# UNIVERSITY OF MAINE BOARDMAN HALL MODERNIZATION STUDY

July 1, 2024

PERKINS EASTMAN

SMRT

MAINE

# TABLE OF CONTENTS

# ACKNOWLEDGMENTS


## UNIVERSITY OF MAINE

GIOVANNA GUIDOBONI DEAN, MAINE COLLEGE OF ENGINEERING AND COMPUTING
RYAN WARD DIRECTOR OF SPACE & CAPITAL MANAGEMENT SERVICES
EMILY HADDAD DEAN, COLLEGE OF LIBERAL ARTS & SCIENCES
STEWART HARVEY EXECUTIVE DIRECTOR OF FACILITIES AND CAPITAL MANAGEMENT SERVICES
WALTER SHANNO ASSISTANT DIRECTOR OF CAPITAL PLANNING & PROJECT MANAGEMENT
SARAH KELLY ADMIN AND FINANCIAL MANAGER, MAINE COLLEGE OF ENGINEERING AND COMPUTING
JOSHUA BURKE UNIVERSITY PLANNER
CHRISTOPHER KARLEN COMMUNICATIONS SPECIALIST, MAINE COLLEGE OF ENGINEERING AND COMPUTING

## PERKINS EASTMAN (ARCHITECTURE & PLANNING)

DANIEL ARONS PRINCIPAL
SARAH JOHNSON PROJECT ARCHITECT & PROGRAMMING LEAD
LEO PATTERSON PROJECT MANAGER
RION PHILBIN PROJECT DESIGNER
KLIL LOEB PROJECT DESIGNER

## SMRT ARCHITECTS & ENGINEERS (BUILDING SYSTEMS ASSESSMENT)

NICK VAUGHHN PRINCIPAL, DIRECTOR OF EDUCATION + ATHLETICS PRACTICE
LURA WADE SENIOR ELECTRICAL ENGINEER
KEARY WILLETTE SENIOR MECHANICAL ENGINEER
EMMA BLAIR MECHANICAL DESIGNER
MATTHEW KRAMER SENIOR STRUCTURAL ENGINEER
LIZ NEFF PROJECT COORDINATOR

## VERMEULENS (COST ESTIMATING)

CRAIG CHIARELLI PRINCIPAL, DIRECTOR OF ESTIMATING
SARA GTAT PROJECT ASSISTANT

# EXECUTIVE SUMMARY

# EXECUTIVE SUMMARY

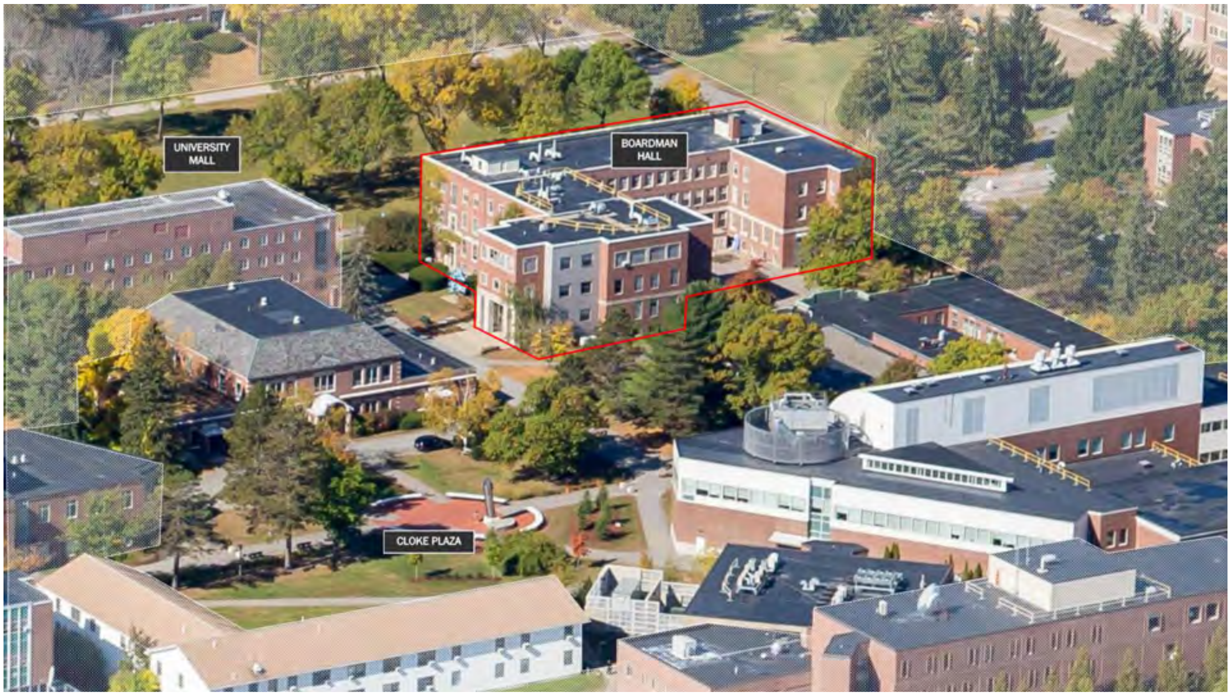
## INTRODUCTION

The Maine College of Engineering, Computing, and Information Science (MCECIS) Master Plan, conducted during 2021 and 2022 for The University of Maine (UMaine), identified Boardman Hall, including the Llewellyn Edwards wing, as a top priority for preservation and refurbishment during the initial implementation phase. Now, the Maine College of Engineering and Computing (MCEC), together with the Perkins Eastman/SMRT design team has developed a vision for the modernization, including updating the programmatic approach, defining scope, suggesting layouts, and providing a sufficient definition for an updated cost estimate. The study and cost estimate articulate the vision for the next phase of physical improvements to the Engineering and Computing District. MCEC will provide modern, interdisciplinary, and visionary facilities to support its mission and growth, promoting the integration of research and learning that turns knowledge into innovative solutions, produces new technologies, and plays a vital role in preparing an educated workforce needed to move Maine's economy forward.

## BOARDMAN HALL - RE-ENVISIONED FOR THE NEXT GENERATION

Marking the northeast cornerstone of the University Mall, the vision of a modernized Boardman Hall is to serve three primary objectives: to bring people together, advance collaboration, and reinforce the identity of the newly formed Maine College of Engineering and Computing. Throughout this Boardman Hall Modernization Study, we have learned more about the building's history and its identity as a legacy feature for the campus. We have heard clear direction that UMaine and MCEC intend to preserve Boardman Hall while acknowledging that its current condition requires comprehensive rehabilitation so that it may operate successfully across the coming century of its existence. Boardman Hall is a handsome brick collegiate building, which is a non-contributing building within the University of Maine at Orono Historic District . It is beloved, has a stately presence, and occupies a primary location on campus that could serve as a conduit. This report proposes conscious, fundamental improvements to its appearance, layout, infrastructure, and performance. These enhancements heighten the academic experience for the Maine College of Engineering and Computing population through updated program offerings and improved functionality. This project exemplifies the commitment and investment in preserving and elevating essential assets for the larger campus community. We've heard that Boardman Hall is to deliver on what the moment requires by:

- Being a welcoming front door for MCEC on University Mall, providing opportunities for people to collect, converge, engage, and collaborate,
- Serving as a channel for activity into the MCEC district, including to the Ferland Engineering Education and Design Center (EEDC) and central node at Cloke Plaza,
- Maximizing utilization through vastly-improved efficiency, shifting focus from individualized areas to shared, multi-functional, and flexible spaces, and
- Hosting a collection of study disciplines for Engineering and Computing to foster integration.




Above: Boardman Hall is prominent on campus, and to MCEC's district node at Cloke Plaza. (Image taken prior to Ferland EEDC)

## STRATEGIC PLANNING - CONSIDERING WELLNESS, EQUITY, AND COMMUNITY

Continuing the legacy of engagement, yet looking towards the future, the new building needs to **amplify student success, equity, and community**. To achieve this vision, three key strategies were developed:

1. Solve the accessibility challenge
2. Create opportunities for multidisciplinary collaboration
3. Utilize strategic programs to create a student-centric hub

## 1. COST AND SCHEDULE

The design team has the current understanding of cost categorizations, as confirmed by UMaine. A detailed explanation of the approach and a comprehensive cost estimate by Vermeulens Cost Consultants appears in the main body of this document, with the detail provided in the appendix.

- Base Costs plus a service grossing factor (1.5 multiplier) is applied to achieve the Estimated Construction Cost (ECC).
- A typical multiplier of 33% (x1.33) on top of Estimated Construction Cost (ECC) will be applied to achieve Total Project Cost (TPC).
- Escalation may vary over time, especially in the next few years, but is estimated at an average of 4% per annum. The estimate is based on bidding Q2, 2024 utilizing construction manager delivery.
- UMaine articulated their Boardman Hall budget as $35.1 M; Vermeulens independently estimated from the scope of work, an Estimated Construction Cost (ECC) as $35.4 million.

# ARCHITECTURAL PROGRAM & TEST-FITS

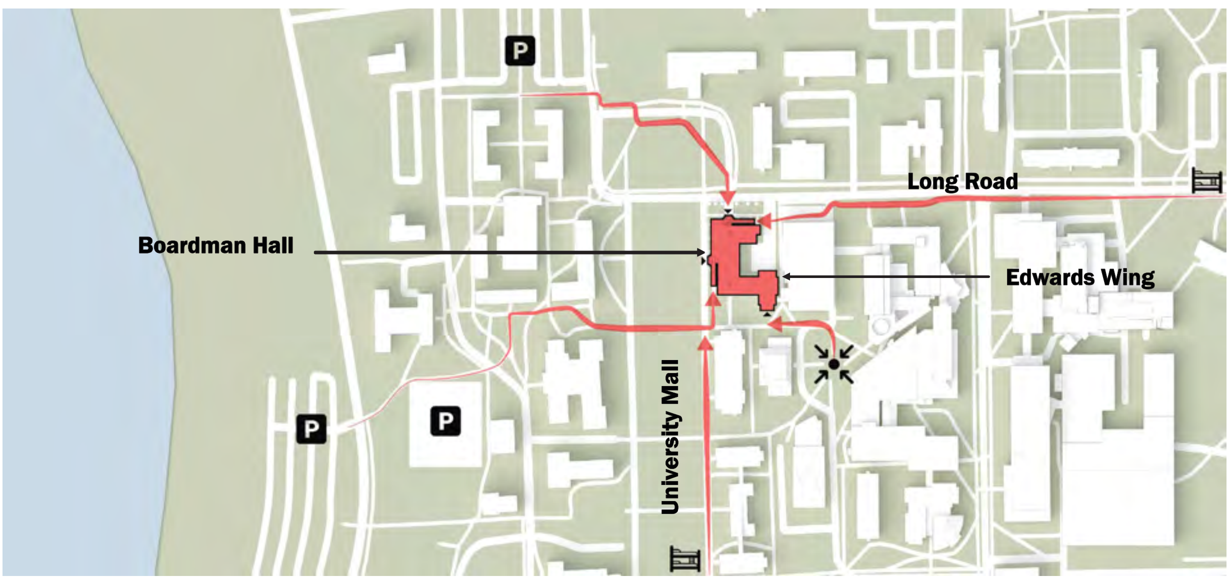
## STRATEGIC PLANNING STRATEGIES:

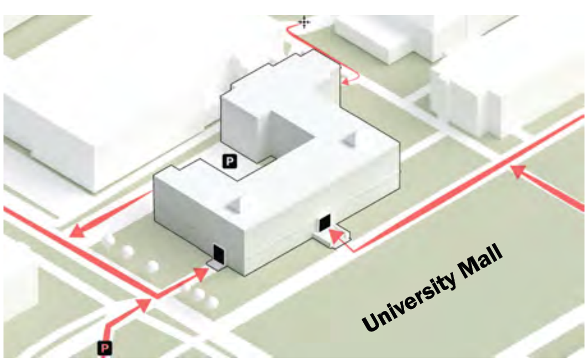
The Boardman Hall modernization wiil **amplify student success, equity, and community**. To achieve this vision, the design shall solve the accessibility challenge at north, south and west entrances, create opportunities for multidisciplinary collaboration, and utilize strategic programs to create a student centric hub

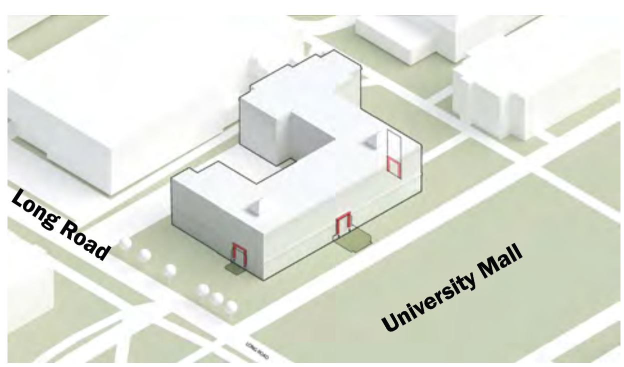
1. **Strategy 1:**

**Accessibility drives equity.** Providing a universally  accessibility facility is fundamental in bringing Boardman Hall into the next generation. Creating space for all to use and feel welcome is essential to its success.

Boardman Hall, built in 1949, like many buildings of its era, features a main entrance on the West façade with a grand stair leading to a mid-level interior landing. While this design is grand in its gesture of arrival, it excludes users needing an accessible entry. Additionally, as the campus has grown over the years, most pedestrian traffic entering Boardman Hall arrives either from Long Road to the North or from the Edward wing towards the southeast. Mid-level landings also encumber these secondary entrances. Despite these challenges, it is essential to maintain a front entry on the University Mall to welcome all of the campus into MCEC and celebrate Boardman Hall's historic façade.



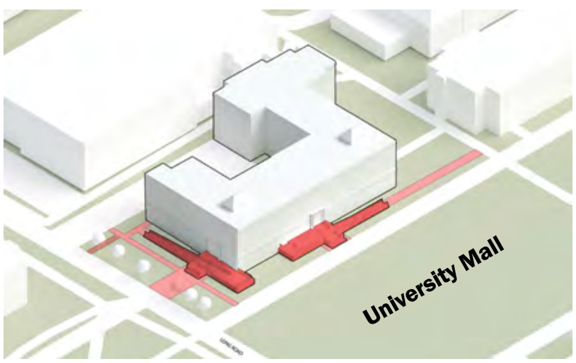
To solve the accessibility challenge in Boardman Hall while preserving its historic and aesthetic features, a comprehensive design intervention is proposed. The primary goals are to ensure accessible entry points, maintain the historic facade's significance, and improve overall building circulation. The following are specific suggested interventions:

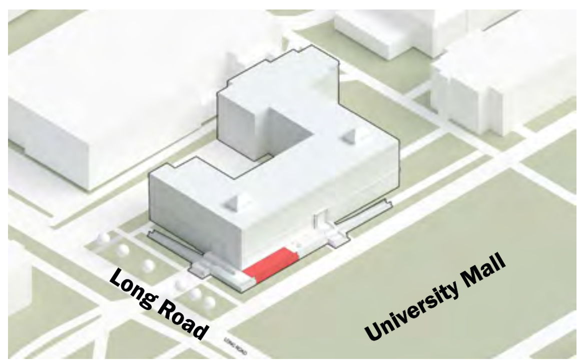
Accessible Ramp Design:

- A new series of accessible ramps will be integrated into the building's entrance layout. These ramps will connect the North and West entries via a plinth, which wraps around the Northwest corner of the building.
- The new entry point from Long Road (North) with the existing Llewellyn wing entrance (Southeast) caters to the majority of pedestrian traffic, reflecting the current campus layout and usage patterns with preserving the buildings historic gesture of arrival.

Plinth Integration:

- The plinth not only serves as a base for the ramps but also creates a strong, defined presence at the corner of the Mall, enhancing the building's visual and functional connection to the surrounding campus.




Interior Structural Adjustments:

- To ensure seamless access from the ramps into the building, the interior structural slab at both the North and West entries will be raised to match the level 1 condition. This modification will eliminate any steps or barriers at these entry points, making them fully accessible. However, this intervention renders the existing North egress stair nonfunctional, which opens up the opportunity to reconfigure the egress function.

- A new open communicating egress stair will be installed further into the building. This stair will provide visual connectivity across all levels, improving wayfinding and creating a more engaging interior space.

By implementing these changes, Boardman Hall achieves a balance between historical preservation and modern accessibility standards. The building becomes more inclusive, welcoming, and functional, addressing the needs of all users while respecting its architectural heritage.

**Strategy 2:**

**Create Opportunities for Collaboration.** To enhance the collaborative environment and modernize Boardman Hall, the following interventions are proposed:

New Open Stair at the North:

- A new open stair at the North entrance will provide vertical connectivity across all levels, encouraging interaction and collaboration among building users. This visual and physical connection makes it easier for people to meet and work together.
-

Removal of the South Egress Stair:

- The Llewellyn Wing addition brought a new egress stair and elevator to the far southeast of the building. Consequently, the original south egress stair is no longer required for egress purposes.
- Removing the south egress stair opens up the building vertically at the south end, creating an expansive, connected space that enhances collaboration and awareness through improved visual connectivity.
-

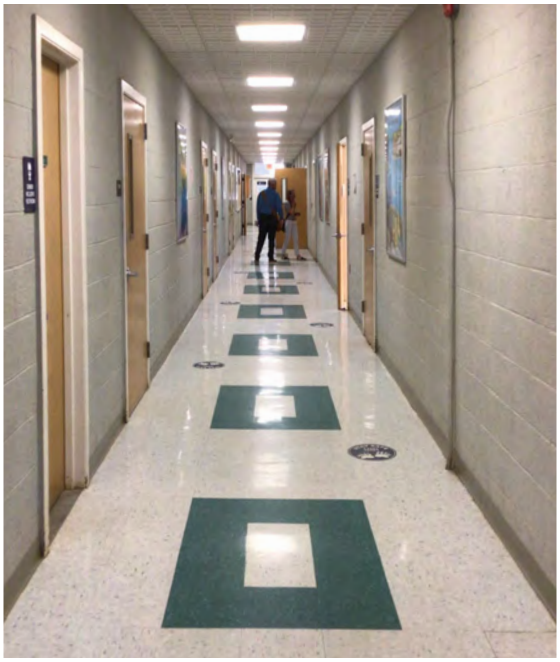
Shifting Circulation Corridors:

- To align with next-generation planning, the circulation corridors on the upper two levels will be shifted to the west of the column line.
- This shift optimizes office space on the west, allowing offices to be "right-sized" for their intended use, and frees up space on the east for a more dynamic and collaborative office environment.
-

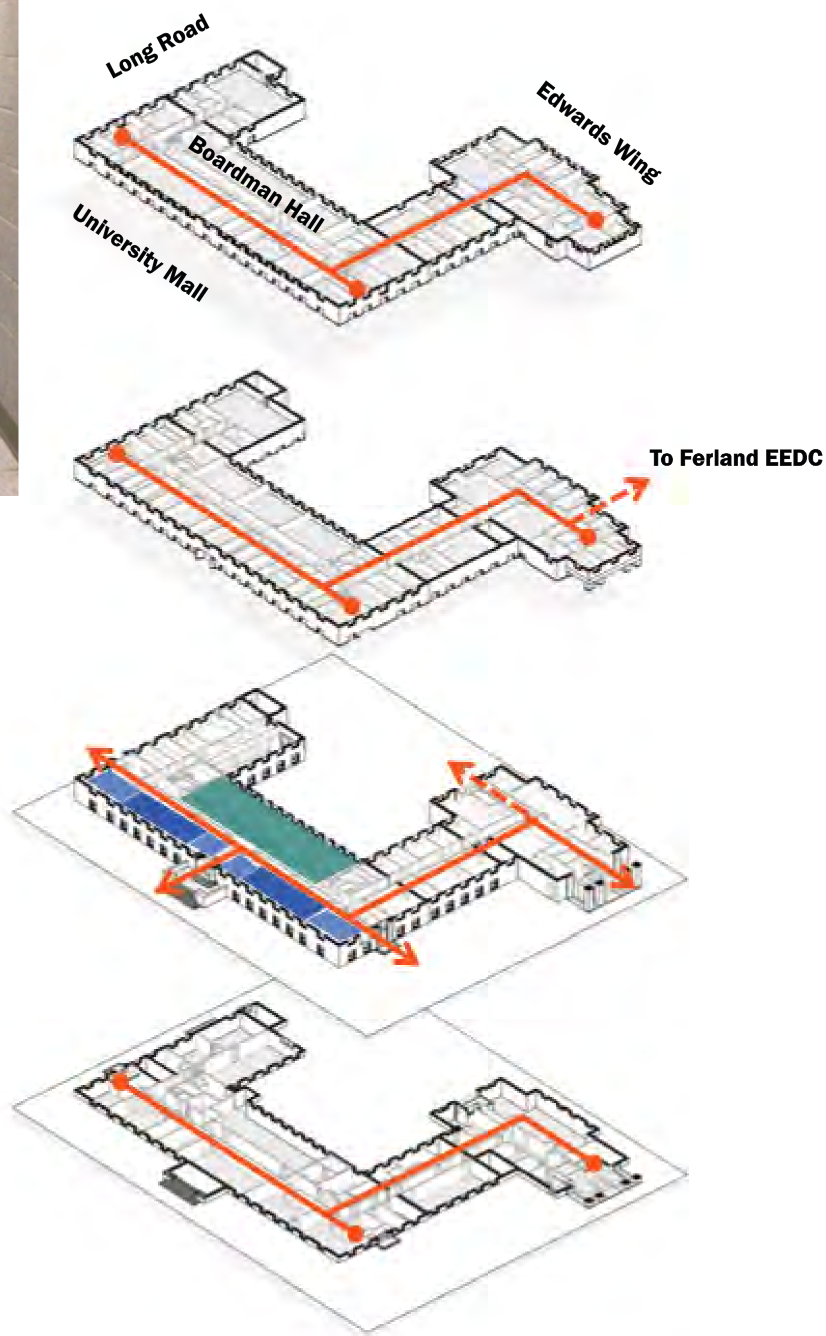
Utilizing Largest Structural Bays:

- The largest structural bays will be optimized for larger classrooms. These classrooms will be designed to accommodate modern teaching methods and larger groups of students, making the most of the available space.
- Adjacent to these classrooms, there will be dedicated student spaces that serve as ante spaces for students and faculty to interact before and after classes. These spaces will foster informal learning and collaboration.

**Above: Boardman Vision for Reimagined Level 1 Passage**



Above: Boardman Hall's typical corridor existing, Level 2.




Existing Building Circulation:

- Double loaded corridors
- Oversized, single occupancy offices (+140 sf
- No informal student collaboration
- Structure limits size of class / lab and office


MCEC
STUDENT SUCCESS AND ADVISING CENTER


MCEC
STUDENT


Opposite top: The new Student Success Center is the hub of the building. Here, students come to find information, meet advisors, and work together.

Opposite bottom: The Student Success Center is located at the crossroads of open circulation. A welcoming environment connects the historic west entrance and the University Mall to the north entrance along Long Road.

Above : A new strategic opening in the floor plate at the south end of the building allows for visual connection between the ground floor and second level. A community feeling and sense of belonging is enhanced for students, faculty, and staff.

Opposite top: As viewed from the end of Long Road and the University Mall, improvements to the north entry of Boardman Hall will provide universal accessibility. Modern openings at the north end of the building provide ample visual connection to the Student Success Center within, giving a sense of belonging even before students enter the building. A patio at the west side of the building, provides dynamic activity adjacent to the University Mall while contemporary fenestration controls west light and architecturally connects to the Ferland EEDC beyond, along Long Road.

Opposite bottom: Approaching across the University Mall, MCEC will have a vibrant new entrance through Boardman Hall in the historic entrance on the west. The south stair entrance is replaced with a bay window containing a two-story connector between the Student Success Center and the faculty offices and classrooms above. This enhances the gateway to Cloke Plaza between Boardman Hall and Williams Hall.

**Strategy 3:**

**Utilize Strategic Programs to Activate the Building.** Transform Boardman Hall into a vibrant, student-centric hub that serves as the new cornerstone of the MCEC Community, the following strategic programs will be implemented:

Create a Student-Centric Hub:

- The building will be designed to include all ancillary functions required to create a welcoming and supportive environment for students. This hub will be the focal point of student activity, providing various resources and services in one convenient location.

Re-locate College Administration:

- Relocating the college administration to Boardman Hall will centralize key administrative functions, making them more accessible to students. This move will facilitate better interaction between students and administrative staff, fostering a supportive environment.

## PROGRAM

**Program Goals for Enhanced Multidisciplinary Collaboration**

The success of creating enhanced multidisciplinary collaboration will hinge on implementing flexible planning strategies that allow for growth and provide a range of space types. These strategies are designed to support various activities and interactions, fostering a dynamic and adaptable environment conducive to collaboration across disciplines. The following space types are further defined in the tabular program and are reflected in the test fit plans.

**Classrooms:** There are three classroom types identified for the modernization of Boardman Hall. Classroom spaces should be simple and flexible.

- Active Learning Classrooms. Due to existing structural conditions, larger classrooms are limited to 28-30 seats for an active learning configuration. These classrooms will be optimized for active learning teaching methods and equipped with modern technology and flexible furniture to adapt varying pedagogies.
- Seminar Rooms: Seating 12-18 people, these rooms are intended for discussions, seminars and group projects, fostering a closer interaction between students and faculty.
- Multi-Purpose Classroom: Technology enhanced space supporting distance learning, group presentation or real world training. This space should be versatile and easily re-configurable for various training events, workshops, and collaborative activities.

**Class Labs:** Computer Labs should be designed for flexibility and adaptability as technology continually evolves. Infrastructure should support advanced technology integration with ample plug load considerations. The program identifies a range of computer laboratory section sizes from (8) to (42), largely a result of existing conditions. Note several of the spaces can be combined to create larger spaces if needed.

**Research Labs**: Specialized research labs are defined as spaces having particular equipment, infrastructure or space requirements for particular functions. These labs can be flexible and multi-disciplinary.

Offices: A variety of office space types will be created to accommodate different work styles and needs. This will include:

- Private offices for focused work requiring minimal interruption.

DRAFT

- Touchdown spaces for brief, informal work sessions.
- Huddle and meeting spaces for collaborative work and team meetings.

The tabular program identifies three office groupings for space allocation. The test show how office environments could be arranged to create the range of space types that will foster engagement and provide flexibility over time.

**Study:** A variety of study spaces are provided to accommodate a range of study and work habits. Quiet study spaces are often for more private focused work while informal collaboration spaces are open and social. Both functions work together to create an overall space which is comfortable and welcoming to all users. The Chez student space has been maintained and has historic importance as being a space owned by students. This program should be carried forward for the next generation of students to further define.

**Commons:** The Student Success Center is envisioned as the vibrant heart of Boardman Hall, serving as both an activator of the building and the new front door experience to the district. This program is designed to be lively and interactive, providing a student-centric hub of activity where students can meet friends, receive help on assignments, meet with advisors, and obtain essential information. Its success is crucial to the College’s mission of producing graduates and new technologies needed to move Maine’s economy forward.

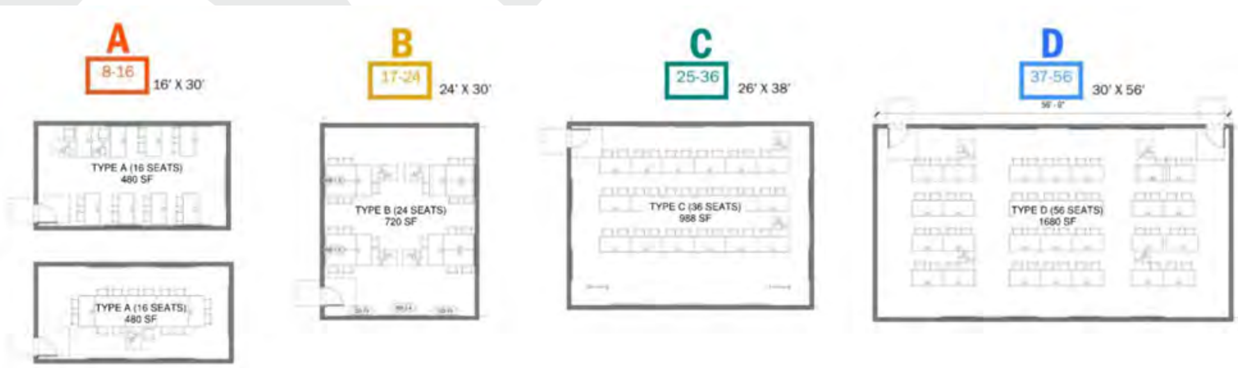
As part of the commons, a meeting room intended to accommodate sensory diversity could be considered. This space may have more intentional requirements specific to sensory sensitivities. This may include daylighting and task lights, ergonomic furniture with tactile finishes, a calming color palette, enhanced acoustical treatments or white noise machines, fidget tools or resources, or enhanced climate control.

By implementing these flexible planning strategies and providing a variety of space types, Boardman Hall will become a dynamic, adaptable, and collaborative environment. This transformation will support the multidisciplinary needs of students, faculty, and staff, driving innovation and success within the MCEC Community.

## PROGRAM SPACE TYPOLOGIES

**Right-sized for active learning classrooms**

The initial layout concepts shown below were used to dialogue on the expected class sizes and capacities for allocating available space in Boardman Hall. The program priorities by floor, determined the amount of classrooms could be present when weighed in relation to other space needs such as class labs, shared equipment, meeting rooms, common collaboration areas and offices,



## CLIMATE COMMITMENT APPROACH

The latest University master plan has made recommendations relevant to carbon emissions, energy sourcing, resilience, and carbon. The goals are an emissions reduction of 30% by 2030 and 80% by 2050. These targets require continued diligence with how facilities are operated and maintained. The study dialogue included visioning, campus, district, and building-scale approaches to move forward.

## BOARDMAN HALL WELLNESS & EQUITY AND SUSTAINABILITY

The Boardman Hall modernization will be focused on building community, supporting students, and reflecting the values of the Maine College of Engineering and Computer Science. As such, this work must be forward-looking reflecting the life of the hall into its second century of serving Maine. The challenges that will face society and not least its engineers and computer scientists include addressing social equity, well-being, and climate change. This study has these challenges knit into its fabric. The development of the design and construction of the building modernization will need to dive deeper and be more explicit about metrics for success and priority of strategies. Finally, performance should be tracked, and post-occupancy experience documented to continue the ongoing quality improvement.

### Equity and Well-Being

- Providing spaces for a wide range of activities, including individual to group interaction and supporting neurodivergency
- Putting student support and community activities up front, creating a visibly dynamic community
- Healthy Materials – selecting materials to prioritize fewer applied materials, natural materials, and avoiding chemicals of concern such as PFAS
- Recycled or reused materials should be utilized to limit waste and lower embodied carbon
- -Indoor Air Quality – prioritized dedicated outdoor air, “clean/filtered” air changes, and operable windows, providing connections to the outdoors and offering resilience
- -Lighting – optimizing glazing for visible light and daylight autonomy together with reducing glare
- -WELL Certification guidelines – utilizing wellness-oriented guidelines to provide benchmarking for spaces that suort individual wellness
- Selecting local/regional materials for their multiple benefits – reducing embodied carbon, supporting local economies, and supporting Maine communities.

# SUSTAINABILITY AND CLIMATE CHANGE

### Design for net-zero carbon

- Embodied carbon – the building will be reused, reusing investments in carbon (concrete, brick and block making, for example, and not discarding that except where significant value can be obtained by making strategic investments in the future
- Interventions will be limited and strategic. Concrete block will not be added unnecessarily
- Laboratories will be reused and updated as needed in the future
- Lightweight materials with low embodied energy will be preferred over carbon intensive materials or systems.
- Finishes and partitions will be a significant contributor to embodied carbon. Low carbon framing and board should be selected.
- A major contributor beyond finishes and partitions will be insulation, so these should be studied for overall net carbon impact.
- This modernization can be a leading demonstration of low embodied carbon by tackling embodied carbon of mechanical/electrical/plumbing systems as they will contribute more proportionally here than on a new building.
- Operational Carbon – Energy Efficiency
- The study envisions significant improvements to the building envelope through insulation, window replacements, and air sealing. The orientation is largely toward that mall, and while that façade has some deciduous shading from trees, detailing of west-facing windows should be studied for glass selection, exterior shading, and potentially electrochromic glazing.
- Active systems must not only be energy efficient, utilizing dedicated outdoor air systems and low energy systems for immediate operation, but also be ready to be incorporated into a campus-wide system for low temperature hot water and distributed chilled water off (future) heat pump technologies.
- Control systems should be provided to optimize the active systems
- digital control should provide maximal turn-down of systems
- HVAC controls should incorporate operable windows to avoid poor energy results or negative operational conditions, like having windows open while air conditioning is on.
- Setpoints should be localized and push to the efficient side of bandwidths (warmer in summer, cooler in winter)
- Radiant systems should be considered for greater comfort and wider temperature ranges.

**Water Conservation** – new fixtures will help reduce water consumption. Biogardens and planters, together with blue roof(s) can help reduce district stormwater challenges that otherwise might require additional civil stormwater systems.

### Performance Metrics

These are some of the metrics that might be considered.
We encourage the use of metrics to encourage compliance.

**Embodied carbon** - KgCO2eq/sm

**Operating energy** – kbtu/sf-yr

**Clean air** – filtered air changes per hour

**Materials without chemicals of concern** – Quantity or % of Material Cost

# ARCHITECTURAL NARRATIVE

## BACKGROUND

Originally named the "Engineering Building," Boardman Hall is 75 years old as of 2024. Sited and built in 1949, the building occupies a prominent northeast parcel bordering University Mall. With its elegant, classically inspired design featuring red brick and white limestone, Boardman Hall serves as the anchor and gateway building for the engineering district. The four-story building houses the Civil and Environmental Engineering Department, hosts various functions across the Maine College of Engineering and Computing (MCEC), and includes "The CHEZ," a popular student study lounge.

Above: A front (west-facing facade) view of Boardman Hall; c. UMaine Office of .

The building is named for Harold S. Boardman, a Bangor, Maine native and Civil Engineering graduate of the class of 1895. He began teaching at his alma mater in 1901, became the first dean of the University of Maine Technology College in 1910, and later served as UMaine's seventh president and first alumnus president, from 1926 to 1934. Boardman led the university through the social and economic challenges of the Great Depression. Despite severe funding cuts from the state and other sources, he managed to reduce tuition and boarding costs for students while improving efficiency and coordination between programs and colleges. During his tenure, Boardman oversaw the funding, design, and construction of the Memorial Gym and Field House in 1933, and Stevens Hall in 1934. He lived to see the dedication and first additions to the building named in his honor, passing away in 1969 at the age of 95.

## EXISTING CONDITIONS OVERVIEW

### Building Area

- The building has an area of approximately 64,800 gross square feet (GSF), as follows:
- Basement Level (B1): 16,609 GSF
- First Floor Level (L1): 15,906 GSF
- Second Floor Level (L2): 16,132 GSF
- Third Floor Level (L3): 16,132 GSF
- Roof Area (R4): 16,132 GSF, not included in building gross

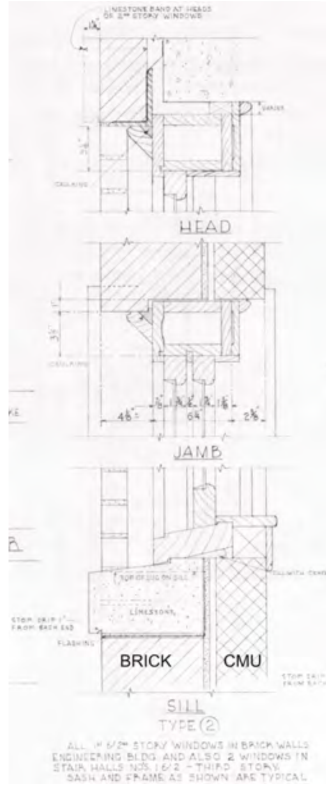
### Existing Structure and Building Elements

Boardman Hall has a steel-reinforced cast concrete footing and foundation substructure at the basement level, with reinforced concrete columns at the perimeter and on a regular internal grid along the corridors. These columns support 8-inch floors and a 7.5-inch roof slab. The above-grade superstructure features a load-bearing façade of stacked brick with natural limestone accents, including beltcourses, windowsills, and trim elements. The exterior wall thickness varies: in the basement, it is 4 inches thick and backed by a reinforced concrete wall; above the first floor, it consists of 8 inches of brick, a 1-inch air gap, and 4-inch cinder block load-bearing walls with reinforced concrete perimeter beams integrated with each floor slab.

The original 1948 drawings do not show insulation in the wall sections or window details, suggesting that the exposed cinder block walls in classrooms are original and that much of the building remains uninsulated. The third-story façade windows on the west side are bordered by limestone trim, with the outside stone jambs and some stone piers aligning with cast concrete structural columns behind them.


Above: A fish-eye view of Boardman Hall in winter; posted to UMaine's Facebook page

The exterior façade features double-hung, single-glazed, twelve-over-twelve divided-light wood windows with natural limestone window sills. These sills accommodate brick jamb returns with lug drops, a time-tested detail that functions well. Compared to modern standards, these existing windows are very energy inefficient. In most locations, the window lintels are steel relieving angles with lead-coated copper flashing beneath the brick, except for the continuous limestone band at the window head height on the first floor.

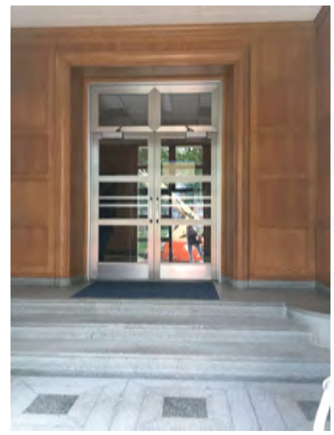



The building terminates in height with a lead-coated copper metal cap on a full-depth brick parapet rising approximately 4 feet above the roof slab. The drawings show a 1-inch thickness of roof insulation and a cinder concrete fill layer, pitching the roof t three roof drain locations with internal leader piping below. Two overflow scuppers are present on the back façade, east side, facing the courtyard. The roof hosts two mechanical equipment penthouses, labeled Fan Rooms No. 1 and No. 2, respectively. Each penthouse has a 6-inch cast concrete perimeter curb acting as a water dam and 4-inch cinder block walls rising to steel eave and roof framing. The penthouses are entirely clad in lead-coated copper, covering both the walls and roof.

During a construction tour of the Ferland EEDC, the design team observed Boardman Hall's roof, pictured below. Photo documentation suggests that the roof membrane may have been restored or replaced over time, but this does preclude a complete upgrade during the renovation. Lead-coated copper metal is visible on the interior face of the parapet wall as originally designed. The roof does not appear to have added insulation, evidenced by an unaltered scupper height. At some point, the lead-coated copper cap around the parapet and both penthouses was painted white, perhaps to encapsulate or mitigate the flashing material from further oxidation, and staining the brick and limestone.

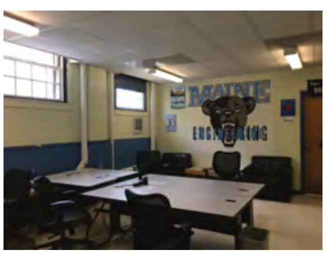
Exterior features unique to Boardman Hall include its elaborately designed main entrance. Approaching from the west at University Mall, the building is accessed by climbing two tiers of steps up to a mid-level granite plinth and passing through a timeless limestone archway. The single-stone portal header bears the building name while a distinctive wrought iron element adorns the stone and impression of a railing and occupiable balcony.

Tall aluminum and glass doors, standing seven feet high in an eleven foot opening, make way to reveal a terrazzo floor and a warm, wood-paneled foyer. Inside the vestibule, traversing its depth and ascending three final steps brings visitors to the first-floor level. Passing through one final set of doors, one arrives at the main foyer and primary corridor. The experience is further enhanced by the continuation of wood-paneled walls on both sides and front. A welcoming display case featuring highlights of the department's history now occupies this area.



## OBSERVATIONS ON EXISTING CONDITIONS

Boardman Hall is due for a comprehensive revamp, with expectations for significant improvements in nearly every aspect. While the MCEC leadership and the design team value its historic charm and the nostalgia it evokes in the UMaine community, the building currently lacks a youthful or contemporary feel, creating a disconnect between MCEC's goals and Boardman Hall's current state. Examples of outdated appearance and functionality are detailed below. Additionally, the design team has provided



Top Left: "The Chez", a popular student study lounge space.

Bottom Left: Detail of retrofit network wiring for devices below a chalkboard.

Top Middle: CIE (Alexander) conference room 101 table and seating.

Bottom Middle: Conference room displays projection screen and chalkboard

Top Right: Classroom 216, a student's view.

Bottom Right: A radiant heater cabinet in classroom 216, below the window

an in-depth analysis of Boardman Hall's existing conditions, including structure, mechanical systems, electrical and lighting systems, plumbing, and fire protection, in the appendix of this report.

The original building underwent expansions in both 1964 and 1991; the first replaced minor buildings and added north and south wings of equal depth and height, aligning all floors and roofs to create a recognizable three-bar "U" configuration. The 1964 expanded areas also lack insulation in the exterior envelope (foundation, walls, roof, windows, and doors), and accessibility issues exist. Matching the original western bar, the expansion

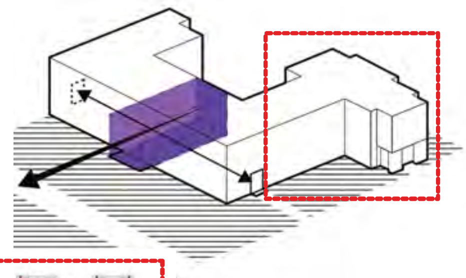
Above Left and Above Right: The north and south wing expansions (ca. 1964) highlighted in yellow color.

Above: The south-facing facade of Boardman Hall with UMaine's AISC sculpture featured in the landscape..

Middle:Right: An axonometric view of Boardman Hall with Llewelyn Edwards wing highlighted by dashed red box.

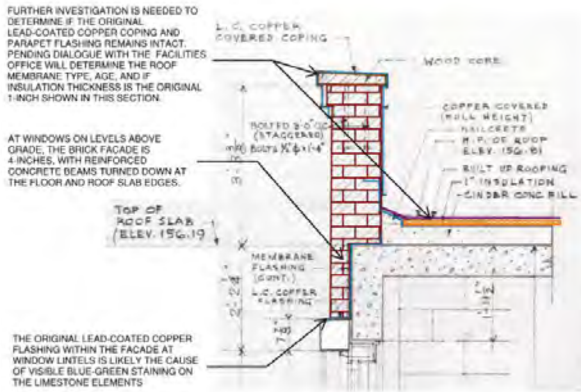
Middle Left: A plan view of the Llewelyn Edwards wing highlighted by dashed red box.

Below: A view of the Llewelyn Edwards wing's south-facing entrance during the construction of Ferland EEDC.

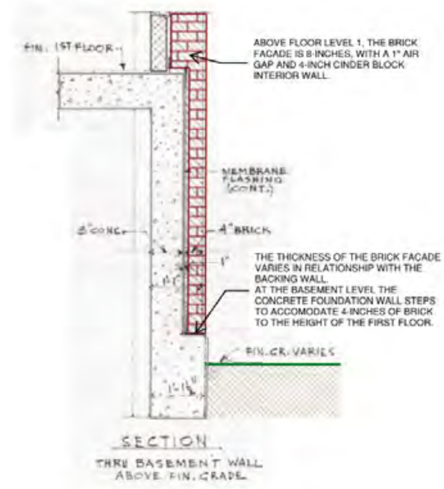


wings north and south have double-loaded internal corridors with walls of load-bearing block masonry. The exterior window pattern has little flexibility due to the perimeter concrete dropped beams and supporting column layout, making it structurally challenging and expensive to modify openings.

The 1991 Llewelyn Edwards addition, a hammerhead expansion added to the south bar (ca. 1964), is a different building structural and envelope approach, more modern in that it has insulation in the exterior walls and roof but still underperforming by today's standards. The aesthetics are in a postmodern style of the period evocative of the original classical-referencing design, with a few significant alterations. First, the architects introduce a full-height wall massing of glazed brick, grey in color, as a formal acknowledgment of the break between the older building and this addition. Material change as a signifier; the additional volume and materiality are not expected to blend or be mistaken for part of the original. This act of separation works to free the architects to change the exterior language of the building, and as a result, the addition has differing floor-to-floor heights, window sizes, brick coursing, and other features. The new masonry coursing does not align with the previous masonry, except at the bottom and top of the precast concrete belt course that aligns with the original limestone beltcourse.

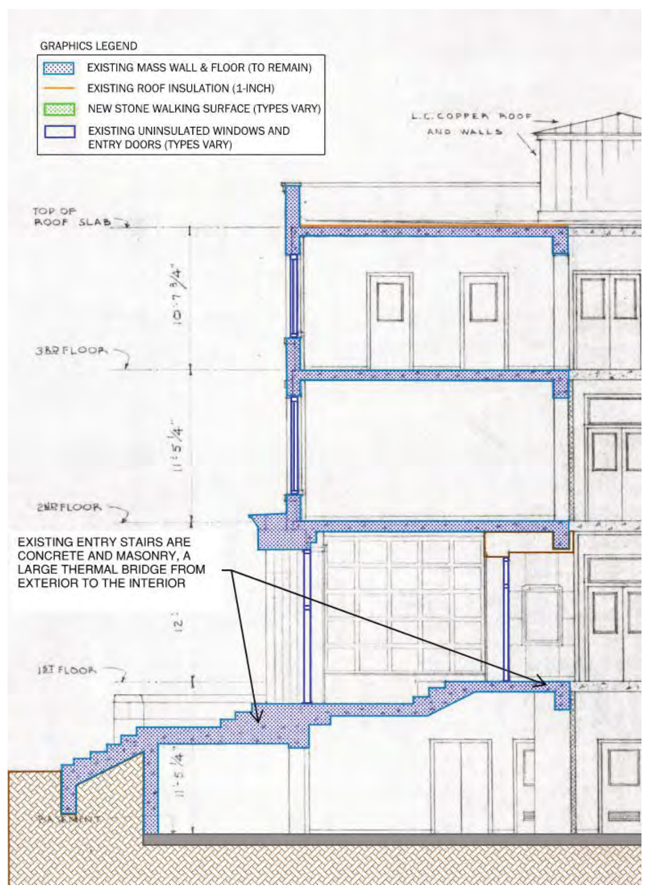



SECTION - THRU 3RD FLOOR
WINDOW ROOF AND PARAPET

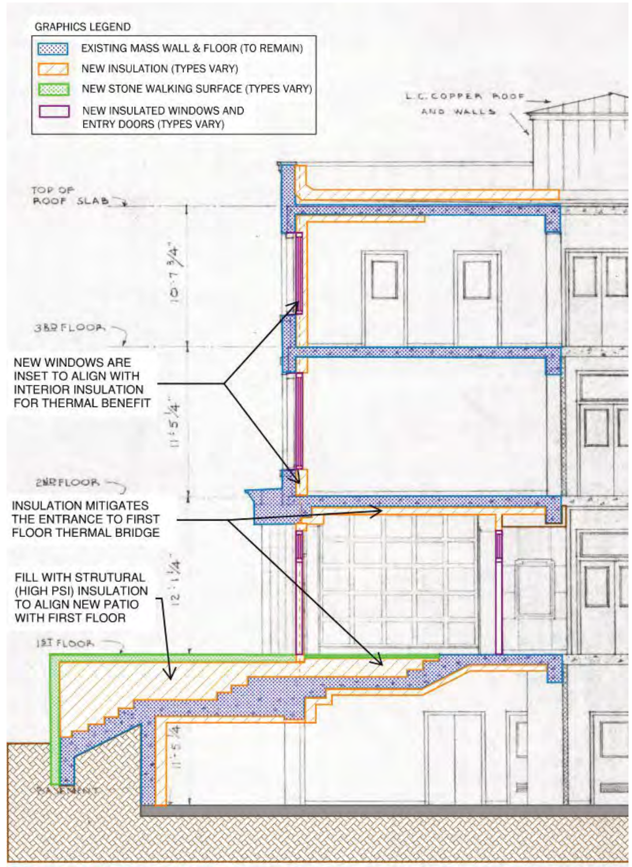



## EXISTING MASS WALL DESIGN

Mass walls offer two main energy benefits that help preserve exterior façades. Firstly, they act as thermal capacitors, slowly absorbing and releasing heat, which delays peak temperatures to later in the day. Secondly, they provide insulation, serving as thick dampeners. At Boardman Hall, the exterior mass walls have performed well for seventy-five years, thanks to diligent maintenance and the inherent qualities of mass walls. The maintenance team has consistently cared for the façade, as observed by the design team in 2021 during a campus walkthrough. This maintenance included inspection, cleaning, tuckpointing, and sealant repairs. Despite being partially covered in ivy, the façade has not absorbed significant moisture, as indicated by minimal mortar joint cracks and no widespread brick deterioration or spalling from freeze-thaw cycles.




Right: A cropped view of the original architect's drawings, a building section, showing a full-height cut through of the west-facing facade, roof, foundation and Level-1 main entryway. This view is looking north and highlights the substantial thermal bridges created by the mass of brick and stone envelope paired with a concrete structural system and stone plinth entrance stairwell.




Right: The same section view as above with supplemental graphics showing an approach to moderating thermal bridges through the strategic use of insulation. This diagram shows our design teams big-picture understanding paired with some early ideas about what may be possible within the project's budget parameters.

## RETROFIT APPROACH PRIORITIES

1. The deign team should utilize resources from within MCEC, the Office of Facilities Management, and the larger University of Maine collective to source Maine-based companies, products, and services for practical solutions to design challenges within Boardman Hall. The design team understands that there are many individuals within the UMaine collective that could offer insight as to products, industry connections, and local support for the rehabilitation of this building. For example, a University of Maine's Construction Engineering Technology Professor (Will Manion) is listed as an industry resource on the Passive House Maine's website.

2. Retrofit Boardman Hall to be as energy-efficient as possible, utilizing accepted Passive House and other best-practice design strategies in compliment with UMaine's Office of Facilities Management's guidance for maintenance and longevity of systems.

- Focus on air tightness
- Mitigate thermal bridges
- Improve insulating ability
- Minimize energy consumption wherever possible
- Balance fresh air ventilation with heat recovery
- Track the performance improvements, and share metrics to tell the story

3. Ensure that unsafe materials are responsibly removed, and that the new materials used in the retrofit of Boardman Hall have a low carbon footprint, are safe for the building occupants, and functional and durable for continued use over the decades of teaching and learning ahead.

# A POTENTIAL RETROFIT STRATEGY

## Façade Brick and Limestone (Masonry Restoration)

- Cut and point deteriorated mortar joints.
- Remove and replace cracked/spalled brick masonry units.
- Remove and repair brick/mortar at abandoned fasteners.
- Clean efflorescence and atmospheric staining.
- Acid wash down
- Architectural limestone banding & window sills may require some attention.
- Remove and replace any damaged lintels.
- New through-wall flashing where necessary brick or limestone is repaired.

## Exterior Façade Wall Assembly Interior Insulation (Preferred Approach)

- Passive House level insulation and materials tape and seal. Minimize thermal bridging wherever possible.
- Insulation on the inside of the brick and masonry unit façade
- Assembly from exterior is as follows: New interior wood stud wall, AVB, and Service Cavity with overall R-Value of >R-30. In the detail shown below, the “Brick wall” is our brick façade, 1” mortar/air gap, and unit masonry backer together.
- Assembly from exterior: Existing 4-8” Brick Façade to remain (varies slab edge dropped beams and the basement foundation); Existing 1” mortar gap; Existing 4” Masonry Unit (restore where compromised); New 2” thick TimberBoard (R7); New dimensional lumber framed-walls, 2x6 (5.5” nom.) wood studs full height to underside of structure above. Fill stud cavity with continuous Timber Batt (R22) insulation between wood studs; New Intello Plus air-vapor barrier continuous, taped; New 2x3 battens run horizontal providing service cavity, fill with Timber Batt (R10); New 5/8” MR-Gypsum Wall Board; New Paint layer; New or salvaged wood base moldings to match historic conditions. The detail below described the intent.
- Interior insulation overlaps across the underside of the roof slab at underside 8-10’
- Possible exploratory to evaluate as-built condition and materials of exterior wall construction.
- Engage a consultant for guidance on hygrothermal testing of the brick

## Exterior Façade Wall Assembly Interior Insulation and Air Vapor Barrier (Products)

- Timber HP, American wood fiber products (local to this region of Maine)
- Air and vapor barrier: Intello Plus or equal

## Roof Assembly Retrofit to improve upon heat retention/prevention, and remain water tight.

The cost estimate assumes a whole-roof replacement including improvements to the insulating ability, retaining heat inside, and seal all penetrations for water and air tightness. Boardman Hall may also be able to host a blue roof, retaining a specific amount of rainwater on the roof helping to insulate the building. When combined with light-colored roofing materials, blue roofs can be especially effective at reducing cooling costs. The stored excess rainwater of blue roofs both evaporate over time or slowly release it into drains, which can relieve pressure on campus drainage systems. Roof scuppers are anticipated to remain as the backup strategy for relief of water from the roof surface, although they may be relocated or raised.

## Roofing Materials (Membrane, Edge)

- Replace the current roof drains leading to internal leader piping down.
- New weighted R-Value of R-50 built-up roof insulation; 6" thickness of insulation minimum (10" average thickness). The Roof Insulation is to be green polyisocyanurate, with coverboard and high-albedo membrane system above all sloped to the roof drains.
- New insulation will appear below the roof slab as well; 2" thickness of TimberBoard (R7) insulation is to extend 10'-0" out at the underside of roof slab from the down-turned beam at the perimeter to mitigate thermal bridge effects; see building sections below displaying the current conditions and potential new wall and roof conditions.
- Remove and replace roof metal, including flashings, edge metals, roof gutters, and leaders.
- Maintain scupper overflow relief.
- Flash the new roofing membrane up vertical penthouse walls, onto curbs at doors, and up the parapet to a minimum of 12", using cove blocking, and continuous retaining bar securement.
- New vertical surface waterproofing barrier is to be compatible, and overlap the continuous roof membrane and entire parapet beneath the coping cap.
- Replace all roof metal, including edge, parapet, and scupper flashing, and provide pre-aged copper, or similar painted metal to maintain a historic appearance.
- Fan Room penthouse exterior cladding, and elevator penthouse restoration is to be determined through dialogue with the Facilities Office and administration during the design process.

## Windows & Doors Replacement to improve upon thermal transmittance (U-Value), and air tightness.

The cost estimate assumes a whole-building window and door replacement to improve insulating ability, which includes new gaskets, sweeps, and seals to mitigate unintended air penetration into Boardman Hall. By addressing these large penetrations, the design team intends to significantly increase the air-tightness of the building as a holistic strategy, with the potential to be informed by goal setting, diagnostic testing, and metrics on the improvements.

- The main building will have a full replacement of the windows: The typical will be a single-hung sash, with triple-pane, Low-E coating, and argon or other high-performance gas. These windows may also have aluminum-clad two-sided simulated divided light muntins to match existing historic 12-over-12 pattern.
- Exterior Level 1 (Student Success) Typical full-height window at the will likely be three glass lites tall and a fixed spandrel panel below starting at 12" above Level 1 sill/curb, and up to counter height at 36" (24"); middle section is a tall clear active leaf from 36" A.F.F. (60"H) to 96" A.F.F., transom lite from 96" (24") to 120" A.F.F. at Level 1.
- Exterior Level 1 (Student Success) Glass: Triple-pane tall casement windows, Low-E, high performance, with tilt-and-turn hopper and swing door opening.
- Brand: Oknoplast, Intus or similar european style tilt and turn model by US-based manufacturer dependent on cost, performance, and carbon impact
- Color of frames and mullions: Oil Rubbed Bronze color with oxidized patina wash, 3-coat Kynar liquid paint finish or equal.
- Exterior Level 1 (Student Success) Glass: Select areas of spandrel glass, interior face ceramic coat (or insulated shadow box) depending on cost
- Typical full-height window exterior Level 1 Student Success, west side only: Single vertical perforated metal fin shading device; anchor to mullions at 36" (low) and 96" (high). Match window system Oil Rubbed Bronze color with oxidized patina wash, 3-coat Kynar liquid paint finish.

- Level 1 Entrance Vestibules (North and West) have a minimum of 10’-0” walking depth, with a stainless steel recessed scrape-and-dry walk-off grille. Each vestibule There will be surveillance cameras and intercom at the vestibule, as well as ADA push-button and FOB after-hours access.
- Level 1 Entrance Doors are an air-lock vestibule; Oldcastle custom “glass box” solution; See attached shop drawings from Hudson Exchange project as basis of design. Doors and hardware are CRL-Blumcraft® Oil Rubbed Bronze 1301 Entry Door 3/4" Glass w/Overhead Closer - Entry with Panic; 12” Oil Rubbed Bronze Double-sided Toe-kick , sweeps and gaskets to seal.
- Level 1 Entrance Doors have magnetic pad lock-and-release and Fob access from exterior and vestibule. An ADA automatic door opener: recessed pivot by Tormaxx (heavy duty for high winds) or similar, with push button actuators on pedestal at both sides of both sets of doors (exterior, vestibule, interior) so that air lock functions without both doors open at same time.
- Interior Glass Coatings / Sandblast or Acid-etch areas, 2/3 of total height and full-width including glass doors, at all conference rooms and classrooms
- Float glass is to have options of semi-reflective coatings to resist solar heat gains (Colors)
- Replacement of Laboratory overhead coiling doors (Basement Level, east side) with new insulated and gasketed doors of a similar type is expected.

Projected Bay at Level 1 - Quiet Study along the south façade:

- Triple-pane, Low-E, butt-style structurally glazed, curtainwall system.
- Basis-of-design product: 2500 UT UNITWALL® SYSTEM
- Metal panel cladding at bay parapet, bay roof aligns with Floor Level 3
- Insulated green roof with internal drainage, bay roof aligns with Floor Level 3
- Metal panel cladding at sill and insulated underside, Floor Level 1 and below.

## SUMMARY

The existing architectural systems of Boardman Hall, its more recent addition and the Edwards wing will need careful and detailed consideration for several technical challenges to modernizing the building.  The need for high performance building envelopes to support low carbon requirements together with creating comfortable interiors that support health and wellness must be balanced with modifications to the thermal and moisture regimen of the envelope so that the integrity of existing masonry is not compromized.

The historic fabric of Boardman Hall must be carefuly maintained and enhanced to support the updated image of MCEC and its role in aiding Student Success.

# Building System Narratives

# SCHEMATIC PRICING REPORT

## University of Maine
## Boardman Hall

**Orono, ME**

**Project No: 24020**

**Submitted by:**
**SMRT Architects & Engineers**
**March 25, 2024**
**smrtinc.com**

## TABLE OF CONTENTS

## STRUCTURAL

### Overview

For a total project description, refer to the Architectural Sections of this schematic design narrative. The project consists of a three-story education building of approximately 41,000 square feet in Orono, Maine.

### Scope

The existing original building constructed in 1948 is a three-story concrete structure with a basement level. The basement level is a 4" thick reinforced concrete slab on grade with foundation retaining walls as the exterior wall. The framing for the subsequent floors and roof level are constructed of concrete columns and beams supporting an 8" one way spanning concrete structural slab.

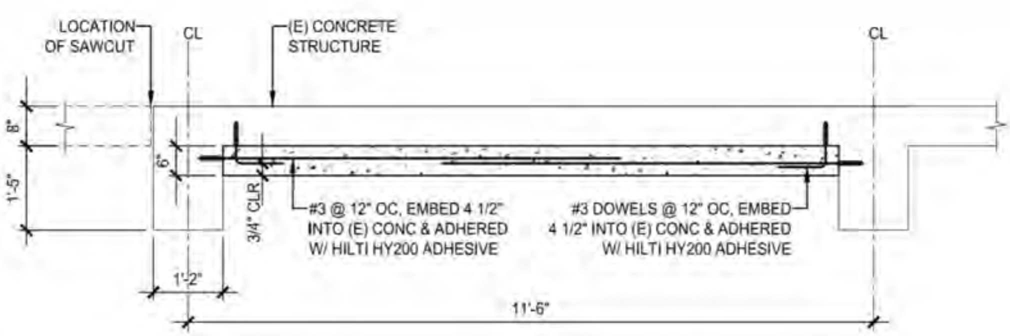
A three-story addition consisting of steel structure with a basement level was constructed in 1990. The basement level is a 4" thick fiber reinforced concrete slab on grade with foundation retaining walls as the exterior wall. Framing for the subsequent floors and roof level are constructed of steel columns and beams with open web bar joists supporting a 1" metal deck with 3 ½" of reinforced concrete.

The structural scope of the renovation consists of new floor openings for a full height staircase, new openings for duct chases, slab penetrations for bathroom plumbing, removal, and infill of two existing full height stair locations, new front entrance porch, support of rooftop mechanical units.

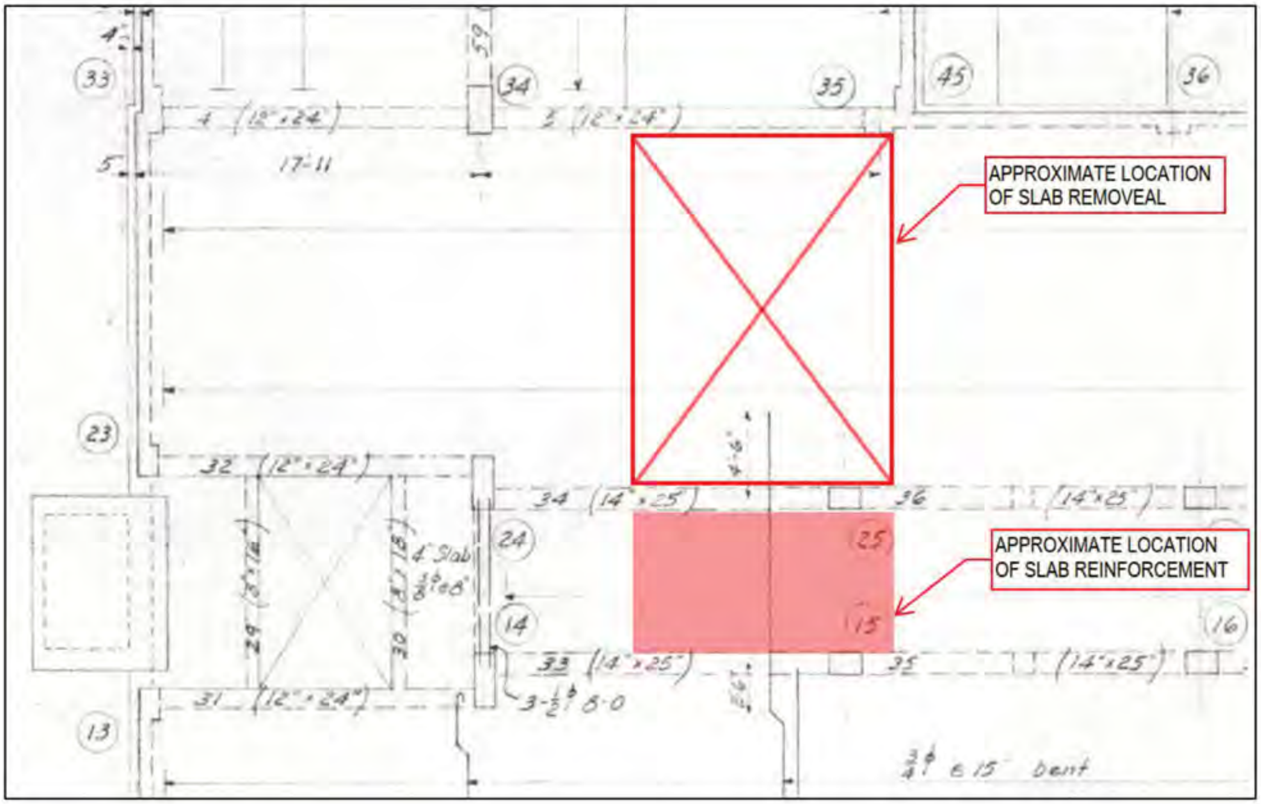
Due to the small scope of structural work required to the building and the geometry of the buildings renovations it is not required for the buildings lateral system to be upgraded.

#### Floor Opening for New Stair

The existing 8" continuous concrete slab will be required to be sawcut and removed at the new stair location. Extents of the saw cutting will be from the face of the existing hallway beams to the interior face of the concrete beam at the exterior wall. Removal of the slab will require reinforcement of the adjacent slab. Reinforcement can be achieved with either the below detail or application of a FRP composite carbon fiber skin to the underside of the slab at the stair location.




FLOOR REINFORCEMENT AT NEW STAIR (1)
1/2" = 1'-0"

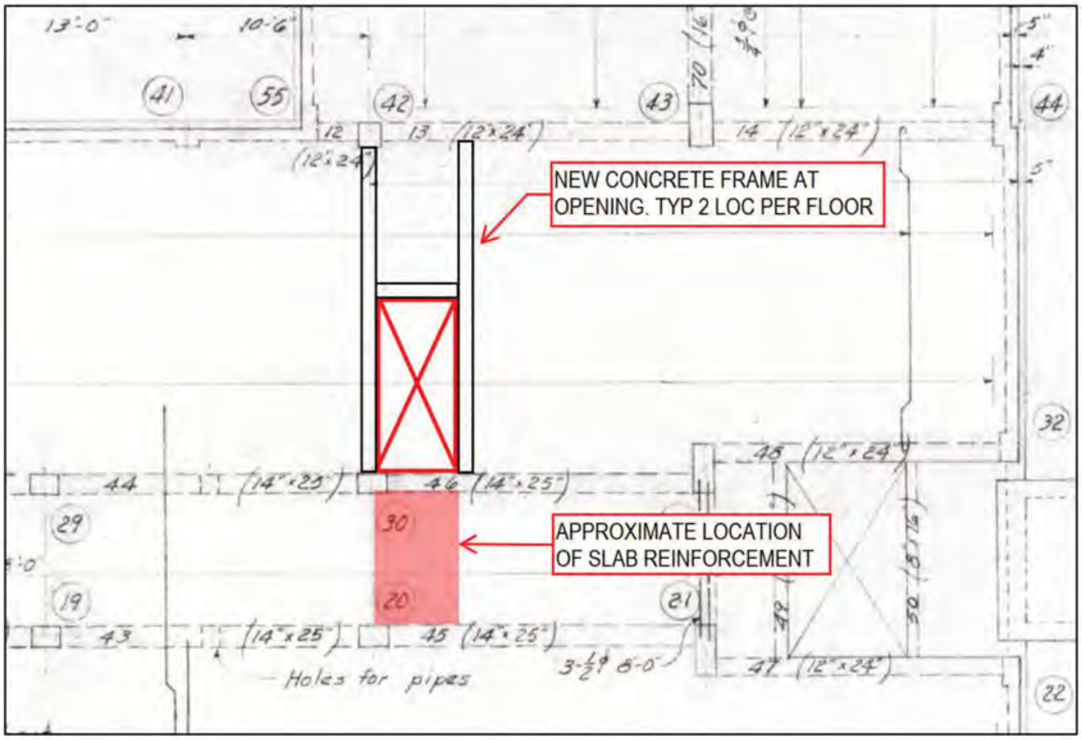


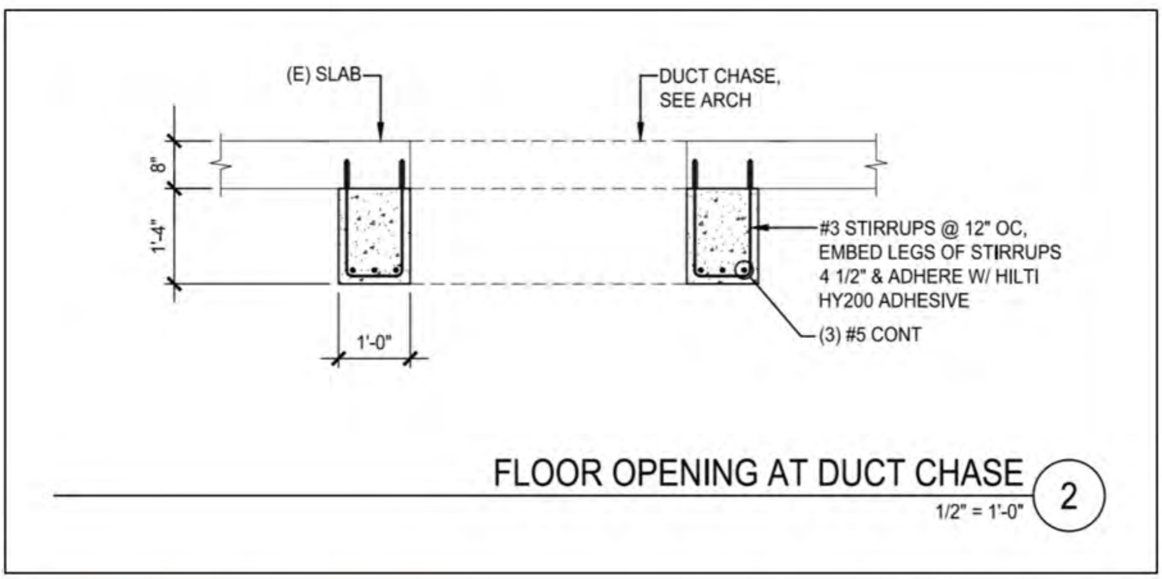

### New Stair

The new stair structure will be constructed from architecturally exposed structural steel (AESS) stringers and columns. The stair structure shall be independent from the existing building structure. Four new 5'-0"x5'-0"x1'-0" reinforced concrete footings will be required beneath the new columns. The top of footing elevation will be 1'-0" below the existing slab. Existing slabs will be required to be sawcut and removed, then replaced once the stair construction is complete. Dowels will be required to be drilled and adhered in the existing slab.

### Floor Openings for Duct Chases

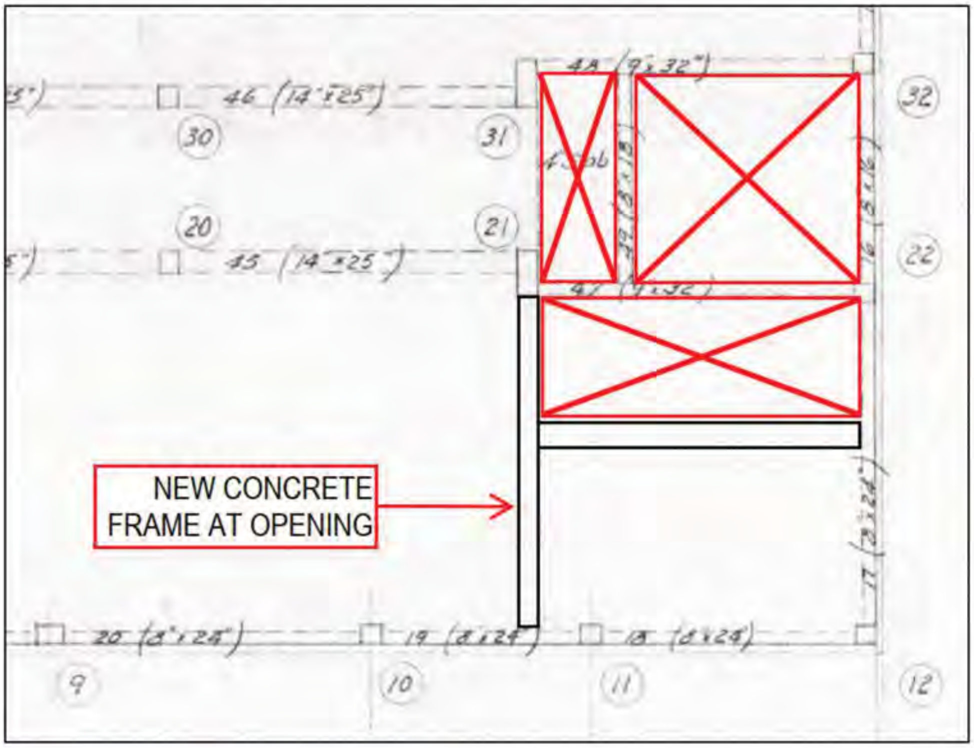
A portion of the 8" concrete structural slab span will be sawcut and removed to provide two new duct chases per floor. The existing slab will require support at the perimeter of the slab opening. A new 12"x16" cast in place concrete beam frame on the underside of the slab will be required on the 3 sides of the slab that is unsupported. The contractor will be required to dowel into the underside of the existing slab to place reinforcement. Similar to the stair opening requirements, the span of slab beneath the existing corridor will require reinforcement. This will be required at both duct chases at all levels.




### Slab Opening at Double Height Space

A portion of the 8" concrete structural slab span will be sawcut and removed to provide a new double height space. The existing slab will require support at the perimeter of the slab opening. A new 12"x24" cast in place concrete beam frame on the underside of the slab will be required on the 2 sides of the slab that is unsupported. The contractor will be required to dowel into the underside of the existing slab to place reinforcement.




### Wall Opening at Double Height Space

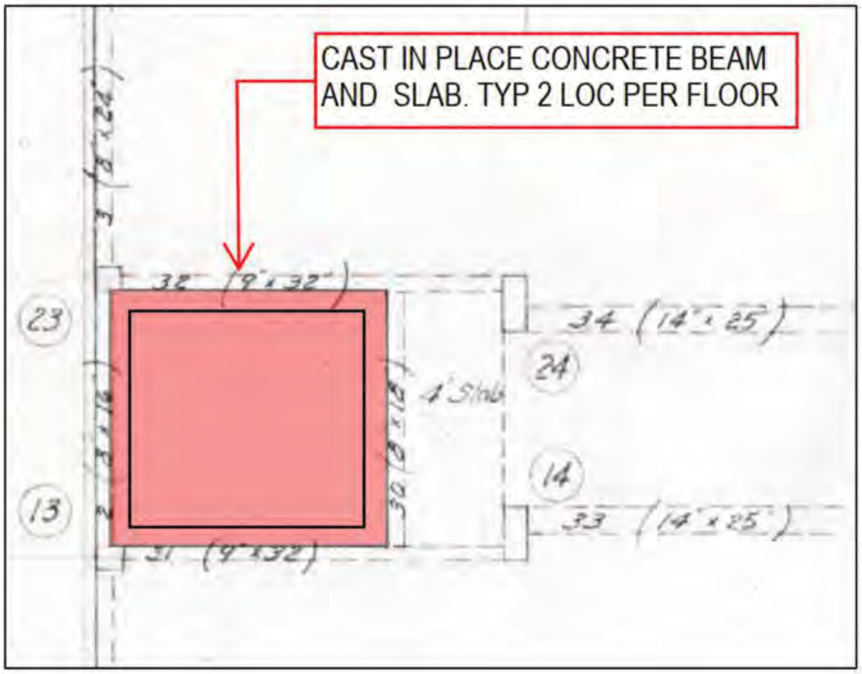
The double-height wall opening at the South side of the building will require demolition of the existing non load bearing structure. Existing brick will be required to be supported with a new lintel for the enlarged window opening. The opening is too large for a loose lintel, therefore a lintel hung from the existing structure will be required to support the existing brick. Existing building frame members (columns and beams) will be required to be kept. Concrete foundation wall extends up to the 1st floor framing level and be required to be saw cut, locations supporting the building structure will be required to be untouched.

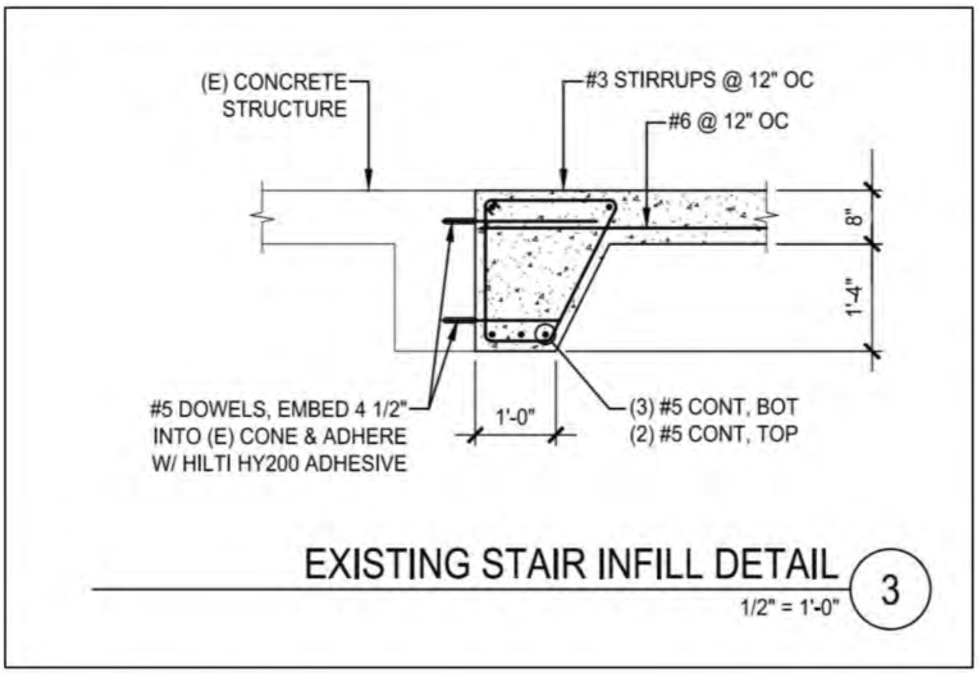
### Bathroom Plumbing Floor Penetrations

Plumbing penetrations will be required to be coordinated with the locations of existing concrete reinforcement. Prior to coring of slab, nondestructive testing will be required to verify the location of concrete reinforcement. Slab cores for plumbing will be required to be located between reinforcement locations.

### Existing Staircase Infill

Existing stair locations to be infilled will require new reinforced concrete structural slab to be cast in place. A new perimeter beam will be cast adjacent to the existing beam, dowels will be used to connect the new beam to the existing beam. An integral reinforced concrete slab will be installed to provide a walking surface at those locations. This detail will be used at all floor levels at both staircases.



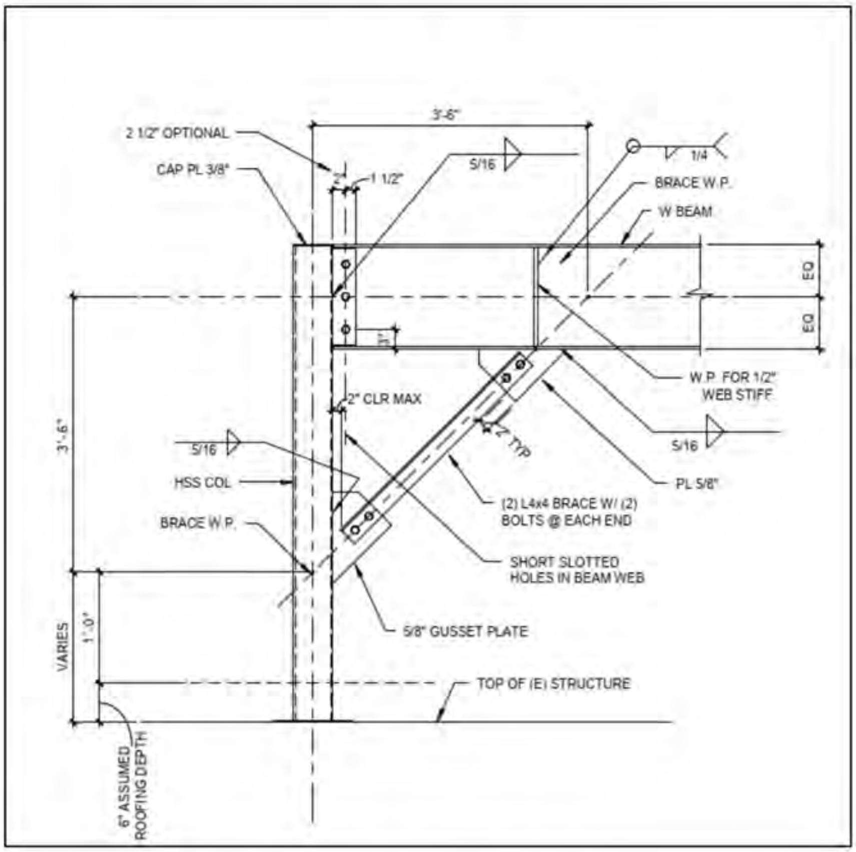

### Entrance Porch

The new entrance stairs and ramp will be cast in place reinforced concrete. The walking surface will be 4" thick reinforced concrete slab with welded wire fabric and bear on structural fill. Foundation wall will be 8" thick and reinforced with #5 rebar @ 12" on center, footing will be 3'-0" wide by 1'-0" thick and be reinforced with #5 rebar at 12" on center each way. The bottom of footing should align with the existing building footing elevation (Approximately 7'-0" below grade) to not induce additional surcharge load on the existing structure. Footings adjacent to the existing footing will require doweling. Infilling the existing basement windows with masonry will be required at these locations, masonry shall match the existing size, shape, and finish.

### Rooftop Mechanical Equipment Support

Care should be taken to limit the weight added to the existing roof, snow loads have increased since the building has been constructed and it is not anticipated to have much additional capacity in the slab and beams. Locating the units on the ground or basement level would be the optimal location for them based on the structure.

If rooftop units are required, new dunnage platforms will be required for the DOAS systems so that the structure does not become overloaded. Four dunnage posts per platform will be located above the existing building column locations, post installed epoxy anchors will be used to fasten the post to the existing structure. Structural steel wide flanges will span between the post locations. All steel exposed to the environment will be hot dipped galvanized. The top of steel at the dunnage platform will be approximately 4'-0" above the roof structure. If required, a walking surface will be covered with 1 ¼" galvanized bar grating with an OSHA approved guardrail and stair where needed.




## Applicable Codes, Standards and References

### Governing Building Codes

- 2015 Edition of the International Building Code (IBC 2015)
- Maine Uniform Building and Energy Code

### Structural Design Codes/Provisions

- Minimum Design Loads for Buildings and Other Structures, ASCE 7-10

### Concrete Design

- Building Code Requirements for Structural Concrete, ACI 318-14

### Steel Design

- Specification for Structural Steel Buildings, AISC 360-10
- SDI Steel Deck Institute

## Design Criteria

### Live Loads

As required by the code, the structure shall be designed with the following live load criteria:

| | |
|---|---|
| • Slabs-on-grade, stairs, first floor corridors | 100 PSF |
| • Corridors above first floor | 80 PSF |
| • Offices | 50 PSF |
| • Classrooms | 40 PSF |
| • Laboratories | 60 PSF |
| • Ground Snow Load | 80 PSF (Drift as applicable) |
| • Flat Roof Snow Load | 62 PSF |
| • Partition allowance | 15 PSF |
| • Handrails | 50 PLF any direction, 200 LBS conc. load |

### Wind Load Requirements

Wind loads shall be in accordance with the requisite provisions of ASCE 7

| | |
|---|---|
| • Basic Wind Speed | 115 MPH |
| • Risk Category | II |
| • Exposure Category | B |
| • Internal Pressure Coefficient | +/- 0.18 |

### Seismic Load Requirements

Seismic loads shall be in accordance with the requisite provisions of IBC 2009 and the Maine State Building Code.

| | |
|---|---|
| • SDS | 0.223 g (to be confirmed) |
| • SD1 | 0.121 g (to be confirmed) |
| • Site Class | D (assumed, by geotechnical report) |
| • Risk Category | II |
| • Importance Factor | 1.0 |
| • Seismic Design Category | B |
| • Analysis Procedure | Equiv. Lateral Force |
| • Basic Seismic Force Resisting System | Ordinary reinforced concrete moment frames |

| Dead Loads | Unit Weights |
|---|---|
| • Normal Weight Concrete | 150 pcf |
| • Soil | 130 pcf |
| • Mechanical, Sprinkler and other hung items | 5 psf |

### Deflections/Performance Requirements for Beams

| | |
|---|---|
| • Due to total load: | 1/240 of span |
| • Due to live load only: | 1/360 of span |
| • Due to snow load only: | 1/240 of span |
| • Exterior Members | L/360 of span or 0.75" max |

## Materials

### Concrete

| | |
|---|---|
| • Foundation Walls: | f'c=3,000 psi air entrained |
| • Spread Footings | f'c=3,000 psi air entrained |
| • Interior Slabs-On-Grade and Elevated Slabs | f'c=4,000 psi |
| • Exterior slabs and other exposed concrete | f'c=4,500 psi air entrained |
| • All Other Normal Weight Concrete: | f'c=4,000 psi |

### Reinforcement

| | |
|---|---|
| • Reinforcing Bars: | ASTM A615, Deformed |
| • Welded Wire Fabric | ASTM A185, Plain-steel |

### Structural Steel

| | |
|---|---|
| • W-shapes | ASTM A992, fy=50 ksi |
| • Tubes, square, rectangular: | ASTM A500, Gr C, fy=50 ksi |
| • Tubes, round | ASTM A500, Gr B, fy = 42 ksi |
| • Pipe Columns: | ASTM A53, Gr B, fy=35 ksi |
| • Channels, Angles, Plates | ASTM A36, fy = 36 ksi |

### Connections

| | |
|---|---|
| • High-Strength Bolts | A325N or A490N |
| • Anchor Rods | F1554 Gr. 36 U.N.O. |
| • Weld Electrodes | E70XX |
| • Shear Stud Connectors | A108 |

## Special Inspection Requirements

Structural special inspections shall be performed by a special inspector in accordance with the requirements of Chapter 17 of the 2015 International Building Code. The type of work to be inspected shall include the following at a minimum:

- Foundations
- Concrete Reinforcing Steel
- Cast-in-Place Structural Concrete
- High-Strength Bolts
- Structural Welding
- Post-Installed Anchors

## FIRE PROTECTION

### System Design

For the overall project description, refer to the architectural sections of this schematic design narrative. The existing building is partially sprinklered, with the 1990 Llewelyn Addition having automatic sprinkler protection, and the original 1948 construction un-sprinklered. Sprinkler systems shall be modified as required for planned program changes in the 1990 Llewelyn Addition. The 1948 original building will be provided with a new sprinkler system. The sprinkler system shall be designed per the codes and standards listed below, as well as the owners insurance carrier, FM Global.

Installing fire protection contractor to provide full hydraulically designed systems, including permits, drawings, and calculations per the requirements of NFPA 13, NFPA 14, FM Global and the authorities having jurisdiction. The contractor shall conduct a flow test to serve as the basis of system designs. Designs shall bear the original wet stamp and signature of a Registered Professional Fire Protection Engineer or NICET Level IV certified designer.

The Llewelyn Buidling is served by a 6" fire service. The existing sprinkler main will be extended to serve the original building, and a minimum of a 4" standpipe riser will be provided in each stairwell (typical of 4). Fire hose connections will be provided on each floor level. Two (2) of the standpipe risers will be combination sprinkler/standpipe with floor control valve assemblies for each floor. Each floor's sprinkler mains will be looped together to help reduce sprinkler main sizes on each floor.

Complete sprinkler coverage will be provided throughout the building as required by code. Wet pipe sprinkler systems will be zoned by floor, using floor control valve assemblies, (FCVA). Systems are to be hydraulically designed for Light and Ordinary Hazard densities, per NFPA 13 requirements. Fire protection systems will be seismically braced. The sprinkler system will be primarily wet pipe, with the following exceptions:

- Exception #1: In areas subject to freezing, shall be provided with dry-pipe systems.

### Piping Material, Joining Methods, and Sprinkler Heads

Piping materials shall be as follows:

- Project materials to be UL listed and FM approved for their intended use.
- Wet-pipe sprinkler, 2-inch and smaller; Schedule 40 steel with iron fittings and threaded joints.
- Wet-pipe sprinkler, 2-1/2-inch and larger; Schedule 10 steel with steel fittings and grooved joints.

Sprinkler heads to be commercial, quick response type with the following styles:

- Provide upright sprinkler heads with brass finish in areas without ceiling.
- Provide semi-recessed pendent sprinkler heads in areas with ACT ceiling.
- Provide concealed sprinkler heads with white cover plates in areas with gypsum ceiling.
- Sprinklers in areas subject to freezing shall be dry-barrel type to prevent accumulation of water.
- Custom color sprinkler heads to be provided in areas with non-white ceiling finishes.

### Annunciation

Fire Protection systems will be fully supervised by the facility fire alarm system, which will annunciate at the control panel which is anticipated to be located within the new mechanical room, with a remote annunciation panel to be located near the fire department connection. The pre-action system detection devices will provided by the fire alarm contractor. Fire protection contractor to provide pre-action control panel.

### Codes

- IBC International Building Code, with Amendments, 2015 Edition
- NFPA 1 Uniform Code, with Amendments, 2018 Edition
- NFPA 13, Standard for the Installation of Sprinkler Systems, 2016 Edition
- NFPA 13, Standard for the Installation of Standpipes, 2013 Edition
- NFPA 101 – Life Safety Code, 2018 Edition

### Standards

- UL – Underwriters' Laboratories
- ASME – American Society of Mechanical Engineers
- NFPA – National Fire Protection Association
- ANSI – American National Standards Institute
- ASHRAE – American Society of Heating, Refrigerating, and Air Conditioning Engineers
- ASTM – American Society of Testing and Materials
- NEMA – National Electrical Manufacturers' Association
- NEC – National Electrical Code
- FM – Factory Mutual
- ASTM – American Society for Testing and Materials
- OSHA – Occupational Safety and Health Act
- NEMA National Electrical Manufacturer's Association

## HVAC

### Systems Overview

The existing HVAC systems serving Boardman Hall shall be demolished in their entirety. The building is currently served by a 3" and 4" diameter high pressure 50 PSI steam supply lines. Steam is supplied from the campus central steam plant. Once inside the building, the steam is converted to low pressure 5 PSI steam. There is distributed finned tube in the building, some are served by steam and some hot water. There are also cabinet unit heaters in the vestibules and stairwells. Existing condensate pumps are currently in use. There are several exhaust fans located in the penthouses serving the general bathroom exhaust. All these existing systems and equipment shall be demolished in their entirety, along with any existing controls systems in the building.

The first HVAC design option is a distributed water source heat pump system. The basis of design will be Trane EXHF0187 High Efficiency series. This will be paired with roof mounted water source heat pump DOAS units to provide ventilation air to the building. The basis of design will be Trane Horizon WSHP. The condenser water loop that serves the heat pumps, would be heated by the existing steam plant via a new steam to water heat exchanger and cooled by a two (2) adiabatic fluid cooler(s) mounted at grade. The fluid cooler basis of design will be Evapco EAW-VA series. Low temperature hot water will be supplied from a new steam to water heat exchanger. The dedicated outside air units (water source heat pump) would have low temperature hot water supplemental heat also provided by the steam plant through the steam to water heat exchanger. For supplemental heat at the windows and in the vestibules, the low temperature hot water will also serve finned tube radiation, unit heaters, and cabinet unit heaters.

### HVAC System Alternate 1 (Chilled Beam System)

The following HVAC system shall be priced as Alternate 1. The basis of design will be a Chilled Beam system consisting of heat recovery chillers, closed loop evaporative coolers and passive and active chilled beams. The DOAS units are changed to an air source heat pump, basis of design Trane OAGE with supplemental hot water coil. Active 4 pipe chilled beams will be located at the exterior zones. All other interior zones shall use the passive chilled beams. The heat recovery chiller basis of design will be Trane Thermafit Water Source Modular Multi-Pipe or equivalent. For supplemental heat at the windows and in the vestibules, low temperature hot water will also serve the 4 pipe active beams, finned tube radiation, unit heaters, and cabinet unit heaters.

The chiller condenser water loop will be served by two 2-cell (65% each cell) closed loop evaporative coolers. The fluid cooler basis of design will be Evapco EAW-VA series. There will be a new water-to-water plate heat exchanger that transfer energy between the tower loop (35% propylene glycol) and the chiller condenser water loop. The chiller condenser water loop supplemental heat source will be provided by a new steam to water shell and tube heat exchanger which uses steam from the existing steam plant. The chiller hot water loop will provide heating water to the 4 pipe chilled beams, cabinet unit heaters, and any finned tube. The chilled water loop will provide cooling water to the chilled beams.

### HVAC Systems Basis of Design

Boardman Hall will be heated and cooled by distributed, water source heat pumps with ducted supply and returns. Conditioned ventilation air will be provided by four (4) roof mounted DOAS units. The DOAS units will be equipped with integral water to air heat pumps. The DOAS units will supply ventilation air to VAV boxes located at each heat pump. The VAV box will modulate to maintain minimum required ventilation air in response to space mounted $CO_2$ sensors.

The heat pump condenser water loop will be served by two 2-cell (65% each cell) closed loop evaporative coolers. The fluid cooler basis of design will be Evapco EAW-VA series. There will be a new water-to-water plate heat exchanger that transfer energy between the tower loop (35% propylene glycol) and the heat pump condenser water loop. The heat pump loop heat source will be provided by a new steam to water shell and tube heat exchanger which uses steam from the existing steam plant. There will be a second shell and tube heat exchanger to serve any supplemental heating units such as unit heaters, cabinet unit heaters, and any finned tube.

### Dedicated Outdoor Air Units DOAS-1-4

Four roof mounted dedicated outdoor air units will supply ventilation air per ASHRAE 62.1 to the occupied spaces. Dedicated outdoor air-handling units shall be factory assembled and consist of fans, motor and drive assembly, heat pump, exhaust air energy recovery wheel, plenums, Merv 8 filters, condensate pans, Merv 14 filter section, control devices, and accessories. The units shall be completely factory-wired to a junction box at the outside of the unit. Damper actuators (Belimo or approved equal) shall be factory installed and wired to terminal strips inside an enclosure mounted on the exterior of the units.

### Water Source Heat Pumps

The building will be heated and cooled by ducted horizontal water source heat pumps. The heat pump basis of design is Trane EXHF0187 High Efficiency, 265V/1P, 10.9 MCA, 4.2 GPM (water), at 73F entering condenser water temperature. The heat pumps will be located in the corridors directly adjacent to the areas they serve. The heat pumps will be fully ducted with a minimum of (2) 90 elbows on the return. The first 5ft of the supply duct will be insulated with acoustical duct liner. A two-position isolation valve and automatic flow balancing valve hose kit will be supplied at each heat pump to utilize variable condenser pump water flow.
Condenser Water and Tower Loop Circulating Pumps
The tower loop primary and standby circulating pumps P-1 and P-2 shall be Taco Model 3011D End Suction Closed Couple, 480V/3P, with VFD Control. This loop will have 35% propylene glycol. There will be a heat exchanger transferring energy between these two loops. The condenser water loop primary and standby circulating pumps P-3 and P-4 shall be Taco Model 40131D End Suction Closed Couple, 480V/3P, with VFD Control. This loop will be water with no glycol. These pumps will be located in the Basement Mechanical Room.

### VAV Box Ventilation Supply Air

Ventilation air will be disturbed to the heat pumps through cooling only VAV boxes. Each heat pump will be assigned a dedicated ventilation air VAV box. The VAV box supply air damper will modulate to maintain maximum return air CO2 set point. The basis of design VAV box will be Trane Model VCCF-06, double wall insulated construction and 24-volt damper motor.

### Ductwork

New HVAC system ductwork shall be G90 galvanized sheet metal fabricated and installed in accordance with ASHRAE and SMACNA standards and sealed to Class A standards. Supply and return ductwork shall be based on SMACNA pressure class of 3" W.C. and shall be sized for a maximum velocity of 1,500 fpm and a maximum pressure drop of 0.08" W.C. per 100' of duct. Smoke, fire and combination smoke/fire dampers will be installed in accordance with code requirements. All exposed supply and return ductwork will be painted spiral round and oval.

### Standard Diffusers

New diffusers and grilles shall be similar to Price SPD plaque ceiling diffusers and Price 630 louvered faced return grilles.

### Duct Insulation

Supply Ductwork: 1-1/2" thick fiberglass ductwrap with factory applied reinforced metal foil vapor barrier, with a K=0.29 at 75°F, based on Johns Manville Microlite or equivalent. Exposed spiral supply ductwork located withing the conditioned space will not be insulated.

### Thermal Zoning

Thermal zoning of building spaces shall reflect owner input, space orientation and number of exposures; space usage, including thermal gains; healthcare code requirements and space size and occupancy.

### Variable Air Volume Boxes

Variable air volume boxes shall be controlled by an application specific controller. Airflow shall be measured by the flow measuring transmitter and displayed on the graphics at the front-end workstation. Provide primary air damper actuator control.

### Hydronic Hot Water Piping

Install piping complete with pipe fittings, valves, strainers, hangers, supports, guides, sleeves and accessories. Provide adequate supports for pipe and contents to prevent sagging and vibration. Allow for expansion and contraction.

Piping material shall be ASTM B 88M Type L hard drawn copper tubing with lead free soldered joints or ASTM A53 schedule 40 black steel with grooved or threaded joints.

Insulate piping with 1" thick fiberglass with vapor barrier ASJ jacket. Label all piping, equipment, and ductwork, maximum 20ft intervals. Provide valve tags at all valves. Coordinate tagging with university.

### Water Piping (Above Ground)

Tower glycol condenser water loop piping shall be Type L drawn-temper copper tubing with soldered joints or schedule 40 steel pipe with threaded joints. Glycol water, NPS 2-1/2" and larger: Schedule 40 steel with welded and flanged joints or grooved mechanical joint couplings.

Heat pump condenser water loop piping shall be Type L drawn-temper copper tubing with soldered joints or schedule 40 steel pipe with threaded joints. Water, NPS 2-1/2" and larger: Schedule 40 steel with welded and flanged joints or grooved mechanical joint couplings.

### Automatic Temperature Controls

The new DDC system shall be an extension of the building existing Johnson control system. All associated heat pump, DOAS unit, pumps, VAV boxes, valves, sensors, etc. shall be controlled to maintain airflow, and temperature set points. HVAC equipment shall be controlled as per the sequence of operation provided by the design engineer. The controls contractor shall make and execute a points list for controlling all zones.
All controls shall be coordinated between owners/program users, the design engineers and controls contractors to provide a system that is most suitable for the facility and users requirements.

### Testing, Adjusting and Balancing (TAB)

A complete air and water system TAB shall be conducted for all air and water HVAC systems accordance with AABC or NEBB procedures and documentation.

### Commissioning of HVAC and Plumbing Systems

The CxA Commissioning Authority will provide commission of all HVAC and plumbing equipment and controls including DOAS Units, VAV boxes, exhaust fans, room pressure monitors, heat pumps, pumps, domestic water heaters, and all associated DDC controls.

## Mechanical Systems Specifications

### HVAC Design Criteria

- Indoor design conditions
    - All spaces: 70 - 75 deg. F db. (adj.), minimum 20% relative humidity, maximum 60% relative humidity
- Outdoor design conditions: HVAC system design to be based on 2017 ASHRAE Fundamentals Handbook Climatic design conditions data for Bangor, ME.
    - 99.6% Winter Frequency of Occurrence: -7.0 deg. F. db.
    - 0.4% Summer Frequency of Occurrence: 87.7 deg. F. db. / 70.5 deg. F. wb.

### Codes

- ASHRAE Standard 62.1 2016 Ventilation for Acceptable Indoor Air Quality
- ASHRAE Standard 34 Designation and Safety Classification of Refrigerants, 2019 Edition
- ASHRAE Standard 15 Safety Standard for Refrigeration Systems, 2013 Edition
- IBC International Building Code, with Amendments, 2015 Edition
- IMC International Mechanical Code, with Amendments, 2015 Edition
- IECC International Energy Conservation Code, with Amendments, 2021 Edition
- NFPA 1 Uniform Code, with Amendments, 2018 Edition
- NFPA 101 – Life Safety Code, 2018 Edition
- ICC International Plumbing Code, with Amendments, 2014 Edition

### Standards

- Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) HVAC Duct Construction Standards
- UL – Underwriters' Laboratories
- ASME – American Society of Mechanical Engineers
- NFPA – National Fire Protection Association
- ANSI – American National Standards Institute
- ASHRAE – American Society of Heating, Refrigerating, and Air Conditioning Engineers
- ARI – American Refrigeration Institute
- ASTM – American Society of Testing and Materials
- NEMA – National Electrical Manufacturers' Association
- NEC – National Electrical Code
- FM – Factory Mutual
- ASTM – American Society for Testing and Materials
- USP800 – Hazardous Drugs – Handling in Healthcare Settings
- OSHA – Occupational Safety and Health Act
- NEMA National Electrical Manufacturer's Association
- AABC – Associated Air Balance Council
- AMCA – Air Movement and Control Association
- NEBB – National Environmental Balancing Bureau

## ELECTRICAL

### General Electrical Design

Electrical systems for all new spaces will be designed in accordance with the following Codes and standards:

- Maine Uniform Building and Energy Code (MUBEC)
- NFPA 70 (National Electrical Code), 2023 Edition
- NFPA 101 (Life Safety Code), 2018 Edition
- International Building Code (IBC), 2015 edition.
- International Energy Conservation Code (IECC), 2015 edition.
- Maine Uniform Building and Energy Code (MUBEC)
- ASHRAE Standard 90.1-2019 Energy Standard for Buildings Except Low-Rise Residential Buildings.

### Electrical Demolition

The existing Electrical systems within Boardman Hall shall be demolished in their entirety. Demolition shall include removal of existing 4,160V to 600V liquid-filled transformers located within Level B transformer vault.

### Medium Voltage Electrical Infrastructure

In order to facilitate full renovation of Boardman Hall, Boardman Hall shall be provided with new padmounted transformer, associated medium voltage switchgear, and primary conductors required reconnection to existing campus underground distribution system.

All new primary conductors shall be 15kV rated, Type MV-105, Ethylene Propylene Rubber (EPR) 133% insulation, #350 MCM Copper Conductor. All new primary ductbanks associated with this project shall utilize 5" concrete-encased fiberglass conduits per UMaine Electrical Infrastructure standards.

Boardman Hall shall be provided with a 15kV, 3-way, solid dielectric insulated pad-mounted switches (Basis of Design, G & W). Ways 1 and 2 of each switch shall have 3-phase epoxy encapsulated load break switch with integral visible break while Way 3 shall have 3-phase epoxy encapsulated fault interrupter switch with integral visible break. Way 3 of each switch shall be utilized to feed one of three new service transformer associated with Boardman Hall.

New transformers shall be pad-mounted with dual primary (15kV/5kV) and 480V secondary. Anticipated service transformer shall be rated for 2 MVA. Secondaries from transformer shall run underground to serve dedicated main distribution panels located within Level B main electrical room.

All secondary ductbanks shall utilize concrete-encased, standard wall fiberglass conduit.

### Electrical Service

Refer to Medium Voltage Electrical Infrastructure description above for additional information on full scope of electrical infrastructure work.

Initial estimates for the main distribution panel (located with Level B) shall be a 2,400A, 480Y/277V, 3-phase, 4-wire in order to support general building and HVAC system loads.

Feeders shall extend from the main distribution panels to serve subpanels and associated low voltage transformers, also located within either the main electrical rooms or in dedicated electrical rooms located on each floor of the new building. Subpanels shall be installed to allow for branch circuit segregation and submetering, if LEEDv4.1 Advanced Energy Metering is pursued, by load type (HVAC, lighting, convenience power, etc.). All panelboards located within the North Lab, South Lab, or Mini-GEM shall have NEMA 12 enclosures.

Power meter shall be provided at main distribution panel and all feeder circuits associated with the large laboratory equipment loads. The University of Maine campus is primary metered so new utility meters for the building will not be required.

### Standby Power

There are currently no plans for a standby generator associated with this project.

### Renewable Energy Systems

To further the University of Maine's sustainability goals, photovoltaic panels are being explored as a source of renewable energy. To support this future installation of roof mounted solar, project shall be provided with (2) 4" conduit w/ pull string from rooftop of building to main electrical room for connection into main distribution panel associated with the building loads. Main distribution panel shall be provided with prepared space capable of accommodating a 400A max reverse feed rated breaker. PV breaker shall be installed at opposite end of busbar from main breaker. Conduit to roof shall be made weathertight. Panels, mounts, inverters, and all other solar equipment shall not be included in this project.

### Grounding and Bonding

Grounding electrodes for the building shall be copper-clad steel, ¾ inch diameter and 10 feet long. Grounding conductors shall be stranded copper, sized to meet NFPA 70 requirements. Separated insulated equipment grounding conductors within each feeder and branch circuit raceway shall be provided, with each end terminated on a suitable lug, bus, or bushing. Water service, fire protection system, mechanical piping, telecommunication service, and any rebar within slab shall be bonded to main electrical room ground bar. All structural steel will be grounded to ensure there will no grounding potential issues. Radon and metallic piping shall also be grounded per NFPA 70 requirements.

A ground bus bar, ¼ inch thick and 4 inches wide, shall be provided in both the main electrical room and the main telecommunication distribution room to allow for bonding between the main electrical services, main telecommunication service and other building systems components as required by Code. Additional ground bus bars (¼ inch thick and 2 inches wide) shall be provided in each IDF located within the building and connected to bus bar located within the main telecommunication service entrance.

### Interior Lighting

All interior lighting shall be designed in accordance with current IESNA standards recommended for specific space usage and task. All lighting shall utilize LED technology with corresponding 0-10V dimming drivers with continuous dimming to 10% of the fixture's output. Fixture lumen packages shall be selected such that illumination levels comply with Illuminating Engineering Society (IES) recommendations for space type. Whenever possible, fixtures shall be a DesignLight Consortium (DLC) or Energy Star listed product.

Interior lighting shall be provided as follows:

- Offices Spaces: 2' x 2' ceiling recessed, direct/indirect, architectural LED troffer with 0-10V dimming driver.
- Learning Labs: 3" W architectural linear fixtures with 0-10V dimming driver.

- Storage and Utility Spaces: 4' L surface mounted LED striplight fixture with 0-10V dimming driver. Fixture shall be provided with stem or chain mounting kits where direct ceiling mounting is not possible.
- Electrical/Mechanical Rooms: 4'L ceiling suspended lensed LED striplight with 0-10V dimming driver. Fixture shall be provided with chain hangers to allow for mounting underneath potential obstructions.
- Stairwells: 4'L (stairwell) wall mounted LED linear with white opal lens and 0-10V dimming driver. Stairwell fixtures shall be provided with integral occupancy sensors to allow for unoccupied lighting level setback and integral emergency battery pack.
- Conference/Meeting Rooms: Ceiling recessed 3"W linear LED pendants and 6" dia. recessed downlights with 0-10V dimming driver.
- Restrooms: Ceiling recessed downlights and linear slot style fixtures.
- Student Success Pendants: Large scale, ceiling suspended decorative pendants; exact style to be determined during Design. All fixtures shall be provided with 0-10V dimming driver.
- Corridors: Suspended 3" wide linear slot style fixtures with direct/indirect optics; fixtures shall run perpendicular to corridor.

Decorative lighting may be used to enhance focal and/or display areas as appropriate. Target lighting power density of entire building is 0.75 watts per square foot or lower.

### Lighting Controls

A simple, but energy-efficient lighting control system shall be provided for the lighting systems. All common spaces and educational spaces (classrooms, laboratories, etc.) shall be controlled via ceiling mounted occupancy sensors connected to lighting control system to allow for schedule on/off events as well as automatic control. Individual offices shall be provided with a wall-mounted vacancy sensor with integral 0-10V dimmer to allow for manual on, automatic off operation as well as user lighting level adjustability. , Lecture spaces, conference/meeting rooms, and group rooms shall be provided with multi-zone room controllers with ceiling mounted occupancy sensor and wall mounted low voltage dimmers. Connection of controllers to overall lighting control system and to AV systems shall be reviewed in Design. Daylight dimming controls shall be provided in administrative areas will greater than 250 square feet of glazing in accordance with ASHRAE 90.1-2019 standards.

#### Expected Control Scenarios

- Private Offices: Ceiling mounted, dual-technology sensor with wall mounted 0-10V dimming controls to allow users to adjust lighting levels.
- Conference Rooms & Learning Labs: Stand-alone, multi-zone room controller with occupancy sensor, daylight harvesting, and low voltage switch(es).
- Corridors/Common Spaces/Collaboration Spaces: Building wide, lighting control system with low voltage wall stations, dual technology occupancy sensors, and daylight harvesting.
- Storage/Restrooms/Janitorial Spaces: Ceiling or wall mounted, dual-technology occupancy sensor.
- Mechanical/Electrical Space: Wall mounted, toggle switch.

Lighting controls shall also provide automatic control for 50% of plugloads within space as required by Energy Codes. All occupancy and vacancy sensors shall be provided with adjustable time delays for automatically turning lights off when areas are unoccupied.

### Emergency Lighting and Exit Signage

Emergency lighting shall be achieved via connection standalone UL924 central lighting inverter with illumination levels as required by NFPA 101. UL924 lighting control relays shall be utilized as necessary to ensure all lighting within an area can be controlled via the same lighting control device during normal operation. Exit signs shall be provided with LED lamps and connection to lighting inverter as well.

### Exterior Lighting

All exterior fixtures shall utilize LED technology and shall be full-cutoff type as designed by IESNA, in order to minimize light pollution into the night sky. Control shall be achieved through the building wide lighting control system as noted above. Fixture type shall be coordinated with the University of Maine standards and facilities personnel. Exact layout, mounting height, and distribution of fixtures shall be determined during Design.

Exterior lighting shall be controlled via astronomical time clock control integral to building wide lighting control system.

### Electrical Distribution

Normal power for building shall be extended from associated switchgear located within the main electrical rooms to feed panelboards located throughout the facility. All new electrical panels shall be panelboard construction grade and provided with door-in-door fronts. Dry-type transformers shall be provided as necessary to serve 208Y/120V loads. All dry-type transformers shall have copper windings and a minimum K rating of 4.

Branch circuit breakers shall be bolt-on type. Panelboards associated with any labs or any other spaces with a high density of electronic equipment shall be provided with electronic grade panelboards with an integral TVSS device.

Load centers are not acceptable.

All feeders shall be installed in metallic conduit systems and shall be copper for all conductors smaller than No. 4 AWG. Feeders larger than No. 4 AWG may be copper or aluminum.

Metal-clad (NEC type MC) cabling where concealed in walls or above accessible ceilings will be allowed. All branch circuit conductors including elevator conductors shall be copper. All wiring shall be sized in accordance with NEC as required for the load fed.

### Electrical Power Systems – Mechanical, Plumbing, and Fire Protection Loads

All equipment connections shall be coordinated to provide method of power disconnects as required by Code. Motors shall be provided with starters and disconnects, or variable frequency drives as applicable, per manufacturers' recommendations. Power connections, disconnects, overcurrent protection, etc. shall be coordinated with equipment provided (i.e. HVAC equipment, etc). All VFDs shall be a minimum of 12-pulse drives to reduce the risks of harmonic distortion in the electrical system.

The following mechanical and plumbing loads are also expected with the building (see mechanical narrative for more in-depth system descriptions):

### HVAC

Basis of Design

- General Building:
  - Water Source Heat Pumps
    - (2) Evaporative Coolers
    - Indoor heat pumps located in corridors spaces
    - Circulating Pumps w/ VFD controls (located in Level B Mechanical Room)
  - (4) Roof Mounted Dedicated Outdoor Air System (DOAS) units
- Stairs, MEP Spaces, Storage Rooms:
  - Hot water cabinet unit heaters and unit heaters

Alternate #1

- General Building:
  - Variable Refrigerant Flow System
    - Roof Mounted Outdoor Condensing Units
    - Branch Controller Boxes
    - Indoor Evaporator Units
  - Water-Source Heat Pump Dedicated Outdoor Air System (DOAS) units

### Plumbing

- General Building
  - Air compressors, as required, to support compressed air within lab spaces.
  - Condensate pump at each heat pump
  - Water Heating:
    - Basis of Design: Water Source Heat Pump Domestic Water Heater with electric back up.
    - Alternate #1: Air Source Heat Pump Domestic Water Heater
      - Recirculation Pumps
  - Sump Pump in elevator pit(s)

### Wiring Devices

Receptacles throughout the facility shall be specification grade, NEMA 5-20R type, unless noted otherwise below. Ground fault interrupter (GFCI) receptacles shall be provided in bathrooms, within 6 feet from the edge of sinks, and elsewhere as required by Code. Power shall be provided and coordinated for all appliances and equipment as indicated on Architectural plans. Receptacles shall be provided as follows:

- Offices (Private, Shared): Workstations shall be provided with one quadraplex receptacle per seat. Convenience receptacles shall be provided throughout space as needed. Convenience receptacles shall be installed such that one receptacle is provided along each wall of the room and devices are not more than 12 linear feet apart. Printers, copiers, and other office equipment shall be provided with a dedicated duplex receptacle. All receptacles within offices or at workstations within shared office spaces shall be half-controlled receptacles for plug-load control in accordance with ASHRAE 90.1.

- Learning Labs: Receptacles shall be installed such that a minimum of one receptacle is provided along each wall and devices are not more than 12 linear feet apart. Learning lab spaces shall be provided with recessed floor boxes and/or ceiling suspended receptacles that allow flexible power and data. Furniture integrated power options will be reviewed during Design Development. Receptacle placement associated with AV and other equipment shall also be coordinated during Design Development.

- Conference Rooms/Meeting Rooms/Collaboration Spaces: Receptacles shall be installed such that a minimum of one receptacle is provided along each wall and devices are not more than 12 linear feet apart. Conference rooms shall be provided with a minimum of one recessed floor box as required by NFPA 70 and to accommodate flexible furniture layouts and provide necessary power to work area. Furniture integrated power options will be reviewed during Design Development. Receptacle placement shall also be coordinated with AV design during Design Development. All receptacles within conference room shall be half-controlled receptacles for plug-load control in accordance with ASHRAE 90.1.

- Small Laboratories: Convenience receptacles shall be provided throughout space. Surface mounted, multi-outlet raceway shall be provided along walls to provide maximum flexibility for equipment connections. Each raceway segment shall be provided with a minimum of (3) circuits. All loads with voltage greater than 120V shall be provided with dedicated outlet or power connection. All 208Y/120V connections within the lab spaces shall homerun to dedicated panelboard with integral TVSS device, installed with each lab.

- Restrooms: One GFCI receptacle, mounted at 48" above finished floor, shall be provided near sinks.

- Corridors: Provide one duplex receptacle every 20 linear feet.

- Open Office Spaces: Convenience receptacles shall be provided throughout space. Receptacles shall be installed such that a minimum of one receptacle is provided along each wall of the room and devices are not more than 12 linear feet apart. Floorboxes shall be utilized to provide power to floating workstations. Furniture integrated power options will be reviewed during Design Development. Receptacles with integral USB ports shall be provided near seating areas. All receptacles associated with wall mounted displays shall be mounted at 72" above finished floor. All receptacles or circuits associated with workstations shall be half-controlled receptacles or connected to building control system for plug-load control in accordance with ASHRAE 90.1.

## Communication Systems

### Structured Cabling Systems

New telecommunication services (optical fiber and copper) shall be extended from the existing campus data center located within Neville Hall to demarcation points within the main telecommunication distribution room (MDF) located on Level B. Optical fiber backbone (12-strand, minimum) shall be provided from MDF on Level B to each IDF room and dedicated AV rack throughout the building.

All telecommunication rooms shall be provided with floor mounted rack(s), patch panels, and other passive communication equipment as required to serve all horizontal cabling runs within new building.

All horizontal cabling shall be Category 6 cable. Cables located above accessible ceilings shall be installed in cable tray, while cables running exposed or above non-accessible ceiling shall be installed in conduit. Each workstation shall be provided with a minimum of two data outlets. Conference and meeting rooms shall be provided with a minimum of (1) hardwired data outlets throughout the space with additional outlets being provided at 60" above finished floor to accommodate wall mounted displays. Where floorboxes are to be installed, a minimum of (2) data outlets shall be provided for future flexibility. Additional locations requiring data outlets shall be coordinated with Owner during Design.

Wireless access points shall be provided throughout the facility, with one horizontal cabling run to each access point location. All horizontal cabling associated with access points shall be Category 6A.

Rack mounted UPS units shall be provided in every rack located with telecommunication rooms.

Telecommunication cabling, devices, and terminations shall be provided by Owner's approved vendor with all equipment room fittings, pathways, and device boxes being provided by the electrical contractor.

#### Audio/Visual Systems

In-depth audio/visual design requirements shall be coordinated with Owner during Design. The following areas are expected to have intensive audio-visual systems:

- Student Success Center
- Classrooms
- Collaboration Spaces
- Learning Labs
- Conference Rooms

A/V equipment, cabling, devices, and terminations shall be provided by Owner's vendor with all pathways and device boxes being provided by the electrical contractor.

### Electronic Safety and Security Systems

#### Access Control

A new access control system shall be provided to allow for restricted access to the exterior doors, telecommunication rooms, and any other areas where general circulation shall be limited. System shall consist of basic door controller, proximity card reader, door contacts, locking mortise, and request to exit devices that are integral to the door hardware. System shall be easily expandable to allow addition of controlled doors. Access control system shall utilize either Category 6 or composite access control cabling and shall be compatible with existing system on Campus.

Access control system equipment, cabling, devices, and terminations shall be provided by Owner's Security vendor with all pathways and device boxes being provided by the electrical contractor.

### Video Surveillance

A new video surveillance system shall be provided at the exterior and select interior common spaces of the facility. System shall consist of cameras, network video recorder, monitor and all associated switches, cabling, and accessories. Cameras shall be IP-based, with a single Category 6 connection at each camera. Exact location of new cameras will be coordinated with Owner during Design.

Video surveillance equipment, cabling, devices, and terminations shall be provided by Owner's Security vendor with all pathways and device boxes being provided by the electrical contractor.

### Fire Alarm System

Facility shall be provided with new, addressable type fire alarm system and located within the main electrical room (Basement Level). System shall include manual initiation and automatic detection consisting of smoke and heat detectors, sprinkler tamper, pressure, and flow switches, and manual pull stations. Notification to occupants shall be comprised of horn/strobe devices in normally occupied areas with the exception of private offices and individual toilets. Individual toilets shall be provided with visual only (strobe) devices. Fire alarm system shall monitor automatic sprinkler system for alarm and trouble conditions. Fire alarm system shall be interconnected to HVAC where required. Carbon monoxide detectors shall be provided in vicinity of all gas burning equipment. The system shall be provided with battery backup and charger. Fire alarm system shall be in accordance with NFPA 1, NFPA 72, 101 and the State Fire Marshal's office.

### Mass Notification System

UMaine currently employs a cellular based mass notification system with emergency notifications being delivered via texts, emails, and automated calls. Requirements for integration of mass notification system along with any wall mounted display locations will be coordinated with Owner during Design.

# Cost Estimate

VERMEULENS

# University of Maine - Boardman Hall

Concept - V02


prepared for
Leo Patterson
Senior Associate
l.patterson@perkinseastman.com
857 222 6221

prepared by
Craig Chiarelli
Principal
cchiarelli@vermeulens.com
647 285 1157

Perkins Eastman
20 Ashburton Place, Floor 8
Boston, MA 02108
857 222 6221
perkinseastman.com

Vermeulens
470 Atlantic Avenue, 4th Floor
Boston, MA 02210
617 263 8879
vermeulens.com


May 22, 2024
Proposal #24777

Construction Economists

Boston New York Toronto Dallas Austin San Antonio Denver Los Angeles

VERMEULENS

May 22, 2024

Leo Patterson
Perkins Eastman
20 Ashburton Place, Floor 8
Boston, MA 02108

Re: University of Maine - Boardman Hall - Concept - V02

Dear Leo,

Please find enclosed our revised cost estimate for the above project based on concept.

| COMPONENT | AREA (SF) | $/SF | $ | Project Multiplier x1.33 |
|---|---|---|---|---|
| Boardman Hall | 66,024 | 536 | 35,374,945 | 47,048,677 |
| Alternate: Elevator | 4 | stops | 650,000 | 864,500 |

This estimate includes all direct construction costs, general contractor's overhead and profit, design and construction contingencies. Cost escalation assumes a current Q2, 2024 rates. We recommend using 4%/year moving forward to an anticipated construction start date

Excluded from the estimate are: hazardous waste removal, loose furnishings and equipment, project contingency, architect's and engineer's fees, moving, administrative and financing costs.

Bidding conditions are expected to reflect one construction manager, open bidding for sub-contractors, open specifications for materials and manufactures.

This estimate is based on bids received in this market for comparable work. Projected changes in design and inflation are covered by contingency. Variances from these projections can occur due to lack or surplus of bidders at time of bid, proprietary specifications, contractual and procurement practice, documentation and tendering changes, contractor's errors and omissions etc. We expect bids received to be within 5 - 10% of estimated values 19 times out of 20 recognizing the above.

If you have any questions or require further analysis please do not hesitate to contact us.

Yours very truly,

VERMEULENS

May 22, 2024

Leo Patterson
Perkins Eastman
20 Ashburton Place, Floor 8
Boston, MA 02108

Re: University of Maine - Boardman Hall - Concept - V02

Dear Leo,

Please find enclosed our revised cost estimate for the above project based on concept.

| COMPONENT | AREA (SF) | $/SF | $ | Project Multiplier x1.33 |
|---|---|---|---|---|
| Boardman Hall | 66,024 | 536 | 35,374,945 | 47,048,677 |
| Alternate: Elevator | 4 | stops | 650,000 | 864,500 |

This estimate includes all direct construction costs, general contractor's overhead and profit, design and construction contingencies. Cost escalation assumes a current Q2, 2024 rates. We recommend using 4%/year moving forward to an anticipated construction start date

Excluded from the estimate are: hazardous waste removal, loose furnishings and equipment, project contingency, architect's and engineer's fees, moving, administrative and financing costs.

Bidding conditions are expected to reflect one construction manager, open bidding for sub-contractors, open specifications for materials and manufactures.

This estimate is based on bids received in this market for comparable work. Projected changes in design and inflation are covered by contingency. Variances from these projections can occur due to lack or surplus of bidders at time of bid, proprietary specifications, contractual and procurement practice, documentation and tendering changes, contractor's errors and omissions etc. We expect bids received to be within 5 - 10% of estimated values 19 times out of 20 recognizing the above.

If you have any questions or require further analysis please do not hesitate to contact us.

Yours very truly,



VERMEULENS

C Chiarelli

Craig Chiarelli
Principal

| LEVEL 2 ELEMENTAL SUMMARY<br>GROSS FLOOR AREA | $/sf | Element $<br>66,064 sf | % |
|---|---|---|---|
| A1 SUBSTRUCTURE | 0.52 | 34,075 | 0% |
| A2 STRUCTURE | 13.60 | 898,215 | 3% |
| A3 ENCLOSURE | 67.35 | 4,449,521 | 13% |
| B1 PARTITIONS & DOORS | 30.92 | 2,042,716 | 6% |
| B2 FINISHES | 44.54 | 2,942,439 | 8% |
| B3 FITTINGS & EQUIPMENT | 24.39 | 1,611,604 | 5% |
| C1 MECHANICAL | 114.20 | 7,544,403 | 21% |
| C2 ELECTRICAL | 65.42 | 4,322,066 | 12% |
| D1 SITE WORK | 22.79 | 1,505,310 | 4% |
| D2 ANCILLARY WORK | 10.00 | 660,640 | 2% |
| DIRECT CONSTRUCTION COST | 393.72 | $26,010,989 | 74% |
| Z1 GENERAL REQUIREMENTS | 63.00 | 4,161,758 | 12% |
| Z2 CONTINGENCIES | 78.74 | 5,202,198 | 15% |
| Z3 OTHER COSTS | 0.00 | 0 | 0% |
| TOTAL CONSTRUCTION COST | 535.46 | 35,374,945 | 100% |



| ELEMENTAL SUMMARY<br>GROSS FLOOR AREA | $/sf | Element $<br>66,064 sf | % |
|---|---|---|---|
| A1 SUBSTRUCTURE | | | |
| A11 Foundations | 0.33 | 21,575 | |
| A12 Building Excavation | 0.19 | 12,500 | |
| A2 STRUCTURE | | | |
| A21 Lowest Floor Structure | 0.45 | 29,868 | |
| A22 Upper Floor Structure | 11.60 | 766,255 | |
| A23 Roof Structure | 1.55 | 102,093 | |
| A3 ENCLOSURE | | | |
| A32 Walls Above Grade | 9.89 | 653,355 | |
| A33 Windows & Entrances | 47.63 | 3,146,360 | |
| A34 Roof Covering | 9.84 | 649,806 | |
| B1 PARTITIONS & DOORS | | | |
| B11 Partitions | 22.91 | 1,513,216 | |
| B12 Doors | 8.01 | 529,500 | |
| B2 FINISHES | | | |
| B21 Floor Finishes | 14.98 | 989,851 | |
| B22 Ceiling Finishes | 16.01 | 1,057,527 | |
| B23 Wall Finishes | 13.55 | 895,061 | |
| B3 FITTINGS & EQUIPMENT | | | |
| B31 Fittings | 22.01 | 1,454,200 | |
| B32 Equipment | 2.38 | 157,400 | |
| B33 Conveying Systems | 0.00 | 4 | |
| C1 MECHANICAL | | | |
| C11 Plumbing & Drainage | 12.88 | 851,193 | |
| C12 Fire Protection | 6.78 | 447,810 | |
| C13 HVAC | 78.84 | 5,208,196 | |
| C14 Controls | 15.70 | 1,037,205 | |
| C2 ELECTRICAL | | | |
| C21 Service & Distribution | 21.66 | 1,431,224 | |
| C22 Lighting & Devices | 30.00 | 1,981,920 | |
| C23 Systems | 13.76 | 908,922 | |

VERMEULENS | 24777 Version 02<br>Concept Design | The University of Maine<br>Boardman Hall | Estimate Date: 2024-04-12<br>Printed: 17:12 2024-05-22 L3.3

## ELEMENTAL SUMMARY

| GROSS FLOOR AREA | $/sf | Element $<br>66,064 sf | % |
|---|---|---|---|
| D1 SITE WORK | | | |
| D11 Site Development | 12.46 | 823,010 | |
| D12 Mechanical Site Services | 0.76 | 50,000 | |
| D13 Electrical Site Services | 9.57 | 632,300 | |
| D2 ANCILLARY WORK | | | |
| D21 Demolition | 10.00 | 660,640 | |
| DIRECT CONSTRUCTION COST | | $26,010,989 | |
| Z1 GENERAL REQUIREMENTS | | | |
| Z11 General Requirements | 51.18 | 3,381,429 | 13.0% |
| Z12 Fee | 11.81 | 780,330 | 3.0% |
| Z2 CONTINGENCIES | | | |
| Z21 Design Contingency | 59.06 | 3,901,649 | 15.0% |
| Z22 Escalation Contingency | 0.00 | 0 | 0.0% |
| Z23 Construction Contingency | 19.69 | 1,300,550 | 5.0% |
| Z3 OTHER COSTS | | | |
| Z31 Other Costs | 0.00 | 0 | 0.0% |
| TOTAL CONSTRUCTION COST | 535.46 | 35,374,945 | 100% |

VERMEULENS | 24777 Version 02<br>Concept Design | The University of Maine<br>Boardman Hall | Estimate Date: 2024-04-12
Printed: 17:13 2024-05-22 E.4

## ELEMENTAL ESTIMATE

| Description | Quantity | Rate | Amount |
|---|---|---|---|
| GROSS FLOOR AREA | | | |
| Level 1 | 16,024 sf | | |
| Level 2 | 16,564 sf | | |
| Level 3 | 16,837 sf | | |
| Level 4 | 16,639 sf | | |
| TOTAL GROSS FLOOR AREA | 66,064 sf | | |

REPORT NOTES

| VERMEULENS | 24777 Version 02 Concept Design | The University of Maine Boardman Hall | Estimate Date: 2024-04-12 Printed: 17:13 2024-05-22 | E.5 |
|---|---|---|---|---|

ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| A1 SUBSTRUCTURE | | | | | | |
| A11 Foundations | | | | | | |
| Foundations | | | | | | |
| existing no work | | + | 15,709 | sf | 0.00 | 0 |
| column footings 5x5x1', 4 no | | | 4 | cy | 5,000.00 | 20,000 |
| foundation details, misc | | + | 315 | sf | 5.00 | 1,575 |
| Subtotal Foundations | | | 16,024 | sf | 1.35 | 21,575 |
| Total A11 Foundations | | | 66,064 | sf | 0.33 | 21,575 |
| A12 Building Excavation | | | | | | |
| Earthwork | | | | | | |
| hand excavation, backfill 2' | | + | 25 | cy | 500.00 | 12,500 |
| Subtotal Earthwork | | | 25 | cy | 500.00 | 12,500 |
| Total A12 Building Excavation | | | 66,064 | sf | 0.19 | 12,500 |
| TOTAL A1 SUBSTRUCTURE | | | | | | 34,075 |

| VERMEULENS | 24777 Version 02 Concept Design | The University of Maine Boardman Hall | Estimate Date: 2024-04-12 Printed: 17:13 2024-05-22 | E.6 |
|---|---|---|---|---|

ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| A2 STRUCTURE | | | | | | |
| A21 Lowest Floor Structure | | | | | | |
| On Grade | | | | | | |
| existing cut patch, make good | | + | 15,709 | sf | 1.40 | 21,993 |
| slab on grade remove and replace | | + | 315 | sf | 25.00 | 7,875 |
| Subtotal On Grade | | | 16,024 | sf | 1.86 | 29,868 |
| Total A21 Lowest Floor Structure | | | 66,064 | sf | 0.45 | 29,868 |
| A22 Upper Floor Structure | | | | | | |
| Floor Structure | | | | | | |
| existing cut patch, make good | | + | 48,762 | sf | 2.50 | 121,905 |
| existing sawcut/frame plumbing openings allow | | | 1,193 | sf | 25.00 | 29,825 |
| existing sawcut/frame double height space opening 20x20' | | | 400 | sf | 75.00 | 30,000 |
| existing sawcut/frame stair openings 15x19', 3 no | | | 855 | sf | 75.00 | 64,125 |
| existing sawcut/frame duct chase openings 5x10', 6 no | | | 300 | sf | 75.00 | 22,500 |
| concrete slab reinforcement | | | 560 | sf | 20.00 | 11,200 |
| concrete support beams 12x16", 621 lf | | | 31 | cy | 3,500.00 | 108,500 |
| concrete support beams 12x24", 46 lf | | | 3 | cy | 3,500.00 | 10,500 |
| concrete slab infill at existing stairs 8" | | + | 1,278 | sf | 40.00 | 51,120 |
| lintel to support brick at wall opening | | | 18 | lf | 500.00 | 9,000 |
| Subtotal Floor Structure | | | 50,040 | sf | 9.17 | 458,675 |
| Stairs, Miscellaneous | | | | | | |
| metal pan stairs 5x12' | | | 3 | flt | 75,000.00 | 225,000 |
| metals misc | | + | 66,064 | sf | 0.75 | 49,548 |

ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| safing, sealing | | | 66,064 | sf | 0.50 | 33,032 |
| Subtotal Stairs, Miscellaneous | | | 66,064 | sf | 4.66 | 307,580 |
| Total A22 Upper Floor Structure | | | 66,064 | sf | 11.60 | 766,255 |
| A23 Roof Structure | | | | | | |
| Roof Structure | | | | | | |
| existing roof structure cut patch, make good | | + | 16,837 | sf | 2.50 | 42,093 |
| dunnage/mechanical pads, misc | | | 50,000 | ls | 1.00 | 50,000 |
| structure | | + | 100 | sf | 100.00 | 10,000 |
| Subtotal Roof Structure | | | 16,937 | sf | 6.03 | 102,093 |
| Total A23 Roof Structure | | | 66,064 | sf | 1.55 | 102,093 |
| TOTAL A2 STRUCTURE | | | | | | 898,215 |



ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| A3 ENCLOSURE | | | | | | |
| A32 Walls Above Grade | | | | | | |
| Cladding | | | | | | |
| precast panels allow | | + | 400 | sf | 125.00 | 50,000 |
| precast detailing allow | | | 470 | lf | 150.00 | 70,500 |
| metal panel penthouses, existing | | + | 1,120 | sf | 0.00 | 0 |
| existing basement windows infill | | | 391 | sf | 65.00 | 25,415 |
| cladding details, misc | | | 400 | sf | 12.50 | 5,000 |
| Subtotal Cladding | | | 1,520 | sf | 99.29 | 150,915 |
| Backup | | | | | | |
| light gage 6" | | + | 400 | sf | 20.00 | 8,000 |
| steel bracing, details, 2 psf | | | 400 | sf | 10.00 | 4,000 |
| sheathing, avb, insul, gyp | | | 400 | sf | 30.00 | 12,000 |
| add insulation, gyp, stud | | | 31,000 | sf | 15.00 | 465,000 |
| metal panel penthouses, upgrade backup assembly | | + | 1,120 | sf | 12.00 | 13,440 |
| Subtotal Backup | | | 1,520 | sf | 330.55 | 502,440 |
| Total A32 Walls Above Grade | | | 66,064 | sf | 9.89 | 653,355 |
| A33 Windows & Entrances | | | | | | |
| Windows | | | | | | |
| existing windows remove and replace triple glazed operable | | + | 8,199 | sf | 300.00 | 2,459,700 |
| existing windows reseal/make good brick | | | 3,801 | lf | 35.00 | 133,035 |
| storefront, triple glazed, operable | | + | 1,935 | sf | 175.00 | 338,625 |
| bay window system | | + | 800 | sf | 225.00 | 180,000 |
| Subtotal Windows | | | 10,934 | sf | 284.56 | 3,111,360 |

VERMEULENS | 24777 Version 02 | Concept Design | The University of Maine | Boardman Hall | Estimate Date: 2024-04-12 | Printed: 17:13 2024-05-22 | E.9

ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| Entrances | | | | | | |
| glazed aluminum | | + | 4 | no | 6,000.00 | 24,000 |
| auto-openers | | | 2 | no | 5,500.00 | 11,000 |
| Subtotal Entrances | | | 4 | no | 8,750.00 | 35,000 |
| Total A33 Windows & Entrances | | | 66,064 | sf | 47.63 | 3,146,360 |
| A34 Roof Covering | | | | | | |
| Roofing | | | | | | |
| existing roof membrane remove | | | 16,837 | sf | 3.00 | 50,511 |
| new roof membrane, insulation | | + | 16,837 | sf | 35.00 | 589,295 |
| green roof | | + | 100 | sf | 100.00 | 10,000 |
| Subtotal Roofing | | | 16,937 | sf | 38.37 | 649,806 |
| Total A34 Roof Covering | | | 66,064 | sf | 9.84 | 649,806 |
| TOTAL A3 ENCLOSURE | | | | | | 4,449,521 |

VERMEULENS | 24777 Version 02 | Concept Design | The University of Maine | Boardman Hall | Estimate Date: 2024-04-12 | Printed: 17:13 2024-05-22 | E.10

ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| B1 PARTITIONS & DOORS | | | | | | |
| B11 Partitions | | | | | | |
| Partitions | | | | | | |
| existing cut/patch make good | | + | 28,946 | sf | 3.00 | 86,838 |
| gyp2, stud2, batt to chase | | + | 1,146 | sf | 17.60 | 20,170 |
| gyp4, stud, batt to rated | | + | 639 | sf | 16.85 | 10,767 |
| gyp2, liner, stud, batt to shafts | | + | 2,093 | sf | 16.85 | 35,267 |
| gyp3, stud, batt to demising | | + | 24,873 | sf | 14.35 | 356,928 |
| gyp2, stud, batt to typical | | + | 21,307 | sf | 11.80 | 251,423 |
| gyp, stud/furring 10% | | | 8,000 | sf | 7.05 | 56,400 |
| wood blocking | | | 13,426 | lf | 7.45 | 100,024 |
| glazed screens, lites | | | 4,000 | sf | 80.00 | 320,000 |
| Subtotal Partitions | | | 79,004 | sf | 15.67 | 1,237,816 |
| Railings | | | | | | |
| existing make good | | + | 280 | lf | 120.00 | 33,600 |
| glass guard | | + | 372 | lf | 650.00 | 241,800 |
| Subtotal Railings | | | 652 | lf | 422.39 | 275,400 |
| Total B11 Partitions | | | 66,064 | sf | 22.91 | 1,513,216 |
| B12 Doors | | | | | | |
| Doors, Frames, Hardware | | | | | | |
| existing make good | | + | 70 | no | 925.00 | 64,750 |
| glazed aluminum | | + | 16 | no | 4,650.00 | 74,400 |
| glazed 2 panel sliding | | + | 1 | no | 10,000.00 | 10,000 |
| veneer flush | | + | 33 | no | 2,950.00 | 97,350 |
| veneer half glazed | | + | 49 | no | 3,250.00 | 159,250 |
| painted to service/support | | + | 50 | no | 2,085.00 | 104,250 |

ELEMENTAL ESTIMATE

| Description | Trade | Quantity | | Rate | Amount |
|---|---|---|---|---|---|
| hardware auto openers | | 3 | no | 6,500.00 | 19,500 |
| Subtotal Doors, Frames, Hardware | | 219 | no | 2,417.81 | 529,500 |
| Total B12 Doors | | 66,064 | sf | 8.01 | 529,500 |
| TOTAL B1 PARTITIONS & DOORS | | | | | 2,042,716 |



ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| B2 FINISHES | | | | | | |
| B21 Floor Finishes | | | | | | |
| Flooring | | | | | | |
| concrete sealed to service | | + | 2,474 | sf | 1.80 | 4,453 |
| porcelain tile, upgrade | | + | 10,469 | sf | 34.00 | 355,946 |
| terrazzo | | + | 237 | sf | 35.00 | 8,295 |
| terrazzo tread/riser | | + | 796 | sf | 120.00 | 95,520 |
| tile porcelain | | + | 287 | sf | 26.50 | 7,606 |
| resilient sheet | | + | 11,641 | sf | 12.15 | 141,438 |
| carpet | | + | 29,249 | sf | 7.00 | 204,743 |
| walk off grille stainless | | + | 227 | sf | 75.00 | 17,025 |
| Subtotal Flooring | | | 55,380 | sf | 15.08 | 835,026 |
| Base | | | | | | |
| tile | | + | 5,312 | lf | 21.00 | 111,552 |
| rubber | | + | 10,182 | lf | 4.25 | 43,274 |
| Subtotal Base | | | 15,494 | lf | 9.99 | 154,826 |
| Total B21 Floor Finishes | | | 66,064 | sf | 14.98 | 989,851 |
| B22 Ceiling Finishes | | | | | | |
| Ceilings | | | | | | |
| gyp suspended | | + | 1,926 | sf | 14.00 | 26,964 |
| gyp details, fascia, soffits | | | 4,000 | lf | 28.00 | 112,000 |
| acoustic tile standard to office | | + | 35,180 | sf | 8.00 | 281,440 |
| acoustic tile standard to corridor | | + | 10,488 | sf | 10.00 | 104,880 |
| acoustic wood plank | | + | 6,111 | sf | 85.50 | 522,491 |
| paint | | | 1,926 | sf | 2.15 | 4,141 |
| paint exposed | | + | 1,675 | sf | 3.35 | 5,611 |
| Subtotal Ceilings | | | 55,380 | sf | 19.10 | 1,057,527 |

ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| Total B22 Ceiling Finishes | | | 66,064 | sf | 16.01 | 1,057,527 |
| **B23 Wall Finishes** | | | | | | |
| Wall Finishes | | | | | | |
| wood panel | | + | 1,739 | sf | 85.00 | 147,815 |
| panel acoustic to seminar, confrence, presentation,classroom and meeting | | | 8,048 | sf | 40.00 | 321,920 |
| panel fiberglass reinforced | | + | 462 | sf | 20.00 | 9,240 |
| tile porcelain | | + | 1,439 | sf | 24.25 | 34,896 |
| accent wall | | + | 1,174 | sf | 35.00 | 41,090 |
| paint | | + | 158,186 | sf | 2.15 | 340,100 |
| Subtotal Wall Finishes | | | 163,000 | sf | 5.49 | 895,061 |
| Total B23 Wall Finishes | | | 66,064 | sf | 13.55 | 895,061 |
| TOTAL B2 FINISHES | | | | | | 2,942,439 |



ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| **B3 FITTINGS & EQUIPMENT** | | | | | | |
| **B31 Fittings** | | | | | | |
| Casework | | | | | | |
| wood, solid top typical | | + | | lf | | |
| casework | | + | 650 | lf | 460.00 | 299,000 |
| Subtotal Casework | | | 650 | lf | 460.00 | 299,000 |
| Casework - Lab | | | | | | |
| lab, lab support no (13) | | | | sf | | |
| lab casework | | + | 1,000 | lf | 630.00 | 630,000 |
| Subtotal Casework - Lab | | | 1,000 | lf | 630.00 | 630,000 |
| Fittings - Misc | | | | | | |
| specialties, misc. | | + | 202 | no | 2,600.00 | 525,200 |
| Subtotal Fittings - Misc | | | 202 | no | 2,600.00 | 525,200 |
| Total B31 Fittings | | | 66,064 | sf | 22.01 | 1,454,200 |
| **B32 Equipment** | | | | | | |
| Equipment - Other | | | | | | |
| appliances to kitchenette | | | 4 | no | 5,500.00 | 22,000 |
| Subtotal Equipment - Other | | | | | | 22,000 |
| Equipment - Special | | | | | | |
| lab equipment | | + | 50,000 | ls | 1.00 | 50,000 |
| Subtotal Equipment - Special | | | 50,000 | ls | 1.00 | 50,000 |
| Equipment - Audio-Visual | | | | | | |

ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| audio visual projector screens and metals to confrence, seminar, classrooms | | | 14 | no | 6,100.00 | 85,400 |
| Subtotal Equipment - Audio-Visual | | | | | | 85,400 |
| Total B32 Equipment | | | 66,064 | sf | 2.38 | 157,400 |
| B33 Conveying Systems | | | | | | |
| Elevators | | | | | | |
| passenger existing | | + | 4 | st | 1.00 | 4 |
| Subtotal Elevators | | | 4 | st | 1.00 | 4 |
| Total B33 Conveying Systems | | | 66,064 | sf | 0.00 | 4 |
| TOTAL B3 FITTINGS & EQUIPMENT | | | | | | 1,611,604 |



ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| C1 MECHANICAL | | | | | | |
| C11 Plumbing & Drainage | | | | | | |
| Equipment | | | | | | |
| water service entrance, water meter, RPBP, etc | | | 20,000 | ls | 1.00 | 20,000 |
| domestic water source heat pump w/ electrical backup | | | 1 | no | 60,000.00 | 60,000 |
| recirculation pump | | | 1 | no | 5,720.00 | 5,720 |
| sump pump | | | 1 | no | 8,500.00 | 8,500 |
| sewage ejector, storm ejector, grease traps, mixing valves, etc. | | | 66,064 | sf | 0.60 | 39,638 |
| testing, coordination, BIM | | | 66,064 | sf | 0.60 | 39,638 |
| demo support/make safe | | | 66,064 | sf | 0.25 | 16,516 |
| Subtotal Equipment | | | | | | 190,013 |
| Major Domestic Fixtures | | | | | | |
| major fixtures | | + | 60 | no | 2,000.00 | 120,000 |
| Subtotal Major Domestic Fixtures | | | 60 | no | 2,000.00 | 120,000 |
| Minor Domestic Fixtures | | | | | | |
| minor fixtures | | + | 30 | no | 700.00 | 21,000 |
| roof drains, modify per new roof | | | 10,000 | ls | 1.00 | 10,000 |
| Subtotal Minor Domestic Fixtures | | | 30 | no | 1,033.33 | 31,000 |
| Piping | | | | | | |
| water | | + | 3,200 | lf | 60.00 | 192,000 |
| waste & vent | | + | 2,500 | lf | 72.00 | 180,000 |
| storm, existing to remain | | + | | lf | 0.00 | 0 |
| headend equipment connections | | | 3 | no | 2,660.00 | 7,980 |
| fixture connections | | | 60 | no | 310.00 | 18,600 |

ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| Subtotal Piping | | | 5,700 | lf | 69.93 | 398,580 |
| Med/Lab Equipment | | | | | | |
| air compressor | | | 1 | no | 35,000.00 | 35,000 |
| Subtotal Med/Lab Equipment | | | | | | 35,000 |
| Med/Lab Fixtures | | | | | | |
| compressed air connections | | + | 54 | no | 400.00 | 21,600 |
| Subtotal Med/Lab Fixtures | | | 54 | no | 400.00 | 21,600 |
| Med/Lab Piping | | | | | | |
| air | | + | 1,100 | lf | 50.00 | 55,000 |
| Subtotal Med/Lab Piping | | | 1,100 | lf | 50.00 | 55,000 |
| Total C11 Plumbing & Drainage | | | 66,064 | sf | 12.88 | 851,193 |
| C12 Fire Protection | | | | | | |
| Sprinklers | | | | | | |
| incoming service, DCVA, FDC | | | 25,000 | ls | 1.00 | 25,000 |
| sprinkler coverage | | + | 66,064 | sf | 6.40 | 422,810 |
| Subtotal Sprinklers | | | 66,064 | sf | 6.78 | 447,810 |
| Total C12 Fire Protection | | | 66,064 | sf | 6.78 | 447,810 |
| C13 HVAC | | | | | | |
| Air Handling Units | | | | | | |
| DOAS w/ heat recovery and heat pumps(4no) | | + | 30,000 | cfm | 30.00 | 900,000 |
| Subtotal Air Handling Units | | | 30,000 | cfm | 30.00 | 900,000 |



ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| Fans | | | | | | |
| general supply/exhaust | | | 66,064 | sf | 0.50 | 33,032 |
| Subtotal Fans | | | | | | 33,032 |
| Heating Plant | | | | | | |
| connect to incoming service steam | | | 20,000 | ls | 1.00 | 20,000 |
| PRV station | | | 1 | no | 30,000.00 | 30,000 |
| heat exchanger, plate & frame | | | 1 | no | 40,000.00 | 40,000 |
| heat exchanger, shell & tube | | | 1 | no | 30,000.00 | 30,000 |
| hot water pumps w/vfd's | | | 2 | no | 15,000.00 | 30,000 |
| remainder of plant: air separators, expansion tanks, flash tanks | | | 10,000 | ls | 1.00 | 10,000 |
| Subtotal Heating Plant | | | | | | 160,000 |
| Cooling Plant | | | | | | |
| adiabatic fluid cooler (2no) | | + | 220 | tns | 1,950.00 | 429,000 |
| heat exchanger, plate & frame | | | 1 | no | 40,000.00 | 40,000 |
| pumps w/vfd's | | | 2 | no | 15,000.00 | 30,000 |
| remainder of plant: air separators, expansion tanks, chemical treatment, flash tanks | | | 10,000 | ls | 1.00 | 10,000 |
| Subtotal Cooling Plant | | | 220 | tns | 2,313.64 | 509,000 |
| Air Distribution | | | | | | |
| ductwork | | + | 66,100 | lbs | 17.00 | 1,123,700 |
| insulation | | | 36,400 | sf | 5.70 | 207,480 |
| air distribution | | | 66,064 | sf | 3.50 | 231,224 |
| Subtotal Air Distribution | | | 66,100 | lbs | 23.64 | 1,562,404 |
| Terminal Units | | | | | | |
| terminal units, cabinet unit heaters, fin tube radiation, etc | | + | 20 | no | 2,000.00 | 40,000 |
| water source heat pump w/VAV's | | + | 75 | no | 10,500.00 | 787,500 |

ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| Subtotal Terminal Units | | | 95 | no | 8,710.53 | 827,500 |
| Piping | | | | | | |
| piping, plant | | + | 1,000 | lf | 250.00 | 250,000 |
| piping, mains | | + | 6,000 | lf | 80.00 | 480,000 |
| piping, terminal unit | | + | 3,800 | lf | 50.00 | 190,000 |
| headend equipment connections | | | 14 | no | 3,050.00 | 42,700 |
| terminal unit connections | | | 170 | no | 520.00 | 88,400 |
| Subtotal Piping | | | 10,800 | lf | 97.32 | 1,051,100 |
| Miscellaneous | | | | | | |
| testing, balancing, BIM, coordination, as-builts & 3rd party assist commissioning | | | 66,064 | sf | 2.00 | 132,128 |
| demo support/make safe | | | 66,064 | sf | 0.50 | 33,032 |
| Subtotal Miscellaneous | | | | | | 165,160 |
| Total C13 HVAC | | | 66,064 | sf | 78.84 | 5,208,196 |
| C14 Controls | | | | | | |
| Controls | | | | | | |
| controls | | | 66,064 | sf | 15.70 | 1,037,205 |
| Subtotal Controls | | | | | | 1,037,205 |
| Total C14 Controls | | | 66,064 | sf | 15.70 | 1,037,205 |
| TOTAL C1 MECHANICAL | | | | | | 7,544,403 |



ELEMENTAL ESTIMATE

| Description | Trade | | Quantity | | Rate | Amount |
|---|---|---|---|---|---|---|
| C2 ELECTRICAL | | | | | | |
| C21 Service & Distribution | | | | | | |
| Normal Service & Distribution | | | | | | |
| distribution equipment & feeders | | + | 2,400 | A | 500.00 | 1,200,000 |
| Subtotal Normal Service & Distribution | | | 2,400 | A | 500.00 | 1,200,000 |
| Emergency Service & Distribution | | | | | | |
| emergency service, not reqd | | + | | kw | 0.00 | 0 |
| Subtotal Emergency Service & Distribution | | | | kw | | 0 |
| Motor Wiring & Control | | | | | | |
| motor wiring | | | 66,064 | sf | 3.50 | 231,224 |
| Subtotal Motor Wiring & Control | | | | | | 231,224 |
| Total C21 Service & Distribution | | | 66,064 | sf | 21.66 | 1,431,224 |
| C22 Lighting & Devices | | | | | | |
| Lighting | | | | | | |
| lighting | | + | 66,064 | sf | 20.00 | 1,321,280 |
| lighting controls | | | 66,064 | sf | 2.00 | 132,128 |
| Subtotal Lighting | | | 66,064 | sf | 22.00 | 1,453,408 |
| Devices | | | | | | |
| devices | | + | 66,064 | sf | 8.00 | 528,512 |
| Subtotal Devices | | | 66,064 | sf | 8.00 | 528,512 |
| Total C22 Lighting & Devices | | | 66,064 | sf | 30.00 | 1,981,920 |

ELEMENTAL ESTIMATE

| Description | Trade | Quantity | | Rate | Amount |
|---|---|---|---|---|---|
| DIRECT CONSTRUCTION COST | | | | | 26,010,989 |
| Z1 GENERAL REQUIREMENTS | | | | | |
| Z11 General Requirements | | | | | |
| GCs, GRs, Permits, Bonds, Insurance | | | | | |
| GCs, GRs, Permits, Bonds, Insurance | + | 13.0% | ls | | 3,381,429 |
| Subtotal GCs, GRs, Permits, Bonds, Insurance | | | ls | | 3,381,429 |
| Total Z11 General Requirements | | 66.064 | sf | | 3.381.429 |
| Z12 Fee | | | | | |
| Profit/Fee/Risk | | | | | |

Z121 Profit/Fee:
Head office overhead, construction manager's fee, general contractors profit.

Z122 Risk:
Warranties, guarantees and liquidated damages.
Labour restrictions & requirements; Strike or lockout delays.
Bidding restrictions and requirements.

| Description | Trade | Quantity | | Rate | Amount |
|---|---|---|---|---|---|
| Profit/Fee/Risk | + | 3.0% | ls | | 780,330 |
| Subtotal Profit/Fee/Risk | | | ls | | 780,330 |
| Total Z12 Fee | | 66.064 | sf | | 780.330 |
| TOTAL Z1 GENERAL REQUIREMENTS | | | | | 4.161.758 |



ELEMENTAL ESTIMATE

| Description | Trade | Quantity | | Rate | Amount |
|---|---|---|---|---|---|
| Z2 CONTINGENCIES | | | | | |
| Z21 Design Contingency | | | | | |
| Design Stage Contingency | | | | | |

Design contingency covers unanticipated changes during design and is absorbed as design progresses and more detailed information becomes available and is normally reduced to zero for final documents.

Z211 Documentation
Covers errors and omissions in design documents, definition of lump sum allocations (unmeasured items), development and definition of measured elements, development and definition of details and assemblies.

Z212 Estimating
Covers estimating errors and omissions.

Z213 Program
Covers unforeseen site conditions, program and user scope changes, owner directed design changes, design changes caused by regulatory bodies (excluded - typically with project contingency).

| Description | Trade | Quantity | | Rate | Amount |
|---|---|---|---|---|---|
| Design Stage Contingency | + | 15.0% | ls | | 3,901,649 |
| Subtotal Design Stage Contingency | | | ls | | 3,901,649 |
| Total Z21 Design Contingency | | 66.064 | sf | | 3.901.649 |
| Z22 Escalation Contingency | | | | | |
| Escalation Contingency | | | | | |

ELEMENTAL ESTIMATE

| Description | Trade | Quantity | | Rate | Amount |
|---|---|---|---|---|---|
| Escalation contingency covers rate increases from the present to the start of construction and is normally reduced to zero for final documents. | | | | | |
| Z221 Inflation: Covers increases due to inflation (labour and materials) until start of construction. | | | | | |
| Z222 Bidding: Covers increases due to lack of bidders or busy market conditions, variance between actual bid amounts and averages used in estimating. | | | | | |
| During periods of unstable market conditions and price volatility, we recommend a bidding contingency (usually 5 - 10 percent) be included to reflect both the sudden upward or downward shifts in the market and the greater spread to be expected in the range of bids. | | | | | |
| Escalation Contingency | + | 0.0% | ls | | 0 |
| Subtotal Escalation Contingency | | | ls | | 0 |
| **Bidding Contingency** | | | | | |
| Bidding Contingency | + | 0.0% | ls | | 0 |
| Subtotal Bidding Contingency | | | ls | | 0 |
| Total Z22 Escalation Contingency | | 66.064 | sf | | 0 |
| Z23 Construction Contingency | | | | | |
| Construction Contingency | | | | | |
| Construction contingency covers changes during construction. | | | | | |
| Z231 Documentation Covers extra costs during construction due to unforeseen site conditions, errors and omissions in documentation or construction management, etc. (typically included). | | | | | |
| Z232 Program Covers extra costs during construction due to program and user scope modifications, changes caused by regulatory bodies, overrun of cash allowances, etc (excluded - typically with project contingency). | | | | | |
| Construction Contingency | + | 5.0% | ls | | 1,300,550 |



ELEMENTAL ESTIMATE

| Description | Trade | Quantity | | Rate | Amount |
|---|---|---|---|---|---|
| Subtotal Construction Contingency | | | ls | | 1,300,550 |
| Total Z23 Construction Contingency | | 66.064 | sf | | 1,300,550 |
| TOTAL Z2 CONTINGENCIES | | | | | 5,202,198 |

ELEMENTAL ESTIMATE

| Description | Trade | Quantity | | Rate | Amount |
|---|---|---|---|---|---|
| Z3 OTHER COSTS | | | | | |
| Z31 Other Costs | | | | | |
| Ancillary Costs | | | | | |
| (1) Development charges & special taxes – NIC.<br>(2) Payments to other agencies – NIC,<br>(3) Hazardous waste removal – NIC,<br>(4) Occupancy Costs: loose furnishing and equipment – NIC, moving costs – NIC,<br>(5) Design: preconstruction services – NIC, architects, engineers, and other consultants fees – NIC.<br>(6) Administrative and financing costs – NIC<br>(7) Land acquisition – NIC, survey and legal fees – NIC. | | | | | |
| Ancillary Costs | + | 0.0% | ls | | 0 |
| Subtotal Ancillary Costs | | | ls | | 0 |
| Total Z31 Other Costs | | 66,064 | sf | | 0 |
| TOTAL Z3 OTHER COSTS | | | | | 0 |



ELEMENTAL ESTIMATE

| Description | Trade | Quantity | Rate | Amount |
|---|---|---|---|---|
| INDIRECT CONSTRUCTION COST | | | | 9,363,956 |
| TOTAL COSTS | | | | 35,374,945 |