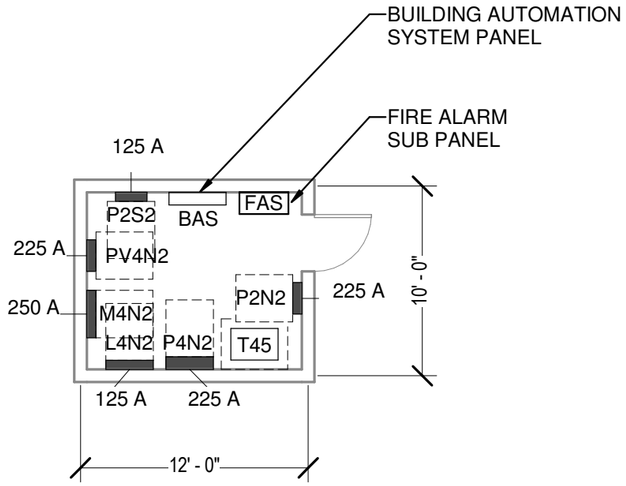
Tobin Montessori
Vassal Lane School

Cambridge, MA

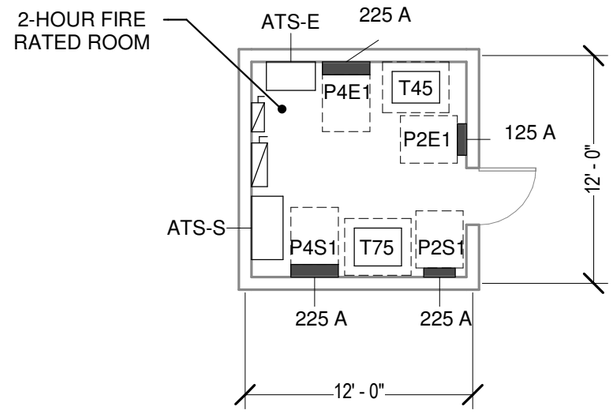
TRANSFORMER VAULT AND MAIN ELECTRICAL ROOM

Drawn By	AA
Checked By	PGW
Date	02/14/20
Project Number	8795.001
Scale	As indicated
Dwg. Reference	
Dwg.Number:	SKE1

2/13/2020 12:06:36 PM



1 TYPICAL SATELLITE ELECTRICAL ROOM
1/8" = 1'-0"



2 MAIN EMERGENCY ROOM
1/8" = 1'-0"

PANELBOARD LABELING

D = DISTRIBUTION
M = MECHANICAL
L = LIGHTING
P = POWER / RECEPTACLE
K = KITCHEN
B = LAB / CLASSROOM
A= AUDIO
PV = PV SYSTEM

N = NORMAL
E = EMERGENCY
S = STAND-BY

D4N1A

PANEL DESIGNATION
(ON FLOOR)

INDICATES VOLTAGE
2 = 208/120
4 = 480/277

FLOOR LEVEL LOCATION
1 = FIRST FLOOR
2 = SECOND FLOOR
3 = THIRD FLOOR
4 = FOURTH FLOOR

RFS engineering
Rist Frost Shumway Engineering, P.C.
NH: 71 Water St
Laconia, NH 03246
P: 603.524.4647
MA: 50 Milk St, 16th Floor
Boston, MA 02109
P: 617.494.1464
ME: 82 Hanover St, Suite 2
Portland, ME 04101
P: 207.761.4647
www.rfsengineering.com

Tobin Montessori
Vassal Lane School

Cambridge, MA

TYPICAL SATELLITE ELECTRICAL ROOM & MAIN EMERGENCY ROOM

Drawn By	AA
Checked By	PGW
Date	02/14/20
Project Number	8795.001
Scale	As indicated
Dwg. Reference	
Dwg.Number:	SKE2

2/14/2020 8:04:08 AM

Mechanical

Electrical

Plumbing

Fire Protection

Civil

Structural

Technology

Lighting

Sustainability

Commissioning

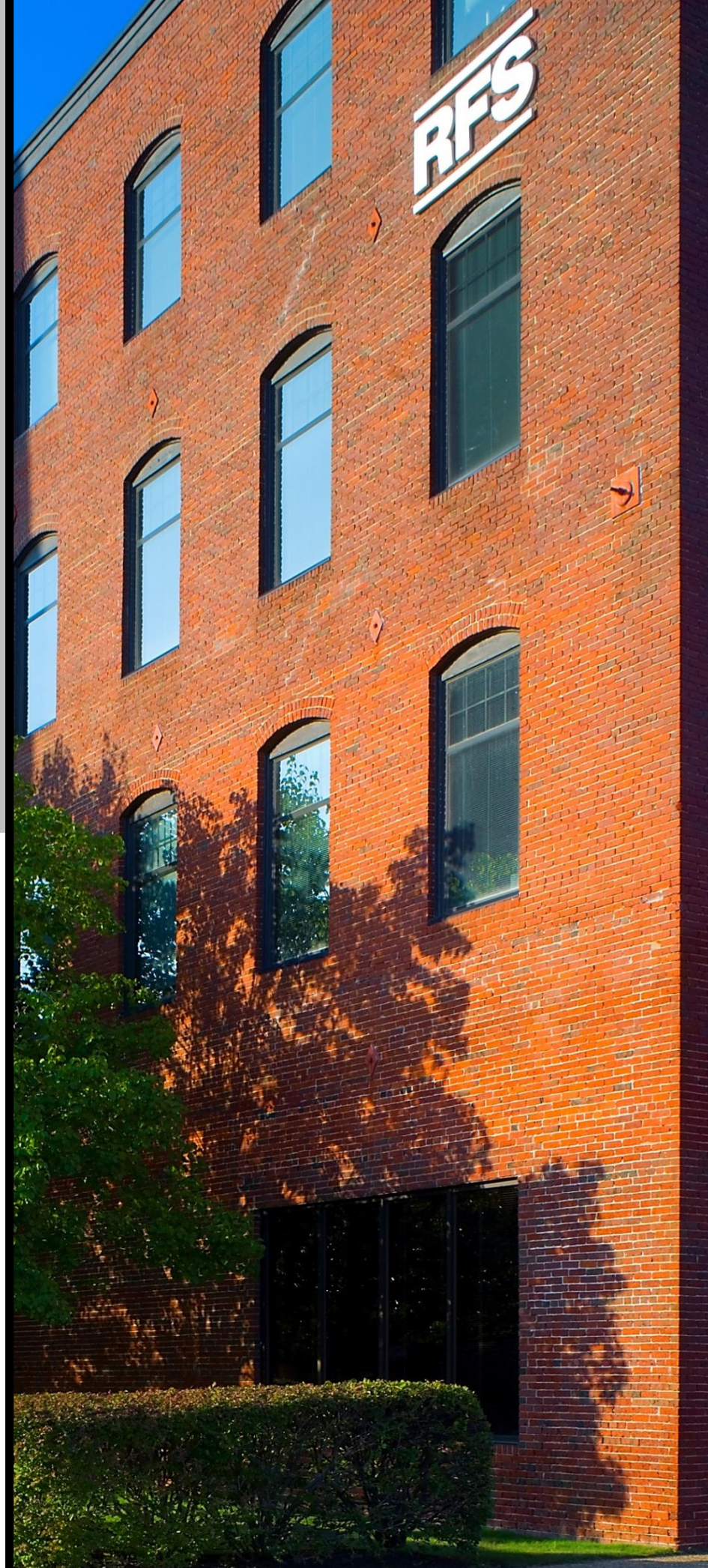
RFS engineering

Rist-Frost-Shumway Engineering, P.C.

71 Water Street
Laconia, NH 03246
603.524.4647

50 Milk Street, 16th Floor
Boston, MA 02109
617.494.1464

82 Hanover Street, Suite 2
Portland, ME 04101
207.761.4647



2.7 Food Service

Feasibility Study DRAFT section 4.6 - Food Service dated January 21, 2020

4.6 Food Service

The new kitchen facility shall include all the necessary components of a full service cooking kitchen to include: a receiving area to be used as a staging point for the breakdown and distribution of delivered goods. These goods shall be distributed to refrigerated rooms for storage of refrigerated and frozen ingredients. The size if the rooms shall be sized to accommodate the needs of the facility. In addition, dry goods storage room is planned for the keeping of canned, boxed, and other non-refrigerated food items.

Food preparation shall take place on stainless steel tables of various sizes and configurations. Tables may be fashioned with sinks, drawers, shelves, and overhead pot storage hook racks. Motorized food preparation equipment such as a food slicer, food cutter, and mixer shall be provided. Sizing of this equipment will be based on the scope of food preparation and tailored to fit the designed operation.

Cooking shall take place in a common location adjacent to both food storage and preparation.

Cooking equipment shall consist of standard pieces such as convection ovens, cooking kettles, braising pans, steamers, and combination oven/steamers. Adjustments shall be made to cooking equipment to suite the specific desired menu. The facility will include the necessary ware washing equipment to clean and sanitize pots, trays, and pans.

Serving will take place on two identical separate lines organized in a linear configuration, allowing for orderly and secure serving of food. These lines also include the necessary equipment needed to provide cold side offerings such as fruit and beverages. A separate salad bar will be the focal point of the serving area.

Other support facilities located in or adjacent to the kitchen will include a staff toilet for men and women, a dedicated kitchen slop sink area with enough space for the storage of mops, buckets and detergents. Typically grouped with this equipment are employee locker accommodations for the storage of personal items such as coats, handbags, or shoes.

Equipment typically required and specifically requested include:

- 20 quart mixer, automatic food slicer, and food processor
- A small blast chiller for preparing meals to be served at a later time and to quickly chill food through the danger zone. A blast chiller increases food safety as well as improves food quality.
- Two decks of combination ovens, a braising pan, and 40 gallon kettle
- A steamer, and combination oven/steamer
- Exhaust ventilation complete with a fire suppression system and variable speed drive system to be tied in to exhaust fans and building BM system.

This facility will target Net Zero energy building. As a result, the selection of the kitchen equipment is critical to achieving the Net Zero goal. Critical features will include:

- Limiting the exhaust hood length to be as short as possible, so as not to over design the cooking systems and supporting exhaust fans.
- The use of a variable speed exhaust fan control system will be used to reduce air exhaust volumes.
- Hot food wells will be fully insulated and limited to 800w units.
- Refrigerated rooms will utilize state or the art mechanical components utilizing variable speed motors and smart controllers to limit electricity use:
    - Smart Coil defrost systems
    - Variable speed motors (EC fan and condenser motors)
    - Increased R-values for walk-in wall panels
    - LED light fixtures
- Energy Star rated equipment will be utilized
- In addition to Energy Star, all electrical equipment will be evaluated on a total kilowatt-hours per day of consumption benchmark.
- Hot water consumption shall be limited.
- No fossil fuel combustion cooking. All cooking equipment will utilize electrical power.

Other work in the Kitchen shall include:

- Fabricated equipment other than catalog items.
- Plumbing trim consisting of mechanical system components required for standard operation of equipment items such as faucets and waste outlets. Vacuum breakers shall be furnished for equipment where water is introduced less than 2" above flood level.
- Electrical equipment forming an integral part of equipment items such as electric motors, heating elements, controls, switches, starters, temperature regulators and internal wiring to a control panel or switch, if mounted on the equipment.
- Finished floor and walls, structural supports for all ceiling supported equipment, acoustical ceilings and related building work as set forth in the Contract Documents.
- Connecting piping, waste lines, traps and vent piping, complete with shut-off valves to all the equipment, and the rough-in for sanitary waste, domestic water, floor drains and plumbing fixtures.
- Exhaust ventilating systems complete with blowers, ductwork, hangers, access panels, and insulation between the exhaust collars and the exhaust blowers:
- External wiring, the mounting and wiring of motor starters, solenoid valves, switches and receptacles not integral with the equipment, connecting conduit, and external connections to equipment to the building electrical distribution system:
- Flooring in walk-in cooler and freezer: Kitchen flooring must be carried over and installed into the walk-in cooler and freezer.

Fabricated Equipment - Stainless Steel

- Metals shall be free from defects impairing strength, durability or appearance, made of new materials with structural properties to withstand strains and stresses to which normally subject.
- Stainless steel shall be non-magnetic corrosion resistant chromium-nickel steel, Type 302 or 304 (18-8 Alloy), polished to a Number 4 finish where exposed.
- Counters, table tops and drainboards shall be 14 gauge stainless steel, of NSF construction, with edges per Item Specifications. Metal tops shall be made of the largest pieces available and shall appear as one piece with all field and shop joints reinforced and welded, ground and polished. Short pieces of metal will not be acceptable. Counter bends shall be not less than 1/8" radius. Wherever a fixture has a waste or drain outlet, the surface shall pitch toward the outlet.
- Counters, table tops and drainboards shall be reinforced with channel or angle frame as specified in the Item Specifications. Framing shall be secured to the underside with sound deadening material sandwiched between the surfaces, weld studs, and nuts.
- CASTERS: 5" diameter polyurethane tired, swivel, plate or stem mount to suit application, 300 pound capacity, brakes only if specified, NSF approved; Component Hardware C-21-3050 (plate/no brake), C21-3051 (plate/brake) C23-3350 (stem/no brake) or C23-3351 (stem/brake), or equal.
- DRAWER PULLS: Stainless steel, full grip type with beveled edge, NSF approved for stud mounting in device, in horizontal attitude to meet NSF requirements; Component Hardware P63-1012, or equal.
- DRAWER PANS: Molded plastic or fiberglass, 20" x 20" x 5" deep, NSF approved; Component Hardware S80-2020, or equal.
- DRAWER SLIDES: Stainless steel, NSF approved, full extension, 200 pound capacity with stainless steel ball bearing wheels; Component Hardware S-52 series, or equal.
    - Drawer assemblies shall consist of a removable drawer pan set in a removable 16 gauge stainless steel channel shaped drawer support frame with gusset plate reinforced corners.
    - Support frame shall have double pan front cover consisting of boxed 18 gauge stainless steel outer shell with welded corners, flush mounted recessed stainless steel pull, 20 gauge stainless steel back shell tack welded to outer shell with fiberglass sound deadening between. Drawer shall be provided with rubber bumpers to quiet closing. Support drawer frame on full extension drawer slides.
    - Drawer shall be suspended from table in a three-sided, 16 gauge stainless steel enclosure with flanged-in bottom edges, banded lower front, flanged-out front side and top edges. All sharp corners shall be broken and any exposed exterior threads of slide mounting bolts shall be provided with solid metal acorn nuts.
    - Provide each drawer with a cylinder lock with all drawers keyed alike.
    - Component Hardware S91-0020C with thermoplastic pan and cylinder lock is considered as equivalent to the above specified construction.
- FAUCET SETS, DECK MOUNTED: Chrome plated cast bronze with 1/2" IPS eccentric flanged female inlets on 8" centers, removable cartridges, lever handles, and aerator tip on swivel nozzle

or swivel gooseneck to suit the application; T&S Brass B-0221 or B-0321, or equal by Component Hardware, Chicago, or Fisher.

- FAUCET SETS, POTWASHING SINK: Chrome plated cast bronze with removable cartridges, 3/4" passages, eccentric flanged female inlets on 8" centers with LL street EL inlets with locknuts, four prong handles, 12" swing spout; T&S Brass B-290.
- FAUCET SETS, SPLASH MOUNTED: Chrome plated cast bronze with 1/2" IPS eccentric flanged female inlets on 8" centers, removable cartridges, lever handles, and aerator tip on 12" swing spout; T&S Brass, B-0231 or equal by Component Hardware, Chicago, or Fisher. Provide each with a mounting kit.
- GUSSETS: Stainless steel, stepped side, fully closed, NSF approved, mild steel interior reinforcement, wide flange for welding to framing, set screw anchor for leg; Component Hardware A20-0206C, or equal.
- LEG AND BULLET FOOT ASSEMBLIES: Stainless steel tubing, 16 gauge, number 4 finish, adjustable bullet foot with minimum of 3" vertical travel, 2,000 pound capacity, top designed for mounting in gusset, length to suit application; Component Hardware A46-6272-C, or equal.
- LEG AND FLANGED FOOT ASSEMBLIES: Stainless steel tubing, 16 gauge, number 4 finish, adjustable bullet foot with 3-1/2" diameter flange and two holes for securing to floor, minimum of 3" vertical travel, 2,000 pound capacity, top designed for mounting in gusset, length to suit application; Component Hardware A46-4272-C, or equal.
- NUTS: Zinc plated "Pal Nuts" with integral cap and lockwasher; Component Hardware Q-34-1024 or equal.
- SEALANT: Sealant for sealing equipment to walls or filling crevices between components. For interior adhesives and sealants applied within the weatherproof barrier, submit a printed statement of VOC content. All materials that are used in the building interior must not exceed the following requirements:
- GFCI RECEPTACLES: Pass & Seymour 2095W, 10kA SCCR, 20A/125VAC, White or equal

Plastic Laminate Materials

- The laminate facing shall be GP-50, .050" thick, general purpose, high pressure, decorative plastic laminate that meets or exceeds the requirements of NEMA Publication LD3-1985, and NSF Standard 35. The plastic laminate exposed surfaces shall be provided in accordance with the specified manufacturer, finish and color. Balancing sheet shall be backing grade GP-28 in matching color at semi-exposed and BK-20 unfinished where hidden.
- Plastic laminate covered surfaces shall be factory fabricated with 3/4" thick core having plastic laminate facing on both faces and all edges, laminated with waterproof glue under pressure in accordance with the plastic laminate manufacturer's specifications.
- The core shall be medium density phenolic resin particleboard conforming to ANSI A208.1, Type 2-M-2, 45 pound per cubic foot density minimum.
- Provide veneer core plywood or solid hardwood edge banding for doors and vertical dividers or panels where hardware is attached to casework.
- Hinges shall be articulated, spring loaded type equal to Grass 1200 or Stanley, with quantity adequate to support the door without deformation
- Sinks and Sink Inserts

- Unless otherwise specified, sinks including sink inserts built into tops of fixtures, shall be made of 14 gauge stainless steel with all vertical and horizontal corners rounded to a radius of approximately 3/4" with the intersections meeting in a spherical section. Sinks shall be integrally welded to fixture tops.
- Sinks with two or more compartments shall have full height, 1" thick double wall partitions consisting of two pieces of stainless steel back-to-back so fabricated that each compartment will be a deep bowl with coved corners. Partitions shall be welded in place to the bottom, front and back of the sink with smooth rounded coved corners. Top edges of the partitions shall be continuously welded. The front of the sinks shall consist of a stainless steel smooth, flush apron, same gauge as the sinks. Bottom and rear of partitions shall be closed. Sink dimensions contained in Item Specifications are inside dimensions.
- Sinks shall be provided with integral 14 gauge stainless steel drainboards when specified. Drainboards and sink basins shall be pitched toward waste outlets and shall be self draining. The underside of all sink basins shall sound deadened. Sink units shall be provided with an integral splash at walls. Provide the necessary holes for the mounting of faucet sets.

- Undershelves
  - Undershelf in an open type table shall be 16 gauge stainless steel unless otherwise noted. Edges shall be turned down 1-1/2" and in 1/2" at 45° with corners notched out to fit legs to which shelf shall be welded from underside. Line up all edges of shelf with centerline of legs. Reinforce underside with longitudinal 14 gauge channel on the centerline.

- Wall Brackets
  - Dish tables, sinks and counters with sinks shall be securely anchored 3" off the face of the wall unless specified otherwise. Brackets shall be "Z" shaped and fabricated of 3" wide, 14 gauge stainless steel. Brackets shall be secured in a vertical attitude to the rear of equipment backsplash with weld studs, and to the wall with appropriate fasteners.
  - Counters that are specified tight-to-wall shall be secured in a hidden manner with steel clips, and the wall/fixture joint shall be sealed.

- Wall Shelves
  - Wall shelves shall be fabricated of 16 gauge stainless steel, size per Item Specifications, with back and ends raised 1-1/2", front edges of ends angled back, all corners broken, and front turned down 1-1/2", and in 1/2" at 45°. Shelf corners shall be welded, ground and polished. Mount shelf 1" off face of wall with suitable fasteners on 14 gauge stainless steel flag brackets, 48" on center maximum. Flag brackets shall have a web angle of 30°, measured from horizontal.

Walk in Cooler and Freezer

- Installation - The walk-in refrigerated room shall be installed in a 7" deep ID recess (below finished floor). Recess depth allows 1" for use of leveling sand; 4" for the insulated floor panels; 2" for finished floor and setting bed that shall be carried in from the adjacent room and level to same. The finished floor and setting bed shall be furnished and installed by the General Contractor, and

shall have coved joints at all walls, turned up a minimum of 3". The unit shall be set level on a bed of clean, dry mason's sand. Shims are not acceptable for leveling material.

- Construction - All standard construction per the manufacturer, modified to meet the specific following points:
    - Walls to be 4" thick with CFC free urethane foam insulation, UL Class 1 rated and Factory Mutual listed meeting FM Approvals Standard 4880.
    - Cam type locking devices
    - 34" x 76" minimum door clearance
    - Polished hardware (hinges and latch to match)
    - Three hinges on doors (to include one Kason 1248 spring assist hinge per door)
    - Leveraged pull handle (mechanical advantage type, Kason 1236 or equal)
    - Quarter turn inside safety release lever handle mechanism (not screw type)
    - Prewired door sections with heater wires and light fixtures and switches
    - Kason 1806 LED light fixtures
    - Dial type thermometers at doors
    - Model 200 (with two sets of dry contacts) or Modularm 75LC 200 (with two sets of dry contacts) temperature and HACCP monitoring system at doors
    - NSF construction throughout with exception of buried floor panels
    - Interior and exterior faces of doors and exposed exterior wall panels shall be provided with aluminum diamond tread plate protective material to a height of 48" above finished floor.
- Minimum materials - Interior and exterior wall surfaces shall be clad with .038" pebble finished aluminum. The ceiling shall be finished in white polyester over 24 gauge galvanized steel. Interior buried floor shall be 14 gauge galvanized steel.
- Accessories - Freezer shall be provided with an electrically heated pressure relief port. Each door shall be provided with a heated vision panel, 14-1/2" x 23", constructed of three panels of tempered unbreakable glass, electrically heated, with sealed air spaces between. Provide matching trim strips and closure panels to adjoining surfaces, fabricated per details, made of largest pieces available to minimize number of joints, and installed in accordance with NSF Brochure 770202, Installation Manual for Walk-in Refrigerators and Freezers. Provide six total extra Kason 1806 LED light fixtures for mounting in the rooms and deliver to Electrical Contractor for field installation.
- Guarantee - The walk-in refrigerated room panels shall be guaranteed for a period of ten (10) years from the date of approved installation for defects in materials and workmanship when subjected to normal use and service; remainder of rooms for one year.

Mechanical Refrigeration System

- Furnish and install complete refrigeration systems for the walk-in refrigerated rooms in accordance with the plans. The systems shall include condensing units, evaporator coils, piping, all specified accessories, and those components required to provide complete and satisfactory systems in accordance with accepted refrigeration practice.

- The installation work shall be performed by a fully qualified refrigeration contractor employing a certified mechanic fully trained in the installation of commercial refrigeration systems. Submittal shall list the installing company and the qualified system installer.
- Piping - Furnish and install the interconnecting piping between the condensing units and their respective unit coolers. Piping shall be installed in a neat and workmanlike manner with adjustable hangers spaced at no more than ten foot intervals on horizontal runs; six foot intervals, vertical runs.
- Line sizes shall be in accordance with ASHRAE standards and best refrigeration practice to assure proper feed to evaporator, avoid excessive pressure drop, and prevent excessive amounts of lubricating oil from being trapped in any part of the system. Line sizing shall be such that it will protect the compressor from loss of lubrication at all times, prevent liquid refrigerant from entering the compressor during operating or idle time, and maintain a clean and dry system.
- Refrigeration piping shall be Type L, ACR grade, hard drawn seamless copper tubing, wrought type copper fittings, and silver soldered joints. Precharged lines are not acceptable.
- Furnish and install sleeves for refrigerant and evaporator drain piping wherever piping passes through a wall or ceiling. Sleeves shall be non-conductive gray plastic tubing, with interior dimension sized at least 1/4" larger than piping, and shall be neatly packed with brine putty after installation.
- Furnish and install condensate drain piping from the unit cooler to an open drain. Piping shall consist of not less than 7/8" Type L copper tubing, supported 36" on center maximum, in such a way that there will be 1" clearance between the wall and the tubing. Provide a union or slip fitting at the connection to the evaporator drain pan to allow easy disassembly for service and cleaning. Drain piping shall be pitched 4" to the foot and carried through the wall of the refrigerated area. It shall be trapped to prevent entry of warm air and insects to the refrigerated rooms and discharged to a floor drain with the code required air gap. The exposed drain piping shall be spray painted.
- Provide an electric drainline heater tape in the freezer, with a length equal to five wraps per foot of length of the drainline located within the freezer compartment. Wrap and secure in accordance with manufacturer's recommendations.
- Provide chrome plated escutcheon plates at all exposed points where piping penetrates the wall or ceilings.
- Insulation - Suction lines for refrigerated rooms having a temperature above freezing shall be covered with 3/4" wall thickness Armaflex insulation.
- Suction lines for refrigerated rooms having a temperature below freezing shall be covered with 1" wall thickness Armaflex insulation.
- The insulation shall be applied to these lines in accordance with manufacturer's recommendations, and as they are being installed so that insulation will not be split. All joints shall be completely sealed with overlapping, cemented material to prevent the formation of frost on the lines.
- Controls - Each evaporator shall be provided with a Smart-Vap II electronic control as manufactured by National Refrigeration. The time clock and heater contactor shall be removed from the condensing unit. No control wiring will be required from evaporator to the condensing unit.
- Refrigerant Testing - The entire system shall be pressure and leak tested at no less than 100 PSIG, cleaned and dehydrated by maintaining a vacuum of 50 microns or lower for a period of five hours.

The required operating charge of refrigerant and oil, if necessary, shall be added and the entire system tested for performance. Each system shall be clearly marked as to the type refrigerant required.

- Guarantee - The equipment shall be guaranteed to maintain the specified temperatures. All mechanical refrigeration equipment shall be mechanically guaranteed for a period of one year after date of acceptance by the Owner. The emergency service shall be provided free of charge, whenever necessary on a 24 hour, seven day-per-week basis during the guarantee period.
- Any leaks that occur during the first year of operation after acceptance by the Owner, shall be repaired and the necessary refrigerant added at no expense to the Owner.
- The year's service shall be provided by the installing company, and under no circumstances will the service policy be sublet to another refrigeration contractor. The name of the installer/service agency for the guarantee period shall be located at a prominent place on the condensing units.
- The condensing units shall be provided with an additional four year parts warranty to commence upon the completion of the aforementioned guarantee, bringing the total parts warranty to five years.
- Condensing Units - The condensing units shall consist of an EC energy saving motor with variable speed controller, compressor, refrigerant condenser, liquid receiver, compressor service valves, and a dual high-low pressure control. The units shall be as manufactured by National Refrigeration.
- The condensing units shall be outdoor type. The compressor shall be serviceable semi-hermetic or scroll type per schedule, and fitted with aluminum fin and copper tube condenser, suction service valve, discharge service valve, compressor contactor, high and low pressure controls, receiver with fusible plug, liquid shut-off valve and charging port, mounted fused disconnect switch, waterproof electrical control box, discharge line vibration eliminator, weather resistant enameled galvanized steel cabinet, access guard, liquid line assembly, suction line filter and vibration eliminator, crankcase heater, and 1-1/2" high raised steel base.
- Evaporator Coils - Each evaporator shall be provided with a Smart-Vap II electronic control as manufactured by National Refrigeration. The time clock and heater contactor shall be removed from the condensing unit. No control wiring will be required from evaporator to the condensing unit.
- The freezer coil shall be provided with an automatic electric defrost system consisting of one evaporator coil as indicated in the schedule. Evaporator shall be low profile type six fins per inch complete with EC energy saving fan motors. Coil shall be NSF and UL Listed.
- The cooler coil shall be provided with one evaporator coil as indicated in the schedule. Evaporator shall be low profile type six fins per inch complete with EC energy saving fan motors. Coil shall be NSF and UL Listed.
- Furnish and install 1/4" minimum diameter stainless steel threaded mounting rods for the hanging of the evaporator coils, with stainless steel washers and nuts on the interior ends, and reinforcing angle at the exterior top of the room. Plated steel running thread is not acceptable.

Sanitation Requirements and Execution

- Equipment specified herein shall be fabricated to conform to the "Food Service Equipment Standards" of the National Sanitation Foundation prepared by the Committee on Food Service

Standards, and published by the National Sanitation Foundation, Ann Arbor, Michigan. Any differences of opinion on sanitation shall be referred to the State Department of Health for a ruling.

- Equipment shall be installed in accordance with the manufacturer's instructions and the best practices of the food service industry, with careful attention to eliminating all cracks, crevices and concealed spaces in wet areas that would be difficult to clean or keep free of vermin and soil.

3.0 Attachments

3.1 Existing Conditions
- 3.1.1 Existing Conditions Assessment, Traverse Landscape Architects, dated May 2019
- 3.1.2 Existing Conditions Structural Report, Foley Buhl Roberts & Associates, dated March 2019
- 3.1.3 Hazardous Building Materials Visual Inspection, Fuss & O'Neill, dated May 2019
- 3.1.4 Hazardous Building Materials Opinion of Abatement Costs, Fuss & O'Neill, dated October 2019
- 3.1.5 Geotechnical Reports

3.2 Floor Plans

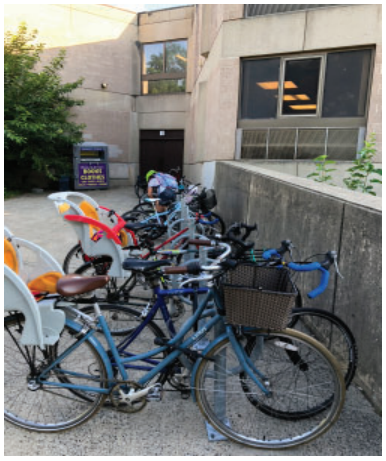
3.3 Stormwater Study

3.4 Building Fenestration Study and Envelope Analysis

TRAVERSE
landscape architects

May 2019

EXISTING CONDITIONS ASSESSMENT
Building: John M. Tobin Elementary School
Schools: Tobin Montessori School and Vassal Lane Upper School
197 Vassal Lane, Cambridge, MA 02138



A. Site Access and Circulation

The Tobin Montessori and the Vassal Middle School are combined in one building facility at 197 Vassal Lane in Cambridge. The site is located near Fresh Pond and Fresh Pond Parkway to the west and Concord Avenue to the north. There is a mix of residential and commercial properties surrounding the school property. The property includes the building, drop off loop, parking lot, two playgrounds, three ball fields and two basketball courts used by both the school and the community.

Main vehicular access is the drop off/pick up loop coming in and out of Vassal Lane at the front of the school. The staff parking lot is also accessed off of Vassal Lane which also includes access to the service area.

Pedestrians access the site from both Concord Avenue to the north and Vassal Lane to the south by way of sidewalks on both streets connecting to the neighborhoods to the north, east and south as well as Fresh Pond Parkway to the west.

Public transit includes bus routes and a stop along Concord Avenue.

Designated bike paths are located throughout the neighborhood and specifically the AlewifeT/Minuteman Bike Path rund along Vassal Lane in front of the school. Bike racks are located throughout the school and park site including several near the main entrance to the school.

B. Parking, Paving, Service and Emergency Access

Parking is located in the back of the school building. The school is registered to have 60 spaces. This includes 2 accessible spaces. There is also access to a service area on the north side of the building. The lot is over capacity during the school days with cars parked in unmarked spaces, along edges and along the access driveway.

Emergency access is along the front drop-off loop as well as the parking lot which leads to Callanan Park. Further emergency

access is along the bituminous path along the east property line.

C. Amenities

The project site has several noteworthy amenities including little league fields, basketball courts, playgrounds, walking paths, storage, drinking fountains, security fencing, landscaping, lighting, seating, receptacles and signage. The community uses the recreational amenities as well as the school.

There are several amenities that serve the little league fields and two plaques identifying the main field as well as honoring all the fields. These are documented to the right. Other amenities are in good functional condition and include the following:

- bleachers
- storage
- fencing and safety guard
- flag pole
- irrigation
- fenced dugouts with benches
- backstops
- maintained skinned infields and baselines
- litter receptacles
- bike racks

TRAVERSE
landscape architects

The overall park named Reverend Patrick H. Callanan Park is owned and maintained by the City of Cambridge. These items are functioning and in good condition and include the following:

- lighted path
- two basketball courts with benches and shade trees
- one picnic table
- tot lot with play equipment, seating and water play
- playground with play strucuture, pavement markings and hard court area
- benches
- stone seat blocks
- drinking fountain
- spot lights
- emergency call box

TRAVERSE
landscape architects

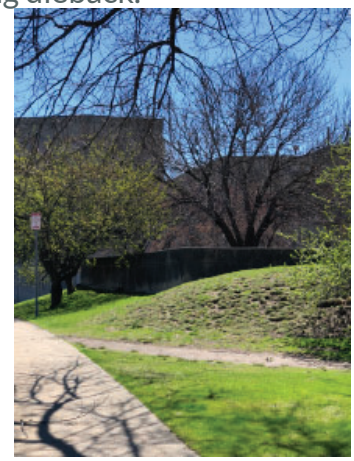
There are additional amenities along the Concord Avenue streetscape including bike racks, special paving, bus shelter, major crosswalk to Fern Ave, pedestrian safety islands, linkage to Danehy Park to the north, litter receptacles and generous sidewalks. These items are functioning and in good condition.

TRAVERSE
landscape architects

D. Landscape

There are a significant number of mature trees on the school and park property including Oak, Maple, Sycamore and Pine. Most of these significant trees are located along the perimeter of the property. There are younger species of Oak and Maple and Juniper around the playgrounds and improved park areas. There are a variety of ornamental trees of various sizes and ages located around the school.

Most of the vegetation has withstood excess compaction due to pavement and playground conditions and is not irrigated. There are a few trees showing more stress including the pines between the parking lot and the adjacent Armory property as well as some of the older ornamental trees surrounding the building. Additionally, some of the Maples around the basketball court are showing dieback.

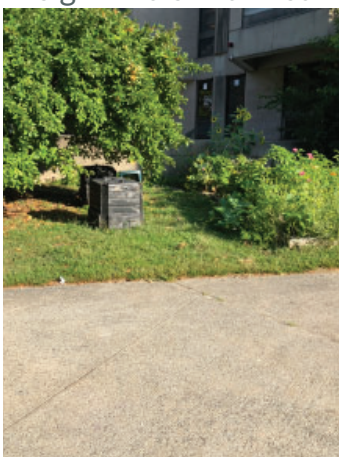


TRAVERSE
landscape architects

E. School Gardening and Outdoor Learning
The CitySprouts Program is a non-profit organization with a mission of advancing and promoting outdoor gardening and learning by supporting the students and the staff at the Pre-K through Grade 12 public schools in the City of Cambridge as well as the City of Boston.

CitySprouts provides teacher support to Tobin Montessori and Vassal Middle School teachers as well as run an after school club and summer programs. Tobin and Vassal share raised garden beds, storage shed and gardening equipment as well as provides teachers with specific lessons that support the academic goals of the classrooms.

The Tobin Montessori and Vassal Lane Upper School has several garden areas in the courtyards formed by the building's unique design of raised and sunken spaces.



TRAVERSE
landscape architects

F. Miscellaneous

The courtyards formed by the building design offer unique outdoor spaces that are enclosed by walls. They have been used in a variety of ways including outdoor play, murals, picnic tables and outdoor gardening and learning.

There is also a space created for parents away from the main school entrance which includes benches, planters and a painted rock garden.

Recently a commuter bike program has been installed along the school drop-off area.

There is a main entrance plaza off of the drop off loop which is a concrete sidewalk with a slope at the front doors that does not meet code for accessibility.

Foley Buhl Roberts & ASSOCIATES INC
structural engineers

2150 Washington Street
Newton MA 02462
T 617·527·9600
F 617·527·9606
offices in:
Newton MA
Manchester NH
Portland ME
Decatur GA
www.fbra.com

TOBIN MONTESSORI AND VASSAL LANE UPPER SCHOOL
Cambridge, Massachusetts

EXISTING CONDITIONS STRUCTURAL REPORT
March 29, 2019

INTRODUCTION

Foley Buhl Roberts & Associates, Inc. (FBRA) is collaborating with *Perkins Eastman (PE)* in the review and evaluation of the Tobin Montessori and Vassal Lane Upper School in Cambridge, Massachusetts. The purpose of this *Existing Conditions Structural Report* is to identify and describe the structural systems of the facility and to comment on the structural issues/conditions observed. General comments relating to potential renovations, alterations and additions to the building (governed by the Existing Building Code of Massachusetts (MEBC - 9th Edition)) are presented as well.

The Tobin Montessori and Vassal Lane Upper School is located at 197 Vassal Lane in Cambridge. The building was constructed in 1971 on a generally flat site. The site is bordered by residential neighborhoods to the south and east, the Callahan Park/Playground to the northeast, the Cambridge Armory (former National Guard Organizational Maintenance Shop) to the northwest, and by commercial buildings including a gas station to the west. The site includes the school building, courtyards, playgrounds, and the school parking lots. The building footprint is a "bow-tie" shape and consists of Units A, B, and C. Units A and C are symmetrical two-story classroom wings with their lowest level at the 2nd floor, above a crawl space. Unit B is at the middle of the "bow-tie" and is partly a three-story wing and partly a one-story wing, with its lowest level at the 1st floor, partially below grade. A partial 4th level in Unit B is unoccupied. Unit B includes the Gymnasium, Auditorium, Cafeteria, and Library. An additional crawl space (used for outdoor storage) is located beneath the Gymnasium. There have been no significant additions or renovations made to the original building.

The Tobin Building currently houses both the Tobin Montessori School for pre-K to 5th grade students and the Vassal Lane Upper School for 6th to 8th grade students. The building was not originally designed for the two separate school facilities but the school district reorganized its structure in 2012 resulting in a sharing of the space. The layout of the existing building is not compatible for the separate areas needed for the two schools.

The total building (floor) area is 135,600+/- SF.

The current enrollment is approximately 270 students in the Vassal Lane Upper School and 300 students in the Tobin Montessori School.

The building is a reinforced concrete structure with non-load-bearing ground-face masonry block exterior walls. The gymnasium roof is framed with open web steel joists. Exposed concrete columns and beams are common at both the building interior and exterior. The interior partition walls are typically concrete block (CMU) construction (running bond). The roofs are flat with a

built-up, ballasted EDPM membrane. The roof membrane is the original 1971 installation, with local repairs as needed throughout the years.

The location is the site of a former clay mining facility. After the mining activities ended, the clay pit was used as an uncontrolled waste pit (from the 1930's to the 1950's). As such, a sub-slab depressurization and venting system was installed in the 1990's to prevent migration of waste material and land-filled gas to the school building's indoor air. The school and neighboring Callahan Field are regulated under the Massachusetts Contingency Plan (MCP), and there is an Activity and Use Limitation (AUL) in place.

Structural conditions at the Tobin Montessori and Vassal Lane Upper School were reviewed at the site (where accessible and exposed) by FBRA on February 22, 2019.

The following documents were reviewed in the preparation of this Existing Conditions Structural Report:

> *John M. Tobin Elementary School - Cambridge, Massachusetts:* Architectural Drawings A1-A14, A21, prepared by Pietro Belluschi (Principal Architect) and Sasaki, Dawson, DeMay Associates, Inc. (Associate Architect) - Watertown, Massachusetts, dated October 25, 1968, Revised January 20, 1969.
>
> *John M. Tobin Elementary School - Cambridge, Massachusetts:* Structural Drawings S1-S17, prepared by LeMessurier Associates - Boston, Massachusetts, dated October 25, 1968, Revised January 20, 1969.

No exploratory demolition or structural materials testing was conducted in conjunction with this study**.** Soil borings were available from the original building (included in Attachment B of CDM Smith's Tobin School Phase 2 Comprehensive Data Report, dated July 17, 2018).

I. STRUCTURAL SYSTEMS DESCRIPTION

The existing building is a reinforced concrete structure with structural slabs and pile foundations. The structural slabs are supported by reinforced concrete columns and beams. The gymnasium roof is framed with open web steel joists.

Original Structural Drawings for this building were available for preparation of this report. The information presented below is based on the original Structural Drawings and conditions observed on site by FBRA.

Structural Materials: Structural concrete strengths are noted on the original Structural Drawings (S1) as the following:

Concrete:

Piles:	4,000 psi compressive strength
Columns, Beams, Slabs, and all Concrete Exposed to the Weather:	4000 psi compressive strength
Roof Fill:	2000 psi compressive strength
All Other Unless Noted Otherwise:	3000 psi compressive strength

Steel Reinforcing (deformed bars):

Column Vertical Bars, Beam Longitudinal Bars	60,000 psi yield strength
All Other Bars	40,000 psi yield strength

Welded Wire Fabric Reinforcing: ASTM A 185

Design Loads:

Design live load information was noted on the original Structural Drawings (S1), as listed below.

Roof (Snow):	30 psf (no provisions for snow drift)
Classrooms, Corridors (Including Partitions):	100 psf
Gymnasium, Auditorium, Kitchen:	100 psf
Mechanical Spaces:	150 psf
Transformer Room:	150 psf Min. (or Equipment Load)

Design wind load information was noted on the original Structural Drawings (S1), as listed below:

Wind:	
0 to 30’	20 psf
30’ to 50’	25 psf

Representative structural calculations generally confirm these design live loads. Floor design loads are appropriate and meet or exceed present Building Code requirements. The current, minimum flat roof snow load required by the 9th Edition of the Massachusetts State Building Code for a school building in Cambridge is 30.8 psf; typical (non-drift) roof areas most likely meet this requirement. Snow drifting areas require further review.

The building appears to have performed satisfactorily over time under the current use. There are no apparent indications of structural overstress or failure. A comprehensive investigation and evaluation of the floor and roof structural capacity is beyond the scope of this report. However, it should be noted that reinforced concrete structures constructed in the 1960’s and 1970’s were designed under codes which were more conservative than current codes.

With respect to lateral (wind and seismic) loads, the building was presumably designed for the wind loads noted above. The current wind load required by the 9th Edition of the Massachusetts State Building Code for a school building with Exposure Category C is 43 psf ultimate or 25.8 psf service load. The existing structure may meet this requirement. As the design and construction of this facility preceded the introduction of the Massachusetts State Building Code, it was not designed for seismic loads and would not meet current Code requirements in that regard.

Story Heights: Story heights are as follows:

First Floor to Second Floor:	10’-8”
Second Floor to Third Floor:	10’-8”
Third Floor to Fourth Floor / Low Roof:	10’-8”
Fourth Floor / Low Roof to Main Roof:	10’-8”
Main Roof to Penthouse Roof:	10’-8”

Expansion Joints: There is reference to a ½” expansion joint along Gridline H at the Third Floor of Unit B, at the roof of the locker rooms (see Section 3-4 on S15). This expansion joint does not appear to track down to the Second Floor of Unit B. Elsewhere, in lieu of expansion/contraction joints, 3’-0” wide shrinkage strips/bays (infilled after main concrete placement has been allowed to shrink), were specified. These occur at the east and west ends of Unit B, at each level.

Structural Bays/Spans: The structural bay sizes vary throughout the building. The classrooms are situated in a pseudo-honeycomb arrangement and therefore are not rectangular. At Units A and C the classroom bays are roughly 25' to 30' x 34'. Typically there are columns at both sides of the central corridor.

Penthouse Roof Construction (Unit B): Penthouse roof construction at Unit B (Elevation 72'-0") consists of an 8" flat slab spanning to 16" wide x 32" deep concrete perimeter beams. The beams are supported by hexagonal concrete columns.

Roof Construction (Unit B): Roof construction at the Gymnasium (Elevation 61'-4") consists of 3" deep, 20 gage metal roof deck, spanning to 48LJ16 open web steel joists. The steel joists are spaced at 9'-9" and the top chord slopes to achieve the 1/8"/ft roof pitch. Steel joists are supported by concrete beams 16" wide x 32" deep, spanning to hexagonal concrete columns.

Roof construction at the Auditorium (Elevation 61'-4") consists of a one-way 6" slab supported by 16" wide x 32" deep concrete roof beams spaced at 9'-9" on center. The roof beams are supported by concrete roof girders spanning to hexagonal concrete columns.

Additional main roof areas at Unit B (Elevation 61'-4") consist of 8" flat slabs spanning to 16" wide x 32" deep concrete beams, which are supported by hexagonal concrete columns.

Roof Construction (Units A and C): Roof construction at Units A and C classroom wings (Elevation 50'-8") is a flat slab, typically 8" thick, supported by concrete beams spanning between hexagonal concrete columns. The beams are typically 16" wide x 32" deep. There are trapezoidal shaped balconies cantilevered along the perimeter. Concrete fill is added at the roof to achieve the required pitch for roof drainage.

Above the stairway at Units A and C is a 6" Penthouse Roof slab (Elevation 61'-4") supported by concrete beams and hexagonal concrete columns.

Fourth Floor Roof Construction (Unit B): Typical Fourth Floor roof construction at Unit B (Elevation 50'-8") consists of an 8" thick, flat slab supported by 16" wide x 32" deep concrete beams spanning to hexagonal concrete columns. Along the perimeter are trapezoidal shaped balconies, cantilevered from the main slab.

Low Roof Construction (Unit B): Low roof construction at the locker rooms adjacent to the Gymnasium (Elevation 40'-0") consists of 6" concrete joists spaced at 3'-0" on center, with a 4" minimum concrete topping. At the east side of the Gymnasium where the joist span is 19'-6", the joists are 8" deep. At the south side of the Gymnasium where the joist span is roughly 33'-9", the joists are 12" deep. The joists frame into concrete beams supported by hexagonal concrete columns. The concrete topping thickness varies in order to achieve the required pitch for roof drainage.

Third Floor Construction (Unit B): Typical Third Floor construction at Unit B (Elevation 40'-0") consists of a 9" thick, flat slab supported by 16" wide x 32" deep concrete beams and hexagonal concrete columns. At the corridor the slab is reduced to 8" thickness. At the Science Laboratory the slab is increased to 13" thickness. At the Auditorium the slab is sloped to accommodate the tiered seating. At select locations along the perimeter are trapezoidal shaped balconies, cantilevered from the main slab.

Third Floor Construction (Units A and C): Typical Third Floor construction at Units A and C (Elevation 40'-0") consists of a 9" thick, flat slab supported by 16" wide x 32" deep concrete beams and hexagonal concrete columns. At the corridor the slab is reduced to 8" thickness.

There are trapezoidal sections of slab cantilevered along the perimeter at balcony locations. Concrete fill is added at the low roof areas to achieve the required pitch for roof drainage.

Second Floor Construction (Unit B): Typical Second Floor construction at Unit B (Elevation 29'-4") consists of an 8" thick, flat slab supported by hexagonal concrete columns and 16" wide x 32" deep concrete beams. The base reinforcement in both the north-south and east-west direction is #5 bars at 9" on center bottom and #5 bars at 16" on center top. Additional reinforcement is added at certain locations. The main entrance to the school occurs at this level at the south side of the building at Elevation 23'-10 ¼". There are ramps up and down from the main entry area to access the Second Floor slab at 29'-4" and the First Floor slab at Elevation 18'-8". There is an opening in the slab to allow for a double-height space at the Cafeteria. At two locations along the perimeter are trapezoidal shaped balconies, cantilevered from the main slab.

Second Floor Construction (Units A and C): Typical Second Floor construction at Units A and C (Elevation 29'-4", the lowest occupied level at these units) consists of a flat slab, 8" or 12" in thickness, supported by hexagonal concrete columns and piles. The base reinforcement is #5 continuous bars at 12" on center bottom each way. Additional reinforcement is added at certain locations. There are 16" wide concrete grade beams at the perimeter. Below this structural slab is a crawl space (roughly 6'-0" high) with a 2½" concrete mud mat at the floor above 4" of gravel.

First Floor Construction (Unit B): Typical First Floor construction at Unit B (Elevation 18'-8", the lowest occupied level) consists of an 8" thick, flat slab supported by piles. The base reinforcement in both the north-south and east-west direction is #5 bars at 9" on center bottom and #5 bars at 16" on center top. Additional reinforcement is added at certain locations. There are 16" wide concrete grade beams at the perimeter. At the northern portion of the Unit B first floor (below the Gymnasium slab) is a crawl space (used for outdoor storage; 6'-8"+/- height), with a concrete mud mat at the floor pitched to drain. At the southern portion of the Unit B first floor are two 'sunken gardens' or courtyards, separated from the higher adjacent grade with retaining walls supported by wood piles.

Exterior Wall Construction: Typical exterior wall construction is non-load bearing ground-face CMU block in between the cast-in-place concrete superstructure (beams and columns).

Interior Wall Construction: Interior walls are typically non-load bearing ground-face CMU.

Stair Construction: Stairs are cast-in-place concrete construction.

Subsurface Soils/Foundations: No information is given on the Structural Drawings for the subsurface soil conditions or pile capacities. The building is supported on concrete end bearing piles typically, with some wood friction piles at Unit B. A 'Pile Location Plan' is included with the Structural Drawings on sheet S2, in addition to the pile cap details. Columns and perimeter grade beams are supported on pile caps, and there are also intermediate, single-pile pile caps providing additional support for the lowest level slab.

Drainage: The existing Structural Drawings do include a typical detail for foundation and underslab drainage, and the underslab drainage is shown on the First Floor plan for Unit B.

Fire Resistance*:* The cast-in-place concrete structure has an inherent resistance to fire. The rating for the majority of the existing building would likely be over 1½ hours, given the structural slab thicknesses, concrete cover to reinforcing, etc. The unprotected steel joists at the Gymnasium roof have no fire resistance; however, the bottom of the steel roof joists is over 20 feet above the floor.

Lateral Load Resistance: As previously mentioned, the Structural Drawings note the design wind loads; presumably, the building was designed to resist these noted wind loads. While there is no explicit mention of shear walls or lateral frames on the Structural Drawings, it is implied that the overall concrete frame (beams and columns) was designed to resist the lateral wind load. The current Code design wind load is slightly higher than that noted on the Structural Drawings; hence, further analysis would be needed to determine whether the existing frame can meet current wind load requirements. As the design and construction of this facility preceded the introduction of the Massachusetts State Building Code, it was not designed for seismic loads and would not meet current Code requirements in that regard.

II. STRUCTURAL CONDITION/COMMENTS

Structural Conditions at the Tobin Montessori and Vassal Lane Upper School were reviewed (where accessible and exposed) on February 22, 2019. Generally speaking, floor and roof construction appear to be performing satisfactorily; there is no apparent evidence of structural distress that would indicate significantly overstressed, deteriorated or failed structural members.

Foundations appear to be performing adequately; there are no signs of significant total or differential settlements.

Where visible, floor and roof construction appear to have been constructed in accordance with the original Structural Drawings.

Structural/structurally related conditions observed during the February 22, 2019 site visit are noted below (Refer to photographs in the Appendix at the end of this report):

1. The condition of non-load bearing interior masonry corridor walls and partitions is generally satisfactory; minimal (shrinkage related) cracking was observed.

2. It appears that cementitious parging has been applied to structural concrete walls in some locations. Parging on the west wall of the Gymnasium in Unit B has debonded (See Photo 1). Cosmetic repair required.

3. Corroded reinforcing was observed in some locations on the building exterior, where bars were located too close to the exposed concrete surface. The expansion of the corroded reinforcing has resulted in local concrete spalling (see Photos 2, 3, 4 and 5). These conditions do not present an immediate structural concern; however, periodic monitoring is recommended to ensure that these areas remain stable. Any loose concrete should be removed.

4. Exterior, exposed concrete surfaces have deteriorated in a number of locations around the building (see Photos 6, 7 and 8). These conditions do not present an immediate structural concern; however, further review and monitoring is recommended.

5. Exterior (non-load bearing) masonry walls show signs of deterioration, efflorescence and discoloration at numerous areas around the building. Efflorescence is visible on interior wall surfaces at some locations as well. These conditions appear to be moisture related (absorption, wall/structure joint deficiencies, roof leaks, etc.). See Photos 9, 10, 11 and 12).

6. The outside face of exterior (non-load bearing) masonry walls has spalled in a number of locations at the upper levels of the building, and at base of the building, adjacent to

walkways. These conditions are due to the wetting of the masonry and freeze-thaw action. See Photos 13, 14, 15 and 16.

7. According to school maintenance personnel, wind-driven rains penetrate the exterior envelope in certain locations.

8. There is a significant roof leak in Unit B over the central (east-west) corridor (near the Library; Room 333). Water travels down through the entire building. There are also roof leaks in the Auditorium, the Gymnasium and elsewhere in the building. FBRA noted that the stone ballast on the roof was missing in a number of locations.

9. According to school maintenance personnel, there are no groundwater related issues at the lowest level floor slabs (note that the slabs in Units A and C are constructed over a crawl space). Underslab drainage was provided below the Unit B structural slab on grade. There are no moisture related issues with flooring.

10. The (minimal) expansion joint along Column Line H in Unit B does not appear to be functioning as intended at Column H-23 (See Photo 17). The details of this joint are not clear in the original documents; further review is recommended.

11. The entry stair on the south side of Unit C is showing signs of deterioration (See Photo 18).

12. Sidewalk construction has been damaged and displaced (likely due to frost heave) in some locations, resulting in a tripping hazard (See Photo 19).

13. Metal exterior doors have rusted at their base in a number of locations.

Note: Refer to the Architectural Report and those of the other consultants for additional information regarding the condition of the building envelope (exterior walls, roofing, windows, etc.), and recommendations for the repair, rehabilitation and/or replacement of these systems.

III. RENOVATIONS AND ADDITIONS - MEBC REQUIREMENTS

General comments relating to potential renovations, alterations, and additions to the Tobin Montessori and Vassal Lane Upper School are presented in this section. Renovations, alterations, repairs, and additions to existing buildings in Massachusetts are governed by the provisions of the Massachusetts State Building Code (MSBC; 780 CMR - 9th Edition) and the Existing Building Code of Massachusetts (EBCM; 780 CMR - 9th Edition, Chapter 34.00). These documents are based on amended versions of the *2015 International Building Code (IBC)* and the *2015 International Existing Building Code (IEBC)*, respectively.

Section 104.2.2.1 of the EBCM requires that the existing building be investigated and evaluated in sufficient detail as to ascertain the effects of the proposed work on the structural systems (both gravity load carrying elements and lateral force (wind and seismic) resisting elements).

The EBCM defines three (3) compliance methods for the repair, alteration, change of occupancy, addition, or relocation of an existing building. The method of compliance is chosen by the Design Team (based on the project scope and cost considerations) and cannot be combined with other methods.

The *Prescriptive Compliance Method* (IEBC Chapter 4) prescribes specific minimum requirements for construction related to additions, alterations, repairs, fire escapes, glass

replacement, change of occupancy, historic buildings, moved buildings, and accessibility. If the impact of the proposed alterations and additions to structural elements carrying gravity loads and lateral (wind and seismic) loads is minimal (less than 5% and 10%, respectively), structural/seismic reinforcing of an existing building is not required. Provided that not more than 50% of the spaces in the building are reconfigured, seismic hazards such as bracing the tops of interior masonry walls and partitions, anchorage of floor and roof diaphragms to the exterior walls, bracing of parapets and chimneys, etc. would not be required by code, but could be addressed on a voluntary basis. If the area of reconfigured spaces exceeds 50% of the gross floor area, these seismic hazards must be addressed to meet the provisions of the EBCM.

The *Work Area Compliance Method* (IEBC Chapters 5 through 13) is based on a proportional approach to compliance, where upgrades to an existing building are triggered by the type and extent of work. The Work Area Compliance Method includes requirements for three levels of alterations, in addition to requirements for repairs, changes in occupancy, additions, historic buildings, or moved buildings. A complete seismic evaluation of the existing building is required under the following conditions: Level 2 alterations where the demand (mass/seismic force) to capacity (lateral force resistance) ratio of lateral load resisting elements has been increased by more than 10%, all Level 3 alterations, a change in occupancy to a higher category (not applicable here), and where structurally attached additions (vertical or horizontal) are planned. Provided that not more than 50% of the spaces in the building are reconfigured, renovations would be classified as *Level 2*. Assuming that modifications to the existing masonry walls and the existing concrete frame (each providing a degree of lateral force resistance) will not be significant (i.e. less than 10% reduction in capacity), seismic upgrades or seismic strengthening of the building would not be required by code. However, seismic hazards such as bracing the tops of interior masonry walls and partitions, anchorage of floor and roof diaphragms to the exterior masonry walls, bracing of chimneys, etc. could be addressed on a voluntary basis. In a *Level 3* alteration (more than 50% of the building reconfigured), these seismic hazards must be addressed by code.

The *Performance Compliance Method* (IEBC Chapter 14) provides for evaluating a building based on fire safety, means of egress and general safety (19 parameters total). This method allows for the evaluation of the existing building to demonstrate that the altered building, while not complying with the code requirements for new construction, will maintain or improve the level of compliance that existed prior to the alterations. A structural investigation and analysis of the existing building is required to determine the adequacy of the structural systems for the proposed alteration, addition or change of occupancy. A report of the investigation and evaluation, along with proposed compliance alternatives, must be submitted to the code official for approval.

Additions - General Comments - EBCM

The design and construction of any addition to the Tobin Montessori and Vassal Lane Upper School would be conducted in accordance with the Code for new construction. New additions should be structurally separated from the existing, adjacent construction by an expansion (movement) joint to avoid an increase in gravity loads or lateral loads to existing structural elements.

Renovations/Alterations - General Comments - EBCM

Where proposed alterations to existing structural elements carrying gravity loads result in a stress increase of over 5%, the affected element will need to be reinforced or replaced (if necessary) to comply with the Code for new construction.

Proposed alterations to existing structural elements that are resisting lateral loads (which are not explicitly identified in the Structural Drawings) that result in an increase in the lateral force demand to capacity ratio of over 10% (due to a capacity reduction) should be avoided, if possible. Essentially, this means that removal of masonry walls resisting lateral forces (or creating large openings in these walls) and/or removing sections of the existing slab, beam, and column framing that may be providing lateral force resistance should be avoided; otherwise, seismic strengthening of the building, as well as additional seismic upgrades, may be triggered.

End of Existing Conditions Structural Report

APPENDIX – PHOTOGRAPHS

Photo 1: Debonded Parging

Photo 2: Corroded Reinforcing/Spalled Concrete Cover

Photo 3: Corroded Reinforcing/Spalled Concrete Cover

Photo 4: Corroded Reinforcing/Spalled Concrete Cover and Surface Deterioration

Photo 5: Corroded Reinforcing/Spalled Concrete Cover

Photo 6: Crack in Concrete Spandrel Beam

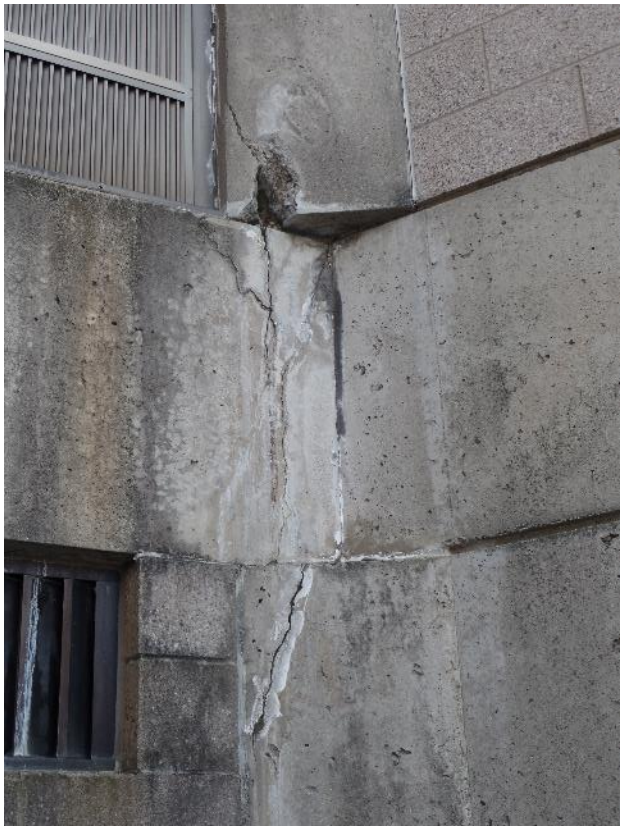


Photo 7: Corrosion/Spalled Concrete Cover and Cracking/Deterioration

Photo 8: Corrosion/Spalled Concrete Cover and Cracking/Deterioration

Photo 9: Exterior Masonry Wall - Moisture Damage

Photo10: Efflorescence on Interior Face of Exterior Wall

Photo 11: Exterior Masonry Wall - Moisture Damage

Photo 12: Exterior Masonry Wall -Moisture Damage

Photo 13: Exterior Masonry Wall - Surficial Damage at Walkway

Photo 14: Exterior Masonry Wall - Surficial Damage

Photo 15: Exterior Masonry Wall - Surficial Damage

Photo 16: Exterior Masonry Wall - Surficial Damage

Photo 17: Expansion Joint South of the Gymnasium

Photo 18: Unit C South Entry Stair

Photo 19: Cracked/Frost-Heaved Sidewalk

DRAFT PREFERRED ALTERNATIVE STORMWATER STUDY DIAGRAM 2/13/2020

TOTAL REQUIRED PHOSPHORUS REDUCTION = 4.5 lbs P/yr

-If Green Roof is used for 1/2 roof, 3.67 lbs P/yr

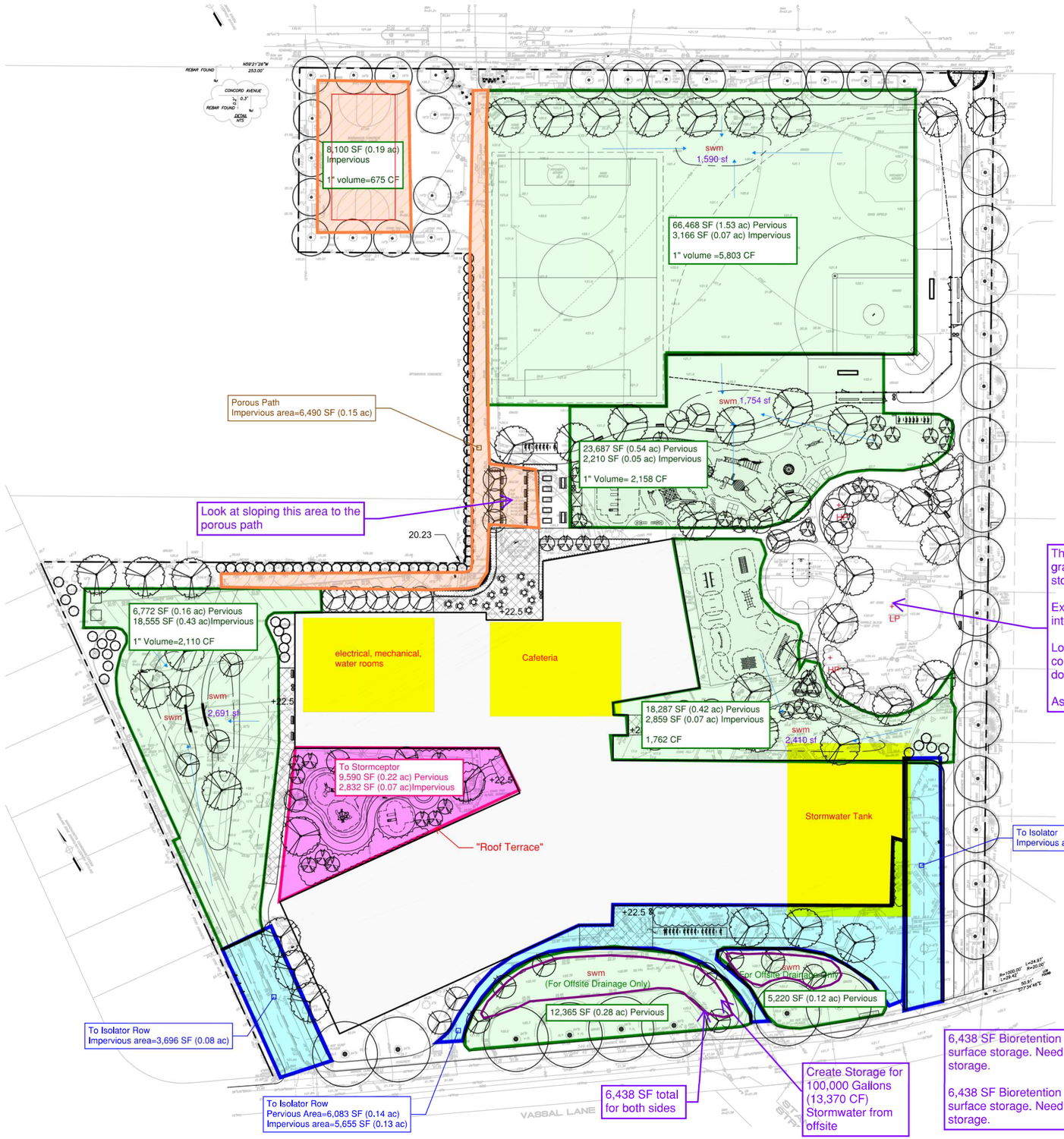
BIORETENTION
Impervious= 0.81 ac
Pervious= 3.05 ac

POROUR PAVEMENT
Impervious= 0.15 ac
Pervious= 0 ac

ISOLATOR ROW
Impervious= 0.20 ac
Pervious= 0.14 ac

STORMCEPTOR
Impervious= 0.07 ac
Pervious= 0.22 ac

Removes 2.75 lbs P/yr



BUILDING FENESTRATION STUDY

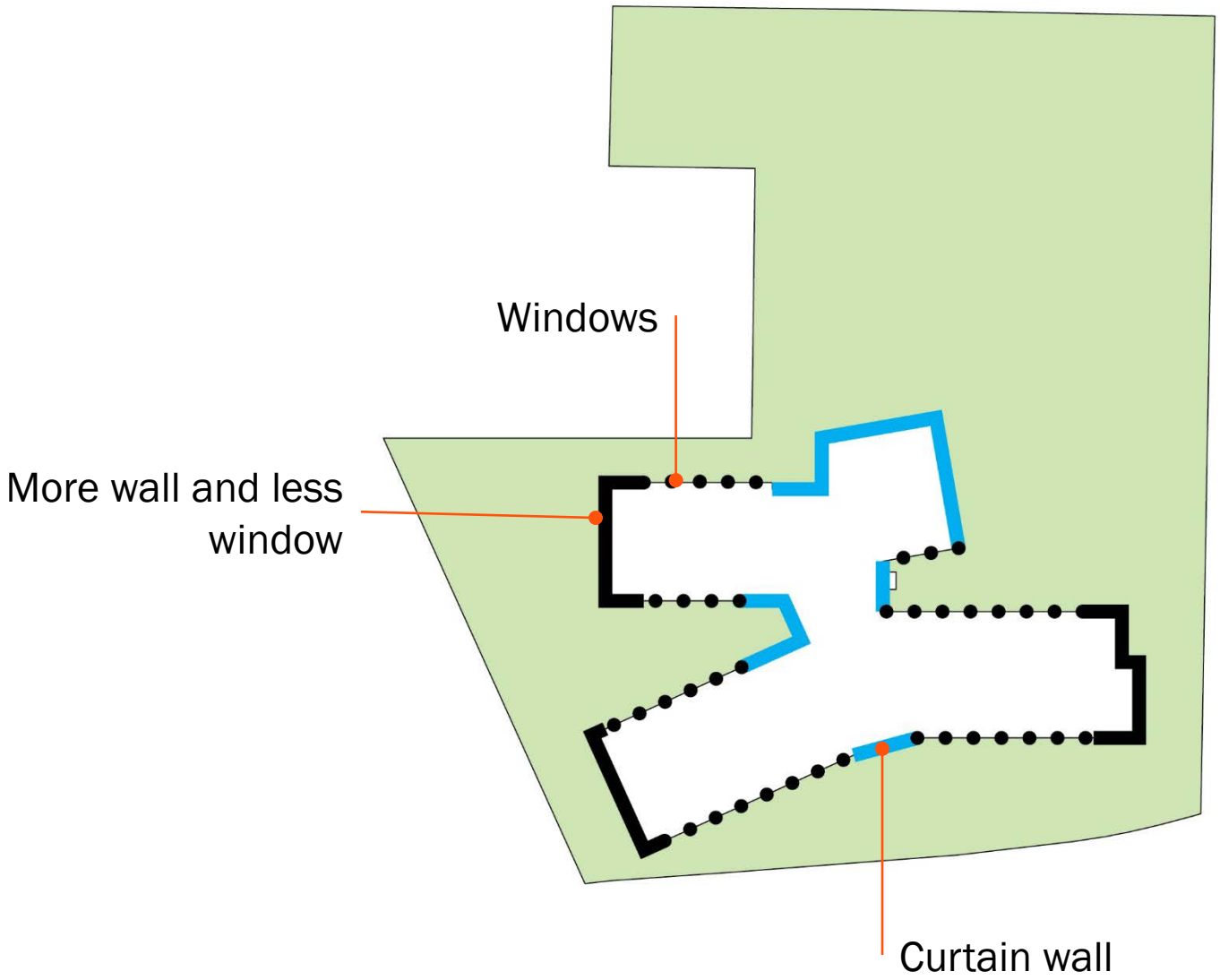
FOR INITIAL ENERGY MODELING

General Notes:

1. These diagrams are for defining scope, energy performance, and cost analysis.

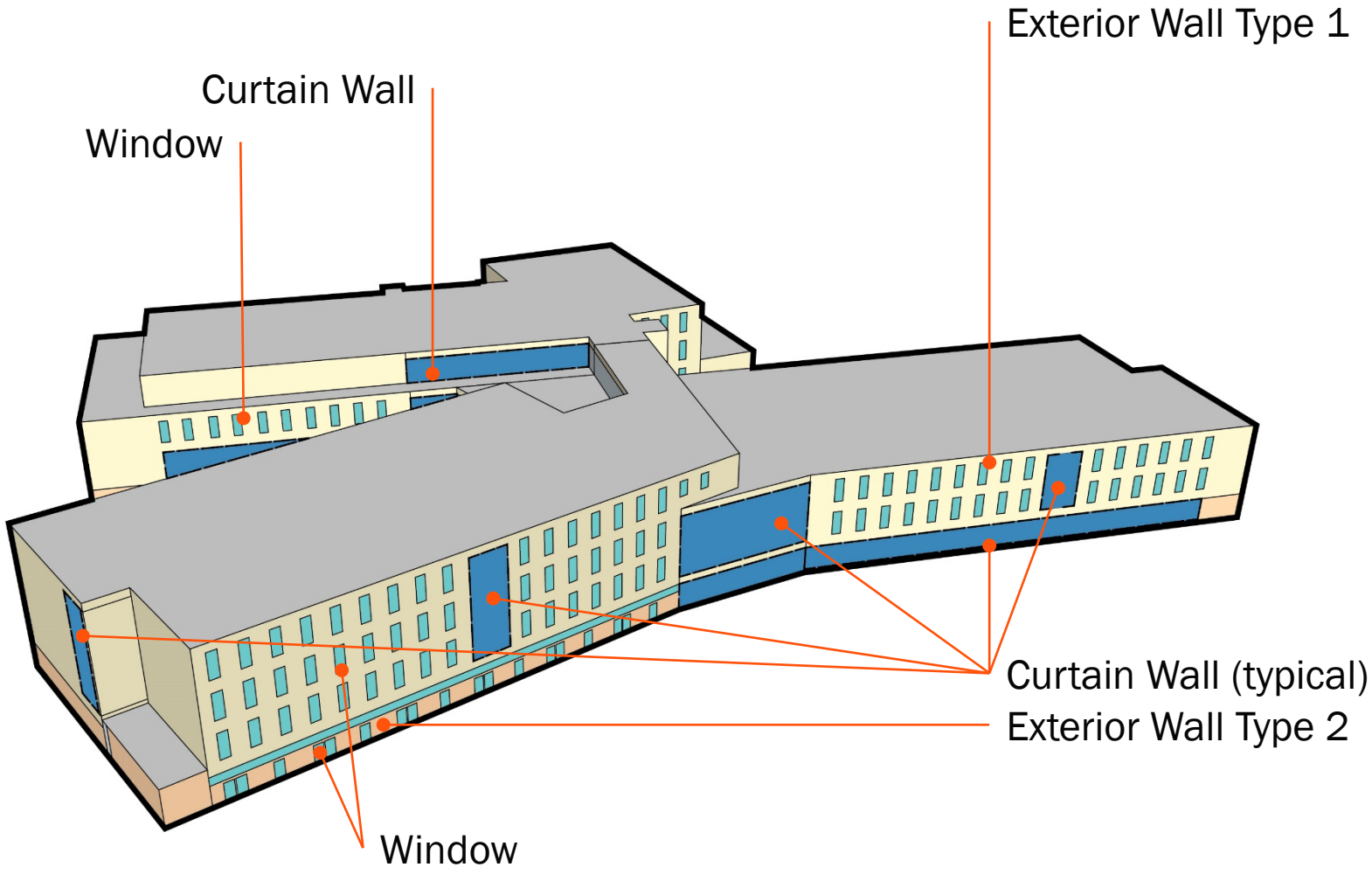
2. The content presented here is not a design. The diagrams that follow are offered as point of information to establish a basis for potential apportionment of fenestration (windows and curtain wall, versus opaque walls.

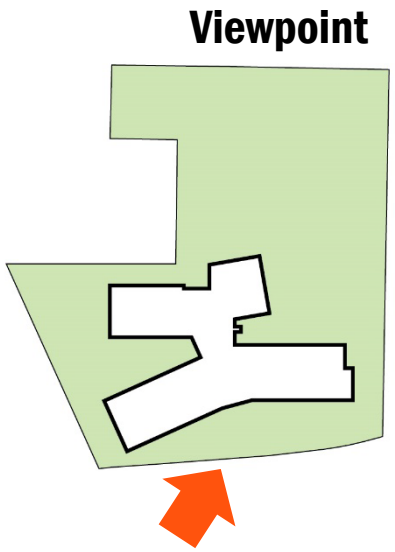
3. Refer to the architectural narrative that accompany these diagrams for additional scope information.



ENVELOPE ANALYSIS

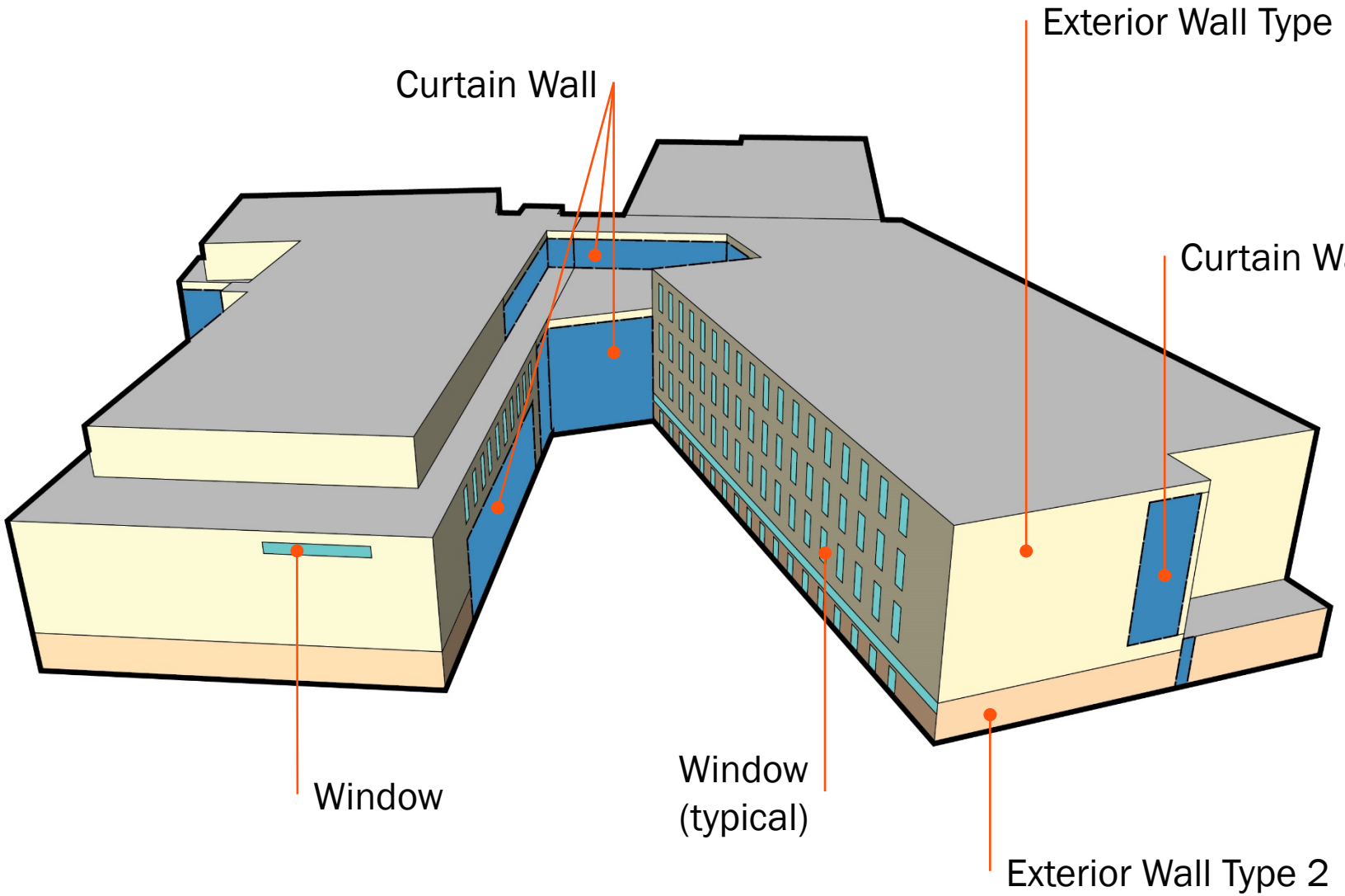
SOUTH FACING

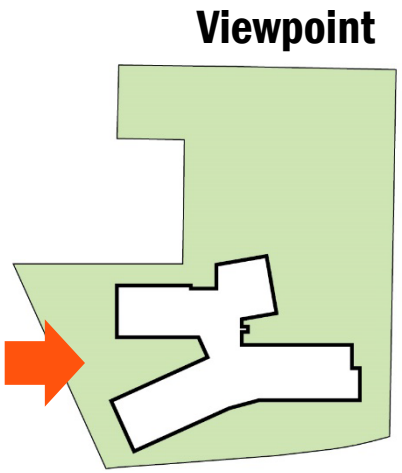




ENVELOPE ANALYSIS

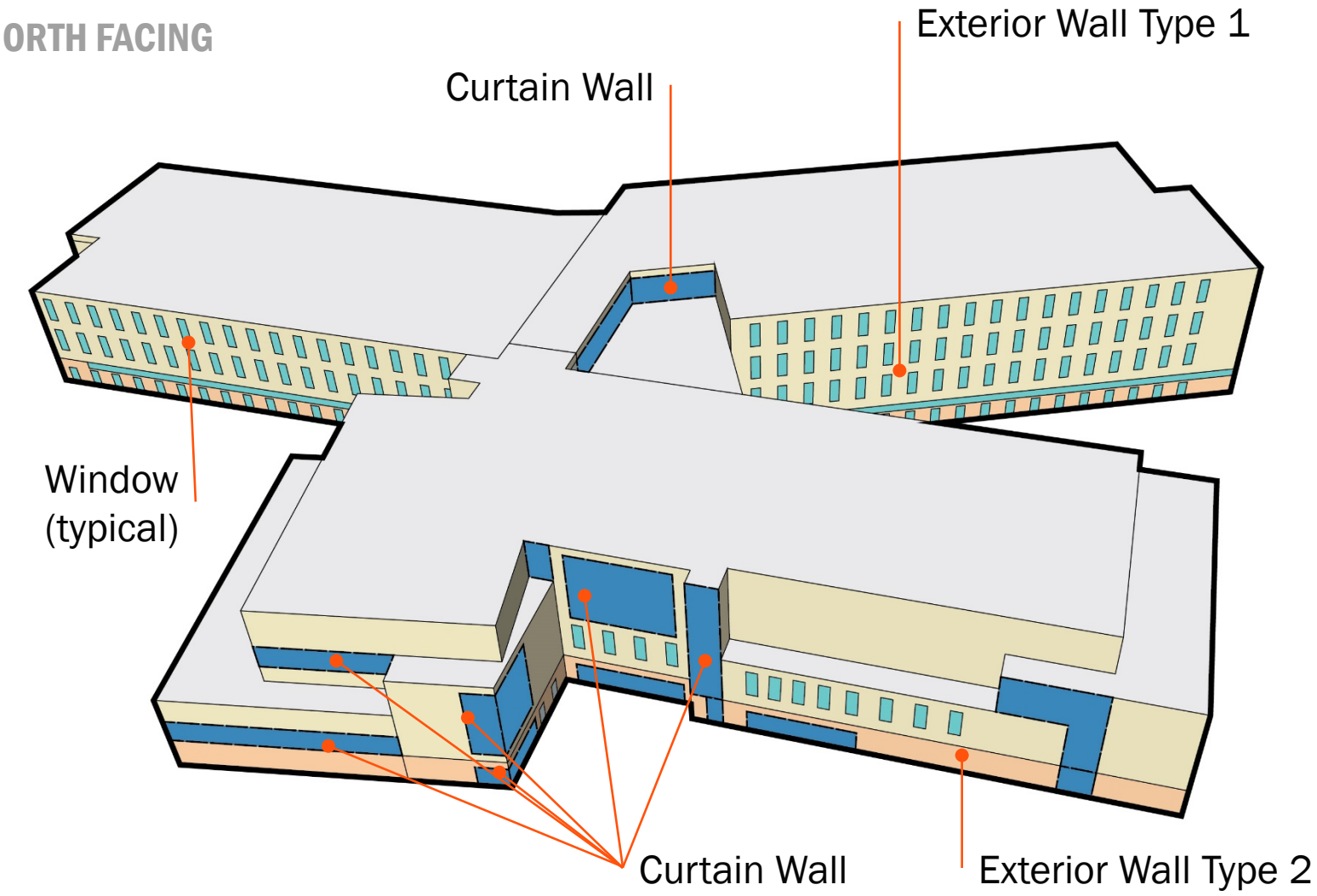
WEST FACING



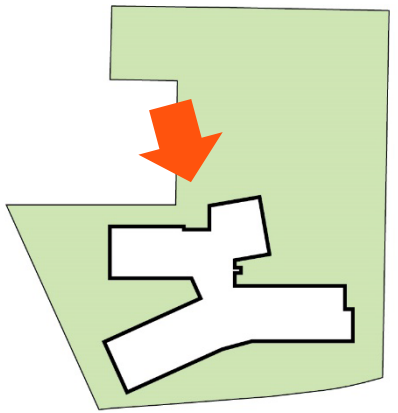


ENVELOPE ANALYSIS

NORTH FACING

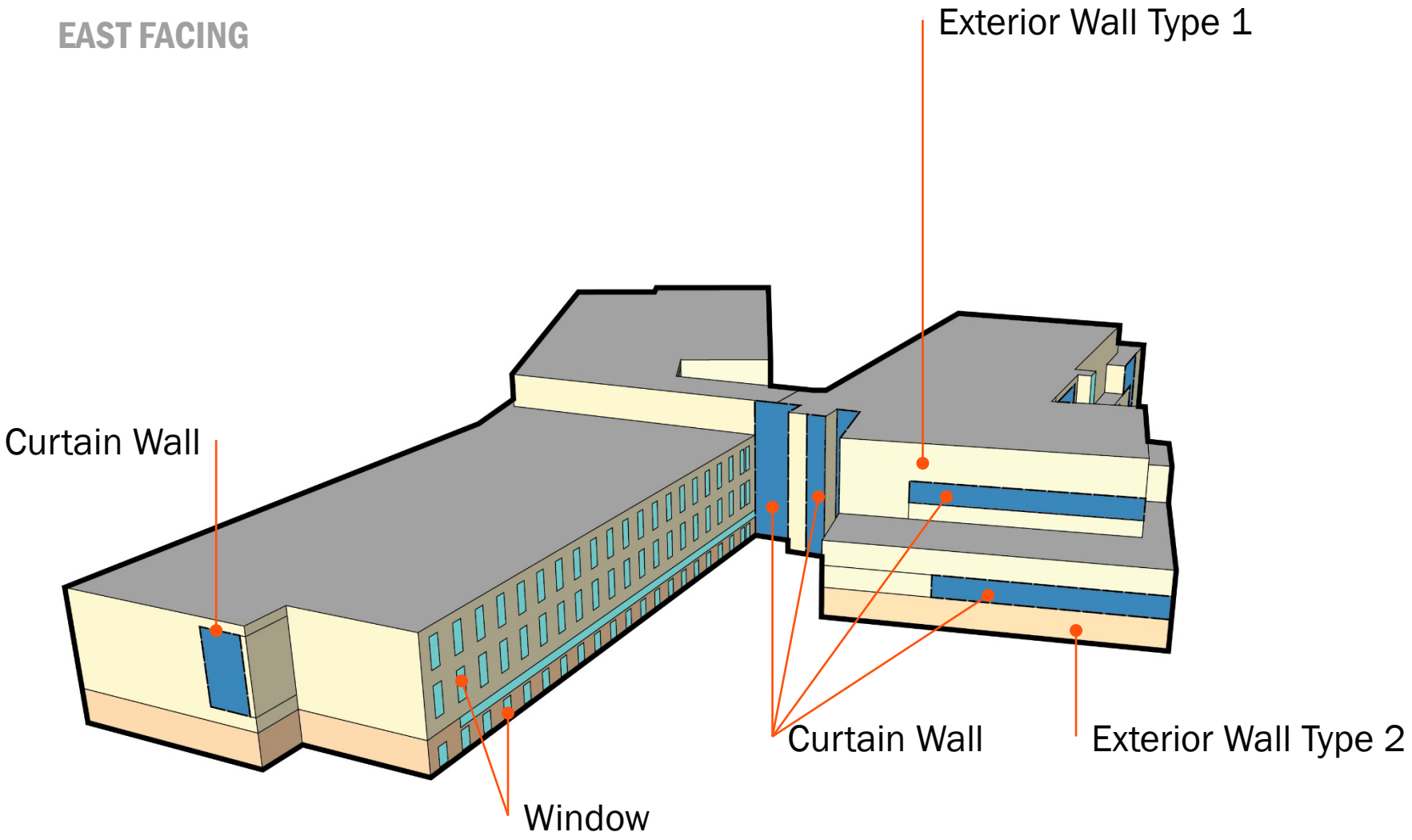


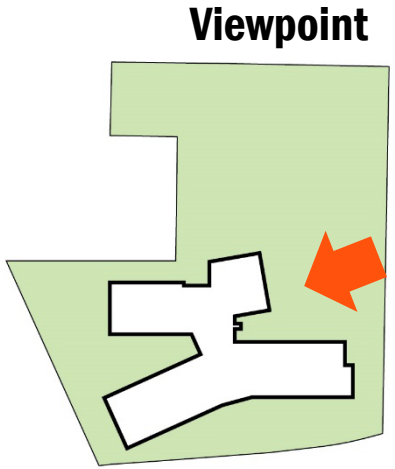
Viewpoint



ENVELOPE ANALYSIS

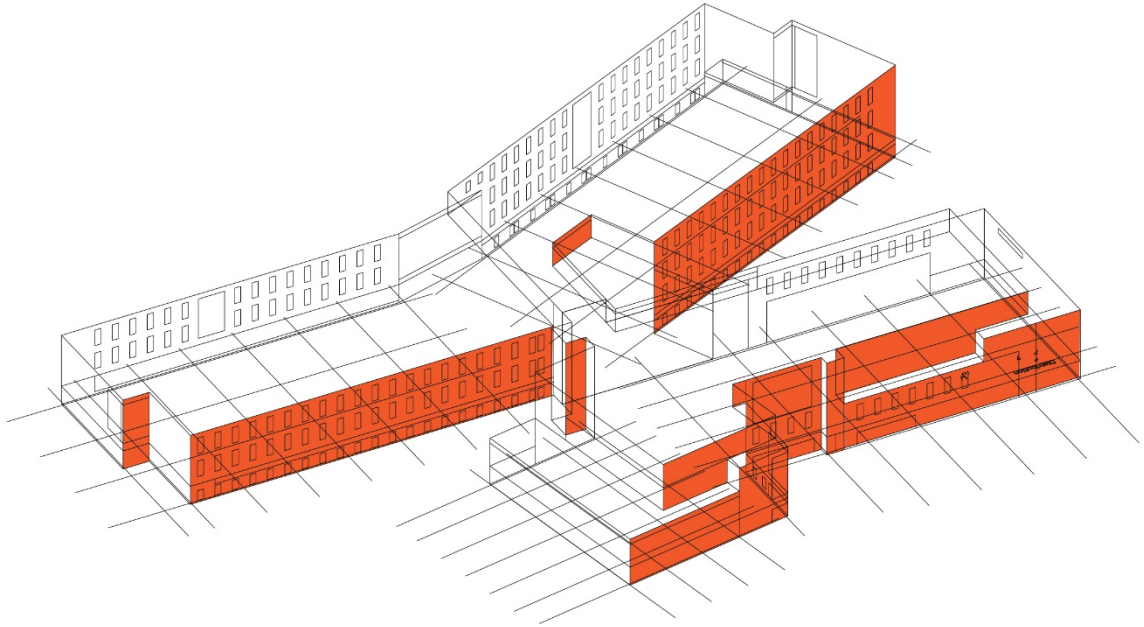
EAST FACING



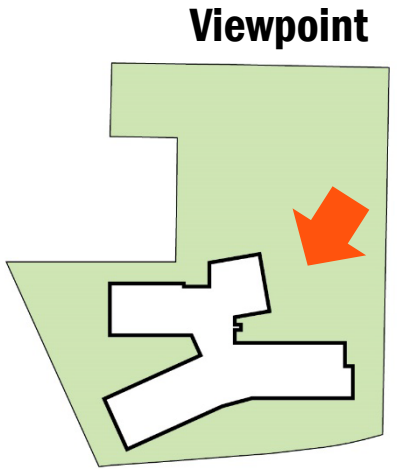


WINDOW/WALL RATIO ANALYSIS

NORTH FACING

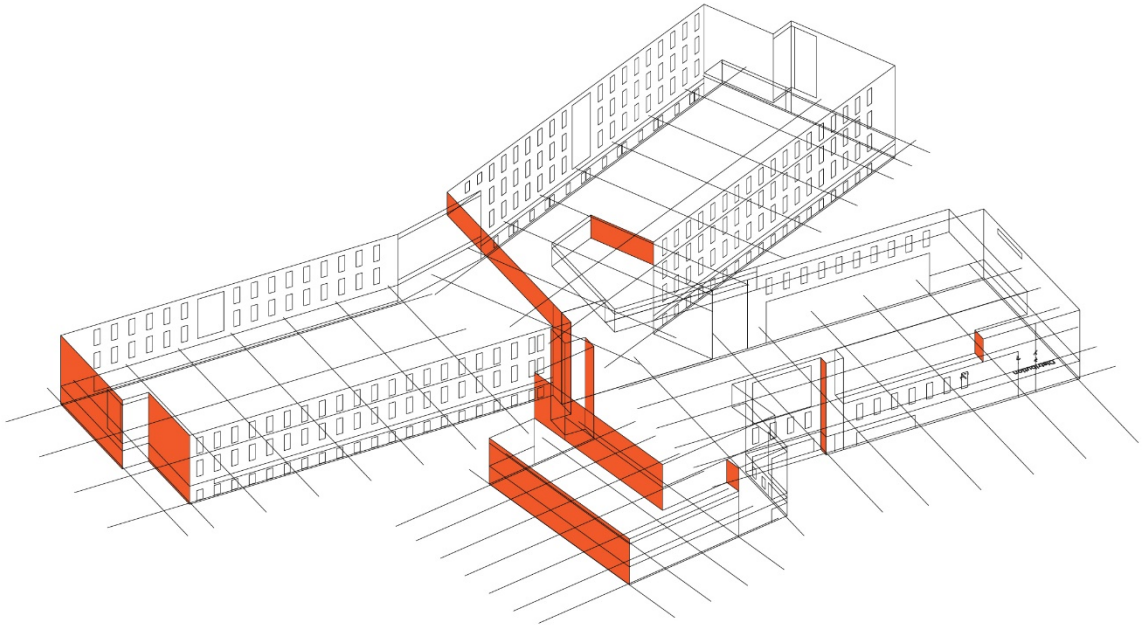


36,800 sf	Envelope surface area
9,830 sf	Estimated window area
7%	Window to Wall “ratio”

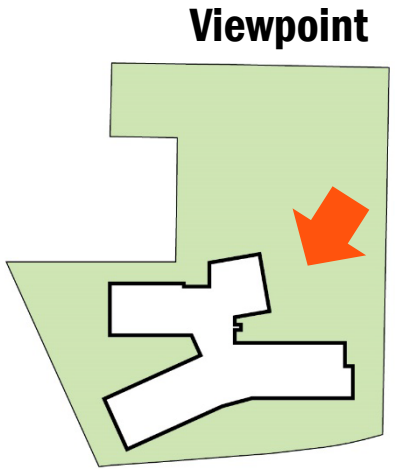


WINDOW/WALL RATIO ANALYSIS

EAST FACING

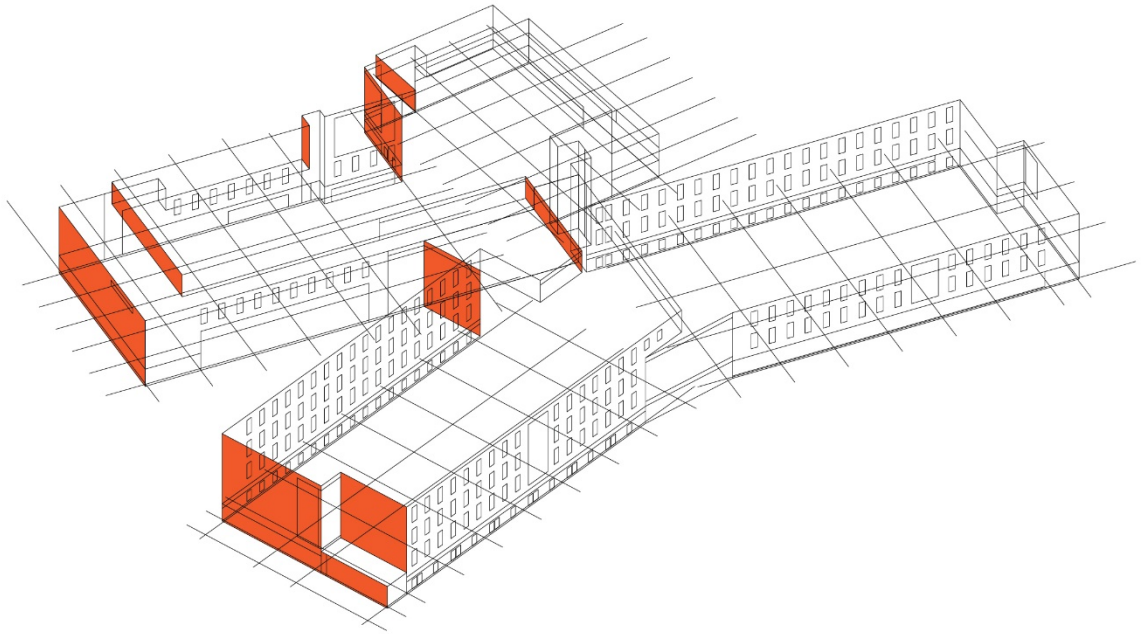


15,960 sf	Envelope surface area
3,610 sf	Estimated window area
23%	Window to Wall “ratio”

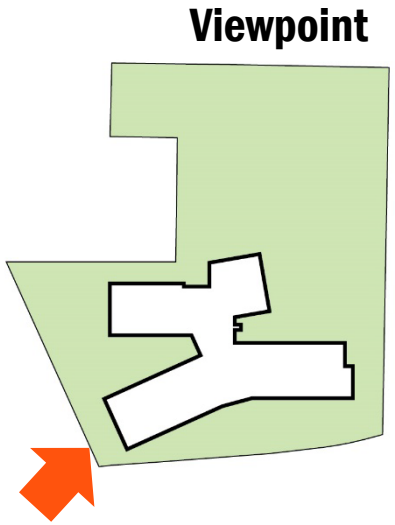


WINDOW/WALL RATIO ANALYSIS

WEST FACING

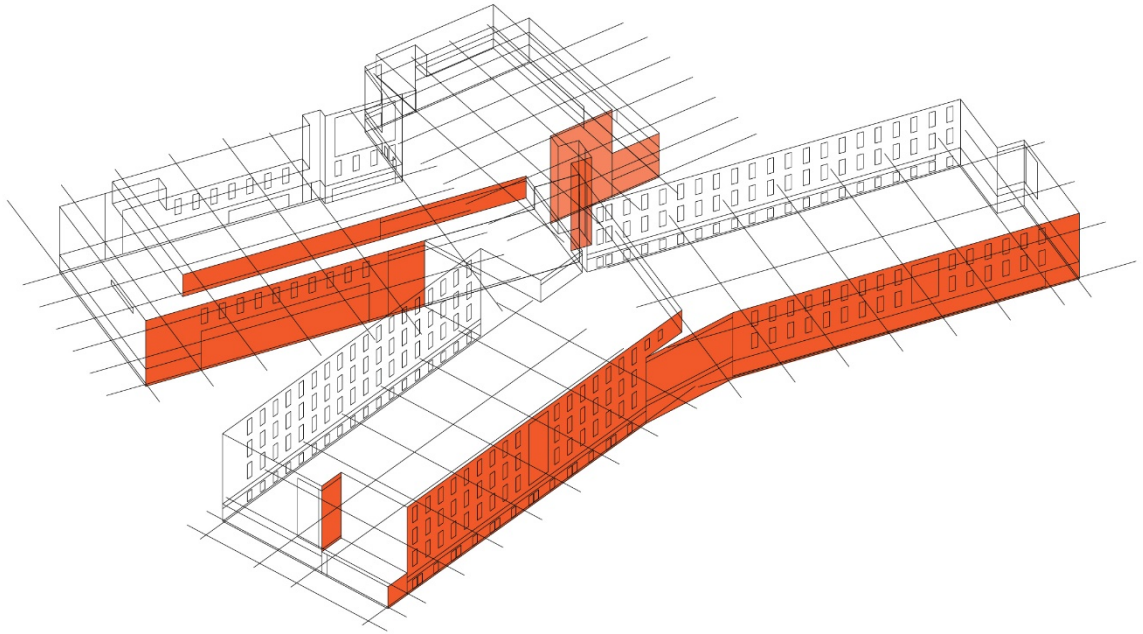


16,790 sf	Envelope surface area
3,560 sf	Estimated window area
21%	Window to Wall “ratio”

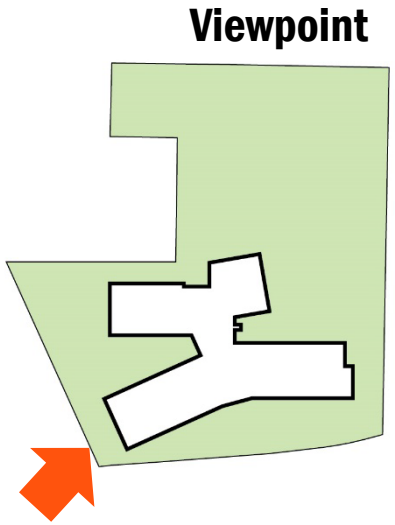


WINDOW/WALL RATIO ANALYSIS

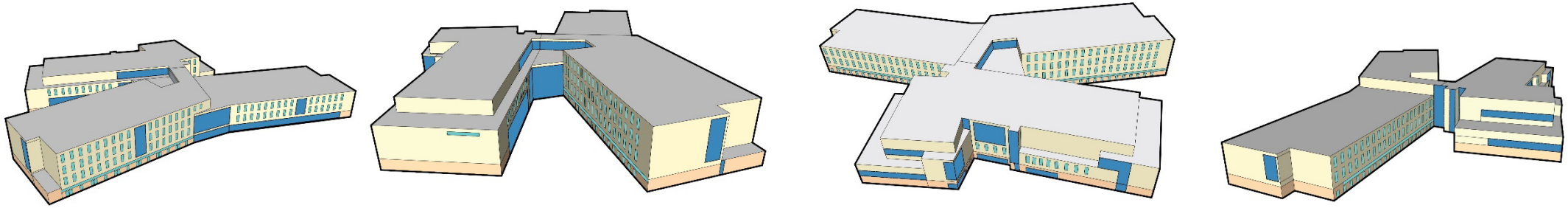
SOUTH FACING



22,100 sf	Envelope surface area
8,230 sf	Estimated window area
37%	Window to Wall “ratio”

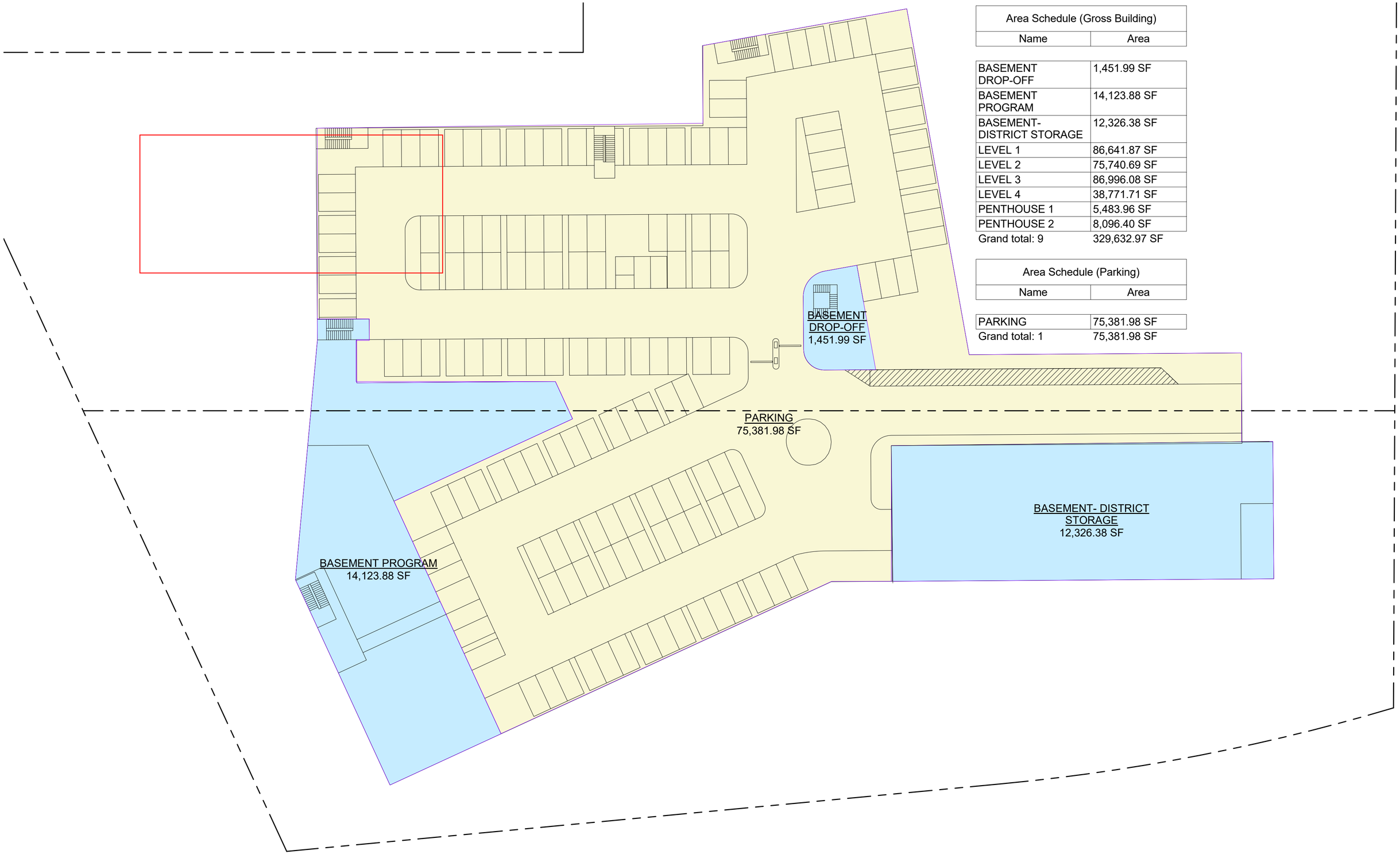


SUMMARY



	Totals:
104,460 sf	Envelope surface area
29,950 sf	Estimated Fenestration area
29%	“Window to Wall Ratio”

	Totals by Type (est):
61,420 sf	Exterior Wall Type 1
13,090 sf	Exterior Wall Type 2
29,950 sf	Fenestration Area
104,460 sf	Total Wall + Fenestration Area
29%	Window to Wall “ratio”



Area Schedule (Gross Building)	
Name	Area
BASEMENT DROP-OFF	1,451.99 SF
BASEMENT PROGRAM	14,123.88 SF
BASEMENT- DISTRICT STORAGE	12,326.38 SF
LEVEL 1	86,641.87 SF
LEVEL 2	75,740.69 SF
LEVEL 3	86,996.08 SF
LEVEL 4	38,771.71 SF
PENTHOUSE 1	5,483.96 SF
PENTHOUSE 2	8,096.40 SF
Grand total: 9	329,632.97 SF

Area Schedule (Parking)	
Name	Area
PARKING	75,381.98 SF
Grand total: 1	75,381.98 SF

1 BASEMENT

1" = 30'-0"

Gross Area Basement

PERKINS EASTMAN
20 Ashburton Place, Floor 8
Boston, MA 02108
T. +1 617 449 4000
F. +1 617 449 4049

Tobin Montessori and Vassal Lane Upper School

197 Vassal Lane
Cambridge, MA 02138

SCALE: 1" = 30'-0"

PRINTED ON: 3/3/2020 9:28:56 AM

Project Issue Date

A12

1 LEVEL 1
1" = 30'-0"

Gross Area Level 1

PERKINS EASTMAN
20 Ashburton Place, Floor 8
Boston, MA 02108
T. +1 617 449 4000
F. +1 617 449 4049

Tobin Montessori and Vassal Lane Upper School
197 Vassal Lane
Cambridge, MA 02138

SCALE: 1" = 30'-0"
PRINTED ON: 3/3/2020 9:28:57 AM
Project Issue Date

A13

1 LEVEL 2
1" = 30'-0"

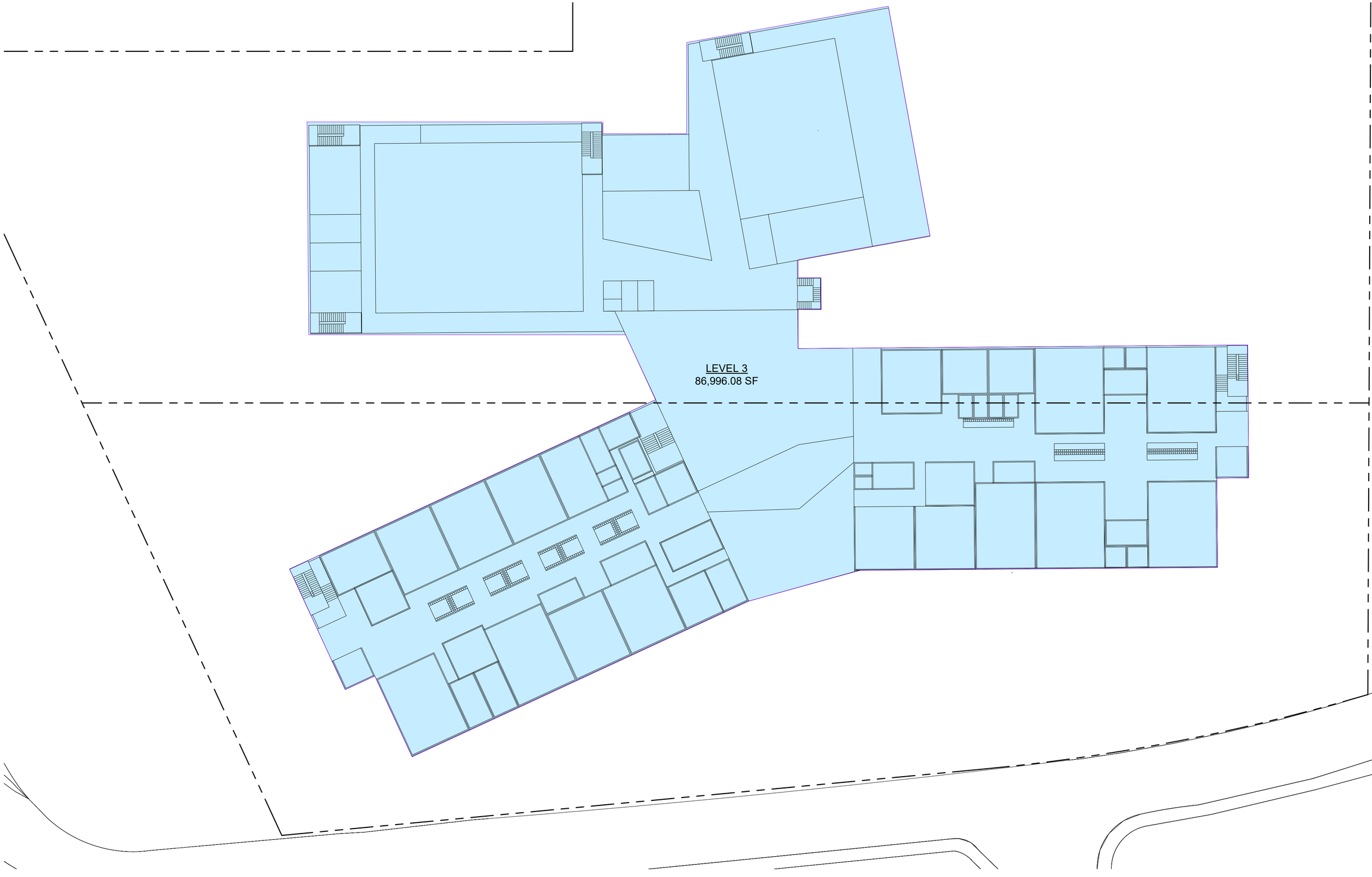
Gross Area Level 2

PERKINS EASTMAN
20 Ashburton Place, Floor 8
Boston, MA 02108
T. +1 617 449 4000
F. +1 617 449 4049

Tobin Montessori and Vassal Lane Upper School
197 Vassal Lane
Cambridge, MA 02138

SCALE: 1" = 30'-0"
PRINTED ON: 3/3/2020 9:28:57 AM
Project Issue Date

A14



1 LEVEL 3
1" = 30'-0"

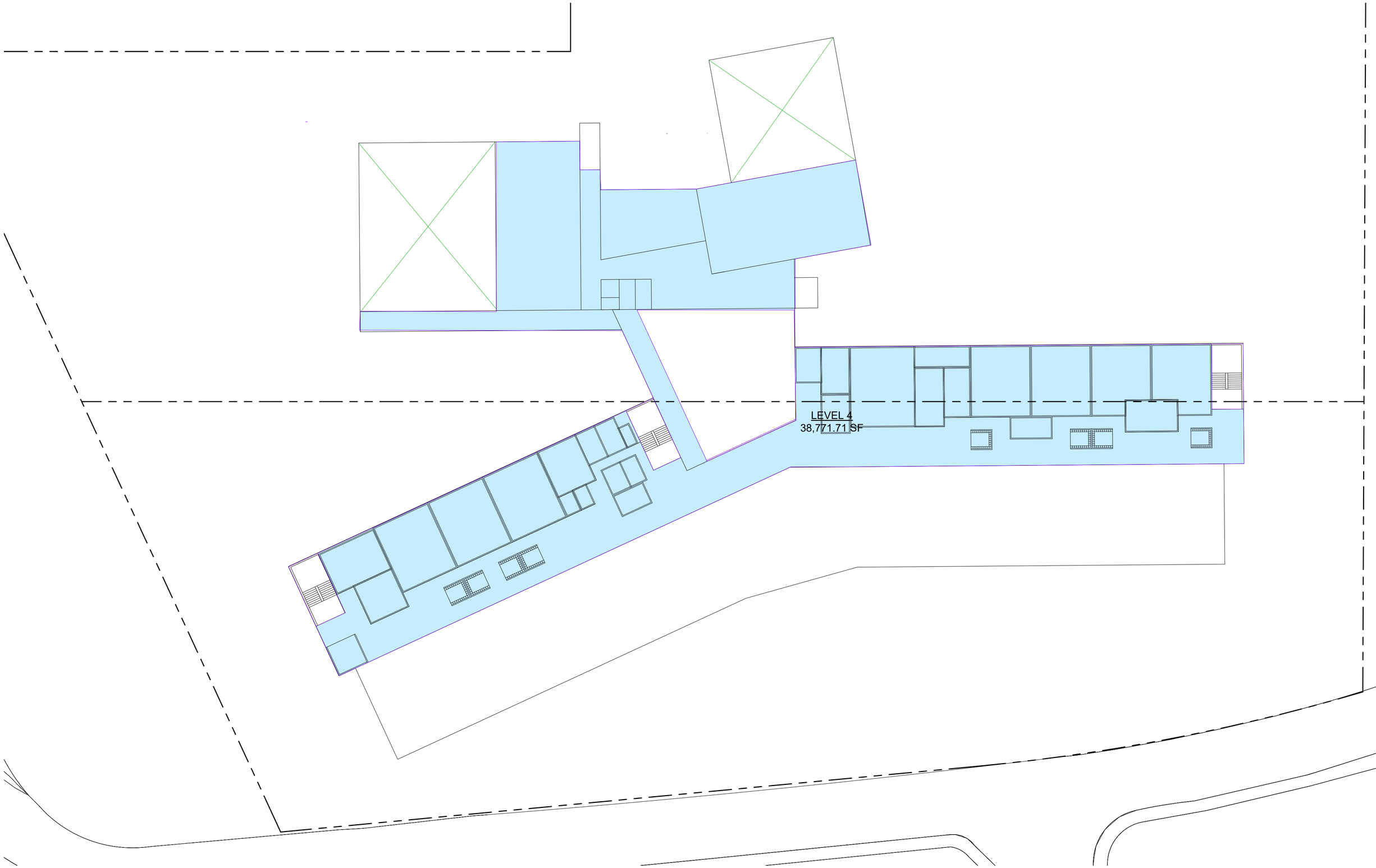
Gross Area Level 3

PERKINS EASTMAN
20 Ashburton Place, Floor 8
Boston, MA 02108
T. +1 617 449 4000
F. +1 617 449 4049

Tobin Montessori and Vassal Lane Upper School
197 Vassal Lane
Cambridge, MA 02138

SCALE: 1" = 30'-0"
PRINTED ON: 3/3/2020 9:28:58 AM
Project Issue Date

A15



1 LEVEL 4
1" = 30'-0"

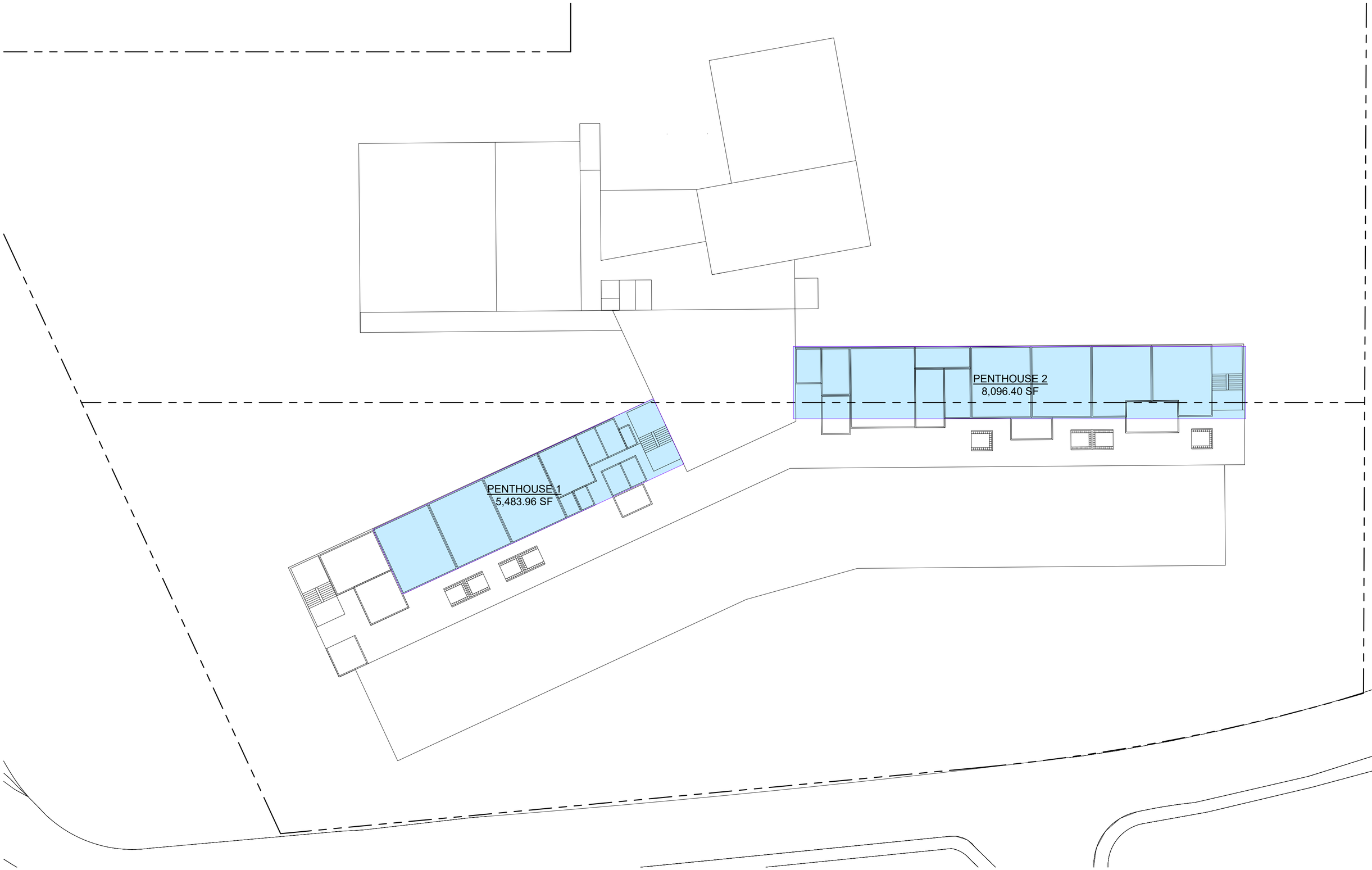
Gross Area Level 4

PERKINS EASTMAN
20 Ashburton Place, Floor 8
Boston, MA 02108
T. +1 617 449 4000
F. +1 617 449 4049

Tobin Montessori and Vassal Lane Upper School
197 Vassal Lane
Cambridge, MA 02138

SCALE: 1" = 30'-0"
PRINTED ON: 3/3/2020 9:28:59 AM
Project Issue Date

A16



1 PENTHOUSE

1" = 30'-0"

Gross Area Penthouse

PERKINS EASTMAN
20 Ashburton Place, Floor 8
Boston, MA 02108
T. +1 617 449 4000
F. +1 617 449 4049

Tobin Montessori and Vassal Lane Upper School

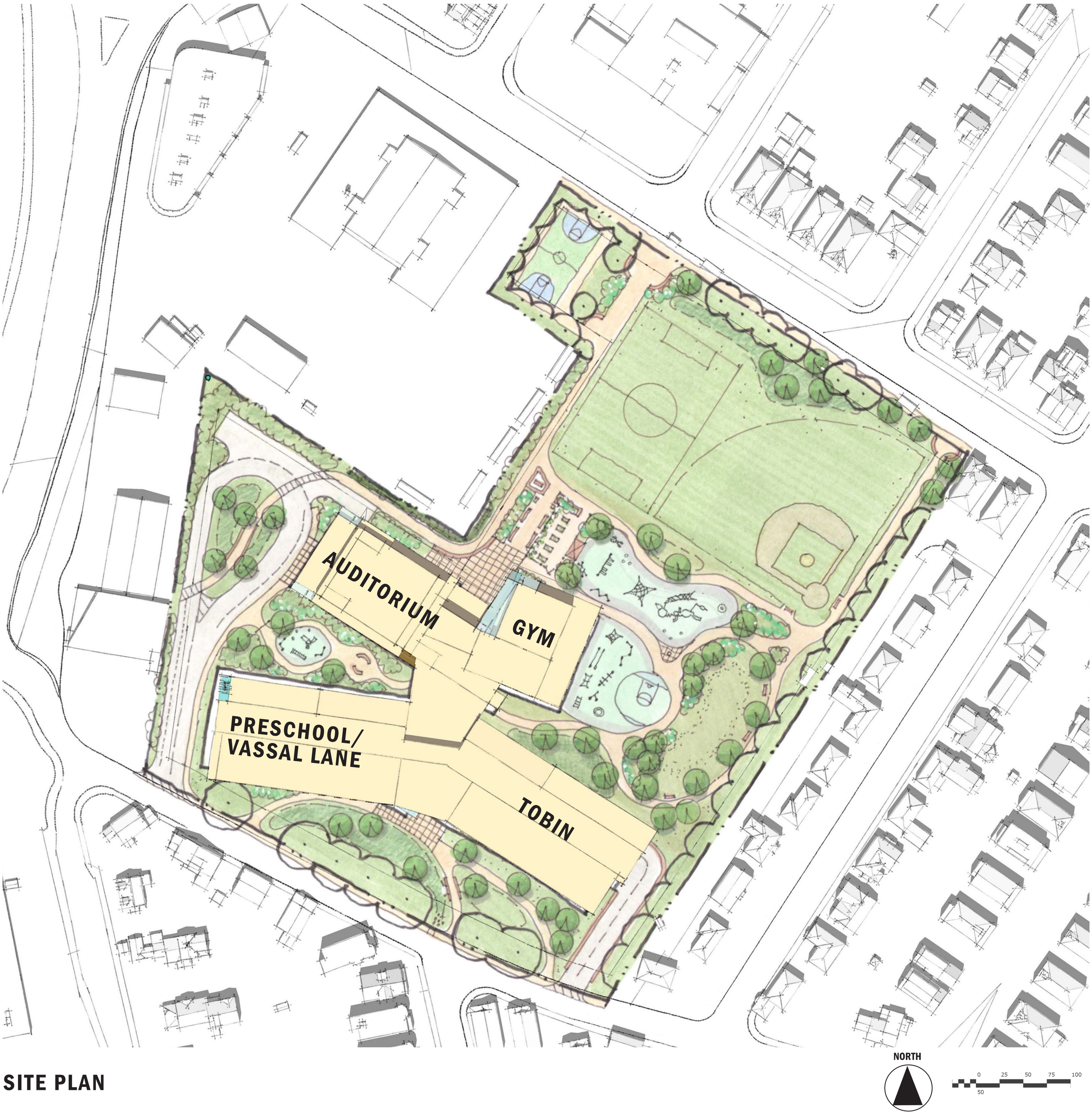
197 Vassal Lane
Cambridge, MA 02138

SCALE: 1" = 30'-0"

PRINTED ON: 3/3/2020 9:28:59 AM

Project Issue Date

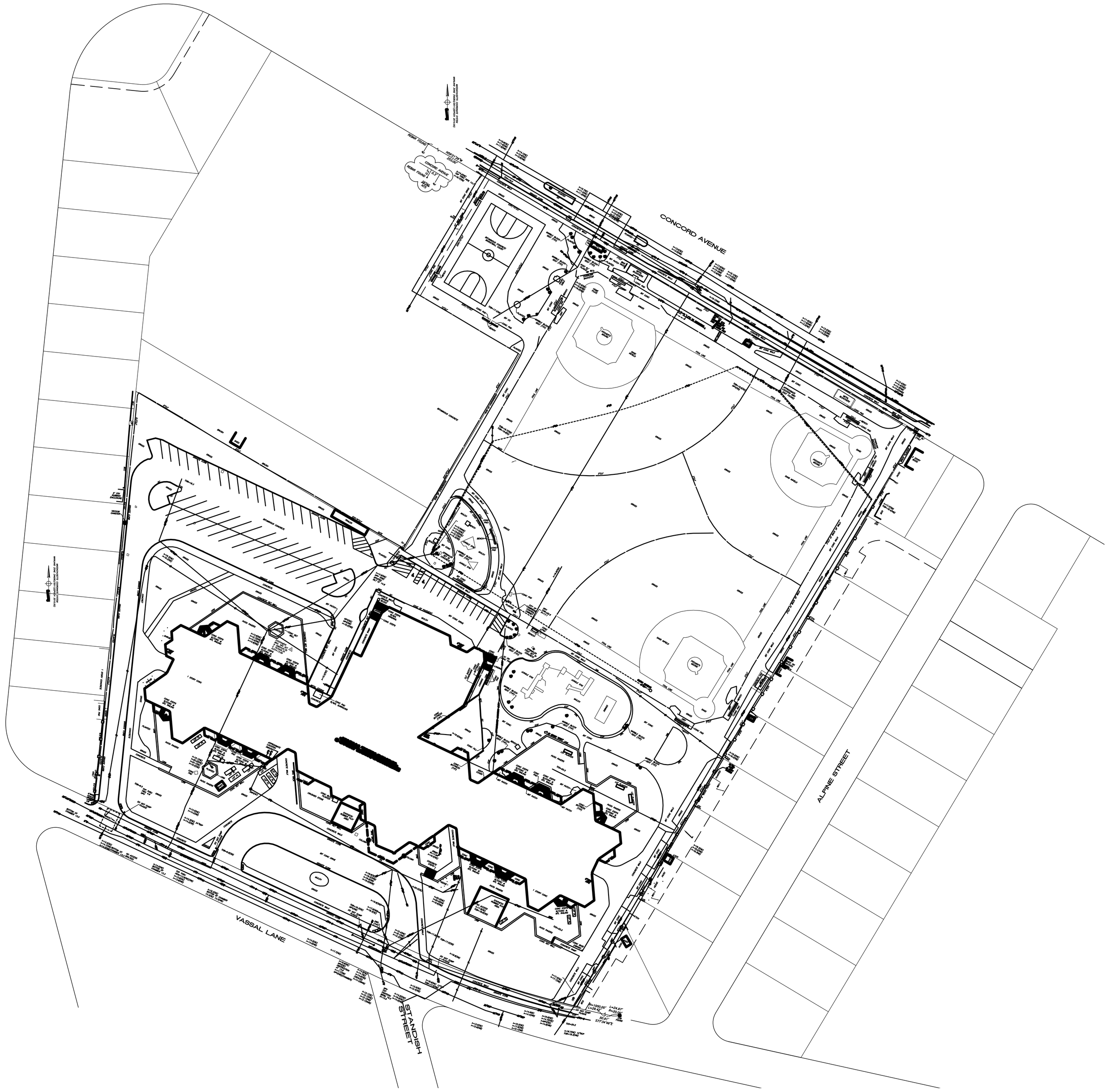
A17


AUDITORIUM
GYM
PRESCHOOL/
VASSAL LANE
TOBIN
NORTH
0
25
50
75
100
50

SITE PLAN

SITE PLAN

SITE PLAN

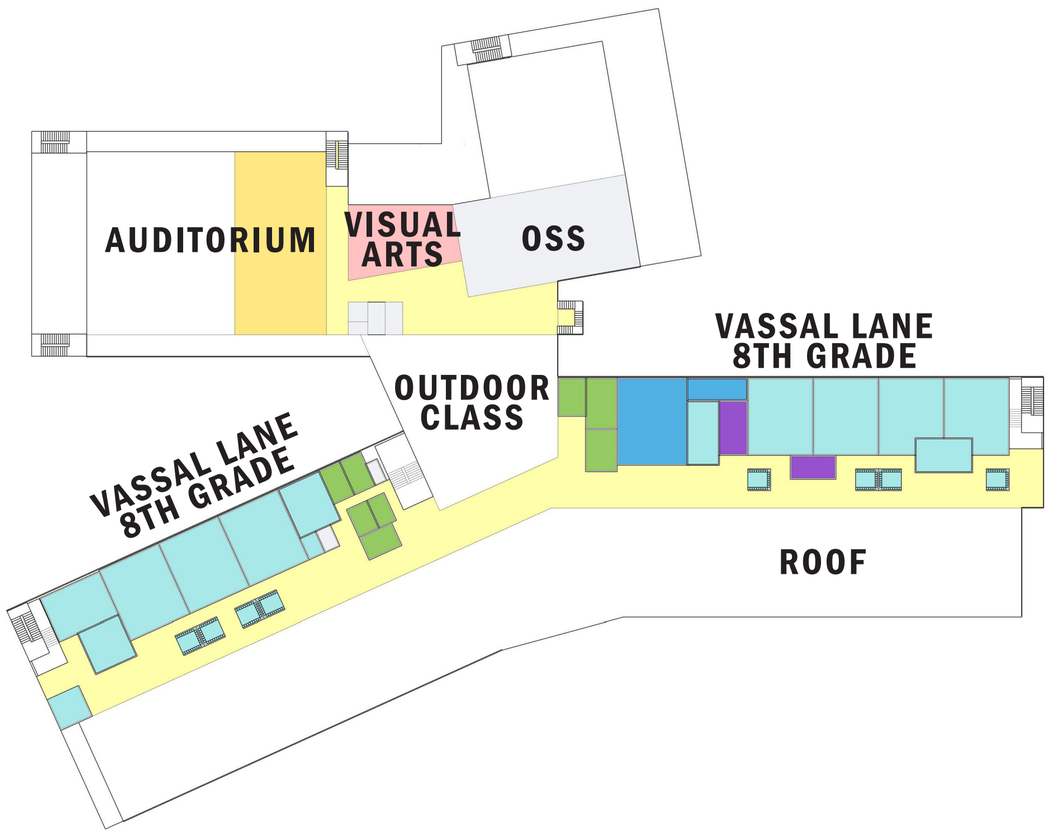

CONCORD AVENUE
ALPINE STREET
VASSAL LANE
STANDISH STREET
NORTH
0
25
50
75
100

FIRST FLOOR SITE PLAN

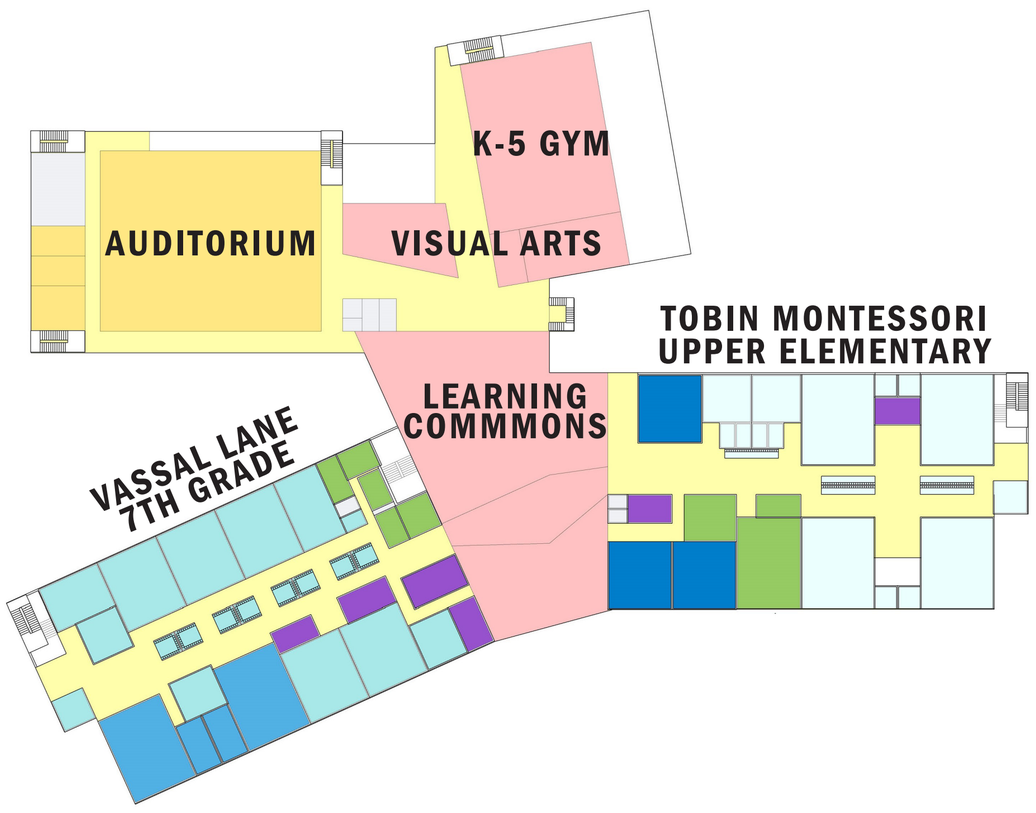
NORTH

0 25 50 75 100

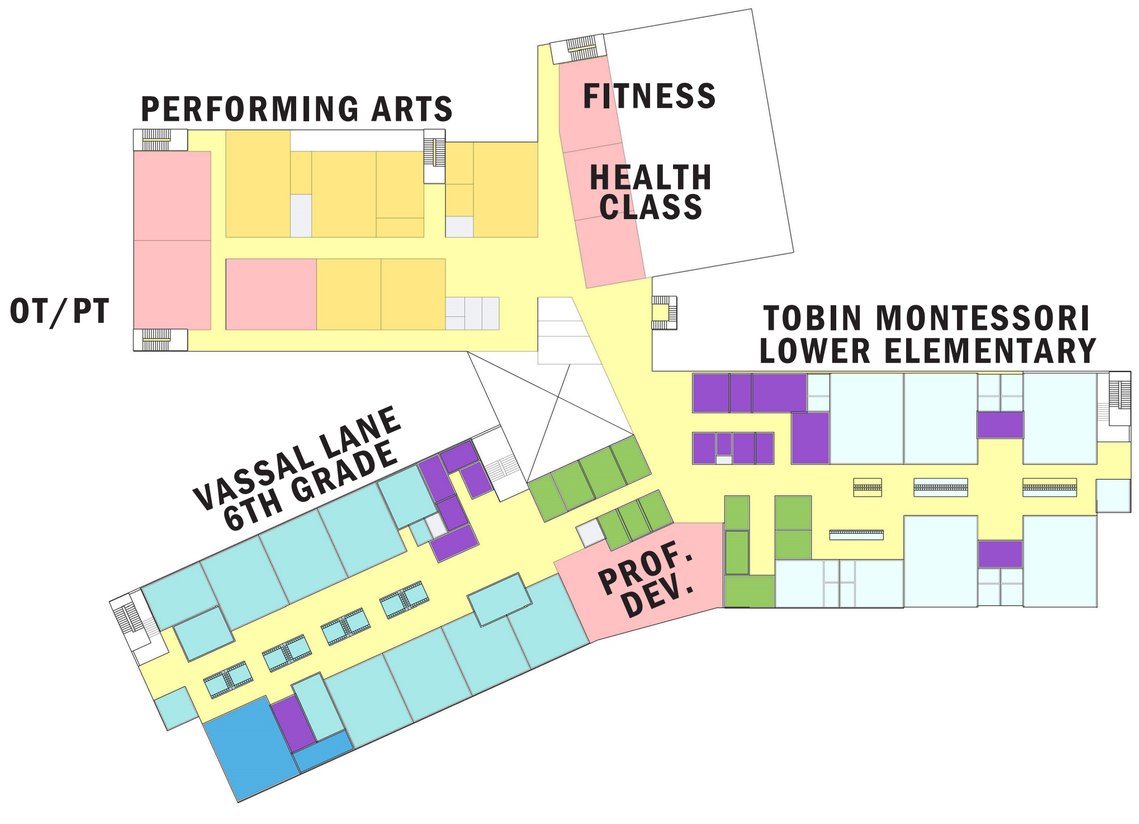
50



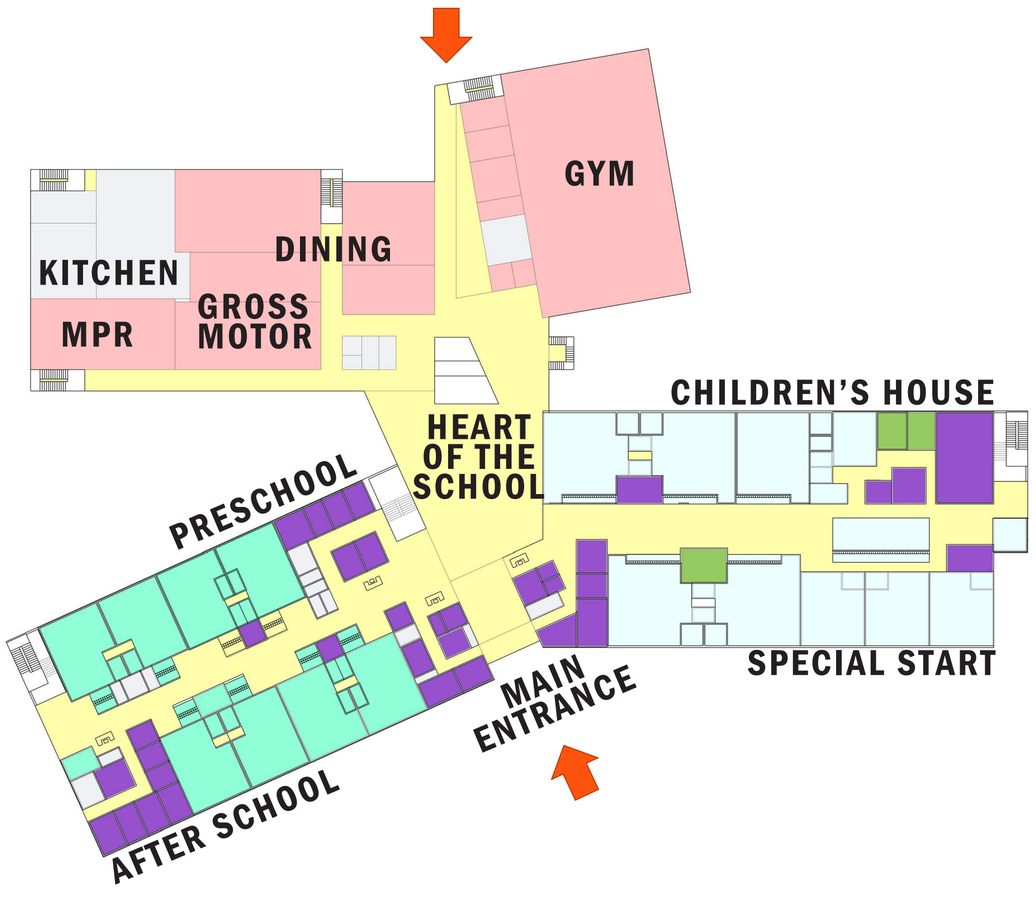
FOURTH FLOOR PLAN



THIRD FLOOR PLAN



SECOND FLOOR PLAN



FIRST FLOOR PLAN

0 25 50 75 100
50

The Tobin School
Table 1.1
Preliminary Excavation Volumes with the Stormwater Tank Located Beneath Bus Drop Off

	Excavation Depth (ft)		Waste Volume (CYD)		Clay Volume (CYD)		Till Volume (CYD)	Rock Volume	Total Volume (CYD)	
Structure	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum			Minimum	Maximum
Proposed Building and Garage	13	15	41,876	48,035	0	283	-	-	41,876	48,318
Parking Garage Below Western Playground	13	15	6,258	6,963	140	420	-	-	6,398	7,383
Parking Ramp	13	15	950	1,058	820	1,131	-	-	1,770	2,189
Stormwater Tank [1]	21	23	2,139	2,139	1,789	2,100	-	-	3,928	4,239
48-inch-diameter Conduit to Concord Ave	9	11	1,453	1,776	-	-	-	-	1,453	1,776
48-inch-diameter Conduit to Vassal Lane	9	11	413	825	94	206	-	-	506	1,031
10-inch-diameter Force Main to Vassal Lane	6	8	295	589	-	-	-	-	295	589
Biobasin/Green Infrastructure to Stormwater Tank	9	11	692	973	31	69	-	-	723	1,042
		Sum	**54,075**	**62,358**	**2,874**	**4,210**	-	-	**56,949**	**66,567**

	Excavation Depth (ft)		Waste Volume (CYD)	Clay Volume (CYD)	Till Volume (CYD)	Rock Volume (CYD)	Total Volume (CYD)	Casing Length (ft) [2]	
Geothermal Well Field	Minimum	Maximum						Minimum	Maximum
Well Field (60 wells, 500' deep)	-	-	14	7	7	360	389	1,273	1,393
		Sum	**14**	**7**	**7**	**360**	**389**	**1,273**	**1,393**
						Total	**57,338 - 66,956**		

General Notes:

– All excavation depths include 1ft thick sand and gravel or crushed stone pack.
– Tank excavation depth include frost line depth, assumed at 4 ft bgs.
– Structure dimensions determined based on architect drawings scaled with regards to existing conditions.
– 8" diameter hole assumed for geothermal wells.
– Vertical excavation cuts at all structures unless noted otherwise

Specific Notes:

[1] : Stormwater Tank dimensions obtained from Stantec drawing

[2]: Minimum casing length = 3 ft into Clay, Maximum = 5 ft into Clay

The Tobin School
Table 1.2
Preliminary Excavation Volumes with the Stormwater Tank Located Beneath Parking Garage

	Excavation Depth (ft)		Waste Volume (CYD)		Clay Volume (CYD)		Till Volume (CYD)	Rock Volume	Total Volume (CYD)	
Structure	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum			Minimum	Maximum
Proposed Building and Garage	13	15	41,876	48,035	0	283	-	-	41,876	48,318
Parking Garage Below Western Playground	13	15	6,258	6,963	140	420	-	-	6,398	7,383
Parking Ramp	13	15	950	1,058	820	1,131	-	-	1,770	2,189
Stormwater Tank [1]	33	38	-	-	7,044	8,289	-	-	7,044	8,289
48-inch-diameter Conduit to Concord Ave	9	11	1,099	1,307	21	62	-	-	1,120	1,369
48-inch-diameter Conduit to Vassal Lane	9	11	93	93	93	135	-	-	187	228
10-inch-diameter Force Main to Vassal Lane	6	8	74	104	-	-	-	-	74	104
Biobasin/Green Infrastructure to Stormwater Tank	9	11	280	342	-	-	-	-	280	342
		Sum	**50,631**	**57,902**	**8,118**	**10,320**	-	-	**58,749**	**68,222**

	Excavation Depth (ft)		Waste Volume (CYD)	Clay Volume (CYD)	Till Volume (CYD)	Rock Volume (CYD)	Total Volume (CYD)	Casing Length (ft) [2]	
Geothermal Well Field	Minimum	Maximum						Minimum	Maximum
Well Field (60 wells, 500' deep)	-	-	14	7	7	360	389	1,273	1,393
		Sum	**14**	**7**	**7**	**360**	**389**	**1,273**	**1,393**
						Total	**59,138 - 68,611**		

General Notes:

– All excavation depths include 1ft thick sand and gravel or crushed stone pack.
– Tank excavation depth include frost line depth, assumed at 4 ft bgs.
– Structure dimensions determined based on architect drawings scaled with regards to existing conditions.
– 8" diameter hole assumed for geothermal wells.
– Vertical excavation cuts at all structures unless noted otherwise

Specific Notes:

[1] : Stormwater Tank dimensions obtained from Stantec drawing

[2]: Minimum casing length = 3 ft into Clay, Maximum = 5 ft into Clay


CLASSROOM
120
GOOD
MORNING
count
high
five

2.0

COST ESTIMATE

TOBIN MONTESSORI & VASSAL LANE UPPER SCHOOLS

197 Vassal Lane,
Cambridge, MA

Feasibility Estimate

April 8, 2020

PERKINS EASTMAN
20 Ashburton Place, Floor 8
Boston, MA, 02110

ELLANA
Construction Cost Consultants
98 North Washington St., Suite 109
Boston, MA 02114

ELLANA
Construction Cost Consultants

TOBIN MONTESSORI & VASSAL LANE UPPER SCHOOLS

Feasibility Estimate

04/08/20

SUMMARY

SUMMARY			BUILDING AREA (bgsf)	405,015 sf	
		Subtotal Trade	Total $	Cost/sf $	%
A	**SUBSTRUCTURE**		16,614,075	41.02	9.52%
	A10 Foundations	-			
	A20 Basement Construction	16,614,075			
B	**SHELL**		40,309,067	99.52	23.09%
	B10 Superstructure	20,443,049			
	B20 Exterior Enclosure	17,241,915			
	B30 Roofing	2,624,103			
C	**INTERIORS**		23,229,331	57.35	13.31%
	C10 Interior Construction	10,918,779			
	C20 Stairs	1,190,000			
	C30 Interior Finishes	11,120,552			
D	**SERVICES**		45,653,077	112.72	26.15%
	D10 Conveying	565,000			
	D20 Plumbing	6,885,000			
	D30 HVAC	19,640,311			
	D40 Fire Protection	2,378,347			
	D50 Electrical	16,184,420			
E	**EQUIPMENT & FURNISHINGS**		5,570,083	13.75	3.19%
	E10 Equipment	2,330,396			
	E20 Furnishings	3,239,687			
F	**SPECIAL CONSTRUCTION & DEMOLITION**		11,196,427	27.64	6.41%
	F10 Special Construction	4,279,840			
	F20 Selective Building Demolition	6,916,587			
G	**SITEWORK**		31,987,700	78.98	18.32%
	G10 Site Preparation	25,455,430			
	G20 Site Improvements	2,241,089			
	G30 Site Mechanical Utilities	1,634,221			
	G40 Site Electrical Utilities	1,072,009			
	G90 Other Site Construction	1,584,950			
	TOTAL DIRECT COST	**$ 174,559,759**	**174,559,759**	**431.00**	**100%**

[Tab]

ELLANA Construction Cost Consultants

TOBIN MONTESSORI & VASSAL LANE UPPER SCHOOLS

Feasibility Estimate

04/08/20

SUMMARY

SUMMARY			BUILDING AREA (bgsf)	405,015 sf	
		Subtotal Trade	Total $	Cost/sf $	%
Design Contingency	15.0%	on Direct Cost	26,183,964		
Escalation to mid-point of construction; 3% a year	7.29%	on Direct Cost excl Early Works Package	10,249,944		
**Construction mid-point June 2022*					
Escalation to mid-point of construction; 3% a year	3.00%	on Early Work Package Cost	1,018,709		
**Construction mid-point April 2021*					
Subtotal			212,012,376		
Subtotal - Construction Cost			**212,012,376**		
General Conditions	LS		15,352,000		
General Requirements	LS		1,077,200		
CM Fee	LS		3,600,000		
CM Contingency	2.0%		4,240,248		
Pre-Construction	LS		435,000		
Insurances & Bonds					
Performance & payment bond	$8 / '000	on overage	453,735		
Builders Risk Insurance	$1.50 / '000	on overage	85,075		
General Liability Insurance	$5.50 / '000	on overage	311,943		
CM Fee	2%	on overage	1,134,336		
Subtotal			238,701,912		
TOTAL ESTIMATED CONSTRUCTION COST			**$ 238,701,912**	**589.37**	**/sf**

[Tab]

		Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
A		**SUBSTRUCTURE**						
	A10	**Foundations**						
		Foundations	-	cy	-	-		With basement
		Sub Total : Foundations				-		
	A20	**Basement Construction**						
		Bulk excavation for lower level	77,500	cy	15.00	1,162,500		
		Piling						
		Steel H-Piles, 4 per pile cap average, assumes 75' deep, 100 ton	45,000	lf	125.00	5,625,000		
		Test piles	1,500	lf	125.00	187,500		
		Mobilization / demobilization		incl		-		
		Form & Pour:						
		Pile Caps	156	cy	950.00	148,200		
		Grade Beams	278	cy	950.00	264,100		
		Piers	31	cy	1,125.00	34,875		
		Foundation Walls; 22"	2,423	cy	1,200.00	2,907,600		
		Misc tie beams, etc,	145	cy	1,000.00	145,000		
		Excavate for footings, etc	610	cy	70.00	42,700		
		Backfill						
		Off-site disposal of excess						See Hazardous Waste below
		Stone under slab	3,825	cy	60.00	229,500		
		Vapor barrier	113,612	sf	1.40	159,057		Inc turndowns, etc
		Hydraulic 12" Structural slab on Grade	103,284	sf	25.50	2,633,742		
		Add cost for elevator pits	2	ea	20,000.00	40,000		
		Waterproof slab	103,284	sf	14.00	1,445,976		
		Insulation under slab	103,284	sf	3.75	387,315		
		Underslab drainage	5,200	lf	27.00	140,400		
		Underslab drainage in basement	2,500	lf	28.00	70,000		
		Waterproof foundation walls	34,051	sf	17.25	587,380		
		Rigid insulation to foundation walls	34,051	sf	4.50	153,230		
		Misc. foundations	1	ls	250,000.00	250,000		
		Sub Total : Basement Construction				**16,614,075**		
		SUBTOTAL FOR SUBSTRUCTURE				**End of Trade**	**$ 16,614,075**	

		Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
B		**SHELL**						
	B10	**Superstructure**						
		Floor Construction						
		Building						
		Structural steel flooring system	2,489	ton	3,700.00	9,209,300		16.5 # / sf
		Misc clips, angles, etc	-	ton	4,070.00	incl		
		Metal floor deck	301,731	sf	4.75	1,433,222		
		Concrete slab on deck	301,731	sf	10.25	3,092,743		
		Fireproofing	301,731	sf	2.75	829,760		
		Roof Construction						
		Parking garage at plazas, etc						
		Form and pour 18" reinforced concrete slab at Plaza	16,642	sf	47.50	790,495		
		Structural steel roof system	685	ton	3,700.00	2,534,500		15.75 # / sf
		Misc clips, angles, etc	-	ton	4,070.00	incl		
		Add cost for roof dunnage	25	ton	4,000.00	100,000		Qty allowance; galv.
		PV support steel (5 lbs/sf)	234	ton	4,200.00	982,800		
		PV support steel at canopy	120	ton	3,700.00	444,000		
		Metal roof deck	72,039	sf	5.00	360,193		
		Acoustic metal roof deck	14,958	sf	5.75	86,006		
		Concrete slab on deck; at roof dunnage at acoustical areas only	15,000	sf	10.25	153,750		SF qty allowance
		Fireproofing, including deck	86,996	sf	4.90	426,280		
		Sub Total : Superstructure				**20,443,049**		
	B20	**Exterior Enclosure**						Net zero goal
		Masonry:						
		Stone façade system	13,900	sf	85.00	1,181,500		Type 2
		Light gauge framing back up system	13,900	sf	22.50	312,750		Incl insul, AVB, etc
		Canopies and soffits - allowance	1	ls	330,000.00	330,000		
		Rainscreen:						Type 1
		Cementitious panel façade system	75,922	sf	75.00	5,694,150		
		Light gauge framing back up system	75,922	sf	22.50	1,708,245		Incl insul, AVB, etc
		CMU backup	8,000	sf	28.00	224,000		
		Parapet	3,944	lf	250.00	986,000		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Glass & Glazing:						
	Curtainwall systems	23,339	sf	150.00	3,500,850		
	Punch windows	7,651	sf	150.00	1,147,650		
	Add for motorized operable windows	1	ls	150,000.00	150,000		
	Add for safety glazing	1	ls	50,000.00	50,000		
	Prefinished window surrounds on interiors	4,500	lf	115.00	517,500		
	Window sills	3,000	lf	65.00	195,000		
	Window blocking	30,990	sf	5.00	154,950		
	Entrance doors - sgl	12	pr	4,000.00	48,000		
	Entrance doors - dbl	24	pr	8,000.00	192,000		
	HM single doors	36	ea	2,250.00	81,000		
	Add cost for solar shades	9,917	lf	60.00	595,008		
	O/H Doors	3	ea	17,500.00	52,500		
	Sealants	120,812	sf	1.00	120,812		
	Sub Total : Exterior Enclosure				**17,241,915**		
B30	**Roofing**						
	Roofing						
	TPO roofing system	86,996	sf	23.00	2,000,908		
	Vapor retarder				incl		
	8" tapered insulation				incl		
	1/2" gypsum protection board				incl		
	80 mil membrane				incl		
	Associated flashings, etc.				incl		
	Photovoltaic canopy						See B10
	Add cost for plaza waterproofing over parking garage	16,642	sf	22.50	374,445		
	Add cost for landscaping at occupiable rooftop classroom	1,000	sf	8.75	8,750		
	Add cost for pavers at rooftop classroom	8,000	sf	30.00	240,000		
	Sub Total : Roofing				**2,624,103**		
	SUBTOTAL FOR SHELL				**End of Trade**	**$ 40,309,067**	

		Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
C		**INTERIORS**						
	C10	**Interior Construction**						
		Drywall & Carpentry						
		Lower School Classroom	47,368	sf	23.70	1,122,622		
		Lower School Instructional Support	8,525	sf	23.70	202,043		
		Lower School Administrative	3,767	sf	26.50	99,812		
		Upper School Classroom	54,906	sf	23.70	1,301,264		
		Upper School Instructional Support	6,045	sf	23.70	143,267		
		Upper School Administrative	3,612	sf	26.50	95,705		
		Human Services Preschool	14,493	sf	25.10	363,762		
		Human Services After School Instructional	7,897	sf	26.50	209,277		
		Human Services Administrative	1,783	sf	26.50	47,236		
		Learning Commons	14,741	sf	19.50	287,440		
		Professional Development & MPR	3,782	sf	19.50	73,749		
		Gym/Health Center	30,876	sf	12.85	396,757		
		Dining	16,128	sf	12.85	207,242		
		Auditorium	14,958	sf	12.85	192,204		
		Visual Arts	10,501	sf	15.30	160,669		
		Performing Arts	10,788	sf	15.30	165,056		
		Nursing Suite	1,496	sf	26.50	39,637		
		OT/PT	4,619	sf	26.50	122,404		
		Other; Bathrooms, etc	6,743	sf	23.70	159,797		
		Buildings & Grounds	6,169	sf	26.85	165,638		
		Districtwide Programs	22,271	sf	26.50	590,178		
		Additional circulation, public space	38,169	sf	26.50	1,011,479		
		Garage	75,382	sf	1.00	75,382		
		Doors						
		Lower School Classroom	47,368	sf	5.50	260,524		
		Lower School Instructional Support	8,525	sf	6.00	51,150		
		Lower School Administrative	3,767	sf	6.00	22,599		
		Upper School Classroom	54,906	sf	5.50	301,981		
		Upper School Instructional Support	6,045	sf	6.00	36,270		
		Upper School Administrative	3,612	sf	6.00	21,669		
		Human Services Preschool	14,493	sf	5.75	83,332		
		Human Services After School Instructional	7,897	sf	6.00	47,384		
		Human Services Administrative	1,783	sf	6.00	10,695		
		Learning Commons	14,741	sf	5.25	77,388		
		Professional Development & MPR	3,782	sf	5.25	19,856		
		Gym/Health Center	30,876	sf	3.25	100,347		
		Dining	16,128	sf	3.25	52,415		
		Auditorium	14,958	sf	3.25	48,612		
		Visual Arts	10,501	sf	3.50	36,754		
		Performing Arts	10,788	sf	3.50	37,758		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Nursing Suite	1,496	sf	6.00	8,975		
	OT/PT	4,619	sf	6.00	27,714		
	Other; Bathrooms, etc	6,743	sf	5.50	37,084		
	Buildings & Grounds	6,169	sf	6.00	37,014		
	Districtwide Programs	22,271	sf	6.00	133,625		
	Additional circulation, public space	38,169	sf	6.00	229,014		
	Garage	75,382	sf	0.85	64,075		
	Add cost for fire doors; 12' x 11' 3hr rated	4	ea	19,140.00	76,560		
	Add for glazing to doors and sidelites	1	ls	225,000.00	225,000		
	Premium for door hardware	1	ls	200,000.00	200,000		
	Miscellaneous O/H doors	1	ls	40,000.00	40,000		
	Fire shutters allowance	1	ls	75,000.00	75,000		
	Add for access doors and frames	1	ls	40,000.00	40,000		
	Fittings						
	Lower School Classroom	47,368	sf	3.75	177,630		
	Lower School Instructional Support	8,525	sf	3.25	27,706		
	Lower School Administrative	3,767	sf	3.25	12,241		
	Upper School Classroom	54,906	sf	3.75	205,896		
	Upper School Instructional Support	6,045	sf	3.25	19,646		
	Upper School Administrative	3,612	sf	3.25	11,737		
	Human Services Preschool	14,493	sf	3.25	47,101		
	Human Services After School Instructional	7,897	sf	3.25	25,666		
	Human Services Administrative	1,783	sf	3.25	5,793		
	Learning Commons	14,741	sf	3.50	51,592		
	Professional Development & MPR	3,782	sf	3.25	12,292		
	Gym/Health Center	30,876	sf	5.75	177,537		
	Dining	16,128	sf	3.75	60,479		
	Auditorium	14,958	sf	4.00	59,830		
	Visual Arts	10,501	sf	4.00	42,005		
	Performing Arts	10,788	sf	4.00	43,152		
	Nursing Suite	1,496	sf	3.25	4,861		
	OT/PT	4,619	sf	3.25	15,012		
	Other; Bathrooms, etc	6,743	sf	3.25	21,913		
	Buildings & Grounds	6,169	sf	3.50	21,592		
	Districtwide Programs	22,271	sf	3.50	77,948		
	Additional circulation, public space	38,169	sf	3.25	124,049		
	Garage	75,382	sf	0.50	37,691		
	Sub Total : Interior Construction				**10,918,779**		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
C20	**Stairs**						
	Metal pan stairs	28	flts	35,000.00	980,000		
	Heart of the School Grand Stair; includes stadium seating	1	allow	140,000.00	140,000		
	Stair finishes	1	allow	40,000.00	40,000		
	Miscellaneous handrails	1	allow	30,000.00	30,000		
	Sub Total : Stairs				**1,190,000**		
C30	**Interior Finishes**						
	Floor:						
	Lower School Classroom	47,368	sf	6.00	284,208		Bamboo
	Lower School Instructional Support	8,525	sf	6.00	51,150		
	Lower School Administrative	3,767	sf	6.00	22,599		
	Upper School Classroom	54,906	sf	6.00	329,434		Linoleum (Typ)
	Upper School Instructional Support	6,045	sf	6.00	36,270		
	Upper School Administrative	3,612	sf	6.00	21,669		
	Human Services Preschool	14,493	sf	6.00	86,955		
	Human Services After School Instructional	7,897	sf	6.00	47,384		
	Human Services Administrative	1,783	sf	6.00	10,695		
	Learning Commons	14,741	sf	10.00	147,405		
	Professional Development & MPR	3,782	sf	6.00	22,692		
	Gym/Health Center	30,876	sf	20.00	617,520		Wood
	Dining	16,128	sf	10.00	161,278		Linoleum, QT in kitchen
	Auditorium	14,958	sf	10.00	149,575		Carpet & Rubber
	Visual Arts	10,501	sf	15.00	157,519		
	Performing Arts	10,788	sf	15.00	161,820		
	Nursing Suite	1,496	sf	6.00	8,975		Linoleum
	OT/PT	4,619	sf	8.75	40,416		
	Other; Bathrooms, etc	6,743	sf	19.75	133,164		Tile
	Buildings & Grounds	6,169	sf	8.25	50,894		
	Districtwide Programs	22,271	sf	8.25	183,735		
	Additional circulation, public space	20,169	sf	6.00	121,014		
	Heart of School - terrazzo	18,000	sf	32.00	576,000		
	Garage	75,382	sf	1.75	131,919		

Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
Ceilings:						
Lower School Classroom	47,368	sf	9.00	426,312		2x2 ACT
Lower School Instructional Support	8,525	sf	9.00	76,725		
Lower School Administrative	3,767	sf	9.00	33,899		
Upper School Classroom	54,906	sf	9.00	494,151		2x2 ACT
Upper School Instructional Support	6,045	sf	9.00	54,405		
Upper School Administrative	3,612	sf	9.00	32,504		
Human Services Preschool	14,493	sf	9.00	130,433		
Human Services After School Instructional	7,897	sf	9.00	71,075		
Human Services Administrative	1,783	sf	9.00	16,043		
Learning Commons	14,741	sf	9.00	132,665		
Professional Development & MPR	3,782	sf	9.00	34,038		
Gym/Health Center	30,876	sf	2.50	77,190		Exposed painted
Dining	16,128	sf	15.00	241,916		Acoustic baffle, Clean ACT in kitchen
Auditorium	14,958	sf	2.50	37,394		Exposed painted
Auditorium ceiling reflectors for acoustic	3,600	sf	90.00	324,000		
Visual Arts	10,501	sf	12.00	126,015		
Performing Arts	10,788	sf	12.00	129,456		
Nursing Suite	1,496	sf	9.00	13,462		ACT
OT/PT	4,619	sf	9.00	41,571		
Other; Bathrooms, etc	6,743	sf	12.00	80,910		Drywall
Buildings & Grounds	6,169	sf	9.00	55,521		
Districtwide Programs	22,271	sf	9.00	200,438		
Additional circulation, public space	38,169	sf	9.00	343,521		
Garage	75,382	sf	27.00	2,035,314		
Walls:						Excludes millwork; paneling, etc
Lower School Classroom	47,368	sf	6.75	319,734		
Lower School Instructional Support	8,525	sf	5.75	49,019		
Lower School Administrative	3,767	sf	5.75	21,657		
Upper School Classroom	54,906	sf	6.75	370,613		
Upper School Instructional Support	6,045	sf	5.75	34,759		
Upper School Administrative	3,612	sf	5.75	20,766		
Human Services Preschool	14,493	sf	6.75	97,824		
Human Services After School Instructional	7,897	sf	5.75	45,409		
Human Services Administrative	1,783	sf	5.75	10,249		
Learning Commons	14,741	sf	7.25	106,869		
Professional Development & MPR	3,782	sf	5.75	21,747		
Gym/Health Center	30,876	sf	7.00	216,132		
Dining	16,128	sf	7.75	124,990		Tile wainscot
Auditorium	14,958	sf	15.00	224,363		Includes wall reflectors
Visual Arts	10,501	sf	7.75	81,385		
Performing Arts	10,788	sf	7.75	83,607		
Nursing Suite	1,496	sf	5.75	8,601		
OT/PT	4,619	sf	5.75	26,559		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Other; Bathrooms, etc	6,743	sf	17.00	114,623		
	Buildings & Grounds	6,169	sf	1.95	12,030		
	Districtwide Programs	22,271	sf	5.75	128,057		
	Additional circulation, public space	38,169	sf	5.75	219,472		
	Garage	75,382	sf	0.25	18,846		
	Sub Total : Interior Finishes				**11,120,552**		
	SUBTOTAL FOR INTERIORS				**End of Trade**	**$ 23,229,331**	
D	**SERVICES**						
D10	**Conveying**						
	Passenger elevators; 5 stop	2	ea	282,500.00	565,000		
	Sub Total : Conveying				**565,000**		
D20	**Plumbing**						
D2010	Domestic Water Distribution						
	Plumbing Fixtures	329,633	gsf	3.00	988,899		
	Water Closet				incl		
	Urinal				incl		
	Lavatory				incl		
	Mop Sink				incl		
	Bi Level Water Cooler				incl		
	Shower receptor only				incl		
	Emergency Shower / Eyewash				incl		
	Plaster Trap				incl		
	Casework Sink Install only				incl		
	Roughing for fixtures				incl		
	Electronic Valves				incl		
	Incoming Service						
	Domestic water Pipe	329,633	gsf	0.16	52,741		
	Connection to site piping				incl		
	Curb valve				incl		
	Link Seal				incl		
	RPZ Backflow Preventer Assembly				incl		
	Water Service Meter Assist Labor				incl		
	Domestic Water Equipment	329,633	gsf	2.50	824,083		
	Air Source Heat Pump				incl		
	Domestic Water Storage Tanks				incl		
	Waste Heat HX for kitchen refrigeration units				incl		
	Expansion Tank				incl		
	Circulation 'Pump				incl		
	Meters for HVAC and Irrigation				incl		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Domestic Water Pipe						
	Domestic Water DI Buried Pipe	329,633	gsf	0.01	3,296		
	Trenching Backfill by Others				incl		
	Domestic Water Copper Type L Pipe	329,633	gsf	4.02	1,325,125		
	Trap Primer				incl		
	Irrigation system				incl		
	Pipe insulation				incl		
	RPZ's				incl		
	Water Hammer Arrestor				incl		
	Thermostatic Mixing Valve				incl		
	Hose Bib				incl		
	Hose Bib Non Freeze				incl		
D2020	Sanitary Drainage						
	Sanitary Sewage Equipment	329,633	gsf	3.76	1,239,420		
	Elevator Sump Pump				incl		
	Duplex Sewage Ejector Pump				incl		
	Solids Interceptor				incl		
	Grease Interceptor				incl		
	Sanitary Sewage Piping				incl		
	Hub and Spigot Buried Pipe				incl		
	Trenching Backfill by Others				incl		
	Link Seal				incl		
	Hubless Pipe Above Ground				incl		
	House Trap				incl		
	Sump Pump Discharge Pipe Galv. Steel				incl		
	Deck Plate Clean Outs				incl		
	Wall Clean outs				incl		
	Floor Drains				incl		
	VTR				incl		
D2040	Storm						
	Hub and Spigot Buried						
	15" Pipe Size	329,633	gsf	2.25	741,674		
	Trenching Backfill by Others				incl		
	Link Seal				incl		
	Hub and Spigot Above Ground				incl		
	15" Pipe Size				incl		
	8" Storm Pipe Size				incl		
	6" Storm Pipe Size				incl		
	Deck Plate Clean outs				incl		
	Clean outs				incl		
	Roof Drains				incl		
	Pipe Insulation				incl		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Gray Water System	1	ls	450,000.00	450,000		
	20,000 gal exterior Tank				incl		
	1,000 gal interior tank				incl		
	Expansion Tank				incl		
	Grey water distribution				incl		
	UV Sterilizers				incl		
	Booster Pumps				incl		
	Exterior Tank Duplex pump set				incl		
	Garage Storm System	75,382	gsf	2.50	188,455		
	Chemical Waste System	329,633	gsf	0.75	247,225		
	Acid Waste Pipe Buried				incl		
	Trenching Backfill by Others						
	Acid Waste Pipe Above Ground						
	Acid Neutralizing tank and monitoring						
D2050	Additional Trade Costs:	329,633	gsf	2.50	824,083		REDUCED
	Charts				incl		
	Flushing and Cleaning				incl		
	Test of piping system - pressure				incl		
	Permits / fee / certifications / inspections				incl		
	Chopping / patching /fire sealing				incl		
	Miscellaneous job expenses				incl		
	Core drilling and sleeves				incl		
	Wall Sleeves				incl		
	Vibration Isolation				incl		
	CAD and Coordination				incl		
	Project Supervision (foreman)				incl		
	Commissioning/Startup				incl		
	Sub Total : Plumbing				**6,885,000**		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
D30	**HVAC**						
	Based on HVAC Option 1						
D3020	Heat Generation						
D3030	Cooling Generation						
	Equipment						
	Geothermal System; 200 wells, 2.5ton/well, 500tons						
	HPDE Piping						
	2" Buried Main Loop piping	20,000	lf	3.37	67,470		
	1-1/4" Well Drop Looped Piping	200,000	lf	2.53	505,800		
	Trench for piping	20,000	lf	7.50	150,000		
	Backfill Well Buried Loop Piping BY OTHERS	20,000	lf				
	6" Well; 200 drilled to 500'	100,000	lf	23.39	2,338,750		
	6" Well Casing; Allow 80' per well	16,000	lf	51.75	828,000		
	Test Well	1	ls	25,000.00	25,000		
	Plate Frame Heat Exchanger; 400gpm	2	ea	63,335.00	126,670		
	Well Loop Pump	2	ea	13,525.00	27,050		
	Heat Pump Loop Pump	2	ea	28,525.00	57,050		
	VFD	4	ea	6,800.00	27,200		
D3050	Distribution Systems						
	Piping Distribution	329,633	gsf	11.50	3,790,780		
	Pipe Heating, Cooling, Condensate				incl		
	Distribution Manifold				incl		
	Pipe Insulation				incl		
	Expansion Tank				incl		
	Air Separators				incl		
	Pipe Insulation				incl		
	Glycol; 20% Solution				incl		
	Glycol Make up tank and feed pump				incl		
	Water treatment				incl		
D3060	Ventilation						
	Air Distribution:	329,633	gsf	13.50	4,450,046		
	Sheetmetal				incl		
	Duct insulation				incl		
	Registers /Grilles /Diffusers				incl		
	Dampers/Fire Smoke Dampers				incl		
	Exhaust	329,633	gsf	0.21	69,223		
	TX	*3*	*ea*		incl		
	GX	*2*	*ea*		incl		
	KX	*1*	*ea*		incl		
	Roof Curb	*6*	*ea*		incl		
	Garage Exhaust System	75,382	gsf	5.00	376,910		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
D3050	Terminal and Package Units						
	Package Equipment						
	Air handlers Condenser Water						
	AHU - 1; 12,000cfm, 40 tons VAV, heat pump, economizer	1	ea	120,428.80	120,429		
	AHU - 2; 14,000cfm, 40 tons, single zone VAV, heat pump, economizer	1	ea	144,088.00	144,088		
	AHU - 3; 10,000cfm, 25 tons, single zone VAV, heat pump, economizer	1	ea	103,106.00	103,106		
	AHU - 4; 12,000cfm, 40 tons, VAV, heat pump, economizer	1	ea	124,508.40	124,508		
	Energy Recovery Unit Condenser Water				-		
	ERU - 1; 2,000cfm, 5 tons, DOAS energy recovery, heat pump	1	ea	36,108.80	36,109		
	ERU - 2; 8,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	143,046.40	143,046		
	ERU - 3; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 4; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 5; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 6; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 7; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 8; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 9; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 10; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	Variable Frequency Drives	14	ea	6,800.00	95,200		
					-		
	Terminal Units						
	Water Source Heat Pumps						
	Water Source Heat Pump; 170 tons installed	1	ls	381,340.00	381,340		
	Condensate pumps	68	ea		incl		
	Condensate pan	68	ea		incl		
	Disconnect Switch	68	ea		incl		
D3060	Controls & Instrumentation						
	Controls & Instrumentation	329,633	gsf	10.00	3,296,330		
D3070							
	Systems Testing & Balancing						
	Systems Testing & Balancing	329,633	gsf	1.25	412,041		
D3080	Other Systems	329,633	gsf	0.01	1,648		
	Emergency Power				incl		
	Sound Attenuator Generator				incl		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
D3090	Additional Trade Costs:	329,633	gsf	2.00	659,266		
	Charts				incl		
	Flushing and Cleaning				incl		
	Core drilling, cutting, patching and firestopping				incl		
	Wall Sleeves				incl		
	Rigging and Hoisting				incl		
	Vibration Isolation				incl		
	CAD and Coordination				incl		
	Project Supervision (foreman)				incl		
	Commissioning/Startup				incl		
	Sub Total : HVAC				**19,640,311**		
D40	**Fire Protection**						
D4010	Fire Water Service						
	Fire Department Connection				incl		
	Flow test - hydrant Assist Fire Department				incl		
	Test Header				incl		
	Incoming Service incl back flow; 8"				incl		
	Link Seal				incl		
	Thrust Block by others				incl		
	Fire Pump				incl		
	Jockey Pump				incl		
	Controller and ATS				incl		
	Additional Tamper Switches included in above work				incl		
	Isolation Valves with Tamper Switches				incl		
D4020	Sprinklers						
	Sprinkler system; bldg.	329,633	gsf	5.50	1,812,982		Wet
	Sprinkler system; garage	75,382	gsf	7.50	565,365		Dry
	Fire Department Connection				incl		
	Heads with Branches				incl		
	4" dia Pipe				incl		
D4030	Standpipes						
	Pipe				incl		
	Drain Pipe				incl		
	Roof Manifold				incl		
	Fire Hose Valve				incl		
	Cabinet Installed by Others				incl		
D4050	Other Fire Protection Systems & Equipment						
	Dry Pipe System				incl		
	Heads with Branches				incl		
	Dry Pipe Valve				incl		
	Nitrogen Generator System w air compressor				incl		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Preaction system						
	FM 200 System 60 Tanks; 240 sqft	2			incl		
	FM 200 System Dispersion Nozzle heads				incl		
	FM 200 System Piping 1" CS Sch 40				incl		
	FM 200 System Panels				incl		
	Kitchen Hood Fire Suppression System by Others						
	Fire Extinguishers by Others				incl		
D4060	Additional Trade Costs:						
	Test of piping system - pressure				incl		
	Permits / fee / certifications / inspections				incl		
	Painting of fire main				incl		
	Chopping / patching /fire sealing				incl		
	Miscellaneous job expenses				incl		
	Core drilling and sleeves				incl		
	Wall Sleeves				incl		
	Vibration Isolation				incl		
	CAD and Coordination				incl		
	Project Supervision (foreman)				incl		
	Sub Total : Fire Protection				**2,378,347**		
D50	**Electrical**						
D5010	Electrical Service & Distribution						
	Switchgear						
	6000 Amp main switchboard	1	ea	275,000.00	275,000		
	3000 Amp switchboard	2	ea	80,000.00	160,000		
	6000 Amp busway	65	lf	2,000.00	130,000		
	800 Amp distribution board	2	ea	22,400.00	44,800		
	400 Amp panel	2	ea	14,732.00	29,464		
	250 Amp panel	17	ea	5,750.00	97,750		
	225 Amp panel	51	ea	5,392.00	274,992		
	125 Amp panel	34	ea	4,800.00	163,200		
	225 KVA transformer	1	ea	20,840.00	20,840		
	150 KVA transformer	1	ea	15,406.00	15,406		
	75 KVA transformer	1	ea	10,338.50	10,339		
	45 KVA transformer	17	ea	7,465.00	126,905		
	225 Amp ATS	2	ea	12,000.00	24,000		
	Disconnect switches	1	ls	5,000.00	5,000		
	Metering system	1	ls	30,000.00	30,000		
	Mounting assemblies	128	ea	135.00	17,280		
	Pull and junction boxes	1	ls	5,000.00	5,000		
	Surge protective device (SPD)				incl		
	Concrete pads	3	ea		w/GC		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Electric Power Monitoring System (EPMS)	1	ls	35,000.00	35,000		
	500 KW generator	1	ea	250,000.00	250,000		
	Sound attenuated enclosure, WP	1	ea		incl		
	Load bank				incl		
	Unload/unpack/set in place generator and accessories				incl		
	Feeders - Normal and Emergency Power	329,633	sf	4.50	1,483,349		
	Incoming Service						
	4" PVC sch.40	180	lf	25.90	4,662		
	500 MCM	600	lf	18.32	10,992		
	# 3/0 wire	150	lf	8.67	1,301		
	Excavation/backfill/concrete encasement	10	lf	170.00	1,700		
	Work in transformer vault/network protector	1	ls	200,000.00	200,000		
	Add cost for garage service	75,382	gsf	6.00	452,292		
D5020	Lighting & Branch Wiring						
	Lighting	329,633	sf	11.00	3,625,963		
	Security Lighting (during construction)	1	ls	20,000.00	20,000		
	Exterior Lighting	1	ls	85,000.00	85,000		
	Building mounted LED fixtures				incl		
	Pole mounted LED fixtures				incl		
	Astronomical time clock				incl		
	Concrete base				incl		
	Excavation/backfill (trenching and bases)				incl		
	Conduit and wire				incl		
	Rigging				incl		
	Lighting Control	329,633	sf	2.25	741,674		
	Theatrical Lighting and Dimming System	1	ls	350,000.00	350,000		
	Add cost for garage lighting	75,382	gsf	6.00	452,292		
	Branch Requirements	329,633	sf	3.25	1,071,307		
	Add cost for garage branch requirements	75,382	gsf	0.50	37,691		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
D5030	Communications & Security						
	Public Address/Intercom System	329,633	sf	1.10	362,596		
	Intercom control panel				incl		
	Speaker				incl		
	Horn/speaker				incl		
	Volume control				incl		
	1" conduit				incl		
	Low voltage wire				incl		
	Testing				incl		
	Master Clock System	329,633	sf	0.30	98,890		
	Master clock/transmitter				incl		
	LV clock, wall mounted				incl		
	Wire guards (in GYM)				incl		
	Conduit and wire				incl		
	Testing				incl		
	Telecommunications	329,633	sf	3.00	988,899		
	Head end (active) equipment				FF & E		
	Work in MDF and IDF rooms				incl		
	Equipment racks				incl		
	FO cable and cable cat.6 patch panels				incl		
	100-pair 110 block				incl		
	Horizontal and vertical wire managers				incl		
	Plywood backboard				incl		
	Communication outlets				incl		
	Ladder rack				incl		
	Main grounding bus bar (TMGB)				incl		
	Grounding bus bar (TGB)				incl		
	Sleeves (vertical and horizontal)				incl		
	Conduit				incl		
	Cables cat.6E and FO				incl		
	Terminations				incl		
	Testing/labeling				incl		
	Cable support (J-hooks)				incl		
	Special Communication Systems System	329,633	sf	1.30	428,523		
	Elevator Lobby Communication System				incl		
	First Responder Bi-directional Amplifier System				incl		
	Mass Notification System				incl		
	Cellular DAS System				incl		
	Add cost for garage communications	75,382	gsf	1.00	75,382		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Integrated Electronic Security System						
	Access Control System	329,633	sf	0.30	98,890		
	Access control panel				incl		
	Card readers				incl		
	Request to exit sensors				incl		
	Conduit and LV wire				incl		
	Testing				incl		
	Intrusion Alarm System	329,633	sf	0.45	148,335		
	Door contacts				incl		
	Motion sensors				incl		
	Glass break sensors				incl		
	Key pad				incl		
	Door power supply				incl		
	Junction boxes				incl		
	Conduit and LV wire				incl		
	Testing				incl		
	Closed Circuit TV System (Surveillance)	329,633	sf	1.00	329,633		
	IP CCTV fixed cameras				incl		
	PTZ cameras				incl		
	Cameras, WP				incl		
	Pull box				incl		
	RGS and EMT conduit				incl		
	3/4" conduit				incl		
	Cable cat.6				incl		
	Testing/engineering fees				incl		
	Software, camera license				incl		
	Add cost for garage security	75,382	gsf	1.50	113,073		
D5040	Other Electrical Systems						
	Power to equipment and devices (F & I B.O.)	1	ls	150,000.00	150,000		
	Elevator pit assembly (GFI receptacle, light, switch)				incl		
	Hand dryers				incl		
	Electronic plumbing faucets/valves				incl		
	Food service equipment				incl		
	Pre-action System				incl		
	GYM equipment				incl		
	LV systems (Tel/Data, Security, A/V, PA)				incl		
	Photovoltaic System - electrical connection	1	ls	50,000.00	50,000		
	Add cost for other garage systems	99,820	gsf	0.50	49,910		
	Mechanical Requirements	329,633	sf	1.20	395,560		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Fire Alarm System	329,633	sf	2.25	741,674		
	Fire alarm control panel				incl		
	Annunciator panel				incl		
	Printer				incl		
	Fuse cut-out				incl		
	FA devices				incl		
	Conduit, wire, cable				incl		
	Programming/testing/fees				incl		
	Miscellaneous FA work (support signage, etc.)				incl		
	Add cost for garage fire alarm	75,382	gsf	3.00	226,146		
	Demolition (disconnect and make safe for demo by GC)	329,633	sf	0.75	247,225		
	Temporary power and light	329,633	sf	1.40	461,486		
	Electrical coordination and Arc-Flash Study	1	ls	40,000.00	40,000		
	Vibration isolation/seismic restraint	1	ls	25,000.00	25,000		
	Sleeves/firestopping	1	ls	25,000.00	25,000		
	Testing/commissioning	1	ls	75,000.00	75,000		
	Miscellaneous work, coordination w/other trades, deliveries, etc.	1	ls	800,000.00	800,000		
	Sub Total : Electrical				**16,184,420**		
	SUBTOTAL FOR SERVICES				**End of Trade**	**$ 45,653,077**	
E	**EQUIPMENT & FURNISHINGS**						
E10	**Equipment**						
	Lower School Classroom	47,368	sf	6.00	284,208		Apliances
	Lower School Instructional Support	8,525	sf	1.00	8,525		Gym
	Lower School Administrative	3,767	sf	1.00	3,767		Science
	Upper School Classroom	54,906	sf	6.00	329,434		
	Upper School Instructional Support	6,045	sf	1.00	6,045		
	Upper School Administrative	3,612	sf	1.00	3,612		
	Human Services Preschool	14,493	sf	6.00	86,955		
	Human Services After School Instructional	7,897	sf	1.00	7,897		
	Human Services Administrative	1,783	sf	1.00	1,783		
	Learning Commons	14,741	sf	1.00	14,741		
	Professional Development & MPR	3,782	sf	1.00	3,782		
	Gym/Health Center	30,876	sf	6.50	200,694		
	Dining	16,128	sf	5.00	80,639		
	Auditorium	14,958	sf	12.50	186,969		
	Visual Arts	10,501	sf	3.25	34,129		
	Performing Arts	10,788	sf	3.25	35,061		
	Nursing Suite	1,496	sf	1.00	1,496		
	OT/PT	4,619	sf	1.00	4,619		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Other; Bathrooms, etc	6,743	sf	1.00	6,743		
	Buildings & Grounds	6,169	sf	1.00	6,169		
	Districtwide Programs	22,271	sf	1.00	22,271		
	Additional circulation, public space	38,169	sf	1.00	38,169		
	Garage	75,382	sf	0.50	37,691		
	Add cost for dining hall food service equipment	1	allow	450,000.00	450,000		
	Add cost for walk in cooler	1	ea	included	-		
	Add cost for walk in freezer	1	ea	included	-		
	Theater rigging	1	ls	475,000.00	475,000		
	Sub Total : Equipment				**2,330,396**		
E20	**Furnishings**						
	Furnishings						
	Lower School Classroom	47,368	sf	3.00	142,104		Theater
	Lower School Instructional Support	8,525	sf	2.00	17,050		Shades
	Lower School Administrative	3,767	sf	2.00	7,533		
	Upper School Classroom	54,906	sf	3.00	164,717		
	Upper School Instructional Support	6,045	sf	2.00	12,090		
	Upper School Administrative	3,612	sf	2.00	7,223		
	Human Services Preschool	14,493	sf	3.00	43,478		
	Human Services After School Instructional	7,897	sf	2.00	15,795		
	Human Services Administrative	1,783	sf	2.00	3,565		
	Learning Commons	14,741	sf	2.00	29,481		
	Professional Development & MPR	3,782	sf	2.00	7,564		
	Gym/Health Center	30,876	sf	2.25	69,471		
	Dining	16,128	sf	1.00	16,128		
	Auditorium	14,958	sf	1.00	14,958		
	Visual Arts	10,501	sf	1.00	10,501		
	Performing Arts	10,788	sf	1.00	10,788		
	Nursing Suite	1,496	sf	2.00	2,992		
	OT/PT	4,619	sf	2.00	9,238		
	Other; Bathrooms, etc	6,743	sf	2.00	13,485		
	Buildings & Grounds	6,169	sf	2.00	12,338		
	Districtwide Programs	22,271	sf	2.00	44,542		
	Additional circulation, public space	38,169	sf	2.00	76,338		
	Garage	75,382	sf	-	-		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Millwork						
	Lower School Classroom	47,368	sf	8.00	378,944		
	Lower School Instructional Support	8,525	sf	6.00	51,150		
	Lower School Administrative	3,767	sf	6.00	22,599		
	Upper School Classroom	54,906	sf	8.00	439,245		
	Upper School Instructional Support	6,045	sf	6.00	36,270		
	Upper School Administrative	3,612	sf	6.00	21,669		
	Human Services Preschool	14,493	sf	7.00	101,448		
	Human Services After School Instructional	7,897	sf	6.00	47,384		
	Human Services Administrative	1,783	sf	6.00	10,695		
	Learning Commons	14,741	sf	6.00	88,443		
	Professional Development & MPR	3,782	sf	6.00	22,692		
	Gym/Health Center	30,876	sf	5.00	154,380		
	Dining	16,128	sf	7.00	112,894		
	Auditorium	14,958	sf	15.00	224,363		
	Visual Arts	10,501	sf	15.00	157,519		
	Performing Arts	10,788	sf	15.00	161,820		
	Nursing Suite	1,496	sf	6.00	8,975		
	OT/PT	4,619	sf	6.00	27,714		
	Other; Bathrooms, etc	6,743	sf	6.00	40,455		
	Buildings & Grounds	6,169	sf	6.00	37,014		
	Districtwide Programs	22,271	sf	6.00	133,625		
	Additional circulation, public space	38,169	sf	6.00	229,014		
	Garage	75,382	sf	-	-		
	Sub Total : Furnishings				**3,239,687**		
	SUBTOTAL FOR EQUIPMENT & FURNISHINGS				**End of Trade**	**$ 5,570,083**	
F	**SPECIAL CONSTRUCTION & DEMOLITION**						
F10	**Special Construction**						
	Photovoltaic System - allowance	106,996	sf	40.00	4,279,840		Roof area + 20,000sf
	Main solar AC switchboard				incl		
	Solar panels				incl		
	Inverters				incl		
	Combiner boxes				incl		
	AC/DC switches				incl		
	Conduit and wire				incl		
	Net metering				incl		
	Testing				incl		
	Energy monitoring hardware and software				incl		
	Sub Total : Special Construction				**4,279,840**		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
F20	**Selective Building Demolition**						
	Demolish extg bldg.	2,468,410	sf	0.70	1,727,887		
	Hazardous Material Abatement						
	Hazardous materials removals within extg bldg. to be demolished	1	ls	5,188,700.00	5,188,700		
	Per Fuss & O'Neil report dated 1.1.0.19; "Opinion of Probable Cost"						
	Sub Total : Selective Building Demolition				**6,916,587**		
	SUBTOTAL FOR SPECIAL CONSTRUCTION & DEMOLITION				**End of Trade**	**$ 11,196,427**	
G	**SITEWORK**	*403,000*	*gsf*				
G10	**Site Preparation**						
	Site preparation, removals, etc.	*403,000*	*sf*				
	Soil erosion control measures	1	ls	75,000.00	75,000		
	Building demolition	1	ea	-	-		Ref Div F
	Bituminous paving removal, full depth	48,300	sf	1.50	72,450		
	Sidewalk & playground surface area removals	22,500	ls	2.00	45,000		
	Hardscape demolition	39,643	sf	2.75	109,018		
	Surface removal at playing fields	74,451	sf	0.25	18,613		
	Landscaping removals	161,063	sf	0.30	48,319		
	Misc demo, protection, etc	1	ls	75,000.00	75,000		
	Construction fence	1,750	lf	30.00	52,500		includes gates
	Grading						
	Site						
	Cut, fill, rough grade site; assumes balanced site	33,300	sy	9.00	299,700		
	Add cost to rough grade bioretention basins	5,600	sy	17.50	98,000		
	Allowance for poor soils conditions replacement	1	allow	25,000.00	25,000		
	Prep & grade for paving, sidewalks, hardscape, etc	57,801	sf	2.50	144,503		
	Building						
	Bulk basement cut	72,700	cy	15.00	1,090,500		
	Support of Excavation				-		See Soilcrete wall below
	Dewatering	1	allow	450,000.00	450,000		Groundwater at 3' to 12' below extg grade
	Backfill				-		See Hazardous Waste below
	Off-site disposal of excess				-		See Hazardous Waste below
	Add cost for contaminated soils disposal				-		See Hazardous Waste below
	Add cost to excavate elevator pits	2	ea	15,000.00	30,000		
	Poor soils replacement allowance	1	allow	250,000.00	250,000		
	Proofroll & prep pad	103,284	sf	12.00	1,239,408		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Treat Hazard Waste onsite And disposal offsite						
	Building Foundation and Garage and With Tank below bus drop off (Table 4)	126,312	ton	110.00	13,894,320		
	Pre-stabilizing treatment for disposal of soils - 100%	72,700	cy	49.00	3,562,300		
	Testings and protections	1	ls	50,000.00	50,000		
	VOC and odors control - RusFoam - allowance	1	ls	250,000.00	250,000		
	Soilcrete wall						
	Mobilization/demobilization	2	ea	425,000.00	850,000		
	Jet grout	1,680	lf	310.00	520,800		
	Soil Crete wall at perimeter of building and tank	19,000	cy	75.00	1,425,000		
	Soil crete below structure for stablization	15,000	cy	52.00	780,000		
	Sub Total : Site Preparation				**25,455,430**		
G20	**Site Improvements**						
	Paving						
	Site						
	Vehicular paving	2,440	sy	57.50	140,300		
	Pedestrian concrete paving	23,331	sf	9.75	227,477		
	Porous asphalt paving; bike paths, etc	1,390	sy	70.00	97,300		
	Concrete curb	1,170	lf	11.00	12,870		
	Pavement markings	1	ls	7,500.00	7,500		
	Off-site						
	Replace granite curbs	1,809	lf	18.00	32,562		
	Street asphalt paving repairs	1,005	sy	70.00	70,350		
	Concrete curb	1,170	lf	14.00	16,380		
	Pavement markings	1	ls	7,500.00	7,500		
	Hardscape						
	New basketball court	2,400	sf	8.00	19,200		
	Pavers	6,307	sf	40.00	252,280		
	Playground surfacing	20,000	sf	21.00	420,000		
	Retaining walls, fencing etc.	1	ls	150,000.00	150,000		
	Improvements						
	Basketball court equipment	1	court	7,500.00	7,500		
	Baseball backstop, etc	1	ls	25,000.00	25,000		
	Soccer goals	1	set	3,000.00	3,000		
	Playground equipment	3	loc	25,000.00	75,000		
	Misc improvements; benches, tables, trash cans, signage, etc.	1	ls	100,000.00	100,000		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Landscape						
	New trees	50	ea	1,500.00	75,000		
	Shrubs	500	ea	35.00	17,500		
	Perennials, much, etc	15,000	sf	3.00	45,000		
	Fine grade, seed playing fields	74,500	sf	0.35	26,075		
	Fine grade , seed site	123,700	sf	0.35	43,295		
	Imported topsoil	2,000	cy	60.00	120,000		
	Under-field drainage system	1	allow	150,000.00	150,000		
	Irrigation system	1	allow	100,000.00	100,000		
	Sub Total : Site Improvements				**2,241,089**		
G30	**Site Mechanical Utilities**						
	Sanitary:						
	Sanitary Line; assumed PVC 8" dia.	610	lf	13.60	8,296		
	Sanitary Line; assumed kitchen PVC 6" dia.	21	lf	10.75	226		
	Grease Trap; assumed 25 GPM, 50lb fat capacity	1	ea	15,000.00	15,000		
	Building connection	3	ea	3,500.00	10,500		
	Sewer Manhole	9	ea	4,500.00	40,500		
	Street connection	1	ea	8,000.00	8,000		
	Sawcut	1,470	lf	8.00	11,760		Incl. all sawcutting required sanitary
	Demo & Surface Removal	3,630	sf	2.00	7,260		
	Excavate	874	cy	25.00	21,850		
	Backfill	831	cy	50.00	41,550		
	Off site disposal of excess				-		See Hazardous Waste above
	Add cost for contaminated soils				-		See Hazardous Waste above
	Surface Restoration; paved or otherwise	1,271	sf	5.00	6,353		
	Water:						
	Domestic:						
	Building connection	1	ea	5,000.00	5,000		
	Domestic Water Supply, Cement lined DIP, assumed 8" dia.	327	lf	89.00	29,103		
	Wet Tap Tee 8x8x8 Domestic Water	1	ea	12,000.00	12,000		Wet Tap

Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
Fire:						
Building connection	1	ea	5,000.00	5,000		
Fire Water Supply, Cement lined DIP, assumed 6" dia.	321	lf	80.50	25,841		
Wet Tap Tee 8x8x6 Fire Water	1	ea	10,000.00	10,000		Wet Tap
Sawcut	770	lf	8.00	6,160		
Demo & Surface Removal	1,510	sf	2.00	3,020		
Excavate	308	cy	25.00	7,700		
Backfill	302	cy	50.00	15,100		
Off site disposal of excess				-		See Hazardous Waste above
Add cost for contaminated soils				-		See Hazardous Waste above
Surface Restoration; paved or otherwise	1,510	sf	5.00	7,548		
Storm:						
Regional stormwater storage system						Refer G90
Foundation drain	1,600	lf	65.00	104,000		
Connect to Ex. 36" dia. RCP Storm Sewer	2	loc	4,500.00	9,000		
Isolator Row	409	lf	30.00	12,270		
CPP; 8" dia.	69	lf	9.75	673		
Drain Pipe Between Subsurface storages; assumed CPP 24"	92	lf	32.00	2,944		
Drain Pipe; assumed PVC 12" dia.	2,668	lf	25.50	68,034		
Underdrain; 6" perf. PVC	892	lf	19.60	17,483		
Trench Drain	26	lf	150.00	3,900		
Lined Bioretention Basin	12,078	sf	5.00	60,390		
Lined Bioretention Basin w/subsurface storage tank	6,428	sf	8.00	51,424		Tank separate
Subsurface Storage 1; assumed 35EA SC740, 7 x 5	1,208	sf	27.00	32,616		
Subsurface Storage 2; assumed 25EA SC740, 5 x 5	469	sf	59.00	27,671		
Area Drain	17	ea	1,500.00	25,500		
Drainage Manhole	26	ea	5,000.00	130,000		
Routing of yard ADs to Water Quality Struct. under bldg.; premium	1	ea	25,000.00	25,000		
Excavate	10,738	cy	25.00	268,450		
Backfill	9,942	cy	50.00	497,100		
Off site disposal of excess				-		See Hazardous Waste above
Add cost for contaminated soils				-		See Hazardous Waste above
Gas:						
Gas Service	-	ls	-	Extg to remain		
Gas line to generator	-	ls	-	By utility		
Sub Total : Site Mechanical Utilities				**1,634,221**		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
G40	**Site Electrical Utilities**						
	Site Electrical - allow						
	Utility transformer	2	ea		by Eversource		
	Housekeeping concrete pad	2	ea		w/GC		
	4" PVC sch.40	6,282	lf	25.90	162,704		
	500 MCM	20,940	lf	18.32	383,621		DELETE
	# 3/0 wire	5,235	lf	8.67	45,387		DELETE
	Concrete encasement	349	lf	150.00	52,350		See Hazardous Waste above
	Site Communications - allow	1	ls	150,000.00	150,000		reduce to $50k
	4" conduit (from the pole line to building)				included		
	Cables (FO and copper)				included		
	Manholes				included		
	Site Lighting - allow						
	LED lighting fixture, pole mounted	25	ea	450.00	11,250		
	Lighting pole (20')	25	ea	2,100.00	52,500		
	Concrete base	25	ea	750.00	18,750		
	Conduit and wire	1,250	lf	35.50	44,375		
	Excavation/backfill (base)	25	ea	300.00	7,500		
	Excavation/backfill (trenching)	1,250	lf	20.00	25,000		
	Rigging	1	ls	25,000.00	25,000		
	Bollard lighting	1	ls	50,000.00	50,000		
	Telephone, Cable TV, City Fiber - allow				-		
	4" RGS	400	lf	108.93	43,572		
	Excavation/backfill (trenching)				-		See Hazardous Waste above
	Sub Total : Site Electrical Utilities				**1,072,009**		
G90	**Other Site Construction**						
	Regional stormwater storage system						
	Weir structure	2	ea	25,000.00	50,000		
	Connections to extg systems	2	loc	4,500.00	9,000		
	36" storm line	520	lf	125.00	65,000		Inc excavation & backfill (typ)
	42" storm line	390	lf	140.00	54,600		

Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
Stormwater storage tank	*8,400*	*sf*				
Excavate	8,800	cy	25.00	220,000		
Stone base	310	cy	85.00	26,350		
Concrete tank	1	ls	860,000.00	860,000		140 x 60 x 20' deep; 3' thick SoG
Backfill	3,250	cy	50.00	162,500		
Off site disposal of excess				-		See Hazardous Waste above
Add cost for contaminated soils				-		See Hazardous Waste above
10" force main						
10" line	380	lf	175.00	66,500		
Connections at tank at weir	2	loc	3,000.00	6,000		
Pump	1	ea	50,000.00	50,000		
Electrical connections	1	ls	15,000.00	15,000		
Sub Total : Other Site Construction				**1,584,950**		
SUBTOTAL FOR SITEWORK				**End of Trade**	**$ 31,987,700**	

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Alternates						
A1	Alternate #1 - Hybrid Structural System	8,338,762					
A2	Alternate #2 - HVAC Option 2	(4,606,040)					
A3	Alternate #3 - HVAC Option 3	(3,345,730)					
A1	**Alternate #1 - Hybrid Structural System**						
	Delete structural steel system	(1)	ls	20,443,048.78	(20,443,049)		
	Add hybrid system						
	Structural steel system	116,618	sf	52.59	6,132,915		Assumes 30%
	Glue laminated timber & cross timber member system	272,109	sf	75.00	20,408,168		
	Sub Total:				6,098,033		
	Mark Ups:			36.7%	2,240,728		
	Total : Alternate #1 - Hybrid Structural System				**8,338,762**		
A2	**Alternate #2 - HVAC Option 2**						
	Delete HVAC Option 1	(1)	ls	19,640,310.95	(19,640,311)		
	HVAC Option 2						
D3020	Heat Generation						
	Supplemental Electric Heat	291,464	gsf	0.25	72,866		
	Cabinet Unit Heaters				incl		
	Unit Heaters				incl		
D3030	Cooling Generation						
D3050	Distribution Systems						
	Piping Distribution	291,464	gsf	9.34	2,721,020		
	Pipe Refrigerant				incl		
	Pipe Condensate				incl		
	Pipe Insulation				incl		
D3060	Ventilation						
	Air Distribution:	291,464	gsf	13.50	3,934,764		
	Sheetmetal				incl		
	Duct insulation				incl		
	Registers /Grilles /Diffusers				incl		
	Dampers/Fire Smoke Dampers				incl		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Exhaust	291,464	gsf	0.21	61,207		
	TX	*3*	*ea*		incl		
	GX	*2*	*ea*		incl		
	KX	*1*	*ea*		incl		
	Roof Curb	*6*	*ea*		incl		
	Garage Exhaust System	99,820	gsf	5.00	499,100		
D3050	Terminal and Package Units						
	Package Equipment						
	Air handlers DX						
	AHU - 1; 12,000cfm, 40 tons VAV, heat pump, economizer	1	ea	120,428.80	120,429		
	AHU - 2; 14,000cfm, 40 tons, single zone VAV, heat pump, economizer	1	ea	144,088.00	144,088		
	AHU - 3; 10,000cfm, 25 tons, single zone VAV, heat pump, economizer	1	ea	103,106.00	103,106		
	AHU - 4; 12,000cfm, 40 tons, VAV, heat pump, economizer	1	ea	124,508.40	124,508		
	Energy Recovery Unit DX				-		
	ERU - 1; 2,000cfm, 5 tons, DOAS energy recovery, heat pump	1	ea	36,108.80	36,109		
	ERU - 2; 8,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	143,046.40	143,046		
	ERU - 3; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 4; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 5; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 6; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 7; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 8; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 9; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 10; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	Variable Frequency Drives	14	ea	6,800.00	95,200		
	Roof Curb				incl		
					-		
	Terminal Units				-		
	VRF Units; 480 tons installed	1	ls	1,529,640.00	1,529,640		
	Air Cooled Condensing Units; 480 tons installed	1	ls	1,540,280.00	1,540,280		
	Condensate pumps	160	ea		incl		
	Condensate pan	160	ea		incl		
	Disconnect Switch	192	ea		incl		
	Roof Curb	32	ea		incl		
D3060	Controls & Instrumentation						
	Controls & Instrumentation	291,464	gsf	10.00	2,914,640		
D3070							
	Systems Testing & Balancing						
	Systems Testing & Balancing	291,464	gsf	1.25	364,330		
D3080	Other Systems	291,464	gsf	0.01	1,457		
	Emergency Power				incl		
	Sound Attenuator Generator				incl		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
D3090	Additional Trade Costs:	291,464	gsf	2.00	582,928		
	Charts				incl		
	Flushing and Cleaning				incl		
	Core drilling, cutting, patching and firestopping				incl		
	Wall Sleeves				incl		
	Rigging and Hoisting				incl		
	Vibration Isolation				incl		
	CAD and Coordination				incl		
	Project Supervision (foreman)				incl		
	Commissioning/Startup				incl		
	Sub Total:				(3,368,340)		
	Mark Ups:			36.7%	(1,237,700)		
	Total : Alternate #2 - HVAC Option 2				**(4,606,040)**		
A3	**Alternate #3 - HVAC Option 3**						
	Delete PVC Roof	(1)	ls	19,640,310.95	(19,640,311)		
	HVAC Option 3						
D3020	Heat Generation						
	Supplemental Electric Heat	291,464	gsf	0.25	72,866		
	Cabinet Unit Heaters				incl		
	Unit Heaters				incl		
D3030	Cooling Generation						
	Equipment						
	Geothermal System; 60 wells, 2.5ton/well, 150tons						
	HPDE Piping						
	2" Buried Main Loop piping	6,000	lf	3.37	20,241		
	1-1/4" Well Drop Looped Piping	60,000	lf	2.53	151,740		
	Trench for piping	6,000	lf	7.50	45,000		
	Backfill Well Buried Loop Piping BY OTHERS	6,000	lf				
	6" Well; 60 drilled to 500'	30,000	lf	23.39	701,625		
	6" Well Casing; Allow 80' per well	4,800	lf	51.75	248,400		
	Test Well	1	ls	25,000.00	25,000		
	Plate Frame Heat Exchanger; 150gpm	2	ea	31,667.50	63,335		
	Well Loop Pump	2	ea	10,032.50	20,065		
	Heat Pump Loop Pump	2	ea	38,525.00	77,050		
	VFD	4	ea	6,800.00	27,200		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
D3050	Distribution Systems						
	Piping Distribution	291,464	gsf	9.85	2,872,188		
	Pipe Heating, Cooling, Condensate				incl		
	Distribution Manifold				incl		
	Pipe Refrigerant				incl		
	Pipe Condensate				incl		
	Pipe Insulation				incl		
	Expansion Tank				incl		
	Air Separators				incl		
	Pipe Insulation				incl		
	Glycol; 20% Solution				incl		
	Glycol Make up tank and feed pump				incl		
	Water treatment				incl		
D3060	Ventilation						
	Air Distribution:	291,464	gsf	13.50	3,934,764		
	Sheetmetal				incl		
	Duct insulation				incl		
	Registers /Grilles /Diffusers				incl		
	Dampers/Fire Smoke Dampers				incl		
	Exhaust	291,464	gsf	0.21	61,207		
	TX	*3*	*ea*		incl		
	GX	*2*	*ea*		incl		
	KX	*1*	*ea*		incl		
	Roof Curb	*6*	*ea*		incl		
	Garage Exhaust System	99,820	gsf	5.00	499,100		
D3050	Terminal and Package Units						
	Package Equipment						
	Air handlers						
	AHU - 1; 12,000cfm, 40 tons VAV, heat pump, economizer	1	ea	120,428.80	120,429		
	AHU - 2; 14,000cfm, 40 tons, single zone VAV, heat pump, economizer	1	ea	144,088.00	144,088		
	AHU - 3; 10,000cfm, 25 tons, single zone VAV, heat pump, economizer	1	ea	103,106.00	103,106		
	AHU - 4; 12,000cfm, 40 tons, VAV, heat pump, economizer	1	ea	124,508.40	124,508		
	Energy Recovery Unit				-		
	ERU - 1; 2,000cfm, 5 tons, DOAS energy recovery, heat pump	1	ea	36,108.80	36,109		
	ERU - 2; 8,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	143,046.40	143,046		
	ERU - 3; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 4; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 5; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 6; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 7; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 8; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 9; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		
	ERU - 10; 9,000cfm, 20 tons, DOAS energy recovery, heat pump	1	ea	160,406.40	160,406		

	Description	Quantity	Unit	Unit Price	Total $	Subtotal Trades	Notes
	Variable Frequency Drives	14	ea	6,800.00	95,200		
	Roof Curb				incl		
					-		
	Terminal Units						
	Water Source Heat Pumps						
	Water Source Heat Pump; 150 tons installed	1	ls	303,300.00	303,300		
	VRF Units; 330 tons installed	1	ls	1,075,065.00	1,075,065		
	Air Cooled Condensing Units; 330 tons installed	1	ls	1,082,380.00	1,082,380		
	Condensate pumps	236	ea		incl		
	Condensate pan	236	ea		incl		
	Disconnect Switch	258	ea		incl		
	Roof Curb	22	ea		incl		
D3060	Controls & Instrumentation						
	Controls & Instrumentation	291,464	gsf	10.00	2,914,640		
D3070							
	Systems Testing & Balancing						
	Systems Testing & Balancing	291,464	gsf	1.25	364,330		
D3080	Other Systems	291,464	gsf	0.01	1,457		
	Emergency Power				incl		
	Sound Attenuator Generator				incl		
D3090	Additional Trade Costs:	291,464	gsf	2.00	582,928		
	Charts				incl		
	Flushing and Cleaning				incl		
	Core drilling, cutting, patching and firestopping				incl		
	Wall Sleeves				incl		
	Rigging and Hoisting				incl		
	Vibration Isolation				incl		
	CAD and Coordination				incl		
	Project Supervision (foreman)				incl		
	Commissioning/Startup				incl		
	Sub Total:				(2,446,691)		
	Mark Ups:			36.7%	(899,039)		
	Total : Alternate #3 - HVAC Option 3				**(3,345,730)**		


Paws Off!
Place Value
Skills for Learning
Be Assertive

3.0

RFIS

Request for Information (RFI) Log

Project: Tobin Montessori Vassal Lane Upper School Project
Architect: Perkins Eastman
Construction Manager: W.T. Rich Company, Inc.

RFI No:	Drawing Page/ Spec Section	Parg. Or Detail No.	Description:	Date Sent:	Review Status:	Responsible Party:	Response Sent:	Response:
RFI #1 - 2-28-2020								
1	**Building GSF**		What is the GSF we should use for the project? We calculated 369,286 including the basement. Please provide the total GSF and perimeter of each levels.	2/28/20			3/4/20	Building is 329,633 GSF. Basement - 27,902 SF program and Underground Parking 75,382 SF. Level 1 - 86,641 SF. Level 2 - 75,741 SF. Level 3 - 86,996. Level 4 - 38,772. Penthouse - 13,580 SF.
2	**Floor to floor heights**		Any idea yet on floor to floor heights? Using 14' at first floor at 13'4" at upper floors we show a very similar exterior envelope based on the drawings provided.	2/28/20			3/4/20	First floor is at El. 23.7' (approx 23'-8 1/2"). Floor to floor is conceptually 14'-0". This is Level 1 (ground floor), so garage is nominally 9.7'
3	**parapets/roof edges**		Realizing we are at a conceptual level - is there any thought yet to roof edges and parapets. Maybe we can discuss an appropriate allowance.	2/28/20			3/4/20	Not assuming parapets, typically. Heart of School will have classroom/green roof and will need a barrier (may be a guard that is set in from roof edge)
4	**exterior soffits**		is there a recommended area allowance? Looks like they are to be solid wood.	2/28/20			3/4/20	Assume exterior Rulon or similar wood slat ceiling. These will occur at entrances. Assume 750 sf total
5	**Windows**		Are portion of the windows and curtain walls operable?	2/28/20			3/4/20	Yes. Defined in window and curtain wall narrative.
6	**elevations**		Is it possible to print PDF exterior elevations from the current model? One of the goals being to quantify windows vs curtainwall.	2/28/20			3/4/20	The model doesn't have fenestration drawn. We've made assumptions about WWR ratios (provided in the Cost Narrative) refer to diagram for general locations
7	**Roof Decks**		Where do Roof type 2 oocur? Are the areas quantifiable at this point?	2/28/20			3/4/20	Location of Roof Type 2 is in narrative. There are sub-types 2a and 2b, locations to be determined.
8	**Canopies**		Can we agree on an qty allowance for canopies?	2/28/20			3/4/20	FBRA Recommends 20 PSF of steel; Low level AESS (no lift tabs, clean steel, no marks, but typical tolerances. Exposed Steel, cellular roof deck, etc. is anticipated. See soffit description.
9	**roof screen**		Are roof screens anticipated on the project? Again, maybe agree on an allowance?	2/28/20			3/4/20	Currently not assuming roof screens. Mechanical equipment is carried in roof-top penthouses
10	**floor plans**		Is it possible to get a legend for the different colors shown on the floor plans or identify what is each space? Possible to quantify how many rooms for each type identified in the narrative?	2/28/20			3/4/20	*See plans and program
11	**Kitchen/Food Service**		Is there an allowance - or can we agree on an allowance for estimating purposes? What is the floor area for the kitchen?	2/28/20			3/4/20	*See plans and program
12	**Auditorium**		Is this a performance theater? Can we agree on rigging, lighting and AV allowance? How many seats required?	2/28/20			3/4/20	Yes, it is for school and educational use. 625 seats required.
13	**Elevators**		How many and what types of elevators required for the Project?	2/28/20			3/4/20	Assume 2 high efficiency electric traction passenger elevators, each with 5 stops.

RFI No:	Drawing Page/ Spec Section	Parg. Or Detail No.	Description:	Date Sent:	Review Status:	Responsible Party:	Response Sent:	Response:
14	**Roof**		Any skylights, green roof anticipated for this Project?	2/28/20			3/4/20	Assume three skylights at preschool playground. Green roof over hub including "green" and "pavers." FBRA has noted that concrete slab on deck construction be provided at green roof areas (approximately 8.000 SF, per the Narrative (B1020, Page 8).
15	**Interior**		Are special column cover anticipated for this Project?	2/28/20			3/4/20	TBD
16	**Water Storage Tank**		Is the 1.25million gallon storm water storage tank located inside the garage level or outside the building?	2/28/20			3/4/20	There are two alternates -- See draft narrative. See FBRA Narrative. If under the building, it will be integral with the building foundations.
17	**Water Storage Tank**		Is the storm water storage tank pre-cast or cast in place as per the structural Narrative?	2/28/20			3/4/20	There are two alternates -- See draft narrative.
18	**Foundation**		Are we using H-pile or pre-cast pile to support the structure? The Structural narrative call for 100 Ton H-Pile. The pre-cast concrete pile tend to have more problem with obstruction. Please confirm	2/28/20			3/4/20	See structural narrative. CDM Smith please confirm. FBRA prefers steel piles, due to potential breakage concerns with precast.
19	**Foundation and Slab**		Are underslab drainage and perimeter foundation drain required?	2/28/20			3/4/20	Yes. See architectural Narrative. CDM Smith please confirm. Structural has recommended that both be included - see Section A10, Item 3 on Page 4 of the 2/25/20 Narrative.
20	**HVAC**		There are Three HVAC options are included in the MEP Narrative Report. Please confirm which one is the prefer option and should be used as the base estimate	2/28/20			3/4/20	Assume hybrid ASHP/GSHP as base estimate.
21	**Solar PV System**		What is the target Solar Photovoltiac System capacity we should be using for this Project	2/28/20			3/4/20	High performance PV (18Wdc/sf). Assume same area as roof. Where high roof, assume ballasted, otherwise, assume canopy. Total area 86,000 sf (1,550 KWdc system). Plus, provide also 20,000 sf of additional ground or building mounted canopy with PV for nze, for an additional 360 KWdc)
RFI #2 - 3-3-2020								
22	**Exterior Wall Type 1**		#1 Location refers to a penthouse. Is any more information available? Size/location? Elevation study shows 4 floor structure.	3/3/20			3/4/20	Refer to RFI #1 - 1 for penthouse sq. ft. See plans and program for further information. No See diagram of window and curtainwall placement in feasibility study report.
23	**Exterior Wall Type 2**		Is there a type of stone and color range anticipated yet?	3/3/20			3/4/20	Regional stone, similart to Ashfield schist
24	**Solar Shades**		Type 1 and 2 and we can make some assumptions. Type 3 the description is not enough to price. Can we get more information or agree on an allowance?	3/3/20			3/4/20	Type 3 to match Type 2, but horizontal
25	**Roof Type #**		PV Canopy - what is the proposed location and extent of this canopy?	3/3/20			3/4/20	See RFI Item #21
26	**Lockers**		How many student lockers/team lockers on the job?	3/3/20			3/4/20	1,204 student lockers, 50 gym lockers and 58 staff lockers
27	**Glazed Block**		Please confirm glazed block or gyms, ktichen, stage, stairs, and misc other area vs CMU.	3/3/20			3/4/20	TBD
28	**Archtectural Interiors**		What is a 1/2" datum reveal joint at room perimeter?	3/3/20			3/4/20	1/2" U-reveal galvanized steel molding set within GWB appoximately 2'-0" below ceiling. Typically divides GWB finish for two colors of paint.
29	**Garage**		What is the total garage floor area	3/3/20			3/4/20	EE- Parking Garage is currently 75,380 sf (reference 03/02 plan). Additional basement program totals 27,900 sf
30	**Garage**		Assuming the garage is not heated, what type of insulation required for the garage ceiling	3/3/20			3/4/20	See architectural narrative.

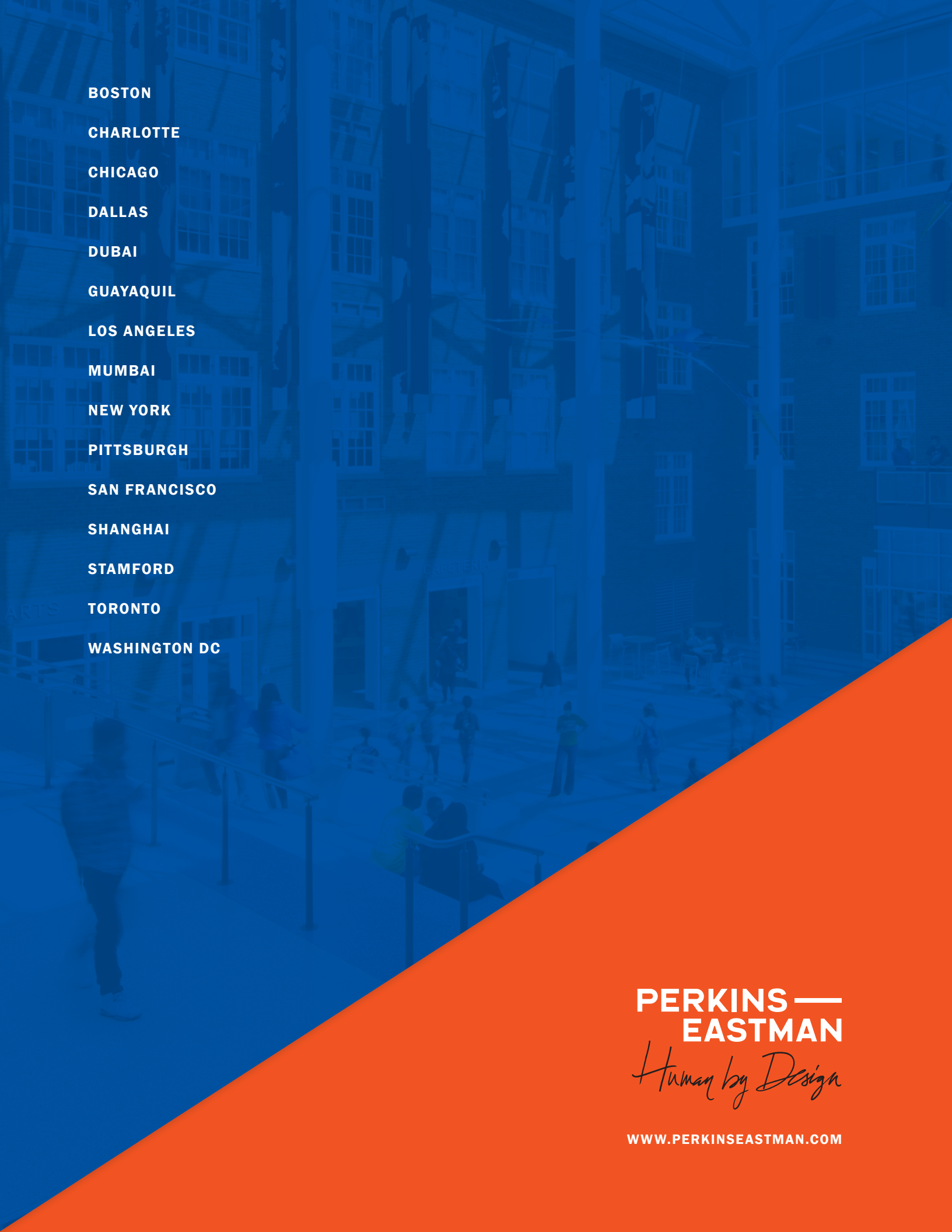
Request for Information (RFI) Log

Project: Tobin Montessori Vassal Lane Upper School Project
Architect: Perkins Eastman
Construction Manager: W.T. Rich Company, Inc.

RFI No:	Drawing Page/ Spec Section	Parg. Or Detail No.	Description:	Date Sent:	Review Status:	Responsible Party:	Response Sent:	Response:
RFI #1 - 2-28-2020								
1	**Building GSF**		What is the GSF we should use for the project? We calculated 369,286 including the basement. Please provide the total GSF and perimeter of each levels.	2/28/20	Closed		3/4/20	Building is329,633 GSF. Basement - 27,902 SF program and Underground Parking75,382 SF. Level 1 - 86,641 SF. Level 2 - 75,741 SF. Level 3 - 86,996. Level 4 - 38,772. Penthouse - 13,580 SF.
2	**Floor to floor heights**		Any idea yet on floor to floor heights? Using 14' at first floor at 13'4" at upper floors we show a very similar exterior envelope based on the drawings provided.	2/28/20	Closed		3/4/20	First floor is at El. 23.7' (approx 23'-8 1/2"). Floor to floor is conceptually 14'-0". This is Level 1 (ground floor), so garage is nominally 9.7'
3	**parapets/roof edges**		Realizing we are at a conceptual level - is there any thought yet to roof edges and parapets. Maybe we can discuss an appropriate allowance.	2/28/20	**See Revision**		3/4/2020 Rev 3/12/2020	Not assuming parapets, typically. Heart of School will have classroom/green roof and will need a barrier (may be a guard that is set in from roof edge) **Revised Response: See Item 35, which supercedes this response.**
4	**exterior soffits**		is there a recommended area allowance? Looks like they are to be solid wood.	2/28/20	Closed		3/4/20	Assume exterior Rulon or similar wood slat ceiling. These will occur at entrances. Assume 750 sf total
5	**Windows**		Are portion of the windows and curtain walls operable?	2/28/20	Closed		3/4/20	Yes. Defined in window and curtain wall narrative.
6	**elevations**		Is it possible to print PDF exterior elevations from the current model? One of the goals being to quantify windows vs curtainwall.	2/28/20	Closed		3/4/20	The model doesn't have fenestration drawn. We've made assumptions about WWR ratios (provided in the Cost Narrative) refer to diagram for general locations
7	**Roof Decks**		Where do Roof type 2 oocur? Are the areas quantifiable at this point?	2/28/20	Closed		3/4/20	Location of Roof Type 2 is in narrative. There are sub-types 2a and 2b, locations to be determined.
8	**Canopies**		Can we agree on an qty allowance for canopies?	2/28/20	Closed		3/4/20	FBRA Recommends 20 PSF of steel; Low level AESS (no lift tabs, clean steel, no marks, but typical tolerances. Exposed Steel, cellular roof deck, etc. is anticipated. See soffit description.
9	**roof screen**		Are roof screens anticipated on the project? Again, maybe agree on an allowance?	2/28/20	Closed		3/4/20	Currently not assuming roof screens. Mechanical equipment is carried in roof-top penthouses
10	**floor plans**		Is it possible to get a legend for the different colors shown on the floor plans or identify what is each space? Possible to quantify how many rooms for each type identified in the narrative?	2/28/20	Open		3/4/20	*See plans and program

RFI No:	Drawing Page/ Spec Section	Parg. Or Detail No.	Description:	Date Sent:	Review Status:	Responsible Party:	Response Sent:	Response:
11	**Kitchen/Food Service**		Is there an allowance - or can we agree on an allowance for estimating purposes? What is the floor area for the kitchen?	2/28/20	Open		3/4/20	*See plans and program --No more is going to be provided at FS. Additional information will be provided in SD. If WTR would like to provide an allowance and basis for same, then we can review it together with Ellana
12	**Auditorium**		Is this a performance theater? Can we agree on rigging, lighting and AV allowance? How many seats required?	2/28/20	Closed		3/4/20 Rev 3/12/2020	Yes, it is for school and educational use. 625 seats required.
13	**Elevators**		How many and what types of elevators required for the Project?	2/28/20	Closed		3/4/20	Assume 2 high efficiency electric traction passenger elevators, each with 5 stops.
14	**Roof**		Any skylights, green roof anticipated for this Project?	2/28/20	Closed		3/4/20	Assume three skylights at preschool playground. Green roof over hub including "green" and "pavers." FBRA has noted that concrete slab on deck construction be provided at green roof areas (approximately 8.000 SF, per the Narrative (B1020, Page 8).
15	**Interior**		Are special column cover anticipated for this Project?	2/28/20			3/4/20	TBD -- No additional information will be provided in FS
16	**Water Storage Tank**		Is the 1.25million gallon storm water storage tank located inside the garage level or outside the building?	2/28/20	Closed		3/4/20	There are two alternates -- See draft narrative. See FBRA Narrative. If under the building, it will be integral with the building foundations.
17	**Water Storage Tank**		Is the storm water storage tank pre-cast or cast in place as per the structural Narrative?	2/28/20	Closed		3/4/20	There are two alternates -- See draft narrative.
18	**Foundation**		Are we using H-pile or pre-cast pile to support the structure? The Structural narrative call for 100 Ton H-Pile. The pre-cast concrete pile tend to have more problem with obstruction. Please confirm	2/28/20	Closed		3/4/20	See structural narrative. CDM Smith please confirm. FBRA prefers steel piles, due to potential breakage concerns with precast.
19	**Foundation and Slab**		Are underslab drainage and perimeter foundation drain required?	2/28/20	Closed		3/4/20	Yes. See architectural Narrative. CDM Smith please confirm. Structural has recommended that both be included - see Section A10, Item 3 on Page 4 of the 2/25/20 Narrative.
20	**HVAC**		There are Three HVAC options are included in the MEP Narrative Report. Please confirm which one is the prefer option and should be used as the base estimate	2/28/20	Closed		3/4/20	Assume hybrid ASHP/GSHP as base estimate.
21	**Solar PV System**		What is the target Solar Photovoltiac System capacity we should be using for this Project	2/28/20	Closed		3/4/20	High performance PV (18Wdc/sf). Assume same area as roof. Where high roof, assume ballasted, otherwise, assume canopy. Total area 86,000 sf (1,550 KWdc system). Plus, provide also 20,000 sf of additional ground or building mounted canopy with PV for nze, for an additional 360 KWdc)
RFI #2 - 3-3-2020								
22	**Exterior Wall Type 1**		#1 Location refers to a penthouse. Is any more information available? Size/location? Elevation study shows 4 floor structure.	3/3/20	Closed		3/4/20	Refer to RFI #1 - 1 for penthouse sq. ft. See plans and program for further information. See diagram of window and curtainwall placement in feasibility study report.
23	**Exterior Wall Type 2**		Is there a type of stone and color range anticipated yet?	3/3/20	Closed		3/4/20	Regional stone, similart to Ashfield schist

RFI No:	Drawing Page/ Spec Section	Parg. Or Detail No.	Description:	Date Sent:	Review Status:	Responsible Party:	Response Sent:	Response:
24	**Solar Shades**		Type 1 and 2 and we can make some assumptions. Type 3 the description is not enough to price. Can we get more information or agree on an allowance?	3/3/20	Closed		3/4/20	Type 3 to match Type 2, but horizontal
25	**Roof Type #**		PV Canopy - what is the proposed location and extent of this canopy?	3/3/20	Closed		3/4/20	See RFI Item #21
26	**Lockers**		How many student lockers/team lockers on the job?	3/3/20	Closed		3/4/20	1,204 student lockers, 50 gym lockers and 58 staff lockers
27	**Glazed Block**		Please confirm glazed block or gyms, ktichen, stage, stairs, and misc other area vs CMU.	3/3/20	Closed		3/4/20	TBD
28	**Archtectural Interiors**		What is a 1/2" datum reveal joint at room perimeter?	3/3/20	Closed		3/4/20	1/2" U-reveal galvanized steel molding set within GWB appoximately 2'-0" below ceiling. Typically divides GWB finish for two colors of paint.
29	**Garage**		What is the total garage floor area	3/3/20	Closed		3/4/20	EE- Parking Garage is currently 75,380 sf (reference 03/02 plan). Additional basement program totals 27,900 sf
30	**Garage**		Assuming the garage is not heated, what type of insulation required for the garage ceiling	3/3/20	Closed		3/4/20	See architectural narrative.



BOSTON

CHARLOTTE

CHICAGO

DALLAS

DUBAI

GUAYAQUIL

LOS ANGELES

MUMBAI

NEW YORK

PITTSBURGH

SAN FRANCISCO

SHANGHAI

STAMFORD

TORONTO

WASHINGTON DC

PERKINS EASTMAN

Human by Design

WWW.PERKINSEASTMAN.COM