WILMINGTON WILDWOOD ELEMENTARY SCHOOL PROJECT

MSBA – Module 6

DESIGN DEVELOPMENT REPORT

20 March 2026

DORE + WHITTIER

Left Field PROJECT MANAGEMENT

FONTAINE BROS.

March 20, 2026

Ms. Katie Cronin, Project Coordinator
Ms. Robin McElaney, Senior Project Coordinator/ DSP Administrator
Massachusetts School Building Authority
40 Broad Street; Suite 500
Boston, MA 02109

RE: Town of Wilmington; Wilmington Elementary School
MSBA Design Development Submission

Dear Ms. Cronin & Ms. McElaney

I, David Saindon, have reviewed the enclosed Wilmington Elementary School ("the Project") Design Development submission and certify that the information is accurate and complete to the best of my knowledge and belief. In addition, I certify the following:

1. Leftfield has reviewed and coordinated the materials with Dore + Whittier Architects
2. The submittal is complete and conforms to MSBA requirements
3. The proposed project, as documented within this DD submission, is in general alignment with the scope as depicted in the schematic design submission/Town approval
4. The proposed project, as documented within this DD submission, is within the District's budget, and the District has approved the materials for submission to the MSBA.

Please note the following: The proposed Project remains on budget and on schedule, with Fontaine Bros. anticipated to mobilize for early site work this summer. On March 17, 2026, Dore + Whittier Architects and LeftField presented the Design Development (DD) documentation to the Building Committee, which unanimously voted to approve and advance the DD submission to the MSBA. A certification of that vote is included with this cover letter. The approved meeting minutes from the March 17, 2026 meeting will be forwarded as a supplement to this submission following their anticipated approval by the School Building Committee at its meeting currently scheduled for April 14, 2026. Additionally, there have been no changes to the Project's gross square footage (GSF), nor to the net square footage or room locations associated with the DESE special education program.

Please feel free to contact me with any questions regarding the enclosed information.

Sincerely,
Leftfield, LLC

David Saindon
Project Director

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March 20, 2026

Katie Cronin, Project Coordinator
Robin McElaney, Senior Project Coordinator/ DSP Administrator
Massachusetts School Building Authority
40 Broad Street; Suite 500
Boston, MA 02109

RE: Certification of Vote Authorizing MSBA Design Development Submission

Dear Ms. Cronin & Ms. McElaney:

The Wilmington Elementary School Building Committee, also known as the Wildwood School Building Committee ("SBC"), convened in an open meeting on March 17, 2026, at 6:00 PM. A quorum of the Committee was present. During this meeting, LeftField and Dore + Whittier Architects presented the Design Development ("DD") submission for the Wilmington Elementary School Project. Upon completion of the presentation, the following vote was taken:

Motion: Moved by Ms. O'Connell, seconded by Ms. Varbedian

"To authorize Dore + Whittier Architects and LeftField, on behalf of the Town, to submit the Design Development (DD) submission, as presented, to the Massachusetts School Building Authority."
A roll call vote of the members present was taken as follows:

Diane M. Allan – Yes
Christine Holloran – Yes
David A. Ragsdale – Yes
Gregory B. Bendel – Yes
Dennis Kelley – Yes
Stacy Scott – Yes
Kate Bissell – Yes
Lilia Maselli – Yes
Paul J. Melaragni – Yes
Dr. David Thomson – Yes
Michael Camoscio – Yes
Craig P. Miner – Yes
Stephen Turner – Yes
Justin Cusce – Yes
Christine Murray – Yes
Vivian Varbedian – Yes
Marianne Gallezzo – Yes
Judith L. O'Connell – Yes
Nicholas Golden – Yes
Christine Prendergast – Yes

The SBC voted unanimously, with 20 votes in favor, 0 opposed, and 0 abstentions.

I hereby certify that the above is a true and accurate record of the action taken at the March 17, 2026 SBC meeting with respect to the submission of the Design Development materials to the Massachusetts School Building Authority.

Judith L. O'Connell

Judith L. O'Connell, Assistant Town Manager
Chair of the School Building Committee

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Acknowledgements

Dore & Whittier Architects, Inc. acknowledges the following individuals from the Town of Wilmington and the Wilmington Public School District and for their assistance to the Design Team.

Town of Wilmington
R. Eric Slagle, Town Manager
Judith O'Connell, Assistant Town Manager
Dennis Kelley, Public Buildings Superintendent
Jamie Magaldi, DPW
Paul Alunni, Town Engineer
Valerie Gingrich, Planning and Conservation
Al Spaulding, Building Inspector

School Building Committee (SBC)
Judith O'Connell – Assistant Town Manager, Committee Chair
Vivian Varbedian, North Side Parent, Committee Vice Chair
Diane M. Allan, Permanent Building Committee
Gregory B. Bendel, Former Board of Selectmen, Parent
Kate Bissell, Principal, Wildwood Early Childhood Center
Kevin A. Caira, Board of Selectmen Alternate
Michael Camoscio, North Side Parent/Mechanical Engineer
Justin Cusce, North Side Parent
Marianne Gallezzo, Finance Committee
Nicholas Golden, School Committee
Christine Holloran, Wildwood Teacher
John C. Holloway, Permanent Building Committee
Dennis Kelley, Public Buildings Superintendent
Paul J. Melaragni, Permanent Building Committee
Craig Miner, West Side Parent/Civil Engineer
Christine Murray, Interim Director of Student Support Services
Christine Prendergast, North Side Parent
David A. Ragsdale, School Committee
Paul Ruggiero, Assistant Superintendent of Administration & Finance (now retired)
Stacey Scott, Principal, Woburn Street Elementary School
R. Eric Slagle – Town Manager
Dr. David Thomson, Interim Superintendent of School
Stephen Turner, School Committee

Wilmington Public Schools District
All staff

School Committee
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Nicholas Golden, Vice Chair
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INTRODUCTION

Summary

This design team is excited to submit this document for the Design Development of the new Wilmington Wildwood Elementary School, located at 320 Salem Street, Wilmington, MA, 01887.

A Special Town Meeting Election to approve the project was held on October 13, 2025, resulting in overwhelming support for the plans for a new consolidated elementary school serving 755 students in grades K-5 and 100 preschool students. The project is proceeding with Construction Management at Risk (CMR) under the Ch 149A construction delivery method. Fontaine Brothers ("FBI") is currently under contract, working in the preconstruction phase.

The building design measures an area of 165,035 GSF and aligns with the Schematic Design Submission and the execution of the Project Funding Agreement.

The project is designed to support the consolidated educational program with a lens on safety, durability, and sustainability. Integrated Special Education and Extended Learning spaces provide inclusive access for all students and support a wide range of teaching and learning opportunities.

Design Process Update

The Design Team began the Design Development phase with another series of User Group meetings with key faculty and staff to confirm design direction and room details with these representative users. The team has continued to hold regular meetings with the Owner, OPM, School Building Committee (SBC), and SBC Liaisons for Site and Interiors, to advance the plans through the Design Development process. These groups include key Administration, the District and Town Department of Public Works, Fire and Police Departments, Town regulatory staff, community representatives, including Abutters, and our consultants. Public presentations have included building and site plan updates with landscape design elements, traffic discussions regarding operational procedures for parent vehicles and buses, Engineering updates, and perspective interior and exterior renderings with material samples. Recommendations and comments from these meetings have been included in the updated plans.

Interior & Exterior Design

The Design Team presented design images, materials, and options to the SBC Liaisons that were appointed during this phase. Meetings were held both in person and online as the design progressed. The drawings and renderings included in this submission reflect the work and guidance of these individuals.

Summary of Building and Site Plan Updates

The overall site plan layout has not changed significantly. Adjustments include more robust landscaping elements, especially along the property line to provide screening for abutters. Early in

Design Development, the design team met with Planning and Conservation to review the resource areas identified as non-jurisdictional. Additional information led to a change in the status of the resource areas, which is reflected in the revised plans and permitting schedule.

As a result of ongoing user-group meetings during this phase, minor modifications to a couple of spaces around the school have been implemented while maintaining the overall design intent. As a result, the design is more efficient and functional in terms of layout and ease of use of the spaces.

Apart from these edits to space configurations, there have been the typical adjustments to: walls in relationship to structural grids; edits to structure; adjustment in number, size, and location of service chases; and other minor detailing adjustments.

Project Budget and Construction Cost

The project budget per the PFA is $173,265,626, with a schematic design construction budget of $137,743,666. The current DD construction budget, utilizing the Fontaine Bros. ("FBI") as the new DD construction control estimate, is $137,629,181. This reflects an underrun of $114,485 as compared to the schematic design construction control budget. None of the revisions during the design phase has had an impact on the project budget or schedule. In fact, the team has worked diligently and creatively throughout the design phase to manage the costs to stay within budget.

Early Bid Packages/ Schedule

A revised project schedule is included and has been approved by the Building Committee, reflecting ongoing planning and discussions among the District/Town, Leftfield, Fontaine Brothers, and Dore and Whittier. Under this schedule, Phase I of the project, the new elementary school, will commence construction activities in late June 2026 and be substantially complete by July 2028. This will allow ample time for technology and FF+E deployment prior to Fall 2028 occupancy. Phase II of the project, the demolition of the existing HS and completion of site development, will be complete by August 2029. While the exact scope of Early Bid Packages is still being evaluated by the Team, at a minimum, we currently anticipate the following Early Bid Packages:

- EBP #1 (Site enabling) – released with the 60% CD set in June 2026.
- EBP #2 (Foundations, Structural Steel, elevator, Switchgear) – released based on the 90% CD design anticipated to be issued on August 14, 2026, for award in September 2026.
- EBP #2A (Switchgear/ Other TBD) – release placeholder based on market and supply chain conditions.
- ERP #3 (All remaining scope) – released based on the 100% CD documents anticipated to be issued to the MSBA and for trade bidding in early November of 2026. This set is considered the "bid" set.

An Early Release Package (ERP) Definition and Schedule Matrix outlining the above is available in Section 6A.2.0, under Project Scope and Budget.

Construction Delivery Method

On November 19, 2024, the Wilmington Elementary School Building Committee (the "Committee") approved the Construction Manager at Risk (CM-R) delivery method as the preferred construction approach for the Project.

Inspector General Status Update

In December 2024, SMMA, on behalf of the Town, the Project, and the project team, submitted the CM-R application to the Office of the Inspector General ("IG"). On January 13, 2025, the IG issued its approval authorizing the Project to proceed using the Construction Manager at Risk delivery method. Pursuant to the IG approval letter, the IG must be notified if the Owner's Project Manager (OPM) changes. In June 2025, LeftField was formally selected as the Town's new OPM, and a contract was executed on September 17, 2025. In July 2025, LeftField formally notified the IG of the change in OPM services. The IG subsequently acknowledged the notification and took no exception to the change.

Fontaine Status Update

The Committee received Statements of Qualifications (SOQs) from four CM firms in response to the CM-R procurement. Following review of the SOQs, the Wilmington Elementary School Building Committee CM-R Subcommittee (the "Subcommittee") interviewed all four firms. The Subcommittee conducted interviews on February 11 and February 12, 2025. Following the interview process, the Subcommittee ranked Fontaine Bros., Inc. ("FBI") as the highest-qualified firm. FBI was subsequently notified of its selection for construction management services on March 11, 2025.

Since that time, Fontaine has been actively providing preconstruction services in accordance with the RFP and executed contract. These services have included site logistics planning, development of early trade package procurement strategies, preparation of a schematic design cost estimate and reconciliation with the design team, continued support in addressing neighborhood concerns, coordination of preconstruction condition surveys of adjoining properties, and preparation of the design development cost estimate and reconciliation.

Supplier Diversity Office ("SDO") Status Update

Following review of the executed Town–Fontaine construction manager agreement, LeftField prepared an amendment to align the contract language with standard LeftField construction manager agreement provisions. Fontaine has reviewed the proposed amendment and has taken no exception. During this review, LeftField also identified that consultation with the Massachusetts Supplier Diversity Office (SDO) had not occurred prior to the award of the CM-R agreement. LeftField

has since engaged with the SDO and is currently coordinating with their office to establish appropriate SDO participation goals for the Project. Upon finalization of the SDO participation goals, LeftField will issue a contract amendment to Fontaine and the Town to formally incorporate the SDO requirements and LeftField contract provisions into the construction manager agreement.

Project Budget Update and Compliance

The Project Funding Agreement (PFA) has a total project budget of $173,265,626. The current budget, as of the issuance of this Design Development ("DD") Submittal, results in no change to the PFA budget. No additional funding appropriations are being considered.

The PFA has an estimated schematic design construction cost/ budget of $137,743,666. The reconciled DD estimates prepared by Fontaine ("FBI") and PM+C resulted in a construction budget line underrun. For purposes of establishing a DD control estimate, the Project Team is using the FBI estimate. As you will see in other sections of the DD submittal, the FBI DD control estimate of $137,629,181 is $114,485 under the control PFA schematic construction budget of $137,743,666. The Designer's (PM+C) reconciled DD construction cost estimate is 135,413,592, which is $2,330,074 under the control PFA construction budget of $137,743,666.

PFA Schematic Design Construction Budget	Design Development Reconciled Estimates		% Δ Between Estimates
	PM+C	Fontaine	
$137,743,666	$135,413,592	$137,629,181	1.62%
Underrun >>	$2,330,074	$114,485	

A copy of the Designer's cost estimate is provided in Section 6A.3.4 of this report. A copy of the CM-R's cost estimate is provided in Appendix 20 of this report.

OPM Deliverables

OPM Design Development Review and Coordination

As part of the Design Development ("DD") phase, LeftField completed a detailed review of the DD drawings, specifications, and project manual documents. Review comments were documented in the OPM Review Comment Tracking Form and shared with the design team for coordination and incorporation into future design submissions. The review included an evaluation of the project manual, as well as civil, landscape, architectural, structural, mechanical, electrical, plumbing, fire protection, and technology drawings.

The review comments generally focused on document coordination, constructability considerations, and opportunities to refine the drawings and specifications further as the design advances into the Construction Documents phase. Several comments addressed coordination between disciplines, including alignment between architectural and structural elements, plumbing and mechanical equipment locations, and coordination of building systems such as fire protection, electrical distribution, and mechanical equipment layouts. Additional comments recommended clarifications to site drainage strategies, accessibility elements, building security and egress considerations, and site operations such as snow removal and maintenance access.

Comments also included recommendations to improve document clarity and coordination within the project manual and drawings, such as correcting references between specification sections, refining schedules and legends, and incorporating additional details in future drawing sets to support construction coordination. In general, the review found that the Design Development ("DD") documents are appropriately developed for this stage of design and provide a sufficient level of detail to support advancement into the Construction Documents phase. Based on this review of the DD drawings, specifications, and associated project documentation, LeftField recommends approval of the Design Development submission to the MSBA.

The design team will review and respond to the OPM comments as the design progresses, with anticipated coordination and responses incorporated and documented into the forthcoming 60% CD submissions. A complete log of the OPM review comments is included in Appendix 11 of this report.

Design Coordination

Technical Accuracy, Coordination, & Clarity

LeftField has reviewed the Design Development ("DD") submission, with consideration of technical accuracy, coordination, and the overall clarity of the drawings and specifications. In general, the DD documents are consistent with the level of development expected for an MSBA Design Development submission. While the DD documents represent the typical level of design expected at this phase, the set is also being advanced to support early bidding of site enabling, utilities, and earthwork scopes, which are anticipated to be procured from the 60% Construction Documents package scheduled for mid-May.

During the DD phase, additional investigative work was completed to further inform the design, including geotechnical exploration, environmental testing, hazardous materials (ACM) investigations, and hydrant flow testing. These reports are included in the Appendices of this report. As part of ongoing coordination between Fontaine Brothers, Inc. and the Project Team, adjustments were made to the underground detention system to support the planned construction phasing strategy, which includes Phase I construction of the new school, followed by Phase II demolition of the existing building and completion of final site improvements.

In the coming months, Fontaine Brothers will continue coordination with Reading Municipal Light regarding routing options and ductbank requirements for the primary electrical service to the new school facility. Additional coordination efforts will focus on the structural steel and glulam beam systems, particularly the interface between these structural elements, as the superstructure scope is anticipated to be bid and procured from the 90% Construction Documents set scheduled for August of this year.

Throughout the DD phase, Dore + Whittier continued to conduct numerous user group meetings with project stakeholders, including school district departments, police and fire representatives, and town facilities personnel. Overall, the DD submission demonstrates an appropriate level of accuracy, coordination, and clarity for an MSBA Design Development submission while also laying the foundation for early procurement of site-enabling work associated with the forthcoming 60% Construction Documents submission.

Efficiency & Cost Effectiveness

LeftField has reviewed the Design Development ("DD") submission in conjunction with the reconciled construction cost estimates prepared by Fontaine Brothers, Inc., and PM+C. Based on this review, a formal Value Engineering ("VE") process requiring Committee approval is not necessary at this time, as the Project remains within the approved construction budget.

However, as part of the Project Team's continued efforts to evaluate potential cost optimization opportunities, a Value Engineering log has been developed for future consideration. The VE log identifies potential items that may be evaluated as the design progresses through the Construction Documents phase. Over the coming months, the Project Team and Project stakeholders will continue to review and assess these potential items to determine whether any may provide value to the Project. A copy of the VE log is included in this section of the report as Item G.

LeftField has participated in numerous coordination meetings with the design team and Project stakeholders throughout the DD phase. Based on these discussions and our review of the DD documents, the design and project scope remain consistent with the overall program and scope established during the Schematic Design phase. Based on our experience with similar school construction projects in Massachusetts and the scope previously defined, the current design approach is considered efficient and cost-effective.

Operability

LeftField has reviewed the Design Development ("DD") submission with consideration for the facility's long-term operability. Based on this review, the DD documents reflect a design that appropriately

supports the day-to-day operations of an elementary school and incorporates feedback received through the ongoing stakeholder engagement process.

Throughout the design process, Dore + Whittier has conducted multiple user group meetings and coordination sessions with district facilities personnel, school staff, and district leadership to review operational needs and building functionality. Input received during these meetings has been incorporated into the design to help ensure that building systems, end-user use, and operational areas support the District's educational and facilities management objectives. Overall, the DD submission reflects a design approach that supports efficient building operations and long-term facility use.

Constructability

LeftField has reviewed the Design Development ("DD") submission with consideration for constructability and the ability to efficiently implement the proposed design in the field. Based on this review, the DD documents reflect a design that is generally consistent with industry standards and applicable Massachusetts energy code requirements. The drawings and specifications are developed to a level appropriate for the DD phase and provide a sufficient foundation for advancing the design into the Construction Documents phase.

In addition, the DD documents support the Project Team's planned procurement strategy for early site enabling and sitework scopes that are anticipated to be bid from the forthcoming 60% Construction Documents submission. As the design continues to advance, the Project Team will further refine key construction details, including wall sections and transitions between foundation systems, slab-on-grade and slab-on-deck conditions, and roof assemblies. These refinements will incorporate Fontaine Brothers' constructability feedback and preferred sequencing strategies to help ensure efficient construction execution. In addition, Fontaine has provided a DD review which can be found in Appendix 13 of this report.

Phasing

LeftField has reviewed the Design Development ("DD") submission with consideration for the project phasing approach established during the Schematic Design phase. The DD documents reflect the previously defined phasing strategy, which includes the construction of the new school facility, followed by the demolition of the existing building and the completion of final site improvements.

Fontaine Brothers will further develop a detailed construction logistics and site utilization plan as the Project advances into the Construction Documents phase. The District is familiar with the proposed phasing strategy and understands the adjustments to site circulation, including student drop-off and pick-up operations, that will occur during various stages of construction. Site phasing and circulation concepts have also been reviewed with the local police and fire departments to confirm that emergency access and operational considerations are maintained throughout construction.

As the Project progresses, the Project Team will continue to refine Phase II logistics to address parking availability and site circulation requirements during the period when the new school is occupied, and demolition of the existing building and construction of final parking areas are underway.

Bid Ability

LeftField has reviewed the Design Development ("DD") submission, considering the project's bid strategy and the ability to effectively procure the work through a phased bidding approach. Based on this review, the DD documents support the Project Team's planned strategy to implement early bid packages associated with sitework and superstructure scopes of work in advance of the full Construction Documents submission.

The Project Team anticipates utilizing a phased procurement approach that includes Early Release Package (ERP) #1 for site enabling and sitework activities and ERP #2 for superstructure-related elements. These packages are planned to be issued from the forthcoming Construction Documents submissions in order to support the overall project schedule and address potential market and supply chain considerations.

Additional information regarding the anticipated early release packages and their relationship to the Construction Documents submissions is provided in the table titled "Wilmington – Early Release Package (ERP) Definition and Schedule Matrix," which can be found in Appendix 10 of this report.

Site Access During Construction

LeftField has reviewed the Design Development ("DD") submission with consideration for site access and circulation during construction. Based on this review, the DD documents address construction access in a manner that supports safe and efficient site operations while allowing the existing school to remain operational during the construction of the new facility.

Fontaine Brothers' preliminary construction logistics plan proposes a dedicated construction entrance that separates construction-related traffic from existing school operations. This approach is intended to allow normal school access and daily site operations to continue with minimal disruption during construction activities. The logistics plan also maintains clear emergency vehicle access around the existing North Intermediate School throughout construction.

As the Project advances, the Project Team will continue to refine the construction logistics planning to address parking and circulation conditions associated with Phase II of the project. This will include coordination of parking accommodations and site access during the period when the new school is occupied, the existing school building is demolished, and final parking areas are constructed.

Design Process Update

During the Design Development ("DD") phase, Dore + Whittier continued to meet with various user groups consisting of key faculty and staff to review and confirm design direction, program requirements, and room layouts with representative users. These meetings helped refine the design and ensure that the building program and individual spaces align with the District's operational and educational needs.

Throughout the DD phase, the Project Team also continued to conduct regular meetings with the Owner, Owner's Project Manager, School Building Committee (SBC), and SBC liaisons for both Site and Interiors to advance the design. These coordination efforts included participation from key District administration, the Town's Department of Public Works, Police and Fire Departments, Town regulatory staff, community representatives, and project consultants.

Public presentations and discussions during this phase included updates to the building and site plans, landscape design elements, traffic circulation, and operational procedures for parent vehicles and buses, engineering updates, and interior and exterior building renderings. Feedback and recommendations received during these meetings were considered by the design team and incorporated into the evolving design where appropriate.

Commissioning Consultants Review & Summary

ICO Energy and Engineering has been engaged by the MSBA as the Project's Commissioning Agent. LeftField coordinated with ICO Energy and Engineering regarding the Design Development ("DD") submission review, and a coordination meeting was held on February 27, 2026, with ICO Energy and Engineering, Dore + Whittier, and Fontaine Brothers.

As part of its commissioning scope, ICO Energy and Engineering reviewed the 100% Design Development documents issued on February 6, 2026. The review evaluated the mechanical, electrical, and plumbing systems to confirm alignment with the project's Owner's Project Requirements (OPR), Basis of Design (BOD), and applicable codes, standards, and industry best practices.

The review identified several items for clarification and coordination as the design advances toward the Construction Documents phase. Key topics included confirmation of OPR documentation for LEED compliance, coordination of plumbing fixtures, such as eyewash stations and associated controls, and verification of mechanical system elements, including condensate drainage, building air balance requirements, and supply air distribution to specific program spaces. Additional comments addressed coordination of the building automation system (BMS), lighting control integration, completion of mechanical and electrical equipment schedules, confirmation of system load calculations, and emergency generator loads. The review also noted the need for additional documentation in future submissions, including single-line and riser diagrams, equipment tagging, and confirmation of metering strategies for mechanical and plumbing systems.

These comments are typical for the Design Development phase and will be addressed by Dore + Whittier and their consultants as the design progresses into the Construction Documents phase, with responses documented as part of the 60% Construction Documents submission. A detailed log of the Commissioning Agent's review comments is included in Appendix 12 of this report.

Construction Manager DD Review Summary

Fontaine conducted a constructability review of the 100% Design Development documents dated February 6, 2026, for the Wilmington Elementary School project. The purpose of the review was to identify areas where additional coordination, clarification, or refinement may be beneficial prior to advancing the design into the Construction Documents phase.

Overall, the review identified a number of coordination items and requests for clarification across several disciplines, including civil/site, landscape, structural, architectural, electrical, mechanical, and plumbing systems. The comments primarily relate to coordination between drawings and specifications, clarification of design intent, and identification of areas where additional detail or alignment between disciplines will support efficient construction.

Several comments focus on coordination between drawings and specifications where certain materials, installation requirements, or dimensions appear to differ between documents. Additional comments address clarification of trade responsibilities for certain scopes of work, including items involving civil, plumbing, mechanical, electrical, roofing, and façade systems. The review also highlights areas of site and utility coordination, including routing of utilities, irrigation supply responsibilities, drainage coordination, and considerations related to maintaining service to the existing school during construction.

The review further identifies several structural and architectural coordination items, including clarification of roof equipment openings, structural supports, depressed slab conditions, and interface details between building systems. In addition, several mechanical, electrical, and plumbing comments note potential congestion within ceiling spaces, equipment schedule coordination, and the need for further alignment between MEP systems and architectural layouts.

Overall, the comments are typical for a project at this stage of design and are intended to support continued coordination and refinement as the design team progresses toward completion of the Construction Documents phase. A copy of the Fontaine DD review comments can be found in Appendix 13 of this report.

Coordination of District's Response to the MSBA Schematic Design Submission

A copy of the MSBA schematic design review and the District's return comments can be found in Appendix 1 of this report. There are no items requiring a resolution.

DCAMM Designer Evaluation for Study Phase

LeftField confirms submission of the DCAMM Designer evaluation for the Study Phase. The evaluation was issued to DCAMM electronically on October 31, 2025. A confirmation screenshot can be found in Appendix 28 of this report.

Project Schedule

Pursuant to the MSBA DD CD review template regarding various approvals and permitting, please note the following:

MSBA DD Review Element	DD Submission Project Response
○ DESE - Special Education approval by Department of Elementary and Secondary Education	The total GSF of the facility has remained the same, and the NET SF dedicated to the delivery of special education has remained unchanged. A copy of the DESE approval letter can be found in Appendix 14 of this report.
○ MHC – Project Notification Form and approvals by MA Historical Commission	The project has received MHC review and confirmation that it is not within its jurisdiction. No further action is required. A copy of the MHC approval letter can be found in appendix 15 of this report.
○ OIG - Construction Manager at Risk approval by the Office of Inspector General	All OIG approvals for CM-R have been obtained. No further action is required. A copy of the IG approval to proceed can be found in Appendix 16 of this report.

○ Executive Office of Energy and Environmental Affairs/EEA:	
▪ MSBA- State Site Permit Tracking Worksheet (refer to MSBA Project Advisory #88 for additional information). Note that all project submittals must include a completed and current State Site Permit Tracking Worksheet regardless of the status of the project's site approvals.	Please see Appendix 17 of this report.
▪ MEPA - MA Environmental Policy Act by Energy & Environmental Affairs:	A MEPA process will not be required. No further action is required. However, a MEPA checklist has been provided and can be found in Appendix 18 of this report.
• ENF - Environmental Notification Form	N/A. No further action is required.
• EIR - Environmental Impact Report	N/A. No further action is required.
▪ Article 97 Land Disposition Policy approval by Energy & Environmental Affairs	N/A. No further action is required.
○ MA DEP - Massachusetts Department of Environmental Protection	The project will submit an NTWP (non-traditional work plan) for the removal of ACM associated with the existing North Intermediate School at a future date in the spring of 2028.
○ MA DOT - Massachusetts Department of Transportation	N/A. No further action is required.
○ MA DPH - Massachusetts Department of Public Health	N/A. No further action is required.
○ EPA –NPDES National Pollutant Discharge Elimination System Notice of Intent approval by the US Environmental Protection Agency	The project will submit its NPDES notice of intent in May of 2026. This is referenced in the schedule attached to this report.
○ MAAB - Accessibility variances by MA Architectural Access Board	No MAAB variances are required for this project.
○ Indicate all required state reviews or permits on the milestone schedule including actual or planned approval dates, which are required in order to maintain the planned bidding and construction schedule and milestones indicated therein. For required state reviews or permit approvals which have not been obtained on schedule, provide a separate (sub network) schedule depicting recovery actions to obtain required approvals in order to maintain the bidding and construction schedule.	No State reviews or permits are required for this project.
○ Confirmation that the Project has undergone review and obtained all necessary approvals by any departments or Commonwealth agencies required by law to review the Project, including but not limited to the approvals listed above. Attached such documentation letters evidencing such reviews and approvals. In accordance with the Project Funding Agreement ("PFA") Section 4.12, the District must obtain such reviews or approvals prior to construction bids solicitation.	No State reviews or permits are required for this project.

○ For any required state reviews or permits for which approval has not been obtained as of the Design Development submission date, provide a status update including actions taken to date and actions planned to obtain the required state reviews and permit approval(s) in order to comply with the PFA Section 4.12 and maintain the projected schedule milestones listed in the OPM Deliverables.	N/A. No further action is required.
○ List all target dates for all local zoning approvals, testing and permits.	N/A. No further action is required.
○ Provide a certification that all applicable utility officials have been contacted by the Designer regarding each basic utility connection.	Please note that all utility entities have been contacted, and coordination will continue throughout the course of the project.

Additional Project Approval details can be found in the Updated Project Schedule, attached as Appendix 19 of this report.

Project Scope and Budget

CM Construction Cost Estimate – Uniformat II and CSI MasterFormat (no VE required)
Fontaine construction cost estimate, dated 03/10/2026, can be found in Appendix 20 of this report.

PM+C Construction Cost Estimate – Uniformat II and CSI MasterFormat (no VE required)
PM+C construction cost estimate, dated 03/10/2026, can be found in Section 6A.3.4 of this report.

OPM Cost Estimate Reconciliation Form
LeftField OPM reconciliation of the CM-R and Designer construction cost estimates form can be found in Appendix 21 of this report.

Cost Estimate Comparison Form
The LeftField updated cost estimate comparison form can be found in Appendix 22 of this report.

Updated Project Budget

The Project Funding Agreement (PFA) established a total project budget of $173,265,626. As of the issuance of this Design Development ("DD") submission, the overall Project budget remains consistent with the approved PFA, and no adjustments to increase or decrease the total project budget are proposed. At this time, the District is not pursuing any additional funding appropriations.

The PFA includes a Schematic Design construction budget of $137,743,666. As part of the DD phase, independent construction cost estimates were prepared by Fontaine Brothers, Inc. and PM+C and subsequently reconciled. The reconciliation resulted in estimates that are both below the PFA construction budget. For purposes of establishing the Project's DD control estimate moving forward, the Project Team has elected to utilize the Fontaine Brothers, Inc. estimate.

The Fontaine Brothers, Inc. DD control estimate totals $137,629,181, which is $114,485 below the PFA Schematic Design construction budget of $137,743,666. The Designer's reconciled DD construction estimate, prepared by PM+C, totals $135,413,592, which is $2,330,074 below the PFA construction budget.

PFA Schematic Design Construction Budget	Design Development Reconciled Estimates		% Δ Between Estimates
	PM+C	Fontaine	
$137,743,666	$135,413,592	$137,629,181	1.62%
Underrun >>	$2,330,074	$114,485	

As a result of Budget Revision Requests (BRR) #1 and #2, as well as anticipated cost savings reflected in the Fontaine Brothers, Inc. DD reconciled estimate, LeftField has prepared a revised MSBA 3011 budget as part of the DD submission requirements. Probable savings reflected in the reconciled estimate have been temporarily reallocated within the revised 3011 budget to the Owner's Construction Contingency. This reallocation has been made solely for purposes of the DD submission requirements, and LeftField is not currently planning to submit a Budget Revision Request associated with this projected cost underrun.

An updated MSBA 3011 budget, dated March 20, 2026, is included in Appendix 23 of this report.

Early Bid Packages

As identified during the Schematic Design phase, the Project Team evaluated the use of early release packages as part of the overall procurement strategy for the Wilmington Elementary School Project. Following the engagement of Fontaine Brothers, Inc., and through continued evaluation of market conditions and supply chain considerations, the scope and sequencing of these early release packages have been further refined.

An updated project schedule has been developed and reflects continued coordination among the District/Town, LeftField, Fontaine Brothers, Inc., and Dore + Whittier. Under the current schedule, Phase I of the project, which includes construction of the new elementary school facility, is anticipated to commence construction activities in late June 2026, with Substantial Completion targeted for July 2028. This schedule provides sufficient time for installing technology systems and FF&E prior to the planned Fall 2028 occupancy. Phase II of the project, consisting of demolition of the existing school building and completion of final site improvements, is currently scheduled to conclude in August 2029.

To support schedule certainty and address potential procurement and supply chain risks, the Project Team continues to evaluate the use of Early Bid Packages (EBPs). While the final scope of early release work will continue to be refined as the Construction Documents advance, the Project Team currently anticipates implementing the following early bid packages:

- EBP #1 – Site Enabling: anticipated to be issued with the 60% Construction Documents in June 2026.
- EBP #2 – Foundations, Structural Steel, Elevator, and Switchgear: anticipated to be issued with the 90% Construction Documents, currently scheduled for August 14, 2026, with trade awards targeted for September 2026.
- EBP #2A – Switchgear / Other Items TBD: placeholder package that may be advanced depending on market conditions and supply chain considerations.
- EBP #3 – Remaining Project Scope: anticipated to be issued with the 100% Construction Documents, currently scheduled for early November 2026, for submission to the MSBA and public trade bidding. This set shall be considered the "bid" set.

Additional details regarding the anticipated early release packages, including package definitions, estimating timelines, MSBA submission milestones, MSBA review periods, and anticipated award timing, are included in Appendix 10 of this report.

As of the issuance of this Design Development submission, no early bid packages have been awarded. However, site enabling and sitework scopes are anticipated to be bid and awarded from the 60% Construction Documents submission as outlined in the Early Release Package matrix included in this report.

Value Engineering Recommendations

Based on the reconciliation of the Design Development construction cost estimates prepared by Fontaine Brothers, Inc. and PM+C, the Project remains within the approved construction budget. As a result, a formal Value Engineering (VE) process requiring review and approval by the School Building Committee has not been necessary as part of the Design Development submission.

However, as part of the Project Team's continued effort to evaluate potential cost efficiencies and maintain budget alignment as the design advances, a Value Engineering log has been developed to track potential opportunities for consideration. The VE log identifies potential items that the Project Team and Project stakeholders may evaluate as the design progresses into the Construction Documents phase.

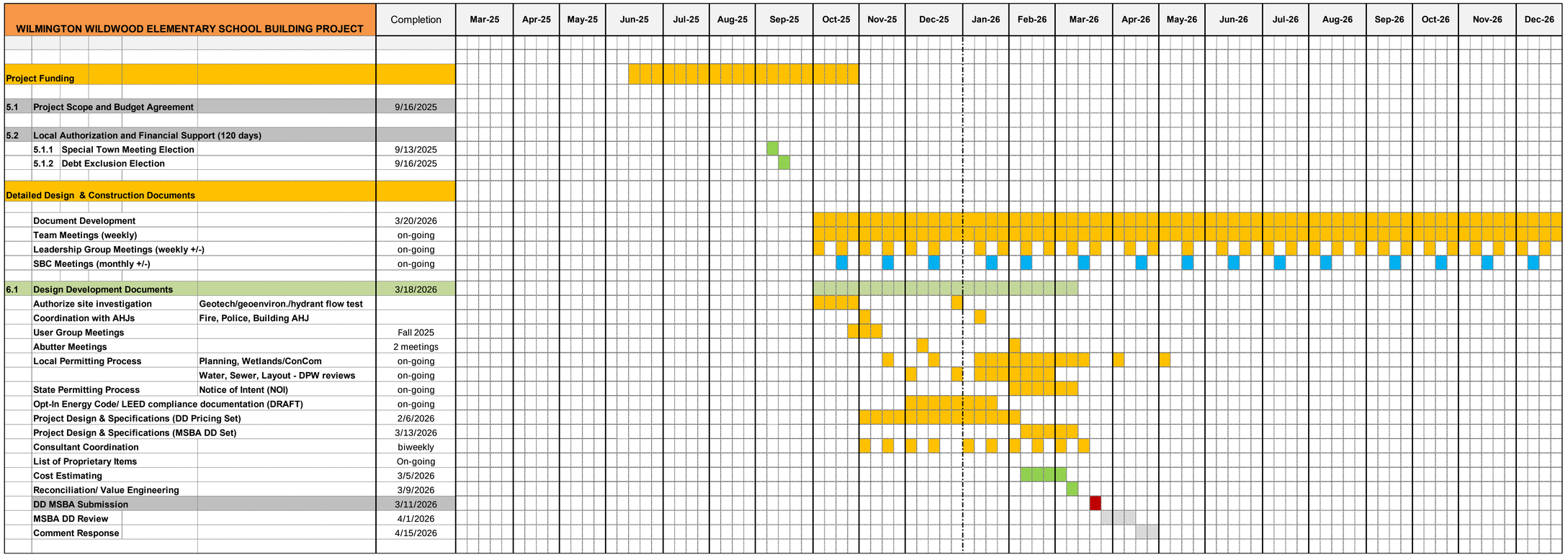
The VE log will continue to be reviewed and assessed by the Project Team, District leadership, and the School Building Committee to determine whether any of the identified items provide value to the Project while maintaining the design intent and program requirements. A copy of the VE log is included in Appendix 24 of this report. The MSBA Value Engineering summary tracking sheet is also included in Appendix 25 of this report.

Copy of Committee Vote for Accepted VE

Not Applicable, please see the comment above.

UPDATED WORK PLAN A

WILMINGTON WILDWOOD ELEMENTARY SCHOOL BUILDING PROJECT			Completion
Project Funding			
5.1	**Project Scope and Budget Agreement**		9/16/2025
5.2	**Local Authorization and Financial Support (120 days)**		
	5.1.1 **Special Town Meeting Election**		9/13/2025
	5.1.2 **Debt Exclusion Election**		9/16/2025
Detailed Design & Construction Documents			
	Document Development		3/20/2026
	Team Meetings (weekly)		on-going
	Leadership Group Meetings (weekly +/-)		on-going
	SBC Meetings (monthly +/-)		on-going
6.1	**Design Development Documents**		3/18/2026
	Authorize site investigation	**Geotech/geoenviron./hydrant flow test**	
	Coordination with AHJs	**Fire, Police, Building AHJ**	
	User Group Meetings		Fall 2025
	Abutter Meetings		2 meetings
	Local Permitting Process	**Planning, Wetlands/ConCom**	on-going
		Water, Sewer, Layout - DPW reviews	on-going
	State Permitting Process	**Notice of Intent (NOI)**	on-going
	Opt-In Energy Code/ LEED compliance documentation (DRAFT)		on-going
	Project Design & Specifications (DD Pricing Set)		2/6/2026
	Project Design & Specifications (MSBA DD Set)		3/13/2026
	Consultant Coordination		biweekly
	List of Proprietary Items		On-going
	Cost Estimating		3/5/2026
	Reconciliation/ Value Engineering		3/9/2026
	DD MSBA Submission		3/11/2026
	MSBA DD Review		4/1/2026
	Comment Response		4/15/2026



	WILMINGTON WILDWOOD ELEMENTARY SCHOOL BUILDING PROJECT		Completion
6.2	60% Construction Documents		6/22/2026
	Budget Management Incorporation		3/11/2026
	Project Budget Update		3/27/2026
	Project Schedule Update		3/27/2026
	Work Plan Update		3/27/2026
	Permitting Assessment		3/27/2026
	Updated Space Summary		3/18/2026
	Design Narratives		5/6/2026
	Interior Color Board		5/6/2026
	Interior Elevations		5/6/2026
	Updated Code Analysis		5/6/2026
	Opt-In Energy Code/ LEED compliance documentation (90%)		5/6/2026
	Updated Specifications		5/8/2026
	Updated Design Documents (all trades - CD60 Pricing Set)		5/15/2026
	Updated Design Documents (all trades - CD60 MSBA set)		6/18/2026
	Consultant Coordination		biweekly
	ERP #1 (Site/Civil/Soil)		5/22/2026
	Cost Estimating		6/4/2026
	Reconciliation/ VE as required		6/11/2026
	60% CD MSBA Submission		6/25/2026
	MSBA 60% CD Review		7/16/2026
	Comment Response		8/5/2026
6.3	90% Construction Documents		9/25/2026
	Budget Management Incorporation		6/29/2026
	Updated Work Plan		6/29/2026
	Updated Permitting Schedules		6/29/2026
	Project Schedule Update		6/29/2026
	Updated Space Summary		6/29/2026
	Structural & Energy Calculations		7/13/2026
	Updated Code Analysis		7/13/2026
	Updated Specifications		7/13/2026
	Updated Design Documents (all trades - CD90 Pricing Set)		7/13/2026
	Updated Design Documents (all trades - CD90 MSBA Set)		9/21/2026
	Consultant Coordination		biweekly
	Cost Estimating		9/3/2026
	Reconciliation		9/7/2026
	ERP #2 (Foundations/Dampproofing/Structural/Elevator)		8/14/2026
	90% CD MSBA Submission		9/22/2026
	MSBA 90% CD Review		10/19/2026
	Comment Response		11/6/2026
6.4	100% Construction Documents		10/30/2026
	Final Bid Specifications		10/28/2026
	Final Bid Documents		10/30/2026
	Opt-In Energy Code/ LEED compliance documentation (FINAL)		12/3/2026
	LEED Design Credits Submission to GBCI		1/3/2027
	100% CD MSBA Submission (with addenda)		1/25/2027
6.5	Bidding & Procurement		1/25/2027
7	Construction	Schedule beyond dates shown	
		Demo and Sitework Phase 2 A	9/5/2028
		Sitework Phase 2 B	12/19/2028
		Final Completion	12/19/2028
		Closeout	6/13/2029

BASIS OF DESIGN NARRATIVES B

BASIS OF DESIGN NARRATIVE - ARCHITECTURE

Summary

The project will be a newly-constructed elementary school with a design enrollment of 755 students in grades K-5 plus 100 PreK on the same site as the existing North Intermediate School. The building gross floor area is 165,035 SF.

Architectural Characteristics Narrative

The architecture of the building draws inspiration from both the natural landscape and the historical character of Wilmington. The town's wetlands, wooded areas, waterways, and natural features such as Silver Lake inform a calm and cohesive environment that supports learning, orientation, and student development. At the same time, Wilmington's civic traditions and history—reflected in places such as the Town Common and the town's growth during the railroad era—provide additional influence on the building's character and relationship to the community.

During the study phase, several functional and educational goals were established to guide the development of the design.

Design Inspiration – Connection to Wilmington

Wilmington's history as a New England town shaped by its civic spaces, natural landscape, and transportation networks provides an important influence on the design. Established in 1730, the Wilmington Town Common has long served as the historic center of the community and a gathering place for social, civic, and educational activities. The Common reflects the traditional New England pattern of shared public space surrounded by civic buildings, reinforcing the importance of community connection and public life.

During the 19th century, Wilmington's railroads connected the town to regional markets, fostering economic growth and the exchange of new ideas. This period of industrial activity brought technological progress and innovation, shaping the town's development and contributing to a culture that values both tradition and forward thinking.

Wilmington Town Common

Railroad & Industry

Original North Wilmington railroad station

The original railroad station in North Wilmington, which was erected in 1855. It burned down in 1912.
The "telephone pole" is for the telegraph wires used by the Boston & Maine Railroad. There were no electric lights in Wilmington at the time the picture was taken. Notice

Silver Lake represents another defining feature of Wilmington's identity. As a natural landscape supporting both ecology and recreation, the lake has long been an important community resource. Historically, a school was located near the lake, reinforcing the connection between education and the surrounding landscape and embedding learning within the natural character of the town.

Together, these civic, historical, and environmental influences informed the design approach for the proposed school. The building draws inspiration from Wilmington's tradition of durable materials, simple forms, and thoughtful relationships to landscape and community spaces. Interpreted through contemporary design, these ideas create a learning environment that reflects the character of Wilmington while supporting the needs of today's students.

Desired Visual or Aesthetic Focal Point or Features of the School

The architecture of the elementary school building continues to draw inspiration from the character of the Town and the architectural language established through the School Building Committee process and community input. At Design Development, the design has been further refined to strengthen the balance between tradition and youthful energy that shaped the original concept.

Aerial view of the site

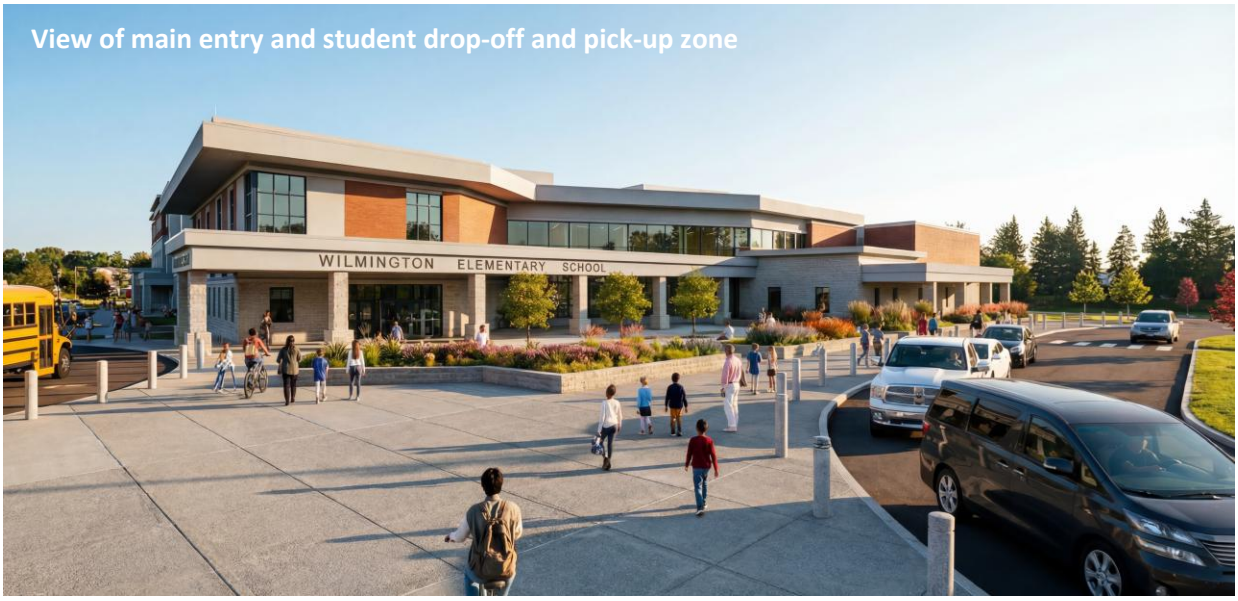
The building maintains a timeless palette of materials, including warm red brick and soft-toned masonry, which anchors the design within the town's historic context while prioritizing durable, cost-effective construction. During this phase, the exterior materials, detailing, and facade compositions have been further developed to reinforce a cohesive architectural expression. The energy-efficient design and compact, functional layout continue to support traditional building forms that integrate comfortably with the surrounding neighborhood.

The building massing has also been further studied and refined. The three-story academic wing remains positioned behind the two-story public core, minimizing the visual impact of the taller volume and maintaining an approachable, human-scaled presence along Salem and Ballardvale Streets. This layered massing strategy continues to support a civic identity while remaining sensitive to the surrounding neighborhood context and the scale of elementary-aged students.

View of building massing looking northwest

At the same time, the design continues to embrace the joyful spirit of an elementary school. Playful elements, including accent colors and wayfinding graphics, integrated throughout the building introduce moments of identity at entry points and key gathering spaces. Natural wood elements and increased access to daylight strengthen the connection between interior spaces and the natural environment, supporting vibrant learning environments that feel open, safe, and inspiring.

Through the Design Development process, the project team has continued to refine the building's architectural expression while maintaining the core vision established during Schematic Design, creating a school that reflects the character of Wilmington while fostering curiosity, imagination, and a love for learning. The building's compact massing and durable material palette also support key energy performance goals by reducing the overall building envelope area and improving thermal efficiency. High-performance envelope assemblies and carefully integrated glazing enhance daylighting within classrooms and shared spaces while maintaining strong thermal performance. The use of durable, long-lasting materials further supports sustainability goals by reducing long-term



View of main entry and student drop-off and pick-up zone

maintenance and lifecycle impacts, contributing to a resilient and energy-efficient learning environment.

As visitors arrive at the school, the design aims to clearly highlight the entrance of the building as the destination, whether arriving by bus, vehicular or pedestrian. Featuring a prominent canopy, the entry plaza serves as a focal point, signaling to both students and visitors that they have reached the main entrance.

Flanking the entrance, the administration and library are positioned on one side, while the cafeteria is located on the opposite side. The thoughtful integration of masonry with brick accents, curtain wall and roof overhangs adds texture and visual balance to the front facade, creating an inviting and well-proportioned entrance that feels both open and grounded.

Upon entering the building, visitors are welcomed by the warmth of natural wood, with exposed glulam framing and a two-story open space bathed in natural light streaming through a large curtain wall. This cafeteria, a multi-functional space (assemblies, concerts, community events), serves as the heart of the building.

Situated directly above the main entrance, the Library is designed to be a highly visible hub, both from the exterior and from the Cafeteria. Its strategic location offers a visual connection for students as they move between the dining area and educational wings. Serving as a central anchor to the building's core, it also boasts views of the field and playground.

Within each grade community, extended learning areas are integrated adjacently within the classrooms. As an alternate learning space and extension of the classroom, the extended learning areas serve multiple purposes, from small group collaboration, indoor play, to large class gatherings. The space is an extension of the classroom and fosters connection and flexibility to meet the needs of a neurodiverse student population.

Extended Learning Area

Typical classroom

View of the Gymnasium

BASIS OF DESIGN – STRUCTURAL

SUBSTRUCTURE

Foundations

Based on the recommendations on the geotechnical report, the columns of the proposed structure will bear on reinforced concrete spread footings and the perimeter foundation walls will bear on continuous reinforced concrete strip footings extending at least 4 ft.- 0 in. below grade. With the bearing capacity of the soil of 4,000 pounds per square foot, a typical interior footing will be 11 ft.- 0 in. x 11 ft.- 0 in. x 24 in. deep and the typical exterior footings will be 10 ft.- 0 in. x 10 ft.- 0 in. x 24 in. deep in the three-story areas. In the two-story areas a typical interior footing will be 9 ft.- 0 in. x 9 ft.- 0 in. x 24 in. deep and the typical exterior footings will be 8 ft.- 0 in. x 8 ft.- 0 in. x 24 in. deep. In single-story areas a typical interior footing would be 7 ft.- 0 in. x 7 ft.- 0 in. x 24 in. deep and the typical exterior footings will be 6 ft.- 0 in. x ft.- 0 in. x 24 in. deep. Typical interior and exterior footings at the cafeteria and gymnasium will be 8 ft.- 0 in. x 8 ft.- 0 in. x 24 in. deep. The exterior foundation walls will be 14 to 16 in. thick, reinforced cast-in-place concrete walls on 24 to 36 in. wide continuous reinforced concrete strip footings around the perimeter of the building extending a minimum of 4 ft.- 0 in. below finished grade.

Slabs-on-Grade

Based on the recommendations on the geotechnical report, the lowest level of the proposed structure will be a 5 in. thick concrete slab-on-grade reinforced with welded wire reinforcing over a vapor barrier on 2 in. thick rigid insulation on 8 in. of compacted granular structural fill and a base course of 8 in. of compacted gravel.

SUPERSTRUCTURE

Floor Construction

Typical Floor Construction

The floor construction will be 5 ¼ in. light weight concrete composite metal deck slab reinforced with welded wire reinforcing on wide flange steel beams spanning between steel girders and columns. The weight of the structural steel is estimated to be 15 psf for the typical framing. Allow for 20 psf of weight of structural steel for the classrooms above the gymnasium, the floor will be framed with steel beams or trusses spanning across width of the gymnasium.

Roof Construction

Typical Roof Construction

The roof construction will be galvanized, corrugated 3 in. deep, Type 'N' metal roof deck spanning between wide flange steel beams and girders. At locations of roof supported mechanical equipment, a concrete slab will be provided similar to the typical supported slab. The weight of the structural steel is estimated to be 14 psf.

Library Roof Framing

The roof construction will be ¾ in. APA-rated Sturd-I-Floor tongue-and-groove plywood sheathing, and spruce pine fir dowel laminated timber paneling, spanning across douglas fir glued laminated timber beams, spaced at 10 ft. on center, supported by glued laminated and steel girders and columns.

Cafeteria Roof Framing

The roof construction will be ¾ in. APA-rated Sturd-I-Floor tongue-and-groove plywood sheathing, and spruce pine fir dowel laminated timber paneling, spanning across douglas fir glued laminated timber beams, spaced at 10 ft. on center, supported by glued laminated and steel girders and columns.

Gymnasium Roof Framing

The roof construction will be a continuation of the adjacent floor construction, comprised of 5 ¼ in. light weight concrete composite metal deck slab reinforced with welded wire reinforcing on wide flange steel beams or trusses spanning between steel girders and columns. The weight of the structural steel framing is estimated to be 20 psf.

VERTICAL FRAMING ELEMENTS

Columns

Columns will be hollow structural steel columns. Typical columns will be HSS 8 x 8 columns. Typical columns in double-story areas will be HSS 12 x 12 steel columns. Typical mass timber columns will be 16 in. x 16 in. douglas fir glue-laminated wood columns.

Lateral Load-Resisting System

The typical lateral load resisting system will be concentric braced frames comprised of hollow structural steel (HSS) members. The lateral load resisting system of the Gymnasium and Kitchen areas will be reinforced masonry shear walls.

BASIS OF DESIGN – CIVIL

PAVEMENT/CURB/SIDEWALKS

The proposed site includes curb cuts along Ballardvale Street and Salem Street to provide vehicular access to the campus. A loop driveway is provided around the Elementary School to accommodate parent drop-off and pick-up circulation and emergency vehicle access. A parent vehicle turnaround is proposed to the northwest of the new building, while a bus loop is proposed at the southeast corner.

The primary access driveways consist of a 25-foot-wide bituminous concrete pavement section designed to support passenger vehicles, buses, and emergency equipment vehicles. A total of 199 parking spaces are provided within the proposed parking areas.

Five to ten-foot-wide sidewalks are provided throughout the site to ensure pedestrian connectivity between parking areas, building entrances, playgrounds, and athletic facilities. Both 5-foot-wide and 10-foot-wide crosswalks are provided at designated pedestrian crossings to enhance safety and accessibility.

Curbing in the paved areas surrounding the school will consist of Vertical Granite Curb, while the parking areas will have Precast Concrete Curb. Flush curb sections at pedestrian crossings and curb ramps, including detectable warning panels, will be provided to ensure ADA compliance.

All paved surfaces, including driveways and parking areas, will be bituminous concrete. Sidewalks are proposed to be concrete.

SEWER

Under the proposed conditions, the existing gravity sewer line connecting the school to the main on Ballardvale Street will be demolished. New 8-inch PVC pipes and associated manholes will be installed, with one line exiting the new school from the front and rear sides and traveling along the paved areas to connect to an existing sewer manhole near the school entrance at the northeast corner of the site.

WATER

The project site is served by the public water supply system. Under the proposed conditions, a new 8-inch ductile iron water main will be installed and looped around the proposed Elementary School building to provide adequate circulation and fire protection coverage throughout the campus.

The looped water main will serve four new fire hydrants located around the building in accordance with fire protection requirements. A new domestic water service and a new fire service connection will be provided to the building, with both services entering near the designated loading area.

The proposed water main loop will connect to the existing 12-inch water main along Ballardvale Street in the eastern portion of the site, and to the existing 10-inch water main along Salem Street in the southern portion of the site.

SOILS

The site is underlain by Deerfield loamy fine sand with a Hydrological Soil Group (HSG) of A, which has moderately high to very high infiltration rates. Udorthents, due to the variable composition of this fill material, do not have an assigned Hydrologic Soil Group (HSG). Subsurface explorations conducted by Lahlaf Geotechnical Consulting, Inc. in April 2025 and December 2025 included soil borings and test pits. Groundwater was encountered at depths ranging from approximately 8 to 10.8 feet below the ground surface. Infiltrometer tests were also conducted throughout the site, yielding results ranging from 0.05 in/hr to 126.5 in/hr.

For stormwater management design, HSG rating A will be used to determine curve numbers and calculate required groundwater recharge and water-quality treatment volumes. The infiltration rate for each system reflects the results of infiltrometer tests conducted near the systems.

STORMWATER

Stormwater from the existing site drains in all directions—north, east, northeast, west, and northwest. In paved areas, the stormwater system consists of strategically located catch basins at low points. These catch basins connect to three separate underground infiltration systems, two comprised of chambers and one with 36" perforated pipes. The stormwater areas are more generally described as follows:

Stormwater North

Watershed E-4 is located northwest of the project site and includes portions of grassed areas and wooded areas. Runoff flows northerly and discharges onto the abutters' properties (DP-4p).

Stormwater East

The following watersheds discharge to DP-1p, which is the existing drainage system along Ballardvale Street:

Watershed P-1a is located on the southeastern side of the site and includes sidewalks, paved parking areas, and landscaped grass areas. Runoff flows easterly and discharges at DP-1p.

Watersheds P-1b, P-1c, P-1d, P-1e, and P-1f are generally located along the southern, eastern, and northern portions of the site and include combinations of sidewalks, paved parking, basketball courts, playground areas, roof drainage, wooded areas, and grassed surfaces. Runoff from these watersheds is collected by a series of catch basins and conveyed to the Underground Infiltration System UGI-1 (400 units of the Cultec R-300HD). Treated flows are then discharged easterly to DP-1p.

Stormwater Northeast

Watershed E-5 is located north of the project site and includes portions of grassy fields and wooded areas. Runoff flows to the northeast and discharges onto the abutters' properties (DP-5p).

Stormwater West

The following watersheds discharge to DP-2p, reflecting the existing drainage system along Arlene Avenue to the western portion of the site:

Watersheds P-2a, P-2b, P-2c, and P-2d are located along the southern and western portions of the site and include wooded areas, grassed fields, paved parking, and sidewalks. Runoff from these areas generally flows westerly and discharges at DP-2p.

Watersheds P-2e, P-2f, and P-2g are located on the southern portion of the site and include sidewalks, paved parking areas, and roof drainage from the proposed elementary school. Runoff is collected by catch basins and routed to the underground detention system, DS-1 (ADS N-12, 36-inch diameter). The controlled discharge from DS-1 flows westerly to DP-2p.

Watersheds P-2h, P-2i, and P-2j are located along the southern and northwestern portions of the site and include roof drainage, playground areas, paved parking, and grassed surfaces. Runoff is collected by catch basins and conveyed to the Underground Infiltration System UGI-2 (180 units of the Cultec R-300HD). Discharge from UGI-2 flows westerly to DP-2p.

Stormwater Northwest

Watershed E-3 is located northwest of the proposed Elementary School and includes grassed areas and paved parking. Runoff flows toward the northwest and discharges at DP-3p.

Proposed Stormwater

Under the proposed conditions, new underground stormwater systems have been shown throughout the site and sized to mitigate increases in runoff flow rate resulting from additional impervious areas.

These underground systems connect back into the existing drainage systems along Ballardvale Street and Arlene Avenue.

PERMITTING REQUIREMENTS

A Notice of Intent filed with the local conservation commission will be required for work within 100 feet of the wetlands that are to the south and west of the project. The site is not in a flood zone.

BASIS OF DESIGN – LANDSCAPE ARCHITECTURE

Summary

The proposed new Wilmington Elementary School will be located on the current site of the North Intermediate School, located at 320 Salem Street in Wilmington, Massachusetts. The project involves the construction of a new elementary school (grades pre-K to 5) to replace the current school building in a different location and configuration within the site. The final project will provide the Town with a new school building and an integrated site to become a community asset. Regarding the immediate school grounds, the students and administration will enjoy improved access to a variety of program elements, including: three playgrounds; separated by age groups (Pre-K, K-2nd grade, 3rd-5th grade), two full basketball courts, one U-8 soccer field, outdoor classroom opportunities, inner courtyard with seating for gatherings and community events, large open lawn areas for active recreation and informal youth sporting events.

Site Improvements

In reference to the Design Development site plans (dated March 20, 2026), the proposed landscape will include a variety of student-focused program elements that will be integrated with the new building, the existing topography, and the existing vegetation to the greatest extent possible.

Given the location of the proposed building and its relationship to the existing topography, working closely with the civil engineer, we will coordinate the anticipated roadway, parking lot, and site grading throughout the property together with design spaces for arrival, gathering, outdoor learning, recreation, and play. In addition to designing for visibility and safety, the site design considers stormwater and drainage patterns as designed by the Civil Engineering team.

In review of the site circulation, the location and orientation of the new school will allow for safe, defined bus and parent drop-off/pick-up zones and vehicular circulation loops with long access for queuing to pull passenger vehicles from Salem Street and Ballardvale Street to address increased traffic concerns. A drop-off loop to the northwest provides a turnaround for parents. When this loop is not in use for vehicular access, it can be utilized for ancillary play space. Toward the west of the property, there will be a drive lane for emergency vehicle access only. As shown in the plan, the following features are included within the Design Development Plans:

1. Bituminous concrete vehicular drop-off and pick-up zone and associated parking lot with traffic calming and wayfinding elements throughout (to be coordinated with the civil engineer).
2. Vehicular gates to control traffic circulation.
3. For pedestrian/vehicular safety, a series of crash-rated bollards (every other to include LED lighting) at the drop-off and pick-up zone at the main entries to the school building (by Electrical Engineer).
4. Tactile warning surfaces will be used at all pedestrian curb cuts to indicate flush conditions where vehicular circulation crosses pedestrian routes.
5. Stone drip edge with aluminum edging will be used at the building foundation adjacent to the exterior façades where it abuts softscape (foundation planting and lawn panels).
6. The parking lot will contain planted medians with lawn and shade trees.

7. The perimeter of the site (at the west, south, and northeast) will receive dense screened planting, including deciduous shade trees, evergreen trees, understory shrubs, and herbaceous material to create a buffer at abutting properties. In addition, revegetation will occur adjacent to two isolated vegetated wetlands (to be further reviewed with the appropriate Town Agencies).
8. Lawn areas will receive a combination of Tall Fescue Blue Seed Mix (for general lawn areas), Fescue and Rye Grass (for shade and sloped areas), Athletic Field Seed Mix (for athletic field areas), as well as Low-Growing Wildflower and Right-of-way Native Woods with Annual Ryegrass mixes (at wetland restoration areas).
9. The utility zones will maintain:
    a. Cast-in-place concrete pads for dumpsters, each utility, and one maintenance shed (10'-0" x 20'-0")
    b. Metal enclosure screen fences and gates at the dumpster and utilities
10. The entrance plazas at the building will maintain:
    a. Cast-in-place concrete paving (at the student loading and unloading zones)
    b. Concrete unit pavers; wet set; pedestrian (plazas, walkways)
    c. Retaining walls (modular wall system)
    d. Granite monolith seatwalls
    e. Benches with backs and arms
    f. Tables with Integral Seating; ADA Accessible
    g. Litter and recycling receptacles
    h. Bicycle racks (final quantity and type as defined per zoning requirements)
    i. Deciduous shade trees with grates (including soil cells to maximize health and longevity)
    j. Low shrub and perennial foundation beds

To enhance the interior/exterior relationship between the building and the landscape for the students, administration, and community uses, the landscape will provide outdoor spaces for both passive and active recreation, in addition to outdoor classrooms and gathering areas. Per plan, the proposed program elements will include:

1. Athletic field:
    a. Soccer goals
    b. Players' benches
    c. Athletic field seed mix
    d. Chain link fence (4-foot height) with fence strip
2. Full Basketball Court (2 locations):
    a. Bituminous concrete/asphalt paving (pedestrian; ADA accessible) with color sealcoat and line striping for basketball court
    b. Basketball hoop and goal systems
    c. Chain link fence (10-foot height) with fence strip and gates
    d. Litter and recycling receptacles
3. Pre-K Playground:
    a. Poured-in-place resilient rubber surfacing with underdrainage (ADA accessible)

   b. Synthetic Lawn with underdrainage
   c. Play equipment
   d. Crash-test rated fence (4-foot height) with fence strip and gates
   e. Shade sail
4. Kindergarten through 2nd Grade Playground:
   a. Poured-in-place resilient rubber surfacing with underdrainage (ADA accessible)
   b. Play equipment
   c. Crash-test rated fence (4-foot height) with fence strip and gates
5. 3rd grade through 5th Grade Playground:
   a. Poured-in-place resilient rubber surfacing (ADA accessible)
   b. Play equipment
   c. Black vinyl chain link fence (4-foot height) with fence strip and gates
6. Courtyard:
   a. Concrete Unit Pavers; wet set; pedestrian
   b. Synthetic Lawn with underdrainage
   c. Cast-in-place Concrete Paving
   d. Bituminous concrete/asphalt paving (pedestrian; ADA accessible) with color sealcoat and line striping for four-square
   e. Granite Monolith Seatwalls
   f. Masonry Panel System Seatwalls
   g. Movable Modular Block Seats
   h. Sculptural Benches
   i. Backless Benches
   j. Circular Benches
   k. Stump Seats
   l. Raised Planters; ADA Accessible
   m. Litter Receptacles
7. Outdoor Classroom:
   a. Synthetic Lawn with underdrainage
   b. Cast-in-place Concrete Paving
   c. Free-Form Benches
   d. Movable Modular Block Seats
   e. Backed Benches
   f. Litter Receptacles

Throughout each gathering, play, and outdoor learning space, low-growing, low-maintenance plant material shall be provided for seasonal interest and aesthetics. Plant material, in most locations, shall be secured with plant beds edged with vertical granite curb. To extend the plant material's longevity, maintenance will be critical, and irrigation (even if temporary during establishment) is strongly encouraged. The primary athletic field shall be irrigated.

The landscape features must be inclusive to all users; therefore, the site paving, topography, and site elements shall adhere to the MAAB (Massachusetts Architectural Access Board) and the ADA (Americans with Disabilities Act) requirements. Where possible, sloped walkways (maximum 5% slope) are encouraged over ramps, which require handrails (maximum 8% slope).

BASIS OF DESIGN – MECHANICAL

A lifecycle cost analysis (LCCA) has been performed to quantify anticipated upfront costs, operating costs, and avoided energy costs for several mechanical system options to serve the HVAC needs of the Wilmington Wildwood Elementary School. The Elementary School is a new three-story school with an approximate gross area of 167,000 s.f. The building has been simulated with the school's anticipated hours of operation provided by the owner as follows:

It is anticipated that the typical student hours will occur from 6:30 am – 6:00 pm (Mon-Fri) while the building will be occupied between 6 pm – 9 pm (Mon-Fri) for limited community use, sports, and recreation programs. Limited summer programming shall occur throughout the building from 7:00 am – 3:30 pm (Mon-Fri) for special needs, summer camps, recreation, and sports practices. The Gym will also have limited community use on the weekends from 9:00 am – 9:00 pm.

The goal of the mechanical system lifecycle engineering economic analysis is to assess the performance of various mechanical systems in comparison to a baseline mechanical system.

Each option is compared to the baseline system to determine the greatest combined savings over a 50 year cycle to determine the most advantageous system considering anticipated hours of operation, electrical costs, maintenance costs, initial construction costs, and replacement costs.

By comparison of each option to the baseline system, the option with the greatest total life-cycle savings has been recommended.

The results of the LCCA have been presented to the Town's building committee who subsequently voted to proceed with the option that is outlined in the following the HVAC system narrative, which defines the scope of work and capacities of the HVAC system as well as the Basis of Design. The HVAC systems shall be designed and constructed for *LEED for Schools v4* where indicated on this narrative.

1. CODES

   All work installed under Division 230000 shall comply with the Commonwealth of Massachusetts Adopted Building Codes (IBC, IMC, IECC latest Adopted Editions with MA amendments), and all local, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT

   The work of Division 230000 is described within the narrative report. The HVAC project scope of work shall consist of providing new HVAC equipment and systems as described here within. All new work shall consist of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Heating, Ventilating and Air Conditioning work and all items incidental thereto, including commissioning and testing.

   The HVAC narrative below provides a summary of new HVAC systems which shall be designated for the building.

3. BASIS OF DESIGN: (MASS CODE)

Project weather and Code temperature values are listed herein based on weather data values as determined from ASHRAE weather data tables and the International Energy Conservation Code.

Outside: Winter 2.3 degrees F, Summer 91 degrees F DB 74 degrees F WB

Inside: 70 deg. F +/- 2 degrees F for Heating, 75 degrees F +/- 2 degrees F (55 percent RH) for all Air-conditioned areas (Administration, Nurses Office, Guidance, Cafeteria, Classrooms, Teacher Support, Gym).

Unoccupied temperature setback will be provided (60 degrees F heating (adj.), 85 degrees F cooling (adj.).

Outside air shall be provided at the rate in accordance with ASHRAE Standard 62.1 and the International Mechanical Code (latest adopted editions) as a minimum. All occupied areas will be designed to maintain 800 PPM carbon dioxide maximum.

4. SYSTEM DESCRIPTION – Air Source Heat Pump Chiller/Heater with Classroom Displacement Ventilation

A. Central Heating and Cooling Plant:

Heating and cooling for building areas shall be provided by a high-efficiency air source heat recovery heat pump chiller/heater plant that include the following quantities of chiller modules:

15 modular air source to water heat pump chillers with simultaneous heating and cooling and a capacity of 30 tons each. An additional heat pump chiller/heater or a supplemental 1000 kw backup electric boiler shall be included to inject heat into the hot water heating loop when ambient conditions limit the output capacity of the air-source heat pump chiller.

One of the modules will be redundant for heating/cooling backup purposes. The air-cooled heat pump chiller units will be grade mounted and shall be capable of providing 130 degrees F heating hot water supply at a 5 degrees F ambient temperature condition. A large outdoor location for the air-cooled heat pump chillers will be required. Provide pre-insulated underground piping from heating/cooling plant to an indoor mechanical room.

A mechanical room shall be provided for the associated hot water and chilled water pumps and hydronic accessories. The heat pump chiller plant will supply heating hot water and chilled water to heating and cooling equipment and air handling equipment throughout the building via a four-pipe fiberglass insulated schedule 40 black steel and copper piping system.

Primary hot water pumps (Quantity of two in a primary/standby arrangement) with variable frequency drives will be provided and will modulate speed to maintain a minimum flow to the heat pump chiller. Secondary hot water pumps (Quantity of two in a primary/standby arrangement) with variable frequency drives will be provided for meeting the variable flow needs of the hot water system distribution throughout the building. A plate & frame heat exchanger installed within the mechanical room shall be

provided to separate the primary and secondary piping loops. In addition to pumps, new hot water accessories including air separators, expansion tanks, and buffer tanks shall be provided.

Primary chilled water pumps (Quantity of two in a primary/standby arrangement) with variable frequency drives will be provided and will modulate speed to maintain a minimum flow to the heat pump chiller. Secondary chilled water pumps (Quantity of two in a primary/standby arrangement) with variable frequency drives will be provided for meeting the variable flow needs of the chilled water system distribution throughout the building. A plate & frame heat exchanger installed within the mechanical room shall be provided to separate the primary and secondary piping loops. In addition to pumps, new hot water accessories including air separators, expansion tanks, and buffer tanks shall be provided.

1. The heat pump chiller plant will distribute between 45 degrees F and 55 degrees F chilled water to the roof mounted air handling units located throughout the building and will distribute between 58 degrees F and 62 degrees F chilled water to the terminal radiant cooling panels units in the fully-air conditioned building. The chilled water distribution piping will be of the fiberglass insulated schedule 40 type and will be separate from the hot water distribution piping system. Compensated chilled water pumps with variable frequency drives will be provided for variable flow chilled water system distribution.

B. Ventilation air handling equipment: It is proposed that a new air-conditioning displacement ventilation system be installed to provide air-conditioning and ventilation to the occupied areas of the building.

1. New recirculating rooftop air handling units with supply and return air fans, VFDs, dual core energy recovery sections, hot water heating (and reheat) coils with modulating valve, chilled water cooling coil, economizer capability, and MERV 14 filtration will be provided to serve a new full air conditioning displacement ventilation system. Different building rooms and zones shall be provided with a variable volume (VAV) terminal box with combination temperature, humidity, and CO2 sensor controls. The controls will reduce outside air as allowed maintaining a maximum of 800 PPM while providing sufficient ventilation to meet the required heating or cooling load of the spaces served. As VAV boxes modulate, the supply and return air fans associated Variable Frequency Drives (VFD) of the rooftop units will adjust the fan speed based on system static pressure, reducing the energy consumed by the fans. Each room (or zone) shall be provided with low wall or floor mounted supply air displacement diffusers. Classrooms will typically be provided with two individual wall mounted displacement diffusing units between 250 and 400 CFM each (depending on room size). Return air will be drawn back to the units by ceiling return air registers located within the rooms and will be routed back to the rooftop unit by a galvanized sheet metal return air ductwork distribution system. Supplemental ceiling mounted chilled/hot water radiant panels will be provided along exterior walls that shall be interlocked with space enthalpy sensors that shall modulate the control valve of the terminal cooling coil closed when the space enthalpy is above dewpoint conditions.

Preliminary RTU Quantities, zones and airflow capacities are as follows:

RTU-A: (Classroom Wing) – 17,000 CFM Total, 75 Tons cooling, 475 MBH heating

RTU-B: (Classroom Wing) – 20,000 CFM Total, 75 Tons cooling, 475 MBH heating

RTU-C: (Classroom Wing) – 17;000 CFM Total, 75 Tons cooling, 475 MBH heating

RTU-D: (Gym) – 13,000 CFM Total, 50 Ton ASHP Packaged Unit

RTU-E: (Media Ctr) – 3,255 CFM Total, 12 Tons cooling, 88 MBH heating

RTU-F: (Cafetorium) – 10,000 CMF Total, 40 Tons Cooling, 260 MBH heating

RTU-G: (Kitchen/Custodial) – 3,000 CFM Total, 16 Tons cooling, 90 MBH heating

RTU-H: (Admin) – 4,000 CFM Total, 16 Tons cooling, 115 MBH heating

RTU-I: (Music) – 2,000 CFM Total, 8 Tons Cooling, 55 MBH Heating

MAU: (Kitchen Hood Makeup) – 4500 CFM Total, 24 Tons cooling, 390 MBH heating

C. Air Distribution Systems:

The building areas are to be served by a fully air-conditioned variable volume displacement ventilation air distribution system with supplemental chilled water radiant cooling and heating panel system.

New ductwork shall be constructed and installed in accordance with SMACNA and IMC requirements. All new supply and return air ductwork shall be insulated per IMC code requirements (R-8). All new Kitchen exhaust fans shall be provided with new Fire-wrapped carbon steel or insulated stainless steel grease ductwork.

D. Exhaust Air Fan Systems:

2. Code required exhaust for the majority of building areas, including toilet rooms, shall be provided through the localized energy recovery ventilation (ERV) systems.

3. Dedicated exhaust air fan systems shall be provided for Kitchen exhaust air (if provided) and Janitor's closet areas.

E. Terminal Heating & Cooling Equipment:

Provide new hot and chilled water radiant heating and cooling panels for the perimeter heating and cooling for all fully air conditioned areas (eg. Admin Offices, Guidance, Nurse's suite, cafeteria) of the building. Classrooms shall be provided with hot water radiant heating panels. New hot water radiant heating panels or fin tube radiation shall be provided for perimeter heating of all restrooms with exterior exposure heating loads. Hot water radiation heating equipment shall be provided for all corridors, entryways. Hot water unit heaters shall be provided for all utility rooms.

F. Split system AC heat pump units:

New ductless split system high efficiency heat pump AC units will be installed to serve Elevator machine rooms, and IT and MDF Server rooms.

G. Lobby, Corridor, and Entry Way Heating:

New hot water convectors, cabinet unit heaters, and fin tube radiation heating equipment shall be installed to provide heating to building entry way and stairwell areas. Corridors shall be ventilated from adjacent air handling unit systems. Main Corridor and Lobby areas shall be heated and dehumidified by the displacement ventilation systems.

H. Utility Areas:

Utility areas will be provided with exhaust air fan systems for ventilation and will typically be heated with horizontal type ceiling suspended hot water or electric unit heaters.

The Main Electric Rooms and IDF rooms will be air conditioned by high efficiency ductless air source heat pumps.

I. Testing, Adjusting, Balancing & Commissioning:

All new HVAC systems shall be tested, adjusted, balanced and commissioned as art of the project scope.

J. Automatic Temperature Controls – Building Energy Management System:

A new DDC (direct digital control) Automatic Temperature Control and Building Energy Management System shall be installed to control and monitor building HVAC systems. Energy metering shall be installed to monitor the energy usage of building HVAC systems and utilities (electric, water). The new DDC/ATC system shall be a BACNet open protocol system that is capable of being integrated into the Town Wide Central energy management system.

5. TESTING REQUIREMENTS:

A. The Mechanical Contractor shall provide testing of the following systems with the Owner and Owner's Representative present where applicable to the selected HVAC option.

- Heat pump chiller plant system
- Back up boiler plant
- Air handling unit systems including all rooftop units, indoor air handling systems and exhaust air systems
- All pumps
- Terminal heating and cooling devices
- Ductless AC Systems
- Automatic temperature control and building energy management system

B. Testing reports shall be submitted to the Engineer for review and approval before providing to the Owner.

6. OPERATION MANUALS AND MAINTENANCE MANUALS

When the project is completed, the Mechanical Contractor shall provide operation and maintenance manuals to the owner.

7. RECORD DRAWINGS AND CONTROL DOCUMENTS

When the project is completed, an as-built set of drawings, showing all mechanical system requirements from contract and addendum items will be provided to the owner.

8. COMMISSIONING

The project shall be commissioned per the Commissioning Section of the specifications.

9. LEED Energy Savings Summary

To estimate the LEED V4 EAc2 – Optimize Energy Performance savings, energy model simulations have been performed comparing the design building to a baseline ASHRAE Standard 90.1-2010 building.

The ASHRAE Standard 90.1-2010 baseline building is as follows:

- Envelope:
  - Wall: U-0.064
  - Roof: U-0.048
  - Windows: 0.55 U-Value, 0.40 SHGC
  - Curtainwall/Storefront: 0.45 U-Value, 0.40 SHGC
- Mechanical System:
  - System 8 - Electric heating/chilled water cooling air handling units with energy recovery wheels and terminal fan-powered VAV boxes with electric reheat coils (one per floor)
  - System 4 – Packaged electric heat pump cooling/heating constant volume single zone air handling units (serving spaces with loads varying by 10 Btuh/s.f. of the average space load)
  - (2) high-efficiency water-cooled chillers with associated cooling tower
- Domestic Hot Water System:
  - Instantaneous electric domestic hot water system
- Lighting System:
  - 0.99 w/s.f.

The design building is as follows:

- Envelope:
  - Roof: U-0.018
  - Brick Veneer Walls: U-0.028
  - MCM Panel Walls: U-0.025
  - Windows: U-0.25, 0.30 SHGC
  - Curtainwall: U-0.25, 0.30 SHGC
- Mechanical System:
  - (Refer to System description)
- Domestic Hot Water System:
  - Instantaneous electric domestic hot water system

- Lighting System:
  - 0.5 w/s.f.

10. LEED Energy Savings Summary

A comparison of the Design Building against the ASHRAE Standard 90.1-2010 Baseline Building results in an energy cost savings of 42.8% for 16 total points relating to LEED V4 EAc2 – Optimize Energy Performance.

Note:

The values indicated above are based on energy modelling performed for system comparison purposes only. Our office strongly recommends adding a 30% safety factor to the calculated values of this report for budgeting purposes to account for potential variances to the actual operation of the building. Per ASHRAE Standard 90.1:

Neither the proposed building performance nor the baseline building performance are predictions of actual energy consumption or costs for the proposed design after construction. Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by this procedure, changes in energy rates between design of the building and occupancy, and the precision of the calculation tool.

BASIS OF DESIGN – ELECTRICAL

The following is the Electrical Systems narrative, which defines the scope of work and capacities of the Power and Lighting System, as well as, the Basis of Design. The Electrical Systems shall be designed and constructed for ***LEED for Schools*** where indicated on this narrative.

1. CODES

All work installed under Section 260000 shall comply with the Massachusetts State Building Code and all local, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT

The work of Section 260000 is as described in this narrative. All work is new and consists of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the electrical work and all items incidental thereto, including commissioning and testing.

3. SEQUENCE OF OPERATIONS AND INTERACTIONS

A. Classroom and Corridor lighting will be controlled via "addressable relays", which is achieved through programming networked controls. The control of the relays will be by automatic means, such as an occupancy sensor in each classroom. The system will have a BacNet gateway and will be interfaced with the DDC control system for scheduled functions. The controllability shall be in conformance with credit ***LEED credit IEQC 6.1.***

B. Automatic control of receptacles based on occupancy will be provided for at least 50% of the receptacles installed in private offices, open offices, conference rooms, rooms used primarily for printing and/or copying functions, break rooms, individual workstations, and classrooms. Controlled receptacles will be marked per NEC 406.3 (E).

C. Exterior lighting will be controlled by photocell "ON" and "scheduled" for "OFF" operation. The parking area lighting will be controlled by "zones" with dimmable capability. Exterior lights will be addressable and dimmable. Fixtures will be designed and programmed to turn on at dusk utilizing photo sensor input. Fixture shall be turned off based on scheduled preference typically 5AM-6AM. Fixture

output shall be scheduled to be reduced by 50% after 12AM. Additional schedule functionality shall be provided based on end user input.

D. Emergency and Exit lighting will be run through life safety panels and will be “ON” during normal power conditions, as well as power outage conditions. The emergency lighting system will have time control so that lights are “ON” only when the building is occupied.

4. DESCRIPTION OF THE SYSTEMS

A. Utilities:

1. The new building will be supplied with utility power from the utility company Reading Municipal Light Department (RMLD). The new service will be fed via underground primary duct bank to a pad mounted utility company owned liquid filled transformer.

2. The service electrical transformer will be furnished, installed, owned and maintained by RMLD, and it will be located adjacent to the building as shown on the civil drawings. The transformer will be of the pad- mounted type with a primary voltage of 13.8 kV and a secondary voltage of 480Y/277 volts. The transformer will be sized by the utility company based on the load data provided by The Design team.

3. Concrete pad and grounding grid for the pad-mounted transformer is provided by the Contractor per the RMLD standards.

4. Concrete encased duct bank of the two 4" PVC conduits will be provided by the Electrical Contractor for the primary feeder installation from a utility pole to the pad-mounted transformer. Pre-cast concrete manholes 5' x 5' will be provided by the Contractor to facilitate the primary cables field installation. The duct bank routing is shown on the civil drawings.

5. Utility company will provide a primary feeder cable from the utility manhole to the pad-mounted transformer via the new manhole and terminate the feeder cable on both ends.

6. Transformer secondary feeder of the copper conductors will be installed underground in the duct bank of four 4" PVC conduits from the pad-mounted transformer to the main electrical switchboard located in the main electrical room. The secondary feeder and terminations at the switchboard side will be provided by the Electrical Contractor and terminated at the transformer side by RMLD. The new service will be metered at the transformer secondary voltage.

7. RMLD metering CTs will be installed in a CT section of the switch board, the meter will be located at the direction of the utility company.

8. Telephone, Cable TV, and City Fiber will be fed underground into the building’s Main Distribution Frame/Head End Room.

9. Copper conductors shall be utilized for all branch circuit and feeder wiring. Aluminum conductors will be allowed for feeders 100 amperes or over.

10. The building connected electrical load estimate is based on the preliminary building systems design:

Load Type	KVA
HVAC Loads (including AHU, Destratification Fans, DCU, Chiller, UH, VRF, Boilers, FCs, Pumps, RTUs, Exhaust Fans, DCU)	1440 KVA
Elevator	31.7 KVA
Exterior Lighting	2.0 KVA
Interior Lighting	90 KVA
General Power	360 KVA
Kitchen	112.5 KVA
EV Charging	144 KVA
Plumbing/Fire Protection (Pumps, etc.)	210 KVA
Total Connected Load	**2,390.2 KVA**

B. Electrical Distribution System:

1. Service ratings for the building are designed for a connected load of 15 watts/S.F. The service capacity will be sized for 3,000 Amperes with an 80% rated main breaker. The main bus will be sized at 4,000 Amperes and will have an available breaker space provision at the end of the switchboard to accommodate a future grid connected photovoltaic array. The switchboard will be furnished with a service entrance surge protection device (SPD) rated at 240 kA and a digital metering unit to monitor voltage, current, power factor, demand KW and with a data communication port for interface with BMS. Main switchboard's short circuit rating will be coordinated with the Utility Company but will be rated for 65 KAIC.

2. New lighting and power panels will be provided to accommodate respective loads. The equipment locations will be in dedicated rooms or closets.

C. Interior Lighting System:

1. The intent of the lighting design is to provide a visual environment for the students and faculty that is supportive of the educational activities within the building. The

lighting system will be designed in compliance with the applicable Energy Code and be eligible for the Utility company rebate program.

2. Interior lighting illumination levels will meet the IES recommended values for applicable activity type, be in compliance with the IECC 2021 energy allowances and LEED for Schools control requirements.

PROPOSED Illumination Levels

Location	Average Illumination Levels
Classrooms	30 FC
Offices, Conference Rooms, Library	30 FC
Kitchen	50 FC
Gymnasium	50 FC
Cafeteria	30 FC
Corridors	20 FC
Utility and Storage Rooms	20 FC

3. Classroom lighting fixtures will consist of recessed/surface mounted direct/indirect luminaries with integral LED source and electronic dimmable drivers. The fixtures will be pre-wired for continuous dimming control where natural daylight is available and also for multi-level switching. Two daylight dimming zones will be provided in each classroom.

4. Office lighting fixtures will consist of recessed/surface mounted direct only LED luminaries and electronic drivers for dual-level switching. Offices on the perimeter with windows will have daylight dimming where lighting within the daylight zone exceeds 150W.

5. In general, lighting power density will be 20-40% less than IECC 2021. The power density reduction relates to associated LEED credit in energy and atmosphere.

6. Lighting levels will be approximately 30 foot candles in classrooms and offices. The daylight dimming foot-candle level will be in compliance with associated LEED credit in indoor environment quality.

7. Gymnasium lighting will be comprised of direct/indirect fixtures with integral LED source and electronic drivers. The fixtures will be provided with poly carbonate lensing. The light level will be designed for approximately 50 foot candles. Multi-level switching will be provided.

8. Daylight dimming will be provided within 15 feet of skylights or glazing where lighting within the daylight zone exceeds 150W. Daylight dimming controls will be similar in operation to classrooms.
9. Corridor lighting will be comprised of recessed mounted linear fixtures with integral LED source and electronic drivers. The Corridor light level will be designed for approximately 20-foot candles. Corridor lighting will be controlled via time schedules during normal business hours and set to occupancy control thereafter.
10. Cafeteria lighting will be a combination of pendant mounted fixtures with direct only and direct/indirect distribution types. All fixtures shall be provided with integral LED source and electronic drivers. The light levels will be designed for approximately 30 foot candles.
11. Stage and Auditorium theatrical lights with connector strips and a dimming system will be provided for performances. House lighting in Auditorium will be DMX dimmable to black LED and controlled by a theatrical dimming system.
12. Kitchen and Servery lighting will consist of recessed 2'x2' and 2'x4' acrylic lensed gasketed troffers with aluminum frame doors, integral LED source, electronic drivers and NSF rated for food preparation areas. Light levels will be approximately 50 foot candles.
13. Media Center lighting will be a combination of pendant decorative pendant fixtures and recessed fixtures with integral LED source and electronic drivers. The light levels will be designed for approximately 30 foot candles. Daylighting controls will be provided on perimeter light fixtures with 15 feet of glazing
14. Each area will be locally switched and designed for multi-level controls. Each Classroom, Office space, and Toilet room will have occupancy sensors to turn lights off when unoccupied. Occupancy sensors will be set to vacancy mode where required by Energy Code.
15. Daylight dimming sensors will be installed in each room where natural light is available for continuous dimming of light fixtures. The control system will be in accordance with associated LEED credit in indoor environmental quality when lighting within the daylight zone exceeds 150W threshold.
16. The entire school will be controlled with an automatic lighting control system for programming of interior and exterior lights "on and off". Lighting control system will be interfaced with BMS system, and will be demand response capable in accordance with associated LEED credit in Energy and atmosphere.

D. Emergency Lighting System

1. An exterior 600KW, 750KVA (diesel fired emergency generator with sound attenuated enclosure and base tank with alarms will be provided. An integral resistive load bank will be provided for generator testing under load. Light fixtures and LED Exit signs will be installed to serve all egress areas such as Corridors, Intervening Spaces, Toilets, Stairs, and Exit discharge exterior doors. The Administration area lighting will be connected to the emergency generator.

2. The generator power system has been sized to support emergency (life safety), and optional standby building loads. The life safety branch of the emergency system will be provided with a manual transfer switch on the emergency line side of the transfer switch in compliance with NEC 700.3(F).

a. Emergency (life safety) Power Loads as required by the Code:

- Emergency exit and egress lighting (interior and building exterior at the exits)
- Fire alarm system

b. Standby Power Loads:

- Heating system with associated heat pumps and controls
- Telephone/ data closets and associated A/C equipment
- Communication systems (telephone and public address systems)
- Building DDC system control panels
- Kitchen refrigeration equipment
- Lighting and power in the nurse/medical area
- Security system equipment

E. Site Lighting System: LEED Credit SSC8

1. Fixtures for area lighting will be pole mounted cut-off 'LED' luminaries in the parking area and roadways. Pole heights will be 20 feet. The exterior lighting will be connected to the automatic lighting control system for photocell "ON" and timed "OFF" operation. The site lighting fixtures will be dark sky compliant. The illumination level will be 0.5 foot-candle for parking areas in accordance with the Illuminating Engineering Society.

2. Building perimeter will be 'LED' wall mounted cut-off fixtures over exterior doors for exit discharge.

F. Wiring Devices:

1. Classrooms will have a minimum of (2) duplex receptacles per teaching wall and (2) double duplex receptacles on dedicated circuits at classroom

computer workstations. The teacher's workstation will have a double duplex receptacle also on a dedicated circuit.

2. New Office areas will generally have (1) duplex outlet per wall. At each workstation a double duplex receptacle will be provided.

3. Corridors will have a cleaning receptacle at approximately 25-40-foot intervals.

4. Exterior weatherproof receptacles with lockable enclosures will be installed at exterior doors.

5. A system of computer grade panelboards with double neutrals and surge protective devices will be provided for receptacle circuits.

6. Surface mounted raceways will be provided within renovated areas where raceways cannot be concealed in public spaces.

7. All receptacles will be of the tamper resistant type.

G. Fire Alarm System with Mass Notification:

1. A fire alarm/mass notification system and detection system will be provided with 60-hour battery back-up. The system will be of the addressable type where each detection device will be identified at the control panel and remote annunciators by device type and location to facilitate search for origin of alarms. The notification system will be in conformance with NFPA 72 Chapter 24 emergency communications systems.
2. Smoke detectors will be provided in open areas, corridors, stairwells and other egress ways.
3. The sprinkler system will be supervised for water flow and tampering with valves.
4. Speaker/strobes will be provided in egress ways, classrooms, assembly spaces, open areas and other large spaces. Strobe only units will be provided in single toilets and conference rooms.
5. Manual pull stations will be provided at exit discharge doors.

6. The system will be remotely connected to automatically report alarms to the fire department via a Gamewell local energy master box as approved by the fire department.

7. A mass notification system will be provided with separate strobes from the fire alarm system. Audible tone shall be through fire alarm speakers. System activation shall be through panic buttons and card readers with dedicated lockdown key fob.

H. Metering:

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

   a. Total electrical energy

   b. Sub-metering in accordance with ASHRAE 90.1 paragraph 8.4.3

2. Recording and Reporting:

   a. The electrical energy usage for all loads listed above shall be recorded a minimum of every 15 minutes and reported at least hourly, daily, monthly, and annually. The system shall be capable of maintaining all data collected for a minimum of 36 months.

I. Uninterruptible Power Supply (UPS):

1. One (1) 24 kW, three phase centralized UPS system will be provided with seven minutes of battery back-up.

2. The system will provide conditioned power to sensitive electronic loads, telecommunication systems, bridge over power interruptions of short duration and allow an orderly shutdown of servers and communication systems during a prolonged power outage.

3. The UPS system will also be connected to the stand-by generator.

J. Lightning Protection System:

1. A system of lightning protection devices will be provided.

2. The lightning protection equipment will include air terminals, roof main conductors and down conductors, conduits, fasteners, connectors, ground rods, etc.

3. The facility will be issued a UL Master Label Certificate.

K. Renewable Energy System Provisions:

1. Electrical provisions will be made for a roof mounted renewable energy system consisting of a grid (location on Roof of Addition) connected photovoltaic PV system intended to reduce the facilities demand for power.

L. Two-Way Communications System:

1. A Two-Way Communications System will be provided at the elevator lobbies that do not have grade access. Area of rescue assistance call boxes will be provided at Elevator Lobbies with no grade access. The call boxes connect to a main panel located adjacent to the Fire Alarm annunciator panel.

M. Level 2 AC Dual Electric Vehicle Charging Equipment. (EVSE)

1. Provide provisions for ten (10) dual port EVSE stations fed with 40 ampere feeders back to a EVSE panel. Two protective bollards will be installed at each charging station.

N. Distribution Antennae System (DAS):

1. A public safety radio distributed antenna system (DAS) which consists of bi-directional amplifiers (BDA), donor antennas, coverage antennas, coax cable, coax connectors, splitters, combiners, and couplers. These devices will be used as part of a system for in-building public safety 2-way radio system communication.

5. TESTING REQUIREMENTS

A. The Electrical Contractor shall provide testing of the following systems with the Owner and Owner's Representative present:

- Lighting and power panels for correct phase balance.

- Emergency generator system.
- Lighting control system (interior and exterior).
- Fire alarm system.
- Uninterruptible Power System, UPS.
- Lightning protection system.
- Two-way communication system.
- Distributed Antennae system.

B. Testing reports shall be submitted to the Engineer for review and approval before provided to the Owner.

6. OPERATION MANUALS AND MAINTENANCE MANUALS

When the project is completed, the Electrical Contractor shall provide operation and maintenance manuals to the Owner.

7. RECORD DRAWINGS AND CONTROL DOCUMENTS

When the project is completed, an as-built set of drawings, showing all lighting and power requirements from contract and addendum items, will be provided to the Owner.

8. COMMISSIONING

The project shall be commissioned per Commissioning Section of the specifications.

9. PHASING

A. Cut cap and make safe existing building for demolition by demolition contractor.

BASIS OF DESIGN – PLUMBING

Plumbing Fixtures

Plumbing fixtures will be equipped with the following water conserving features, such as manual flush valves and flow restricting aerators (for indoor water use reduction-LEED v4- WE Credit 2 & 4).

Water Closet	Urinals	Lavatory
1.28 gpf High Efficiency Toilet, 1.28 gpf manual flush valve.	0.125 gpf Ultra High Efficiency urinal with manual flush valve.	Delta metering faucet with temperature mixing valve, 0.35 gpm flow restricting aerator.

Water closets and urinals will be commercial vitreous china, wall hung (ADA compliant). Lavatories will be wall-mounted china. Each floor includes a janitor's closet with a mop service basin, if chemical dispenser will be attached to water supply, a code required BFP will be required, Toilet cores on each floor will include a drinking water fountain with a high-low handicapped accessible configuration and a bottle filling station. Toilet and mechanical rooms will have a floor drain with a trap primer. Hose bibs will be provided in each multi-stall bathroom and mechanical room. Roof Hydrants will be provided on the roof.

All classrooms will have two self-rimming stainless-steel sinks with 0.5 gpm gooseneck type faucets with aerator.

Drinking fountain will be dual height with bottle filler. Elkay, Hasley Taylor or Oasis.

Plumbing connections will be provided to each kitchen appliance requiring plumbing.

Any art room and STE room sinks will be provided with in-line solids interceptor.

Exterior non-freeze wall hydrants will be provided on all sides of the school building.

Domestic Water Distribution

New 4" domestic water supply line will enter the water room. A Reduced Pressure Backflow Preventer will be provided to the main domestic water supply to protect the service (per the DEP regulation 310 CMR 22). The domestic water distribution will incorporate water meter at main line and few branch piping to monitor the water usage on various levels such as boiler room, water heater and irrigation system if one is being provided. Boiler water feed, make-up, and any other mechanical take-offs will branch off through a reduced pressure-principle backflow preventer.

The domestic cold-water piping inside the building will be distributed in "L" type copper tube with wrought or cast copper fittings. Potable water will meet both the NSF 61 and NSF 372 standards for the lead-free Safe Drinking Water Act. The piping will be insulated to prevent condensation.

Domestic hot water system will be three (3) electric hot water heaters all with 120-gallon storage capacity. Two heaters have a 50 kW capacity and the third has 90 kW capacity. The capacity may be able to be reduced if HVAC can provide pre-heated water.

The acceptable manufacturers of hot water heaters are PVI, Lochinvar, A.O. Smith, Rheem or equal.

The water heater will supply hot water to classroom fixtures and kitchen appliances. The domestic hot water distribution system will have a recirculation system including but not limited to pump, aqua-stat and automatic thermostatic mixing valves. Piping will extend to each fixture with no dead leg more than 12 feet in length. There will be one temperature hot water supply / recirculation system in the building. The system will operate at 120°F and will serve all plumbing fixtures. Faucets will reduce the temperature to 105°F at the public lavatories and classroom sinks via associated mixing valves.

Domestic hot water will be distributed in "L" type copper tube with wrought or cast copper fittings. The hot water (HW), and re-circulating (HWR) piping will be insulated as required by the Energy Code.

Sanitary Waste

Multiple 4" gravity outlets will exit the building and connect to the sewer system. Refer to Civil narrative for details on sewer infrastructure.

A dedicated 4" grease waste line will be installed to collect grease laden waste water from the new Kitchen appliances and fixtures. An interior grease trap will service fixtures that require one, such as dishwashers and the 3-bay sink. The grease line will then exit the building and will be connected to an exterior grease trap outside the building provided under the site. A dedicated 4" chamber vent will be provided and will run back to building and terminate independently through the roof. For culinary sinks, 3-bay sink, grease troughs and dishwasher an interior grease trap will be provided at the source.

Above ground sanitary drainage will be piped in cast iron with "no-hub" joints (3" or larger). Piping smaller than 3 inches will be piped in copper. Piping below floor shall be weight cast iron hub and spigot type.

Each elevator pit will be provided with a 50 GPM sump pump with water minder system that will run to an oil separator before it connects to sanitary. A monitoring point would be added to Mechanical discipline BMS.

Rain Water Drainage

Roof Drain system will carry rainwater away from the flat roof of the new building with conventional primary roof drains. Overflow drains will be provided and run independently from the primary drains. Overflow piping will spill to daylight via wall scuppers. Rainwater piping and the system will be sized to handle a rainfall rate of 4 inches per hour, with a total runoff from the main roof and the roof deck of just under 1 cubic foot per second. The storm system will be installed in cast iron piping with all horizontal piping insulated to prevent condensation. The storm system will exit the building in multiple locations.

BASIS OF DESIGN – FIRE PROTECTION

GENERAL

The fire protection systems design complies with the Massachusetts State Building Code (780 CMR), Massachusetts Comprehensive Fire Code (527 CMR), NFPA 13, NFPA 14 (2019 Edition), NFPA 24, NFPA 101, the MSBA School Construction Guidelines, and the requirements of the Wilmington Fire Department.

WATER SUPPLY AND SERVICE

A hydrant flow test conducted in coordination with the Town of Wilmington Water Department confirms that the available municipal water supply provides adequate static pressure, residual pressure, and flow to meet the calculated sprinkler and standpipe system demand. Based on hydraulic analysis completed at this stage, a fire pump is not required.

An 8-inch fire service is extended from the site hydrant loop into the building's Water Entry Room. Cross-connection control is provided by a supervised 8-inch double check valve assembly backflow preventer located at the service entrance. The Water Entry Room also houses the wet alarm check valve. Downstream of the backflow assembly, a 6-inch wet riser supplies the combined sprinkler and standpipe systems.

SYSTEM DESCRIPTION

The building is protected by a fully automatic wet-pipe sprinkler system designed and hydraulically calculated in accordance with NFPA 13. Standpipes are provided in each required egress stair enclosure and adjacent to the stage in accordance with NFPA 14. The layout has been arranged so that no portion of the building is more than 200 feet from a standpipe hose valve.

Each standpipe is equipped with a 2½-inch fire department hose valve with a 1½-inch reducer located at the stair floor landing. Hose valves are installed within recessed cabinets coordinated with architectural finishes.

Floor control valve stations are provided at several standpipe risers, in each floor to serve the sprinkler zones such that each zone coverage does not exceed 52,000 sq. ft. Each station includes a monitored shut-off valve, waterflow switch, and an inspector's test valve with sight glass. All valves controlling water flow are electrically supervised and report to the building fire alarm system.

A Storz-type fire department connection is provided at the exterior wall within 100 feet of a site hydrant. The final configuration, whether wall-mounted or free-standing, will be confirmed in coordination with the Fire Department Authority Having Jurisdiction.

HAZARD CLASSIFICATIONS AND DESIGN CRITERIA

Light Hazard areas include classrooms, corridors, cafeteria, restrooms, offices, media spaces, and gymnasium areas. These spaces are designed at a density of 0.10 gallons per minute per square foot over a 1,500 square foot remote area.

Ordinary Hazard Group 1 areas include the kitchen, mechanical rooms, electrical rooms, locker rooms, and science classrooms. These areas are designed at 0.15 gallons per minute per square foot over a 1,500 square foot remote area. Where applicable, Ordinary Hazard Group 2 areas are designed at 0.20 gallons per minute per square foot over a 1,500 square foot remote area.

Maximum sprinkler spacing complies with NFPA 13, with Light Hazard areas limited to 225 square feet per sprinkler and Ordinary Hazard areas limited to 130 square feet per sprinkler. Required hose stream allowances are included in the hydraulic calculations.

An exterior canopy condition, where occupied building space is located above, will be protected by a dry-pipe sprinkler system.

SPRINKLER TYPES AND MATERIALS

Concealed quick-response pendant sprinklers are provided in areas with finished ceilings, with selected locations receiving custom color cover plates to coordinate with architectural finishes. Upright quick-response sprinklers are installed in areas without suspended ceilings. Sprinklers located in the gymnasium and mechanical rooms are provided with listed wire guards for protection.

Fire protection piping 1½ inches and smaller is Schedule 40 steel with threaded or grooved fittings. Piping 2 inches and larger is Schedule 10 steel with roll-grooved fittings and couplings. All fittings are grooved type. Dry system piping is galvanized to improve long-term durability.

The system will undergo hydrostatic testing, main drain testing, dry system trip testing, alarm verification, and final inspection with the Wilmington Fire Department prior to acceptance. Record drawings and hydraulic calculation documentation will be provided at project closeout.

BASIS OF DESIGN – DATA/COMMUNICATIONS/SECURITY

Voice/Data Structured Cabling System

Voice/data outlets shall be installed in all academic and administrative spaces including but not limited to classrooms and instructional areas, large group assembly spaces, gym, cafeteria, and Library. Voice/data outlets shall be installed at every desk workstation in all offices.

Pathways between each Intermediate Distribution Frame (IDF) Room and the Main Distribution Frame (MDF) Room will be furnished and installed using conduit between rooms and above the finished ceiling of main corridors, as well as conduits between floors. Twelve-strand OM4 multimode and twelve-strand single-mode fiber optic cabling, as well as multi-pair voice riser cable, shall be installed between each IDF and the MDF. Fiber patch panels and voice cross-connect blocks shall be installed in rooms for terminating fiber and multi-pair riser cable.

Data drops shall be furnished and installed including a voice drop for a telephone in each classroom and instructional space.

In new construction areas with new CMU or gypsum walls, furnish and install in-wall two gang outlet boxes, plaster ring, 1 inch conduit to nearest accessible ceiling, insulating bushings, and pull line for all voice/data outlet locations. If nearby accessible ceilings are not feasible, conduits may be extended to the nearest accessible ceiling or directly to nearest IDF room.

A structured cabling system shall be provided consisting of Category 6A voice/data cable, modular jacks, patch panels, wiring blocks, racks, fiber optic cable, fiber patch panels, 2-post and 4-post open equipment racks, device plates, outlet boxes, conduit, etc. for a complete and fully functional voice/data/video system.

Provide structured cabling for wireless access points to be located on ceilings and wall enclosures at designated locations throughout the building to ensure 100% coverage. Provide two Category 6A data cables/jacks at the wireless access point outlet for connection of a future Wireless Access Point to the building Local Area Network.

Preparation for Instructional Video Presentation Equipment

Video presentation equipment and cabling shall be specified and procured as part of the equipment phase of the project for all instructional spaces including but not limited to classrooms, small group meeting spaces, SPED rooms, Library, and conference rooms, etc. Therefore, all academic and administrative areas designated to receive video presentation equipment shall be prepared during construction to accommodate primarily wall-mounted interactive flat panel display technology.

This will include providing conduit pathways, back boxes, and power to support video presentation equipment, and shall include but not be limited to providing empty double gang outlet boxes at the projector and flat panel device location and at a separate location for making connections to the

device, plaster rings, 1¼ inch conduit to nearest accessible ceiling, insulating bushings, and pull line for all future system video cabling.

Digital Signage System

Data outlets and power receptacles shall be installed in strategic areas to support the installation of Digital Signage displays. Data outlets shall consist of Category 6A cable, devices plates, outlet boxes, conduit, etc.

The Digital Signage System shall consist of 65", 75", and 86" LED flat panel display with easy to manage signage player and software.

Gymnasium Local Sound and Projection System

A dedicated local sound system for the Gymnasium shall be furnished and installed and shall include an amplifier, overhead program playback speakers, Bluetooth for mobile device connections, wireless microphone system, dedicated microphone outlets and an assistive listening system mounted in a sound system rack with a lockable door.

A portable high-lumen projector and a built-in tensioned electric projection screen will be provided in the Gymnasium with user connection plates and a system interface to control the selection of video sources and system volume.

Cafeteria Local Sound and Projection System

A dedicated local sound system for the Cafeteria shall be furnished and installed and shall include an amplifier, program playback as well as voice lift speakers, Bluetooth for mobile device connections, wireless microphone system, dedicated hardwired microphone outlets and an assistive listening system mounted in a sound system rack with a lockable door.

A permanently mounted high-lumen projector and a built-in tensioned electric projection screen will be provided in the Cafeteria with user connection plates and a system interface to control the selection of video sources and system volume.

Master Clock and Distributed Communication System

A master clock system with connections to the internet for synchronizing time shall be included in the building. Low voltage secondary clocks shall be installed in all academic and administrative spaces, and in all common spaces such as conference rooms, library, gymnasium, and cafeteria. The master clock shall be located in the MDF room. A fully IP-based distributed communication system shall be furnished and installed with public address speakers located in all classrooms and instructional spaces, offices, administrative areas, conference rooms, library, gymnasium, cafeteria and main corridors. IP PoE Talkback speakers with a call-in switch shall be furnished and installed in all academic classroom and instructional spaces. The distributed communication system central equipment shall be located in the MDF room. The system shall be integrated with the telephone system so that public address announcements can be initiated from any telephone handset using an access code. The

system shall be interfaced to the Master Clock system for generating scheduled bell tones over the distributed communication system speakers.

Video Intercom and Door Control System

A video intercom system shall be installed at the school's main entry doors to provide administrators with a means of communicating with visitors to the school before allowing entry. The system shall provide a way to interact with visitors while receiving visual verification. The system shall also provide administrators with the ability to unlock doors for visitors remotely. The system shall include door stations with speaker and camera, master stations with display and control buttons, and all low voltage cabling and power supplies. The door vendor shall provide electronic door latch hardware.

Integrated Security System

Intrusion Detection: A complete intrusion detection system shall be furnished and installed to include but not be limited to magnetic door contacts, motion detectors, sirens, alarm keypads for arming and disarming the system, conduit, and wire. Intrusion detectors shall be installed in corridors, lobbies and all exterior ground level rooms with windows.

Video Surveillance: A complete video surveillance system shall be furnished and installed to include but not be limited to a server and software, color IP cameras, dedicated network switches, and adequate network storage for archiving video. Interior IP cameras at all egress doors and corridors shall be furnished and installed. Exterior cameras shall be furnished and installed around the exterior of the building. Dedicated Ethernet switches with Power over Ethernet (PoE) ports shall provide power and connectivity to all IP security cameras to the server. A Network Video Recorder (NVR), Video Management System (VMS), and client software shall be included. The NVR shall be large enough to store thirty (30) days of image storage at 15 fps. A cabinet/rack shall be provided in the MDF to house the main equipment including the NVR, rack-mounted monitor, and a UPS system. Conduit and cabling for security camera surveillance system shall be provided under the voice/data structured cabling system. The NVR system including all VMS software and licensing shall be a proprietary system manufactured by Milestone, so that the system matches the existing surveillance VMS currently installed in other buildings. Cameras shall be manufactured by Axis Communications to match the standard in the Town.

Access Control: A complete access control system shall be furnished and installed at designated door locations. The system shall include Card/Proximity Readers, all low voltage cabling, power supplies, and a system server with management software. The door hardware vendor shall provide electronic door latch hardware and Request to Exit devices. The system shall be a proprietary system manufactured by Lenel/S2 to match the existing Netbox Extreme access control system equipment installed in other school buildings.

A complete conduit system including back boxes pull lines, plaster rings, etc. as required to support all security system devices shall be furnished and installed.

Classroom Speech Reinforcement System

A speech reinforcement system shall be provided in all classrooms size instructional spaces. The system shall consist of an amplifier/speaker assembly installed in the finished ceiling utilizing an integrated and dedicated wireless technology, wireless media connector, and two wireless microphones, one lapel microphone for the teacher and another handheld microphone for students.

The system shall amplify the teacher's voice to increase intelligibility, as well as provide a means for providing enhanced program audio playback for multimedia presentations in the classrooms.

School Network Switches and Wireless Access Points

All modern building systems, including but not limited to lighting, HVAC, security, etc., require network connectivity to the internet to function properly.

Therefore, building-wide Network Switches shall be provided, which will deliver network connectivity to voice and data outlets, wireless access points, VoIP telephone handsets, as well as for all building management systems. The Network switch design will also include multiple 10 GbE connections over fiber between IDF Rooms and the MDF room. The network switches and wireless access points shall be a proprietary system manufactured by Cisco Meraki to match the district wide networking standards, which is the basis for all schools in the district.

Telephone and Voicemail System

A telephone system shall be provided, including telephone handsets in all classrooms and instructional spaces; at all administrative/staff office workstations, and in all common areas such as conference rooms, library, etc. The telephone system shall be capable of Voice over IP (VoIP). All head end equipment, including a voice mail system, sized appropriately for the number of users, shall be installed in the MDF.

The system shall be integrated with the Distributed Communication System so that public address announcements can be made from any telephone system handset with the proper access codes pressed at the handset.

The Telephone and Voicemail System shall be a proprietary hosted Zoom VoIP system manufactured by Yealink to match the district wide telephone standards, which is the basis for all schools in the district.

Technology Systems procured and installed during the Equipment Phase (FF&E phase):

Instructional Video Presentation Equipment

Video presentation equipment at all teaching stations including classrooms, SPED rooms, Library, etc. Equipment shall include 65", 75", and 86" interactive flat panels and document cameras. Some ultrashort interactive projectors may also be deployed in specialized areas. Flat panels (and projectors) shall be mounted to the wall with specialized cabling extending between display device and an interface outlet on the teaching wall. Small group meeting spaces and conference rooms may be equipped with smaller 55" interactive flat panel displays.

Computer Network Equipment

Computer network equipment shall include but not be limited to servers, network storage, firewall appliances, teacher and staff computers, teacher tablets, teacher Chromebooks, student computers, student tablets, and Chromebooks.

Computer Carts and Lockers

Storage and Charging Carts and Lockers will be purchased for securing and charging student tablets, Chromebooks, and computer laptops. Lockers provide a means for securely storing and charging student devices in classrooms, while carts offer portability and flexibility in utilizing the technology within the school.

Network Copier/Printer Equipment

Large Copier/Printers shall be supplied and supplemented with smaller workgroup laser printers and personal laser printers in key administrative and teacher support areas.

Portable Video Presentation System

Mobile interactive flat panel and/or projectors on durable, stable wheeled carts or stands for use in areas not equipped with display technology.

Cafeteria Point of Sale Equipment

Electronic Cash Register(s) for processing the purchase of school meals shall be provided.

Visitor Management System

A visitor management system for providing the ability to scan visitor's picture identifications (driver's license) and printing visitor credentials while on school premises shall be provided.

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WILMINGTON ELEMENTARY SCHOOL
SUMMARY OF BUILDING REGULATIONS

Design Development

DORE + WHITTIER

Project Number: **23-0847**
Prepared by: **Dave Mentzer**

Project Summary & Applicable Codes

The Wilmington Elementary School (the Project) includes construction of a new elementary school serving grades Pre-Kindergarten through grade 5. This summary is intended to convey compliance of the completed school building project with the 10th Edition of the Massachusetts State Building Code (CMR 780) which is anticipated to be effective when the project is eligible for construction permitting.

Applicable Codes:

1. Massachusetts State Building Code (780 CMR), 10th Edition (2021 IBC with amendments)
2. Uniform Sate Plumbing Code (248 CMR 10.00)
3. Massachusetts Architectural Access Board (MAAB) Regulations (521 CMR)
4. 2010 Americans with Disabilities Act Standards for Accessible Design (where more stringent than MAAB)
5. Massachusetts Base Energy Code (780 CMR, Chapter 13), 10th Edition (2021 IECC with amendments)*
6. Massachusetts Fire Code (537 CMR 1.00) 2021 NFPA 1 with MA Amendments
7. Massachusetts Electrical Code (527 CMR 12.00) 2023 NFPA 70 with MA Amendments
8. Massachusetts Board of Elevator Regulations (524 CMR)

*The Base Energy Code is listed here as the required minimum energy code applicable in Wilmington. The project has been designed to comply with the Massachusetts Specialized Opt-In Code, CMR 225 c.23 (2021 IECC including Appendix CC as amended for Opt-In Code.)

Occupancy Characteristics

The completed project will contain classrooms for grades Pre-K through 5, administrative offices, a cafeteria (including a performance platform) and associated kitchen, a gymnasium, and associated support spaces (mechanical, electrical, and storage spaces).

The occupancy of the complex will be generally classified as Use Group E (Educational) as defined in Section 305 with specific functions and occupancies defined as follows:

Level	Function	Use Group
1	Classrooms	E
	Offices	B (2)
	Gymnasium	E (1)
	Media Center (Library)	E (1)
	Cafeteria & Kitchen	E (1)
	Storage	S-2 (2)

	Utility & Miscellaneous	U (2)(3)
2	Classrooms	E
	Offices	B(2)
	Storage	S-2 (2)
	Utility & Miscellaneous	U (2)
3	Classrooms	E
	Offices	B(2)
	Storage	S-2 (2)
	Utility & Miscellaneous	U (2)

Note 1: Assembly areas that are accessory to Group E occupancies are not considered separate occupancies (§303.1.3).
Note 2: Accessory occupancies are not required to be separated from the main occupancy (§508.2.4).
Note 3: Incidental Accessory Occupancies shall be separated from the main occupancy as described in Table 509.

Physical Characteristics

The project is organized into a three-story classroom wing to the west and a one and two-story public spaces building to the east. The classroom wing contains primarily educational spaces while the public wing incorporates large volume assembly spaces, additional educational spaces, and administrative areas.

The total facility area of the project identified in the Code Plan Diagrams is described as follows:

Level	**Building Area (SF)**
1	76,227
2	64,165
3	42,206
Total:	**160,731**

The building heights from the average grade plane to highest portion of the flat roof can be characterized as follows:

Stories	**Building Height (Area)**
Three-Story	44 feet (Classrooms)
Two-Story	29 feet (Media Center, Gymnasium

Construction Type, Allowable Height, Allowable Area

Occupancy Separations & Mixed Use

The building is classified as **Type IIA** construction.

Allowable Height

The allowable tabular building height in feet as described in table 504.3 for Type II A, Group E in a building equipped with an automatic sprinkler system is **85 feet.** The maximum roof height, above the average grade is **44 feet,** at the three-story classroom wing. The building complies.

The allowable tabular building height in stories as described in table 504.4 for Type II A, Group E in a building equipped with an automatic sprinkler system is **4 stories.** The maximum number of stories at the classroom wings is **3 stories.** The building complies.

Allowable Area

The allowable tabular area in square feet as described in Table 506.2 for Type II A, Group E in a multistory building equipped with an automatic sprinkler system is **79,500 square feet**.

The project includes a fire access road providing 30-plus foot wide access to 100% of the perimeter of the building. The amount of Area Increase determined in accordance with Table 506.3.3 is **0.75.**

The Project is considered Mixed-Occupancy, Multistory building, and the allowable area for each story is determined in accordance with Section 506.2.2. Because the building is less than four stories, each story will comply individually with Section 508.1 for Mixed Use and Occupancy.

Allowable Area (Aa) = $[A_t + (NS \times I_f)]$
Aa = [79,500 + (26,500 x 0.75)] = **99,375 SF**

Each Story includes unseparated accessory occupancies that do not occupy more than 10 percent of the floor area of the story and complies with Section 508.2 for Accessory Occupancies.

The following Incidental Uses will be provided with the required separation and/or protection in accordance with Table 509:

Incidental Use per Table 509	**Separation and/or Protection**
Electrical rooms containing transformers over 112 1/2 Kva	1 hour separation [1]
Emergency Electrical rooms & closets	2 hour separation [1]

Note 1: Separation based on NEC requirement, included for convenience

Fire Resistance Rating of Building Elements:

Fire resistance rating of building elements for **Type IIA** construction are based on the requirements of Table 601 or by other code provisions as described below. Refer to Means of Egress section of this Summary for rating of egress components.

Primary Structural Elements

1 hour fire-resistance rating

The Project will utilize Heavy Timber framing in accordance with section 2304.11. Heavy Timber portions will support the roof construction over the Cafeteria and portions of the Media Center.

In accordance with Table 601-note c. Heavy Timber complying with section 2304.11 shall be allowed for roof construction, including primary structural frame members, where a 1-hour or less fire-resistance rating is required.

Bearing Walls

Exterior: **1-hour** fire-resistance rating
Interior: **1-hour** fire-resistance rating

Other Exterior Walls

The building is significantly separated from any other building and therefore exterior walls are not subject to the fire resistive rating requirements based on separation distance in Table 602.

Exterior walls may be required to be rated in close proximity to exit enclosures in accordance with Section 1023.7.

Portions of exterior walls within 4 feet of the intersection with the fire wall between Code Buildings AB and C will be rated for 1-hour in accordance with section 706.5.1.2.

Interior Walls & Partitions

No requirement based on construction type per Table 601. Interior walls and partitions shall be rated based on the specific conditions outlined in the Occupancy Separations and Mixed Use, Building Separations, or Special Use & Occupancy Considerations sections of this Code Summary. Additional interior wall & partition ratings may also be required by other sections of the code and are described elsewhere in this Summary.

Floor Construction and Secondary Members:

1-hour fire-resistance rating

No requirement based on construction type per Table 601. Horizontal assemblies in compliance with Section 711.2 will be required to separate occupancies as outlined in the Occupancy Separations and Mixed Use, Building Separations, or Special Use & Occupancy Considerations sections of this Code Summary.

Roof Construction and Secondary Members:

1 hour fire-resistance rating

The Project will utilize Heavy Timber framing in accordance with section 2304.11. Heavy Timber portions will support the roof construction over the Cafeteria and portions of the Media Center.

In accordance with Table 601-note c. Heavy Timber complying with section 2304.11 shall be allowed for roof construction, including primary structural frame members, where a 1-hour or less fire-resistance rating is required.

Means of Egress

Occupant Loads will be calculated based on Table 1004.1.2 for Assembly Spaces without fixed seating, by actual seat count for spaces with fixed seating (1004.4), or by the design occupant load where this value exceeds the tabular values in accordance with Section 1004.2.

Exception: The gymnasium will have a reduced maximum occupancy of **950 occupants** in lieu of the calculation for assembly spaces without fixed seating in accordance with the Section 1004.5 Exception. Such maximum occupancy will be posted at each door of the gymnasium.

For the sake of these calculations, General Classrooms and other instructional spaces intended to contain only loose furniture are calculated as “Classroom area” (20 net square feet per occupant). Art Studios, Music Classrooms, and other vocational or specialty instruction spaces intended to contain large amounts of fixed casework and/or equipment are calculated as “Shops and other vocational areas” (50 net square feet per occupant).

Exception: Kindergarten and Pre-K classrooms will have a reduced maximum occupancy of **49 occupants** in lieu of the calculation at 20 SF / occupant in accordance with the Section 1004.5 Exception. Such maximum occupancy will be posted at the door to the classrooms. As such, theses spaces are not required to have two means of egress, exit signs, or doors with exit devices.

Occupancy loads for individual spaces are indicated on the Code Plan Diagrams.

The number of required exits per story (per section 1006.3) and the total egress capacity required and provided are summarized on the Code Plan Diagrams.

At least two exits or exit access doorways shall be provided from all spaces with a maximum occupant load larger than 49 per Table 1006.2.1; this requirement is applicable to all general classrooms with a net square footage over 1000 SF except for the alternative occupant loads reviewed and accepted by the Authority Having Jurisdiction noted above.

At least three exits shall be provided from spaces with an occupant load of 501 to 1,000 occupants, and at least four exits shall be provided from spaces with an occupant load greater than 1,000 occupants (1006.2.1.1). Exits shall be arranged in accordance with section 1007.1.1.

The Common Path of Egress Travel shall be limited in accordance with Table 1006.2.1 as follows:

75 feet in Educational and Assembly Occupancies
100 feet in Business Occupancies

Unoccupied mechanical rooms and penthouses are not required to comply with Common Path of Egress Travel requirements in accordance with Section 1006.2.1 Exception 3.

The maximum length of exit access travel distance shall not exceed 250 feet in accordance with Table 1017.2.

Corridors are not required to be rated per Table 1020.1.

Corridors with a required Educational occupancy of 100 or more shall not be less than 72" wide in accordance with Table 1020.2, or not less than 44" for all other portions of the building.

Dead end corridors shall not be greater than 50' in length (1020.4 Ex. 2)

Interior exit stairways, which provide a protected path of egress travel to the exit discharge, shall be enclosed with fire barriers and / or horizontal assemblies with a rating of not less than 1 hour (1023.2).

Exit access stairways, which serve only two stories, are not required to be enclosed with a rated shaft enclosure (1019.3.1).

Special Occupancy & Use Considerations

Cafeteria with Performance Platform

Different occupant loads for the Cafeteria were calculated for Multiple Function Occupant Load in accordance with Section 1004.3. The means of egress assume the highest occupant load scenario. The total occupant load for the Cafeteria is greater than 50 and less than 500, requiring two means of egress per Section 1006.2.

The area identified on the plans as the Platform meets the code definition of a Platform defined in section 202. Portions of section 410 related to stages, proscenium ratings, roof vents, egress from stairs, and rated separations are not applicable to the platform. The construction of the platform will comply with section 410.4.

Gymnasium

A maximum occupant load for the Gymnasium of 950 has been mandated by the Town. As such, the maximum occupant load is reduced as noted above.

Media Center

The occupant load for the Media Center has assumed portions of the space containing shelving will be classified as Stacks and the other portions will be classified as Reading Areas in accordance with table 1004.1.2.

Special Egress Considerations:

Stairways:

Exit access stairways connecting only two stories and which are not open to other stories are not required to be enclosed (1019.3, Ex. 1). The exit access stairway from the upper level adjacent to the Media Center that descends to the Cafeteria will not be enclosed.

Where the exterior stair enclosure walls are not rated, the exterior walls that are less than 180 degrees from the unrated exterior wall of a stairway enclosure shall have a fire resistance rating of not less than 1 hour for a distance of 10 feet from the stair enclosure per section 1023.7. Openings within these walls will have a fire protection rating of ¾ hour.

Fire Protection Systems

Sprinkler systems will be provided in accordance with 903.3.2(1)(a). Such systems will be NFPA 13 systems as required by Section 903.3.1.1

Sprinklers will not be provided in the elevator machine room per Section 903.2 Exception 2. Specific areas exempted from fire protection under section 903.3.1.1.1 require the approval of the fire code official.

Alternative fire-extinguishing systems shall be provided for all Type I hoods in commercial kitchens per section 904.2.2.

Because no floor level is more than 30 feet above the lowest level of fire department vehicle access, no Class III standpipes are required due to building height per section 905.3.1. However, a standpipe will be provided in the enclosed stair as directed by the local Fire Department.

Per section 905.4, Class I standpipe hose connections will be provided to improve the firefighting operations in the following locations:

- At floor level landings of enclosed egress stairs.

The new school will be provided with portable fire extinguishers in accordance with Section 906.1. In addition to general portable fire distribution, additional portable fire extinguishers will be provided in the following locations:

- Within 30 feet of commercial cooking equipment.
- In the elevator machine room.
- On each floor of structure *while under construction* (to be provided by the General Contractor).
- Where required by the International Fire Code sections on Table 906.1. (No such areas have been identified in the project).
- Special hazard areas such as Science Classrooms, Tech classrooms, or other locations required by the fire code official. (No such areas have been identified in the project).

Fire alarm and detection systems will be installed in accordance with Section 907. Refer to Fire Alarm drawings for additional information and requirements.

Emergency Power & Lighting

Emergency Power shall be provided by an on-site generator and in accordance with Chapter 27 to provide the illumination levels set forth in Section 1008. Refer to Electrical drawings for additional information related to generator and egress lighting.

Plumbing Fixtures

The required plumbing fixture types and counts have been calculated based on 248 CMR 10.00: Uniform State Plumbing Code, Table 1.

Pre-Kindergarten **Classrooms with Unisex / Gender-neutral toilet rooms pet 10.10 (15)(c)12.d**								
	Students Only	Toilets	Lavs				Jan. Sink	DF
Required Student Fixtures[9]:	**90**	**5**	**9**				**1 per Flr**	
Provided:							YES	
Gen Neut Allocation[9]	1 Tlt Rm per Classroom	5	5					
Lavs Provide in Classrooms[10]	2 per Classroom		10					
Total Fixtures Provided:		**5**	**15**				**0**	**0**

Kindergarten **Classrooms with Unisex / Gender-neutral toilet rooms pet 10.10 (15)(c)12.d**								
	Students Only	Toilets	Lavs				Jan. Sink	DF
Required Student Fixtures[9]:	**144**	**6**	**6**				**1 per Flr**	
Provided:							YES	
Gen Neut Allocation[9]	1 Tlt Rm per Classroom	8	8					
Lavs Provide in Classrooms[10]	2 per Classroom		16					
Total Fixtures Provided:		**8**	**24**				**0**	**0**

Educational Occupancy Scenario - Whole Building (Excluding Pre-Kindergarten & Kindergarten)								
	Total Occupants	F Toilets	F Lavs	M Toilet	M Lav	M Urinal	Jan. Sink	DF
Required Student Fixtures[1]:	**890**	**11**	**18**	**11**	**18**	**up to 50%**	**1 per Flr**	**7**
Provided:							4	7
Group Toilet Rooms		28	22	27	23	7		
Gen Neut Allocation[4]	0 GN	3	5	6	6			
Total Fixtures Provided:		**31**	**27**	**33**	**29**	**7**	**4**	**7**

Required Faculty Fixtures:					
	Total Occupants	F Toilets	F Lavs	M Toilet	M Lav
Required Faculty Fixtures[2]:	**140**	**4**	**4**	**3**	**4**
Provided:					
Gen Neut Allocation[4]	13 GN = 7F / 6M	7	7	6	6
Total Fixtures Provided:		**7**	**7**	**6**	**6**

Assembly Occupancy Scenario - Code Building B						
	Total Occupants	F Toilets	F Lavs	M Toilet	M Lav	M Urinal
Required Fixtures[3]:	**1240**	**17**	**13**	**9**	**13**	**up to 67%**
Provided[5]:						
Group Toilet Rooms		20	14	15	14	6
Gen Neut Allocation[4]	5 GN = 2F / 3M	2	2	2	2	0
Total Fixtures Provided:		**22**	**16**	**17**	**16**	**6**

1. Student Fixture Counts based on 248 CMR 10.10(15) Table 1 for "Public & Private Schools, Kindergarten, Middle & High School"
2. Faculty Fixture Counts based on 248 CMR 10.10(15) Table 1 for "Public & Private Schools, Kindergarten, Middle & High School Staff"
3. Student Fixture Counts based on 248 CMR 10.10(15) Table 1 for "Assembly - Indoor Recreational Facilities, Rinks, Swimming Pools, Gymnasiums and Other with Spectator Seating (Patrons & Staff)"
4. Gender Neutral Allocation accounts for how designated single user gender neutral toilet rooms have been allocated to male or female fixture requirements to satisfy minimum fixture requiremetn of Table1.
5. Only "open to public" gang and single user toilet rooms on Level 1 have been included in the provided fixtures for Assembly use tabulation.
6. Gender Neutral toilet rooms are used to satisfy the minimum fixture requirements using one of the two options provided in 10.10(15)(g) for each occupancy group.
7. Where option (r) 2. is utilized, the balance of requried fixutres are provided in gender-designated gang toilet rooms
8. Where option (r) 1. is utilized, all required plumbing fixtures are provided in gender neutural single user toilet rooms
9. Fixture Counts based on 248 CMR 10.10(15) Table 1 for "Public & Private Pre-Schools and Daycare" one single user rest toom is allowed for up to 20 children and staff combined. The district has committed to a Pre-Kinderegarten target class size of 15 students per classroom.
10. Per 248 CMR 10.10(15)(c)(12)(d)(ii) for Students younger than six years old, lavatories may be installed in classroom areas.
11. Per 248 CMR 10.10(15)(c)(12)(d)(i) for Students younger than six years old, unisex/gender neutral toilet facilities may be installed.

The minimum fixture counts for students in Special Education classrooms and in Kindergarten through 2nd grade classrooms are provided as unisex/gender-neutral toilet rooms as permitted in section 10:10(15)(g)(2) of 248 CMR. Gang toilet rooms are provided to meet the required fixture counts for students in grades 3 through 5.

Energy Efficiency

The Town of Wilmington is not a Strech Code or Opt-In Code community. However, new school building will be designed in accordance with the Massachusetts Municipal Opt-In Specialized Code (225 CMR 23.00: 2021 International Energy Code with Massachusetts Amendments, including Appendix CC.)

The Project will seek compliance through the Targeted Performance Compliance requirements of Section C401.2.1(2).

The building envelope will demonstrate compliance with the Component Performance Alternative method for Low Glazed Wall System Buildings described in section C402.1.5.1.

A solar ready zone will be indicated on the drawings in accordance with the requirements of section C402.3 and Appendix CB. The required reserved electrical requirements stipulated in Appendix CB will be provided.

Section C402.5 - Air Leakage Thermal Envelope

A continuous air barrier complying with Section C402.5.1 will be provided for the building envelope.

The air leakage of all fenestrations will be specified in accordance with the limitations described in Table C402.5.3.

Building entrances shall be designed with Vestibules in accordance with Section C402.5.5. Exterior doors exempt from this requirement include:

- The Shipping / Receiving door and Mechanical Room door. (Section 402.5.8, Ex. 2).

Accessibility

The Project will comply with the Massachusetts Architectural Access Board (MAAB) 521 CMR, or the 2010 Americans with Disability Act Standards for Accessible Design where it is more stringent than MAAB. Spaces accessed only by ladder, crawlspaces, catwalks, or non-passenger elevators are exempt (Section 3.12).

In educational facilities, only administrative areas, instructional spaces, and areas open to students or the general population are required to comply with 521 CMR (Section 12.1.1). Areas with restricted access intended for use only by staff (such as instructor toilets, toilets for kitchen staff, mechanical and other support spaces) are not required to comply with 521 CMR. Such staff-only toilet rooms or spaces will comply with ADA Standards.

Accessible Routes, General Site and Building Elements

An Accessible Route shall be provided from accessible parking, passenger loading sizes, and public streets or sidewalks to the accessible building entrance they serve and shall coincide with the route for the general public (Section 20.2). At least one accessible route shall connect the building with all facilities, elements, and spaces on the site and within the building (Section 20.2.1). The accessible route will comply with the provisions of Section 20.

All spaces required to be accessible will be provided with at least one accessible means of egress in accordance with Section 20.11.1.

Curb cuts complying with Section 21 shall be provided wherever an accessible route crosses a curb (Section 21.2).

Accessible parking spaces shall be provided in accordance with Table 23.2.1. One in every six, but not less than 1 accessible space shall be van accessible in accordance with ADA 208.2.4 (note this requirement is more stringent than MAAB Section 23.2.2). Accessible spaces will be located on the shortest accessible route from the parking to an accessible entrance (Section 23.3.1). Where an accessible space cannot be located within 200 feet of an accessible entrance, an accessible passenger drop-off shall be provided within 100 feet of the accessible entrance (23.3.3). Accessible Parking Spaces, Accessible Van Spaces, and the associated access to the site Accessible Route will comply with Section 23.4

Plumbing Elements and Facilities

Single User Toilet Rooms intended for use by the students or general public or located in the Administrative Suite shall be accessible in accordance with 521 CMR. Toilet rooms with restricted access only by staff members shall be accessible in accordance with the 2010 ADA Standards.

Toilet rooms intended for use only by pre-kindergarten (Pre-K) and elementary school aged children (as defined Section 30.1-b) shall be designed in accordance with Sections 30.14 through 30.20. This includes single user toilet rooms in Special Education classrooms, single user toilet rooms in Pre-Kindergarten through 2nd grade classrooms, and gang toilet rooms serving assembly spaces and the grades 3 through 5 classroom wing.

Drinking fountains shall be located on each floor along the accessible route and installed in accordance with 521 CMR Section 36.

Special Occupancy Rooms and Features

The spaces or portions of the building described below require unique description and consideration with respect to accessibility.

Stairways and Elevators.

All stairs connecting public and educational or administrative staff areas will be designed as accessible stairways in accordance with Section 27. Stairways intended only for use by service staff, including the roof access stairs or ladders, are not required to be accessible (Section 12.1.1).

The elevator will be designed in accordance with Section 28 and to accommodate the required gurney size described in 524 CRM (Massachusetts Elevator Regulations) Section 17.40-(1). As such, it will accommodate the dimensional requirements described in 521 CMR Section 28.

Assembly Spaces in Educational Facilities - Generally

Amphitheaters, lecture halls, and classrooms will comply with Chapter 14 for Places of assembly in accordance with section 12.1.3. The gymnasium and cafeteria will also comply with the requirements of Chapter 14.

Assistive Listening Systems shall be provided for all assembly spaces in accordance with 14.5.

Gymnasium

Fixed operable bleacher seating will be provided in the Gymnasium, and the requirements for Number of Accessible Seats (Section 14.2) will be provided for each section of operable bleachers.

Cafeteria

No fixed seating will be provided in the Cafeteria, and the requirements for Number of Accessible Seats (Section 14.2) are not applicable to this space.

Cafeteria tables will be a combination of fixed (attached) and loose seating and will accommodate wheelchairs.

The raised platform (Stage) has an accessible route consisting of a ramp designed in accordance with Section 24 (per Section 14.6.1-a.).

Media Center

The Media Center will be designed to accommodate the requirements for Libraries described in Section 12.2.

At least 5% of all reading and study areas, stacks, reference rooms, computer work stations, shall be accessible and designed to accommodate the requirements of Section 12.2.2.

At least one lane of the check-out area will have a counter a maximum of 36" in height (Section 12.2.3).

Security devices and Card Catalogs will not be provided for the facility.

Aisles between stacks will have a minimum clear width of 42" as the preferred dimension described in Section 12.2.6.

Built In Furnishings and Equipment

Per Section 12.4, a minimum of 1 type of each element in each classroom will comply with the following:

- Countertops and sinks will comply with Section 12.2.2-b, c, and d and consist of a Clear Floor Space with Knee Clearance and a countertop height of 28" to 34".
- At least 50% of shelf space in cabinets with comply with Sections 6.5 Forward Reach and 6.6 Side Reach.
- Controls and operating mechanisms shall comply with Section 39 Controls.

GREEN COMMUNITES DESIGNATIONS / REQUIREMENTS D

GREEN COMMUNITIES DESIGNATION AND REQUIREMENTS

The Town of Wilmington has not adopted the **MA Stretch Energy Code.**

The Wilmington Elementary School project will meet the minimum energy efficiency requirements described in the MA DOER "Opt-in Specialized Code" standards. The results of the TEDI analysis indicate that the basis of design complies with the Stretch Code TEDI requirements. The detail of the report is included in Appendix 27.

SUSTAINABILITY NARRATIVE

The Town of Wilmington and the design team identified sustainability as an important goal for the Project early in the process and have developed the design with sustainability best practices in mind.

The Project is following the MSBA's Green Schools Program, Project Advisory 81, dated June 2023 and is targeting a minimum of LEED for Schools v4 'Silver' level of certification. The Project will achieve a minimum total of three of seven available points related to indoor air quality and will be designed to, at a minimum, meet the minimum energy efficiency requirements described in the MA DOER "Stretch Code Green Community" standards.

In addition to meeting the minimum requirements of the recently updated MSBA Green Schools Program, the Project will achieve the following to earn additional reimbursement of the Estimated Basis of Total Facilities Grant:

- For 3%: Meet the minimum energy efficiency requirements described in the MA DOER "Opt-in Specialized Code" standards.
- For 1%: Achieve a minimum total of five points (from seven available points) in the LEED indoor air quality points.

Making sustainable choices for the built environment requires the collaboration of all design disciplines in an integrated process, including the architect, owner, consultants addressing the needs of the students and teachers. To that end, the team conducted initial workshops to help expand on these goals and to outline tasks and responsibilities going forward.

The goals for a sustainable project include designing a low impact site and energy-efficient building that serves as an educational tool for staff, students, and visitors. Daylighting and acoustics will be key design elements to improve the interior environmental quality. To the extent possible, the design team

will seek to select building materials and furniture that are low-emitting and have a reduced environmental impact. Per MSBA requirements, the building systems, including the envelope and HVAC systems will be commissioned to ensure they operate efficiently and as designed. Additional sustainable design features will be further reviewed as the design develops.

The Project must achieve a minimum of 50-59 points to be LEED for Schools 'Silver'. Currently, the Project is tracking 63 points as 'Yes' and another 20 identified as 'Maybe'. See below for a summary of the credits being targeted as 'Yes'. In some instances, the beta v4.1 rating system, which is intended to serve as an update to (and improvement upon) LEEDv4, have been followed. The USGBC allows LEEDv4 projects to substitute any prerequisite or targeted credit for the LEEDv4.1 equivalent. An updated LEED scorecard has been provided in which credits this project intends to pursue using the v4.1 criterion have been denoted with (v4.1).

CREDIT-BY-CREDIT SUMMARY

Integrative Process

- IPc1 Integrative Process: The project team perform energy and water-use analyses in early design.

Location + Transportation

- LTc2 Sensitive Land Protection: The project is located on previously developed land.
- LTc3 High Priority Site: The project is located on a Difficult to Develop Area (DDA) as designated by HUD.
- LTc4 Surrounding Density and Diverse Uses: The project is located within 1/2-mile walking distance of at least 4-7 diverse uses.
- LTc8 Electric Vehicles **v4.1**: Electric vehicle charging spaces will be provided for at least 5% of the total parking capacity of the project.

Sustainable Sites

- SSc1 Site Assessment: Early analysis was completed to assess the impacts of the site topography, hydrology, climate, vegetation, soils, human use, and potential human health effects.
- SSc2 Site Development – Protect or Restore Habitat: The project will restore 30% (including the building footprint) of the previously developed site area with native & adaptive vegetation.
- SSc3 Open Space: The project will provide outdoor space greater than or equal to 30% of the total site area (including building footprint), where a minimum of 25% of that outdoor space must be vegetated. The outdoor space will be physically accessible.
- SSc4 Rainwater Management **v4.1**: The Project will be able to treat and manage the 80th percentile storm events on-site using low-impact development and green infrastructure.

- SSc6 Light Pollution Reduction: The Project team is exploring opportunities to meet uplight and light trespass requirements for the area's lighting zone.
- SSc8 Joint Use of Facilities: The project will include spaces that are designated for joint use.

Water Efficiency

- WEc1 Outdoor Water Use Reduction: The Project will require no permanent irrigation for landscaping (excluding athletic fields).
- WEc2 Indoor Water Use Reduction: Potable water use will be reduced by at least 30% compared to the baseline for indoor plumbing fixtures and all commercial kitchen fixtures and appliances will meet credit requirements.
- WEc3 Optimize Process Water Use **v4.1**: Following Option 2, the project will show a 100% reduction in annual water use as compared to a water-cooled chiller system by not including a cooling tower in the design.
- WEc4 Water Metering: The Project will include submeters for at least two of the following water subsystems to meet credit requirements: irrigation, indoor plumbing fixtures and fittings, domestic hot water, boiler, and/or other process water.

Energy + Atmosphere

- EAc1 Enhanced Commissioning: As required by the MSBA, a third-party commissioning agent will be brought on board to perform enhanced commissioning activities for the building systems and envelope. Monitoring-based commissioning will also be pursued.
- EAc2 Optimize Energy Performance: The project will follow the Electrification Alternative Compliance Pathway (ACP): EApc161 Energy Simulation Performance Path. The ACP uses "Demand Adjusted Energy" metric, that considers both electricity and fuel consumption to evaluate energy performance, as well as calculating and evaluating a reduction in greenhouse gas emission.
- EAc3 Advanced Energy Metering: The project will include advanced energy meters on all energy sources used by the base building, as well as any individual energy end uses that represent 10% or more of the total annual consumption of the building.

Materials + Resources

- MRc2 BPDO: EPDs **v4.1**: The project manual will be developed to include language for environmental product declarations for at least 20 different, permanently installed products.
- MRc4 BPDO: Material Ingredients **v4.1**: The project manual will be developed to include language for healthy materials with disclosure documentation in the form of health product declarations, Declare Labels, Cradle-to-Cradle Certification, or Product Lens certification for at least 20 different, permanently installed products.

- MRc5 Construction and Demolition Waste Management: The project will target the diversion of at least 4 distinct waste streams at a rate of at least 50% during construction and demolition phases.

Indoor Environmental Quality

- EQc1 Enhanced IAQ Strategies: MERV 13+ filtration media will be installed for all units delivering supply air. Cross-contamination measures (i.e., negative pressure, automatic door closers, etc.) will be provided for all hazardous chemical storage areas. Walk-off mats will be provided at all regularly used entrances. All densely occupied spaces will be provided with CO2 monitoring.
- EQc2 Low-Emitting Materials **v4.1**: The project manual will be developed to include language for low-emitting materials for project finishes such as adhesives & sealants, paints & coatings, flooring, ceilings, insulation, wall panels, and composite wood.
- EQc3 Construction IAQ Management Plan: The Project will require the contractor to develop and implement an IAQ management plan that requires compliance with all applicable control measures of the SMACNA IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008–2008, Chapter 3.
- EQc4 IAQ Assessment: The Project will conduct a flush-out of the building prior to occupancy.
- EQc5 Thermal Comfort: The Project will meet the thermal comfort criteria established by ASHRAE 55-2010 for applicable spaces. At least 50% of individual occupant spaces and all multi-occupant spaces will be equipped with thermal controls.
- EQc6 Interior Lighting: At least 90% of individual occupant spaces and all multi-occupant spaces will be equipped with lighting controls.

Innovation

- INc1 Innovation – O+M Green Cleaning + IPM: The Project will implement a Green Cleaning Plan and an Integrated Pest Management Plan.
- INc2 Innovation – Local Food Production: The project will include adequate space for growing edible plantings, as well as programmatic areas nearby for students to congregate.
- INc3 Innovation – Purchasing - Lamps: The lighting design is 100% LED.
- INc4 Exemplary Performance – Optimize Process Water Use: Following Option 2, the project will show a 100% reduction in annual water use as compared to a water-cooled chiller system by not including a cooling tower in the design.
- INc5 Pilot – Integrative Analysis of Building Materials: The Project will use at least 3 different permanently installed products that have a documented qualitative analysis of the potential health, safety, and environmental impacts of the product in five stages of the product's life cycle.
- INc6 LEED AP: Multiple principal project participants are LEED Accredited Professionals.

UPDATED LEED SCORECARD E

LEEDv4 BD+C: Schools (LEEDv4 SC)
Project Scorecard

The Green Engineer
Sustainable Design Consulting

Project: Wilmington Elementary School
Address: 320 Salem Street Wilmington, MA
Date: 2/19/26

Yes	Maybe	No				
1	0	0	**INTEGRATIVE PROCESS**		**1**	**Responsible**
1			IPc1	Integrative Process	1	Team
Yes	**Maybe**	**No**				
4	0	11	**LOCATION & TRANSPORTATION**		**15**	**Responsible**
		N	LTc1	LEED for Neighborhood Development Location	15	Team
1			LTc2	Sensitive Land Protection	1	Civil
1		1	LTc3	High Priority Site	1-2	Env. Eng.
1		4	LTc4	Surrounding Density and Diverse Uses	1-5	TGE
		4	LTc5	Access to Quality Transit	1-4	TGE
		1	LTc6	Bicycle Facilities	1	Arch/LA
		1	LTc7	Reduced Parking Footprint	1	Arch/Civil
1			LTc8	Green Vehicles	1	Arch/Civil
Yes	**Maybe**	**No**				
7	4	1	**SUSTAINABLE SITES**		**12**	**Responsible**
Y			SSpr1	Construction Activity Pollution Prevention	Req'd	Civl/CM
Y			SSpr2	Environmental Site Assessment	Req'd	Env. Eng.
1			SSc1	Site Assessment	1	Arch/Civil/LA
2			SSc2	Site Development - Protect or Restore Habitat	1-2	LA
1			SSc3	Open Space	1	LA
1	2		SSc4	Rainwater Management	2-3	Civil
	2		SSc5	Heat Island Reduction	1-2	Arch/LA
1			SSc6	Light Pollution Reduction	1	MEP/LA
		1	SSc7	Site Master Plan	1	Owner
1			SSc8	Joint Use of Facilities	1	Arch/Owner
Yes	**Maybe**	**No**				
8	2	2	**WATER EFFICIENCY**		**12**	**Responsible**
Y			WEpr1	Outdoor Water Use Reduction	Req'd	LA
Y			WEpr2	Indoor Water Use Reduction	Req'd	MEP
Y			WEpr3	Building-level Water Metering	Req'd	Owner/MEP
2			WEc1	Outdoor Water Use Reduction	1-2	LA
3	2	2	WEc2	Indoor Water Use Reduction	1-7	MEP
2			WEc3	Cooling Tower Water Use	1-2	MEP
1			WEc4	Water Metering	1	MEP
Yes	**Maybe**	**No**				
23	1	7	**ENERGY & ATMOSPHERE**		**31**	**Responsible**
Y			EApr1	Fundamental Commissioning and Verification	Req'd	CxA
Y			EApr2	Minimum Energy Performance	Req'd	Team/Modeler
Y			EApr3	Building-level Energy Metering	Req'd	MEP
Y			EApr4	Fundamental Refrigerant Management	Req'd	MEP
6			EAc1	Enhanced Commissioning	2-6	CxA
16			EAc2	Optimize Energy Performance	1-16	Team/Modeler
1			EAc3	Advanced Energy Metering	1	MEP
		2	EAc4	Demand Response	1-2	Owner/MEP
		5	EAc5	Renewable Energy Production	1-3	Owner
	1		EAc6	Enhanced Refrigerant Management	1	MEP

Yes	Maybe	No	MATERIALS & RESOURCES		13	Responsible
Y			MRpr1	Storage & Collection of Recyclables	Req'd	Owner/Arch.
Y			MRpr2	Construction and Demolition Waste Management Plan	Req'd	CM
	1	4	MRc1	Building Life-Cycle Impact Reduction	2-5	Arch
1	1		MRc2	Building Product Disclosure & Optimization-EPD's	1-2	Arch/CM
	1	1	MRc3	Building Product Disclosure & Optimization-Raw Materials	1-2	Arch/CM
1	1		MRc4	Building Product Disclosure & Optimization-Material Ingredients	1-2	Arch/CM
1	1		MRc5	Construction and Demolition Waste Management	1-2	CM

Yes	Maybe	No	INDOOR ENVIRONMENTAL QUALITY		16	Responsible
Y			EQpr1	Minimum IAQ Performance	Req'd	MEP
Y			EQpr2	Environmental Tobacco Smoke (ETS) Control	Req'd	Owner
Y			EQpr3	Minimum Acoustical Performance	Req'd	Acoust. Eng.
2			EQc1	Enhanced IAQ Strategies	1-2	Arch/MEP
3			EQc2	Low-Emitting Materials	1-3	Arch/CM
1			EQc3	Construction IAQ Management Plan	1	CM
1	1		EQc4	IAQ Assessment	1-2	Owner/CM
1			EQc5	Thermal Comfort	1	MEP
1	1		EQc6	Interior Lighting	1-2	Arch/MEP
	3		EQc7	Daylight	1-3	Arch
	1		EQc8	Quality Views	1	Arch
	1		EQc9	Acoustic Performance	1	Acoust. Eng.

Yes	Maybe	No	INNOVATION		6	Responsible
1			INc1.1	Innovation: O+M - Green Cleaning + IPM	1	Team
1			INc1.2	Innovation: Local Food Production	1	Team
1			INc1.3	Innovation: Purchasing - Lamps	1	Team
1			INc1.4	Exemplary Performance Credit: Optimize Process Water Use (100% reduction)	1	Team
1			INc1.5	Pilot Credit: Integrative Analysis of Building Materials	1	Team
1			INc2	LEED Accredited Professional	1	Team

Yes	Maybe	No	REGIONAL PRIORITY 01887 (underlined)		4	Responsible
		X	RPc1	Regional: Surrounding Density (4 pts)	1	-
		X	RPc2	Regional: Access to Quality Transit (1 pt)	1	-
1			RPc3	Regional: Protect or Restore Habitat (2 pts)	1	-
1			RPc4	Regional: Optimize Energy Performance (8 pts)	1	-
			RPcX	Regional: Renewable Energy (2 pts)	1	-
			RPcX	Regional: Building Lifecycle Impact Reduction (2 pts)	1	-

Yes	Maybe	No	PROJECT TOTALS (Certification Estimates)	110
63	19	26		

Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80+ points

USGBC REGISTRATION

USGBC's Payment Center

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Order summary

Order #	13042886
Amount	$ 1,350.00 USD
Title	Wilmington Wildwood Elementary School
ID	1000195096

SITE VULNERABILITY/ RISK ASSESSMENT G

SITE VULNERABILITY AND RISK ASSESSMENT NARRATIVE

Summary

Below is a statement from D+W describing the status of the project scope, as related to a site vulnerability and risk assessment evaluation for Wilmington Elementary School project. This is an update to the risk assessments of the selected site and project as described in various places in the Modules 2 - 4 Feasibility Study/Schematic Design submissions to the MSBA.

Vulnerabilities Assessments

Flooding & Storm Surges

No changes to the project scope that would affect the risk assessment noted in Module 4 Schematic Design.

High Winds

No changes to the project scope that would affect the risk assessment noted in Module 4 Schematic Design.

Extreme Temperatures

No changes to the project scope that would affect the risk assessment noted in Module 4 Schematic Design.

Winter Weather

No changes to the project scope that would affect the risk assessment noted in Module 4 Schematic Design.

Power Outages

No changes to the project scope that would affect the risk assessment noted in Module 4 Schematic Design.

Community Resilience

No changes to the project scope that would affect the risk assessment noted in Module 4 Schematic Design.

Developmental Considerations

General Site Suitability

No changes to the project scope that would affect the risk assessment noted in Module 4 Schematic Design.

Building Massing & Orientation

No changes to the project scope that would affect the risk assessment noted in Module 4 Schematic Design.

Floor Elevations of Occupied Areas and Critical Equipment

No changes to the project scope that would affect the risk assessment noted in Module 4 Schematic Design.

Stormwater Management

No changes to the project scope that would affect the risk assessment noted in Module 4 Schematic Design.

Building Materials

No changes to the project scope that would affect the risk assessment noted in Module 4 Schematic Design.

Building Systems Selection

No changes to the project scope that would affect the risk assessment noted in Module 4 Schematic Design.

Emergency Back-Up Systems

No changes to the project scope that would affect the risk assessment noted in Module 4 Schematic Design.

Emergency Event Design Considerations

No changes to the project scope that would affect the risk assessment noted in Module 4 Schematic Design.

LIST OF PROPRIETARY ITEMS H

PROPRIETARY PRODUCTS NARRATIVE

Summary

An initial proprietary specification items list has been developed and preliminarily included in the Specifications. The Design Team will continually review these items throughout the development of the documents to identify additional products that meet the required specification and performance criteria to reduce the need for proprietary items.

The school building committee understands that Mass. General Laws, Chapter 30 Section 39M(b), require that materials specifications in construction contracts name a minimum of three manufacturers for each material or product specified in order to provide for competitive bidding. Specifications that restrict competition to less than three manufacturers may only be used for "sound reasons in the public interest" after a reasonable investigation.

For each product, D+W has undertaken an in-depth investigation and determined, in accordance with MGL Chapter 30 Section 39M(b), that for reasons of the product performance, reliability, maintenance issues, coordination with existing products in the district, and/or an anticipated life cycle cost savings, that designation of the products as "proprietary" for bidding purposes is in the public interest for the reasons stated.

Other products are under consideration by the owner and will be further reviewed in the upcioming phase. A vote by the School Building Committee on the final proprietary list will take place during CD phase.

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EXTERIOR AND INTERIOR COLOR THEORY NARRATIVE

Summary

The proposed exterior and interior materials, finishes, and color selections for Wilmington Elementary School are informed by the character of Wilmington's natural landscape and the architectural traditions of New England civic buildings. Drawing inspiration from the region's wetlands, waterways, and wooded terrain, the design establishes a cohesive framework that supports a welcoming learning environment while emphasizing durability, clarity, and long-term performance.

Material and color selections are intentionally restrained and organized to reinforce the building's architectural composition, support intuitive wayfinding, and create spaces that feel calm, grounded, and enduring. Throughout the design development process, the project team has worked closely with the Town, District and School Building Committee to review and confirm the proposed materials, finishes, and color palette to ensure alignment with District priorities for durability, maintainability, and long-term stewardship.

Exterior

The exterior of Wilmington Elementary School is designed to reflect the architectural heritage of New England while complementing the established material palette found throughout Wilmington, Massachusetts. The exterior color and material strategy draws upon traditional masonry tones commonly used in civic and educational buildings, creating a building that feels both timeless and welcoming to the community.

At the base of the building, tan veneer concrete masonry units establish a strong visual foundation. This material wraps the building perimeter and defines key structural elements such as exterior columns, providing a durable and grounded presence at the pedestrian level. The warm tan tone references natural stone and masonry traditionally used in New England institutional buildings while offering a resilient surface suited to areas exposed to high traffic, snow accumulation, and maintenance demands.

Above the base, the first and second floors of the classroom wings are clad in gray masonry brick. This cool gray tone provides a calm, neutral field that balances the warmth of the base while maintaining a restrained civic character appropriate for an educational setting. The gray brick also visually unifies the classroom levels, allowing the building massing to read as cohesive while subtly expressing the rhythm of the internal learning environments.

At the third-floor classroom level, the masonry palette shifts to red brick, introducing a color traditionally associated with schools and civic buildings throughout Massachusetts. This red brick band reinforces the building's connection to regional architectural traditions while helping break

down the building's vertical massing. The layered masonry composition adds visual depth and scale to the façade while maintaining a consistent material language.

Accenting these primary masonry materials are tan cast stone panels and horizontal banding located at key program areas including the Library, Cafeteria, and vertical circulation elements such as stair shafts. These cast stone elements introduce refined detailing that highlights important shared spaces within the school. The warm tone complements the base masonry while providing subtle contrast with both the gray and red brick. The horizontal banding reinforces the building's proportions and provides continuity across façade transitions.

Curtain wall glazing is incorporated at selected program areas, including the Cafeteria and Extended Learning spaces, to introduce transparency and natural light within the primarily masonry façade. These glazed areas create moments of visual openness that emphasize key communal spaces while strengthening connections between the interior and the surrounding site.

At the Cafeteria, expansive curtain wall glazing opens views toward the entry courtyard, reinforcing the space as a central hub of student activity and community engagement. The transparency allows interior activity to be visible from the arrival areas while providing students with views of the landscape and entry sequence.

Similarly, Extended Learning areas include curtain wall glazing oriented toward the playground courtyards. This strategy strengthens the relationship between indoor and outdoor learning environments while allowing staff to maintain visual connection to play areas and bringing natural daylight deeper into the building.

Together, the grounded masonry base, layered brick palette, cast stone accents, and strategically placed curtain wall glazing create a balanced and contextually responsive façade. The design reflects the enduring masonry traditions of New England civic architecture while integrating contemporary elements that support daylight, visibility, and connections to the landscape. The resulting exterior expression is durable, welcoming, and aligned with the character of the Wilmington community.

Figure 1: Exterior view from the southeast.

Interior

Interior Color and Material Narrative

The interior material and color strategy for Wilmington Elementary School draws inspiration from the natural landscape of Wilmington, including its wetlands, wooded areas, and waterways. These environmental qualities inform a calm, cohesive interior environment that supports learning, orientation, and student development.

Rather than relying on literal imagery or highly graphic applications, the design interprets these natural references through a restrained palette of colors, textures, and materials. The goal is to create interiors that feel warm, grounded, and timeless while maintaining clarity, durability, and long-term maintainability appropriate for an elementary school environment.

Movement through the building is supported through clear spatial organization and subtle material and color cues that help students and staff intuitively understand circulation and location within the building.

Interior Framework

The interior color framework reflects the developmental progression of students within the school. As students move through the building's levels, the palette shifts subtly in tone and contrast to reinforce identity and support age-appropriate environments while maintaining overall consistency throughout the building.

Variation in color is carefully controlled so that spaces remain visually calm and easy to navigate. The design intentionally avoids complex patterns or overly decorative applications that could become distracting or difficult to maintain over time.

Level 1 – Foundation

The first level establishes a sense of stability and comfort for the youngest students. Accent tones draw from wetland and woodland conditions, incorporating softened greens, blue-inflected neutrals, and warm earth tones. These colors create a welcoming and grounded atmosphere while supporting orientation and visual clarity.

Primary finishes remain calm and consistent to reduce overstimulation and support focused learning environments.

Level 2 – Growth

The second level introduces slightly richer tones inspired by woodland landscapes, including muted bark tones and mid-range foliage hues. These colors reflect a sense of growth and development while maintaining a balanced and cohesive palette.

At this level, students are developing greater independence, and the environment supports this transition through subtle increases in color variation while maintaining overall visual consistency.

Level 3 – Canopy

The upper level represents the canopy layer of the conceptual framework and reflects increased independence and perspective for older students. Accent tones incorporate slightly higher contrast and lighter, more expansive hues inspired by sky and filtered canopy light.

While color contrast increases modestly at this level, the primary finishes remain consistent with the rest of the building to maintain a unified interior character.

Figure 2: Interior design concept and framework

Material Strategy

Material selections throughout the building prioritize durability, maintainability, and long-term performance while supporting a cohesive aesthetic.

Primary finishes remain consistent across the building to simplify maintenance and reinforce visual clarity. These include:

- Linoleum flooring as the primary flooring material in classrooms and learning areas
- Terrazzo flooring at primary gathering spaces and high-traffic circulation areas
- Durable wall tile at high-impact locations
- Consistent door and casework finishes throughout the building

The primary wall color is a warm neutral that reflects daylight effectively while reducing visual fatigue. Accent colors are introduced selectively to support level identity and assist with orientation.

Floor material transitions are used strategically to reinforce program zones and durability requirements rather than graphic expression. The design intentionally avoids highly patterned flooring applications that could create visual distraction or complicate long-term maintenance.

Wood elements at doors, casework, and select ceiling locations introduce warmth and texture while reinforcing the natural material palette.

Material selections were evaluated based on:

- Durability under heavy daily use
- Ease of cleaning and maintenance
- Long-term aging characteristics
- Availability of replacement materials
- Overall life-cycle value

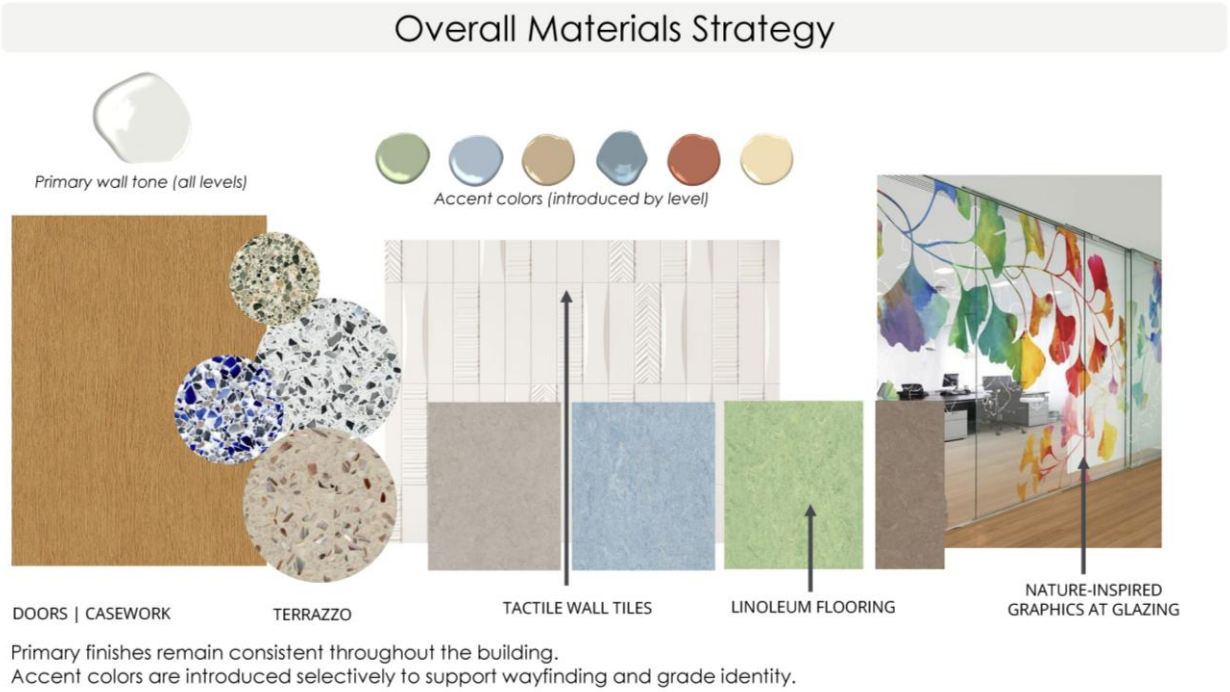

Figure 3: Interior finishes: wood, linoleum and terrazzo flooring, textured wall tile

Wayfinding and Identity

Wayfinding is integrated through architectural elements, controlled accent colors, and clear spatial hierarchy. Level-based accent tones help differentiate grade areas while maintaining a cohesive overall palette throughout the building.

Nature-inspired graphics may be used selectively at key locations to reinforce identity and orientation without overwhelming the environment.

This approach supports intuitive navigation for students and staff while maintaining visual consistency across the building.

District Review and Alignment

Throughout the Design Development phase, the project team has worked closely with the Town and District, including the Site and Interiors Liaisons, and the School Building Committee, to review the proposed exterior and interior materials, finishes, and color selections.

The exterior materials, including masonry, cast stone, and curtain wall systems, were evaluated with the District to ensure alignment with the architectural character of Wilmington and the project's goals for durability and long-term performance. Interior materials and finishes, including flooring, wall finishes, casework, and accent colors, were similarly reviewed to support maintainability, operational needs, and a cohesive learning environment.

The District has reviewed and confirmed alignment with the proposed exterior and interior material, finish, and color selections as part of the Design Development submission.

Figure 4: Cafeteria view from food service

STRUCTURAL CALCULATIONS J

STRUCTURAL CALCULATIONS NARRATIVE

Summary

EDG structural engineers completed the structural loading calculations for the Wilmington Elementary School enclosed.

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Project:

Wilmington Elementary School

MSBA Module 6 Requirements:

Design Development Documents – Structural Loading Calculations

Prepared For:

Dore & Whittier Architects, Inc.

Prepared By:

Alexander Auditore, B.S.E. – Engineers Design Group, Inc.

Checked By:

Mehul Dhruv, P.E. – Engineers Design Group, Inc.

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Dead and Live Loading Parameters ……. 5

Snow Loading Paramters ……. 6

Wind Loading Parameters …… 6

Seismic Loading Paramters …….. 6

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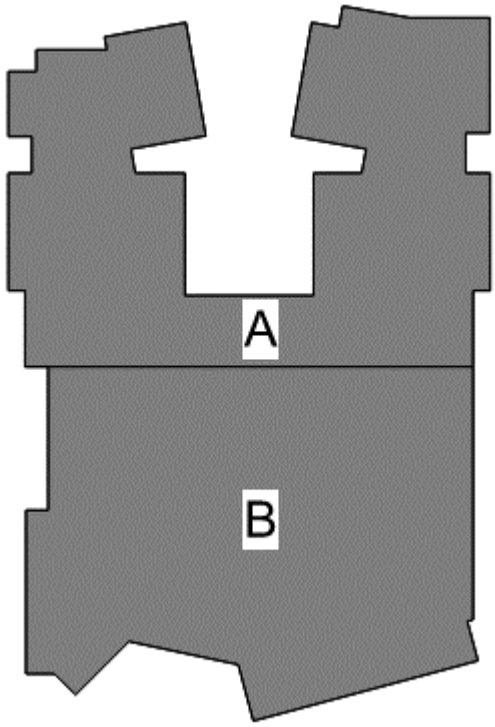

Project Synopsis

The project is located in Wilmington, Massachusetts. The building to be constructed is a three-story elementary school. The building is comprised of two zones, named Area A and B on the project documents. Area A will be a three-story academic wing for classrooms. Area B will be a three-story area for the kitchen, cafeteria, gymnasium, and mechanical rooms.

The majority of the structure will be steel-framed, supported by reinforced concrete foundations. The first floor shall be constructed as a normal-weight concrete slab-on-grade. All floor systems above the first floor will be constructed with light-weight concrete slab-on-steel deck, spanning across steel beams, supported by steel girders and columns. The majority of the roof system throughout the building will constructed with steel deck, spanning across steel beams, supported by steel girders and columns. The roof systems at high-profile areas such as the cafeteria and library will be constructed with dowel-laminated timber paneling, spanning across glue-laminated timber beams, supported by timber and steel girders and columns.

The typical lateral load resisting system for the structure will be ordinary concentric braced frames, comprised of hollow structural steel (HSS) members. Some areas of the structure, such as the gymnasium and kitchen, will utilize special reinforced masonry shear walls for the lateral load resisting system.

Design Codes

1. Massachusetts State Building Code, 10th Edition
2. International Building Code, 2021 Edition
3. ASCE 7-16: Minimum Design Loads for Buildings and Other Structures
4. ACI 318-14: Building Code Requirements for Structural Concrete
5. ACI 530-13: Building Code Requirements for Masonry Structures
6. AISC 360-10: Specification for Structural Steel Buildings
7. *Other codes as required by the design codes listed above*

Geotechnical Recommendations for Foundation Analysis and Design

The foundation design for this project shall be done using the recommendations from the geotechnical report, prepared by Lahlaf Geotechnical Consulting, Inc. from January 14, 2026. Their report includes the recommended maximum net allowable bearing pressure of 4,000 pounds per square-foot to be used for the design of the structure's foundations.

Project Materials and Strengths

Concrete:

a.	Foundations	f_c' = 4500 psi, Normal-Weight Concrete
b.	Slab On Grade	f_c' = 4500 psi, Normal-Weight Concrete
c.	Composite Slab On Steel Deck	f_c' = 4500 psi, Light-Weight Concrete
d.	Exterior Concrete	f_c' = 5000 psi, Normal-Weight Concrete

Reinforcing Steel:	ASTM A615, Grade 60
Welded Wire Reinforcement:	ASTM A1064

Structural Steel:

a.	Wide-Flange	ASTM A992, F_y = 50 ksi
b.	Channels	ASTM A36, F_y = 36 ksi
c.	Plates, Bars, Angles, etc.	ASTM A36, F_y = 36 ksi
d.	Hollow Structural Steel Sections (Square and Rectangular)	ASTM A500, Grade C, F_y = 50 ksi
e.	Hollow Structural Steel Sections (Round)	ASTM A500, Grade C, F_y = 46 ksi
f.	Structural Pipes	ASTM A53, Grade B, F_y = 46 ksi
g.	High-Strength Bolts	ASTM A325-N

Steel Deck	ASTM A653 (Galvanized)
Concrete-Masonry Units	ASTM C90, Grade N – Type I, 2000 psi
Grout:	ASTM C476, 2500 psi
Mortar:	ASTM C270 – Type S, 1800 psi

Glue-Laminated Timber:

a.	Beams	Douglas Fir-Larch, Grade 24F-V4 DF/DF
b.	Girts	Douglas Fir-Larch, Grade 24F-V8 DF/DF
c.	Columns	Douglas Fir-Larch, Grade 26F-V2 DF/DF

Dowel-Laminated Timber:	Spruce Pine Fir, (Minimum) Grade No. 2
Plywood Sheathing:	APA-Rated Sturd-I-Floor Tongue-and-Groove

Dead and Live Loading Parameters

Typical Floor Dead Load:

2 in. x 18-Gauge Composite Steel Deck	3 psf
5 ¼ in. Light-Weight Concrete	42 psf
Mechanical/Electrical/Plumbing/Fire Protection	8 psf
Ceiling	2 psf
Miscellaneous	5 psf
	∑60 psf

Typical Roof Dead Load:

3 in. x 18-Gauge Type NS or NSA Steel Deck	3 psf
Roofing and Insulation	7 psf
Mechanical/Electrical/Plumbing/Fire Protection	8 psf
Ceiling	2 psf
Photovoltaic Panels	15 psf
Miscellaneous	5 psf
	∑40 psf

Typical Mechanical Roof Pad Dead Load:

3 in. x 16-Gauge Composite Steel Deck	4 psf
7 in. Normal-Weight Concrete	66 psf
Roofing and Insulation	7 psf
Mechanical/Electrical/Plumbing/Fire Protection	8 psf
Ceiling	2 psf
Miscellaneous	5 psf
	∑92 psf

Dowel-Laminated Timber Roof Dead Load:

¾ in. APA-Rated Surd-I-Floor Tongue and Groove Sheathing – Exposure 1 Plywood	3 psf
2x8 Acoustic Dowel-Laminated Timber Paneling	20 psf
Roofing and Insulation	7 psf
Mechanical/Electrical/Plumbing/Fire Protection	8 psf
Photovoltaic Panels	15 psf
Miscellaneous	5 psf
	∑58 psf

Typical Live Loads:

Classrooms with Partitions……..	40 psf + 15 psf *(Reducible)*
Reading Rooms……	60 psf *(Reducible)*
Corridors (First Floor)……..	100 psf *(Reducible)*
Corridors (Above First Floor)……..	80 psf *(Reducible)*
Lobbies…….	100 psf *(Non-Reducible)*
Assembly/ Public Gathering Areas……..	100 psf *(Non-Reducible)*
Stairs…….	100 psf *(Non-Reducible)*
Storage (Light)…….	125 psf *(Non-Reducible)*
Storage (Mechanical Equipment Rooms)…….	150 psf *(Non-Reducible)*
Roof (Live)……...	20 psf *(Non-Reducible)*

Snow Loading Paramters

Ground Snow Load, P_g	50 psf
(Minimum) Flat Roof Snow Load, P_f (min)	30 psf
Terrain Category	B
Exposure Factor, C_e	1.00 (Partially Exposed)
Thermal Factor, C_t	1.00 (All)
Importance Factor, I_S	1.10 (Importance Category III)
Flat Roof Snow Load, P_f	30 psf

Allowance for drifting per the tenth edition of the Massachusetts State Building Code

Wind Loading Parameters

Wind loading parameters as per the tenth edition of the Massachusetts State Building Code

Basic Wind Speed, V	126 mph (Risk Category III)
Exposure Category	B

Wind loads in accordance with ASCE 7-16

Seismic Loading Parameters

Seismic loading parameters as per the tenth edition of the Massachusetts State Building Code

Seismic Design Category	C (Risk Category III)
Site Class	D
Mapped Spectral Response Accelerations	$S_S = 0.327$; $S_1 = 0.072$
Basic Seismic Force Resisting Systems	Structural Steel Systems Not Specifically Detailed for Seismic Resistance
Response Modification Factor, R	3.0
Deflection Amplification Factor, C_d	3.0
Analysis Procedure	Equivalent Lateral Force
Seismic Importance Factor, I_E	1.25 (Risk Category III)
Spectral Resopnse Coefficients	$SD_S = 0.335$; $SD_1 = 0.115$
Seismic Response Coefficient, C_s	0.140

Sample Gravity Analysis and Design Calculations

1. Non-Composite Steel Beam

In accordance with AISC 360-10 using the LRFD method

Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free

Applied loading

Beam loads	Dead self weight of beam × 1
	Dead full UDL 0.34 kips/ft
	Roof live full UDL 0.17 kips/ft
	Snow full UDL 0.3 kips/ft

Load combinations

Load combination 1	Support A	Dead × 1.20
		Live × 1.60
		Roof live × 1.60
		Snow × 1.60
		Dead × 1.20
		Live × 1.60
		Roof live × 1.60
		Snow × 1.60
	Support B	Dead × 1.20
		Live × 1.60
		Roof live × 1.60
		Snow × 1.60

Analysis results

Maximum moment	M_{max} = **135.9** kips_ft	M_{min} = **0** kips_ft
Maximum shear	V_{max} = **18.1** kips	V_{min} = **-18.1** kips
Deflection	δ_{max} = **0.9** in	δ_{min} = **0** in
Maximum reaction at support A	R_{A_max} = **18.1** kips	R_{A_min} = **18.1** kips
Unfactored dead load reaction at support A	R_{A_Dead} = **5.7** kips	
Unfactored roof live load reaction at support A	$R_{A_Roof\ live}$ = **2.5** kips	
Unfactored snow load reaction at support A	R_{A_Snow} = **4.5** kips	
Maximum reaction at support B	R_{B_max} = **18.1** kips	R_{B_min} = **18.1** kips
Unfactored dead load reaction at support B	R_{B_Dead} = **5.7** kips	
Unfactored roof live load reaction at support B	$R_{B_Roof\ live}$ = **2.6** kips	
Unfactored snow load reaction at support B	R_{B_Snow} = **4.5** kips	

Section details

Section type	**W 18x40 (AISC 15th Edn (v15.0))**
ASTM steel designation	**A992**
Steel yield stress	F_y = **50** ksi
Steel tensile stress	F_u = **65** ksi
Modulus of elasticity	E = **29000** ksi

Resistance factors

Resistance factor for tensile yielding	ϕ_{ty} = **0.90**
Resistance factor for tensile rupture	ϕ_{tr} = **0.75**
Resistance factor for compression	ϕ_c = **0.90**
Resistance factor for flexure	ϕ_b = **0.90**

Lateral bracing

Span 1 has continuous lateral bracing

Classification of sections for local buckling - Section B4.1

Classification of flanges in flexure - Table B4.1b (case 10)

Width to thickness ratio	$b_f / (2 \times t_f)$ = **5.73**	
Limiting ratio for compact section	$\lambda_{pff} = 0.38 \times \sqrt{[E / F_y]}$ = **9.15**	
Limiting ratio for non-compact section	$\lambda_{rff} = 1.0 \times \sqrt{[E / F_y]}$ = **24.08**	Compact

Classification of web in flexure - Table B4.1b (case 15)

Width to thickness ratio	$(d - 2 \times k) / t_w$ = **50.94**	
Limiting ratio for compact section	$\lambda_{pwf} = 3.76 \times \sqrt{[E / F_y]}$ = **90.55**	
Limiting ratio for non-compact section	$\lambda_{rwf} = 5.70 \times \sqrt{[E / F_y]}$ = **137.27**	Compact

Section is compact in flexure

Design of members for shear - Chapter G

Required shear strength	$V_r = \max(\text{abs}(V_{max}), \text{abs}(V_{min})) =$ **18.123** kips
Web area	$A_w = d \times t_w =$ **5.638** in^2
Web plate buckling coefficient	$k_v =$ **5**
Web shear coefficient - eq G2-3	$C_v =$ **1**
Nominal shear strength – eq G2-1	$V_n = 0.6 \times F_y \times A_w \times C_v =$ **169.155** kips
Resistance factor for shear	$\phi_v =$ **1.00**
Design shear strength	$V_c = \phi_v \times V_n =$ **169.155** kips

PASS - Design shear strength exceeds required shear strength

Design of members for flexure in the major axis - Chapter F

Required flexural strength	$M_r = \max(\text{abs}(M_{s1_max}), \text{abs}(M_{s1_min})) =$ **135.921** kips_ft

Yielding - Section F2.1

Nominal flexural strength for yielding - eq F2-1	$M_{nyld} = M_p = F_y \times Z_x =$ **326.667** kips_ft
Nominal flexural strength	$M_n = M_{nyld} =$ **326.667** kips_ft
Design flexural strength	$M_c = \phi_b \times M_n =$ **294.000** kips_ft

PASS - Design flexural strength exceeds required flexural strength

Design of members for vertical deflection

Consider deflection due to dead, live, roof live and snow loads

Limiting deflection	$\delta_{lim} = \min(1.5 \text{ in}, L_{s1} / 360) =$ **1** in
Maximum deflection span 1	$\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) =$ **0.873** in

PASS - Maximum deflection does not exceed deflection limit

2. Composite Steel Beam

In accordance with AISC 360-16 using the LRFD method

Design summary

Overall design status: Pass

Overall design utilization: 0.674

Description	Unit	Provided	Required	Utilization	Result
Moment, constr	(kip_ft)	294	90.12	0.307	PASS
Shear, constr	(kips)	169.16	12.02	0.071	PASS
Moment, comp	(kip_ft)	476.22	210.21	0.441	PASS
Shear, comp	(kips)	169.16	28.03	0.166	PASS
Deflection, constr	(in)	1.5	0.63	0.418	PASS
Deflection, comp	(in)	1.5	1.01	0.674	PASS

Basic dimensions

Beam span: L = **30.000** ft

Beam spacing on one side: b_1 = **8.500** ft

Beam spacing on other side: b_2 = **8.500** ft

Deck orientation: **Deck ribs perpendicular to beam**

Profiles are assumed to meet all dimensional criteria in AISC 360-16

Overall depth of slab: t = **5.250** in

Height of ribs: h_r = **2.000** in

Centers of ribs: rib_{ccs} = **12.000** in

Average width of rib: w_r = **7.000** in

Material properties

Concrete

Specified compressive strength of concrete: f'_c = **4.50** ksi

Wet density of concrete: w_{cw} = **120** lb/ft^3

Dry density of concrete: w_{cd} = **110** lb/ft^3

Modulus of elasticity of concrete: $E_c = w_{cd}^{1.5} \times \sqrt{(f'_c \times 1\ ksi)} / (1\ lb/ft^3)^{1.5}$ = **2447** ksi

Steel

Specified minimum yield stress of steel: F_y = **50** ksi

Modulus of elasticity of steel: E_S = **29000** ksi

Loading – secondary beam

Weight of slab construction stage	$w_{slab_constr} = [t - h_r \times (1 - w_r / rib_{ccs})] \times w_{cw}$ = **44.167** psf
Weight of slab composite stage	$w_{slab_comp} = [t - h_r \times (1 - w_r / rib_{ccs})] \times w_{cd}$ = **40.486** psf
Weight of steel deck	w_{deck} = **3.000** psf
Additional dead load	w_{d_add} = **0.000** psf
Weight of steel beam	w_{beam_s} = **40.000** lb/ft
Weight of construction live load	w_{constr} = **20.000** psf
Superimposed dead load	w_{serv} = **15.000** psf
Weight of wall parallel to span	w_{w_par} = **0.000** lb/ft
Weight of wall perpendicular to span	w_{w_perp} = **0.000** lb/ft assumed to be at mid-span.
Floor live load	w_{imp} = **80.000** psf
Lightweight partition load	w_{part} = **10.000** psf
Total construction stage dead load	$w_{constr_D} = [(w_{slab_constr}+w_{deck}+w_{d_add})\times((b_1+b_2)/2)] + w_{beam_s}$ = **440.917** lb/ft
Total construction stage live load	$w_{constr_L} = w_{constr} \times (b_1 + b_2) / 2$ = **170.000** lb/ft
Total composite stage dead load(excluding walls)	$w_{comp_D} = [(w_{slab_comp}+w_{deck}+w_{d_add}+w_{serv}) \times (b_1+b_2)/2]+w_{beam_s}$ = **537.132** lb/ft
Total composite stage live load	$w_{comp_L} = (w_{imp} + w_{part}) \times (b_1 + b_2)/2$ = **765.000** lb/ft

Design forces – secondary beam

Max ultimate moment at construction stage	$M_{constr_u} = (1.2 \times w_{constr_D} + 1.6 \times w_{constr_L}) \times L^2/ 8$ = **90.124** kips_ft
Max ultimate shear at construction stage	$V_{constr_u} = (1.2 \times w_{constr_D} + 1.6 \times w_{constr_L}) \times L / 2$ = **12.017** kips

Maximum ultimate moment at composite stage

$M_{comp_u} = (1.2 \times w_{comp_D} + 1.6 \times w_{comp_L}) \times L^2/ 8 + 1.2 \times w_{w_par} \times L^2/8 + 1.2 \times w_{w_perp} \times (b_1 + b_2)/2 \times L/4$= **210.213** kips_ft

Maximum ultimate shear at composite stage

$V_{comp_u} = (1.2 \times w_{comp_D} + 1.6 \times w_{comp_L}) \times L / 2 + 1.2 \times w_{w_par} \times L / 2 + 1.2 \times w_{w_perp} \times (b_1 + b_2)/2 \times 1/2$= **28.028** kips

Point of max. B.M. from nearest support	L_{BM_near} = L/2 =**15.00** ft

Steel section check

Trial steel section	**W18X40**
Plastic modulus of steel section	Z_x = **78.40** in^3
Elastic modulus of steel section	S_x = **68.40** in^3
Width to thickness ratio	$\lambda_f = b_f / (2 \times t_f)$ = **5.733**
Limiting width to thickness ratio (compact)	$\lambda_{pf} = 0.38 \times \sqrt{(E_S / F_y)}$ = **9.152**
Limiting width to thickness ratio (noncompact)	$\lambda_{rf} = \sqrt{(E_S / F_y)}$ = **24.083**

Flange is compact

Depth to thickness ratio (h/t_w)	λ_w = **50.900**
Limiting depth to thickness ratio (compact)	$\lambda_{pw} = 3.76 \times \sqrt{(E_S / F_y)}$ = **90.553**
Limiting depth to thickness ratio (noncompact)	$\lambda_{rw} = 5.70 \times \sqrt{(E_S / F_y)}$ = **137.274**

Web is compact

Strength check at construction stage for flexure

Check for flexure

Plastic moment for steel section	$M_p = F_y \times Z_x =$ **326.667** kip_ft
Resistance factor for flexure	$\phi_b =$ **0.90**
Design flexural strength of steel section alone	$M_{constr_n} = \phi_b \times M_p =$ **294.000** kip_ft
Required flexural strength	$M_{constr_u} =$ **90.124** kip_ft

PASS - Beam bending at construction stage loading

Strength check at construction stage for shear

Web area	$A_w = d \times t_w =$ **5.638** in^2
Web plate buckling coefficient	$k_v =$ **5.34**
Depth to thickness ratio (h/t_w)	$\lambda_w =$ **50.900**
Web shear coefficient	$C_{v1} =$ **1.00**
Resistant factor for shear	$\phi_v =$ **1.0**
Design shear strength	$V_{constr_n} = \phi_v \times (0.6 \times F_y \times A_w \times C_{v1}) =$ **169.155** kips
Required shear strength	$V_{constr_u} =$ **12.017** kips

PASS - Beam shear at construction stage loading

Design of steel anchors

Note - for non-uniform stud layouts a higher concentration of studs should be located towards the ends of the beam

Effective slab width of composite section	$b = \min(L/8, b_1/2) + \min(L/8, b_2/2) =$ **90.000** in
Effective area of concrete flange	$A_c = b \times (t - h_r) =$ **292.50** in^2
Diameter of stud anchor	dia = **0.750** in
Length of stud anchor after weld	$H_s =$ **3.50** in
Specified tensile strength of stud anchor	$F_u =$ **65** ksi
Cross section area of one stud anchor	$A_{sa} = \pi \times dia^2 / 4 =$ **0.442** in^2
Maximum diameter permitted	$dia_{max} = 2.5 \times t_f =$ **1.313** in

PASS - Diameter of stud anchor provided is OK

Point of max. B.M. from nearest support	$L_{BM_near} =$ **15.00** ft
No. of ribs from points of zero to max moment	$rib_{numbers} = int(L_{BM_near} / rib_{ccs} - 1) =$ **14**
No. of ribs with 1 stud per rib	$N_{r1} =$ **14**
No. of ribs with 2 studs per rib	$N_{r2} =$ **0**
No. of ribs with 3 studs per rib	$N_{r3} =$ **0**
Total number of studs	$N_{prov} = N_{r1} + 2 \times N_{r2} + 3 \times N_{r3} =$ **14**
Group effect factor for 1 stud per rib	$R_{g1} =$ **1.00**
Group effect factor for 2 studs per rib	$R_{g2} =$ **0.85**
Group effect factor for 3 studs per rib	$R_{g3} =$ **0.70**
Value of $e_{mid\text{-}ht}$ is less than 2 in (51 mm)	
Position effect factor for deck perpendicular	$R_p =$ **0.60**
Nom. strength of one stud with 1 stud per rib	$Q_{n1} = \min(0.5 \times A_{sa} \times \sqrt{(f'_c \times E_c)}, R_{g1} \times R_p \times A_{sa} \times F_u) =$ **17.230** kips

Nom. strength of one stud with 2 studs per rib	$Q_{n2} = \min(0.5 \times A_{sa} \times \sqrt{(f'_c \times E_c)}, R_{g2} \times R_p \times A_{sa} \times F_u) =$ **14.645** kips
Nom. strength of one stud with 3 studs per rib	$Q_{n3} = \min(0.5 \times A_{sa} \times \sqrt{(f'_c \times E_c)}, R_{g3} \times R_p \times A_{sa} \times F_u) =$ **12.061** kips
Total strength of provided steel anchors	$S_{sc} = N_{r1} \times Q_{n1} + 2 \times N_{r2} \times Q_{n2} + 3 \times N_{r3} \times Q_{n3} =$ **241.22** kips
Resistance of concrete flange	$C_{cf} = 0.85 \times f'_c \times A_c =$ **1118.813** kips
Resistance of steel beam	$T_{sb} = A \times F_y =$ **590.000** kips
Beam/slab interface shear force	$C = \min(C_{cf}, T_{sb}) =$ **590.000** kips

Strength of studs is less than maximum interface shear force therefore partial composite action takes place

Strength check at partial composite action

Actual net tensile force	$V_h = C =$ **590.000** kips
Assuming plastic neutral axis at the bottom of the steel beam flange.	
Resultant compressive force at flange bottom	$P_{yf} = b_f \times t_f \times F_y =$ **158.025** kips
Net force at steel and concrete interface	$C_{net} = T_{sb} - 2 \times P_{yf} =$ **273.950** kips

PNA is in the web of the I Section

Shear connection force	$F_{shear} = S_{sc} =$ **241.22** kips
Total depth of concrete at full stress	$d_c = F_{shear} / (0.85 \times f'_c \times b) =$ **0.701** in
Depth of compression from top of the steel flange	$t' = A / (2 \times t_w) - b_f \times t_f / t_w - 0.85 \times f'_c / F_y \times b \times d_c / (2 \times t_w) + t_f =$ **1.564** in
Tension	
Bottom flange component	$F_{bf} = F_y \times b_f \times t_f =$ **158.025** kips
Moment capacity of bottom flange	$M_{bf} = F_{bf} \times (d - (t_f/2) - t') =$ **211.665** kip_ft
Web component	$F_{web_t} = F_y \times (A - (2 \times b_f \times t_f) - (t' - t_f) \times t_w) =$ **257.583** kips
Moment capacity of web	$M_{web_t} = F_{web_t} \times (d - t' - t_f)/2 =$ **169.691** kip_ft
Compression	
Web component	$F_{web_c} = F_y \times (t' - t_f) \times t_w =$ **16.367** kips
Moment capacity of web	$M_{web_c} = F_{web_c} \times (t' - t_f)/2 =$ **0.709** kip_ft
Top flange component	$F_{tf} = F_y \times b_f \times t_f =$ **158.025** kips
Moment capacity of top flange	$M_{tf} = F_{tf} \times (t' - t_f/2) =$ **17.142** kip_ft
Concrete flange component	$F_{cf} = 0.85 \times f'_c \times b \times d_c =$ **241.215** kips
Moment capacity of concrete flange	$M_{cf} = F_{cf} \times (t - d_c/2 + t') =$ **129.932** kip_ft
Design flexural strength of beam	$M_{comp_n} = \phi_b \times (M_{bf} + M_{web_t} + M_{web_c} + M_{tf} + M_{cf}) =$ **476.225** kip_ft
Required flexural strength	$M_{comp_u} =$ **210.213** kip_ft

PASS - Beam bending at partial composite stage

Check for shear	
Design shear strength	$V_{comp_n} = V_{constr_n} =$ **169.155** kips
Required shear strength	$V_{comp_u} =$ **28.028** kips

PASS - Beam shear at partial composite stage loading

Check for deflection (Commentary section I3.1)

Calculation of immediate construction stage deflection

Deflection due to dead load $\Delta_{short_D} = 5 \times w_{constr_D} \times L^4 / (384 \times E_S \times I_x) =$ **0.4528** in

Amount of beam camber $\Delta_{camber} =$ **0.000** in

PASS - The camber is less than the construction stage dead load deflection

Deflection due to construction live load $\Delta_2 = 5 \times w_{constr_L} \times L^4 / (384 \times E_S \times I_x) =$ **0.1746** in

Net total construction stage deflection $\Delta_{short} = \Delta_{short_D} + \Delta_2 - \Delta_{camber} =$ **0.627** in

For short term loading:-

Short term modular ratio $n_s = E_S / E_c =$ **11.8**

Depth of neutral axis from top of concrete

$y_s = [b\times (t-h_r)/n_s\times (t-h_r)/2 + A\times (t+d/2)] / [b\times (t-h_r)/n_s+A]$

$y_s =$ **5.692** in

Moment of inertia of fully composite section

$I_s = I_x + A\times (d/2+t-y_s)^2 + b\times (t - h_r)^3/(12\times n_s) + b\times (t - h_r)/n_s \times (y_s - (t-h_r)/2)^2$

$I_s =$ **1896** in^4

Effective mt of inertia for partially composite $I_{s_eff} = 0.75 \times [I_x + \sqrt{(F_{shear} / C)} \times (I_s - I_x)] =$ **1074.8** in^4

Proportion of live load which is short term $r_{L_s} =$ **67** %

Deflection due to short term live load $\Delta_{L_s} = 5 \times r_{L_s} \times w_{comp_L} \times L^4 / (384 \times E_S \times I_{s_eff}) =$ **0.2997** in

For long term loading:-

Long term concrete modulus as % of short term $r_{E_l} =$ **50** %

Long term modular ratio $n_l = E_S / (E_c \times r_{E_l}) =$ **23.7**

Depth of neutral axis from top of concrete

$y_l = [b\times (t-h_r)/n_l\times (t-h_r)/2 + A\times (t+d/2)] / [b\times (t-h_r)/n_l+A]$

$y_l =$ **7.771** in

Moment of inertia of fully composite section

$I_l = I_x + A \times (d/2+t-y_l)^2 + b \times (t - h_r)^3/(12\times n_l) + b \times (t - h_r)/n_l \times (y_l - (t-h_r)/2)^2$

$I_l =$ **1577** in^4

Effective mt of inertia for partially composite $I_{l_eff} = 0.75 \times [I_x + \sqrt{(F_{shear} / C)} \times (I_l - I_x)] =$ **921.7** in^4

Proportion of live load which is long term $r_{L_l} = 1 - r_{L_s} =$ **33** %

Deflection due to long term live load $\Delta_{L_l} = 5 \times r_{L_l} \times w_{comp_L} \times L^4 / (384 \times E_S \times I_{l_eff}) =$ **0.1721** in

Dead load due to parallel wall & superimp. dead $w_{D_part} = w_{w_par} + (w_{serv}\times (b_1+ b_2) / 2) =$ **127.5000** lb/ft

Long term deflection due to superimposed dead load (after concrete has cured):-

Wall parallel to span and superimposed dead $\Delta_4 =5 \times (w_{D_part}) \times L^4 / (384 \times E_S \times I_{l_eff}) =$ **0.0869** in

Wall perpendicular to span $\Delta_5 =(w_{w_perp} \times (b_1+ b_2) / 2) \times L^3 / (48 \times E_S \times I_{l_eff}) =$ **0.0000** in

Combined deflections

Net total construction stage deflection	$\Delta_{short} = \Delta_{short_D} + \Delta_2 - \Delta_{camber} =$ **0.627** in
Net total long term deflection	$\Delta_{long} = \Delta_{short_D} + \Delta_{L_s} + \Delta_{L_l} + \Delta_4 + \Delta_5 - \Delta_{camber} =$ **1.012** in
Combined short and long term live load deflectn	$\Delta_{live} = \Delta_{L_s} + \Delta_{L_l} =$ **0.472** in
Net long term dead and super imposed dead defln	$\Delta_{dead} = \Delta_{short_D} + \Delta_4 + \Delta_5 - \Delta_{camber} =$ **0.540** in
Post composite deflection	$\Delta_{comp} = \Delta_{L_s} + \Delta_{L_l} + \Delta_4 + \Delta_5 =$ **0.559** in
Allowable max deflection	$\Delta_{Allow} =$ **1.500** in

PASS - Deflection less than allowable

3. Steel Column

In accordance with AISC 360-16 using the LRFD method

Column and loading details

Column details

Column section	**HSS 8x8x5/16**

Design loading

Required axial strength	P_r = **200** kips (Compression)
Moment about x axis at end 1	M_{x1} = **0.0** kips_ft
Moment about x axis at end 2	M_{x2} = **0.0** kips_ft
Maximum moment about x axis	M_x = max(abs(M_{x1}), abs(M_{x2})) = **0.0** kips_ft
Moment about y axis at end 1	M_{y1} = **0.0** kips_ft
Moment about y axis at end 2	M_{y2} = **0.0** kips_ft
Maximum moment about y axis	M_y = max(abs(M_{y1}), abs(M_{y2})) = **0.0** kips_ft
Maximum shear force parallel to y axis	V_{ry} = **0.0** kips
Maximum shear force parallel to x axis	V_{rx} = **0.0** kips

Material details

Steel grade	**A500 Gr. C**
Yield strength	F_y = **50** ksi
Ultimate strength	F_u = **62** ksi
Modulus of elasticity	E = **29000** ksi
Shear modulus of elasticity	G = **11200** ksi

Unbraced lengths

For buckling about x axis	L_x = **168** in
For buckling about y axis	L_y = **168** in
For torsional buckling	L_z = **168** in

Effective length factors

For buckling about x axis	K_x = **1.00**
For buckling about y axis	K_y = **1.00**
For torsional buckling	K_z = **1.00**

Effective unbraced lengths

For buckling about x axis $L_{cx} = L_x \times K_x =$ **168** in

For buckling about y axis $L_{cy} = L_y \times K_y =$ **168** in

For torsional buckling $L_{cz} = L_z \times K_z =$ **168** in

Section classification

Section classification for local buckling (cl. B4)

Critical flange width $b = b_f - 3 \times t =$ **7.127** in

Critical web width $h = d - 3 \times t =$ **7.127** in

Width to thickness ratio of flange (compression) $\lambda_{f_c} = b / t =$ **24.491**

Width to thickness ratio of web (compression) $\lambda_{w_c} = h / t =$ **24.491**

Width to thickness ratio of flange (major flexure) $\lambda_{f_fx} = b / t =$ **24.491**

Width to thickness ratio of web (major flexure) $\lambda_{w_fx} = h / t =$ **24.491**

Width to thickness ratio of flange (minor flexure) $\lambda_{f_fy} = h / t =$ **24.491**

Width to thickness ratio of web (minor flexure) $\lambda_{w_fy} = b / t =$ **24.491**

Compression

Limit for nonslender section $\lambda_{r_c} = 1.40 \times \sqrt{(E / F_y)} =$ **33.716**

The section is nonslender in compression

Slenderness

Member slenderness

Slenderness ratio about x axis $SR_x = L_{cx} / r_x =$ **53.7**

Slenderness ratio about y axis $SR_y = L_{cy} / r_y =$ **53.7**

Compressive strength

Flexural buckling about x axis (cl. E3)

Elastic critical buckling stress $F_{ex} = \pi^2 \times E / (SR_x)^2 =$ **99.3** ksi

Flexural buckling stress $F_{crx} = (0.658^{F_y / F_{ex}}) \times F_y =$ **40.5** ksi

Nominal compressive strength for flexural buckling $P_{nx} = F_{crx} \times A =$ **354.8** kips

Flexural buckling about y axis (cl. E3)

Elastic critical buckling stress $F_{ey} = \pi^2 \times E / (SR_y)^2 =$ **99.3** ksi

Flexural buckling stress $F_{cry} = (0.658^{F_y / F_{ey}}) \times F_y =$ **40.5** ksi

Nominal compressive strength for flexural buckling $P_{ny} = F_{cry} \times A =$ **354.8** kips

Design compressive strength (cl.E1)

Resistance factor for compression $\phi_c =$ **0.90**

Design compressive strength $P_c = \phi_c \times \min(P_{nx}, P_{ny}) =$ **319.3** kips

PASS - The design compressive strength exceeds the required compressive strength

4. Isolated Reinforced Concrete Footing

In accordance with ACI 318-19 (22)

Summary results

Overall design status PASS

Overall design utilization 0.745

Description	Unit	Applied	Resisting	FoS	Result
Uplift verification	kips	238.3			Pass
Description	**Unit**	**Applied**	**Resisting**	**Utilization**	**Result**
Soil bearing	ksf	3.723	5	0.745	Pass
Description	**Unit**	**Required**	**Provided**	**Utilization**	**Result**
Moment, positive, x-direction	kip_ft	190.2	401.3	0.474	Pass
Moment, positive, y-direction	kip_ft	190.2	386.4	0.492	Pass
Shear, one-way, x-direction	kips	57.3	104.0	0.551	Pass
Shear, one-way, y-direction	kips	57.3	101.5	0.565	Pass
Shear, two-way, Col 1	psi	76.417	201.246	0.380	Pass
Min.area of reinf, bot., x-direction	in^2	4.147	4.400		Pass
Max.reinf.spacing, bot, x-direction	in	18.0	10.1		Pass
Min.area of reinf, bot., y-direction	in^2	4.147	4.400		Pass
Max.reinf.spacing, bot, y-direction	in	18.0	10.1		Pass

Pad footing details

Length of footing L_x = **8** ft

Width of footing L_y = **8** ft

Footing area $A = L_x \times L_y$ = **64** ft^2

Depth of footing h = **24** in

Depth of soil over footing h_{soil} = **18** in

Density of concrete γ_{conc} = **150.0** lb/ft^3

Column no.1 details

Length of column l_{x1} = **12.00** in

Width of column l_{y1} = **12.00** in

position in x-axis x_1 = **48.00** in

position in y-axis y_1 = **48.00** in

Height of pedestal h_{ped1} = **1.00** in

Length of pedestal $l_{x,ped1}$ = **20.00** in

Width of pedestal $l_{y,ped1}$ = **20.00** in

Soil properties

Gross allowable bearing pressure	q_{allow_Gross} = **5** ksf
Density of soil	γ_{soil} = **120.0** lb/ft^3
Angle of internal friction	ϕ_b = **30.0** deg
Design base friction angle	δ_{bb} = **30.0** deg
Coefficient of base friction	tan(δ_{bb}) = **0.577**
Design wall friction angle	δ_b = **15.0** deg
Horizontal acceleration factor	K_h = **0.4**
Vertical acceleration factor	K_v = **0**
Acceleration coefficient	$\theta = \text{atan}(K_h / (1 - K_v))$ = **21.801**
Passive pressure coefficient (Coulomb)	$K_P = \sin(90 - \phi_b)^2 / (\sin(90 + \delta_b) \times [1 - \sqrt{[\sin(\phi_b + \delta_b) \times \sin(\phi_b) / (\sin(90 + \delta_b))]}]^2)$ = **4.977**
Passive dynamic pressure coefficient (M-O)	K_{PE} = 0 = **0**
Dead surcharge load	F_{Dsur} = **25** psf
Live surcharge load	F_{Lsur} = **100** psf
Self weight	$F_{swt} = h \times \gamma_{conc}$ = **300** psf
Soil weight	$F_{soil} = h_{soil} \times \gamma_{soil}$ = **180** psf

Column no.1 loads

Pedestal self weight	F_{SWz1} = **0.0** kips
Dead load in z	F_{Dz1} = **120.0** kips
Live load in z	F_{Lz1} = **80.0** kips
Live roof load in z	F_{Lrz1} = **20.0** kips
Snow load in z	F_{Sz1} = **50.0** kips
Seismic load in x	F_{Ex1} = **3.0** kips

Footing analysis for soil and stability

Load combinations per ASCE 7-16

1.0D (0.475)

1.0D + 1.0L (0.745)

Combination 2 results: 1.0D + 1.0L

Forces on footing

Force in z-axis

$F_{dz} = \gamma_D \times A \times (F_{swt} + F_{soil} + F_{Dsur}) + \gamma_L \times A \times F_{Lsur} + \gamma_D \times (F_{Dz1} + F_{SWz1} - l_{x,ped1} \times l_{y,ped1} \times h_{soil} \times \gamma_{soil}) + \gamma_L \times F_{Lz1}$ = **238.3** kips

Moments on footing

Moment in x-axis, about x is 0

$M_{dx} = \gamma_D \times (A \times (F_{swt} + F_{soil} + F_{Dsur}) \times L_x / 2) + \gamma_L \times A \times F_{Lsur} \times L_x / 2 + \gamma_D \times (((F_{Dz1} + F_{SWz1} - l_{x,ped1} \times l_{y,ped1} \times h_{soil} \times \gamma_{soil})) \times x_1) + \gamma_L \times (F_{Lz1} \times x_1)$ = **953.0** kip_ft

Moment in y-axis, about y is 0

$M_{dy} = \gamma_D \times (A \times (F_{swt} + F_{soil} + F_{Dsur}) \times L_y / 2) + \gamma_L \times A \times F_{Lsur} \times L_y / 2 + \gamma_D \times (((F_{Dz1} + F_{SWz1} - l_{x,ped1} \times l_{y,ped1} \times h_{soil} \times \gamma_{soil})) \times y_1) + \gamma_L \times (F_{Lz1} \times y_1)$ = **953.0** kip_ft

Uplift verification

Vertical force — F_{dz} = **238.255** kips

PASS - Footing is not subject to uplift

Bearing resistance

Eccentricity of base reaction

Eccentricity of base reaction in x-axis — $e_{dx} = M_{dx} / F_{dz} - L_x / 2$ = **0** in

Eccentricity of base reaction in y-axis — $e_{dy} = M_{dy} / F_{dz} - L_y / 2$ = **0** in

Pad base pressures

$q_1 = F_{dz} \times (1 - 6 \times e_{dx} / L_x - 6 \times e_{dy} / L_y) / (L_x \times L_y)$ = **3.723** ksf

$q_2 = F_{dz} \times (1 - 6 \times e_{dx} / L_x + 6 \times e_{dy} / L_y) / (L_x \times L_y)$ = **3.723** ksf

$q_3 = F_{dz} \times (1 + 6 \times e_{dx} / L_x - 6 \times e_{dy} / L_y) / (L_x \times L_y)$ = **3.723** ksf

$q_4 = F_{dz} \times (1 + 6 \times e_{dx} / L_x + 6 \times e_{dy} / L_y) / (L_x \times L_y)$ = **3.723** ksf

Minimum base pressure — $q_{min} = \min(q_1,q_2,q_3,q_4)$ = **3.723** ksf

Maximum base pressure — $q_{max} = \max(q_1,q_2,q_3,q_4)$ = **3.723** ksf

Allowable bearing capacity

Allowable bearing capacity — $q_{allow} = q_{allow_Gross}$ = **5** ksf

q_{max} / q_{allow} = **0.745**

PASS - Allowable bearing capacity exceeds design base pressure

Material details

Compressive strength of concrete — f'_c = **4500** psi

Yield strength of reinforcement — f_y = **60000** psi

Compression-controlled strain limit (21.2.2) — ε_{ty} = **0.00200**

Cover to top of footing — c_{nom_t} = **2** in

Cover to side of footing — c_{nom_s} = **2** in

Cover to bottom of footing — c_{nom_b} = **3** in

Concrete type — Normal weight

Concrete modification factor — λ = **1.00**

Column type — Concrete

Analysis and design of concrete footing

Load combinations per ASCE 7-16

1.4D (0.311)

1.2D + 1.6L + 0.5Lr (0.524)

1.2D + 1.6L + 0.5S (0.552)

1.2D + 1.0L + 1.6Lr (0.475)

1.2D + 1.0L + 1.6S (0.565)

Combination 6 results: 1.2D + 1.0L + 1.6S

Forces on footing

Ultimate force in z-axis

$F_{uz} = \gamma_D \times A \times (F_{swt} + F_{soil} + F_{Dsur}) + \gamma_L \times A \times F_{Lsur} + \gamma_D \times (F_{Dz1} + F_{SWz1} - l_{x,ped1} \times l_{y,ped1} \times h_{soil} \times \gamma_{soil}) + \gamma_L \times F_{Lz1} + \gamma_S \times F_{Sz1} =$ **348.6** kips

Moments on footing

Ultimate moment in x-axis, about x is 0

$M_{ux} = \gamma_D \times (A \times (F_{swt} + F_{soil} + F_{Dsur}) \times L_x / 2) + \gamma_L \times A \times F_{Lsur} \times L_x / 2 + \gamma_D \times (((F_{Dz1} + F_{SWz1} - l_{x,ped1} \times l_{y,ped1} \times h_{soil} \times \gamma_{soil})) \times x_1) + \gamma_L \times (F_{Lz1} \times x_1) + \gamma_S \times (F_{Sz1} \times x_1) =$ **1394.5** kip_ft

Ultimate moment in y-axis, about y is 0

$M_{uy} = \gamma_D \times (A \times (F_{swt} + F_{soil} + F_{Dsur}) \times L_y / 2) + \gamma_L \times A \times F_{Lsur} \times L_y / 2 + \gamma_D \times (((F_{Dz1} + F_{SWz1} - l_{x,ped1} \times l_{y,ped1} \times h_{soil} \times \gamma_{soil})) \times y_1) + \gamma_L \times (F_{Lz1} \times y_1) + \gamma_S \times (F_{Sz1} \times y_1) =$ **1394.5** kip_ft

Eccentricity of base reaction

Eccentricity of base reaction in x-axis

$e_{ux} = M_{ux} / F_{uz} - L_x / 2 =$ **0** in

Eccentricity of base reaction in y-axis

$e_{uy} = M_{uy} / F_{uz} - L_y / 2 =$ **0** in

Pad base pressures

$q_{u1} = F_{uz} \times (1 - 6 \times e_{ux} / L_x - 6 \times e_{uy} / L_y) / (L_x \times L_y) =$ **5.447** ksf

$q_{u2} = F_{uz} \times (1 - 6 \times e_{ux} / L_x + 6 \times e_{uy} / L_y) / (L_x \times L_y) =$ **5.447** ksf

$q_{u3} = F_{uz} \times (1 + 6 \times e_{ux} / L_x - 6 \times e_{uy} / L_y) / (L_x \times L_y) =$ **5.447** ksf

$q_{u4} = F_{uz} \times (1 + 6 \times e_{ux} / L_x + 6 \times e_{uy} / L_y) / (L_x \times L_y) =$ **5.447** ksf

Minimum ultimate base pressure

$q_{umin} = \min(q_{u1},q_{u2},q_{u3},q_{u4}) =$ **5.447** ksf

Maximum ultimate base pressure

$q_{umax} = \max(q_{u1},q_{u2},q_{u3},q_{u4}) =$ **5.447** ksf

Moment design, x direction, positive moment

Ultimate bending moment

$M_{u.x.max} =$ **190.178** kip_ft

Tension reinforcement provided

10 No.6 bottom bars (10.1 in c/c)

Area of tension reinforcement provided

$A_{sx.bot.prov} =$ **4.4** in^2

Minimum area of reinforcement (8.6.1.1)

$A_{s.min} = 0.0018 \times L_y \times h =$ **4.147** in^2

PASS - Area of reinforcement provided exceeds minimum

Maximum spacing of reinforcement (8.7.2.2)

$s_{max} = \min(2 \times h, 18 \text{ in}) =$ **18** in

PASS - Maximum permissible reinforcement spacing exceeds actual spacing

Depth to tension reinforcement

$d = h - c_{nom_b} - \phi_{x.bot} / 2 =$ **20.625** in

Depth of compression block

$a = A_{sx.bot.prov} \times f_y / (0.85 \times f'_c \times L_y) =$ **0.719** in

Neutral axis factor

$\beta_1 =$ **0.83**

Depth to neutral axis

$c = a / b_1 =$ **0.871** in

Strain in tensile reinforcement

$\varepsilon_t = 0.003 \times d / c - 0.003 =$ **0.06800**

Minimum tensile strain(8.3.3.1)

$\varepsilon_{min} = \varepsilon_{ty} + 0.003 =$ **0.00500**

PASS - Tensile strain exceeds minimum required

Nominal moment capacity

$M_n = A_{sx.bot.prov} \times f_y \times (d - a / 2) =$ **445.842** kip_ft

Flexural strength reduction factor

$\phi_f = \min(\max(0.65 + 0.25 \times (\varepsilon_t - \varepsilon_{ty}) / (0.003), 0.65), 0.9) =$ **0.900**

Design moment capacity	$\phi M_n = \phi_f \times M_n =$ **401.257** kip_ft
	$M_{u.x.max} / \phi M_n =$ **0.474**
	PASS - Design moment capacity exceeds ultimate moment load

One-way shear design, x direction

Ultimate shear force	$V_{u.x} =$ **57.29** kips
Depth to reinforcement	$d_v = h - c_{nom_b} - \phi_{x.bot} / 2 =$ **20.625** in
Size effect factor (22.5.5.1.3)	$\lambda_s =$ **1**
Ratio of longitudinal reinforcement	$\rho_w = A_{sx.bot.prov} / (L_y \times d_v) =$ **0.00222**
Shear strength reduction factor	$\phi_v =$ **0.75**
Nominal shear capacity (Eq. 22.5.5.1)	$V_n = \min(8 \times \lambda_s \times 1 \times (\rho_w)^{1/3} \times \sqrt{(f'_c \times 1\ psi)} \times L_y \times d_v, 5 \times \lambda \times \sqrt{(f'_c \times 1\ psi)} \times L_y \times d_v) =$ **138.662** kips
Design shear capacity	$\phi V_n = \phi_v \times V_n =$ **103.996** kips
	$V_{u.x} / \phi V_n =$ **0.551**
	PASS - Design shear capacity exceeds ultimate shear load

Moment design, y direction, positive moment

Ultimate bending moment	$M_{u.y.max} =$ **190.178** kip_ft
Tension reinforcement provided	10 No.6 bottom bars (10.1 in c/c)
Area of tension reinforcement provided	$A_{sy.bot.prov} =$ **4.4** in^2
Minimum area of reinforcement (8.6.1.1)	$A_{s.min} = 0.0018 \times L_x \times h =$ **4.147** in^2
	PASS - Area of reinforcement provided exceeds minimum
Maximum spacing of reinforcement (8.7.2.2)	$s_{max} = \min(2 \times h, 18\ in) =$ **18** in
	PASS - Maximum permissible reinforcement spacing exceeds actual spacing
Depth to tension reinforcement	$d = h - c_{nom_b} - \phi_{x.bot} - \phi_{y.bot} / 2 =$ **19.875** in
Depth of compression block	$a = A_{sy.bot.prov} \times f_y / (0.85 \times f'_c \times L_x) =$ **0.719** in
Neutral axis factor	$b_1 =$ **0.83**
Depth to neutral axis	$c = a / \beta_1 =$ **0.871** in
Strain in tensile reinforcement	$\varepsilon_t = 0.003 \times d / c - 0.003 =$ **0.06542**
Minimum tensile strain(8.3.3.1)	$\varepsilon_{min} = e\varepsilon_{ty} + 0.003 =$ **0.00500**
	PASS - Tensile strain exceeds minimum required
Nominal moment capacity	$M_n = A_{sy.bot.prov} \times f_y \times (d - a / 2) =$ **429.342** kip_ft
Flexural strength reduction factor	$\phi_f = \min(\max(0.65 + 0.25 \times (\varepsilon_t - \varepsilon_{ty}) / (0.003), 0.65), 0.9) =$ **0.900**
Design moment capacity	$\phi M_n = f_f \times M_n =$ **386.407** kip_ft
	$M_{u.y.max} / \phi M_n =$ **0.492**
	PASS - Design moment capacity exceeds ultimate moment load

One-way shear design, y direction

Ultimate shear force	$V_{u.y}$ = **57.29** kips
Depth to reinforcement	$d_v = h - c_{nom_b} - \phi_{x.bot} - \phi_{y.bot} / 2$ = **19.875** in
Size effect factor (22.5.5.1.3)	λ_s = **1**
Ratio of longitudinal reinforcement	$\rho_w = A_{sy.bot.prov} / (L_x \times d_v)$ = **0.00231**
Shear strength reduction factor	ϕ_v = **0.75**
Nominal shear capacity (Eq. 22.5.5.1)	$V_n = \min(8 \times \lambda_s \times \lambda \times (\rho_w)^{1/3} \times \sqrt{(f'_c \times 1\ psi)} \times L_x \times d_v, 5 \times \lambda \times \sqrt{(f'_c \times 1\ psi)} \times L_x \times d_v)$ = **135.28** kips
Design shear capacity	$\phi V_n = \phi_v \times V_n$ = **101.46** kips
	$V_{u.y} / \phi V_n$ = **0.565**
	PASS - Design shear capacity exceeds ultimate shear load

Two-way shear design at column 1

Depth to reinforcement	d_{v2} = **20.25** in
Shear perimeter length (22.6.4)	l_{xp} = **40.250** in
Shear perimeter width (22.6.4)	l_{yp} = **40.250** in
Shear perimeter (22.6.4)	$b_o = 2 \times (l_{x,ped1} + d_{v2}) + 2 \times (l_{y,ped1} + d_{v2})$ = **161.000** in
Shear area	$A_p = l_{x,perim} \times l_{y,perim}$ = **1620.062** in^2
Surcharge loaded area	$A_{sur} = A_p - l_{x,ped1} \times l_{y,ped1}$ = **1220.062** in^2
Ultimate bearing pressure at center of shear area	$q_{up.avg}$ = **5.447** ksf
Ultimate shear load	$F_{up} = \gamma_D \times (F_{Dz1} + F_{SWz1} - l_{x,ped1} \times l_{y,ped1} \times h_{soil} \times \gamma_{soil}) + \gamma_L \times F_{Lz1} + \gamma_S \times F_{Sz1} + \gamma_D \times A_p \times F_{swt} + \gamma_D \times A_{sur} \times F_{soil} + \gamma_D \times A_{sur} \times F_{Dsur} + \gamma_L \times A_{sur}$ ´ $F_{Lsur} - q_{up.avg} \times A_p$ = **249.139** kips
Ultimate shear stress from vertical load	$v_{ug} = \max(F_{up} / (b_o \times d_{v2}), 0\ psi)$ = **76.417** psi
Column geometry factor (Table 22.6.5.2)	$\beta = l_{y,ped1} / l_{x,ped1}$ = **1.00**
Column location factor (22.6.5.3)	α_s =**40**
Size effect factor (22.5.5.1.3)	λ_s = **1**
Concrete shear strength (22.6.5.2)	$v_{cpa} = (2 + 4 / \beta) \times \lambda_s \times 1 \times \sqrt{(f'_c \times 1\ psi)}$ = **402.492** psi
	$v_{cpb} = (\alpha_s \times d_{v2} / b_o + 2) \times \lambda_s \times \lambda \times \sqrt{(f'_c \times 1\ psi)}$ = **471.658** psi
	$v_{cpc} = 4 \times \lambda_s \times \lambda \times \sqrt{(f'_c \times 1\ psi)}$ = **268.328** psi
	$v_{cp} = \min(v_{cpa}, v_{cpb}, v_{cpc})$ = **268.328** psi
Shear strength reduction factor	ϕ_v = **0.75**
Nominal shear stress capacity (Eq. 22.6.1.2)	$v_n = v_{cp}$ = **268.328** psi
Design shear stress capacity (8.5.1.1(d))	$\phi v_n = \phi_v \times v_n$ = **201.246** psi
	$v_{ug} / \phi v_n$ = **0.380**

PASS - Design shear stress capacity exceeds ultimate shear stress load

5. Continuous Reinforced Concrete Strip Footing

In accordance with ACI 318-19 (22)

Summary results

Overall design status PASS

Overall design utilization 0.177

Description	Unit	Applied	Resisting	FoS	Result
Uplift verification	kips	2.4			Pass
Description	**Unit**	**Applied**	**Resisting**	**Utilization**	**Result**
Soil bearing	ksf	0.885	5	0.177	Pass
Description	**Unit**	**Required**	**Provided**	**Utilization**	**Result**
Min.area of reinf, bot., y-direction	in^2	0.259	0.310		Pass
Max.reinf.spacing, bot, y-direction	in	18.0	12.0		Pass

Strip footing details - considering a one meter strip

Length of footing L_x = **1** ft

Width of footing L_y = **2.667** ft

Footing area $A = L_x \times L_y$ = **2.667** ft^2

Depth of footing h = **12** in

Depth of soil over footing h_{soil} = **42** in

Density of concrete γ_{conc} = **150.0** lb/ft^3

Wall no.1 details

Width of wall l_{y1} = **20** in

position in y-axis y_1 = **16** in

Soil properties

Gross allowable bearing pressure q_{allow_Gross} = **5** ksf

Density of soil γ_{soil} = **120.0** lb/ft^3

Angle of internal friction ϕ_b = **30.0** deg

Design base friction angle δ_{bb} = **30.0** deg

Coefficient of base friction $\tan(\delta_{bb})$ = **0.577**

Footing loads

Self weight $F_{swt} = h \times \gamma_{conc}$ = **150** psf

Soil weight $F_{soil} = h_{soil} \times \gamma_{soil}$ = **420** psf

Wall no.1 loads per linear foot

Dead load in z — F_{Dz1} = **1.5** kips

Footing analysis for soil and stability

Load combinations per ASCE 7-16

1.0D (0.177)
1.0D + 1.0L (0.177)
1.0D + 1.0Lr (0.177)
1.0D + 1.0S (0.177)
1.0D + 1.0R (0.177)
1.0D + 0.75L + 0.75Lr (0.177)
1.0D + 0.75L + 0.75S (0.177)
1.0D + 0.75L + 0.75R (0.177)

Combination 1 results: 1.0D

Forces on footing per linear foot

Force in z-axis — $F_{dz} = \gamma_D \times A \times (F_{swt} + F_{soil}) + \gamma_D \times (F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})$ = **2.4** kips

Moments on footing per linear foot

Moment in y-axis, about y is 0 — $M_{dy} = \gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_y / 2) + \gamma_D \times (((F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})) \times y_1)$ = **3.1** kip_ft

Uplift verification

Vertical force — F_{dz} = **2.36** kips

PASS - Footing is not subject to uplift

Stability against sliding

Resistance due to base friction — $F_{RFriction} = \max(F_{dz}, 0\ kN) \times \tan(\delta_{bb})$ = **1.363** kips

Bearing resistance

Eccentricity of base reaction

Eccentricity of base reaction in y-axis — $e_{dy} = M_{dy} / F_{dz} - L_y / 2$ = **-0.001** in

Strip base pressures

$q_1 = F_{dz} \times (1 - 6 \times e_{dy} / L_y) / (L_y \times 1\ ft)$ = **0.885** ksf
$q_2 = F_{dz} \times (1 + 6 \times e_{dy} / L_y) / (L_y \times 1\ ft)$ = **0.885** ksf

Minimum base pressure — $q_{min} = \min(q_1, q_2)$ = **0.885** ksf
Maximum base pressure — $q_{max} = \max(q_1, q_2)$ = **0.885** ksf

Allowable bearing capacity

Allowable bearing capacity

$q_{allow} = q_{allow_Gross} = \mathbf{5}$ ksf

$q_{max} / q_{allow} = \mathbf{0.177}$

PASS - Allowable bearing capacity exceeds design base pressure

Material details

Compressive strength of concrete	$f'_c = \mathbf{45000}$ psi
Yield strength of reinforcement	$f_y = \mathbf{60000}$ psi
Compression-controlled strain limit (21.2.2)	$\varepsilon_{ty} = \mathbf{0.00200}$
Cover to top of footing	$c_{nom_t} = \mathbf{2}$ in
Cover to side of footing	$c_{nom_s} = \mathbf{2}$ in
Cover to bottom of footing	$c_{nom_b} = \mathbf{3}$ in
Concrete type	Normal weight
Concrete modification factor	$\lambda = \mathbf{1.00}$
Wall type	Concrete

Analysis and design of concrete footing

Load combinations per ASCE 7-16

1.4D (0.005)
1.2D + 1.6L + 0.5Lr (0.004)
1.2D + 1.6L + 0.5S (0.004)
1.2D + 1.6L + 0.5R (0.004)
1.2D + 1.0L + 1.6Lr (0.004)
1.2D + 1.0L + 1.6S (0.004)
1.2D + 1.0L + 1.6R (0.004)

Combination 1 results: 1.4D

Forces on footing per linear foot

Ultimate force in z-axis

$F_{uz} = \gamma_D \times A \times (F_{swt} + F_{soil}) + \gamma_D \times (F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil}) = \mathbf{3.3}$ kips

Moments on footing per linear foot

Ultimate moment in y-axis, about y is 0

$M_{uy} = \gamma_D \times (A \times (F_{swt} + F_{soil}) \times L_y / 2) + \gamma_D \times (((F_{Dz1} - l_{x1} \times l_{y1} \times h_{soil} \times \gamma_{soil})) \times y_1) =$ **4.4** kip_ft

Eccentricity of base reaction

Eccentricity of base reaction in y-axis

$e_{uy} = M_{uy} / F_{uz} - L_y / 2 = \mathbf{-0.001}$ in

Strip base pressures

$q_{u1} = F_{uz} \times (1 - 6 \times e_{uy} / L_y) / (L_y \times 1\text{ ft}) =$ **1.239** ksf

$q_{u2} = F_{uz} \times (1 + 6 \times e_{uy} / L_y) / (L_y \times 1\text{ ft}) =$ **1.239** ksf

Minimum ultimate base pressure: $q_{umin} = \min(q_{u1}, q_{u2}) =$ **1.239** ksf

Maximum ultimate base pressure: $q_{umax} = \max(q_{u1}, q_{u2}) =$ **1.239** ksf

Moment design, y direction, positive moment

Ultimate bending moment: $M_{u.y.max} =$ **0.055** kip_ft

Tension reinforcement provided: No.5 bars at 12.0 in c/c bottom

Area of tension reinforcement provided: $A_{sy.bot.prov} =$ **0.31** in^2

Minimum area of reinforcement (7.6.1.1): $A_{s.min} = 0.0018 \times L_x \times h =$ **0.259** in^2

PASS - Area of reinforcement provided exceeds minimum

Maximum spacing of reinforcement (7.7.2.3): $s_{max} = \min(3 \times h, 18\text{ in}) =$ **18** in

PASS - Maximum permissible reinforcement spacing exceeds actual spacing

Depth to tension reinforcement: $d = h - c_{nom_b} - \phi_{y.bot} / 2 =$ **8.688** in

Depth of compression block: $a = A_{sy.bot.prov} \times f_y / (0.85 \times f'_c \times L_x) =$ **0.041** in

Neutral axis factor: $\beta_1 =$ **0.65**

Depth to neutral axis: $c = a / \beta_1 =$ **0.062** in

Strain in tensile reinforcement: $\varepsilon_t = 0.003 \times d / c - 0.003 =$ **0.41505**

Minimum tensile strain(7.3.3.1): $\varepsilon_{min} = \varepsilon_{ty} + 0.003 =$ **0.00500**

PASS - Tensile strain exceeds minimum required

Nominal moment capacity: $M_n = A_{sy.bot.prov} \times f_y \times (d - a / 2) =$ **13.434** kip_ft

Flexural strength reduction factor: $\phi_f = \min(\max(0.65 + 0.25 \times (\varepsilon_t - \varepsilon_{ty}) / (0.003), 0.65), 0.9) =$ **0.900**

Design moment capacity: $\phi M_n = \phi_f \times M_n =$ **12.091** kip_ft

$M_{u.y.max} / \phi M_n =$ **0.005**

PASS - Design moment capacity exceeds ultimate moment load

One-way shear design, y direction

One-way shear design does not apply. Shear failure plane fall outside extents of foundation.

STRUCTURAL PEER REVIEW STATUS K

STRUCTURAL PEER REVIEW STATUS

Evidence that an Independent Structural Design Review is Being Arranged

The designer, OPM, and construction manager have discussed the timing of an independent structural design review in relation to the early release package for concrete foundations and superstructure. The early release package will be issued using the 90% Construction Documents. Therefore, the OPM will take the necessary steps to procure independent structural design review services for the 60% Construction Documents set, which is scheduled to be available in May 2026.

The OPM will collaborate with the designer to develop a list of reputable structural engineering firms with experience in projects of similar type and size. The OPM will solicit proposals from each firm in April 2026, with the goal of receiving at least three proposals. Once received, the proposals will be evaluated and a contract awarded. This procurement will be completed in time for the peer review to be performed on the 60% Construction Documents and review comments to be incorporated by the structural engineer of record in the 90% Construction Documents.

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ENERGY MODEL CALCULATIONS L

ENERGY MODEL CALCULATIONS NARRATIVE

Summary

GGD engineers completed the energy model analysis for the Wilmington Elementary School enclosed.

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MSBA Design Development
Energy Model Calculations
for
Wilmington Elementary School

Wilmington, MA

February 27, 2026

Prepared for:

WILMINGTON PUBLIC SCHOOLS

Prepared by:

GGD Consulting Engineers, Inc.
375 Faunce Corner Road, Suite D
Dartmouth, MA 02747

Wilmington Elementary School
Design Development Energy Model Calculations Report

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EXECUTIVE SUMMARY

GGD Consulting Engineers, Inc.
375 Faunce Corner Road, Suite D
Dartmouth, MA 02747

Wilmington Elementary School – Design Development
Energy Model Calculations

Section 1.0: Executive Summary

The Wilmington Elementary School is a new three-story school with an approximate gross area of 167,000 s.f. The building has been simulated with the school's anticipated hours of operation provided by the owner as follows:

It is anticipated that the typical student hours will occur from 6:30 am – 6:00 pm (Mon-Fri) while the building will be occupied between 6 pm – 9 pm (Mon-Fri) for limited community use, sports, and recreation programs. Limited summer programming shall occur throughout the building from 7:00 am – 3:30 pm (Mon-Fri) for special needs, summer camps, recreation, and sports practices. The Gym will also have limited community use on the weekends from 9:00 am – 9:00 pm.

A mechanical lifecycle engineering economic analysis was performed to assess the performance of various mechanical systems in comparison to a baseline mechanical system to determine the most cost effective system for the project. The results of the report concluded that Option 3, Displacement Ventilation with an Air-Source Heat Pump Plant, represented the lowest life cycle cost of the system options studied by yielding an approximate $5,680,330 savings over the 50 year study period with an instant payback by having a lower capital investment than the baseline system. The design system is as follows:

- 100% outside air hot water heating/chilled water cooling air handling units with energy recovery wheels and terminal variable air volume boxes with demand control ventilation providing displacement ventilation to the following areas:
    - RTU-A: 17,000 CFM Classrooms, Support, & Circulation Areas
    - RTU-B: 20,000 CFM Classrooms, Support, & Circulation Areas
    - RTU-C: 17,000 CFM Classrooms, Support, & Circulation Areas
    - RTU-E: 3,255 CFM Media Center, Support, & Circulation Areas
    - RTU-H: 4,000 CFM Administration, Support, & Circulation Areas
    - RTU-I: 2,000 CFM Music, Support, & Circulation Areas
- Passive chilled beam cooling/heating panels located along exterior walls of the above areas
- Hot water heating/chilled water cooling VAV air handling units with energy recovery wheels and demand control ventilation providing displacement ventilation to the following areas:
    - RTU-D: 10,000 CFM Gym
    - RTU-F: 10,000 CFM Cafetorium, Stage, & Support Areas
    - RTU-G: 3,000 CFM Kitchen, Custodial, & Support Areas
- Hot water radiant heating panels located along exterior walls of the above areas
- 100% outside air chilled/hot water VAV make-up air handling unit and kitchen exhaust fans with kitchen hood controls serving the following areas:
    - MAU-A: 4,500 CFM Kitchen Hood Make-Up
- Overhead fiberglass insulated supply and return air ductwork distribution system

- Hot water radiation and unit heaters for heating only areas such as storage rooms, entry ways, corridors, etc.

- (16) 30 ton high-efficiency air-to-water source modular chilled/hot water heat recovery heat pump plant providing chilled and hot water to the building (480 ton total capacity, 365 ton cooling, 320 ton HHW/DHW heating, 4 modules redundant)

- (1) 1,000 kW electric hot water boiler (Back Up Only)

- Chilled and hot water primary pumping with variable frequency drives

- Direct digital controls throughout

To estimate the LEED V4 EAc2 – Optimize Energy Performance (2024 Update) savings, energy model simulations have been performed comparing the design building to a baseline ASHRAE Standard 90.1-2010 building.

1. The ASHRAE Standard 90.1-2010 baseline building is as follows:

- Envelope:
    - Wall: U-0.064
    - Roof: U-0.048
    - Windows: 0.55 U-Value, 0.40 SHGC
    - Curtainwall/Storefront: 0.45 U-Value, 0.40 SHGC
- Mechanical System:
    - System 8 - Electric heating/chilled water-cooling air handling units with energy recovery wheels and terminal fan-powered VAV boxes with electric reheat coils (one per floor)
    - System 4 – Packaged electric heat pump cooling/heating constant volume single zone air handling units (serving spaces with loads varying by 10 Btuh/s.f. of the average space load)
    - (2) high-efficiency water-cooled chillers with associated cooling tower
- Domestic Hot Water System:
    - Instantaneous electric domestic hot water system
- Lighting System:
    - 0.99 w/s.f.

2. The design building is as follows:

- Envelope:
    - Roof: U-0.018
    - Brick Veneer Walls: U-0.028
    - MCM Panel Walls: U-0.025
    - Windows: U-0.25, 0.30 SHGC
    - Curtainwall: U-0.25, 0.30 SHGC
- Mechanical System:
    - (Refer to system descriptions)
- Domestic Hot Water System:
    - Instantaneous electric domestic hot water system
- Lighting System:
    - 0.5 w/s.f.

LEED Energy Savings Analysis Conclusion

A comparison of the Design Building with against the ASHRAE Standard 90.1-2010 Baseline Building results in an energy cost savings of 45.3% & GHG emissions savings of 44.1% savings for 11 total points for LEED V4 EAc2 – Optimize Energy Performance.

Note:

The values indicated in this report are based on energy modeling performed for system comparison purposes only. Our office strongly recommends adding a 30% safety factor to the calculated values of this report for budgeting purposes to account for potential variances to the actual operation of the building. Per ASHRAE Standard 90.1:

Neither the proposed building performance nor the baseline building performance are predictions of actual energy consumption or costs for the proposed design after construction. Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by this procedure, changes in energy rates between design of the building and occupancy, and the precision of the calculation tool.

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Wilmington Elementary School - LEED v4.0 Energy Savings Summary

Baseline	Description	Annual Elec. Cons. (kWh)	Annual Electric Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Annual GHG Emissions (kg CO2)	Combined Expense Savings**	Energy Cost Savings Percentage**	GHG Emissions Savings Percentage**	Energy Cost Savings Points	GHG Emissions Savings Points	Total LEED EAc2 Points
LEED Baseline	1. ASHRAE 90.1-2010 Envelope 2. ASHRAE 90.1-2010 Mechanical Systems (System 8 - CHW VAV AHU's w/ Fan-Powered VAV Boxes w/ Electric Reheat) 3. ASHRAE 90.1-2010 Lighting System (0.99 w/s.f.) 4. ASHRAE 90.1-2010 Electric Domestic Hot Water Systems	2,122,037	$424,056	$2.54	43.4	542,594.9	-	-	-	-	-	-

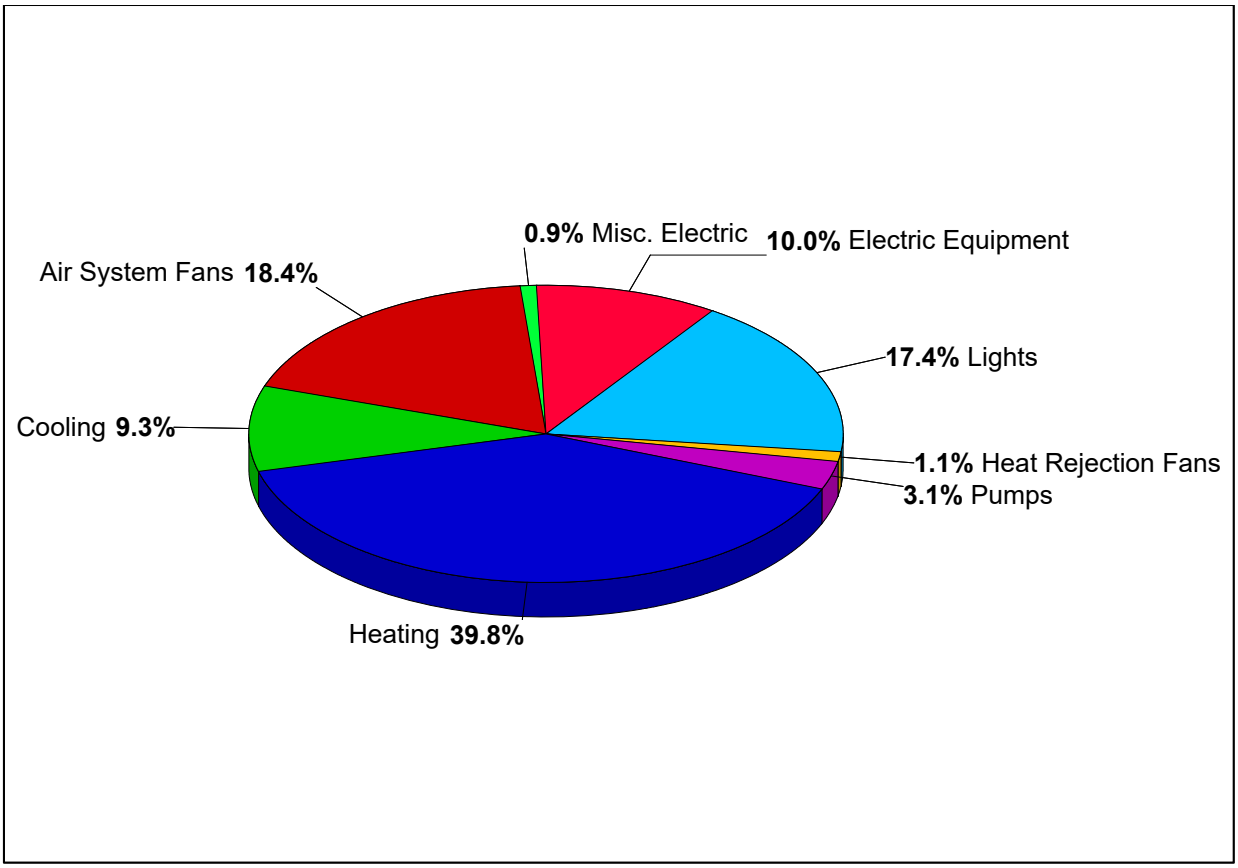
Option	Description	Annual Elec. Cons. (kWh)	Annual Electric Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Annual GHG Emissions (kg CO2)	Combined Expense Savings**	Energy Cost Savings Percentage**	GHG Emissions Savings Percentage**	Energy Cost Savings Points	GHG Emissions Savings Points	Total LEED EAc2 Points
3	1. Design Envelope 2. Design Mechanical Systems (Displacement Ventilation System with Air-Source Heat Recovery Heat Pump Chiller/Heater Plant) 3. Design High-Efficiency Lighting System (0.50 w/s.f.) 4. Electric Domestic Hot Water Systems	1,186,247	$231,915	$1.39	24.2	303,317.8	$192,141	**45.3%**	**44.1%**	**6**	**5**	**11**

*Combined expense savings is the difference between the combined annual expense of the baseline and building in comparison.
**Energy cost/Greenhouse Gas (GHG) emissions savings percentage is the difference between the annual energy costs of the baseline and building in comparison.

Note 1: Values based on energy model performed for HVAC System Life Cycle Cost Analysis purposes. A 30% safety factor should be applied for budgeting purposes to account for potential variances to the actual operation of the building. Per ASHRAE Standard 90.1:

Neither the proposed building performance nor the baseline building performance are predictions of actual energy consumption or costs for the proposed design after construction. Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by this procedure, changes in energy rates between design of the building and occupancy, and the precision of the calculation tool.

ENERGY MODEL
OUTPUT REPORTS



1. Annual Costs

Component	Annual Cost ($)	($/sqft)	Percent of Total (%)
Air System Fans	77,977	0.471	18.4
Cooling	39,430	0.238	9.3
Heating	168,886	1.020	39.8
Pumps	13,014	0.079	3.1
Heat Rejection Fans	4,540	0.027	1.1
HVAC Sub-Total	**303,847**	**1.834**	**71.7**
Lights	73,985	0.447	17.4
Electric Equipment	42,352	0.256	10.0
Misc. Electric	3,871	0.023	0.9
Misc. Fuel Use	0	0.000	0.0
Non-HVAC Sub-Total	**120,209**	**0.726**	**28.3**
Grand Total	**424,056**	**2.560**	**100.0**

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **165,646.4** sqft
Modeled Floor Area ..... **165,646.4** sqft

Energy Budget by System Component - [B] LEED Baseline

Project: Wilmington ES - DD Model 02/27/2026
Prepared by: GGD Consulting Engineers 3:48 PM

1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/sqft)
Cooling Coil Loads	3,995,408	24.120
Heating Coil Loads	2,910,096	17.568
Grand Total	**6,905,504**	**41.688**

2. Energy Consumption by System Component

Component	Site Energy (kBTU)	Site Energy (kBTU/sqft)	Source Energy (kBTU)	Source Energy (kBTU/sqft)
Air System Fans	1,330,727	8.034	4,752,596	28.691
Cooling	668,827	4.038	2,388,668	14.420
Heating	2,902,190	17.520	10,364,962	62.573
Pumps	220,006	1.328	785,735	4.743
Heat Rejection Fans	76,964	0.465	274,872	1.659
HVAC Sub-Total	**5,198,713**	**31.384**	**18,566,833**	**112.087**
Lights	1,256,641	7.586	4,488,002	27.094
Electric Equipment	719,393	4.343	2,569,260	15.511
Misc. Electric	65,901	0.398	235,361	1.421
Misc. Fuel Use	0	0.000	0	0.000
Non-HVAC Sub-Total	**2,041,934**	**12.327**	**7,292,623**	**44.025**
Grand Total	**7,240,648**	**43.711**	**25,859,455**	**156.112**

Notes:
1. 'Cooling Coil Loads' is the sum of all air system cooling coil loads.
2. 'Heating Coil Loads' is the sum of all air system heating coil loads.
3. Site Energy is the actual energy consumed.
4. Source Energy is the site energy divided by the electric generating efficiency (28.0%).
5. Source Energy for fuels equals the site energy value.
6. Energy per unit floor area is based on the gross building floor area.
   Gross Floor Area ..... **165646.4** sqft
   Modeled Floor Area ..... **165646.4** sqft

1. Component Charges

Billing Period	Energy Charges ($)	Demand Charges ($)	Customer Charges ($)	Taxes ($)	Total Charge ($)
Jan	33,425	15,412	13	0	48,850
Feb	28,309	12,479	13	0	40,800
Mar	27,091	12,747	13	0	39,852
Apr	18,208	10,816	13	0	29,037
May	19,586	10,333	13	0	29,932
Jun	25,019	11,534	13	0	36,566
Jul	19,245	10,668	13	0	29,926
Aug	20,614	10,577	13	0	31,204
Sep	26,941	11,939	13	0	38,893
Oct	17,568	10,814	13	0	28,395
Nov	21,271	10,736	13	0	32,020
Dec	26,992	11,577	13	0	38,582
Totals	284,268	139,632	156	0	424,056

2. Totals

Billing Period	Total Charges ($)	Total Consumption (kWh)	Avg Price ($/kWh)
Jan	48,850	249,513	0.1958
Feb	40,800	211,322	0.1931
Mar	39,852	202,234	0.1971
Apr	29,037	135,918	0.2136
May	29,932	146,208	0.2047
Jun	36,566	186,765	0.1958
Jul	29,926	143,660	0.2083
Aug	31,204	153,885	0.2028
Sep	38,893	201,114	0.1934
Oct	28,395	131,141	0.2165
Nov	32,020	158,785	0.2017
Dec	38,582	201,491	0.1915
Totals	424,056	2,122,037	0.1998

3. Consumption Totals

Billing Period	Peak (kWh)	Mid-Peak (kWh)	Normal Peak (kWh)	Off-Peak (kWh)	Overall (kWh)
Jan	0	0	0	0	249,513
Feb	0	0	0	0	211,322
Mar	0	0	0	0	202,234
Apr	0	0	0	0	135,918
May	0	0	0	0	146,208
Jun	0	0	0	0	186,765
Jul	0	0	0	0	143,660
Aug	0	0	0	0	153,885
Sep	0	0	0	0	201,114
Oct	0	0	0	0	131,141
Nov	0	0	0	0	158,785
Dec	0	0	0	0	201,491
Totals	0	0	0	0	2,122,037

4. Billing Demands

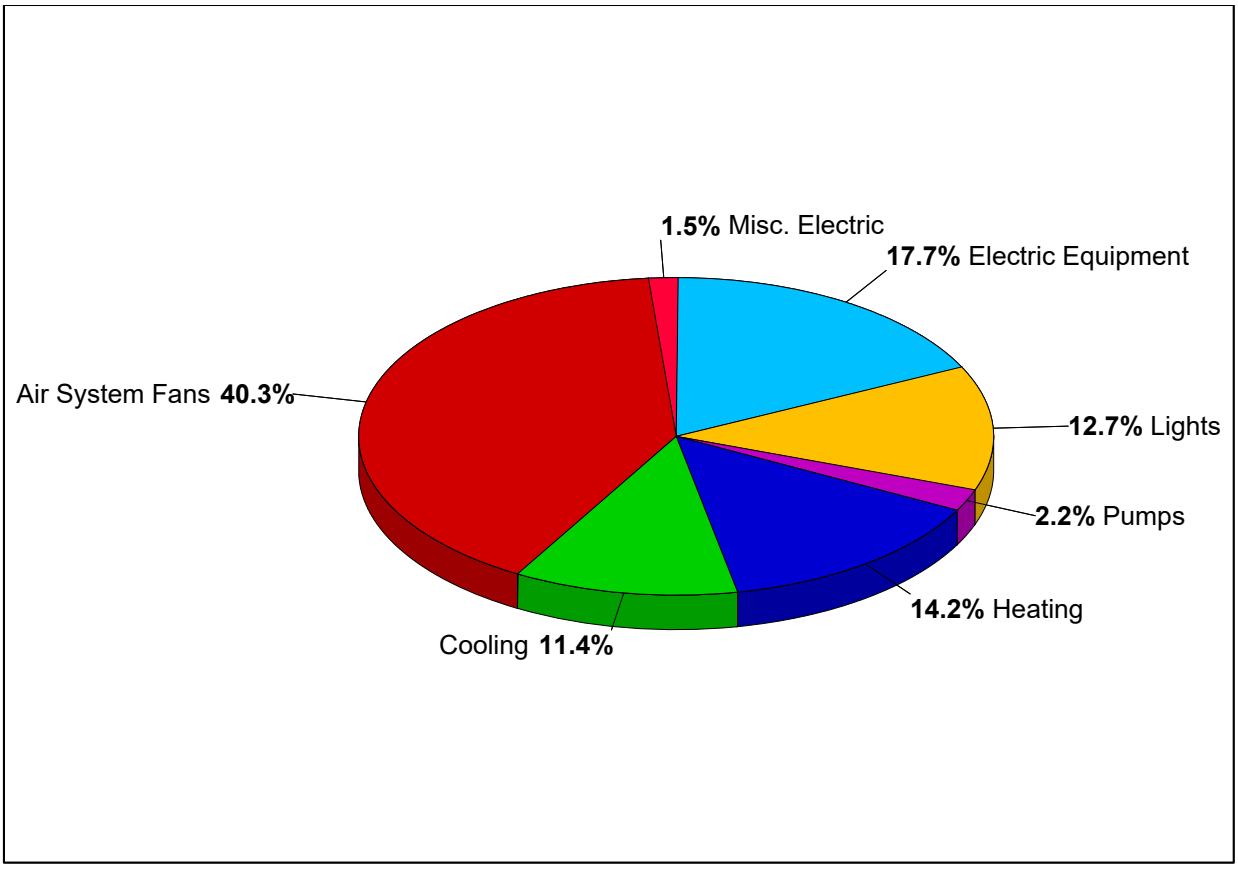
Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	1175.4
Feb	0.0	0.0	0.0	0.0	951.7
Mar	0.0	0.0	0.0	0.0	972.2
Apr	0.0	0.0	0.0	0.0	824.9
May	0.0	0.0	0.0	0.0	788.0
Jun	0.0	0.0	0.0	0.0	879.7
Jul	0.0	0.0	0.0	0.0	813.6
Aug	0.0	0.0	0.0	0.0	806.7
Sep	0.0	0.0	0.0	0.0	910.6
Oct	0.0	0.0	0.0	0.0	824.8
Nov	0.0	0.0	0.0	0.0	818.8
Dec	0.0	0.0	0.0	0.0	883.0

5. Maximum Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	1175.4
Feb	0.0	0.0	0.0	0.0	951.7
Mar	0.0	0.0	0.0	0.0	972.2
Apr	0.0	0.0	0.0	0.0	824.9
May	0.0	0.0	0.0	0.0	788.0
Jun	0.0	0.0	0.0	0.0	879.7
Jul	0.0	0.0	0.0	0.0	813.6
Aug	0.0	0.0	0.0	0.0	806.7
Sep	0.0	0.0	0.0	0.0	910.6
Oct	0.0	0.0	0.0	0.0	824.8
Nov	0.0	0.0	0.0	0.0	818.8
Dec	0.0	0.0	0.0	0.0	883.0

6. Time Of Maximum Demands (Date/Hour)

Billing Period	Peak	Mid-Peak	Normal Peak	Off-Peak	Overall
Jan	n/a	n/a	n/a	n/a	1/30 07:00
Feb	n/a	n/a	n/a	n/a	2/10 06:00
Mar	n/a	n/a	n/a	n/a	3/1 07:00
Apr	n/a	n/a	n/a	n/a	4/10 05:00
May	n/a	n/a	n/a	n/a	5/10 09:00
Jun	n/a	n/a	n/a	n/a	6/26 09:00
Jul	n/a	n/a	n/a	n/a	7/10 09:00
Aug	n/a	n/a	n/a	n/a	8/18 09:00
Sep	n/a	n/a	n/a	n/a	9/27 10:00
Oct	n/a	n/a	n/a	n/a	10/27 09:00
Nov	n/a	n/a	n/a	n/a	11/27 06:00
Dec	n/a	n/a	n/a	n/a	12/25 06:00



1. Annual Costs

Component	Annual Cost ($)	($/sqft)	Percent of Total (%)
Air System Fans	93,425	0.564	40.3
Cooling	26,387	0.159	11.4
Heating	32,969	0.199	14.2
Pumps	5,122	0.031	2.2
Heat Rejection Fans	0	0.000	0.0
HVAC Sub-Total	**157,904**	**0.953**	**68.1**
Lights	29,442	0.178	12.7
Electric Equipment	41,017	0.248	17.7
Misc. Electric	3,549	0.021	1.5
Misc. Fuel Use	0	0.000	0.0
Non-HVAC Sub-Total	**74,009**	**0.447**	**31.9**
Grand Total	**231,913**	**1.400**	**100.0**

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **165,646.4** sqft
Modeled Floor Area ..... **165,646.4** sqft

Energy Budget by System Component - ASHP Displacement Design

Project: Wilmington ES - DD Model 02/27/2026
Prepared by: GGD Consulting Engineers 3:48 PM

1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/sqft)
Cooling Coil Loads	1,609,356	9.716
Heating Coil Loads	633,590	3.825
Grand Total	**2,242,947**	**13.541**

2. Energy Consumption by System Component

Component	Site Energy (kBTU)	Site Energy (kBTU/sqft)	Source Energy (kBTU)	Source Energy (kBTU/sqft)
Air System Fans	1,635,237	9.872	5,840,131	35.257
Cooling	449,988	2.717	1,607,099	9.702
Heating	574,237	3.467	2,050,846	12.381
Pumps	89,738	0.542	320,494	1.935
Heat Rejection Fans	0	0.000	0	0.000
HVAC Sub-Total	**2,749,200**	**16.597**	**9,818,570**	**59.274**
Lights	516,353	3.117	1,844,119	11.133
Electric Equipment	719,390	4.343	2,569,249	15.510
Misc. Electric	62,643	0.378	223,724	1.351
Misc. Fuel Use	0	0.000	0	0.000
Non-HVAC Sub-Total	**1,298,386**	**7.838**	**4,637,092**	**27.994**
Grand Total	**4,047,586**	**24.435**	**14,455,662**	**87.268**

Notes:
1. 'Cooling Coil Loads' is the sum of all air system cooling coil loads.
2. 'Heating Coil Loads' is the sum of all air system heating coil loads.
3. Site Energy is the actual energy consumed.
4. Source Energy is the site energy divided by the electric generating efficiency (28.0%).
5. Source Energy for fuels equals the site energy value.
6. Energy per unit floor area is based on the gross building floor area.
   Gross Floor Area ..... **165646.4** sqft
   Modeled Floor Area ..... **165646.4** sqft

1. Component Charges

Billing Period	Energy Charges ($)	Demand Charges ($)	Customer Charges ($)	Taxes ($)	Total Charge ($)
Jan	15,343	9,117	13	0	24,473
Feb	12,738	5,337	13	0	18,088
Mar	13,823	6,364	13	0	20,199
Apr	11,400	4,749	13	0	16,161
May	13,721	5,496	13	0	19,229
Jun	15,720	7,294	13	0	23,027
Jul	10,970	6,347	13	0	17,330
Aug	11,982	6,151	13	0	18,146
Sep	15,358	7,117	13	0	22,488
Oct	12,638	5,526	13	0	18,177
Nov	12,767	4,652	13	0	17,432
Dec	12,450	4,701	13	0	17,164
Totals	158,910	72,849	156	0	231,915

2. Totals

Billing Period	Total Charges ($)	Total Consumption (kWh)	Avg Price ($/kWh)
Jan	24,473	114,531	0.2137
Feb	18,088	95,092	0.1902
Mar	20,199	103,184	0.1958
Apr	16,161	85,096	0.1899
May	19,229	102,424	0.1877
Jun	23,027	117,352	0.1962
Jul	17,330	81,889	0.2116
Aug	18,146	89,447	0.2029
Sep	22,488	114,643	0.1962
Oct	18,177	94,342	0.1927
Nov	17,432	95,307	0.1829
Dec	17,164	92,938	0.1847
Totals	231,915	1,186,247	0.1955

3. Consumption Totals

Billing Period	Peak (kWh)	Mid-Peak (kWh)	Normal Peak (kWh)	Off-Peak (kWh)	Overall (kWh)
Jan	0	0	0	0	114,531
Feb	0	0	0	0	95,092
Mar	0	0	0	0	103,184
Apr	0	0	0	0	85,096
May	0	0	0	0	102,424
Jun	0	0	0	0	117,352
Jul	0	0	0	0	81,889
Aug	0	0	0	0	89,447
Sep	0	0	0	0	114,643
Oct	0	0	0	0	94,342
Nov	0	0	0	0	95,307
Dec	0	0	0	0	92,938
Totals	0	0	0	0	1,186,247

4. Billing Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	695.3
Feb	0.0	0.0	0.0	0.0	407.0
Mar	0.0	0.0	0.0	0.0	485.3
Apr	0.0	0.0	0.0	0.0	362.2
May	0.0	0.0	0.0	0.0	419.1
Jun	0.0	0.0	0.0	0.0	556.3
Jul	0.0	0.0	0.0	0.0	484.1
Aug	0.0	0.0	0.0	0.0	469.1
Sep	0.0	0.0	0.0	0.0	542.8
Oct	0.0	0.0	0.0	0.0	421.4
Nov	0.0	0.0	0.0	0.0	354.8
Dec	0.0	0.0	0.0	0.0	358.5

5. Maximum Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	695.3
Feb	0.0	0.0	0.0	0.0	407.0
Mar	0.0	0.0	0.0	0.0	485.3
Apr	0.0	0.0	0.0	0.0	362.2
May	0.0	0.0	0.0	0.0	419.1
Jun	0.0	0.0	0.0	0.0	556.3
Jul	0.0	0.0	0.0	0.0	484.1
Aug	0.0	0.0	0.0	0.0	469.1
Sep	0.0	0.0	0.0	0.0	542.8
Oct	0.0	0.0	0.0	0.0	421.4
Nov	0.0	0.0	0.0	0.0	354.8
Dec	0.0	0.0	0.0	0.0	358.5

6. Time Of Maximum Demands (Date/Hour)

Billing Period	Peak	Mid-Peak	Normal Peak	Off-Peak	Overall
Jan	n/a	n/a	n/a	n/a	1/30 08:00
Feb	n/a	n/a	n/a	n/a	2/6 08:00
Mar	n/a	n/a	n/a	n/a	3/1 07:00
Apr	n/a	n/a	n/a	n/a	4/13 10:00
May	n/a	n/a	n/a	n/a	5/10 14:00
Jun	n/a	n/a	n/a	n/a	6/26 09:00
Jul	n/a	n/a	n/a	n/a	7/10 06:00
Aug	n/a	n/a	n/a	n/a	8/21 10:00
Sep	n/a	n/a	n/a	n/a	9/4 09:00
Oct	n/a	n/a	n/a	n/a	10/27 09:00
Nov	n/a	n/a	n/a	n/a	11/30 10:00
Dec	n/a	n/a	n/a	n/a	12/27 08:00

LIFE CYCLE COST ANALYSIS NARRATIVE

Summary

GGD engineers completed an economic cost analysis for the Wilmington Elementary School enclosed.

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Engineering Economic Analysis
for
Wilmington Elementary School

Wilmington, MA

February 25, 2025

Prepared for:

WILMINGTON PUBLIC SCHOOLS

Prepared by:

GGD Consulting Engineers, Inc.
375 Faunce Corner Road, Suite D
Dartmouth, MA 02747

Wilmington Elementary School
Engineering Economic Analysis

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EXECUTIVE SUMMARY

Section 1.0: Executive Summary

The Wilmington Elementary School is a new three-story school with an approximate gross area of 167,000 s.f. The building has been simulated with the school's anticipated hours of operation provided by the owner as follows:

It is anticipated that the typical student hours will occur from 6:30 am – 6:00 pm (Mon-Fri) while the building will be occupied between 6 pm – 9 pm (Mon-Fri) for limited community use, sports, and recreation programs. Limited summer programming shall occur throughout the building from 7:00 am – 3:30 pm (Mon-Fri) for special needs, summer camps, recreation, and sports practices. The Gym will also have limited community use on the weekends from 9:00 am – 9:00 pm.

The goal of the mechanical system lifecycle engineering economic analysis is to assess the performance of various mechanical systems in comparison to a baseline mechanical system.

Each option is compared to the baseline system to determine the greatest combined savings over a 50 year cycle to determine the most advantageous system considering anticipated hours of operation, electrical costs, maintenance costs, initial construction costs, and replacement costs.

By comparison of each option to the baseline system, the option with the greatest total life-cycle savings is generally recommended. To further enhance controllability and overall system performance, additional options should be considered that will enhance year round temperature control and comfort at a possible marginal increase in capital cost.

Upon completion of the mechanical system lifecycle engineering economic analysis, the design building is simulated with the recommended mechanical system in comparison to an ASHRAE Standard 90.1-2010 baseline building to project the anticipated energy cost percentage savings for LEED V4 EAc2 – Optimize Energy Performance.

Section 1.1: Mechanical System Analysis

1.1.A: Baseline System Option – Mixed-Air Overhead Chilled/Hot Water Variable Air Volume (VAV) Air Handling Unit Systems with Air-Source Heat Pump (ASHP) Heat Recovery Chiller/Heater Plant

- Chilled/hot water VAV air handling units with energy recovery wheels and terminal VAV boxes with hot water reheat coils and energy recovery providing mixed-air over-head distribution the following areas:
    - RTU-A: 30,000 CFM Classrooms, Support, & Circulation Areas
    - RTU-B: 35,000 CFM Classrooms, Support, & Circulation Areas
    - RTU-C: 30,000 CFM Classrooms, Support, & Circulation Areas
    - RTU-D: 10,000 CFM Gym
    - RTU-E: 5,000 CFM Media Center, Support, & Circulation Areas
    - RTU-F: 10,000 CFM Cafeteria, Stage, & Support Areas
    - RTU-G: 3,000 CFM Kitchen, Custodial, & Support Areas
    - RTU-H: 6,000 CFM Administration, Support, & Circulation Areas
- 100% outside air chilled/hot water VAV make-up air handling unit and kitchen exhaust fans with kitchen hood controls serving the following areas:
    - MAU-A: 4,500 CFM Kitchen Hood Make-Up
- Overhead fiberglass insulated supply and return air ductwork distribution system

- Hot water radiation and unit heaters for heating only areas such as storage rooms, entry ways, corridors, etc.

- (15) 30 ton high-efficiency air-to-water source modular chilled/hot water heat recovery heat pump plant providing chilled and hot water to the building (450 ton total capacity, 335 ton cooling, 320 ton HHW/DHW heating, 4 modules redundant)

  (1) 1,194 MBH (350 kW) electric hot water boiler (Back Up Only)

- Insulated chilled water, hot water, and condensate piping systems

- Chilled and hot water primary pumping with variable frequency drives

- Direct digital controls throughout

1.1.B: System Option One – VRF ASHP System with Supplemental Electric Heating Units

- 100% outside air ASHP heating/cooling VAV air handling units with energy recovery wheels and terminal variable air volume boxes with demand control ventilation providing ventilation to the terminal VRF units serving the following areas:

  - RTU-A: 14,000 CFM Classrooms, Support, & Circulation Areas
  - RTU-B: 16,000 CFM Classrooms, Support, & Circulation Areas
  - RTU-C: 13,000 CFM Classrooms, Support, & Circulation Areas
  - RTU-E: 2,500 CFM Media Center, Support, & Circulation Areas
  - RTU-H: 3,000 CFM Administration, Support, & Circulation Areas

- Terminal VRF heat pump evaporator units serving the spaces indicated above

- Insulated refrigerant and condensate piping systems

- Air-source heat recovery VRF heat pump condensing units (240 ton total capacity)

- ASHP cooling/heating VAV air handling units with energy recovery wheels and demand control ventilation providing mixed-air over-head distribution the following areas:

  - RTU-D: 10,000 CFM Gym
  - RTU-F: 10,000 CFM Cafeteria, Stage, & Support Areas
  - RTU-G: 3,000 CFM Kitchen, Custodial, & Support Areas

- 100% outside air ASHP cooling/heating VAV make-up air handling unit and kitchen exhaust fans with kitchen hood controls serving the following areas:

  - MAU-A: 4,500 CFM Kitchen Hood Make-Up

- Overhead fiberglass insulated supply and return air ductwork distribution system

- Electric radiation and unit heaters for heating only areas such as storage rooms, entry ways, corridors, etc.

- Direct digital controls throughout

1.1.C: System Option Two – Geothermal Variable Refrigerant Flow (VRF) Ground-Source Heat Pump (GSHP) System with GSHP VAV Air Handling Units

- 100% outside air WSHP heating/cooling VAV air handling units with energy recovery heat exchangers and terminal variable air volume boxes with demand control ventilation providing ventilation to the terminal VRF units serving the following areas:
    - RTU-A: 14,000 CFM Classrooms, Support, & Circulation Areas
    - RTU-B: 16,000 CFM Classrooms, Support, & Circulation Areas
    - RTU-C: 13,000 CFM Classrooms, Support, & Circulation Areas
    - RTU-E: 2,500 CFM Media Center, Support, & Circulation Areas
    - RTU-H: 3,000 CFM Administration, Support, & Circulation Areas
- Terminal VRF heat pump evaporator units serving the spaces indicated above
- Insulated refrigerant and condensate piping systems
- Water-source heat recovery VRF heat pump condensing units (240 ton total capacity)
- WSHP heating/cooling VAV air handling unit with energy recovery wheel and demand control ventilation providing mixed-air over-head distribution the following areas:
    - RTU-D: 10,000 CFM Gym
    - RTU-F: 10,000 CFM Cafeteria, Stage, & Support Areas
    - RTU-G: 3,000 CFM Kitchen, Custodial, & Support Areas
- 100% outside air WSHP cooling/heating VAV make-up air handling unit and kitchen exhaust fans with kitchen hood controls serving the following areas:
    - MAU-A: 4,500 CFM Kitchen Hood Make-Up
- Overhead fiberglass insulated supply and return air ductwork distribution system
- Electric radiation and unit heaters for heating only areas such as storage rooms, entry ways, corridors, etc.
- (80) 600’ closed-loop type ground source geothermal wells (4.25 tons each for 335 tons total capacity)
- (1) 1,194 MBH (350 kW) electric hot water boiler (Back Up Only)
- Insulated condenser water, geothermal water, and condensate piping systems
- Condenser and geothermal well primary pumping with variable frequency drives
- Direct digital controls throughout

1.1.D: System Option Three - Chilled/Hot Water VAV Air Handling Unit Displacement Ventilation Systems with ASHP Heat Recovery Chiller/Heater Plant

- 100% outside air hot water heating/chilled water cooling air handling units with energy recovery wheels and terminal variable air volume boxes with demand control ventilation providing displacement ventilation to the following areas:

    - RTU-A: 17,000 CFM Classrooms, Support, & Circulation Areas
    - RTU-B: 20,000 CFM Classrooms, Support, & Circulation Areas
    - RTU-C: 17,000 CFM Classrooms, Support, & Circulation Areas
    - RTU-E: 3,000 CFM Media Center, Support, & Circulation Areas
    - RTU-H: 4,000 CFM Administration, Support, & Circulation Areas

- Passive chilled beam cooling/heating panels located along exterior walls of the above areas

- Hot water heating/chilled water cooling VAV air handling units with energy recovery wheels and demand control ventilation providing displacement ventilation to the following areas:

    - RTU-D: 10,000 CFM Gym
    - RTU-F: 10,000 CFM Cafeteria, Stage, & Support Areas
    - RTU-G: 3,000 CFM Kitchen, Custodial, & Support Areas

- Hot water radiant heating panels located along exterior walls of the above areas

- 100% outside air chilled/hot water VAV make-up air handling unit and kitchen exhaust fans with kitchen hood controls serving the following areas:

    - MAU-A: 4,500 CFM Kitchen Hood Make-Up

- Overhead fiberglass insulated supply and return air ductwork distribution system

- Hot water radiation and unit heaters for heating only areas such as storage rooms, entry ways, corridors, etc.

- (15) 30 ton high-efficiency air-to-water source modular chilled/hot water heat recovery heat pump plant providing chilled and hot water to the building (450 ton total capacity, 335 ton cooling, 320 ton HHW/DHW heating, 4 modules redundant)

- (1) 1,194 MBH (350 kW) electric hot water boiler (Back Up Only)

- Chilled and hot water primary pumping with variable frequency drives

- Direct digital controls throughout

1.1.E: System Option Four – Chilled/Hot Water Cooling/Heating VAV Air Handling Unit Displacement Ventilation Systems with GSHP Heat Recovery Chiller/Heater Geothermal Plant

- This option is identical to Option 3 as outlined above but will utilize the following ground-source chilled/hot water plant equipment rather than the air-source heat pump chilled/hot water plant and wellfield outlined above:

    - (8) 50 ton high-efficiency air-to-water source modular chilled/hot water heat recovery heat pump plant providing chilled and hot water to the building (400 ton total capacity, 335 ton cooling, 320 ton HHW/DHW heating, 2 modules redundant)

    - (80) 600’ closed-loop type ground source geothermal wells (4.25 tons each for 335 tons total capacity)

- (1) 1,194 MBH (350 kW) electric hot water boiler (Back Up Only)
- Chilled, condenser, geothermal well, and hot water primary pumping with variable frequency drives

Section 1.2: Mechanical System Analysis Conclusion

The variable air volume air handling unit system is selected as the baseline system since it is similar to an ASHRAE 90.1/IECC baseline system but complies with the high-efficiency requirements of the MA Opt-In Stretch Energy Code. Unfortunately, the selection may result in overall ownership costs that in some cases are higher when compared to the alterative systems primarily relating to increased annual operating costs with potentially reduced thermal comfort conditions of the building. The option comparison of each alternative system to the baseline assesses the benefits of improved systems with potentially reduced combined operating costs and improved thermal comfort with the goal of selecting the system with the highest ownership savings over the 50 year study period.

Annual electrical consumption is calculated through the results of a thermal dynamic heat transfer analysis utilizing Department of Energy's (DOE) Energy Plus/Carrier Hourly Analysis Program (HAP) software with all architectural data provided by Dore & Whittier Architects.

The building envelope reflects Dore & Whittier Architects' high-efficiency design with effective insulation U-values in accordance with ASHRAE 90.1 Appendix A as follows:

- Roof: U-0.018
- Brick Veneer Walls: U-0.028
- MCM Panel Walls: U-0.025
- Windows: U-0.25, 0.30 SHGC
- Curtainwall: U-0.25, 0.30 SHGC

Utility cost data for electricity was obtained from utility bills provided by the owner as follows:

Reading Municipal Light Department (RMLD): Commercial Schedule C Rate

- Customer Charge: $13.00/month
- Distribution Demand: $13.11177/kW
- Distribution Energy: $0.02554/kWh
- Electrification Energy: $0.00500/kWh
- Fuel Charge: $0.05120/kWh
- Distributed Solar: $0.00402/kWh
- Purchase Power & Trans.: $0.04820/kWh

The "Building Life-Cycle" analysis was performed in BLCC v5.3-22 and includes future worth of each system option considered using the DOE rates for nominal discount (1.4%), escalation (for each utility type based on region), inflation (2.0%), and interest (2.0%). The analysis includes equipment replacement costs for major system components after 20, 30, and 40 years (varying per system option as indicated in the replacement cost estimate sheet).

Our observations of the Mechanical System Payback Summary suggest that Option 3, Displacement Ventilation with an Air-Source Heat Pump Plant, represents the lowest life cycle cost of the system options studied by yielding an approximate $5,680,330 savings over the 50 year study period with an instant payback by having a lower capital investment than the baseline system.

Section 1.3: Geothermal Federal Tax Credit

There are potentially significant federal tax credits available to the school for installing a geothermal heating system. Per the 2022 Inflation Reduction Act, the Federal Investment Tax Credit (§ 48) can range from 6% to 30% if Prevailing Wage and Apprenticeship (PWA) requirements are met. Additional tax credits may also be available for using Domestic Content (up to 10% of related domestic steel and iron material and manufactured product costs). For the purpose of this study, a 25.5% federal tax credit was factored at this time assuming PWA requirements would be met (accounting for a 15% deduction required by projects funded by tax exempt bonds to the 30% incentive). Please note that it is recommended that the Town consult with a financial tax advisor or attorney to complete the required IRS documentation if a Geothermal heating system is selected.

When accounting for the Federal Tax Credit, the Mechanical System Payback Summary suggests that System Option 4 represents the greatest total life cycle savings by yielding an approximate $8,710,034 savings over the 50 year study period with an instant payback.

The geothermal system additionally provides further benefits that should be considered such as providing the second lowest EUI of all options at 22.3 kBTU/s.f./yr. The system further provides system longevity, reduced maintenance, reduced downtime, and improved controllability of equipment. The geothermal design also does not require exterior mounted condensing equipment which will provide the best acoustics of all options studied.

For additional information please refer to the following references:

- ClimateMaster's IRA 2023 Commercial Geothermal Tax Guide, weblink @ lc028-climatemaster-commercial-federal-tax-incentives-brochure.pdf , and included in Appendix B
- IRS Clean Energy Tax Credit Information: Publication 5817-G (6-2023) (irs.gov), weblink @ https://www.irs.gov/pub/irs-pdf/p5817g.pdf, and included in Appendix B
- IRS & US Treasury Dept Notice 2023-44: Additional Guidance for the Qualifying Advanced Energy Project Credit Allocation Program under Section 48C(e) (irs.gov), weblink @ https://www.irs.gov/pub/irs-drop/n-23-44.pdf

Section 2.0: LEED Energy Savings Summary

To estimate the LEED V4 EAc2 – Optimize Energy Performance savings, energy model simulations have been performed comparing the design building to a baseline ASHRAE Standard 90.1-2010 building.

1. The ASHRAE Standard 90.1-2010 baseline building is as follows:

- Envelope:
  - Wall: U-0.064
  - Roof: U-0.048
  - Windows: 0.55 U-Value, 0.40 SHGC
  - Curtainwall/Storefront: 0.45 U-Value, 0.40 SHGC
- Mechanical System:
  - System 8 - Electric heating/chilled water cooling air handling units with energy recovery wheels and terminal fan-powered VAV boxes with electric reheat coils (one per floor)
  - System 4 – Packaged electric heat pump cooling/heating constant volume single zone air handling units (serving spaces with loads varying by 10 Btuh/s.f. of the average space load)
  - (2) high-efficiency water-cooled chillers with associated cooling tower

- Domestic Hot Water System:
    - Instantaneous electric domestic hot water system
- Lighting System:
    - 0.99 w/s.f.

2. The design building is as follows:

- Envelope:
    - Roof: U-0.018
    - Brick Veneer Walls: U-0.028
    - MCM Panel Walls: U-0.025
    - Windows: U-0.25, 0.30 SHGC
    - Curtainwall: U-0.25, 0.30 SHGC
- Mechanical System:
    - (Refer to System Option descriptions)
- Domestic Hot Water System:
    - Instantaneous electric domestic hot water system
- Lighting System:
    - 0.5 w/s.f.

Section 2.1: LEED Energy Savings Analysis Conclusion

A comparison of the Design Building against the ASHRAE Standard 90.1-2010 Baseline Building results in the following energy cost savings for LEED V4 EAc2 – Optimize Energy Performance for each System Option as follows:

- System Option 1 – 27.1% cost for 11 total points
- System Option 2 – 44.1% cost for 16 total points
- System Option 3 – 42.8% cost for 16 total points
- System Option 4 – 48.6% cost for 16 total points

Note:

The values indicated above are based on energy modelling performed for system comparison purposes only. Our office strongly recommends adding a 30% safety factor to the calculated values of this report for budgeting purposes to account for potential variances to the actual operation of the building. Per ASHRAE Standard 90.1:

Neither the proposed building performance nor the baseline building performance are predictions of actual energy consumption or costs for the proposed design after construction. Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by this procedure, changes in energy rates between design of the building and occupancy, and the precision of the calculation tool.

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Wilmington Elementary School - Mechanical System Payback Summary

Baseline	System	Gross Capital Investment*	Annual Elec. Cons. (kWh)	Annual Electric Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Annual Maint. Cost	20 Year Equipment Replacement Cost	30 Year Equipment Replacement Cost	40 Year Equipment Replacement Cost	Combined Annual Expense	Combined Expense Savings**	Total Life-Cycle Savings***	Discounted Payback (Years)****
-	1. Mixed-Air Overhead CHW/HHW VAV AHU's w/ ERV & Terminal VAV's w/ Hot Water Re-Heat Coils 2. High-Efficiency ASHP Chiller/Heater Plant	$15,838,440	1,738,354	$327,852	$1.96	**35.5**	$77,410	$1,620,000	$3,198,500	$1,620,000	$405,262	-	-	-

Option	System	Gross Capital Investment*	Annual Elec. Cons. (kWh)	Annual Electric Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Annual Maint. Cost	20 Year Equipment Replacement Cost	30 Year Equipment Replacement Cost	40 Year Equipment Replacement Cost	Combined Annual Expense	Combined Expense Savings**	Total Life-Cycle Savings***	Discounted Payback (Years)****
1	1. Variable Refrigerant Flow (VRF) Units w/ Air-Source Condensers serving the Classrooms, Administration and Support Areas 2. ASHP DOAS AHU's w/ ERV & Terminal VAV's w/ DCV providing Ventilation to the VRF Units 3. Mixed-Air Overhead AHSP VAV AHU's w/ ERV & DCV serving the Cafe/Stage and Gym areas 4. Supplemental Electric Resistance Heating Units	$14,007,900	1,443,027	$291,930	$1.75	**29.5**	$58,460	$1,943,500	$1,185,000	$3,167,000	$350,390	**$54,872**	**$4,025,486**	**Instant*****
2	1. VRF System w/ Water-Source Heat Pump (WSHP) Heat Recovery Condensing Units 2. WSHP VAV Dedicated Outdoor Air Systems (DOAS) w/ ERV & DCV with Terminal VAV Boxes 3. Supplemental Electric Heating 4. Geothermal Well Field and Distribution Plant	$19,358,100	1,183,958	$223,944	$1.34	**24.2**	$62,235	$0	$3,945,000	$0	$286,179	**$119,083**	**$2,446,273**	**23**
3	1. Displacement Ventilation Diffusers w/ Radiant Cooling/Heating Panels 2. CHW/HHW Dedicated Outdoor Air System (DOAS) AHU's ERV & Terminal VAV's w/ DCV 3. High-Efficiency ASHP Chiller/Heater Plant 4. Backup Electric Boiler Plant	$14,442,360	1,160,735	$229,174	$1.37	**23.7**	$74,000	$1,620,000	$2,289,500	$1,620,000	$303,174	**$102,088**	**$5,680,330**	**Instant*****
4	1. Displacement Ventilation Diffusers w/ Radiant Cooling/Heating Panels 2. CHW/HHW DOAS AHU's ERV & Terminal VAV's w/ DCV 3. High-Efficiency Ground Source Heat Pump (GSHP) Chiller/Heater Plant w/ Geothermal Well Field 4. Backup Side-Stream Electric Boiler Plant	$18,306,360	1,093,195	$205,748	$1.23	**22.3**	$75,675	$0	$3,379,500	$0	$281,423	**$123,839**	**$4,041,912**	**21**

* Capital Investment Costs based upon in-house cost estimate utilizing cost data from similar past projects and industry standard estimating references. Costs have been estimated for system comparison purposes only and do not incorporate all supplemental/independent HVAC system costs which would be required for all systems studied (i.e. specialty exhaust, overhead and profit).
** Combined expense savings is the difference between the combined annual expense of the baseline and system in comparison.
*** Total life-cycle savings is based on a 50 year study period.
**** Discounted payback years is based upon BLCC5 Life Cycle Analysis.
***** Discounted payback never reached because system is more efficient and/or less expensive than baseline system.

Note 1: Values based on energy model performed for HVAC System Life Cycle Cost Analysis purposes. A 30% safety factor should be applied for budgeting purposes to account for potential variances to the actual operation of the building. Per ASHRAE Standard 90.1:

Neither the proposed building performance nor the baseline building performance are predictions of actual energy consumption or costs for the proposed design after construction. Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by this procedure, changes in energy rates between design of the building and occupancy, and the precision of the calculation tool.

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Wilmington Elementary School - Mechanical System Payback Summary
Including Federal Tax Credit

Baseline	System	Gross Capital Investment*	25.5% IRA Geothermal Federal Tax Credit***	Net Investment	Annual Elec. Cons. (kWh)	Annual Electric Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Annual Maint. Cost	20 Year Equipment Replacement Cost	30 Year Equipment Replacement Cost	40 Year Equipment Replacement Cost	Combined Annual Expense	Combined Expense Savings***	Total Life-Cycle Savings***	Discounted Payback (Years)****
-	**1. Mixed-Air Overhead CHW/HHW VAV AHU's w/ ERV & Terminal VAV's w/ Hot Water Re-Heat Coils 2. High-Efficiency ASHP Chiller/Heater Plant**	$15,838,440	$0	**$15,838,440**	1,738,354	$327,852	$1.96	**35.5**	$77,410	$1,620,000	$3,198,500	$1,620,000	$405,262	-	-	-

Option	System	Gross Capital Investment*	25.5% IRA Geothermal Federal Tax Credit***	Net Investment	Annual Elec. Cons. (kWh)	Annual Electric Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Annual Maint. Cost	20 Year Equipment Replacement Cost	30 Year Equipment Replacement Cost	40 Year Equipment Replacement Cost	Combined Annual Expense	Combined Expense Savings***	Total Life-Cycle Savings***	Discounted Payback (Years)****
1	**1. Variable Refrigerant Flow (VRF) Units w/ Air-Source Condensers serving the Classrooms, Administration and Support Areas 2. ASHP DOAS AHU's w/ ERV & Terminal VAV's w/ DCV providing Ventilation to the VRF Units 3. Mixed-Air Overhead AHSP VAV AHU's w/ ERV & DCV serving the Cafe/Stage and Gym areas 4. Supplemental Electric Resistance Heating Units**	$14,007,900	$0	**$14,007,900**	1,443,027	$291,930	$1.75	**29.5**	$58,460	$1,943,500	$1,185,000	$3,167,000	$350,390	**$54,872**	**$4,025,486**	**Instant*****
2	**1. VRF System w/ Water-Source Heat Pump (WSHP) Heat Recovery Condensing Units 2. WSHP VAV Dedicated Outdoor Air Systems (DOAS) w/ ERV & DCV with Terminal VAV Boxes 3. Supplemental Electric Heating 4. Geothermal Well Field and Distribution Plant**	$19,358,100	$4,936,316	**$14,421,785**	1,183,958	$223,944	$1.34	**24.2**	$62,235	$0	$3,945,000	$0	$286,179	**$119,083**	**$7,382,588**	**Instant*****
3	**1. Displacement Ventilation Diffusers w/ Radiant Cooling/Heating Panels 2. CHW/HHW Dedicated Outdoor Air System (DOAS) AHU's ERV & Terminal VAV's w/ DCV 3. High-Efficiency ASHP Chiller/Heater Plant 4. Backup Electric Boiler Plant**	$14,442,360	$0	**$14,442,360**	1,160,735	$229,174	$1.37	**23.7**	$74,000	$1,620,000	$2,289,500	$1,620,000	$303,174	**$102,088**	**$5,680,330**	**Instant*****
4	**1. Displacement Ventilation Diffusers w/ Radiant Cooling/Heating Panels 2. CHW/HHW DOAS AHU's ERV & Terminal VAV's w/ DCV 3. High-Efficiency Ground Source Heat Pump (GSHP) Chiller/Heater Plant w/ Geothermal Well Field 4. Backup Side-Stream Electric Boiler Plant**	$18,306,360	$4,668,122	**$13,638,238**	1,093,195	$205,748	$1.23	**22.3**	$75,675	$0	$3,379,500	$0	$281,423	**$123,839**	**$8,710,034**	**Instant*****

* Capital Investment Costs based upon in-house cost estimate utilizing cost data from similar past projects and industry standard estimating references. Costs have been estimated for system comparison purposes only and do not incorporate all supplemental/independent HVAC system costs which would be required for all systems studied (i.e. specialty exhaust, overhead and profit).

** Total payment costs indicated for these incentives need to be confirmed by the appropriate parties.

*** Combined expense savings is the difference between the combined annual expense of the baseline and system in comparison.

**** Total life-cycle savings is based on a 50 year study period.

***** Discounted payback years is based upon BLCC5 Life Cycle Analysis.

****** Discounted payback never reached because system is more efficient and/or less expensive than baseline system.

Note 1: Values based on energy model performed for HVAC System Life Cycle Cost Analysis purposes. A 30% safety factor should be applied for budgeting purposes to account for potential variances to the actual operation of the building. Per ASHRAE Standard 90.1:

Neither the proposed building performance nor the baseline building performance are predictions of actual energy consumption or costs for the proposed design after construction. Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by this procedure, changes in energy rates between design of the building and occupancy, and the precision of the calculation tool.

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Wilmington Elementary School - LEED v4.0 Energy Savings Summary

Baseline	Description	Annual Elec. Cons. (kWh)	Annual Electric Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Annual GHG Emissions (kg CO2)	Combined Expense Savings**	Energy Cost Savings Percentage**	Total LEED EAc2 Points
LEED Baseline	**1. ASHRAE 90.1-2010 Envelope 2. ASHRAE 90.1-2010 Mechanical Systems (System 8 - CHW VAV AHU's w/ Fan-Powered VAV Boxes w/ Electric Reheat) 3. ASHRAE 90.1-2010 Lighting System (0.99 w/s.f.) 4. ASHRAE 90.1-2010 Electric Domestic Hot Water Systems**	2,001,943	$400,661	$2.40	40.9	511,887.4	-	-	-

Option	Description	Annual Elec. Cons. (kWh)	Annual Electric Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Annual GHG Emissions (kg CO2)	Combined Expense Savings**	Energy Cost Savings Percentage**	Total LEED EAc2 Points
1	**1. Design Envelope 2. Design Mechanical Systems (Air-Source VRF System) 3. Design High-Efficiency Lighting System (0.45 w/s.f.) 4. Electric Domestic Hot Water Systems**	1,443,027	$291,930	$1.75	29.5	368,975.2	$108,731	**27.1%**	**11**
2	**1. Design Envelope 2. Design Mechanical Systems (Ground-Source VRF System) 3. Design High-Efficiency Lighting System (0.45 w/s.f.) 4. Electric Domestic Hot Water Systems**	1,183,958	$223,944	$1.34	24.2	302,732.5	$176,717	**44.1%**	**16**
3	**1. Design Envelope 2. Design Mechanical Systems (Displacement Ventilation System with Air-Source Heat Recovery Heat Pump Chiller/Heater Plant) 3. Design High-Efficiency Lighting System (0.45 w/s.f.) 4. Electric Domestic Hot Water Systems**	1,160,735	$229,174	$1.37	23.7	296,794.5	$171,487	**42.8%**	**16**
4	**1. Design Envelope 2. Design Mechanical Systems (Geothermal Displacement Ventilation System with Ground-Source Heat Recovery Heat Pump Chiller/Heater Plant) 3. Design High-Efficiency Lighting System (0.45 w/s.f.) 4. Electric Domestic Hot Water Systems**	1,093,195	$205,748	$1.23	22.3	279,524.8	$194,913	**48.6%**	**16**

*Combined expense savings is the difference between the combined annual expense of the baseline and building in comparison.
**Energy cost/Greenhouse Gas (GHG) emissions savings percentage is the difference between the annual energy costs of the baseline and building in comparison.

Note 1: Values based on energy model performed for HVAC System Life Cycle Cost Analysis purposes. A 30% safety factor should be applied for budgeting purposes to account for potential variances to the actual operation of the building. Per ASHRAE Standard 90.1:

Neither the proposed building performance nor the baseline building performance are predictions of actual energy consumption or costs for the proposed design after construction. Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by this procedure, changes in energy rates between design of the building and occupancy, and the precision of the calculation tool.

LIFE CYCLE ANALYSES

NIST BLCC 5.3-22: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology in OMB Circular A-94

Base Case: Baseline - Mixed-Air VAV w/ ASHP Plant

Alternative: Option 1 - ASHP VRF System

General Information

File Name:	C:\Users\keith_lane.GGDMAIL\BLCC 5.3-22\projects\Wilmington Elementary School.xml
Date of Study:	Wed Jan 15 13:51:49 EST 2025
Project Name:	Wilmington Elementary School
Project Location:	Massachusetts
Analysis Type:	OMB Analysis, Non-Energy Project
Analysis Purpose:	Public Investment or Regulatory Analysis
Analyst:	
Base Date:	September 1, 2026
Service Date:	September 1, 2026
Study Period:	50 years 0 months(September 1, 2026 through August 31, 2076)
Discount Rate:	1.4%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$15,838,440	$14,007,900	$1,830,540
Future Costs:			
Energy Consumption Costs	$8,347,407	$6,929,275	$1,418,131
Energy Demand Charges	$3,404,705	$3,535,184	-$130,479
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$7,068,025	$6,160,732	$907,293
Capital Replacements	$0	$0	$0
Residual Value at End of Study Period	$0	$0	$0
	---	---	---
Subtotal (for Future Cost Items)	$18,820,137	$16,625,191	$2,194,946
	---	---	---
Total PV Life-Cycle Cost	$34,658,577	$30,633,091	$4,025,486

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$2,194,946
- Increased Total Investment	-$1,830,540

Net Savings	$4,025,486

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive.

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average	Annual	Consumption-----	Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	1,738,354.0 kWh	1,443,027.0 kWh	295,327.0 kWh	14,765,945.7 kWh

Energy Savings Summary (in MBtu)

Energy	-----Average	Annual	Consumption-----	Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	5,931.5 MBtu	4,923.8 MBtu	1,007.7 MBtu	50,383.5 MBtu

Emissions Reduction Summary

Energy Type	-----Average Base Case	Annual Alternative	Emissions----- Reduction	Life-Cycle Reduction
Electricity				
CO2	573,718.42 kg	476,250.04 kg	97,468.38 kg	4,873,285.33 kg
SO2	162.71 kg	135.07 kg	27.64 kg	1,382.13 kg
NOx	438.08 kg	363.65 kg	74.42 kg	3,721.12 kg
Total:				
CO2	573,718.42 kg	476,250.04 kg	97,468.38 kg	4,873,285.33 kg
SO2	162.71 kg	135.07 kg	27.64 kg	1,382.13 kg
NOx	438.08 kg	363.65 kg	74.42 kg	3,721.12 kg

NIST BLCC 5.3-22: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology in OMB Circular A-94

Base Case: Baseline - Mixed-Air VAV w/ ASHP Plant

Alternative: Option 2 - GSHP VRF System

General Information

File Name:	C:\Users\keith_lane.GGDMAIL\BLCC 5.3-22\projects\Wilmington Elementary School.xml
Date of Study:	Wed Jan 15 13:52:15 EST 2025
Project Name:	Wilmington Elementary School
Project Location:	Massachusetts
Analysis Type:	OMB Analysis, Non-Energy Project
Analysis Purpose:	Public Investment or Regulatory Analysis
Analyst:	
Base Date:	September 1, 2026
Service Date:	September 1, 2026
Study Period:	50 years 0 months(September 1, 2026 through August 31, 2076)
Discount Rate:	1.4%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$15,838,440	$19,358,100	-$3,519,660
Future Costs:			
Energy Consumption Costs	$8,347,407	$5,685,251	$2,662,156
Energy Demand Charges	$3,404,705	$2,342,200	$1,062,505
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$7,068,025	$4,826,752	$2,241,273
Capital Replacements	$0	$0	$0
Residual Value at End of Study Period	$0	$0	$0
	---	---	---
Subtotal (for Future Cost Items)	$18,820,137	$12,854,203	$5,965,933
	---	---	---
Total PV Life-Cycle Cost	$34,658,577	$32,212,303	$2,446,273

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$5,965,933
- Increased Total Investment	$3,519,660

Net Savings	$2,446,273

Savings-to-Investment Ratio (SIR)

SIR = 1.70

Adjusted Internal Rate of Return

AIRR = 2.48%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	21
Discounted Payback occurs in year	23

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	-----Average Base Case	Annual Alternative	Consumption----- Savings	Life-Cycle Savings
Electricity	1,738,354.0 kWh	1,183,958.0 kWh	554,396.0 kWh	27,719,041.1 kWh

Energy Savings Summary (in MBtu)

Energy Type	-----Average Base Case	Annual Alternative	Consumption----- Savings	Life-Cycle Savings
Electricity	5,931.5 MBtu	4,039.8 MBtu	1,891.7 MBtu	94,581.3 MBtu

Emissions Reduction Summary

Energy Type	-----Average Base Case	Annual Alternative	Emissions----- Reduction	Life-Cycle Reduction
Electricity				
CO2	573,718.42 kg	390,748.09 kg	182,970.33 kg	9,148,265.80 kg
SO2	162.71 kg	110.82 kg	51.89 kg	2,594.57 kg
NOx	438.08 kg	298.37 kg	139.71 kg	6,985.39 kg
Total:				
CO2	573,718.42 kg	390,748.09 kg	182,970.33 kg	9,148,265.80 kg
SO2	162.71 kg	110.82 kg	51.89 kg	2,594.57 kg
NOx	438.08 kg	298.37 kg	139.71 kg	6,985.39 kg

NIST BLCC 5.3-22: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology in OMB Circular A-94

Base Case: Baseline - Mixed-Air VAV w/ ASHP Plant

Alternative: Option 3 - ASHP Displacement System

General Information

File Name:	C:\Users\keith_lane.GGDMAIL\BLCC 5.3-22\projects\Wilmington Elementary School.xml
Date of Study:	Wed Jan 15 13:52:29 EST 2025
Project Name:	Wilmington Elementary School
Project Location:	Massachusetts
Analysis Type:	OMB Analysis, Non-Energy Project
Analysis Purpose:	Public Investment or Regulatory Analysis
Analyst:	
Base Date:	September 1, 2026
Service Date:	September 1, 2026
Study Period:	50 years 0 months(September 1, 2026 through August 31, 2076)
Discount Rate:	1.4%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$15,838,440	$15,379,680	$458,760
Future Costs:			
Energy Consumption Costs	$8,347,407	$5,573,736	$2,773,670
Energy Demand Charges	$3,404,705	$2,641,190	$763,515
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$7,068,025	$5,383,640	$1,684,385
Capital Replacements	$0	$0	$0
Residual Value at End of Study Period	$0	$0	$0
	---	---	---
Subtotal (for Future Cost Items)	$18,820,137	$13,598,566	$5,221,570
	---	---	---
Total PV Life-Cycle Cost	$34,658,577	$28,978,246	$5,680,330

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$5,221,570
- Increased Total Investment	-$458,760

Net Savings	$5,680,330

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive.

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average	Annual	Consumption-----	Life-Cycle
Type	**Base Case**	**Alternative**	**Savings**	**Savings**
Electricity	1,738,354.0 kWh	1,160,735.0 kWh	577,619.0 kWh	28,880,159.3 kWh

Energy Savings Summary (in MBtu)

Energy	-----Average	Annual	Consumption-----	Life-Cycle
Type	**Base Case**	**Alternative**	**Savings**	**Savings**
Electricity	5,931.5 MBtu	3,960.6 MBtu	1,970.9 MBtu	98,543.2 MBtu

Emissions Reduction Summary

Energy Type	-----Average Base Case	Annual Alternative	Emissions----- Reduction	Life-Cycle Reduction
Electricity				
CO2	573,718.42 kg	383,083.68 kg	190,634.74 kg	9,531,475.96 kg
SO2	162.71 kg	108.65 kg	54.07 kg	2,703.26 kg
NOx	438.08 kg	292.51 kg	145.56 kg	7,278.00 kg
Total:				
CO2	573,718.42 kg	383,083.68 kg	190,634.74 kg	9,531,475.96 kg
SO2	162.71 kg	108.65 kg	54.07 kg	2,703.26 kg
NOx	438.08 kg	292.51 kg	145.56 kg	7,278.00 kg

NIST BLCC 5.3-22: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology in OMB Circular A-94

Base Case: Baseline - Mixed-Air VAV w/ ASHP Plant

Alternative: Option 4 - GSHP Displacement System

General Information

File Name:	C:\Users\keith_lane.GGDMAIL\BLCC 5.3-22\projects\Wilmington Elementary School.xml
Date of Study:	Wed Jan 15 13:52:50 EST 2025
Project Name:	Wilmington Elementary School
Project Location:	Massachusetts
Analysis Type:	OMB Analysis, Non-Energy Project
Analysis Purpose:	Public Investment or Regulatory Analysis
Analyst:	
Base Date:	September 1, 2026
Service Date:	September 1, 2026
Study Period:	50 years 0 months(September 1, 2026 through August 31, 2076)
Discount Rate:	1.4%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$15,838,440	$18,306,360	-$2,467,920
Future Costs:			
Energy Consumption Costs	$8,347,407	$5,249,416	$3,097,991
Energy Demand Charges	$3,404,705	$2,125,799	$1,278,906
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$7,068,025	$4,935,090	$2,132,935
Capital Replacements	$0	$0	$0
Residual Value at End of Study Period	$0	$0	$0
	---	---	---
Subtotal (for Future Cost Items)	$18,820,137	$12,310,305	$6,509,832
	---	---	---
Total PV Life-Cycle Cost	$34,658,577	$30,616,665	$4,041,912

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$6,509,832
- Increased Total Investment	$2,467,920

Net Savings	$4,041,912

Savings-to-Investment Ratio (SIR)

SIR = 2.64

Adjusted Internal Rate of Return

AIRR = 3.39%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year	20
Discounted Payback occurs in year	21

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average	Annual	Consumption-----	Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	1,738,354.0 kWh	1,093,195.0 kWh	645,159.0 kWh	32,257,066.8 kWh

Energy Savings Summary (in MBtu)

Energy	-----Average	Annual	Consumption-----	Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	5,931.5 MBtu	3,730.1 MBtu	2,201.4 MBtu	110,065.7 MBtu

Emissions Reduction Summary

Energy	-----Average	Annual	Emissions-----	Life-Cycle
Type	Base Case	Alternative	Reduction	Reduction
Electricity				
CO2	573,718.42 kg	360,793.09 kg	212,925.33 kg	10,645,975.11 kg
SO2	162.71 kg	102.33 kg	60.39 kg	3,019.34 kg
NOx	438.08 kg	275.49 kg	162.58 kg	8,129.00 kg
Total:				
CO2	573,718.42 kg	360,793.09 kg	212,925.33 kg	10,645,975.11 kg
SO2	162.71 kg	102.33 kg	60.39 kg	3,019.34 kg
NOx	438.08 kg	275.49 kg	162.58 kg	8,129.00 kg

NIST BLCC 5.3-22: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology in OMB Circular A-94

Base Case: Baseline - Mixed-Air VAV w/ ASHP Plant

Alternative: IRA Rebate Option 2 - GSHP VRF System

General Information

File Name:	C:\Users\keith_lane.GGDMAIL\BLCC 5.3-22\projects\Wilmington Elementary School.xml
Date of Study:	Wed Jan 15 13:53:19 EST 2025
Project Name:	Wilmington Elementary School
Project Location:	Massachusetts
Analysis Type:	OMB Analysis, Non-Energy Project
Analysis Purpose:	Public Investment or Regulatory Analysis
Analyst:	
Base Date:	September 1, 2026
Service Date:	September 1, 2026
Study Period:	50 years 0 months(September 1, 2026 through August 31, 2076)
Discount Rate:	1.4%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$15,838,440	$14,421,785	$1,416,655
Future Costs:			
Energy Consumption Costs	$8,347,407	$5,685,251	$2,662,156
Energy Demand Charges	$3,404,705	$2,342,200	$1,062,505
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$7,068,025	$4,826,752	$2,241,273
Capital Replacements	$0	$0	$0
Residual Value at End of Study Period	$0	$0	$0
	---	---	---
Subtotal (for Future Cost Items)	$18,820,137	$12,854,203	$5,965,933
	---	---	---
Total PV Life-Cycle Cost	$34,658,577	$27,275,988	$7,382,588

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$5,965,933
- Increased Total Investment	-$1,416,655

Net Savings	$7,382,588

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive.

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average	Annual	Consumption-----	Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	1,738,354.0 kWh	1,183,958.0 kWh	554,396.0 kWh	27,719,041.1 kWh

Energy Savings Summary (in MBtu)

Energy	-----Average	Annual	Consumption-----	Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	5,931.5 MBtu	4,039.8 MBtu	1,891.7 MBtu	94,581.3 MBtu

Emissions Reduction Summary

Energy Type	-----Average Base Case	Annual Alternative	Emissions----- Reduction	Life-Cycle Reduction
Electricity				
CO2	573,718.42 kg	390,748.09 kg	182,970.33 kg	9,148,265.80 kg
SO2	162.71 kg	110.82 kg	51.89 kg	2,594.57 kg
NOx	438.08 kg	298.37 kg	139.71 kg	6,985.39 kg
Total:				
CO2	573,718.42 kg	390,748.09 kg	182,970.33 kg	9,148,265.80 kg
SO2	162.71 kg	110.82 kg	51.89 kg	2,594.57 kg
NOx	438.08 kg	298.37 kg	139.71 kg	6,985.39 kg

NIST BLCC 5.3-22: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology in OMB Circular A-94

Base Case: Baseline - Mixed-Air VAV w/ ASHP Plant

Alternative: IRA Rebate Option 4 - GSHP Displacement System

General Information

File Name:	C:\Users\keith_lane.GGDMAIL\BLCC 5.3-22\projects\Wilmington Elementary School.xml
Date of Study:	Wed Jan 15 13:54:21 EST 2025
Project Name:	Wilmington Elementary School
Project Location:	Massachusetts
Analysis Type:	OMB Analysis, Non-Energy Project
Analysis Purpose:	Public Investment or Regulatory Analysis
Analyst:	
Base Date:	September 1, 2026
Service Date:	September 1, 2026
Study Period:	50 years 0 months(September 1, 2026 through August 31, 2076)
Discount Rate:	1.4%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$15,838,440	$13,638,238	$2,200,202
Future Costs:			
Energy Consumption Costs	$8,347,407	$5,249,416	$3,097,991
Energy Demand Charges	$3,404,705	$2,125,799	$1,278,906
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$7,068,025	$4,935,090	$2,132,935
Capital Replacements	$0	$0	$0
Residual Value at End of Study Period	$0	$0	$0
	---	---	---
Subtotal (for Future Cost Items)	$18,820,137	$12,310,305	$6,509,832
	---	---	---
Total PV Life-Cycle Cost	$34,658,577	$25,948,543	$8,710,034

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$6,509,832
- Increased Total Investment	-$2,200,202

Net Savings	$8,710,034

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive.

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average Annual Consumption-----		Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	1,738,354.0 kWh	1,093,195.0 kWh	645,159.0 kWh	32,257,066.8 kWh

Energy Savings Summary (in MBtu)

Energy	-----Average Annual Consumption-----		Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	5,931.5 MBtu	3,730.1 MBtu	2,201.4 MBtu	110,065.7 MBtu

Emissions Reduction Summary

Energy Type	-----Average Base Case	Annual Alternative	Emissions----- Reduction	Life-Cycle Reduction
Electricity				
CO2	573,718.42 kg	360,793.09 kg	212,925.33 kg	10,645,975.11 kg
SO2	162.71 kg	102.33 kg	60.39 kg	3,019.34 kg
NOx	438.08 kg	275.49 kg	162.58 kg	8,129.00 kg
Total:				
CO2	573,718.42 kg	360,793.09 kg	212,925.33 kg	10,645,975.11 kg
SO2	162.71 kg	102.33 kg	60.39 kg	3,019.34 kg
NOx	438.08 kg	275.49 kg	162.58 kg	8,129.00 kg

COST ESTIMATES

GGD Consulting Engineers, Inc.
375 Faunce Corner Road, Suite D
Dartmouth, MA 02747

PROJECT: Wilmington Elementary School
JOB NO: 894 135 00
CLIENT: Dore & Whittier Architects
DATE: 1/13/2025 **BY:** KL

Baseline - Air-Source Heat Pump Plant VAV Systems (MA Opt-In Stretch Energy Code Compliant)

ITEM OF WORK	NO.	UNIT PRICE	AREA	PRICE/S.F.	TOTAL
VAV Box with Hot Water Reheat Coils	150	$1,500			$ 225,000
RTU-A: Classroom Overhead VAV CHW/HHW Cooling/Heating w/ ERV & DCV	30,000 CFM	$21/CFM			$ 630,000
RTU-B: Classroom Overhead VAV CHW/HHW Cooling/Heating w/ ERV & DCV	35,000 CFM	$21/CFM			$ 735,000
RTU-C: Classroom Overhead VAV CHW/HHW Cooling/Heating w/ ERV & DCV	30,000 CFM	$21/CFM			$ 630,000
RTU-D: Gym Overhead VAV CHW/HHW Cooling/Heating w/ ERV & DCV	12,000 CFM	$23/CFM			$ 276,000
RTU-E: Media Center Overhead VAV CHW/HHW Cooling/Heating w/ ERV & DCV	5,000 CFM	$25/CFM			$ 125,000
RTU-F: Cafe/Stage Overhead VAV CHW/HHW Cooling/Heating w/ ERV & DCV	12,000 CFM	$23/CFM			$ 276,000
RTU-G: Kitchen/Custodial Overhead VAV CHW/HHW Cooling/Heating w/ ERV & DCV	3,000 CFM	$25/CFM			$ 75,000
RTU-H: Admin. Overhead VAV CHW/HHW Cooling/Heating w/ ERV & DCV	6,000 CFM	$23/CFM			$ 138,000
MAU-A: Kitchen 100% O.A. VAV MAU CHW/HHW Cooling/Heating w/ Kitchen Hood Controls	4,500 CFM	$23/CFM			$ 103,500
(15) 30 Ton High-Efficiency Air-Source Heat Recovery Heat Pump Chiller/Heater Plant (450 ton total capacity, 335 ton cooling, 320 ton HHW/DHW heating)	450 tons	$3,600/ton			$ 1,620,000
(1) 350 kW Electric Boiler including Accessories (For Back-Up Only)	1	$60,000			$ 60,000
Chilled Water Pumps w/ VFD's, Accessories	2	$40,000			$ 80,000
Hot Water Pumps w/ VFD's, Accessories	2	$40,000			$ 80,000
Hot Water Terminal Heating Units			167,000	$2.00	$ 334,000
Hot Water Piping & Ins. and Accessories			167,000	$6.50	$ 1,085,500
Chilled Water Piping & Insulation and Condensate Piping & Pumps			167,000	$7.00	$ 1,169,000
Ductwork including GRD's, Dampers, & General Exhaust Systems			167,000	$25.00	$ 4,175,000
ATC/DDC Controls			167,000	$7.50	$ 1,252,500
Chilled/Hot Water Fan Coil Units (IDF, EMR, etc.)	10	$5,000			$ 50,000
Cabinet Hot Water Unit Heaters	16	$2,000			$ 32,000
Hot Water Unit Heaters	6	$1,200			$ 7,200
Exhaust Fans (Misc. Areas)					$ 40,000
HVAC General Conditions (as-builts, coordination, shop drawings, testing and balancing, Cx support, Project Management)	20.00%	$13,198,700			$ 2,639,740
				TOTAL	$ 15,838,440
				TOTAL ($/FT²)	$ 94.84

Cost estimates have been derived for system comparison purposes only and are based upon recent project costs. Estimates do not necessarily include HVAC systems and equipment that would be required for all system options studied (i.e. specialty cooling & exhaust systems, etc.).

* Air-Source Heat Pump replacement cost of $1,620,000 after 20 year equipment life expectancy carried in Life-Cycle Analysis calculations.

** Rooftop Unit and Pump replacement cost of $3,198,500 after 30 year equipment life expectancy carried in Life-Cycle Analysis calculations.

*** Air-Source Heat Pump replacement cost of $1,620,000 after 40 year equipment life expectancy carried in Life-Cycle Analysis calculations.

GGD Consulting Engineers, Inc.
375 Faunce Corner Road, Suite D
Dartmouth, MA 02747

Option 1 - Air-Source Heat Pump (ASHP) Variable Refrigerant Flow (VRF) Systems with ASHP Cooling/Heating Air Handling Units

PROJECT:	**Wilmington Elementary School**	
JOB NO:	**894 135 00**	
CLIENT:	**Dore & Whittier Architects**	
DATE:	**1/13/2025**	**BY: KL**

ITEM OF WORK	NO.	UNIT PRICE	AREA	PRICE/S.F.	TOTAL
Indoor VRF Evaporator Units	216	$4,500			$ 972,000
VRF Branch Controllers	14	$12,000			$ 168,000
Outdoor Air Cooled VRF Condensing Units (240 Ton Total Capacity)	240 tons	$3,000/ton			$ 720,000
VAV Box with Demand Ventilation Controls	150	$1,250			$ 187,500
RTU-A: Classroom 100% O.A. ASHP DOAS w/ ERV & DCV	14,000 CFM	$30/CFM			$ 420,000
RTU-B: Classroom 100% O.A. ASHP DOAS w/ ERV & DCV	16,000 CFM	$30/CFM			$ 480,000
RTU-C: Classroom 100% O.A. ASHP DOAS w/ ERV & DCV	13,000 CFM	$30/CFM			$ 390,000
RTU-D: Gym Overhead VAV ASHP w/ ERV & DCV	12,000 CFM	$30/CFM			$ 360,000
RTU-E: Media Center 100% O.A. ASHP DOAS w/ ERV & DCV	2,500 CFM	$35/CFM			$ 87,500
RTU-F: Cafe/Stage Overhead VAV ASHP w/ ERV & DCV	12,000 CFM	$30/CFM			$ 360,000
RTU-G: Kitchen/Custodial Overhead VAV ASHP w/ ERV & DCV	3,000 CFM	$35/CFM			$ 96,000
RTU-H: Admin. 100% O.A. ASHP DOAS w/ ERV & DCV	3,000 CFM	$35/CFM			$ 105,000
MAU-A: Kitchen 100% O.A. ASHP VAV MAU w/ Kitchen Hood Controls	4,500 CFM	$33/CFM			$ 148,500
Electric Terminal Heating Units			167,000	$3.50	$ 584,500
Electric Circuitry for VRF & Electric Terminal Heating Units			167,000	$3.00	$ 501,000
Refrigeration Piping & Insulation and Condensate Piping & Pumps			167,000	$10.00	$ 1,670,000
Ductwork including GRD's, Dampers, & General Exhaust Systems			167,000	$18.00	$ 3,006,000
ATC/DDC Controls w/ Refrigerant Monitoring			167,000	$7.75	$ 1,294,250
Indoor VRF Evaporator Units (IDF, EMR, etc.)	10	$4,500			$ 45,000
Cabinet Electric Unit Heaters	16	$2,000			$ 32,000
Electric Unit Heaters	6	$1,000			$ 6,000
Exhaust Fans (Misc. Areas)					$ 40,000
HVAC General Conditions (as-builts, coordination, shop drawings, testing and balancing, Cx support, Project Management)	20.00%	$11,673,250			$ 2,334,650
				TOTAL	$ 14,007,900
				TOTAL ($/FT²)	$ 83.88

Cost estimates have been derived for system comparison purposes only and are based upon recent project costs. Estimates do not necessarily include HVAC systems and equipment that would be required for all system options studied (i.e. specialty cooling & exhaust systems, etc.).

* Rooftop Unit Condenser & Air-Source VRF Condenser replacement cost of $1,943,450 after 20 year equipment life expectancy carried in Life-Cycle Analysis calculations.

** VRF Evaporator Unit & Branch Controller replacement cost of $1,185,000 after 30 year equipment life expectancy carried in Life-Cycle Analysis calculations.

*** Rooftop Unit & Air-Source VRF Condenser replacement cost of $3,167,000 after 40 year equipment life expectancy carried in Life-Cycle Analysis calculations.

GGD Consulting Engineers, Inc.
375 Faunce Corner Road, Suite D
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PROJECT: Wilmington Elementary School

JOB NO: 894 135 00

CLIENT: Dore & Whittier Architects

DATE: 1/13/2025 **BY:** KL

Option 2 - Geothermal Ground-Source Heat Pump (GSHP) Variable Refrigerant Flow (VRF) Systems with GSHP Cooling/Heating Air Handling Units

ITEM OF WORK	NO.	UNIT PRICE	AREA	PRICE/S.F.	TOTAL
Indoor VRF Evaporator Units	216	$4,500			$ 972,000
VRF Branch Controllers	14	$12,000			$ 168,000
Indoor Water-Source VRF Condensing Units (240 Ton Total Capacity including Redundancy)	240 tons	$2,500/ton			$ 600,000
VAV Box with Demand Ventilation Controls	150	$1,250			$ 187,500
RTU-A: Classroom 100% O.A. GSHP DOAS w/ ERV & DCV	14,000 CFM	$24/CFM			$ 336,000
RTU-B: Classroom 100% O.A. GSHP DOAS w/ ERV & DCV	16,000 CFM	$24/CFM			$ 384,000
RTU-C: Classroom 100% O.A. GSHP DOAS w/ ERV & DCV	13,000 CFM	$24/CFM			$ 312,000
RTU-D: Gym Overhead VAV GSHP w/ ERV & DCV	12,000 CFM	$24/CFM			$ 288,000
RTU-E: Media Center 100% O.A. GSHP DOAS w/ ERV & DCV	2,500 CFM	$29/CFM			$ 72,500
RTU-F: Cafe/Stage Overhead VAV GSHP w/ ERV & DCV	12,000 CFM	$26/CFM			$ 312,000
RTU-G: Kitchen/Custodial Overhead VAV GSHP w/ ERV & DCV	3,000 CFM	$29/CFM			$ 87,000
RTU-H: Admin. 100% O.A. GSHP DOAS w/ ERV & DCV	3,000 CFM	$29/CFM			$ 87,000
MAU-A: Kitchen 100% O.A. GSHP VAV MAU w/ Kitchen Hood Controls	4,500 CFM	$27/CFM			$ 121,500
(80) 600' Deep Closed Loop Type Wells (4.25 tons/well; 335 Tons total capacity) including Underground Piping, Coring, Sleeves, Excavation, Dewatering, Oversight, etc.	80	$45,000			$ 3,600,000
(1) 350 kW Electric Boiler including Accessories (For Back-Up Only)	1	$60,000			$ 60,000
Ground/Condenser Water Pumps w/ VFD's, Accessories	2	$40,000			$ 80,000
Geothermal Pumps and VFDs, Accessories	2	$45,000			$ 90,000
Geothermal CW Piping Mains + Added Glycol Fill					$ 120,000
Electric Terminal Heating Units			167,000	$3.50	$ 584,500
Electric Circuitry for VRF & Electric Terminal Heating Units			167,000	$3.00	$ 501,000
Refrigeration Piping & Insulation and Condensate Piping & Pumps			167,000	$10.00	$ 1,670,000
Condenser Water Piping & Insulation and Condensate Piping & Pumps			167,000	$6.00	$ 1,002,000
Ductwork including GRD's, Dampers, & General Exhaust Systems			167,000	$18.00	$ 3,006,000
ATC/DDC Controls w/ Refrigerant Monitoring			167,000	$8.25	$ 1,377,750
Indoor VRF Evaporator Units (IDF, EMR, etc.)	10	$3,500			$ 35,000
Cabinet Electric Unit Heaters	16	$2,000			$ 32,000
Electric Unit Heaters	6	$1,000			$ 6,000
Exhaust Fans (Misc. Areas)					$ 40,000
HVAC General Conditions (as-builts, coordination, shop drawings, testing and balancing, Cx support, Project Management)	20.00%	$16,131,750			$ 3,226,350
				TOTAL	$ 19,358,100
				TOTAL ($/FT²)	$ 115.92

Cost estimates have been derived for system comparison purposes only and are based upon recent project costs. Estimates do not necessarily include HVAC systems and equipment that would be required for all system options studied (i.e. specialty cooling & exhaust systems, etc.).

* VRF Evaporator Unit & Branch Controller, Rooftop Unit, Water-Source Heat Pump, and Pump replacement cost of $3,945,000 after 30 year equipment life expectancy carried in Life-Cycle Analysis calculations.

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375 Faunce Corner Road, Suite D
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PROJECT: Wilmington Elementary School

JOB NO: 894 135 00

CLIENT: Dore & Whittier Architects

DATE: 1/13/2025 **BY:** KL

Option 3 - Air-Source Heat Pump Plant Displacement Ventilation CHW/HHW Cooling/Heating VAV Systems w/ Terminal Chilled/Hot Water Radiation

ITEM OF WORK	NO.	UNIT PRICE	AREA	PRICE/S.F.	TOTAL
Displacement Diffuser Assemblies	170	$950			$ 161,500
Small Displacement Diffuser Assemblies (Admin.)	46	$850			$ 39,100
VAV Box with Demand Ventilation Controls	150	$1,250			$ 187,500
RTU-A: Classroom Displacement VAV CHW/HHW Cooling/Heating w/ ERV & DCV	17,000 CFM	$21/CFM			$ 357,000
RTU-B: Classroom Displacement VAV CHW/HHW Cooling/Heating w/ ERV & DCV	20,000 CFM	$21/CFM			$ 420,000
RTU-C: Classroom Displacement VAV CHW/HHW Cooling/Heating w/ ERV & DCV	17,000 CFM	$21/CFM			$ 357,000
RTU-D: Gym Displacement VAV CHW/HHW Cooling/Heating w/ ERV & DCV	12,000 CFM	$23/CFM			$ 276,000
RTU-E: Media Center Displacement VAV CHW/HHW Cooling/Heating w/ ERV & DCV	3,000 CFM	$25/CFM			$ 75,000
RTU-F: Cafe/Stage Displacement VAV CHW/HHW Cooling/Heating w/ ERV & DCV	12,000 CFM	$23/CFM			$ 276,000
RTU-G: Kitchen/Custodial Overhead VAV CHW/HHW Cooling/Heating w/ ERV & DCV	3,000 CFM	$25/CFM			$ 75,000
RTU-H: Admin. Displacement VAV CHW/HHW Cooling/Heating w/ ERV & DCV	4,000 CFM	$25/CFM			$ 100,000
MAU-A: Kitchen 100% O.A. VAV MAU CHW/HHW Cooling/Heating w/ Kitchen Hood	4,500 CFM	$23/CFM			$ 103,500
(15) 30 Ton High-Efficiency Air-Source Heat Recovery Heat Pump Chiller/Heater Plant (450 ton total capacity, 335 ton cooling, 320 ton HHW/DHW heating)	450 tons	$3,600/ton			$ 1,620,000
(1) 350 kW Electric Boiler including Accessories (For Back-Up Only)	1	$60,000			$ 60,000
Chilled Water Pumps w/ VFD's, Accessories	2	$40,000			$ 80,000
Hot Water Pumps w/ VFD's, Accessories	2	$40,000			$ 80,000
Compensated Loop Pumps w/ VFD's, Accessories	2	$20,000			$ 40,000
Hot Water Terminal Heating/Cooling Units			167,000	$4.00	$ 668,000
Hot Water Piping & Ins. and Accessories			167,000	$6.50	$ 1,085,500
Chilled Water Piping & Insulation and Condensate Piping & Pumps			167,000	$9.00	$ 1,503,000
Ductwork including GRD's, Dampers, & General Exhaust Systems			167,000	$18.00	$ 3,006,000
ATC/DDC Controls			167,000	$8.00	$ 1,336,000
Chilled/Hot Water Fan Coil Units (IDF, EMR, etc.)	10	$5,000			$ 50,000
Cabinet Hot Water Unit Heaters	16	$2,000			$ 32,000
Hot Water Unit Heaters	6	$1,200			$ 7,200
Exhaust Fans (Misc. Areas)					$ 40,000
HVAC General Conditions (as-builts, coordination, shop drawings, testing and balancing, Cx support, Project Management)	20.00%	$12,035,300			$ 2,407,060
				TOTAL	$ 14,442,360
				TOTAL ($/FT²)	$ 86.48

Cost estimates have been derived for system comparison purposes only and are based upon recent project costs. Estimates do not necessarily include HVAC systems and equipment that would be required for all system options studied (i.e. specialty cooling & exhaust systems, etc.).

* Air-Source Heat Pump replacement cost of $1,620,000 after 20 year equipment life expectancy carried in Life-Cycle Analysis calculations.

** Rooftop Unit and Pump replacement cost of $2,289,500 after 30 year equipment life expectancy carried in Life-Cycle Analysis calculations.

*** Air-Source Heat Pump replacement cost of $1,620,000 after 40 year equipment life expectancy carried in Life-Cycle Analysis calculations.

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PROJECT: Wilmington Elementary School
JOB NO: 894 135 00
CLIENT: Dore & Whittier Architects
DATE: 1/13/2025 **BY:** KL

Option 4 - Geothermal Heat Pump Plant Displacement Ventilation CHW/HHW Cooling/Heating VAV Systems w/ Terminal Chilled/Hot Water Radiation

ITEM OF WORK	NO.	UNIT PRICE	AREA	PRICE/S.F.	TOTAL
Displacement Diffuser Assemblies	170	$950			$ 161,500
Small Displacement Diffuser Assemblies (Admin.)	46	$850			$ 39,100
VAV Box with Demand Ventilation Controls	150	$1,250			$ 187,500
RTU-A: Classroom Displacement VAV CHW/HHW Cooling/Heating w/ ERV & DCV	17,000 CFM	$21/CFM			$ 357,000
RTU-B: Classroom Displacement VAV CHW/HHW Cooling/Heating w/ ERV & DCV	20,000 CFM	$21/CFM			$ 420,000
RTU-C: Classroom Displacement VAV CHW/HHW Cooling/Heating w/ ERV & DCV	17,000 CFM	$21/CFM			$ 357,000
RTU-D: Gym Displacement VAV CHW/HHW Cooling/Heating w/ ERV & DCV	12,000 CFM	$23/CFM			$ 276,000
RTU-E: Media Center Displacement VAV CHW/HHW Cooling/Heating w/ ERV & DCV	3,000 CFM	$25/CFM			$ 75,000
RTU-F: Cafe/Stage Displacement VAV CHW/HHW Cooling/Heating w/ ERV & DCV	12,000 CFM	$23/CFM			$ 276,000
RTU-G: Kitchen/Custodial Overhead VAV CHW/HHW Cooling/Heating w/ ERV & DCV	3,000 CFM	$25/CFM			$ 75,000
RTU-H: Admin. Displacement VAV CHW/HHW Cooling/Heating w/ ERV & DCV	4,000 CFM	$25/CFM			$ 100,000
MAU-A: Kitchen 100% O.A. VAV MAU CHW/HHW Cooling/Heating w/ Kitchen Hood	4,500 CFM	$23/CFM			$ 103,500
(8) 50 Ton High-Efficiency Water-Source Heat Recovery Geothermal Heat Pump Chiller/Heater Plant (400 ton total capacity, 335 ton cooling, 320 ton HHW/DHW heating)	400 tons	$2,500/ton			$ 1,000,000
(80) 600' Deep Closed Loop Type Wells (4.25 tons/well; 335 Tons total capacity) including Underground Piping, Coring, Sleeves, Excavation, Dewatering, Oversight, etc.	80	$45,000			$ 3,600,000
(1) 350 kW Electric Boiler including Accessories (For Back-Up Only)	1	$60,000			$ 60,000
Chilled Water Pumps w/ VFD's, Accessories	2	$40,000			$ 80,000
Hot Water Pumps w/ VFD's, Accessories	2	$40,000			$ 80,000
Compensated Loop Pumps w/ VFD's, Accessories	2	$20,000			$ 40,000
Geothermal Pumps and VFDs, Accessories	2	$45,000			$ 90,000
Geothermal CW Piping Mains + Added Glycol Fill					$ 150,000
Hot Water Terminal Heating/Cooling Units			167,000	$4.00	$ 668,000
Hot Water Piping & Ins. and Accessories			167,000	$6.00	$ 1,002,000
Chilled Water Piping & Insulation and Condensate Piping & Pumps			167,000	$9.00	$ 1,503,000
Ductwork including GRD's, Dampers, & General Exhaust Systems			167,000	$18.00	$ 3,006,000
ATC/DDC Controls			167,000	$8.50	$ 1,419,500
Chilled/Hot Water Fan Coil Units (IDF, EMR, etc.)	10	$5,000			$ 50,000
Cabinet Hot Water Unit Heaters	16	$2,000			$ 32,000
Hot Water Unit Heaters	6	$1,200			$ 7,200
Exhaust Fans (Misc. Areas)					$ 40,000
HVAC General Conditions (as-builts, coordination, shop drawings, testing and balancing, Cx support, Project Management)	20.00%	$15,255,300			$ 3,051,060
				TOTAL	$ 18,306,360
				TOTAL ($/FT²)	$ 109.62

Cost estimates have been derived for system comparison purposes only and are based upon recent project costs. Estimates do not necessarily include HVAC systems and equipment that would be required for all system options studied (i.e. specialty cooling & exhaust systems, etc.).

* Rooftop Unit, Water-Source Heat Pump, and Pump replacement cost of $3,79,500 after 30 year equipment life expectancy carried in Life-Cycle Analysis calculations.

GGD Consulting Engineers, Inc.
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Dartmouth, MA 02747

Wilmington Elementary School - Annual Maintenance Costs

Baseline - Air-Source Heat Pump Plant Overhead VAV

Unit Type	Quantity	Cost/Unit	Annual Cost
VAV Box w/ Reheat Coil	150	$75	$11,250
Terminal Equipment (CUH's, UH's, etc.)	167,000	$0.03	$5,010
Water Treatment	167,000	$0.10	$16,700
ATC Controls	167,000	$0.10	$16,700
Large CHW AHU's (>6,000 CFM)	6	$2,000	$12,000
Small CHW AHU's (<6,000 CFM)	3	$1,500	$4,500
Fan Coil Units	10	$125	$1,250
Air-Source Heat Pump Plant	1	$10,000	$10,000
		TOTAL	**$77,410**

Option 1 - Air-Source VRF System

Unit Type	Quantity	Cost/Unit	Annual Cost
Indoor VRF Evaporators		$150	$0
Air-Cooled VRF Outdoor Units	1	$5,000	$5,000
VAV Box	150	$50	$7,500
Terminal Equipment (CUH's, UH's, etc.)	167,000	$0.03	$5,010
ATC Controls	167,000	$0.10	$16,700
Large ASHP AHU's (>6,000 CFM)	5	$2,750	$13,750
Small ASHP AHU's (<6,000 CFM)	4	$2,250	$9,000
Indoor VRF Fan Coil Units	10	$150	$1,500
		TOTAL	**$58,460**

Option 2 - Geothermal VRF System

Unit Type	Quantity	Cost/Unit	Annual Cost
Indoor VRF Evaporators		$150	$0
VRF Ground Source Plant	1	$3,000	$3,000
VAV Box	150	$50	$7,500
Terminal Equipment (CUH's, UH's, etc.)	167,000	$0.03	$5,010
Water Treatment	167,000	$0.075	$12,525
ATC Controls	167,000	$0.10	$16,700
Large WSHP AHU's (>6,000 CFM)	5	$2,000	$10,000
Small WSHP AHU's (<6,000 CFM)	4	$1,500	$6,000
Indoor VRF Fan Coil Units	10	$150	$1,500
		TOTAL	**$62,235**

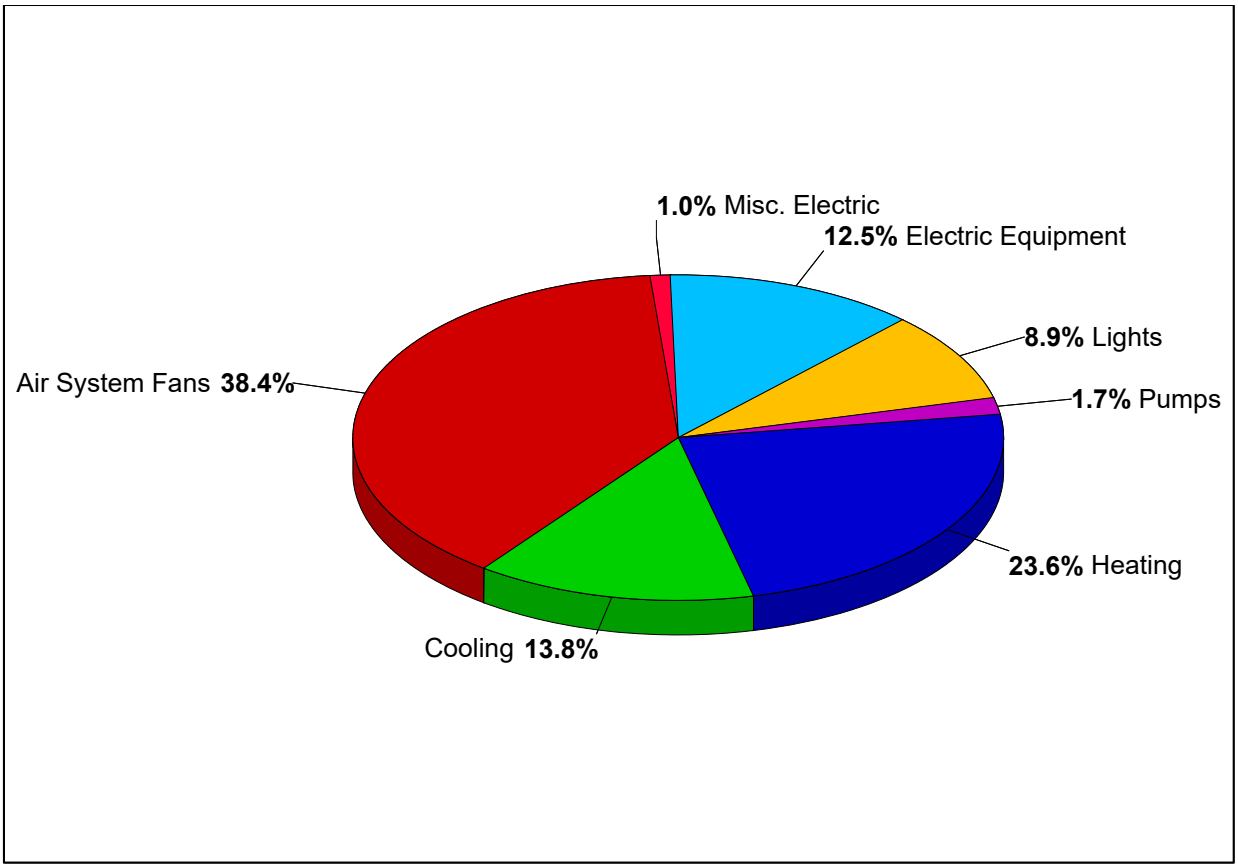
Option 3 - Air-Source Heat Pump Plant Displacement

Unit Type	Quantity	Cost/Unit	Annual Cost
VAV Box	150	$50	$7,500
Terminal Equipment (CUH's, UH's, RP's, etc.)	167,000	$0.05	$8,350
Water Treatment	167,000	$0.10	$16,700
ATC Controls	167,000	$0.10	$16,700
Large CHW AHU's (>6,000 CFM)	5	$2,000	$10,000
Small CHW AHU's (<6,000 CFM)	4	$1,500	$6,000
Fan Coil Units	10	$125	$1,250
Air-Source Heat Pump Plant	1	$7,500	$7,500
		TOTAL	**$74,000**

Option 4 - Geothermal Heat Pump Plant Displacement

Unit Type	Quantity	Cost/Unit	Annual Cost
VAV Box	150	$50	$7,500
Terminal Equipment (CUH's, UH's, RP's, etc.)	167,000	$0.05	$8,350
Water Treatment	167,000	$0.125	$20,875
ATC Controls	167,000	$0.10	$16,700
Large CHW AHU's (>6,000 CFM)	5	$2,000	$10,000
Small CHW AHU's (<6,000 CFM)	4	$1,500	$6,000
Fan Coil Units	10	$125	$1,250
Geothermal Plant	1	$5,000	$5,000
		TOTAL	**$75,675**

ENERGY MODEL OUTPUTS



1. Annual Costs

Component	Annual Cost ($)	($/sqft)	Percent of Total (%)
Air System Fans	125,958	0.753	38.4
Cooling	45,404	0.272	13.8
Heating	77,337	0.463	23.6
Pumps	5,483	0.033	1.7
Heat Rejection Fans	0	0.000	0.0
HVAC Sub-Total	**254,182**	**1.520**	**77.5**
Lights	29,306	0.175	8.9
Electric Equipment	40,926	0.245	12.5
Misc. Electric	3,439	0.021	1.0
Misc. Fuel Use	0	0.000	0.0
Non-HVAC Sub-Total	**73,671**	**0.441**	**22.5**
Grand Total	**327,852**	**1.961**	**100.0**

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **167,180.7** sqft
Modeled Floor Area ..... **167,180.7** sqft

1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/sqft)
Cooling Coil Loads	2,986,634	17.865
Heating Coil Loads	2,728,537	16.321
Grand Total	**5,715,171**	**34.186**

2. Energy Consumption by System Component

Component	Site Energy (kBTU)	Site Energy (kBTU/sqft)	Source Energy (kBTU)	Source Energy (kBTU/sqft)
Air System Fans	2,286,775	13.679	8,167,054	48.852
Cooling	798,997	4.779	2,853,559	17.069
Heating	1,412,824	8.451	5,045,799	30.182
Pumps	99,188	0.593	354,241	2.119
Heat Rejection Fans	0	0.000	0	0.000
HVAC Sub-Total	**4,597,783**	**27.502**	**16,420,653**	**98.221**
Lights	530,509	3.173	1,894,674	11.333
Electric Equipment	740,552	4.430	2,644,829	15.820
Misc. Electric	62,643	0.375	223,724	1.338
Misc. Fuel Use	0	0.000	0	0.000
Non-HVAC Sub-Total	**1,333,703**	**7.978**	**4,763,227**	**28.492**
Grand Total	**5,931,486**	**35.480**	**21,183,880**	**126.713**

Notes:
1. 'Cooling Coil Loads' is the sum of all air system cooling coil loads.
2. 'Heating Coil Loads' is the sum of all air system heating coil loads.
3. Site Energy is the actual energy consumed.
4. Source Energy is the site energy divided by the electric generating efficiency (28.0%).
5. Source Energy for fuels equals the site energy value.
6. Energy per unit floor area is based on the gross building floor area.
   Gross Floor Area ..... **167180.7** sqft
   Modeled Floor Area ..... **167180.7** sqft

1. Component Charges

Billing Period	Energy Charges ($)	Demand Charges ($)	Customer Charges ($)	Taxes ($)	Total Charge ($)
Jan	27,842	12,481	13	0	40,337
Feb	23,777	6,981	13	0	30,771
Mar	23,212	10,510	13	0	33,735
Apr	16,197	6,267	13	0	22,477
May	18,174	7,428	13	0	25,614
Jun	19,785	8,533	13	0	28,331
Jul	13,620	7,005	13	0	20,638
Aug	14,993	7,441	13	0	22,447
Sep	20,035	7,872	13	0	27,920
Oct	16,362	7,576	13	0	23,952
Nov	17,314	6,224	13	0	23,551
Dec	21,558	6,506	13	0	28,077
Totals	232,870	94,826	156	0	327,852

2. Totals

Billing Period	Total Charges ($)	Total Consumption (kWh)	Avg Price ($/kWh)
Jan	40,337	207,842	0.1941
Feb	30,771	177,492	0.1734
Mar	33,735	173,277	0.1947
Apr	22,477	120,910	0.1859
May	25,614	135,665	0.1888
Jun	28,331	147,696	0.1918
Jul	20,638	101,669	0.2030
Aug	22,447	111,920	0.2006
Sep	27,920	149,559	0.1867
Oct	23,952	122,142	0.1961
Nov	23,551	129,250	0.1822
Dec	28,077	160,932	0.1745
Totals	327,852	1,738,354	0.1886

3. Consumption Totals

Billing Period	Peak (kWh)	Mid-Peak (kWh)	Normal Peak (kWh)	Off-Peak (kWh)	Overall (kWh)
Jan	0	0	0	0	207,842
Feb	0	0	0	0	177,492
Mar	0	0	0	0	173,277
Apr	0	0	0	0	120,910
May	0	0	0	0	135,665
Jun	0	0	0	0	147,696
Jul	0	0	0	0	101,669
Aug	0	0	0	0	111,920
Sep	0	0	0	0	149,559
Oct	0	0	0	0	122,142
Nov	0	0	0	0	129,250
Dec	0	0	0	0	160,932
Totals	0	0	0	0	1,738,354

4. Billing Demands

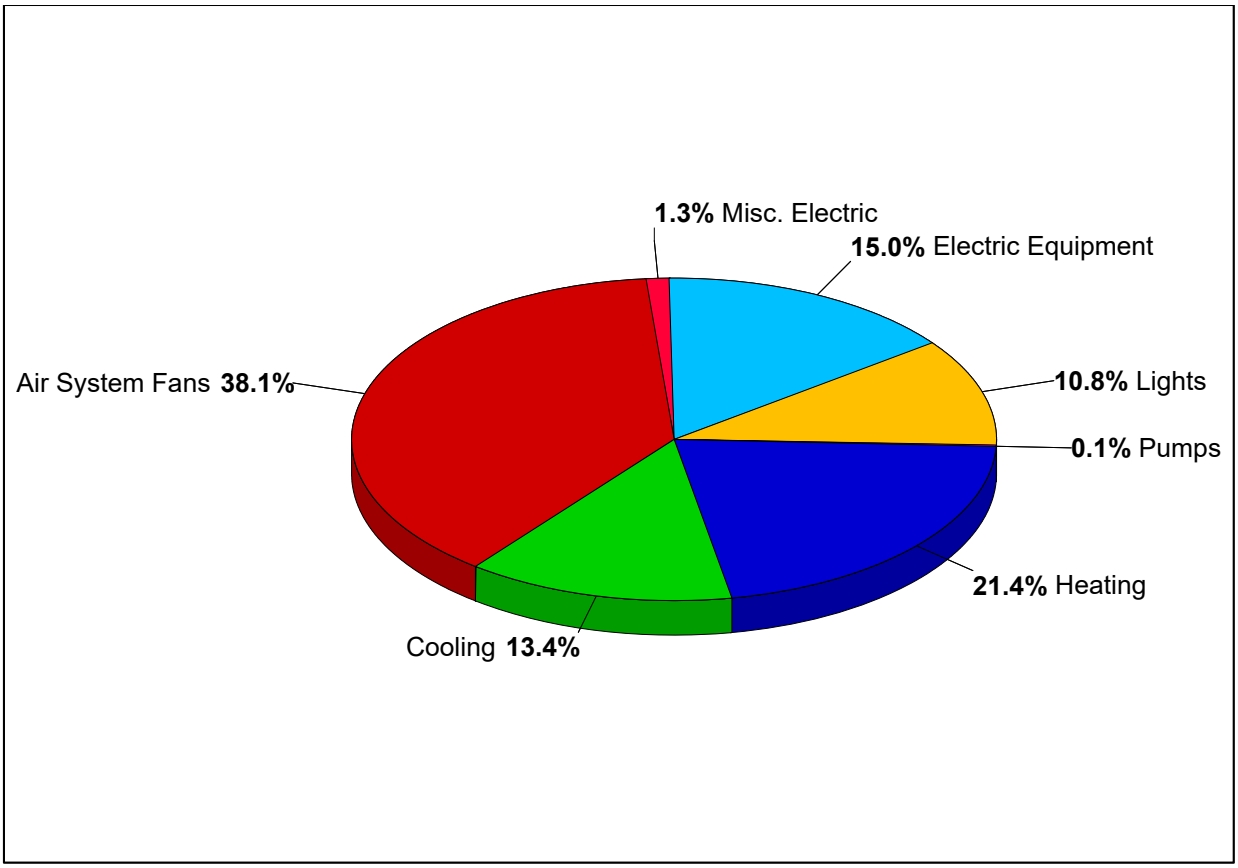
Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	951.9
Feb	0.0	0.0	0.0	0.0	532.5
Mar	0.0	0.0	0.0	0.0	801.6
Apr	0.0	0.0	0.0	0.0	478.0
May	0.0	0.0	0.0	0.0	566.5
Jun	0.0	0.0	0.0	0.0	650.8
Jul	0.0	0.0	0.0	0.0	534.3
Aug	0.0	0.0	0.0	0.0	567.5
Sep	0.0	0.0	0.0	0.0	600.4
Oct	0.0	0.0	0.0	0.0	577.8
Nov	0.0	0.0	0.0	0.0	474.7
Dec	0.0	0.0	0.0	0.0	496.2

5. Maximum Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	951.9
Feb	0.0	0.0	0.0	0.0	532.5
Mar	0.0	0.0	0.0	0.0	801.6
Apr	0.0	0.0	0.0	0.0	478.0
May	0.0	0.0	0.0	0.0	566.5
Jun	0.0	0.0	0.0	0.0	650.8
Jul	0.0	0.0	0.0	0.0	534.3
Aug	0.0	0.0	0.0	0.0	567.5
Sep	0.0	0.0	0.0	0.0	600.4
Oct	0.0	0.0	0.0	0.0	577.8
Nov	0.0	0.0	0.0	0.0	474.7
Dec	0.0	0.0	0.0	0.0	496.2

6. Time Of Maximum Demands (Date/Hour)

Billing Period	Peak	Mid-Peak	Normal Peak	Off-Peak	Overall
Jan	n/a	n/a	n/a	n/a	1/30 07:00
Feb	n/a	n/a	n/a	n/a	2/9 08:00
Mar	n/a	n/a	n/a	n/a	3/1 06:00
Apr	n/a	n/a	n/a	n/a	4/21 09:00
May	n/a	n/a	n/a	n/a	5/10 09:00
Jun	n/a	n/a	n/a	n/a	6/28 09:00
Jul	n/a	n/a	n/a	n/a	7/20 14:00
Aug	n/a	n/a	n/a	n/a	8/24 10:00
Sep	n/a	n/a	n/a	n/a	9/4 08:00
Oct	n/a	n/a	n/a	n/a	10/27 09:00
Nov	n/a	n/a	n/a	n/a	11/27 08:00
Dec	n/a	n/a	n/a	n/a	12/25 07:00



1. Annual Costs

Component	Annual Cost ($)	($/sqft)	Percent of Total (%)
Air System Fans	111,092	0.665	38.1
Cooling	39,034	0.234	13.4
Heating	62,582	0.374	21.4
Pumps	234	0.001	0.1
Heat Rejection Fans	0	0.000	0.0
HVAC Sub-Total	**212,942**	**1.274**	**72.9**
Lights	31,424	0.188	10.8
Electric Equipment	43,874	0.262	15.0
Misc. Electric	3,687	0.022	1.3
Misc. Fuel Use	0	0.000	0.0
Non-HVAC Sub-Total	**78,985**	**0.473**	**27.1**
Grand Total	**291,927**	**1.746**	**100.0**

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **167,180.7** sqft
Modeled Floor Area ..... **167,180.7** sqft

Energy Budget by System Component - [O1] ASHP VRF Design

Project: Wilmington ES - LCCA Energy Model 01/15/2025
Prepared by: GGD Consulting Engineers, Inc. 2:25 PM

1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/sqft)
Cooling Coil Loads	3,964,639	23.715
Heating Coil Loads	1,748,837	10.461
Grand Total	**5,713,476**	**34.176**

2. Energy Consumption by System Component

Component	Site Energy (kBTU)	Site Energy (kBTU/sqft)	Source Energy (kBTU)	Source Energy (kBTU/sqft)
Air System Fans	1,874,878	11.215	6,695,993	40.052
Cooling	649,569	3.885	2,319,889	13.877
Heating	1,061,620	6.350	3,791,500	22.679
Pumps	3,962	0.024	14,151	0.085
Heat Rejection Fans	0	0.000	0	0.000
HVAC Sub-Total	**3,590,029**	**21.474**	**12,821,533**	**76.693**
Lights	530,509	3.173	1,894,674	11.333
Electric Equipment	740,560	4.430	2,644,858	15.820
Misc. Electric	62,643	0.375	223,724	1.338
Misc. Fuel Use	0	0.000	0	0.000
Non-HVAC Sub-Total	**1,333,712**	**7.978**	**4,763,256**	**28.492**
Grand Total	**4,923,741**	**29.452**	**17,584,789**	**105.184**

Notes:
1. 'Cooling Coil Loads' is the sum of all air system cooling coil loads.
2. 'Heating Coil Loads' is the sum of all air system heating coil loads.
3. Site Energy is the actual energy consumed.
4. Source Energy is the site energy divided by the electric generating efficiency (28.0%).
5. Source Energy for fuels equals the site energy value.
6. Energy per unit floor area is based on the gross building floor area.
   Gross Floor Area ..... **167180.7** sqft
   Modeled Floor Area ..... **167180.7** sqft

1. Component Charges

Billing Period	Energy Charges ($)	Demand Charges ($)	Customer Charges ($)	Taxes ($)	Total Charge ($)
Jan	19,297	9,213	13	0	28,524
Feb	16,445	8,053	13	0	24,511
Mar	17,685	7,349	13	0	25,047
Apr	14,024	8,345	13	0	22,382
May	16,235	7,850	13	0	24,098
Jun	18,550	9,076	13	0	27,639
Jul	12,023	7,538	13	0	19,574
Aug	13,188	7,823	13	0	21,024
Sep	18,874	8,830	13	0	27,717
Oct	14,744	7,504	13	0	22,261
Nov	15,713	8,213	13	0	23,939
Dec	16,530	8,670	13	0	25,213
Totals	193,308	98,466	156	0	291,930

2. Totals

Billing Period	Total Charges ($)	Total Consumption (kWh)	Avg Price ($/kWh)
Jan	28,524	144,054	0.1980
Feb	24,511	122,761	0.1997
Mar	25,047	132,016	0.1897
Apr	22,382	104,688	0.2138
May	24,098	121,190	0.1988
Jun	27,639	138,477	0.1996
Jul	19,574	89,751	0.2181
Aug	21,024	98,448	0.2136
Sep	27,717	140,893	0.1967
Oct	22,261	110,062	0.2023
Nov	23,939	117,295	0.2041
Dec	25,213	123,392	0.2043
Totals	291,930	1,443,027	0.2023

3. Consumption Totals

Billing Period	Peak (kWh)	Mid-Peak (kWh)	Normal Peak (kWh)	Off-Peak (kWh)	Overall (kWh)
Jan	0	0	0	0	144,054
Feb	0	0	0	0	122,761
Mar	0	0	0	0	132,016
Apr	0	0	0	0	104,688
May	0	0	0	0	121,190
Jun	0	0	0	0	138,477
Jul	0	0	0	0	89,751
Aug	0	0	0	0	98,448
Sep	0	0	0	0	140,893
Oct	0	0	0	0	110,062
Nov	0	0	0	0	117,295
Dec	0	0	0	0	123,392
Totals	0	0	0	0	1,443,027

4. Billing Demands

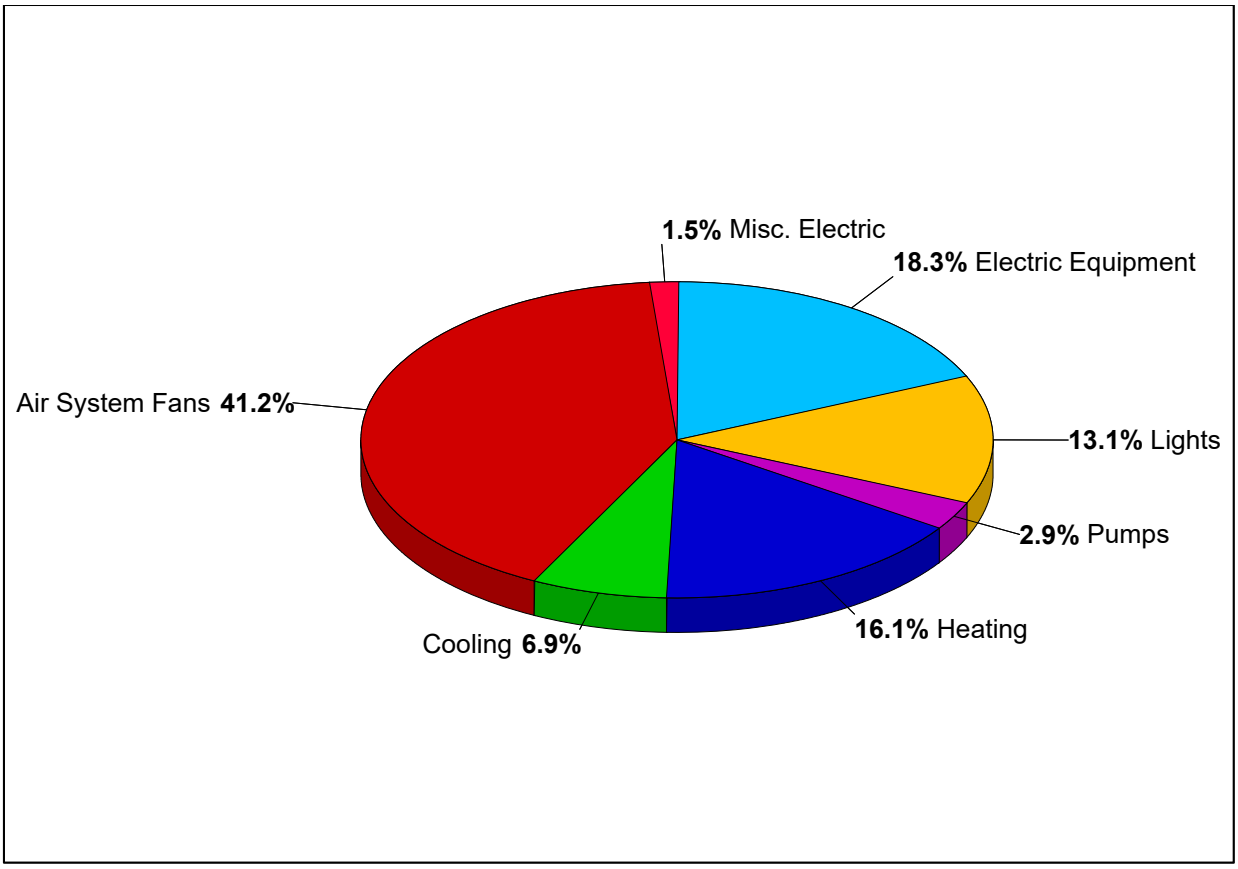
Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	702.7
Feb	0.0	0.0	0.0	0.0	614.2
Mar	0.0	0.0	0.0	0.0	560.5
Apr	0.0	0.0	0.0	0.0	636.4
May	0.0	0.0	0.0	0.0	598.7
Jun	0.0	0.0	0.0	0.0	692.2
Jul	0.0	0.0	0.0	0.0	574.9
Aug	0.0	0.0	0.0	0.0	596.6
Sep	0.0	0.0	0.0	0.0	673.5
Oct	0.0	0.0	0.0	0.0	572.3
Nov	0.0	0.0	0.0	0.0	626.4
Dec	0.0	0.0	0.0	0.0	661.3

5. Maximum Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	702.7
Feb	0.0	0.0	0.0	0.0	614.2
Mar	0.0	0.0	0.0	0.0	560.5
Apr	0.0	0.0	0.0	0.0	636.4
May	0.0	0.0	0.0	0.0	598.7
Jun	0.0	0.0	0.0	0.0	692.2
Jul	0.0	0.0	0.0	0.0	574.9
Aug	0.0	0.0	0.0	0.0	596.6
Sep	0.0	0.0	0.0	0.0	673.5
Oct	0.0	0.0	0.0	0.0	572.3
Nov	0.0	0.0	0.0	0.0	626.4
Dec	0.0	0.0	0.0	0.0	661.3

6. Time Of Maximum Demands (Date/Hour)

Billing Period	Peak	Mid-Peak	Normal Peak	Off-Peak	Overall
Jan	n/a	n/a	n/a	n/a	1/30 07:00
Feb	n/a	n/a	n/a	n/a	2/27 11:00
Mar	n/a	n/a	n/a	n/a	3/6 10:00
Apr	n/a	n/a	n/a	n/a	4/10 10:00
May	n/a	n/a	n/a	n/a	5/15 14:00
Jun	n/a	n/a	n/a	n/a	6/29 10:00
Jul	n/a	n/a	n/a	n/a	7/7 09:00
Aug	n/a	n/a	n/a	n/a	8/21 09:00
Sep	n/a	n/a	n/a	n/a	9/5 10:00
Oct	n/a	n/a	n/a	n/a	10/26 10:00
Nov	n/a	n/a	n/a	n/a	11/30 11:00
Dec	n/a	n/a	n/a	n/a	12/18 11:00



1. Annual Costs

Component	Annual Cost ($)	($/sqft)	Percent of Total (%)
Air System Fans	92,153	0.551	41.2
Cooling	15,519	0.093	6.9
Heating	35,945	0.215	16.1
Pumps	6,511	0.039	2.9
Heat Rejection Fans	0	0.000	0.0
HVAC Sub-Total	**150,128**	**0.898**	**67.0**
Lights	29,371	0.176	13.1
Electric Equipment	41,000	0.245	18.3
Misc. Electric	3,443	0.021	1.5
Misc. Fuel Use	0	0.000	0.0
Non-HVAC Sub-Total	**73,815**	**0.442**	**33.0**
Grand Total	**223,943**	**1.339**	**100.0**

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **167,180.7** sqft
Modeled Floor Area ..... **167,180.7** sqft

Energy Budget by System Component - [O2] Geo VRF Design

Project: Wilmington ES - LCCA Energy Model 01/15/2025
Prepared by: GGD Consulting Engineers, Inc. 2:25 PM

1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/sqft)
Cooling Coil Loads	2,191,877	13.111
Heating Coil Loads	767,193	4.589
Grand Total	**2,959,070**	**17.700**

2. Energy Consumption by System Component

Component	Site Energy (kBTU)	Site Energy (kBTU/sqft)	Source Energy (kBTU)	Source Energy (kBTU/sqft)
Air System Fans	1,664,212	9.955	5,943,614	35.552
Cooling	274,701	1.643	981,075	5.868
Heating	650,323	3.890	2,322,582	13.893
Pumps	116,843	0.699	417,296	2.496
Heat Rejection Fans	0	0.000	0	0.000
HVAC Sub-Total	**2,706,078**	**16.187**	**9,664,566**	**57.809**
Lights	530,513	3.173	1,894,688	11.333
Electric Equipment	740,556	4.430	2,644,844	15.820
Misc. Electric	62,643	0.375	223,724	1.338
Misc. Fuel Use	0	0.000	0	0.000
Non-HVAC Sub-Total	**1,333,712**	**7.978**	**4,763,256**	**28.492**
Grand Total	**4,039,790**	**24.164**	**14,427,822**	**86.301**

Notes:
1. 'Cooling Coil Loads' is the sum of all air system cooling coil loads.
2. 'Heating Coil Loads' is the sum of all air system heating coil loads.
3. Site Energy is the actual energy consumed.
4. Source Energy is the site energy divided by the electric generating efficiency (28.0%).
5. Source Energy for fuels equals the site energy value.
6. Energy per unit floor area is based on the gross building floor area.
   Gross Floor Area ..... **167180.7** sqft
   Modeled Floor Area ..... **167180.7** sqft

1. Component Charges

Billing Period	Energy Charges ($)	Demand Charges ($)	Customer Charges ($)	Taxes ($)	Total Charge ($)
Jan	16,051	6,981	13	0	23,045
Feb	13,735	5,778	13	0	19,526
Mar	14,976	5,666	13	0	20,655
Apr	12,260	5,134	13	0	17,407
May	14,305	5,151	13	0	19,469
Jun	14,309	5,832	13	0	20,154
Jul	8,692	4,561	13	0	13,266
Aug	9,396	4,740	13	0	14,149
Sep	14,180	5,731	13	0	19,924
Oct	13,424	5,220	13	0	18,658
Nov	13,743	5,061	13	0	18,817
Dec	13,531	5,330	13	0	18,874
Totals	158,603	65,185	156	0	223,944

2. Totals

Billing Period	Total Charges ($)	Total Consumption (kWh)	Avg Price ($/kWh)
Jan	23,045	119,821	0.1923
Feb	19,526	102,529	0.1904
Mar	20,655	111,794	0.1848
Apr	17,407	91,518	0.1902
May	19,469	106,787	0.1823
Jun	20,154	106,813	0.1887
Jul	13,266	64,884	0.2045
Aug	14,149	70,143	0.2017
Sep	19,924	105,855	0.1882
Oct	18,658	100,212	0.1862
Nov	18,817	102,591	0.1834
Dec	18,874	101,011	0.1869
Totals	223,944	1,183,958	0.1891

3. Consumption Totals

Billing Period	Peak (kWh)	Mid-Peak (kWh)	Normal Peak (kWh)	Off-Peak (kWh)	Overall (kWh)
Jan	0	0	0	0	119,821
Feb	0	0	0	0	102,529
Mar	0	0	0	0	111,794
Apr	0	0	0	0	91,518
May	0	0	0	0	106,787
Jun	0	0	0	0	106,813
Jul	0	0	0	0	64,884
Aug	0	0	0	0	70,143
Sep	0	0	0	0	105,855
Oct	0	0	0	0	100,212
Nov	0	0	0	0	102,591
Dec	0	0	0	0	101,011
Totals	0	0	0	0	1,183,958

4. Billing Demands

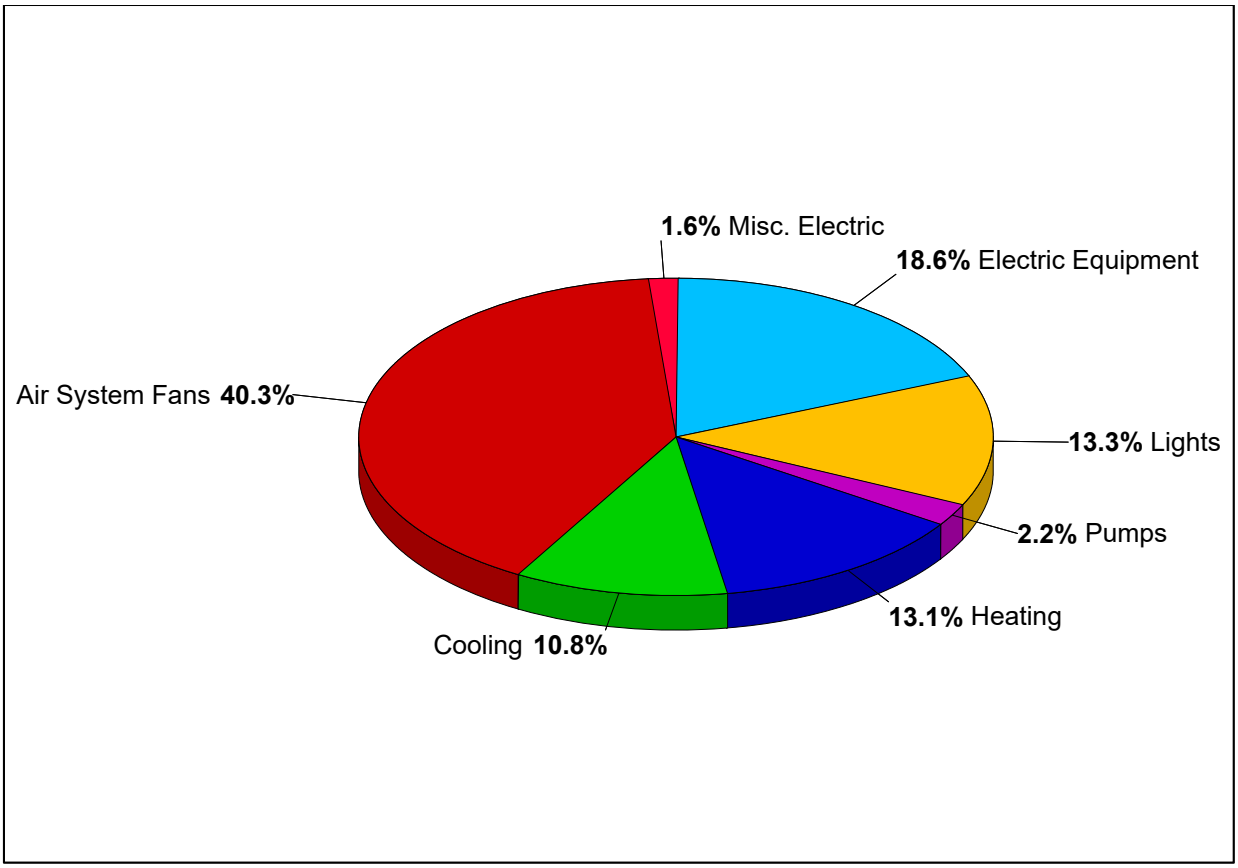
Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	532.4
Feb	0.0	0.0	0.0	0.0	440.7
Mar	0.0	0.0	0.0	0.0	432.2
Apr	0.0	0.0	0.0	0.0	391.6
May	0.0	0.0	0.0	0.0	392.8
Jun	0.0	0.0	0.0	0.0	444.8
Jul	0.0	0.0	0.0	0.0	347.9
Aug	0.0	0.0	0.0	0.0	361.5
Sep	0.0	0.0	0.0	0.0	437.1
Oct	0.0	0.0	0.0	0.0	398.1
Nov	0.0	0.0	0.0	0.0	386.0
Dec	0.0	0.0	0.0	0.0	406.5

5. Maximum Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	532.4
Feb	0.0	0.0	0.0	0.0	440.7
Mar	0.0	0.0	0.0	0.0	432.2
Apr	0.0	0.0	0.0	0.0	391.6
May	0.0	0.0	0.0	0.0	392.8
Jun	0.0	0.0	0.0	0.0	444.8
Jul	0.0	0.0	0.0	0.0	347.9
Aug	0.0	0.0	0.0	0.0	361.5
Sep	0.0	0.0	0.0	0.0	437.1
Oct	0.0	0.0	0.0	0.0	398.1
Nov	0.0	0.0	0.0	0.0	386.0
Dec	0.0	0.0	0.0	0.0	406.5

6. Time Of Maximum Demands (Date/Hour)

Billing Period	Peak	Mid-Peak	Normal Peak	Off-Peak	Overall
Jan	n/a	n/a	n/a	n/a	1/2 09:00
Feb	n/a	n/a	n/a	n/a	2/9 10:00
Mar	n/a	n/a	n/a	n/a	3/1 10:00
Apr	n/a	n/a	n/a	n/a	4/10 09:00
May	n/a	n/a	n/a	n/a	5/16 10:00
Jun	n/a	n/a	n/a	n/a	6/26 09:00
Jul	n/a	n/a	n/a	n/a	7/10 10:00
Aug	n/a	n/a	n/a	n/a	8/21 10:00
Sep	n/a	n/a	n/a	n/a	9/4 09:00
Oct	n/a	n/a	n/a	n/a	10/26 10:00
Nov	n/a	n/a	n/a	n/a	11/30 10:00
Dec	n/a	n/a	n/a	n/a	12/26 10:00



1. Annual Costs

Component	Annual Cost ($)	($/sqft)	Percent of Total (%)
Air System Fans	92,404	0.553	40.3
Cooling	24,818	0.148	10.8
Heating	30,125	0.180	13.1
Pumps	5,123	0.031	2.2
Heat Rejection Fans	0	0.000	0.0
HVAC Sub-Total	**152,470**	**0.912**	**66.5**
Lights	30,523	0.183	13.3
Electric Equipment	42,602	0.255	18.6
Misc. Electric	3,577	0.021	1.6
Misc. Fuel Use	0	0.000	0.0
Non-HVAC Sub-Total	**76,702**	**0.459**	**33.5**
Grand Total	**229,172**	**1.371**	**100.0**

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **167,180.7** sqft
Modeled Floor Area ..... **167,180.7** sqft

Energy Budget by System Component - [O3] ASHP Displacement Design

Project: Wilmington ES - LCCA Energy Model 01/15/2025
Prepared by: GGD Consulting Engineers, Inc. 2:25 PM

1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/sqft)
Cooling Coil Loads	1,485,544	8.886
Heating Coil Loads	465,280	2.783
Grand Total	**1,950,824**	**11.669**

2. Energy Consumption by System Component

Component	Site Energy (kBTU)	Site Energy (kBTU/sqft)	Source Energy (kBTU)	Source Energy (kBTU/sqft)
Air System Fans	1,602,666	9.586	5,723,809	34.237
Cooling	415,080	2.483	1,482,427	8.867
Heating	520,272	3.112	1,858,114	11.114
Pumps	88,818	0.531	317,206	1.897
Heat Rejection Fans	0	0.000	0	0.000
HVAC Sub-Total	**2,626,835**	**15.713**	**9,381,555**	**56.116**
Lights	530,509	3.173	1,894,674	11.333
Electric Equipment	740,552	4.430	2,644,829	15.820
Misc. Electric	62,643	0.375	223,724	1.338
Misc. Fuel Use	0	0.000	0	0.000
Non-HVAC Sub-Total	**1,333,703**	**7.978**	**4,763,227**	**28.492**
Grand Total	**3,960,539**	**23.690**	**14,144,782**	**84.608**

Notes:
1. 'Cooling Coil Loads' is the sum of all air system cooling coil loads.
2. 'Heating Coil Loads' is the sum of all air system heating coil loads.
3. Site Energy is the actual energy consumed.
4. Source Energy is the site energy divided by the electric generating efficiency (28.0%).
5. Source Energy for fuels equals the site energy value.
6. Energy per unit floor area is based on the gross building floor area.
   Gross Floor Area ..... **167180.7** sqft
   Modeled Floor Area ..... **167180.7** sqft

1. Component Charges

Billing Period	Energy Charges ($)	Demand Charges ($)	Customer Charges ($)	Taxes ($)	Total Charge ($)
Jan	15,620	9,551	13	0	25,185
Feb	13,023	5,332	13	0	18,368
Mar	13,937	6,542	13	0	20,492
Apr	11,164	4,743	13	0	15,920
May	13,070	5,397	13	0	18,479
Jun	15,117	7,374	13	0	22,504
Jul	10,515	6,185	13	0	16,713
Aug	11,477	6,532	13	0	18,023
Sep	14,394	6,942	13	0	21,349
Oct	12,153	5,258	13	0	17,424
Nov	12,525	4,655	13	0	17,193
Dec	12,497	5,014	13	0	17,523
Totals	155,492	73,526	156	0	229,174

2. Totals

Billing Period	Total Charges ($)	Total Consumption (kWh)	Avg Price ($/kWh)
Jan	25,185	116,604	0.2160
Feb	18,368	97,214	0.1889
Mar	20,492	104,039	0.1970
Apr	15,920	83,339	0.1910
May	18,479	97,564	0.1894
Jun	22,504	112,845	0.1994
Jul	16,713	78,496	0.2129
Aug	18,023	85,677	0.2104
Sep	21,349	107,452	0.1987
Oct	17,424	90,722	0.1921
Nov	17,193	93,497	0.1839
Dec	17,523	93,286	0.1878
Totals	229,174	1,160,735	0.1974

3. Consumption Totals

Billing Period	Peak (kWh)	Mid-Peak (kWh)	Normal Peak (kWh)	Off-Peak (kWh)	Overall (kWh)
Jan	0	0	0	0	116,604
Feb	0	0	0	0	97,214
Mar	0	0	0	0	104,039
Apr	0	0	0	0	83,339
May	0	0	0	0	97,564
Jun	0	0	0	0	112,845
Jul	0	0	0	0	78,496
Aug	0	0	0	0	85,677
Sep	0	0	0	0	107,452
Oct	0	0	0	0	90,722
Nov	0	0	0	0	93,497
Dec	0	0	0	0	93,286
Totals	0	0	0	0	1,160,735

4. Billing Demands

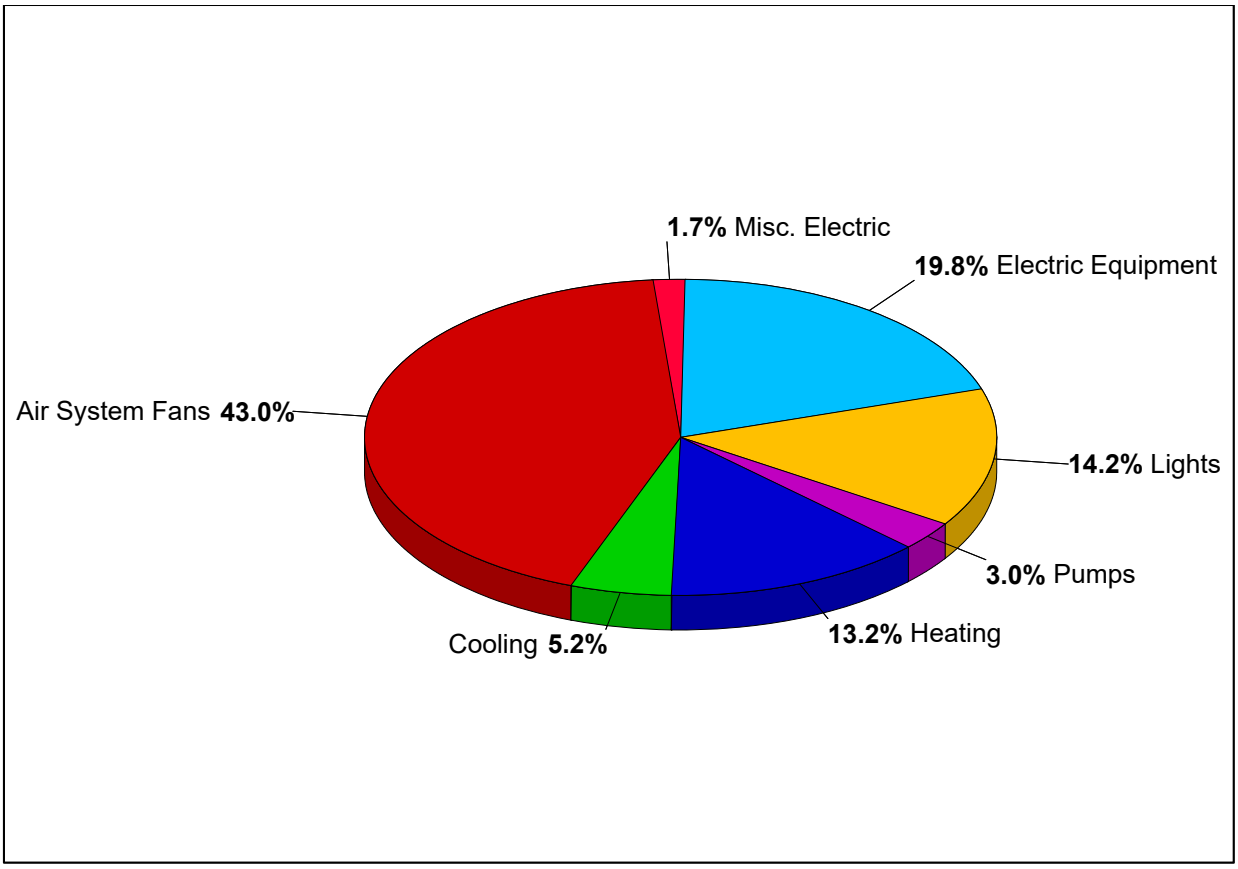
Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	728.5
Feb	0.0	0.0	0.0	0.0	406.6
Mar	0.0	0.0	0.0	0.0	499.0
Apr	0.0	0.0	0.0	0.0	361.8
May	0.0	0.0	0.0	0.0	411.6
Jun	0.0	0.0	0.0	0.0	562.4
Jul	0.0	0.0	0.0	0.0	471.7
Aug	0.0	0.0	0.0	0.0	498.2
Sep	0.0	0.0	0.0	0.0	529.5
Oct	0.0	0.0	0.0	0.0	401.0
Nov	0.0	0.0	0.0	0.0	355.0
Dec	0.0	0.0	0.0	0.0	382.4

5. Maximum Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	728.5
Feb	0.0	0.0	0.0	0.0	406.6
Mar	0.0	0.0	0.0	0.0	499.0
Apr	0.0	0.0	0.0	0.0	361.8
May	0.0	0.0	0.0	0.0	411.6
Jun	0.0	0.0	0.0	0.0	562.4
Jul	0.0	0.0	0.0	0.0	471.7
Aug	0.0	0.0	0.0	0.0	498.2
Sep	0.0	0.0	0.0	0.0	529.5
Oct	0.0	0.0	0.0	0.0	401.0
Nov	0.0	0.0	0.0	0.0	355.0
Dec	0.0	0.0	0.0	0.0	382.4

6. Time Of Maximum Demands (Date/Hour)

Billing Period	Peak	Mid-Peak	Normal Peak	Off-Peak	Overall
Jan	n/a	n/a	n/a	n/a	1/30 08:00
Feb	n/a	n/a	n/a	n/a	2/9 08:00
Mar	n/a	n/a	n/a	n/a	3/1 06:00
Apr	n/a	n/a	n/a	n/a	4/10 08:00
May	n/a	n/a	n/a	n/a	5/10 14:00
Jun	n/a	n/a	n/a	n/a	6/26 09:00
Jul	n/a	n/a	n/a	n/a	7/10 10:00
Aug	n/a	n/a	n/a	n/a	8/21 10:00
Sep	n/a	n/a	n/a	n/a	9/5 09:00
Oct	n/a	n/a	n/a	n/a	10/27 09:00
Nov	n/a	n/a	n/a	n/a	11/22 10:00
Dec	n/a	n/a	n/a	n/a	12/26 09:00



1. Annual Costs

Component	Annual Cost ($)	($/sqft)	Percent of Total (%)
Air System Fans	88,407	0.529	43.0
Cooling	10,639	0.064	5.2
Heating	27,214	0.163	13.2
Pumps	6,131	0.037	3.0
Heat Rejection Fans	0	0.000	0.0
HVAC Sub-Total	**132,390**	**0.792**	**64.3**
Lights	29,184	0.175	14.2
Electric Equipment	40,755	0.244	19.8
Misc. Electric	3,417	0.020	1.7
Misc. Fuel Use	0	0.000	0.0
Non-HVAC Sub-Total	**73,357**	**0.439**	**35.7**
Grand Total	**205,747**	**1.231**	**100.0**

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **167,180.7** sqft
Modeled Floor Area ..... **167,180.7** sqft

Energy Budget by System Component - [O4] Geo Displacement Design

Project: Wilmington ES - LCCA Energy Model 01/15/2025
Prepared by: GGD Consulting Engineers, Inc. 2:25 PM

1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/sqft)
Cooling Coil Loads	1,485,544	8.886
Heating Coil Loads	465,280	2.783
Grand Total	**1,950,824**	**11.669**

2. Energy Consumption by System Component

Component	Site Energy (kBTU)	Site Energy (kBTU/sqft)	Source Energy (kBTU)	Source Energy (kBTU/sqft)
Air System Fans	1,602,666	9.586	5,723,809	34.237
Cooling	185,027	1.107	660,811	3.953
Heating	498,224	2.980	1,779,370	10.643
Pumps	110,465	0.661	394,519	2.360
Heat Rejection Fans	0	0.000	0	0.000
HVAC Sub-Total	**2,396,382**	**14.334**	**8,558,509**	**51.193**
Lights	530,509	3.173	1,894,674	11.333
Electric Equipment	740,552	4.430	2,644,829	15.820
Misc. Electric	62,643	0.375	223,724	1.338
Misc. Fuel Use	0	0.000	0	0.000
Non-HVAC Sub-Total	**1,333,703**	**7.978**	**4,763,227**	**28.492**
Grand Total	**3,730,086**	**22.312**	**13,321,736**	**79.685**

Notes:
1. 'Cooling Coil Loads' is the sum of all air system cooling coil loads.
2. 'Heating Coil Loads' is the sum of all air system heating coil loads.
3. Site Energy is the actual energy consumed.
4. Source Energy is the site energy divided by the electric generating efficiency (28.0%).
5. Source Energy for fuels equals the site energy value.
6. Energy per unit floor area is based on the gross building floor area.
   Gross Floor Area ..... **167180.7** sqft
   Modeled Floor Area ..... **167180.7** sqft

1. Component Charges

Billing Period	Energy Charges ($)	Demand Charges ($)	Customer Charges ($)	Taxes ($)	Total Charge ($)
Jan	14,347	5,473	13	0	19,833
Feb	12,388	4,930	13	0	17,331
Mar	13,460	4,722	13	0	18,195
Apr	11,295	4,529	13	0	15,836
May	13,001	4,724	13	0	17,738
Jun	13,439	5,769	13	0	19,221
Jul	8,732	4,639	13	0	13,384
Aug	9,441	4,966	13	0	14,420
Sep	13,006	5,490	13	0	18,510
Oct	12,354	4,718	13	0	17,085
Nov	12,612	4,618	13	0	17,243
Dec	12,369	4,570	13	0	16,952
Totals	146,444	59,148	156	0	205,748

2. Totals

Billing Period	Total Charges ($)	Total Consumption (kWh)	Avg Price ($/kWh)
Jan	19,833	107,100	0.1852
Feb	17,331	92,478	0.1874
Mar	18,195	100,475	0.1811
Apr	15,836	84,313	0.1878
May	17,738	97,051	0.1828
Jun	19,221	100,319	0.1916
Jul	13,384	65,187	0.2053
Aug	14,420	70,477	0.2046
Sep	18,510	97,091	0.1906
Oct	17,085	92,222	0.1853
Nov	17,243	94,149	0.1832
Dec	16,952	92,332	0.1836
Totals	205,748	1,093,195	0.1882

3. Consumption Totals

Billing Period	Peak (kWh)	Mid-Peak (kWh)	Normal Peak (kWh)	Off-Peak (kWh)	Overall (kWh)
Jan	0	0	0	0	107,100
Feb	0	0	0	0	92,478
Mar	0	0	0	0	100,475
Apr	0	0	0	0	84,313
May	0	0	0	0	97,051
Jun	0	0	0	0	100,319
Jul	0	0	0	0	65,187
Aug	0	0	0	0	70,477
Sep	0	0	0	0	97,091
Oct	0	0	0	0	92,222
Nov	0	0	0	0	94,149
Dec	0	0	0	0	92,332
Totals	0	0	0	0	1,093,195

4. Billing Demands

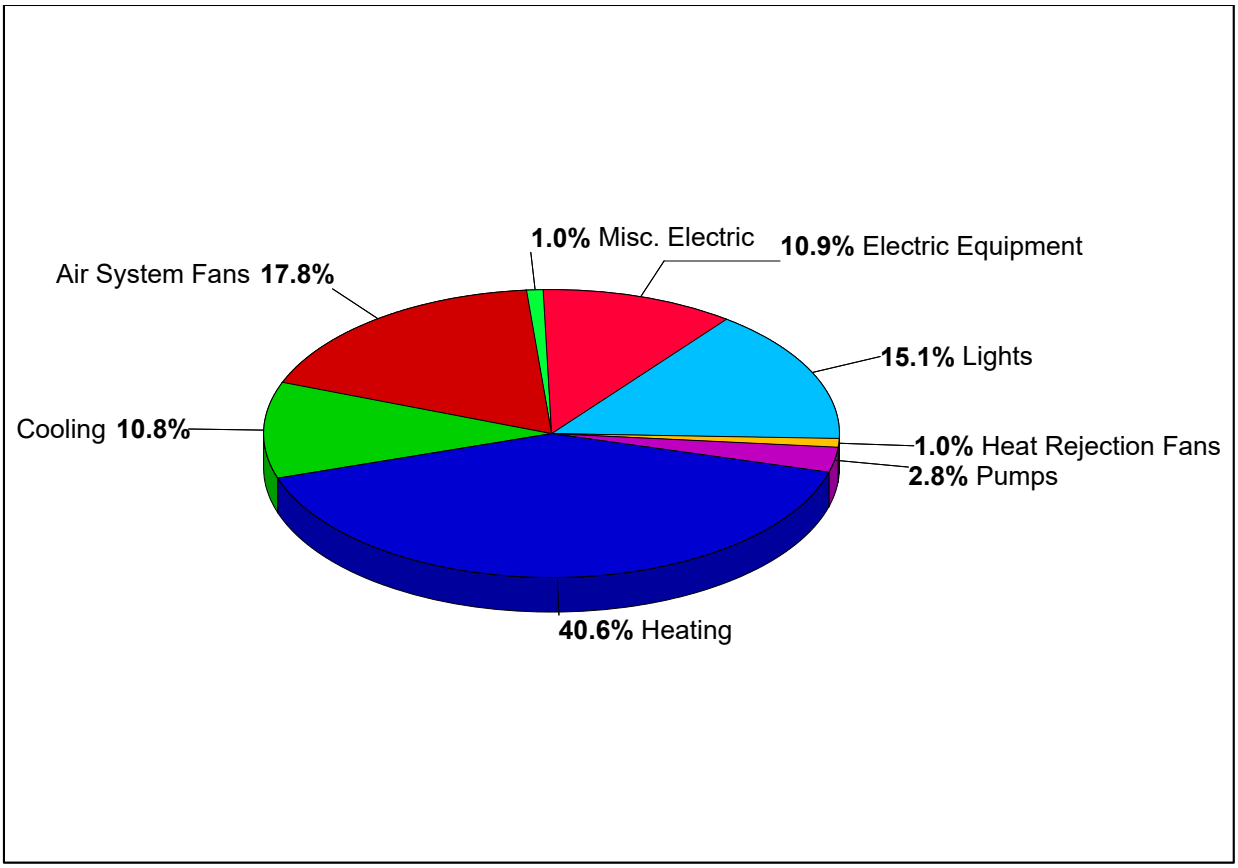
Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	417.4
Feb	0.0	0.0	0.0	0.0	376.0
Mar	0.0	0.0	0.0	0.0	360.2
Apr	0.0	0.0	0.0	0.0	345.4
May	0.0	0.0	0.0	0.0	360.3
Jun	0.0	0.0	0.0	0.0	440.0
Jul	0.0	0.0	0.0	0.0	353.8
Aug	0.0	0.0	0.0	0.0	378.7
Sep	0.0	0.0	0.0	0.0	418.7
Oct	0.0	0.0	0.0	0.0	359.8
Nov	0.0	0.0	0.0	0.0	352.2
Dec	0.0	0.0	0.0	0.0	348.5

5. Maximum Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	417.4
Feb	0.0	0.0	0.0	0.0	376.0
Mar	0.0	0.0	0.0	0.0	360.2
Apr	0.0	0.0	0.0	0.0	345.4
May	0.0	0.0	0.0	0.0	360.3
Jun	0.0	0.0	0.0	0.0	440.0
Jul	0.0	0.0	0.0	0.0	353.8
Aug	0.0	0.0	0.0	0.0	378.7
Sep	0.0	0.0	0.0	0.0	418.7
Oct	0.0	0.0	0.0	0.0	359.8
Nov	0.0	0.0	0.0	0.0	352.2
Dec	0.0	0.0	0.0	0.0	348.5

6. Time Of Maximum Demands (Date/Hour)

Billing Period	Peak	Mid-Peak	Normal Peak	Off-Peak	Overall
Jan	n/a	n/a	n/a	n/a	1/30 08:00
Feb	n/a	n/a	n/a	n/a	2/6 08:00
Mar	n/a	n/a	n/a	n/a	3/1 09:00
Apr	n/a	n/a	n/a	n/a	4/13 10:00
May	n/a	n/a	n/a	n/a	5/11 09:00
Jun	n/a	n/a	n/a	n/a	6/26 09:00
Jul	n/a	n/a	n/a	n/a	7/10 10:00
Aug	n/a	n/a	n/a	n/a	8/21 10:00
Sep	n/a	n/a	n/a	n/a	9/4 09:00
Oct	n/a	n/a	n/a	n/a	10/9 09:00
Nov	n/a	n/a	n/a	n/a	11/30 10:00
Dec	n/a	n/a	n/a	n/a	12/18 10:00



1. Annual Costs

Component	Annual Cost ($)	($/sqft)	Percent of Total (%)
Air System Fans	71,423	0.427	17.8
Cooling	43,219	0.259	10.8
Heating	162,854	0.974	40.6
Pumps	11,182	0.067	2.8
Heat Rejection Fans	3,908	0.023	1.0
HVAC Sub-Total	**292,585**	**1.750**	**73.0**
Lights	60,611	0.363	15.1
Electric Equipment	43,596	0.261	10.9
Misc. Electric	3,866	0.023	1.0
Misc. Fuel Use	0	0.000	0.0
Non-HVAC Sub-Total	**108,074**	**0.646**	**27.0**
Grand Total	**400,659**	**2.397**	**100.0**

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **167,180.6** sqft
Modeled Floor Area ..... **167,180.6** sqft

Energy Budget by System Component - [L-B] LEED Baseline

Project: Wilmington ES - LCCA Energy Model 01/15/2025
Prepared by: GGD Consulting Engineers, Inc. 2:26 PM

1. Annual Coil Loads

Component	Load (kBTU)	(kBTU/sqft)
Cooling Coil Loads	4,050,710	24.230
Heating Coil Loads	3,052,593	18.259
Grand Total	**7,103,303**	**42.489**

2. Energy Consumption by System Component

Component	Site Energy (kBTU)	Site Energy (kBTU/sqft)	Source Energy (kBTU)	Source Energy (kBTU/sqft)
Air System Fans	1,216,465	7.276	4,344,519	25.987
Cooling	732,592	4.382	2,616,399	15.650
Heating	2,790,328	16.691	9,965,459	59.609
Pumps	188,975	1.130	674,909	4.037
Heat Rejection Fans	65,945	0.395	235,516	1.409
HVAC Sub-Total	**4,994,304**	**29.874**	**17,836,802**	**106.692**
Lights	1,030,064	6.161	3,678,800	22.005
Electric Equipment	740,569	4.430	2,644,889	15.821
Misc. Electric	65,901	0.394	235,361	1.408
Misc. Fuel Use	0	0.000	0	0.000
Non-HVAC Sub-Total	**1,836,534**	**10.985**	**6,559,050**	**39.233**
Grand Total	**6,830,838**	**40.859**	**24,395,852**	**145.925**

Notes:
1. 'Cooling Coil Loads' is the sum of all air system cooling coil loads.
2. 'Heating Coil Loads' is the sum of all air system heating coil loads.
3. Site Energy is the actual energy consumed.
4. Source Energy is the site energy divided by the electric generating efficiency (28.0%).
5. Source Energy for fuels equals the site energy value.
6. Energy per unit floor area is based on the gross building floor area.
   Gross Floor Area ..... **167180.6** sqft
   Modeled Floor Area ..... **167180.6** sqft

1. Component Charges

Billing Period	Energy Charges ($)	Demand Charges ($)	Customer Charges ($)	Taxes ($)	Total Charge ($)
Jan	33,464	15,354	13	0	48,831
Feb	28,257	12,664	13	0	40,934
Mar	26,890	12,869	13	0	39,772
Apr	17,452	11,158	13	0	28,622
May	17,687	8,553	13	0	26,253
Jun	21,973	10,185	13	0	32,171
Jul	16,813	9,588	13	0	26,413
Aug	18,031	9,623	13	0	27,667
Sep	23,993	10,743	13	0	34,749
Oct	16,442	8,968	13	0	25,424
Nov	20,842	10,777	13	0	31,632
Dec	26,337	11,843	13	0	38,193
Totals	268,180	132,324	156	0	400,661

2. Totals

Billing Period	Total Charges ($)	Total Consumption (kWh)	Avg Price ($/kWh)
Jan	48,831	249,808	0.1955
Feb	40,934	210,936	0.1941
Mar	39,772	200,732	0.1981
Apr	28,622	130,276	0.2197
May	26,253	132,028	0.1988
Jun	32,171	164,026	0.1961
Jul	26,413	125,505	0.2105
Aug	27,667	134,598	0.2056
Sep	34,749	179,103	0.1940
Oct	25,424	122,741	0.2071
Nov	31,632	155,586	0.2033
Dec	38,193	196,604	0.1943
Totals	400,661	2,001,943	0.2001

3. Consumption Totals

Billing Period	Peak (kWh)	Mid-Peak (kWh)	Normal Peak (kWh)	Off-Peak (kWh)	Overall (kWh)
Jan	0	0	0	0	249,808
Feb	0	0	0	0	210,936
Mar	0	0	0	0	200,732
Apr	0	0	0	0	130,276
May	0	0	0	0	132,028
Jun	0	0	0	0	164,026
Jul	0	0	0	0	125,505
Aug	0	0	0	0	134,598
Sep	0	0	0	0	179,103
Oct	0	0	0	0	122,741
Nov	0	0	0	0	155,586
Dec	0	0	0	0	196,604
Totals	0	0	0	0	2,001,943

4. Billing Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	1171.0
Feb	0.0	0.0	0.0	0.0	965.9
Mar	0.0	0.0	0.0	0.0	981.5
Apr	0.0	0.0	0.0	0.0	851.0
May	0.0	0.0	0.0	0.0	652.4
Jun	0.0	0.0	0.0	0.0	776.8
Jul	0.0	0.0	0.0	0.0	731.2
Aug	0.0	0.0	0.0	0.0	733.9
Sep	0.0	0.0	0.0	0.0	819.4
Oct	0.0	0.0	0.0	0.0	684.0
Nov	0.0	0.0	0.0	0.0	821.9
Dec	0.0	0.0	0.0	0.0	903.2

5. Maximum Demands

Billing Period	Peak (kW)	Mid-Peak (kW)	Normal Peak (kW)	Off-Peak (kW)	Overall (kW)
Jan	0.0	0.0	0.0	0.0	1171.0
Feb	0.0	0.0	0.0	0.0	965.9
Mar	0.0	0.0	0.0	0.0	981.5
Apr	0.0	0.0	0.0	0.0	851.0
May	0.0	0.0	0.0	0.0	652.4
Jun	0.0	0.0	0.0	0.0	776.8
Jul	0.0	0.0	0.0	0.0	731.2
Aug	0.0	0.0	0.0	0.0	733.9
Sep	0.0	0.0	0.0	0.0	819.4
Oct	0.0	0.0	0.0	0.0	684.0
Nov	0.0	0.0	0.0	0.0	821.9
Dec	0.0	0.0	0.0	0.0	903.2

6. Time Of Maximum Demands (Date/Hour)

Billing Period	Peak	Mid-Peak	Normal Peak	Off-Peak	Overall
Jan	n/a	n/a	n/a	n/a	1/30 07:00
Feb	n/a	n/a	n/a	n/a	2/10 06:00
Mar	n/a	n/a	n/a	n/a	3/1 06:00
Apr	n/a	n/a	n/a	n/a	4/10 05:00
May	n/a	n/a	n/a	n/a	5/16 10:00
Jun	n/a	n/a	n/a	n/a	6/26 09:00
Jul	n/a	n/a	n/a	n/a	7/10 10:00
Aug	n/a	n/a	n/a	n/a	8/18 09:00
Sep	n/a	n/a	n/a	n/a	9/5 10:00
Oct	n/a	n/a	n/a	n/a	10/27 10:00
Nov	n/a	n/a	n/a	n/a	11/27 06:00
Dec	n/a	n/a	n/a	n/a	12/27 06:00

APPENDIX:
2022 GEOTHERMAL FEDERAL TAX CREDIT REFERENCES

CLIMATEMASTER
A NIBE GROUP MEMBER

IRA 2023

COMMERCIAL GEOTHERMAL

Tax Guide 2023

INFLATION REDUCTION ACT OF 2022 (IRA)

The Inflation Reduction Act of 2022 (IRA) substantially extends and enhances the federal income tax credits and incentives available for the installation of geothermal heat pump (GHP) energy property in commercial buildings, including the introduction of a new direct payment option for non-taxable entities. For taxable businesses, there are also new carryback and transfer provisions along with a continuation of the accelerated depreciation benefits. These new incentives are unfortunately more complex in structure. This guide is designed to provide a detailed review of the new tax and depreciation incentives available for commercial GHP energy property under the IRA.

Federal Income Tax Credits:

- Investment tax credit (ITC) up to 30% of system cost basis
- Domestic content bonus tax credit up to 10% of system cost basis
- Energy community bonus tax credit up to 10% of system cost basis
- Direct-pay option for non-taxable entities
- No cap on total credit amount
- Can be used to offset AMT tax
- Can be used in more than one year
- Can be carried back up to 3 years or transferred/sold to an unrelated party
- Can be combined with solar and other clean energy tax credits

Accelerated Depreciation:

- 5-year MACRS depreciation of system cost basis (less ½ of tax credit)
- Eligible for first-year bonus depreciation

Eligibility:

- Building located in U.S.
- Original use begins with taxpayer
- Construction commenced before 1/1/2035

Business Energy Investment Tax Credit

The business ITC for geothermal heat pump property was originally enacted in the Energy Improvement and Extension Act of 2008. This legislation added geothermal heat pumps to the definition of energy property under section 48(a) of the Internal Revenue Code with a 10% tax credit. This credit was extended by Bipartisan Budget Act of 2018 and most recently enhanced and further extended by the IRA of 2022. Effective 1/1/2023, there is now a 2-tier structure in place with a base credit rate of 6% and an increased rate of 30% if any one of the following criteria are met:

1. The maximum net output capacity of the GHP project is less than 1 megawatt (3.4 million Btu/h) of thermal energy. The Geothermal Exchange Organization (GEO) has submitted analysis that equates this to a total installed system capacity of 445 tons for distributed zone-level GHPs or 285 tons for central plant GHPs. The Department of Treasury is currently developing guidance.
2. The project is installed under specific prevailing wage and apprenticeship requirements. The IRS issued guidance for these requirements in Notice 2022-61 on 11-30-2022.
3. Construction of the project was commenced prior to 1-29-2023.

The ITC for GHP energy property is effective for projects that commence construction prior to 1/1/2035. In 2033 the base rate drops to 5.2% and the increased rate to 26%, while in 2034 they decline to 4.4% and 22% respectively.

Domestic Bonus Tax Credit

The domestic content bonus requires that any steel, iron, or manufactured product that is part of the GHP project at time of completion be produced in the United States. There is a 2-tier structure in place with a base credit rate of 2% and an increased rate of 10% that is based on the same criteria as for the ITC outlined above.

For purposes of this bonus, steel and iron used in the GHP project must be produced in the United States. This requirement applies to construction materials made primarily of steel or iron, but not to steel or iron used as components or sub-components of other manufactured products. Manufactured products are deemed to have been manufactured in the United States if at least 40% of the total cost of the incorporated components and subcomponents are mined, produced, or manufactured in the United States. The percentage of domestic content required for manufactured products increases to 45% for projects that begin construction in 2025, 50% for projects that begin construction in 2026, and 55% for projects that begin construction after 2026. GHP projects certainly appear to be able meet these requirements, however the Department of Treasury is developing necessary guidance.

The Domestic Content Bonus is not available for GHP projects completed before 1/1/2023

Direct Pay

Non-taxable entities have historically been unable to use the ITC. To address this, the IRA creates a new direct pay mechanism that, in effect, provides a refundable credit equal to the GHP project ITC with any domestic content bonus. Entities eligible include tax exempt organizations, a State or political subdivision thereof, the Tennessee Valley Authority, Indian tribal governments, Alaska Native Corporations, and rural electric cooperatives. Examples of these entities include charities, churches, foundations, state and local government buildings, schools, universities, and other nonprofits.

Direct pay is available for GHP projects that are placed in service after 12/31/2022.

Transfer or Sale of Tax Credit

Taxpayers may transfer the ITC including any domestic content bonus to an unrelated taxpayer. Consideration must be paid in cash, is not included in the income of the transferor, and is not deductible to the transferee. The transferee shall be treated as the taxpayer for all purposes with respect to the credit. For GHP energy projects held by a partnership, only the partnership can elect to transfer the eligible credits, not the individual partners. Direct pay is available for GHP projects that are placed in service after 12/31/2022.

Credit Carryback

The IRA extends the ITC carryback period to 3 years. The credit must originate in a tax year that begins after 12/31/2022. Any unused portion of the credit can also be carried forward.

Depreciation of Energy Property

Energy property is classified as a 5-year property in section 168(e) (3)(B)(vi) of the Internal Revenue Code, meaning the cost of the property can be deducted on an accelerated MACRS basis. For depreciation purposes, the system cost basis must be reduced by one half of the energy tax credit. In the example of a C-corporation in a 26% overall (federal plus state) tax bracket receiving a 40% ITC (includes the domestic content bonus), MACRS depreciation provides an additional tax savings equal to 20.8% of the energy property basis over the first 5 years, or optionally most within the first year. By comparison, conventional heating and cooling systems are generally depreciated on a 39-year straight line basis and would provide only 3.33% of the basis in tax savings over the first 5 years. The tax benefits for pass-through entities such as S-corporations could be much higher due to the higher marginal tax rates for individuals.

Energy property is eligible for first year bonus depreciation. The bonus allowance is 100% in 2022, 80% in 2023, 60% in 2024, 40% in 2025, 20% in 2026 and phases out in 2027. Refer to IRS Publication 946 for more information regarding how to depreciate property.

Eligible Geothermal Heat Pump Energy Property

The tax credit may be claimed for spending on equipment which uses the ground or ground water as a thermal energy source to heat a structure or as a thermal energy sink to cool a structure. The structure must be located in the United States. Spending includes costs of installation.

The credit cannot be claimed for spending on equipment used solely for a purpose other than heating or cooling a structure or on previously used equipment.

Construction Commenced Requirement

The credit can be claimed on spending for projects on which construction has commenced prior to January 1st, 2035. There is no time limit on when the construction must be completed for GHP energy projects. See IRS Notice 2018-59 for methods of establishing the commencement of construction.

System Cost Basis

The cost basis includes the direct costs associated with the purchase and installation of the energy property as well as any indirect costs that may be partly or fully allocable to its construction (including taxes). This includes equipment such as ground heat exchangers or wells, distribution piping and ductwork, pumps, GHPs and controls along with the associated installation labor and materials. The basis also generally includes those portions of the electrical, plumbing, design and GC fees that are specifically associated with the geothermal property. Utility rebates usually reduce the basis. See the uniform capitalization rules of IRS section 263A.

Dual Use Property Hybrid GHP Systems

If a GHP energy property contains a source of energy other than from the ground or ground water, portions of the system that carry both forms of energy may be considered dual use equipment. This would typically be equipment such as ductwork downstream of the GHP. The presence of an auxiliary energy source solely for emergency back-up purposes is not considered in this determination. Otherwise, if more than 25% of the annual energy (not peak energy) comes from the auxiliary source, any dual use equipment in the system may no longer be eligible for inclusion in the ITC cost basis. These comments are based on an interpretation of a 1979 code definition of energy property for direct use geothermal energy such as hot water for heating. There have been no further guidelines published by the IRS since that time. The IRS may not apply this language in this same way to GHP energy property and, as such, this interpretation is offered on a precautionary basis for those developing hybrid GHP energy projects. See 26 CFR 1.48-9 - Definition of energy property.

Energy Credit and AMT

The ITC can be used to offset both regular income taxes and alternative minimum taxes (AMT).

Ownership Considerations

Geothermal energy property ITC credits and depreciation deductions can only be claimed by the owner of the eligible property, including utilities that own energy property. At present, business models as used by the solar industry where a third-party owner (TPO) leases or sells energy from an energy property to a consumer are prohibited for GHP property due to IRS rules related to "limited use." The issue is the non-removable geothermal loop being dedicated to a single customer, in effect making the TPO a lender rather than a true owner. GEO is working with Treasury to develop a work around.

Energy Communities

The law includes an additional bonus credit of 10% (or 2% for projects over 1MW that don't meet prevailing wage/apprenticeship requirements) for Section 48 technologies that are installed in "energy communities." Energy communities are defined as:

- Census tract or adjoining tract with coal mine closed since 2000, or
- Census tract or adjoining tract with coal plant closed since 2010, or
- Defined as "a brownfield site" by the EPA, or
- a metropolitan or non-metropolitan statistical area where 0.17% or more direct employment, or at least 25% of local tax revenues, are related to extraction, processing, transport, or storage of coal, oil, or natural gas, and unemployment is at or above the national average in the previous year

Claiming the Credit

IRS Form 3468 is used to claim the Energy Credit. Visit www.irs.gov to download the latest tax form and instructions.

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Clean Energy Tax Incentives: Elective Pay Eligible Tax Credits

The Inflation Reduction Act of 2022 ("IRA") makes several clean energy tax credits available to businesses; tax-exempt organizations; state, local, and tribal governments; other entities; and individuals. The IRA also enables entities to take advantage of certain clean energy tax credits through its elective pay provision (also colloquially known as direct pay). Elective pay allows several types of entities, such as tax-exempts and governments, to treat the amount of certain credits as a payment against tax on their tax returns and as a result receive direct payments for certain clean energy tax credits.

	Tax Provision	Description
Energy Generation & Carbon Capture	**Production Tax Credit for Electricity from Renewables** (§ 45, pre-2025)	**For production of electricity from eligible renewable sources**, including wind, biomass, geothermal, solar, small irrigation, landfill and trash, hydropower, marine and hydrokinetic energy. **Credit Amount (for 2022):** 0.55 cents/kilowatt (kW); (1/2 rate for electricity produced from open loop biomass, landfill gas, and trash); 2.75 cents/kW if Prevailing Wage and Apprenticeship (PWA) rules are met [1,2,3,7]
	Clean Electricity Production Tax Credit (§ 45Y, 2025 onwards)	**Technology-neutral tax credit for production of clean electricity**. Replaces § 45 for facilities that begin construction and are placed in service after 2024. **Credit Amount:** Starts in 2025, consistent with credit amounts under section 45 [1,2,3,6,7]
	Investment Tax Credit for Energy Property (§ 48, pre-2025)	**For investment in renewable energy projects** including fuel cell, solar, geothermal, small wind, energy storage, biogas, microgrid controllers, and combined heat and power properties **Credit Amount:** 6% of qualified investment (basis); 30% if PWA requirements met [1,4,5,6,8]
	Clean Electricity Investment Tax Credit (§ 48E, 2025 onwards)	**Technology-neutral tax credit for investment in facilities that generate clean electricity** and qualified energy storage technologies. Replaces § 48 for facilities that begin construction and are placed in service after 2024 **Credit Amount:** 6% of qualified investment (basis); 30% if PWA requirements met [1,4,5,6]
	Low-Income Communities Bonus Credit (§ 48(e), 48E(h)) Application required	**Additional investment tax credit for small-scale solar and wind (§ 48(e)) or clean electricity (§48E(h)) facilities** (<5MW net output) on Indian land, federally subsidized housing, in low-income communities, and benefit low-income households. Allocated through an application process. **Credit Amount:** 10 or 20 percentage point increase on base investment tax credit [7]
	Credit for Carbon Oxide Sequestration (§ 45Q)	**Credit for carbon dioxide sequestration** coupled with permitted end uses in the United States. **Credit Amount:** $12-36 per metric ton of qualified carbon oxide captured and sequestered, used as a tertiary injectant, or used, depending on the specified end use; $60-$180 per metric ton if PWA requirements met.[1,7]
	Zero-Emission Nuclear Power Production Credit (§ 45U)	**For electricity from nuclear power facilities.** Facilities in operation prior to August 16, 2022. **Credit Amount (for 2023):** 0.3 cents/kWh (reduced rate for larger facilities); 1.5 cent/kWh if PW req's met [1,7]
Manufacturing	**Advanced Energy Project Credit** (§ 48C) Application required	**For investments in advanced energy projects.** A total of $10 billion will be allocated, not less than $4 billion of which will be allocated to projects in certain energy communities. **Credit Amount:** 6% of taxpayer's qualified investment; 30% if PWA requirements are met [1]
	Advanced Manufacturing Production Credit (§ 45X)	**Production tax credit for domestic clean energy manufacturing** of components including solar and wind energy, inverters, battery components, and critical materials. **Credit Amount:** Varies by component
Vehicles	**Credit for Qualified Commercial Clean Vehicles** (§ 45W)	**For purchasers of commercial clean vehicles**. Qualifying vehicles include passenger vehicles, buses, ambulances, and certain other vehicles for use on public streets, roads, and highways. **Credit Amount:** Up to $40,000 (max $7,500 for vehicles <14,000 lbs) [9]
	Alternative Fuel Vehicle Refueling Property Credit (§ 30C)	**For alternative fuel vehicle refueling and charging property**, located in low-income and non-urban areas. Qualified fuels include electricity, ethanol, natural gas, hydrogen, and biodiesel. **Credit Amount:** 6% of basis for businesses and can increase to 30% if PWA is met.
Fuels	**Clean Hydrogen Production Tax Credit** (§ 45V)	**For producing clean hydrogen** at a qualified, U.S.-based clean hydrogen production facility. **Credit Amount:** $0.60/kg multiplied by the applicable percentage (20% to 100%, depending on lifecycle greenhouse gas emissions), amount increases if PWA is met [1,7]
	Clean Fuel Production Credit (§ 45Z, 2025 onwards)	**Technology neutral tax credit for domestic production of clean transportation fuels**, including sustainable aviation fuels, beginning in 2025* **Credit Amount:** $0.20/gallon ($0.35/gal for aviation fuel) multiplied by CO2 "emissions factor"; $1.00/gallon ($1.75/gal for aviation fuel) multiplied by CO2 "emissions factor" if PWA is met [1,7]

Please see the notes on the next page or see IRS.gov/cleanenergy for more information.

Notes:

The information in this document may be subject to change as guidance is issued or finalized. For all IRA clean energy tax credits, please see **irs.gov/cleanenergy** for further details and eligibility requirements.

[1] Credit is increased by 5 times for projects that pay prevailing wages and use registered apprentices. Apprenticeship requirements do not apply for §§ 45L and 45U. Prevailing wage and apprenticeship requirements do not apply to certain projects, including certain projects of less than 1 megawatt or those that began construction prior to January 29, 2023.

[2] Credit is increased by 10% if the project meets certain domestic content requirements for steel or iron, and manufactured products.

[3] Credit is increased by 10% if located in an energy community.

[4] Credit is increased by up to 10 percentage points for projects meeting certain domestic content requirements for steel, iron, and manufactured products.

[5] Credit is increased by up to 10 percentage points if located in an energy community.

[6] Section 168(e) provides favorable depreciation treatment for facilities or property qualifying for this tax credit. These facilities or property will be treated as a 5-year property for purposes of cost recovery, leaving them with lower taxable income in the earlier years of a clean energy investment.

[7] Credit rate is adjusted annually for inflation.

[8] See section 48 for more detail and applicable exceptions to the credit rate.

[9] The entities eligible for elective pay of the commercial clean vehicle credit is a subset of the entities eligible for elective pay of other credits. In addition, starting January 1, 2024, the amount of a new clean vehicle or previously owned clean vehicle tax credit (but not a commercial clean vehicle credit) can be transferred to a dealer for an equivalent reduction in the eligible vehicle's sales price.

HEAT GAIN/ LOSS CALCULATIONS N

HEAT GAIN/LOSS CALCULATION NARRATIVE

Summary

GGD engineers completed heat gain and loss calculations to for the Wilmington Elementary School, enclosed.

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Zone Heat Balance Summary for Fan Coil Units (Elec, Data, EMR)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:17 AM

Table 1. Heat Balance Loads for Zone 117 ELEC

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 65.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	110 sqft	151	-	110 sqft	0	-
Interior Wall Convection	644 sqft	780	-	644 sqft	0	-
Ceiling Convection	110 sqft	250	-	110 sqft	0	-
Overhead Lighting Convection	55 W	79	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1097 W	2807	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	610	0	25%	0	0
		4677	**0**	**-**	**0**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 2. Heat Balance Loads for Zone 130 ELEC

	DESIGN COOLING - AUGUST 18:00			DESIGN HEATING		
	OA DB / WB 88.1 F / 73.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 65.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	114 sqft	161	-	114 sqft	0	-
Interior Wall Convection	649 sqft	822	-	649 sqft	0	-
Ceiling Convection	114 sqft	276	-	114 sqft	0	-
Overhead Lighting Convection	57 W	82	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1136 W	2908	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	637	0	25%	0	0
		4887	**0**	**-**	**0**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for Fan Coil Units (Elec, Data, EMR)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:17 AM

Table 3. Heat Balance Loads for Zone 149 NETWORK/TELECOM

	DESIGN COOLING - JUNE 23:00			DESIGN HEATING		
	OA DB / WB 73.9 F / 67.8 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 65.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	208 sqft	351	-	208 sqft	-1	-
Interior Wall Convection	868 sqft	1229	-	868 sqft	3	-
Ceiling Convection	208 sqft	679	-	208 sqft	-2	-
Overhead Lighting Convection	104 W	150	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	2084 W	5332	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1161	0	25%	0	0
		8903	**0**	**-**	**0**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 4. Heat Balance Loads for Zone 151 MAIN ELEC

	DESIGN COOLING - JUNE 21:00			DESIGN HEATING		
	OA DB / WB 77.7 F / 69.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 65.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	525 sqft	1347	-	525 sqft	149	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1710 sqft	3200	-	1710 sqft	238	-
Interior Wall Convection	3382 sqft	7784	-	3382 sqft	-257	-
Ceiling Convection	1710 sqft	7105	-	1710 sqft	-129	-
Overhead Lighting Convection	450 W	649	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	17097 W	43752	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	9575	0	25%	0	0
		73412	**0**	**-**	**0**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for Fan Coil Units (Elec, Data, EMR)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:17 AM

Table 5. Heat Balance Loads for Zone 203 IDF

	DESIGN COOLING - JULY 0:00			DESIGN HEATING		
	OA DB / WB 75.5 F / 69.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 65.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	101 sqft	164	-	101 sqft	0	-
Interior Wall Convection	596 sqft	679	-	596 sqft	0	-
Ceiling Convection	101 sqft	254	-	101 sqft	0	-
Overhead Lighting Convection	51 W	73	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1011 W	2587	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	564	0	25%	0	0
		4320	**0**	**-**	**0**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 6. Heat Balance Loads for Zone 221 ELEC

	DESIGN COOLING - OCTOBER 17:00			DESIGN HEATING		
	OA DB / WB 73.8 F / 65.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 65.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	83 sqft	105	-	83 sqft	0	-
Interior Wall Convection	547 sqft	601	-	547 sqft	0	-
Ceiling Convection	83 sqft	178	-	83 sqft	0	-
Overhead Lighting Convection	42 W	60	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	830 W	2125	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	460	0	25%	0	0
		3528	**0**	**-**	**0**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for Fan Coil Units (Elec, Data, EMR)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:17 AM

Table 7. Heat Balance Loads for Zone 229 IDF

	DESIGN COOLING - SEPTEMBER 13:00			DESIGN HEATING		
	OA DB / WB 82.3 F / 70.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 65.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	95 sqft	112	-	95 sqft	-1	-
Interior Wall Convection	581 sqft	643	-	581 sqft	-2	-
Ceiling Convection	95 sqft	212	-	95 sqft	2	-
Overhead Lighting Convection	48 W	69	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	953 W	2440	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	521	0	25%	0	0
		3997	**0**	**-**	**0**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 8. Heat Balance Loads for Zone 249 ELEC

	DESIGN COOLING - JULY 23:00			DESIGN HEATING		
	OA DB / WB 76.9 F / 70.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 65.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	241 sqft	442	-	241 sqft	-1	-
Interior Wall Convection	976 sqft	1622	-	976 sqft	2	-
Ceiling Convection	240 sqft	704	-	240 sqft	-1	-
Overhead Lighting Convection	120 W	174	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	2406 W	6158	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1365	0	25%	0	0
		10464	**0**	**-**	**0**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for Fan Coil Units (Elec, Data, EMR)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:17 AM

Table 9. Heat Balance Loads for Zone 255 ELEC

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 65.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	113 sqft	253	-	113 sqft	26	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	113 sqft	170	-	113 sqft	-6	-
Interior Wall Convection	633 sqft	795	-	633 sqft	-19	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	57 W	82	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1134 W	2901	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	630	0	25%	0	0
		4831	**0**	**-**	**0**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 10. Heat Balance Loads for Zone 304 ELEC

	DESIGN COOLING - SEPTEMBER 15:00			DESIGN HEATING		
	OA DB / WB 85.0 F / 71.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 65.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	98 sqft	192	-	98 sqft	23	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	98 sqft	173	-	98 sqft	-7	-
Interior Wall Convection	580 sqft	1022	-	580 sqft	-16	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	49 W	70	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	976 W	2498	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	593	0	25%	0	0
		4549	**0**	**-**	**0**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for Fan Coil Units (Elec, Data, EMR)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:17 AM

Table 11. Heat Balance Loads for Zone 328 ELEV MACH

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 65.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	78 sqft	137	-	78 sqft	16	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	78 sqft	85	-	78 sqft	-3	-
Interior Wall Convection	540 sqft	518	-	540 sqft	-13	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	39 W	57	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	784 W	2005	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	420	0	25%	0	0
		3223	**0**	**-**	**0**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 12. Heat Balance Loads for Zone 332 ELEC

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 65.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	114 sqft	250	-	114 sqft	26	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	114 sqft	151	-	114 sqft	-5	-
Interior Wall Convection	645 sqft	816	-	645 sqft	-20	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	57 W	82	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1137 W	2911	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	631	0	25%	0	0
		4841	**0**	**-**	**0**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 1. Heat Balance Loads for Zone 105 CORRIDOR

	DESIGN COOLING - SEPTEMBER 15:00			DESIGN HEATING		
	OA DB / WB 85.0 F / 71.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	589 sqft	1276	-	589 sqft	143	-
Interior Wall Convection	1915 sqft	3305	-	1915 sqft	290	-
Ceiling Convection	589 sqft	2004	-	589 sqft	211	-
Overhead Lighting Convection	295 W	425	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	180 W	462	-	0 W	0	-
People Convection	10	735	2050	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1231	308	25%	161	0
		9437	**2358**	**-**	**806**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 2. Heat Balance Loads for Zone 105A-D EXTENDED LEARNING

	DESIGN COOLING - SEPTEMBER 15:00			DESIGN HEATING		
	OA DB / WB 85.0 F / 71.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	106 sqft	234	-	106 sqft	147	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	274 sqft	1937	-	274 sqft	2625	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1481 sqft	3512	-	1481 sqft	1056	-
Interior Wall Convection	2464 sqft	4794	-	2464 sqft	534	-
Ceiling Convection	1481 sqft	5927	-	1481 sqft	641	-
Overhead Lighting Convection	740 W	1069	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1333 W	3410	-	0 W	0	-
People Convection	54	3969	11070	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	3728	1661	25%	1251	0
		28580	**12731**	**-**	**6254**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 3. Heat Balance Loads for Zone 106 MUSIC/CHORUS

	DESIGN COOLING - OCTOBER 12:00			DESIGN HEATING		
	OA DB / WB 70.2 F / 64.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	314 sqft	723	-	314 sqft	427	-
Roof Convection	262 sqft	712	-	262 sqft	368	-
Window Convection	84 sqft	846	-	84 sqft	824	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1212 sqft	2699	-	1212 sqft	1097	-
Interior Wall Convection	2388 sqft	3251	-	2388 sqft	581	-
Ceiling Convection	950 sqft	3067	-	950 sqft	344	-
Overhead Lighting Convection	606 W	875	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	942 W	2411	-	0 W	0	-
People Convection	26	1911	5330	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2474	800	25%	910	0
		18969	**6130**	**-**	**4552**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 4. Heat Balance Loads for Zone 107 STRIDES PK

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	553 sqft	905	-	553 sqft	739	-
Roof Convection	300 sqft	495	-	300 sqft	392	-
Window Convection	84 sqft	869	-	84 sqft	800	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1239 sqft	2323	-	1239 sqft	1392	-
Interior Wall Convection	2235 sqft	3148	-	2235 sqft	425	-
Ceiling Convection	939 sqft	2960	-	939 sqft	374	-
Overhead Lighting Convection	619 W	894	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1020 W	2609	-	0 W	0	-
People Convection	23	1691	4715	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2384	707	25%	1030	0
		18278	**5422**	**-**	**5152**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 5. Heat Balance Loads for Zone 107A CALMING

	DESIGN COOLING - OCTOBER 13:00			DESIGN HEATING		
	OA DB / WB 72.3 F / 65.1 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	112 sqft	71	-	112 sqft	1	-
Interior Wall Convection	639 sqft	362	-	639 sqft	7	-
Ceiling Convection	112 sqft	121	-	112 sqft	2	-
Overhead Lighting Convection	56 W	81	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	101 W	258	-	0 W	0	-
People Convection	1	74	205	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	145	31	25%	2	0
		1111	**236**	**-**	**11**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 6. Heat Balance Loads for Zone 108 SCHOOL PSYCH

	DESIGN COOLING - NOVEMBER 11:00			DESIGN HEATING		
	OA DB / WB 60.0 F / 58.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	104 sqft	188	-	104 sqft	155	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	324	-	31 sqft	340	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	165 sqft	445	-	165 sqft	229	-
Interior Wall Convection	661 sqft	1307	-	661 sqft	167	-
Ceiling Convection	165 sqft	552	-	165 sqft	72	-
Overhead Lighting Convection	83 W	119	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	248 W	634	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	590	154	25%	241	0
		4526	**1179**	**-**	**1204**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 7. Heat Balance Loads for Zone 109 SPEECH/LANG

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	150 sqft	249	-	150 sqft	219	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	342	-	31 sqft	326	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	222 sqft	580	-	222 sqft	306	-
Interior Wall Convection	708 sqft	1130	-	708 sqft	149	-
Ceiling Convection	222 sqft	710	-	222 sqft	95	-
Overhead Lighting Convection	111 W	160	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	333 W	852	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	658	154	25%	274	0
		5048	**1179**	**-**	**1369**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 8. Heat Balance Loads for Zone 110 PRE-K

	DESIGN COOLING - OCTOBER 12:00			DESIGN HEATING		
	OA DB / WB 70.2 F / 64.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	698 sqft	1208	-	698 sqft	981	-
Roof Convection	307 sqft	547	-	307 sqft	418	-
Window Convection	62 sqft	618	-	62 sqft	593	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1315 sqft	2894	-	1315 sqft	1310	-
Interior Wall Convection	2054 sqft	3542	-	2054 sqft	682	-
Ceiling Convection	1008 sqft	3198	-	1008 sqft	427	-
Overhead Lighting Convection	657 W	949	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1121 W	2869	-	0 W	0	-
People Convection	23	1691	4715	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2628	707	25%	1103	0
		20144	**5422**	**-**	**5513**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 9. Heat Balance Loads for Zone 111 SM GROUP

	DESIGN COOLING - SEPTEMBER 10:00			DESIGN HEATING		
	OA DB / WB 73.6 F / 67.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	177 sqft	418	-	177 sqft	45	-
Interior Wall Convection	791 sqft	1954	-	791 sqft	170	-
Ceiling Convection	177 sqft	0	-	177 sqft	0	-
Overhead Lighting Convection	88 W	127	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	159 W	407	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	491	154	25%	54	0
		3764	**1179**	**-**	**269**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 10. Heat Balance Loads for Zone 112 PRE-K

	DESIGN COOLING - JULY 17:00			DESIGN HEATING		
	OA DB / WB 89.8 F / 73.7 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	1080 sqft	1988	-	1080 sqft	1619	-
Roof Convection	292 sqft	578	-	292 sqft	406	-
Window Convection	124 sqft	1061	-	124 sqft	1335	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1272 sqft	2498	-	1272 sqft	1930	-
Interior Wall Convection	1545 sqft	2060	-	1545 sqft	369	-
Ceiling Convection	980 sqft	3054	-	980 sqft	554	-
Overhead Lighting Convection	636 W	918	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1081 W	2767	-	0 W	0	-
People Convection	23	1691	4715	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2492	707	25%	1554	0
		19107	**5422**	**-**	**7769**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 11. Heat Balance Loads for Zone 113 SMALL GROUP

	DESIGN COOLING - DECEMBER 16:00			DESIGN HEATING		
	OA DB / WB 51.6 F / 50.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	170 sqft	272	-	170 sqft	1	-
Interior Wall Convection	779 sqft	948	-	779 sqft	6	-
Ceiling Convection	170 sqft	417	-	170 sqft	1	-
Overhead Lighting Convection	85 W	123	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	153 W	392	-	0 W	0	-
People Convection	7	515	1435	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	400	215	25%	2	0
		3066	**1650**	**-**	**10**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 12. Heat Balance Loads for Zone 114 PRE-K

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	967 sqft	1474	-	967 sqft	1328	-
Roof Convection	293 sqft	504	-	293 sqft	404	-
Window Convection	93 sqft	520	-	93 sqft	926	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1266 sqft	2058	-	1266 sqft	1253	-
Interior Wall Convection	1665 sqft	1780	-	1665 sqft	354	-
Ceiling Convection	972 sqft	2467	-	972 sqft	494	-
Overhead Lighting Convection	633 W	914	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1076 W	2752	-	0 W	0	-
People Convection	23	1691	4715	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2124	707	25%	1190	0
		16283	**5422**	**-**	**5949**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 13. Heat Balance Loads for Zone 115 STRIDES PK

	DESIGN COOLING - JUNE 17:00			DESIGN HEATING		
	OA DB / WB 86.8 F / 71.7 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	781 sqft	1109	-	781 sqft	1045	-
Roof Convection	312 sqft	498	-	312 sqft	413	-
Window Convection	93 sqft	723	-	93 sqft	911	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1300 sqft	2092	-	1300 sqft	1667	-
Interior Wall Convection	2016 sqft	2278	-	2016 sqft	378	-
Ceiling Convection	988 sqft	2525	-	988 sqft	441	-
Overhead Lighting Convection	650 W	938	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1071 W	2742	-	0 W	0	-
People Convection	23	1691	4715	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2189	707	25%	1214	0
		16784	**5422**	**-**	**6069**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 14. Heat Balance Loads for Zone 115A CALMING

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	110 sqft	70	-	110 sqft	1	-
Interior Wall Convection	632 sqft	358	-	632 sqft	7	-
Ceiling Convection	110 sqft	116	-	110 sqft	2	-
Overhead Lighting Convection	55 W	80	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	99 W	254	-	0 W	0	-
People Convection	1	74	205	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	143	31	25%	2	0
		1094	**236**	**-**	**11**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 15. Heat Balance Loads for Zone 116 ART CR

	DESIGN COOLING - JUNE 17:00			DESIGN HEATING		
	OA DB / WB 86.8 F / 71.7 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	307 sqft	538	-	307 sqft	392	-
Roof Convection	264 sqft	614	-	264 sqft	358	-
Window Convection	93 sqft	692	-	93 sqft	890	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1038 sqft	1975	-	1038 sqft	1091	-
Interior Wall Convection	1518 sqft	2225	-	1518 sqft	312	-
Ceiling Convection	774 sqft	2162	-	774 sqft	330	-
Overhead Lighting Convection	519 W	749	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	519 W	1328	-	0 W	0	-
People Convection	26	1911	5330	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1829	800	25%	843	0
		14023	**6130**	**-**	**4215**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 16. Heat Balance Loads for Zone 116A KILN/STO

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	112 sqft	41	-	112 sqft	129	-
Roof Convection	69 sqft	21	-	69 sqft	80	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	172 sqft	57	-	172 sqft	193	-
Interior Wall Convection	772 sqft	266	-	772 sqft	65	-
Ceiling Convection	103 sqft	24	-	103 sqft	29	-
Overhead Lighting Convection	86 W	124	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	17 W	44	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	87	0	25%	124	0
		664	**0**	**-**	**622**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 17. Heat Balance Loads for Zone 204 HEALTH

	DESIGN COOLING - SEPTEMBER 11:00			DESIGN HEATING		
	OA DB / WB 77.1 F / 68.7 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	320 sqft	783	-	320 sqft	539	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	1040	-	93 sqft	1022	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	944 sqft	3098	-	944 sqft	1699	-
Interior Wall Convection	1448 sqft	3033	-	1448 sqft	626	-
Ceiling Convection	944 sqft	3688	-	944 sqft	734	-
Overhead Lighting Convection	472 W	682	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	472 W	1208	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2327	830	25%	1155	0
		17843	**6365**	**-**	**5775**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 18. Heat Balance Loads for Zone 205 CORRIDOR

	DESIGN COOLING - SEPTEMBER 15:00			DESIGN HEATING		
	OA DB / WB 85.0 F / 71.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1048 sqft	3029	-	1048 sqft	175	-
Interior Wall Convection	3581 sqft	7632	-	3581 sqft	423	-
Ceiling Convection	1048 sqft	4987	-	1048 sqft	308	-
Overhead Lighting Convection	524 W	756	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	200 W	512	-	0 W	0	-
People Convection	10	735	2050	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2648	308	25%	226	0
		20298	**2358**	**-**	**1132**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 19. Heat Balance Loads for Zone 205A-D EXTENDED LEARNING

	DESIGN COOLING - SEPTEMBER 15:00			DESIGN HEATING		
	OA DB / WB 85.0 F / 71.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	60 sqft	193	-	60 sqft	82	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	320 sqft	2588	-	320 sqft	3053	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1436 sqft	4617	-	1436 sqft	329	-
Interior Wall Convection	2404 sqft	6593	-	2404 sqft	521	-
Ceiling Convection	1436 sqft	7969	-	1436 sqft	645	-
Overhead Lighting Convection	718 W	1036	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	718 W	1837	-	0 W	0	-
People Convection	144	10584	29520	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	5312	4428	25%	1158	0
		40729	**33948**	**-**	**5788**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 20. Heat Balance Loads for Zone 206 CLASSROOM

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	324 sqft	722	-	324 sqft	401	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	84 sqft	922	-	84 sqft	744	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	930 sqft	2916	-	930 sqft	228	-
Interior Wall Convection	1496 sqft	2857	-	1496 sqft	326	-
Ceiling Convection	930 sqft	3726	-	930 sqft	424	-
Overhead Lighting Convection	465 W	671	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	465 W	1190	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2248	830	25%	531	0
		17236	**6365**	**-**	**2654**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 21. Heat Balance Loads for Zone 207 SM GROUP

	DESIGN COOLING - DECEMBER 11:00			DESIGN HEATING		
	OA DB / WB 48.0 F / 48.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	168 sqft	198	-	168 sqft	1	-
Interior Wall Convection	775 sqft	799	-	775 sqft	9	-
Ceiling Convection	167 sqft	310	-	167 sqft	1	-
Overhead Lighting Convection	84 W	121	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	84 W	215	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	302	154	25%	3	0
		2313	**1179**	**-**	**14**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 22. Heat Balance Loads for Zone 208 CLASSROOM

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	448 sqft	1051	-	448 sqft	559	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	84 sqft	909	-	84 sqft	745	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	993 sqft	2456	-	993 sqft	232	-
Interior Wall Convection	1425 sqft	2838	-	1425 sqft	280	-
Ceiling Convection	993 sqft	3925	-	993 sqft	459	-
Overhead Lighting Convection	496 W	717	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	496 W	1270	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2273	830	25%	569	0
		17424	**6365**	**-**	**2844**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Table 23. Heat Balance Loads for Zone 209 READ

	DESIGN COOLING - OCTOBER 10:00			DESIGN HEATING		
	OA DB / WB 63.6 F / 62.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	125 sqft	213	-	125 sqft	175	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	347	-	31 sqft	307	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	214 sqft	704	-	214 sqft	46	-
Interior Wall Convection	744 sqft	1246	-	744 sqft	159	-
Ceiling Convection	214 sqft	653	-	214 sqft	92	-
Overhead Lighting Convection	107 W	154	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	321 W	820	-	0 W	0	-
People Convection	4	294	820	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	665	123	25%	194	0
		5097	**943**	**-**	**972**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 24. Heat Balance Loads for Zone 210 LEARNING CENTER

	DESIGN COOLING - OCTOBER 10:00			DESIGN HEATING		
	OA DB / WB 63.6 F / 62.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	129 sqft	257	-	129 sqft	179	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	361	-	31 sqft	309	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	218 sqft	780	-	218 sqft	47	-
Interior Wall Convection	747 sqft	1412	-	747 sqft	160	-
Ceiling Convection	218 sqft	806	-	218 sqft	94	-
Overhead Lighting Convection	109 W	158	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	109 W	279	-	0 W	0	-
People Convection	8	588	1640	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	696	246	25%	197	0
		5336	**1886**	**-**	**987**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 25. Heat Balance Loads for Zone 211 CLASSROOM

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	448 sqft	1071	-	448 sqft	574	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	1030	-	93 sqft	851	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	960 sqft	2775	-	960 sqft	232	-
Interior Wall Convection	1435 sqft	3017	-	1435 sqft	317	-
Ceiling Convection	960 sqft	3979	-	960 sqft	455	-
Overhead Lighting Convection	480 W	693	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	480 W	1228	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2367	830	25%	607	0
		18144	**6365**	**-**	**3037**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 26. Heat Balance Loads for Zone 212 SM GROUP

	DESIGN COOLING - FEBRUARY 9:00			DESIGN HEATING		
	OA DB / WB 39.4 F / 39.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	176 sqft	0	-	176 sqft	0	-
Interior Wall Convection	789 sqft	1677	-	789 sqft	134	-
Ceiling Convection	175 sqft	0	-	175 sqft	0	-
Overhead Lighting Convection	88 W	127	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	88 W	225	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	359	154	25%	34	0
		2755	**1179**	**-**	**168**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 27. Heat Balance Loads for Zone 213 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	979 sqft	2072	-	979 sqft	1423	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	740	-	93 sqft	937	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	971 sqft	2110	-	971 sqft	284	-
Interior Wall Convection	861 sqft	1616	-	861 sqft	221	-
Ceiling Convection	971 sqft	3388	-	971 sqft	585	-
Overhead Lighting Convection	485 W	700	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	485 W	1242	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2078	830	25%	862	0
		15929	**6365**	**-**	**4311**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 28. Heat Balance Loads for Zone 214 SMALL GROUP

	DESIGN COOLING - JUNE 19:00			DESIGN HEATING		
	OA DB / WB 83.0 F / 70.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	181 sqft	246	-	181 sqft	1	-
Interior Wall Convection	809 sqft	930	-	809 sqft	8	-
Ceiling Convection	180 sqft	391	-	180 sqft	1	-
Overhead Lighting Convection	90 W	131	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	90 W	231	-	0 W	0	-
People Convection	7	515	1435	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	367	215	25%	3	0
		2811	**1650**	**-**	**13**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 29. Heat Balance Loads for Zone 215 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	839 sqft	1818	-	839 sqft	1160	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	738	-	93 sqft	915	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	973 sqft	2148	-	973 sqft	272	-
Interior Wall Convection	991 sqft	1666	-	991 sqft	241	-
Ceiling Convection	974 sqft	3336	-	974 sqft	560	-
Overhead Lighting Convection	487 W	702	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	487 W	1245	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2046	830	25%	787	0
		15684	**6365**	**-**	**3934**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 30. Heat Balance Loads for Zone 216 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	639 sqft	1227	-	639 sqft	838	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	655	-	93 sqft	872	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	988 sqft	1987	-	988 sqft	251	-
Interior Wall Convection	1218 sqft	2062	-	1218 sqft	270	-
Ceiling Convection	988 sqft	3158	-	988 sqft	518	-
Overhead Lighting Convection	494 W	713	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	494 W	1264	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1958	830	25%	687	0
		15008	**6365**	**-**	**3437**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 31. Heat Balance Loads for Zone 217 SM GROUP

	DESIGN COOLING - JUNE 19:00			DESIGN HEATING		
	OA DB / WB 83.0 F / 70.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	166 sqft	193	-	166 sqft	1	-
Interior Wall Convection	769 sqft	736	-	769 sqft	8	-
Ceiling Convection	166 sqft	297	-	166 sqft	1	-
Overhead Lighting Convection	83 W	120	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	83 W	212	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	289	154	25%	3	0
		2215	**1179**	**-**	**14**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 32. Heat Balance Loads for Zone 218 STAGE 1ST/2ND

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	307 sqft	570	-	307 sqft	367	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	653	-	93 sqft	819	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1061 sqft	1989	-	1061 sqft	209	-
Interior Wall Convection	2360 sqft	3102	-	2360 sqft	317	-
Ceiling Convection	1059 sqft	3072	-	1059 sqft	418	-
Overhead Lighting Convection	530 W	765	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	486 W	1244	-	0 W	0	-
People Convection	28	2058	5740	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2018	861	25%	532	0
		15470	**6601**	**-**	**2662**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 33. Heat Balance Loads for Zone 218A CALMING

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	124 sqft	68	-	124 sqft	135	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	125 sqft	69	-	125 sqft	14	-
Interior Wall Convection	544 sqft	255	-	544 sqft	69	-
Ceiling Convection	126 sqft	81	-	126 sqft	28	-
Overhead Lighting Convection	63 W	90	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	63 W	160	-	0 W	0	-
People Convection	1	74	205	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	119	31	25%	61	0
		915	**236**	**-**	**307**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 34. Heat Balance Loads for Zone 302 CORRIDOR

	DESIGN COOLING - SEPTEMBER 15:00			DESIGN HEATING		
	OA DB / WB 85.0 F / 71.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	664 sqft	2929	-	664 sqft	896	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	663 sqft	2358	-	663 sqft	157	-
Interior Wall Convection	2143 sqft	5819	-	2143 sqft	425	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	332 W	479	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	66 W	170	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1763	0	25%	369	0
		13518	**0**	**-**	**1846**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 35. Heat Balance Loads for Zone 302A-D EXTENDED LEARING

	DESIGN COOLING - AUGUST 15:00			DESIGN HEATING		
	OA DB / WB 91.0 F / 74.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	147 sqft	534	-	147 sqft	215	-
Roof Convection	1443 sqft	6664	-	1443 sqft	2011	-
Window Convection	233 sqft	2085	-	233 sqft	2332	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1442 sqft	5044	-	1442 sqft	343	-
Interior Wall Convection	2430 sqft	7145	-	2430 sqft	553	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	721 W	1041	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	721 W	1845	-	0 W	0	-
People Convection	144	10584	29520	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	5241	4428	25%	1363	0
		40183	**33948**	**-**	**6816**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 36. Heat Balance Loads for Zone 305 ASSIST OFFICE

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	192 sqft	451	-	192 sqft	305	-
Roof Convection	225 sqft	619	-	225 sqft	332	-
Window Convection	31 sqft	376	-	31 sqft	345	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	225 sqft	831	-	225 sqft	67	-
Interior Wall Convection	657 sqft	1592	-	657 sqft	237	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	113 W	162	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	338 W	864	-	0 W	0	-
People Convection	7	515	1435	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	811	215	25%	321	0
		6221	**1650**	**-**	**1606**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 37. Heat Balance Loads for Zone 306 LEARNING CENTER

	DESIGN COOLING - OCTOBER 10:00			DESIGN HEATING		
	OA DB / WB 63.6 F / 62.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	185 sqft	411	-	185 sqft	289	-
Roof Convection	218 sqft	575	-	218 sqft	319	-
Window Convection	31 sqft	362	-	31 sqft	341	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	218 sqft	814	-	218 sqft	64	-
Interior Wall Convection	650 sqft	1364	-	650 sqft	169	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	109 W	157	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	109 W	279	-	0 W	0	-
People Convection	8	588	1640	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	683	246	25%	295	0
		5233	**1886**	**-**	**1477**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 38. Heat Balance Loads for Zone 309 CLASSROOM

	DESIGN COOLING - OCTOBER 10:00			DESIGN HEATING		
	OA DB / WB 63.6 F / 62.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	377 sqft	892	-	377 sqft	546	-
Roof Convection	963 sqft	2822	-	963 sqft	1375	-
Window Convection	84 sqft	918	-	84 sqft	835	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	963 sqft	2802	-	963 sqft	265	-
Interior Wall Convection	1470 sqft	3087	-	1470 sqft	361	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	482 W	695	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	482 W	1232	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2165	830	25%	846	0
		16598	**6365**	**-**	**4229**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 39. Heat Balance Loads for Zone 310 SM GROUP

	DESIGN COOLING - JULY 18:00			DESIGN HEATING		
	OA DB / WB 88.1 F / 73.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	166 sqft	307	-	166 sqft	183	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	166 sqft	201	-	166 sqft	9	-
Interior Wall Convection	770 sqft	799	-	770 sqft	41	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	83 W	120	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	83 W	213	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	301	154	25%	58	0
		2309	**1179**	**-**	**291**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 40. Heat Balance Loads for Zone 311 CLASSROOM

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	441 sqft	1027	-	441 sqft	648	-
Roof Convection	980 sqft	2789	-	980 sqft	1405	-
Window Convection	84 sqft	915	-	84 sqft	839	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	979 sqft	2766	-	979 sqft	271	-
Interior Wall Convection	1418 sqft	2922	-	1418 sqft	340	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	490 W	707	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	490 W	1253	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2155	830	25%	876	0
		16518	**6365**	**-**	**4380**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 41. Heat Balance Loads for Zone 312 READ

	DESIGN COOLING - OCTOBER 10:00			DESIGN HEATING		
	OA DB / WB 63.6 F / 62.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	126 sqft	240	-	126 sqft	189	-
Roof Convection	219 sqft	488	-	219 sqft	309	-
Window Convection	31 sqft	352	-	31 sqft	329	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	219 sqft	752	-	219 sqft	52	-
Interior Wall Convection	756 sqft	1393	-	756 sqft	177	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	110 W	158	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	329 W	842	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	689	154	25%	264	0
		5281	**1179**	**-**	**1319**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 42. Heat Balance Loads for Zone 313 LEARNING CENTER

	DESIGN COOLING - OCTOBER 10:00			DESIGN HEATING		
	OA DB / WB 63.6 F / 62.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	128 sqft	269	-	128 sqft	191	-
Roof Convection	221 sqft	553	-	221 sqft	313	-
Window Convection	31 sqft	358	-	31 sqft	331	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	221 sqft	817	-	221 sqft	53	-
Interior Wall Convection	758 sqft	1489	-	758 sqft	177	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	111 W	160	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	111 W	283	-	0 W	0	-
People Convection	8	588	1640	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	678	246	25%	266	0
		5195	**1886**	**-**	**1331**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 43. Heat Balance Loads for Zone 314 CLASSROOM

	DESIGN COOLING - SEPTEMBER 11:00			DESIGN HEATING		
	OA DB / WB 77.1 F / 68.7 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	455 sqft	919	-	455 sqft	671	-
Roof Convection	963 sqft	2260	-	963 sqft	1346	-
Window Convection	93 sqft	982	-	93 sqft	929	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	963 sqft	2242	-	963 sqft	231	-
Interior Wall Convection	1442 sqft	2503	-	1442 sqft	329	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	481 W	695	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	481 W	1232	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1923	830	25%	876	0
		14740	**6365**	**-**	**4382**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 44. Heat Balance Loads for Zone 315 SM GROUP

	DESIGN COOLING - SEPTEMBER 12:00			DESIGN HEATING		
	OA DB / WB 80.2 F / 69.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	169 sqft	418	-	169 sqft	230	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	169 sqft	0	-	169 sqft	0	-
Interior Wall Convection	776 sqft	1404	-	776 sqft	163	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	85 W	122	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	85 W	216	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	379	154	25%	98	0
		2907	**1179**	**-**	**491**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 45. Heat Balance Loads for Zone 316 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	981 sqft	2288	-	981 sqft	1623	-
Roof Convection	974 sqft	3229	-	974 sqft	1494	-
Window Convection	93 sqft	763	-	93 sqft	1022	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	973 sqft	2325	-	973 sqft	339	-
Interior Wall Convection	863 sqft	1773	-	863 sqft	264	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	486 W	702	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	486 W	1244	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2146	830	25%	1185	0
		16455	**6365**	**-**	**5926**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 46. Heat Balance Loads for Zone 317 SM GROUP

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	184 sqft	331	-	184 sqft	202	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	183 sqft	215	-	183 sqft	10	-
Interior Wall Convection	815 sqft	829	-	815 sqft	46	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	91 W	132	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	91 W	234	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	316	154	25%	65	0
		2424	**1179**	**-**	**323**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 47. Heat Balance Loads for Zone 318 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	837 sqft	2031	-	837 sqft	1342	-
Roof Convection	969 sqft	3141	-	969 sqft	1470	-
Window Convection	93 sqft	761	-	93 sqft	1005	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	969 sqft	2420	-	969 sqft	325	-
Interior Wall Convection	988 sqft	1827	-	988 sqft	290	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	485 W	700	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	485 W	1240	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2115	830	25%	1108	0
		16218	**6365**	**-**	**5540**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 48. Heat Balance Loads for Zone 319 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	632 sqft	1382	-	632 sqft	976	-
Roof Convection	977 sqft	3101	-	977 sqft	1449	-
Window Convection	93 sqft	689	-	93 sqft	978	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	977 sqft	2228	-	977 sqft	304	-
Interior Wall Convection	1211 sqft	2334	-	1211 sqft	327	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	488 W	705	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	488 W	1249	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2051	830	25%	1009	0
		15723	**6365**	**-**	**5044**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 49. Heat Balance Loads for Zone 320 SM GROUP

	DESIGN COOLING - JUNE 20:00			DESIGN HEATING		
	OA DB / WB 79.9 F / 69.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	167 sqft	306	-	167 sqft	184	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	166 sqft	201	-	166 sqft	9	-
Interior Wall Convection	772 sqft	801	-	772 sqft	45	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	83 W	120	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	83 W	212	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	301	154	25%	60	0
		2309	**1179**	**-**	**299**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 50. Heat Balance Loads for Zone 321 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	314 sqft	639	-	314 sqft	449	-
Roof Convection	1067 sqft	3025	-	1067 sqft	1479	-
Window Convection	93 sqft	681	-	93 sqft	934	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1066 sqft	2154	-	1066 sqft	258	-
Interior Wall Convection	2345 sqft	3391	-	2345 sqft	417	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	533 W	769	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	491 W	1257	-	0 W	0	-
People Convection	28	2058	5740	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2096	861	25%	884	0
		16070	**6601**	**-**	**4420**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-1 (S Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:06 AM

Table 51. Heat Balance Loads for Zone 321A CALMING

	DESIGN COOLING - JULY 20:00			DESIGN HEATING		
	OA DB / WB 82.9 F / 71.8 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	124 sqft	79	-	124 sqft	163	-
Roof Convection	121 sqft	118	-	121 sqft	154	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	121 sqft	71	-	121 sqft	16	-
Interior Wall Convection	529 sqft	277	-	529 sqft	87	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	60 W	87	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	60 W	155	-	0 W	0	-
People Convection	1	74	205	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	129	31	25%	105	0
		989	**236**	**-**	**526**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 1. Heat Balance Loads for Zone 131 CORRIDOR

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	548 sqft	1961	-	548 sqft	97	-
Interior Wall Convection	1848 sqft	4808	-	1848 sqft	212	-
Ceiling Convection	548 sqft	3062	-	548 sqft	145	-
Overhead Lighting Convection	274 W	396	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	55 W	140	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1555	0	25%	113	0
		11922	**0**	**-**	**567**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 2. Heat Balance Loads for Zone 131A-D EXTENDED LEARNING

	DESIGN COOLING - AUGUST 16:00			DESIGN HEATING		
	OA DB / WB 91.0 F / 74.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	129 sqft	453	-	129 sqft	165	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	239 sqft	2057	-	239 sqft	2170	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1740 sqft	6231	-	1740 sqft	1320	-
Interior Wall Convection	2991 sqft	8322	-	2991 sqft	455	-
Ceiling Convection	1740 sqft	9787	-	1740 sqft	551	-
Overhead Lighting Convection	870 W	1256	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1566 W	4008	-	0 W	0	-
People Convection	175	12863	35875	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	6746	5381	25%	1165	0
		51721	**41256**	**-**	**5826**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 3. Heat Balance Loads for Zone 131E-F EXTENDED LEARNING

	DESIGN COOLING - SEPTEMBER 16:00			DESIGN HEATING		
	OA DB / WB 85.0 F / 71.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	536 sqft	1910	-	536 sqft	85	-
Interior Wall Convection	1309 sqft	3376	-	1309 sqft	128	-
Ceiling Convection	536 sqft	2847	-	536 sqft	127	-
Overhead Lighting Convection	268 W	387	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	482 W	1234	-	0 W	0	-
People Convection	22	1617	4510	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1706	677	25%	85	0
		13077	**5187**	**-**	**425**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 4. Heat Balance Loads for Zone 132 STRIDES PRE-K

	DESIGN COOLING - OCTOBER 12:00			DESIGN HEATING		
	OA DB / WB 70.2 F / 64.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	323 sqft	546	-	323 sqft	381	-
Roof Convection	240 sqft	450	-	240 sqft	300	-
Window Convection	62 sqft	565	-	62 sqft	542	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1282 sqft	2105	-	1282 sqft	1073	-
Interior Wall Convection	2485 sqft	2988	-	2485 sqft	298	-
Ceiling Convection	1042 sqft	2533	-	1042 sqft	306	-
Overhead Lighting Convection	641 W	925	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1052 W	2691	-	0 W	0	-
People Convection	23	1691	4715	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2174	707	25%	725	0
		16668	**5422**	**-**	**3627**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 5. Heat Balance Loads for Zone 132A CALMING

	DESIGN COOLING - AUGUST 20:00			DESIGN HEATING		
	OA DB / WB 82.9 F / 71.8 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	128 sqft	86	-	128 sqft	162	-
Roof Convection	80 sqft	78	-	80 sqft	98	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	116 sqft	74	-	116 sqft	162	-
Interior Wall Convection	507 sqft	280	-	507 sqft	61	-
Ceiling Convection	36 sqft	33	-	36 sqft	12	-
Overhead Lighting Convection	58 W	84	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	104 W	267	-	0 W	0	-
People Convection	1	74	205	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	146	31	25%	124	0
		1121	**236**	**-**	**618**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 6. Heat Balance Loads for Zone 133 SM GROUP

	DESIGN COOLING - OCTOBER 13:00			DESIGN HEATING		
	OA DB / WB 72.3 F / 65.1 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	176 sqft	221	-	176 sqft	0	-
Interior Wall Convection	794 sqft	798	-	794 sqft	6	-
Ceiling Convection	175 sqft	347	-	175 sqft	1	-
Overhead Lighting Convection	88 W	127	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	158 W	405	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	340	154	25%	2	0
		2606	**1179**	**-**	**9**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 7. Heat Balance Loads for Zone 134 KG

	DESIGN COOLING - SEPTEMBER 13:00			DESIGN HEATING		
	OA DB / WB 82.3 F / 70.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	751 sqft	1174	-	751 sqft	1007	-
Roof Convection	283 sqft	474	-	283 sqft	376	-
Window Convection	93 sqft	770	-	93 sqft	892	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1291 sqft	2343	-	1291 sqft	1632	-
Interior Wall Convection	1886 sqft	2392	-	1886 sqft	370	-
Ceiling Convection	1008 sqft	2915	-	1008 sqft	447	-
Overhead Lighting Convection	645 W	931	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1100 W	2815	-	0 W	0	-
People Convection	23	1691	4715	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2325	707	25%	1181	0
		17829	**5422**	**-**	**5904**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 8. Heat Balance Loads for Zone 135 KG

	DESIGN COOLING - SEPTEMBER 12:00			DESIGN HEATING		
	OA DB / WB 80.2 F / 69.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	959 sqft	1572	-	959 sqft	1348	-
Roof Convection	272 sqft	449	-	272 sqft	369	-
Window Convection	93 sqft	689	-	93 sqft	965	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1235 sqft	2242	-	1235 sqft	1756	-
Interior Wall Convection	1649 sqft	2047	-	1649 sqft	348	-
Ceiling Convection	937 sqft	2713	-	937 sqft	466	-
Overhead Lighting Convection	617 W	891	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1048 W	2682	-	0 W	0	-
People Convection	23	1691	4715	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2246	707	25%	1313	0
		17223	**5422**	**-**	**6566**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 9. Heat Balance Loads for Zone 136 SM GROUP

	DESIGN COOLING - SEPTEMBER 13:00			DESIGN HEATING		
	OA DB / WB 82.3 F / 70.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	177 sqft	221	-	177 sqft	0	-
Interior Wall Convection	796 sqft	793	-	796 sqft	6	-
Ceiling Convection	177 sqft	330	-	177 sqft	1	-
Overhead Lighting Convection	89 W	128	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	159 W	408	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	337	154	25%	2	0
		2583	**1179**	**-**	**9**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 10. Heat Balance Loads for Zone 137 KG

	DESIGN COOLING - SEPTEMBER 14:00			DESIGN HEATING		
	OA DB / WB 84.0 F / 70.7 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	581 sqft	946	-	581 sqft	783	-
Roof Convection	280 sqft	522	-	280 sqft	371	-
Window Convection	93 sqft	777	-	93 sqft	906	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1280 sqft	2528	-	1280 sqft	1474	-
Interior Wall Convection	2050 sqft	3244	-	2050 sqft	456	-
Ceiling Convection	999 sqft	3187	-	999 sqft	431	-
Overhead Lighting Convection	640 W	923	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1090 W	2789	-	0 W	0	-
People Convection	23	1691	4715	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2491	707	25%	1105	0
		19098	**5422**	**-**	**5526**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 11. Heat Balance Loads for Zone 138 KG

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	995 sqft	1605	-	995 sqft	1443	-
Roof Convection	296 sqft	533	-	296 sqft	403	-
Window Convection	93 sqft	646	-	93 sqft	977	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1269 sqft	2298	-	1269 sqft	1816	-
Interior Wall Convection	1659 sqft	2043	-	1659 sqft	355	-
Ceiling Convection	973 sqft	2757	-	973 sqft	489	-
Overhead Lighting Convection	634 W	915	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1074 W	2748	-	0 W	0	-
People Convection	23	1691	4715	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2285	707	25%	1371	0
		17520	**5422**	**-**	**6854**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 12. Heat Balance Loads for Zone 139 SM GROUP

	DESIGN COOLING - JUNE 19:00			DESIGN HEATING		
	OA DB / WB 83.0 F / 70.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	159 sqft	206	-	159 sqft	0	-
Interior Wall Convection	759 sqft	771	-	759 sqft	6	-
Ceiling Convection	158 sqft	308	-	158 sqft	1	-
Overhead Lighting Convection	79 W	115	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	143 W	366	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	320	154	25%	2	0
		2453	**1179**	**-**	**9**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 13. Heat Balance Loads for Zone 140 KG

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	577 sqft	875	-	577 sqft	738	-
Roof Convection	293 sqft	476	-	293 sqft	377	-
Window Convection	62 sqft	417	-	62 sqft	576	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1265 sqft	1997	-	1265 sqft	1157	-
Interior Wall Convection	2093 sqft	2312	-	2093 sqft	337	-
Ceiling Convection	971 sqft	2386	-	971 sqft	359	-
Overhead Lighting Convection	632 W	913	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1072 W	2743	-	0 W	0	-
People Convection	23	1691	4715	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2071	707	25%	886	0
		15880	**5422**	**-**	**4429**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 14. Heat Balance Loads for Zone 141 READ

	DESIGN COOLING - JULY 15:00			DESIGN HEATING		
	OA DB / WB 91.0 F / 74.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	145 sqft	162	-	145 sqft	208	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	96	-	31 sqft	329	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	225 sqft	287	-	225 sqft	304	-
Interior Wall Convection	726 sqft	737	-	726 sqft	149	-
Ceiling Convection	224 sqft	433	-	224 sqft	95	-
Overhead Lighting Convection	112 W	162	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	202 W	518	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	415	154	25%	271	0
		3179	**1179**	**-**	**1357**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 15. Heat Balance Loads for Zone 142 LEARNING CENTER

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	142 sqft	261	-	142 sqft	205	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	239	-	31 sqft	329	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	222 sqft	452	-	222 sqft	301	-
Interior Wall Convection	724 sqft	1239	-	724 sqft	149	-
Ceiling Convection	222 sqft	722	-	222 sqft	94	-
Overhead Lighting Convection	111 W	160	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	200 W	511	-	0 W	0	-
People Convection	8	588	1640	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	626	246	25%	269	0
		4798	**1886**	**-**	**1346**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 16. Heat Balance Loads for Zone 143 KG

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	588 sqft	796	-	588 sqft	751	-
Roof Convection	286 sqft	463	-	286 sqft	366	-
Window Convection	62 sqft	416	-	62 sqft	573	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1298 sqft	2046	-	1298 sqft	1182	-
Interior Wall Convection	2089 sqft	2443	-	2089 sqft	332	-
Ceiling Convection	1012 sqft	2466	-	1012 sqft	371	-
Overhead Lighting Convection	649 W	937	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1104 W	2825	-	0 W	0	-
People Convection	23	1691	4715	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2112	707	25%	894	0
		16195	**5422**	**-**	**4468**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 17. Heat Balance Loads for Zone 144 SM GROUP

	DESIGN COOLING - JUNE 20:00			DESIGN HEATING		
	OA DB / WB 79.9 F / 69.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	166 sqft	202	-	166 sqft	0	-
Interior Wall Convection	773 sqft	744	-	773 sqft	6	-
Ceiling Convection	165 sqft	303	-	165 sqft	1	-
Overhead Lighting Convection	83 W	120	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	83 W	212	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	292	154	25%	2	0
		2241	**1179**	**-**	**9**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 18. Heat Balance Loads for Zone 145 KG

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	532 sqft	766	-	532 sqft	683	-
Roof Convection	289 sqft	439	-	289 sqft	369	-
Window Convection	62 sqft	404	-	62 sqft	578	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1273 sqft	1900	-	1273 sqft	1325	-
Interior Wall Convection	2160 sqft	2337	-	2160 sqft	338	-
Ceiling Convection	984 sqft	2200	-	984 sqft	348	-
Overhead Lighting Convection	637 W	919	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	604 W	1545	-	0 W	0	-
People Convection	23	1691	4715	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1830	707	25%	910	0
		14031	**5422**	**-**	**4551**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 19. Heat Balance Loads for Zone 146 ELL

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	170 sqft	288	-	170 sqft	218	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	62 sqft	294	-	62 sqft	585	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	497 sqft	953	-	497 sqft	134	-
Interior Wall Convection	1135 sqft	1728	-	1135 sqft	239	-
Ceiling Convection	497 sqft	1400	-	497 sqft	223	-
Overhead Lighting Convection	249 W	359	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	249 W	636	-	0 W	0	-
People Convection	16	1176	3280	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1025	492	25%	350	0
		7858	**3772**	**-**	**1748**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 20. Heat Balance Loads for Zone 147 MATH

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	128 sqft	216	-	128 sqft	180	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	236	-	31 sqft	334	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	232 sqft	423	-	232 sqft	300	-
Interior Wall Convection	786 sqft	1487	-	786 sqft	209	-
Ceiling Convection	232 sqft	665	-	232 sqft	96	-
Overhead Lighting Convection	116 W	168	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	348 W	892	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	668	154	25%	280	0
		5123	**1179**	**-**	**1398**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

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Table 21. Heat Balance Loads for Zone 230 CORRIDOR

	DESIGN COOLING - NOVEMBER 10:00			DESIGN HEATING		
	OA DB / WB 56.9 F / 56.9 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1181 sqft	3721	-	1181 sqft	215	-
Interior Wall Convection	3573 sqft	8382	-	3573 sqft	486	-
Ceiling Convection	1180 sqft	5823	-	1180 sqft	353	-
Overhead Lighting Convection	590 W	852	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	298 W	764	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	3229	830	25%	264	0
		24755	**6365**	**-**	**1318**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 22. Heat Balance Loads for Zone 230A-D EXTENDED LEARNING

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	81 sqft	241	-	81 sqft	104	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	310 sqft	2594	-	310 sqft	2757	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1810 sqft	5626	-	1810 sqft	335	-
Interior Wall Convection	3044 sqft	7787	-	3044 sqft	513	-
Ceiling Convection	1807 sqft	9208	-	1807 sqft	637	-
Overhead Lighting Convection	905 W	1306	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	905 W	2316	-	0 W	0	-
People Convection	144	10584	29520	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	5949	4428	25%	1087	0
		45611	**33948**	**-**	**5433**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 23. Heat Balance Loads for Zone 231 STRIDES 1ST/2ND

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	438 sqft	779	-	438 sqft	515	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	998	-	93 sqft	802	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1090 sqft	2448	-	1090 sqft	220	-
Interior Wall Convection	2363 sqft	3713	-	2363 sqft	428	-
Ceiling Convection	1089 sqft	3809	-	1089 sqft	445	-
Overhead Lighting Convection	545 W	786	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	493 W	1262	-	0 W	0	-
People Convection	28	2058	5740	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2378	861	25%	603	0
		18232	**6601**	**-**	**3013**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 24. Heat Balance Loads for Zone 231A CALMING

	DESIGN COOLING - OCTOBER 13:00			DESIGN HEATING		
	OA DB / WB 72.3 F / 65.1 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	114 sqft	84	-	114 sqft	1	-
Interior Wall Convection	632 sqft	345	-	632 sqft	16	-
Ceiling Convection	114 sqft	88	-	114 sqft	2	-
Overhead Lighting Convection	57 W	82	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	57 W	146	-	0 W	0	-
People Convection	1	74	205	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	123	31	25%	5	0
		941	**236**	**-**	**24**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 25. Heat Balance Loads for Zone 232 SMALL GROUP

	DESIGN COOLING - JANUARY 12:00			DESIGN HEATING		
	OA DB / WB 44.1 F / 44.1 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	167 sqft	240	-	167 sqft	1	-
Interior Wall Convection	772 sqft	953	-	772 sqft	7	-
Ceiling Convection	167 sqft	391	-	167 sqft	1	-
Overhead Lighting Convection	84 W	121	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	84 W	214	-	0 W	0	-
People Convection	7	515	1435	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	365	215	25%	2	0
		2799	**1650**	**-**	**11**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 26. Heat Balance Loads for Zone 233 CLASSROOM

	DESIGN COOLING - OCTOBER 10:00			DESIGN HEATING		
	OA DB / WB 63.6 F / 62.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	629 sqft	1381	-	629 sqft	825	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	998	-	93 sqft	858	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	978 sqft	3062	-	978 sqft	247	-
Interior Wall Convection	1223 sqft	2284	-	1223 sqft	269	-
Ceiling Convection	978 sqft	3783	-	978 sqft	512	-
Overhead Lighting Convection	489 W	706	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	489 W	1251	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2317	830	25%	678	0
		17767	**6365**	**-**	**3388**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 27. Heat Balance Loads for Zone 234 CLASSROOM

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	834 sqft	1986	-	834 sqft	1164	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	1028	-	93 sqft	918	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	937 sqft	2462	-	937 sqft	262	-
Interior Wall Convection	980 sqft	2045	-	980 sqft	241	-
Ceiling Convection	938 sqft	3875	-	938 sqft	544	-
Overhead Lighting Convection	469 W	677	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	469 W	1200	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2289	830	25%	782	0
		17545	**6365**	**-**	**3910**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 28. Heat Balance Loads for Zone 235 SM GROUP

	DESIGN COOLING - JANUARY 12:00			DESIGN HEATING		
	OA DB / WB 44.1 F / 44.1 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	174 sqft	194	-	174 sqft	1	-
Interior Wall Convection	789 sqft	789	-	789 sqft	7	-
Ceiling Convection	173 sqft	308	-	173 sqft	1	-
Overhead Lighting Convection	87 W	125	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	87 W	222	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	301	154	25%	2	0
		2306	**1179**	**-**	**11**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 29. Heat Balance Loads for Zone 236 CLASSROOM

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	462 sqft	1311	-	462 sqft	594	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	1089	-	93 sqft	859	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	974 sqft	2931	-	974 sqft	238	-
Interior Wall Convection	1391 sqft	3679	-	1391 sqft	370	-
Ceiling Convection	975 sqft	4761	-	975 sqft	490	-
Overhead Lighting Convection	487 W	703	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	487 W	1246	-	0 W	0	-
People Convection	36	2651	7395	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2756	1109	25%	638	0
		21127	**8504**	**-**	**3190**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 30. Heat Balance Loads for Zone 237 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	842 sqft	1958	-	842 sqft	1209	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	726	-	93 sqft	939	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	945 sqft	2298	-	945 sqft	268	-
Interior Wall Convection	980 sqft	1962	-	980 sqft	247	-
Ceiling Convection	946 sqft	3715	-	946 sqft	556	-
Overhead Lighting Convection	472 W	682	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	472 W	1209	-	0 W	0	-
People Convection	35	2572	7174	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2268	1076	25%	805	0
		17390	**8250**	**-**	**4023**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 31. Heat Balance Loads for Zone 238 SM GROUP

	DESIGN COOLING - JUNE 20:00			DESIGN HEATING		
	OA DB / WB 79.9 F / 69.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	171 sqft	189	-	171 sqft	1	-
Interior Wall Convection	780 sqft	754	-	780 sqft	8	-
Ceiling Convection	171 sqft	300	-	171 sqft	1	-
Overhead Lighting Convection	85 W	123	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	85 W	218	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	293	154	25%	2	0
		2244	**1179**	**-**	**12**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 32. Heat Balance Loads for Zone 239 LANGUAGE 1ST/2ND

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	415 sqft	818	-	415 sqft	528	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	681	-	93 sqft	865	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	939 sqft	2039	-	939 sqft	225	-
Interior Wall Convection	1399 sqft	2420	-	1399 sqft	293	-
Ceiling Convection	940 sqft	3180	-	940 sqft	465	-
Overhead Lighting Convection	470 W	678	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	470 W	1202	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1950	830	25%	594	0
		14954	**6365**	**-**	**2970**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 33. Heat Balance Loads for Zone 240 READ

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	144 sqft	249	-	144 sqft	200	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	238	-	31 sqft	313	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	227 sqft	429	-	227 sqft	50	-
Interior Wall Convection	733 sqft	1213	-	733 sqft	159	-
Ceiling Convection	227 sqft	684	-	227 sqft	101	-
Overhead Lighting Convection	113 W	164	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	340 W	871	-	0 W	0	-
People Convection	7	515	1435	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	654	215	25%	206	0
		5016	**1650**	**-**	**1029**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 34. Heat Balance Loads for Zone 241 LEARNING CENTER

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	143 sqft	254	-	143 sqft	199	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	233	-	31 sqft	313	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	225 sqft	430	-	225 sqft	49	-
Interior Wall Convection	732 sqft	1234	-	732 sqft	159	-
Ceiling Convection	225 sqft	724	-	225 sqft	100	-
Overhead Lighting Convection	112 W	162	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	112 W	288	-	0 W	0	-
People Convection	8	588	1640	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	587	246	25%	205	0
		4501	**1886**	**-**	**1024**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 35. Heat Balance Loads for Zone 242 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	433 sqft	846	-	433 sqft	548	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	679	-	93 sqft	864	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	983 sqft	2038	-	983 sqft	233	-
Interior Wall Convection	1418 sqft	2444	-	1418 sqft	293	-
Ceiling Convection	984 sqft	3241	-	984 sqft	482	-
Overhead Lighting Convection	492 W	709	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	492 W	1258	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1980	830	25%	605	0
		15179	**6365**	**-**	**3025**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 36. Heat Balance Loads for Zone 243 SM GROUP

	DESIGN COOLING - JUNE 20:00			DESIGN HEATING		
	OA DB / WB 79.9 F / 69.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	167 sqft	213	-	167 sqft	1	-
Interior Wall Convection	772 sqft	834	-	772 sqft	8	-
Ceiling Convection	166 sqft	336	-	166 sqft	1	-
Overhead Lighting Convection	84 W	121	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	84 W	214	-	0 W	0	-
People Convection	6	430	1198	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	322	180	25%	2	0
		2469	**1378**	**-**	**12**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 37. Heat Balance Loads for Zone 244 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	361 sqft	700	-	361 sqft	448	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	679	-	93 sqft	852	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	954 sqft	2085	-	954 sqft	220	-
Interior Wall Convection	1466 sqft	2517	-	1466 sqft	300	-
Ceiling Convection	955 sqft	3206	-	955 sqft	457	-
Overhead Lighting Convection	477 W	688	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	477 W	1220	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1962	830	25%	569	0
		15043	**6365**	**-**	**2845**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 38. Heat Balance Loads for Zone 245 BCBA OFFICE

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	160 sqft	234	-	160 sqft	195	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	220	-	31 sqft	285	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	361 sqft	587	-	361 sqft	68	-
Interior Wall Convection	1083 sqft	1443	-	1083 sqft	180	-
Ceiling Convection	361 sqft	960	-	361 sqft	136	-
Overhead Lighting Convection	181 W	261	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	542 W	1387	-	0 W	0	-
People Convection	7	531	1481	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	843	222	25%	216	0
		6466	**1703**	**-**	**1078**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 39. Heat Balance Loads for Zone 246 ADJ

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	183 sqft	302	-	183 sqft	252	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	234	-	31 sqft	320	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	240 sqft	432	-	240 sqft	57	-
Interior Wall Convection	696 sqft	1260	-	696 sqft	193	-
Ceiling Convection	240 sqft	728	-	240 sqft	113	-
Overhead Lighting Convection	120 W	173	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	360 W	921	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	663	154	25%	234	0
		5081	**1179**	**-**	**1169**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 40. Heat Balance Loads for Zone 333 CORRIDOR

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	1027 sqft	3683	-	1027 sqft	1331	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1026 sqft	3353	-	1026 sqft	205	-
Interior Wall Convection	3230 sqft	8287	-	3230 sqft	557	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	513 W	740	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	240 W	614	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2799	830	25%	523	0
		21459	**6365**	**-**	**2615**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 41. Heat Balance Loads for Zone 333A-D EXTENDED LEARNING

	DESIGN COOLING - SEPTEMBER 12:00			DESIGN HEATING		
	OA DB / WB 80.2 F / 69.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	132 sqft	434	-	132 sqft	183	-
Roof Convection	1774 sqft	6863	-	1774 sqft	2372	-
Window Convection	234 sqft	2217	-	234 sqft	2261	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1774 sqft	5761	-	1774 sqft	356	-
Interior Wall Convection	2983 sqft	8107	-	2983 sqft	568	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	887 W	1280	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	887 W	2270	-	0 W	0	-
People Convection	144	10584	29520	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	5627	4428	25%	1435	0
		43143	**33948**	**-**	**7176**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 42. Heat Balance Loads for Zone 334 STRIDES 3RD-5TH

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	438 sqft	820	-	438 sqft	617	-
Roof Convection	1100 sqft	2969	-	1100 sqft	1539	-
Window Convection	93 sqft	1013	-	93 sqft	917	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1100 sqft	2655	-	1100 sqft	271	-
Interior Wall Convection	2347 sqft	4008	-	2347 sqft	529	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	550 W	794	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	500 W	1280	-	0 W	0	-
People Convection	28	2058	5740	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2339	861	25%	968	0
		17936	**6601**	**-**	**4840**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 43. Heat Balance Loads for Zone 334A CALMING

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	111 sqft	111	-	111 sqft	124	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	110 sqft	66	-	110 sqft	8	-
Interior Wall Convection	621 sqft	344	-	621 sqft	52	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	55 W	79	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	55 W	141	-	0 W	0	-
People Convection	1	74	205	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	122	31	25%	46	0
		937	**236**	**-**	**230**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 44. Heat Balance Loads for Zone 335 SM GROUP

	DESIGN COOLING - JULY 18:00			DESIGN HEATING		
	OA DB / WB 88.1 F / 73.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	167 sqft	306	-	167 sqft	183	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	167 sqft	202	-	167 sqft	9	-
Interior Wall Convection	771 sqft	793	-	771 sqft	40	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	83 W	120	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	83 W	213	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	300	154	25%	58	0
		2302	**1179**	**-**	**290**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 45. Heat Balance Loads for Zone 336 CLASSROOM

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	629 sqft	1567	-	629 sqft	971	-
Roof Convection	986 sqft	2990	-	986 sqft	1459	-
Window Convection	93 sqft	1020	-	93 sqft	961	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	986 sqft	2832	-	986 sqft	304	-
Interior Wall Convection	1223 sqft	2680	-	1223 sqft	325	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	493 W	712	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	493 W	1262	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2257	830	25%	1005	0
		17304	**6365**	**-**	**5024**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 46. Heat Balance Loads for Zone 337 CLASSROOM

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	837 sqft	2072	-	837 sqft	1345	-
Roof Convection	949 sqft	2944	-	949 sqft	1441	-
Window Convection	93 sqft	1038	-	93 sqft	1004	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	942 sqft	2734	-	942 sqft	316	-
Interior Wall Convection	982 sqft	2191	-	982 sqft	290	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	471 W	680	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	471 W	1205	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2227	830	25%	1099	0
		17077	**6365**	**-**	**5494**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 47. Heat Balance Loads for Zone 338 SM GROUP

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	176 sqft	318	-	176 sqft	193	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	176 sqft	207	-	176 sqft	9	-
Interior Wall Convection	793 sqft	795	-	793 sqft	44	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	88 W	127	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	88 W	225	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	306	154	25%	62	0
		2346	**1179**	**-**	**308**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 48. Heat Balance Loads for Zone 339 CLASSROOM

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	459 sqft	1214	-	459 sqft	692	-
Roof Convection	976 sqft	3220	-	976 sqft	1429	-
Window Convection	93 sqft	1052	-	93 sqft	960	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	976 sqft	2840	-	976 sqft	290	-
Interior Wall Convection	1388 sqft	3572	-	1388 sqft	440	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	488 W	704	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	488 W	1248	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2375	830	25%	953	0
		18210	**6365**	**-**	**4763**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 49. Heat Balance Loads for Zone 340 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	862 sqft	1887	-	862 sqft	1406	-
Roof Convection	968 sqft	3039	-	968 sqft	1474	-
Window Convection	93 sqft	694	-	93 sqft	1015	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	967 sqft	2250	-	967 sqft	328	-
Interior Wall Convection	963 sqft	1842	-	963 sqft	287	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	484 W	698	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	484 W	1238	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2045	830	25%	1128	0
		15677	**6365**	**-**	**5638**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 50. Heat Balance Loads for Zone 341 SM GROUP

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	173 sqft	319	-	173 sqft	190	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	172 sqft	206	-	172 sqft	9	-
Interior Wall Convection	786 sqft	812	-	786 sqft	44	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	86 W	124	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	86 W	220	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	307	154	25%	61	0
		2356	**1179**	**-**	**304**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 51. Heat Balance Loads for Zone 342 LANGUAGE 3RD-5TH

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	415 sqft	895	-	415 sqft	616	-
Roof Convection	964 sqft	3066	-	964 sqft	1403	-
Window Convection	93 sqft	691	-	93 sqft	956	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	941 sqft	2206	-	941 sqft	275	-
Interior Wall Convection	1399 sqft	2628	-	1399 sqft	357	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	470 W	679	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	470 W	1204	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2003	830	25%	901	0
		15356	**6365**	**-**	**4507**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 52. Heat Balance Loads for Zone 343 READ

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	145 sqft	237	-	145 sqft	217	-
Roof Convection	227 sqft	594	-	227 sqft	323	-
Window Convection	31 sqft	229	-	31 sqft	336	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	226 sqft	405	-	226 sqft	56	-
Interior Wall Convection	730 sqft	1170	-	730 sqft	177	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	113 W	163	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	338 W	866	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	605	154	25%	277	0
		4635	**1179**	**-**	**1386**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 53. Heat Balance Loads for Zone 344 LEARNING CENTER

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	142 sqft	274	-	142 sqft	214	-
Roof Convection	224 sqft	658	-	224 sqft	319	-
Window Convection	31 sqft	237	-	31 sqft	336	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	224 sqft	463	-	224 sqft	55	-
Interior Wall Convection	728 sqft	1317	-	728 sqft	176	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	112 W	161	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	112 W	286	-	0 W	0	-
People Convection	8	588	1640	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	598	246	25%	275	0
		4583	**1886**	**-**	**1375**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 54. Heat Balance Loads for Zone 345 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	433 sqft	928	-	433 sqft	641	-
Roof Convection	985 sqft	3118	-	985 sqft	1429	-
Window Convection	93 sqft	688	-	93 sqft	956	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	984 sqft	2243	-	984 sqft	285	-
Interior Wall Convection	1417 sqft	2677	-	1417 sqft	355	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	492 W	710	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	492 W	1259	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2041	830	25%	917	0
		15649	**6365**	**-**	**4584**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 55. Heat Balance Loads for Zone 346 SM GROUP

	DESIGN COOLING - JUNE 20:00			DESIGN HEATING		
	OA DB / WB 79.9 F / 69.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	166 sqft	309	-	166 sqft	183	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	166 sqft	203	-	166 sqft	9	-
Interior Wall Convection	770 sqft	822	-	770 sqft	41	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	83 W	120	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	83 W	213	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	305	154	25%	58	0
		2340	**1179**	**-**	**291**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 56. Heat Balance Loads for Zone 347 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	361 sqft	757	-	361 sqft	527	-
Roof Convection	956 sqft	3011	-	956 sqft	1382	-
Window Convection	93 sqft	693	-	93 sqft	952	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	955 sqft	2301	-	955 sqft	272	-
Interior Wall Convection	1466 sqft	2741	-	1466 sqft	379	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	477 W	689	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	477 W	1221	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2010	830	25%	878	0
		15407	**6365**	**-**	**4391**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-2 (N Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:09 AM

Table 57. Heat Balance Loads for Zone 348 ELL

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	184 sqft	379	-	184 sqft	273	-
Roof Convection	502 sqft	1564	-	502 sqft	719	-
Window Convection	62 sqft	468	-	62 sqft	651	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	501 sqft	1129	-	501 sqft	130	-
Interior Wall Convection	1223 sqft	2212	-	1223 sqft	312	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	250 W	361	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	250 W	641	-	0 W	0	-
People Convection	16	1176	3280	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1189	492	25%	521	0
		9119	**3772**	**-**	**2606**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 58. Heat Balance Loads for Zone 349 MATH

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	128 sqft	231	-	128 sqft	195	-
Roof Convection	225 sqft	627	-	225 sqft	322	-
Window Convection	31 sqft	233	-	31 sqft	341	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	225 sqft	431	-	225 sqft	56	-
Interior Wall Convection	768 sqft	1517	-	768 sqft	230	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	113 W	163	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	113 W	289	-	0 W	0	-
People Convection	6	441	1230	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	590	185	25%	286	0
		4520	**1415**	**-**	**1430**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 1. Heat Balance Loads for Zone 102 CORRIDOR

	DESIGN COOLING - JULY 20:00			DESIGN HEATING		
	OA DB / WB 82.9 F / 71.8 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	499 sqft	718	-	499 sqft	585	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	4998 sqft	9020	-	4998 sqft	1820	-
Interior Wall Convection	14622 sqft	19065	-	14622 sqft	1818	-
Ceiling Convection	4999 sqft	10705	-	4999 sqft	1048	-
Overhead Lighting Convection	2499 W	3607	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	500 W	1279	-	0 W	0	-
People Convection	19	1397	3895	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	6869	584	25%	1318	0
		52659	**4479**	**-**	**6588**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 2. Heat Balance Loads for Zone 103 SPECH/LANG

	DESIGN COOLING - OCTOBER 12:00			DESIGN HEATING		
	OA DB / WB 70.2 F / 64.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	124 sqft	169	-	124 sqft	173	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	231	-	31 sqft	315	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	225 sqft	462	-	225 sqft	289	-
Interior Wall Convection	781 sqft	1170	-	781 sqft	180	-
Ceiling Convection	225 sqft	673	-	225 sqft	99	-
Overhead Lighting Convection	113 W	163	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	203 W	519	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	563	154	25%	264	0
		4318	**1179**	**-**	**1321**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 3. Heat Balance Loads for Zone 104 ADJUSTMENT

	DESIGN COOLING - SEPTEMBER 11:00			DESIGN HEATING		
	OA DB / WB 77.1 F / 68.7 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	119 sqft	175	-	119 sqft	173	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	228	-	31 sqft	328	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	218 sqft	444	-	218 sqft	285	-
Interior Wall Convection	776 sqft	1060	-	776 sqft	315	-
Ceiling Convection	218 sqft	646	-	218 sqft	109	-
Overhead Lighting Convection	109 W	158	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	327 W	838	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	587	154	25%	302	0
		4503	**1179**	**-**	**1512**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 4. Heat Balance Loads for Zone 125 TEACH COLLAB

	DESIGN COOLING - AUGUST 16:00			DESIGN HEATING		
	OA DB / WB 91.0 F / 74.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	715 sqft	1519	-	715 sqft	947	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	62 sqft	704	-	62 sqft	607	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1018 sqft	2335	-	1018 sqft	1168	-
Interior Wall Convection	1606 sqft	2258	-	1606 sqft	260	-
Ceiling Convection	1018 sqft	3378	-	1018 sqft	412	-
Overhead Lighting Convection	509 W	735	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1916 W	4903	-	0 W	0	-
People Convection	25	1730	3085	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2634	463	25%	848	0
		20195	**3548**	**-**	**4241**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 5. Heat Balance Loads for Zone 125A TEACH WELLNESS

	DESIGN COOLING - OCTOBER 15:00			DESIGN HEATING		
	OA DB / WB 75.0 F / 66.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	104 sqft	201	-	104 sqft	155	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	368	-	31 sqft	353	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	120 sqft	280	-	120 sqft	188	-
Interior Wall Convection	514 sqft	1092	-	514 sqft	129	-
Ceiling Convection	120 sqft	364	-	120 sqft	59	-
Overhead Lighting Convection	72 W	104	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	240 W	613	-	0 W	0	-
People Convection	2	138	240	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	474	36	25%	221	0
		3635	**276**	**-**	**1107**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 6. Heat Balance Loads for Zone 148 IT OFFICE

	DESIGN COOLING - JULY 22:00			DESIGN HEATING		
	OA DB / WB 78.8 F / 70.5 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	137 sqft	93	-	137 sqft	5	-
Interior Wall Convection	687 sqft	399	-	687 sqft	43	-
Ceiling Convection	137 sqft	138	-	137 sqft	10	-
Overhead Lighting Convection	69 W	99	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	206 W	527	-	0 W	0	-
People Convection	1	74	205	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	199	31	25%	15	0
		1529	**236**	**-**	**74**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 7. Heat Balance Loads for Zone 150 CORRIDOR

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	1749 sqft	4190	-	1749 sqft	2145	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	2346 sqft	4711	-	2346 sqft	385	-
Interior Wall Convection	7201 sqft	11485	-	7201 sqft	1779	-
Ceiling Convection	597 sqft	1857	-	597 sqft	203	-
Overhead Lighting Convection	1173 W	1693	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	235 W	600	-	0 W	0	-
People Convection	8	588	1640	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	3769	246	25%	1128	0
		28893	**1886**	**-**	**5639**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 8. Heat Balance Loads for Zone 192 PT CR

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	366 sqft	617	-	366 sqft	480	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	124 sqft	1270	-	124 sqft	1200	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1342 sqft	2768	-	1342 sqft	1269	-
Interior Wall Convection	1956 sqft	2768	-	1956 sqft	325	-
Ceiling Convection	1342 sqft	3748	-	1342 sqft	571	-
Overhead Lighting Convection	671 W	968	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1666 W	4263	-	0 W	0	-
People Convection	11	974	5005	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2606	751	25%	961	0
		19982	**5756**	**-**	**4807**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 9. Heat Balance Loads for Zone 193 OT CR

	DESIGN COOLING - SEPTEMBER 11:00			DESIGN HEATING		
	OA DB / WB 77.1 F / 68.7 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	195 sqft	324	-	195 sqft	270	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	324	-	31 sqft	319	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	284 sqft	637	-	284 sqft	388	-
Interior Wall Convection	767 sqft	1363	-	767 sqft	200	-
Ceiling Convection	284 sqft	825	-	284 sqft	119	-
Overhead Lighting Convection	142 W	205	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	142 W	364	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	661	154	25%	324	0
		5071	**1179**	**-**	**1618**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 10. Heat Balance Loads for Zone 201 CORRIDOR

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	4339 sqft	3034	-	4339 sqft	97	-
Interior Wall Convection	14647 sqft	7848	-	14647 sqft	493	-
Ceiling Convection	4337 sqft	2422	-	4337 sqft	124	-
Overhead Lighting Convection	2170 W	3132	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	434 W	1111	-	0 W	0	-
People Convection	17	1250	3485	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2819	523	25%	179	0
		21615	**4008**	**-**	**893**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 11. Heat Balance Loads for Zone 222 MATH

	DESIGN COOLING - AUGUST 16:00			DESIGN HEATING		
	OA DB / WB 91.0 F / 74.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	164 sqft	309	-	164 sqft	326	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	360	-	31 sqft	390	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	219 sqft	840	-	219 sqft	903	-
Interior Wall Convection	678 sqft	1075	-	678 sqft	339	-
Ceiling Convection	219 sqft	744	-	219 sqft	189	-
Overhead Lighting Convection	109 W	158	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	109 W	280	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	620	154	25%	537	0
		4753	**1179**	**-**	**2684**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 12. Heat Balance Loads for Zone 223 ASSIST PRINCIPAL

	DESIGN COOLING - AUGUST 16:00			DESIGN HEATING		
	OA DB / WB 91.0 F / 74.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	167 sqft	336	-	167 sqft	338	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	377	-	31 sqft	396	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	223 sqft	898	-	223 sqft	959	-
Interior Wall Convection	681 sqft	1155	-	681 sqft	338	-
Ceiling Convection	223 sqft	751	-	223 sqft	200	-
Overhead Lighting Convection	111 W	161	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	334 W	855	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	735	154	25%	558	0
		5635	**1179**	**-**	**2789**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 13. Heat Balance Loads for Zone 224 TEACH COLLAB

	DESIGN COOLING - SEPTEMBER 16:00			DESIGN HEATING		
	OA DB / WB 85.0 F / 71.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	484 sqft	884	-	484 sqft	592	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	62 sqft	696	-	62 sqft	538	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1017 sqft	2356	-	1017 sqft	176	-
Interior Wall Convection	2656 sqft	3569	-	2656 sqft	373	-
Ceiling Convection	1017 sqft	3253	-	1017 sqft	370	-
Overhead Lighting Convection	508 W	734	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1914 W	4897	-	0 W	0	-
People Convection	25	1730	3085	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2718	463	25%	512	0
		20836	**3548**	**-**	**2560**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 14. Heat Balance Loads for Zone 224A TEACH WELLNESS

	DESIGN COOLING - SEPTEMBER 15:00			DESIGN HEATING		
	OA DB / WB 85.0 F / 71.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	110 sqft	191	-	110 sqft	169	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	391	-	31 sqft	343	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	120 sqft	445	-	120 sqft	32	-
Interior Wall Convection	508 sqft	850	-	508 sqft	137	-
Ceiling Convection	120 sqft	356	-	120 sqft	63	-
Overhead Lighting Convection	60 W	86	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	180 W	460	-	0 W	0	-
People Convection	1	74	205	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	428	31	25%	186	0
		3280	**236**	**-**	**930**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 15. Heat Balance Loads for Zone 256 STE CLASSROOM

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	395 sqft	1103	-	395 sqft	610	-
Roof Convection	1257 sqft	4111	-	1257 sqft	1854	-
Window Convection	160 sqft	1801	-	160 sqft	1661	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1280 sqft	4026	-	1280 sqft	387	-
Interior Wall Convection	2387 sqft	4097	-	2387 sqft	506	-
Ceiling Convection	24 sqft	48	-	24 sqft	8	-
Overhead Lighting Convection	640 W	924	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	583 W	1492	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2938	830	25%	1257	0
		22527	**6365**	**-**	**6283**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 16. Heat Balance Loads for Zone 257 FLEX CLASSROOM

	DESIGN COOLING - OCTOBER 11:00			DESIGN HEATING		
	OA DB / WB 67.1 F / 63.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	386 sqft	712	-	386 sqft	464	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	93 sqft	1006	-	93 sqft	804	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1106 sqft	3006	-	1106 sqft	237	-
Interior Wall Convection	2034 sqft	3353	-	2034 sqft	373	-
Ceiling Convection	1106 sqft	4055	-	1106 sqft	494	-
Overhead Lighting Convection	553 W	798	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	522 W	1337	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2438	830	25%	593	0
		18690	**6365**	**-**	**2964**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 17. Heat Balance Loads for Zone 301 CORRIDOR

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	3577 sqft	3922	-	3577 sqft	4045	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	3577 sqft	3228	-	3577 sqft	321	-
Interior Wall Convection	9516 sqft	6768	-	9516 sqft	916	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	1789 W	2581	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	358 W	915	-	0 W	0	-
People Convection	18	1323	3690	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2811	554	25%	1320	0
		21548	**4244**	**-**	**6601**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 18. Heat Balance Loads for Zone 301A EXTENDED LEARNING

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	1083 sqft	1574	-	1083 sqft	1220	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1082 sqft	1137	-	1082 sqft	96	-
Interior Wall Convection	3315 sqft	2241	-	3315 sqft	246	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	541 W	781	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	459 W	1176	-	0 W	0	-
People Convection	28	2058	5740	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1345	861	25%	390	0
		10311	**6601**	**-**	**1952**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 19. Heat Balance Loads for Zone 301B EXTENDED LEARNING

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	413 sqft	695	-	413 sqft	473	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	413 sqft	749	-	413 sqft	82	-
Interior Wall Convection	853 sqft	795	-	853 sqft	64	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	207 W	298	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	207 W	529	-	0 W	0	-
People Convection	10	735	2050	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	570	308	25%	155	0
		4372	**2358**	**-**	**774**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 20. Heat Balance Loads for Zone 325 READ

	DESIGN COOLING - SEPTEMBER 15:00			DESIGN HEATING		
	OA DB / WB 85.0 F / 71.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	156 sqft	303	-	156 sqft	237	-
Roof Convection	223 sqft	605	-	223 sqft	320	-
Window Convection	31 sqft	387	-	31 sqft	334	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	223 sqft	736	-	223 sqft	58	-
Interior Wall Convection	720 sqft	1263	-	720 sqft	184	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	112 W	161	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	335 W	857	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	702	154	25%	283	0
		5382	**1179**	**-**	**1417**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 21. Heat Balance Loads for Zone 326 SCHOOL PSYCH

	DESIGN COOLING - SEPTEMBER 16:00			DESIGN HEATING		
	OA DB / WB 85.0 F / 71.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	175 sqft	383	-	175 sqft	284	-
Roof Convection	167 sqft	508	-	167 sqft	250	-
Window Convection	31 sqft	370	-	31 sqft	359	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	167 sqft	478	-	167 sqft	51	-
Interior Wall Convection	554 sqft	1176	-	554 sqft	171	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	83 W	120	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	250 W	641	-	0 W	0	-
People Convection	4	294	820	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	596	123	25%	279	0
		4567	**943**	**-**	**1393**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 22. Heat Balance Loads for Zone 327 TEACH COLLAB

	DESIGN COOLING - AUGUST 16:00			DESIGN HEATING		
	OA DB / WB 91.0 F / 74.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	452 sqft	1142	-	452 sqft	670	-
Roof Convection	1017 sqft	3452	-	1017 sqft	1463	-
Window Convection	93 sqft	1147	-	93 sqft	945	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1017 sqft	3174	-	1017 sqft	279	-
Interior Wall Convection	1838 sqft	3052	-	1838 sqft	398	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	508 W	734	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1913 W	4897	-	0 W	0	-
People Convection	25	1730	3085	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2899	463	25%	939	0
		22225	**3548**	**-**	**4695**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 23. Heat Balance Loads for Zone 327A TEACH WELLNESS

	DESIGN COOLING - SEPTEMBER 16:00			DESIGN HEATING		
	OA DB / WB 85.0 F / 71.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	110 sqft	226	-	110 sqft	180	-
Roof Convection	120 sqft	349	-	120 sqft	180	-
Window Convection	31 sqft	377	-	31 sqft	362	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	120 sqft	356	-	120 sqft	35	-
Interior Wall Convection	508 sqft	1070	-	508 sqft	147	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	60 W	87	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	240 W	615	-	0 W	0	-
People Convection	1	69	120	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	472	18	25%	226	0
		3622	**138**	**-**	**1131**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 24. Heat Balance Loads for Zone 350 CORRIDOR

	DESIGN COOLING - JULY 20:00			DESIGN HEATING		
	OA DB / WB 82.9 F / 71.8 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	1709 sqft	2423	-	1709 sqft	1936	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1709 sqft	2293	-	1709 sqft	229	-
Interior Wall Convection	3224 sqft	3113	-	3224 sqft	324	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	854 W	1233	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	402 W	1029	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1811	830	25%	622	0
		13888	**6365**	**-**	**3110**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 25. Heat Balance Loads for Zone 351 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	355 sqft	758	-	355 sqft	555	-
Roof Convection	967 sqft	3094	-	967 sqft	1466	-
Window Convection	93 sqft	700	-	93 sqft	993	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	967 sqft	2194	-	967 sqft	607	-
Interior Wall Convection	1465 sqft	3076	-	1465 sqft	505	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	483 W	698	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	483 W	1237	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2061	830	25%	1032	0
		15802	**6365**	**-**	**5158**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 26. Heat Balance Loads for Zone 352 SM GROUP

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	174 sqft	331	-	174 sqft	200	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	174 sqft	270	-	174 sqft	47	-
Interior Wall Convection	790 sqft	828	-	790 sqft	63	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	87 W	125	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	87 W	222	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	322	154	25%	77	0
		2466	**1179**	**-**	**387**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 27. Heat Balance Loads for Zone 353 CLASSROOM

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	839 sqft	1986	-	839 sqft	1461	-
Roof Convection	983 sqft	3159	-	983 sqft	1583	-
Window Convection	124 sqft	817	-	124 sqft	1422	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	983 sqft	2396	-	983 sqft	638	-
Interior Wall Convection	964 sqft	1720	-	964 sqft	349	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	491 W	709	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	491 W	1258	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2104	830	25%	1363	0
		16134	**6365**	**-**	**6817**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 28. Heat Balance Loads for Zone 354 SPEECH

	DESIGN COOLING - JUNE 8:00			DESIGN HEATING		
	OA DB / WB 69.2 F / 66.3 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	179 sqft	334	-	179 sqft	277	-
Roof Convection	231 sqft	537	-	231 sqft	338	-
Window Convection	31 sqft	279	-	31 sqft	350	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	231 sqft	821	-	231 sqft	87	-
Interior Wall Convection	682 sqft	1161	-	682 sqft	183	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	115 W	167	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	115 W	295	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	594	154	25%	309	0
		4554	**1179**	**-**	**1544**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 29. Heat Balance Loads for Zone 355 CLASSROOM

	DESIGN COOLING - JULY 8:00			DESIGN HEATING		
	OA DB / WB 72.2 F / 68.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	765 sqft	1936	-	765 sqft	1290	-
Roof Convection	988 sqft	3117	-	988 sqft	1559	-
Window Convection	124 sqft	1084	-	124 sqft	1392	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	988 sqft	3876	-	988 sqft	483	-
Interior Wall Convection	1030 sqft	2085	-	1030 sqft	338	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	494 W	713	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	494 W	1264	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2409	830	25%	1265	0
		18468	**6365**	**-**	**6327**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 30. Heat Balance Loads for Zone 356 SM GROUP

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	120 sqft	181	-	120 sqft	153	-
Roof Convection	182 sqft	365	-	182 sqft	228	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	182 sqft	375	-	182 sqft	45	-
Interior Wall Convection	692 sqft	754	-	692 sqft	87	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	91 W	131	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	91 W	233	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	361	154	25%	128	0
		2768	**1179**	**-**	**642**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 31. Heat Balance Loads for Zone 357 STRIDES 3RD-5TH

	DESIGN COOLING - JUNE 8:00			DESIGN HEATING		
	OA DB / WB 69.2 F / 66.3 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	211 sqft	468	-	211 sqft	289	-
Roof Convection	1092 sqft	2647	-	1092 sqft	1459	-
Window Convection	62 sqft	543	-	62 sqft	599	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1092 sqft	3109	-	1092 sqft	345	-
Interior Wall Convection	2427 sqft	3428	-	2427 sqft	368	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	546 W	788	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	494 W	1263	-	0 W	0	-
People Convection	28	2058	5740	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2146	861	25%	765	0
		16449	**6601**	**-**	**3825**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 32. Heat Balance Loads for Zone 357A CALMING

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	110 sqft	122	-	110 sqft	123	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	110 sqft	118	-	110 sqft	15	-
Interior Wall Convection	619 sqft	355	-	619 sqft	36	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	55 W	80	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	55 W	141	-	0 W	0	-
People Convection	1	74	205	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	133	31	25%	43	0
		1023	**236**	**-**	**217**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 33. Heat Balance Loads for Zone 358 SM GROUP

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	168 sqft	339	-	168 sqft	189	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	168 sqft	348	-	168 sqft	30	-
Interior Wall Convection	792 sqft	866	-	792 sqft	49	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	84 W	122	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	84 W	216	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	339	154	25%	67	0
		2595	**1179**	**-**	**335**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 34. Heat Balance Loads for Zone 359 CLASSROOM

	DESIGN COOLING - JUNE 8:00			DESIGN HEATING		
	OA DB / WB 69.2 F / 66.3 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	416 sqft	1013	-	416 sqft	624	-
Roof Convection	966 sqft	2973	-	966 sqft	1427	-
Window Convection	93 sqft	855	-	93 sqft	978	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	966 sqft	3488	-	966 sqft	408	-
Interior Wall Convection	1459 sqft	2989	-	1459 sqft	385	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	483 W	697	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	483 W	1236	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2285	830	25%	956	0
		17522	**6365**	**-**	**4778**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 35. Heat Balance Loads for Zone 360 MATH

	DESIGN COOLING - JUNE 8:00			DESIGN HEATING		
	OA DB / WB 69.2 F / 66.3 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	133 sqft	266	-	133 sqft	202	-
Roof Convection	224 sqft	544	-	224 sqft	322	-
Window Convection	31 sqft	292	-	31 sqft	344	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	224 sqft	715	-	224 sqft	86	-
Interior Wall Convection	753 sqft	1444	-	753 sqft	187	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	112 W	162	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	337 W	861	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	698	154	25%	285	0
		5350	**1179**	**-**	**1425**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 36. Heat Balance Loads for Zone 361 SPEECH/LANG

	DESIGN COOLING - JUNE 8:00			DESIGN HEATING		
	OA DB / WB 69.2 F / 66.3 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	133 sqft	263	-	133 sqft	203	-
Roof Convection	225 sqft	538	-	225 sqft	324	-
Window Convection	31 sqft	292	-	31 sqft	346	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	225 sqft	770	-	225 sqft	86	-
Interior Wall Convection	754 sqft	1353	-	754 sqft	186	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	113 W	163	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	338 W	865	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	692	154	25%	286	0
		5303	**1179**	**-**	**1432**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 37. Heat Balance Loads for Zone 362 ADJUSTMENT

	DESIGN COOLING - JUNE 8:00			DESIGN HEATING		
	OA DB / WB 69.2 F / 66.3 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	134 sqft	264	-	134 sqft	204	-
Roof Convection	226 sqft	538	-	226 sqft	325	-
Window Convection	31 sqft	291	-	31 sqft	344	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	226 sqft	799	-	226 sqft	87	-
Interior Wall Convection	754 sqft	1348	-	754 sqft	187	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	113 W	163	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	339 W	868	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	696	154	25%	287	0
		5334	**1179**	**-**	**1434**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 38. Heat Balance Loads for Zone 363 CLASSROOM

	DESIGN COOLING - JUNE 8:00			DESIGN HEATING		
	OA DB / WB 69.2 F / 66.3 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	374 sqft	930	-	374 sqft	556	-
Roof Convection	955 sqft	3007	-	955 sqft	1402	-
Window Convection	93 sqft	855	-	93 sqft	973	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	955 sqft	3124	-	955 sqft	361	-
Interior Wall Convection	1417 sqft	2944	-	1417 sqft	367	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	477 W	689	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	477 W	1222	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2213	830	25%	915	0
		16968	**6365**	**-**	**4574**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Table 39. Heat Balance Loads for Zone 364 SM GROUP

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	166 sqft	309	-	166 sqft	182	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	166 sqft	218	-	166 sqft	10	-
Interior Wall Convection	769 sqft	781	-	769 sqft	41	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	83 W	120	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	83 W	212	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	301	154	25%	58	0
		2307	**1179**	**-**	**291**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 40. Heat Balance Loads for Zone 365 CLASSROOM

	DESIGN COOLING - SEPTEMBER 10:00			DESIGN HEATING		
	OA DB / WB 73.6 F / 67.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	830 sqft	2169	-	830 sqft	1395	-
Roof Convection	965 sqft	3151	-	965 sqft	1512	-
Window Convection	124 sqft	1175	-	124 sqft	1371	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	965 sqft	2845	-	965 sqft	357	-
Interior Wall Convection	955 sqft	2325	-	955 sqft	358	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	482 W	696	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	482 W	1234	-	0 W	0	-
People Convection	27	1985	5535	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2337	830	25%	1248	0
		17917	**6365**	**-**	**6241**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-3 (W Class Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:12 AM

Zone Heat Balance Summary for AHU-4 (Gym Overhead)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:13 AM

Table 1. Heat Balance Loads for Zone 194 GYM

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	1460 sqft	5200	-	1460 sqft	1244	-
Roof Convection	7676 sqft	44050	-	7676 sqft	5337	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	12462 sqft	63178	-	12462 sqft	2222	-
Interior Wall Convection	12494 sqft	43220	-	12494 sqft	1746	-
Ceiling Convection	4787 sqft	28594	-	4787 sqft	722	-
Overhead Lighting Convection	6231 W	8994	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	3086 W	7898	-	0 W	0	-
People Convection	1100	75900	132000	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	5% / 5%	13852	6600	10%	1127	0
		290887	**138600**	**-**	**12398**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-5 (Cafe/Stage Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:14 AM

Table 1. Heat Balance Loads for Zone 168 CAFETERIA

	DESIGN COOLING - JULY 20:00			DESIGN HEATING		
	OA DB / WB 82.9 F / 71.8 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	5495 sqft	8633	-	5495 sqft	6578	-
Roof Convection	5898 sqft	11070	-	5898 sqft	7185	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	6620 sqft	10669	-	6620 sqft	6184	-
Interior Wall Convection	5121 sqft	5939	-	5121 sqft	746	-
Ceiling Convection	722 sqft	328	-	722 sqft	255	-
Overhead Lighting Convection	3310 W	4778	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1655 W	4235	-	0 W	0	-
People Convection	350	29400	94500	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	11258	14175	25%	5237	0
		86310	**108675**	**-**	**26184**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 2. Heat Balance Loads for Zone 169 STAGE

	DESIGN COOLING - JULY 20:00			DESIGN HEATING		
	OA DB / WB 82.9 F / 71.8 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	395 sqft	723	-	395 sqft	442	-
Roof Convection	1145 sqft	2181	-	1145 sqft	1374	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1145 sqft	2011	-	1145 sqft	760	-
Interior Wall Convection	1621 sqft	2555	-	1621 sqft	265	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	572 W	826	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	286 W	733	-	0 W	0	-
People Convection	75	5175	9000	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2130	1350	25%	710	0
		16334	**10350**	**-**	**3552**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-5 (Cafe/Stage Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:14 AM

Zone Heat Balance Summary for AHU-6 (Kitch/Cust)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:14 AM

Table 1. Heat Balance Loads for Zone 153 CHAIR STO

	DESIGN COOLING - JUNE 20:00			DESIGN HEATING		
	OA DB / WB 79.9 F / 69.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	481 sqft	280	-	481 sqft	14	-
Interior Wall Convection	1343 sqft	630	-	1343 sqft	91	-
Ceiling Convection	481 sqft	373	-	481 sqft	36	-
Overhead Lighting Convection	240 W	347	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	48 W	123	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	263	0	25%	35	0
		2017	**0**	**-**	**177**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 2. Heat Balance Loads for Zone 154 CARES STO

	DESIGN COOLING - JUNE 20:00			DESIGN HEATING		
	OA DB / WB 79.9 F / 69.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	526 sqft	315	-	526 sqft	15	-
Interior Wall Convection	1388 sqft	666	-	1388 sqft	85	-
Ceiling Convection	526 sqft	409	-	526 sqft	39	-
Overhead Lighting Convection	263 W	380	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	53 W	135	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	286	0	25%	35	0
		2190	**0**	**-**	**174**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-6 (Kitch/Cust)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:14 AM

Table 3. Heat Balance Loads for Zone 155 RECEIVING

	DESIGN COOLING - JULY 18:00			DESIGN HEATING		
	OA DB / WB 88.1 F / 73.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	1617 sqft	1182	-	1617 sqft	1635	-
Roof Convection	680 sqft	549	-	680 sqft	636	-
Window Convection	7 sqft	37	-	7 sqft	53	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	124 sqft	453	-	124 sqft	617	-
Floor Convection	3073 sqft	1396	-	3073 sqft	1883	-
Interior Wall Convection	3910 sqft	2570	-	3910 sqft	1261	-
Ceiling Convection	2392 sqft	634	-	2392 sqft	421	-
Overhead Lighting Convection	968 W	1397	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	1162 W	2973	-	0 W	0	-
People Convection	3	298	1453	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1723	218	25%	1626	0
		13211	**1671**	**-**	**8132**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 4. Heat Balance Loads for Zone 155C CUST OFF

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	214 sqft	476	-	214 sqft	290	-
Roof Convection	202 sqft	689	-	202 sqft	363	-
Window Convection	62 sqft	519	-	62 sqft	461	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	202 sqft	492	-	202 sqft	441	-
Interior Wall Convection	591 sqft	1365	-	591 sqft	419	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	101 W	146	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	303 W	775	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	724	154	25%	493	0
		5553	**1179**	**-**	**2467**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-6 (Kitch/Cust)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:14 AM

Table 5. Heat Balance Loads for Zone 155D OFF

	DESIGN COOLING - JULY 18:00			DESIGN HEATING		
	OA DB / WB 88.1 F / 73.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	88 sqft	169	-	88 sqft	64	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	88 sqft	122	-	88 sqft	12	-
Interior Wall Convection	552 sqft	620	-	552 sqft	136	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	44 W	64	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	133 W	340	-	0 W	0	-
People Convection	3	221	615	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	230	92	25%	53	0
		1765	**707**	**-**	**264**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 6. Heat Balance Loads for Zone 161 OFFICE

	DESIGN COOLING - JUNE 20:00			DESIGN HEATING		
	OA DB / WB 79.9 F / 69.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	83 sqft	173	-	83 sqft	64	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	83 sqft	124	-	83 sqft	14	-
Interior Wall Convection	535 sqft	710	-	535 sqft	171	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	42 W	60	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	125 W	319	-	0 W	0	-
People Convection	3	221	615	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	241	92	25%	62	0
		1848	**707**	**-**	**312**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-6 (Kitch/Cust)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:14 AM

Zone Heat Balance Summary for AHU-7 (Flex/Quiet Cafe/Music Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Table 1. Heat Balance Loads for Zone 163 INSTRUMENTAL MUSIC

	DESIGN COOLING - JUNE 18:00			DESIGN HEATING		
	OA DB / WB 85.1 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	689 sqft	1816	-	689 sqft	1237	-
Roof Convection	793 sqft	2776	-	793 sqft	1277	-
Window Convection	124 sqft	755	-	124 sqft	1515	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	793 sqft	2306	-	793 sqft	1343	-
Interior Wall Convection	859 sqft	1789	-	859 sqft	572	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	396 W	572	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	396 W	1014	-	0 W	0	-
People Convection	26	1911	5330	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1941	800	25%	1486	0
		14881	**6130**	**-**	**7428**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 2. Heat Balance Loads for Zone 163A INSTR. STO

	DESIGN COOLING - JULY 20:00			DESIGN HEATING		
	OA DB / WB 82.9 F / 71.8 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	243 sqft	131	-	243 sqft	322	-
Roof Convection	261 sqft	144	-	261 sqft	339	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	261 sqft	117	-	261 sqft	353	-
Interior Wall Convection	706 sqft	319	-	706 sqft	100	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	131 W	189	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	26 W	67	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	145	0	25%	279	0
		1111	**0**	**-**	**1393**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-7 (Flex/Quiet Cafe/Music Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Table 3. Heat Balance Loads for Zone 164 QUIET CAFE

	DESIGN COOLING - JUNE 8:00			DESIGN HEATING		
	OA DB / WB 69.2 F / 66.3 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	126 sqft	361	-	126 sqft	194	-
Roof Convection	169 sqft	562	-	169 sqft	247	-
Window Convection	31 sqft	296	-	31 sqft	372	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	169 sqft	485	-	169 sqft	252	-
Interior Wall Convection	621 sqft	1571	-	621 sqft	155	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	85 W	122	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	42 W	108	-	0 W	0	-
People Convection	10	840	2700	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	652	405	25%	305	0
		4996	**3105**	**-**	**1525**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 4. Heat Balance Loads for Zone 165 QUIET CAFE

	DESIGN COOLING - JUNE 8:00			DESIGN HEATING		
	OA DB / WB 69.2 F / 66.3 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	203 sqft	618	-	203 sqft	331	-
Roof Convection	169 sqft	575	-	169 sqft	251	-
Window Convection	31 sqft	305	-	31 sqft	385	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	169 sqft	497	-	169 sqft	286	-
Interior Wall Convection	543 sqft	1571	-	543 sqft	172	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	85 W	122	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	42 W	108	-	0 W	0	-
People Convection	10	840	2700	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	695	405	25%	356	0
		5332	**3105**	**-**	**1781**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-7 (Flex/Quiet Cafe/Music Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Table 5. Heat Balance Loads for Zone 166 QUIET CAFE

	DESIGN COOLING - JUNE 8:00			DESIGN HEATING		
	OA DB / WB 69.2 F / 66.3 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	208 sqft	659	-	208 sqft	336	-
Roof Convection	175 sqft	573	-	175 sqft	260	-
Window Convection	31 sqft	297	-	31 sqft	379	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	175 sqft	497	-	175 sqft	265	-
Interior Wall Convection	549 sqft	1429	-	549 sqft	171	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	88 W	126	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	44 W	112	-	0 W	0	-
People Convection	10	840	2700	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	680	405	25%	353	0
		5212	**3105**	**-**	**1763**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 6. Heat Balance Loads for Zone 171 FLEX CR

	DESIGN COOLING - JULY 9:00			DESIGN HEATING		
	OA DB / WB 75.7 F / 69.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	857 sqft	1683	-	857 sqft	1412	-
Roof Convection	1083 sqft	2602	-	1083 sqft	1629	-
Window Convection	124 sqft	979	-	124 sqft	1432	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1083 sqft	2261	-	1083 sqft	1673	-
Interior Wall Convection	1678 sqft	2211	-	1678 sqft	391	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	636 W	919	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	488 W	1249	-	0 W	0	-
People Convection	22	1617	4510	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	2028	677	25%	1634	0
		15549	**5187**	**-**	**8171**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-7 (Flex/Quiet Cafe/Music Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Zone Heat Balance Summary for AHU-8 (Admin Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Table 1. Heat Balance Loads for Zone 175 CARES OFFICE

	DESIGN COOLING - AUGUST 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	173 sqft	196	-	173 sqft	1	-
Interior Wall Convection	775 sqft	642	-	775 sqft	6	-
Ceiling Convection	173 sqft	323	-	173 sqft	4	-
Overhead Lighting Convection	87 W	125	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	260 W	665	-	0 W	0	-
People Convection	4	294	820	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	337	123	25%	3	0
		2581	**943**	**-**	**14**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 2. Heat Balance Loads for Zone 176 CARES OFFICE

	DESIGN COOLING - AUGUST 17:00			DESIGN HEATING		
	OA DB / WB 89.8 F / 73.7 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	157 sqft	132	-	157 sqft	1	-
Interior Wall Convection	735 sqft	474	-	735 sqft	10	-
Ceiling Convection	157 sqft	248	-	157 sqft	6	-
Overhead Lighting Convection	78 W	113	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	235 W	602	-	0 W	0	-
People Convection	2	147	410	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	258	62	25%	4	0
		1974	**472**	**-**	**21**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-8 (Admin Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Table 3. Heat Balance Loads for Zone 177 OFFICE/WAITING

	DESIGN COOLING - JULY 12:00			DESIGN HEATING		
	OA DB / WB 86.2 F / 72.7 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	320 sqft	331	-	320 sqft	10	-
Interior Wall Convection	1243 sqft	1186	-	1243 sqft	49	-
Ceiling Convection	320 sqft	594	-	320 sqft	38	-
Overhead Lighting Convection	160 W	231	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	480 W	1229	-	0 W	0	-
People Convection	4	294	820	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	580	123	25%	24	0
		4444	**943**	**-**	**121**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 4. Heat Balance Loads for Zone 177A PRINC. SECRETARY

	DESIGN COOLING - SEPTEMBER 11:00			DESIGN HEATING		
	OA DB / WB 77.1 F / 68.7 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	569 sqft	1140	-	569 sqft	905	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	62 sqft	667	-	62 sqft	717	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	430 sqft	820	-	430 sqft	749	-
Interior Wall Convection	694 sqft	1287	-	694 sqft	223	-
Ceiling Convection	430 sqft	1478	-	430 sqft	286	-
Overhead Lighting Convection	215 W	310	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	645 W	1650	-	0 W	0	-
People Convection	3	221	615	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1136	92	25%	720	0
		8710	**707**	**-**	**3600**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-8 (Admin Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Table 5. Heat Balance Loads for Zone 178 CORRIDOR

	DESIGN COOLING - NOVEMBER 11:00			DESIGN HEATING		
	OA DB / WB 60.0 F / 58.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	543 sqft	182	-	543 sqft	3	-
Interior Wall Convection	3166 sqft	1068	-	3166 sqft	27	-
Ceiling Convection	542 sqft	161	-	542 sqft	11	-
Overhead Lighting Convection	271 W	392	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	54 W	139	-	0 W	0	-
People Convection	1	74	205	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	302	31	25%	10	0
		2317	**236**	**-**	**51**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 6. Heat Balance Loads for Zone 179 COPY

	DESIGN COOLING - NOVEMBER 14:00			DESIGN HEATING		
	OA DB / WB 64.8 F / 60.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	139 sqft	198	-	139 sqft	1	-
Interior Wall Convection	519 sqft	563	-	519 sqft	4	-
Ceiling Convection	139 sqft	351	-	139 sqft	3	-
Overhead Lighting Convection	69 W	100	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	693 W	1774	-	0 W	0	-
People Convection	1	51	142	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	455	21	25%	2	0
		3492	**163**	**-**	**9**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-8 (Admin Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Table 7. Heat Balance Loads for Zone 180 CONFERENCE

	DESIGN COOLING - NOVEMBER 14:00			DESIGN HEATING		
	OA DB / WB 64.8 F / 60.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	321 sqft	656	-	321 sqft	2	-
Interior Wall Convection	1073 sqft	1505	-	1073 sqft	13	-
Ceiling Convection	321 sqft	1033	-	321 sqft	10	-
Overhead Lighting Convection	161 W	232	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	161 W	411	-	0 W	0	-
People Convection	16	1176	3280	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	752	492	25%	6	0
		5765	**3772**	**-**	**31**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 8. Heat Balance Loads for Zone 181 PRINCIPAL

	DESIGN COOLING - NOVEMBER 10:00			DESIGN HEATING		
	OA DB / WB 56.9 F / 56.9 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	199 sqft	532	-	199 sqft	317	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	62 sqft	752	-	62 sqft	740	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	232 sqft	694	-	232 sqft	385	-
Interior Wall Convection	644 sqft	1920	-	644 sqft	201	-
Ceiling Convection	232 sqft	1017	-	232 sqft	149	-
Overhead Lighting Convection	116 W	168	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	348 W	891	-	0 W	0	-
People Convection	7	515	1435	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	973	215	25%	448	0
		7460	**1650**	**-**	**2241**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-8 (Admin Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Table 9. Heat Balance Loads for Zone 182 OFFICE

	DESIGN COOLING - OCTOBER 12:00			DESIGN HEATING		
	OA DB / WB 70.2 F / 64.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	125 sqft	302	-	125 sqft	192	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	363	-	31 sqft	360	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	139 sqft	431	-	139 sqft	218	-
Interior Wall Convection	539 sqft	1279	-	539 sqft	136	-
Ceiling Convection	139 sqft	589	-	139 sqft	81	-
Overhead Lighting Convection	69 W	100	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	208 W	532	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	594	154	25%	247	0
		4557	**1179**	**-**	**1234**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 10. Heat Balance Loads for Zone 183 OFFICE

	DESIGN COOLING - NOVEMBER 10:00			DESIGN HEATING		
	OA DB / WB 56.9 F / 56.9 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	126 sqft	247	-	126 sqft	194	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	31 sqft	349	-	31 sqft	359	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	140 sqft	329	-	140 sqft	220	-
Interior Wall Convection	540 sqft	1150	-	540 sqft	136	-
Ceiling Convection	140 sqft	479	-	140 sqft	72	-
Overhead Lighting Convection	70 W	101	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	210 W	538	-	0 W	0	-
People Convection	3	221	615	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	512	92	25%	245	0
		3926	**707**	**-**	**1227**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-8 (Admin Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Table 11. Heat Balance Loads for Zone 184 COORD OFFICE

	DESIGN COOLING - NOVEMBER 10:00			DESIGN HEATING		
	OA DB / WB 56.9 F / 56.9 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	441 sqft	981	-	441 sqft	742	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	62 sqft	688	-	62 sqft	770	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	287 sqft	742	-	287 sqft	534	-
Interior Wall Convection	525 sqft	1341	-	525 sqft	168	-
Ceiling Convection	287 sqft	1075	-	287 sqft	187	-
Overhead Lighting Convection	144 W	207	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	431 W	1102	-	0 W	0	-
People Convection	6	441	1230	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	987	185	25%	600	0
		7565	**1415**	**-**	**3001**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 12. Heat Balance Loads for Zone 186 RECORDS

	DESIGN COOLING - AUGUST 3:00			DESIGN HEATING		
	OA DB / WB 72.0 F / 68.5 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	120 sqft	48	-	120 sqft	142	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	130 sqft	37	-	130 sqft	167	-
Interior Wall Convection	620 sqft	155	-	620 sqft	55	-
Ceiling Convection	130 sqft	29	-	130 sqft	25	-
Overhead Lighting Convection	65 W	94	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	13 W	33	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	59	0	25%	97	0
		455	**0**	**-**	**487**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-8 (Admin Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Table 13. Heat Balance Loads for Zone 188 CONFERENCE

	DESIGN COOLING - SEPTEMBER 13:00			DESIGN HEATING		
	OA DB / WB 82.3 F / 70.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	218 sqft	312	-	218 sqft	2	-
Interior Wall Convection	878 sqft	904	-	878 sqft	14	-
Ceiling Convection	218 sqft	439	-	218 sqft	11	-
Overhead Lighting Convection	109 W	157	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	109 W	279	-	0 W	0	-
People Convection	8	588	1640	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	402	246	25%	7	0
		3081	**1886**	**-**	**33**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 14. Heat Balance Loads for Zone 189 TEACHER WORKROOM

	DESIGN COOLING - DECEMBER 15:00			DESIGN HEATING		
	OA DB / WB 52.8 F / 51.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	367 sqft	448	-	367 sqft	1	-
Interior Wall Convection	861 sqft	745	-	861 sqft	6	-
Ceiling Convection	367 sqft	743	-	367 sqft	7	-
Overhead Lighting Convection	183 W	265	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	734 W	1877	-	0 W	0	-
People Convection	6	414	720	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	674	108	25%	4	0
		5166	**828**	**-**	**18**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-8 (Admin Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Table 15. Heat Balance Loads for Zone 190 MEDICAL

	DESIGN COOLING - SEPTEMBER 11:00			DESIGN HEATING		
	OA DB / WB 77.1 F / 68.7 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	180 sqft	218	-	180 sqft	217	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	7 sqft	71	-	7 sqft	67	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	24 sqft	147	-	24 sqft	172	-
Floor Convection	558 sqft	620	-	558 sqft	492	-
Interior Wall Convection	1711 sqft	1353	-	1711 sqft	161	-
Ceiling Convection	558 sqft	1009	-	558 sqft	170	-
Overhead Lighting Convection	279 W	403	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	738 W	1889	-	0 W	0	-
People Convection	7	515	1435	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	934	215	25%	320	0
		7159	**1650**	**-**	**1599**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 16. Heat Balance Loads for Zone 190A EXAM

	DESIGN COOLING - SEPTEMBER 16:00			DESIGN HEATING		
	OA DB / WB 85.0 F / 71.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	137 sqft	136	-	137 sqft	176	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	113 sqft	109	-	113 sqft	163	-
Interior Wall Convection	491 sqft	360	-	491 sqft	56	-
Ceiling Convection	113 sqft	251	-	113 sqft	35	-
Overhead Lighting Convection	57 W	82	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	170 W	434	-	0 W	0	-
People Convection	2	147	410	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	228	62	25%	108	0
		1747	**472**	**-**	**538**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-8 (Admin Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Table 17. Heat Balance Loads for Zone 190B EXAM

	DESIGN COOLING - NOVEMBER 14:00			DESIGN HEATING		
	OA DB / WB 64.8 F / 60.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	109 sqft	103	-	109 sqft	1	-
Interior Wall Convection	616 sqft	447	-	616 sqft	7	-
Ceiling Convection	109 sqft	233	-	109 sqft	3	-
Overhead Lighting Convection	55 W	79	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	164 W	419	-	0 W	0	-
People Convection	2	147	410	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	214	62	25%	3	0
		1641	**472**	**-**	**14**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 18. Heat Balance Loads for Zone 191 CORRIDOR

	DESIGN COOLING - JULY 21:00			DESIGN HEATING		
	OA DB / WB 80.7 F / 71.1 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1250 sqft	2313	-	1250 sqft	174	-
Interior Wall Convection	4706 sqft	6236	-	4706 sqft	439	-
Ceiling Convection	1248 sqft	2770	-	1248 sqft	222	-
Overhead Lighting Convection	625 W	902	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	125 W	320	-	0 W	0	-
People Convection	2	147	410	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1903	62	25%	209	0
		14591	**472**	**-**	**1043**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-8 (Admin Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Table 19. Heat Balance Loads for Zone 195 OFFICE

	DESIGN COOLING - JULY 23:00			DESIGN HEATING		
	OA DB / WB 76.9 F / 70.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	146 sqft	217	-	146 sqft	4	-
Interior Wall Convection	712 sqft	853	-	712 sqft	32	-
Ceiling Convection	146 sqft	337	-	146 sqft	9	-
Overhead Lighting Convection	73 W	105	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	218 W	559	-	0 W	0	-
People Convection	5	368	1025	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	366	154	25%	11	0
		2804	**1179**	**-**	**57**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 20. Heat Balance Loads for Zone 251 STAFF LUNCH

	DESIGN COOLING - JULY 20:00			DESIGN HEATING		
	OA DB / WB 82.9 F / 71.8 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	198 sqft	295	-	198 sqft	255	-
Roof Convection	326 sqft	719	-	326 sqft	414	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	326 sqft	475	-	326 sqft	82	-
Interior Wall Convection	907 sqft	1187	-	907 sqft	144	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	163 W	235	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	652 W	1668	-	0 W	0	-
People Convection	8	552	960	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	770	144	25%	224	0
		5902	**1104**	**-**	**1119**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-8 (Admin Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:15 AM

Zone Heat Balance Summary for AHU-9 (Media Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:16 AM

Table 1. Heat Balance Loads for Zone 250 CORRIDOR

	DESIGN COOLING - JULY 20:00			DESIGN HEATING		
	OA DB / WB 82.9 F / 71.8 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	100 sqft	55	-	100 sqft	105	-
Roof Convection	1329 sqft	823	-	1329 sqft	1483	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	1603 sqft	976	-	1603 sqft	113	-
Interior Wall Convection	6111 sqft	3214	-	6111 sqft	476	-
Ceiling Convection	274 sqft	158	-	274 sqft	45	-
Overhead Lighting Convection	801 W	1157	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	160 W	410	-	0 W	0	-
People Convection	2	147	410	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	1041	62	25%	555	0
		7979	**472**	**-**	**2777**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 2. Heat Balance Loads for Zone 252 LIBRARY

	DESIGN COOLING - SEPTEMBER 10:00			DESIGN HEATING		
	OA DB / WB 73.6 F / 67.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	2056 sqft	4204	-	2056 sqft	3427	-
Roof Convection	4070 sqft	9969	-	4070 sqft	6497	-
Window Convection	560 sqft	3984	-	560 sqft	6237	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	4069 sqft	10532	-	4069 sqft	2247	-
Interior Wall Convection	3465 sqft	5444	-	3465 sqft	1113	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	2034 W	2936	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	4069 W	10412	-	0 W	0	-
People Convection	52	3588	6240	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	7660	936	25%	4880	0
		58729	**7176**	**-**	**24401**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for AHU-9 (Media Disp)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:16 AM

Table 3. Heat Balance Loads for Zone 252A LIBRARIAN WORKROOM

	DESIGN COOLING - JULY 19:00			DESIGN HEATING		
	OA DB / WB 86.0 F / 72.6 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 75.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	0 sqft	0	-	0 sqft	0	-
Roof Convection	232 sqft	410	-	232 sqft	258	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	232 sqft	260	-	232 sqft	15	-
Interior Wall Convection	911 sqft	819	-	911 sqft	74	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	116 W	167	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	464 W	1187	-	0 W	0	-
People Convection	4	276	480	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	468	72	25%	87	0
		3587	**552**	**-**	**434**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for Unit Heaters (Stairs, Vestibules)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:16 AM

Table 1. Heat Balance Loads for Zone 101 VEST

	DESIGN COOLING - NOVEMBER 9:00			DESIGN HEATING		
	OA DB / WB 53.4 F / 53.4 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 85.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	55 sqft	2	-	55 sqft	74	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	72 sqft	-24	-	72 sqft	502	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	109 sqft	1	-	109 sqft	237	-
Interior Wall Convection	495 sqft	2	-	495 sqft	326	-
Ceiling Convection	109 sqft	17	-	109 sqft	126	-
Overhead Lighting Convection	54 W	78	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	11 W	28	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	-103		-	0	0
Safety Factor	15% / 15%	0	0	25%	316	0
		0	**0**	**-**	**1582**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 2. Heat Balance Loads for Zone 124 VEST

	DESIGN COOLING - FEBRUARY 17:00			DESIGN HEATING		
	OA DB / WB 47.9 F / 47.9 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 85.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	20 sqft	-1	-	20 sqft	41	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	217 sqft	-355	-	217 sqft	1669	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	152 sqft	-74	-	152 sqft	528	-
Interior Wall Convection	512 sqft	218	-	512 sqft	680	-
Ceiling Convection	152 sqft	-215	-	152 sqft	399	-
Overhead Lighting Convection	76 W	109	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	15 W	39	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	278		-	0	0
Safety Factor	15% / 15%	0	0	25%	829	0
		0	**0**	**-**	**4146**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for Unit Heaters (Stairs, Vestibules)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:16 AM

Table 3. Heat Balance Loads for Zone 152 WATER ENTRY

	DESIGN COOLING - JANUARY 0:00			DESIGN HEATING		
	OA DB / WB 29.8 F / 29.8 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 85.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	157 sqft	-93	-	157 sqft	155	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	252 sqft	-45	-	252 sqft	315	-
Interior Wall Convection	847 sqft	-367	-	847 sqft	308	-
Ceiling Convection	252 sqft	0	-	252 sqft	0	-
Overhead Lighting Convection	126 W	182	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	126 W	322	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	15% / 15%	0	0	25%	195	0
		0	**0**	**-**	**974**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 4. Heat Balance Loads for Zone 167 VEST

	DESIGN COOLING - MAY 7:00			DESIGN HEATING		
	OA DB / WB 60.7 F / 60.7 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 85.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	110 sqft	-8	-	110 sqft	149	-
Roof Convection	113 sqft	-29	-	113 sqft	210	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	46 sqft	72	-	46 sqft	402	-
Floor Convection	113 sqft	-14	-	113 sqft	252	-
Interior Wall Convection	466 sqft	-98	-	466 sqft	278	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	56 W	81	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	11 W	29	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	-33		-	0	0
Safety Factor	15% / 15%	0	0	25%	323	0
		0	**0**	**-**	**1613**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for Unit Heaters (Stairs, Vestibules)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:16 AM

Table 5. Heat Balance Loads for Zone 172 VEST

	DESIGN COOLING - JANUARY 8:00			DESIGN HEATING		
	OA DB / WB 31.5 F / 31.5 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 85.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	311 sqft	-7	-	311 sqft	575	-
Roof Convection	68 sqft	8	-	68 sqft	159	-
Window Convection	228 sqft	-23	-	228 sqft	1794	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	352 sqft	15	-	352 sqft	986	-
Interior Wall Convection	565 sqft	-23	-	565 sqft	512	-
Ceiling Convection	284 sqft	3	-	284 sqft	508	-
Overhead Lighting Convection	176 W	254	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	35 W	90	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	-316		-	0	0
Safety Factor	15% / 15%	0	0	25%	1133	0
		0	**0**	**-**	**5667**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 6. Heat Balance Loads for Zone 247 MECHANICAL ROOM

	DESIGN COOLING - JUNE 13:00			DESIGN HEATING		
	OA DB / WB 85.3 F / 71.2 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 85.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	534 sqft	-156	-	534 sqft	366	-
Roof Convection	0 sqft	0	-	0 sqft	0	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	24 sqft	2	-	24 sqft	110	-
Floor Convection	1823 sqft	-915	-	1823 sqft	142	-
Interior Wall Convection	2365 sqft	-1128	-	2365 sqft	300	-
Ceiling Convection	1823 sqft	-1447	-	1823 sqft	197	-
Overhead Lighting Convection	911 W	1316	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	911 W	2332	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	-4		-	0	0
Safety Factor	15% / 15%	0	0	25%	278	0
		0	**0**	**-**	**1392**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for Unit Heaters (Stairs, Vestibules)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:16 AM

Table 7. Heat Balance Loads for Zone S1-1 STAIR 1

	DESIGN COOLING - NOVEMBER 10:00			DESIGN HEATING		
	OA DB / WB 56.9 F / 56.9 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 85.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	1473 sqft	-364	-	1473 sqft	2121	-
Roof Convection	324 sqft	-152	-	324 sqft	524	-
Window Convection	76 sqft	514	-	76 sqft	572	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	46 sqft	5	-	46 sqft	409	-
Floor Convection	971 sqft	-44	-	971 sqft	711	-
Interior Wall Convection	1894 sqft	-501	-	1894 sqft	1242	-
Ceiling Convection	647 sqft	0	-	647 sqft	0	-
Overhead Lighting Convection	486 W	701	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	97 W	248	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	-407		-	0	0
Safety Factor	15% / 15%	0	0	25%	1395	0
		0	**0**	**-**	**6974**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 8. Heat Balance Loads for Zone S2-1 STAIR 2

	DESIGN COOLING - DECEMBER 10:00			DESIGN HEATING		
	OA DB / WB 44.9 F / 44.9 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 85.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	1142 sqft	-1091	-	1142 sqft	1543	-
Roof Convection	377 sqft	-259	-	377 sqft	512	-
Window Convection	114 sqft	1613	-	114 sqft	833	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	46 sqft	527	-	46 sqft	397	-
Floor Convection	1131 sqft	-209	-	1131 sqft	686	-
Interior Wall Convection	2498 sqft	-1051	-	2498 sqft	1257	-
Ceiling Convection	754 sqft	0	-	754 sqft	0	-
Overhead Lighting Convection	565 W	816	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	113 W	289	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	-636		-	0	0
Safety Factor	15% / 15%	0	0	25%	1307	0
		0	**0**	**-**	**6536**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for Unit Heaters (Stairs, Vestibules)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:16 AM

Table 9. Heat Balance Loads for Zone S3-1 STAIR 3

	DESIGN COOLING - DECEMBER 11:00			DESIGN HEATING		
	OA DB / WB 48.0 F / 48.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 85.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	1425 sqft	-835	-	1425 sqft	2155	-
Roof Convection	320 sqft	-221	-	320 sqft	545	-
Window Convection	113 sqft	837	-	113 sqft	864	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	46 sqft	10	-	46 sqft	422	-
Floor Convection	957 sqft	-200	-	957 sqft	728	-
Interior Wall Convection	1877 sqft	-132	-	1877 sqft	1276	-
Ceiling Convection	637 sqft	-3	-	637 sqft	1	-
Overhead Lighting Convection	479 W	691	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	96 W	245	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	-392		-	0	0
Safety Factor	15% / 15%	0	0	25%	1498	0
		0	**0**	**-**	**7488**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 10. Heat Balance Loads for Zone S4-1 STAIR 4

	DESIGN COOLING - JUNE 21:00			DESIGN HEATING		
	OA DB / WB 77.7 F / 69.0 F			OA DB / WB 0.0 F / 0.0 F		
	OCCUPIED T-STAT 85.0 F			OCCUPIED T-STAT 70.0 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	812 sqft	-83	-	812 sqft	865	-
Roof Convection	741 sqft	-1	-	741 sqft	754	-
Window Convection	100 sqft	-130	-	100 sqft	720	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	46 sqft	-67	-	46 sqft	399	-
Floor Convection	2238 sqft	-51	-	2238 sqft	876	-
Interior Wall Convection	3965 sqft	-2074	-	3965 sqft	1516	-
Ceiling Convection	1497 sqft	-3	-	1497 sqft	2	-
Overhead Lighting Convection	1119 W	1615	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	224 W	573	-	0 W	0	-
People Convection	0	0	0	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	220		-	0	0
Safety Factor	15% / 15%	0	0	25%	1283	0
		0	**0**	**-**	**6414**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Zone Heat Balance Summary for Unit Heaters (Stairs, Vestibules)

(In Alternative: ASHP Displacement Design)

Project: Wilmington ES 02/25/2026

Prepared by: GGD Consulting Engineers 11:16 AM

TOTAL ELECTRICAL LOAD CALCULATIONS O

ELECTRICAL LOAD CALCULATION NARRATIVE

Summary

GGD engineers is coordinating with Rading Municipal Light Department for the elementary school project. Electrical load calculations were submitted to RMLD in December 2025, enclosed.

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GGD Consulting Engineers, Inc.
375 Faunce Corner Road, Suite D
Dartmouth, MA 02747

L#96395
J#894 135.00

December 26, 2025

Reading Municipal Light Department
230 Ash Street
Reading, MA 01867

Attn: Vaughan Bryan

Re: Wilmington Elementary School
Wilmington, Ma 01887

The Town of Wilmington will be constructing a new (165,000 SF) Elementary School at 320 Salem Street, Wilmington Massachusetts.

We are requesting two (2) new pad-mounted transformers by Utility Co. with secondary metering at the transformers and primary cables.

A 600 KW emergency standby generator will be provided for this facility.

We are proposing two (2) underground secondary service rated at 2,000 amps, 277/480V, 3Ø, 4W each.

Attached are copies of our proposed Electrical Site Plan, Site Details and Power Riser diagram.

In addition, we request that you send us the following information:

1. Available short circuit duty at the secondary of the transformer.
2. Anticipated transformer size and impedance.
3. Transformer pad installation requirements.
4. Primary line installation details and the work to be performed by the contractor.
5. Requirements for reduced voltage starting.
6. Metering rate schedule.
7. Metering requirements, including location and hot or cold sequence installation.
8. Anticipated back charges

It is anticipated at this time that the largest motor will be 30HP drawing 40 Amps at 480, 3∅, locked rotor current is anticipated to be six times full load current or 240 Amps. Our projected breakdown of loads, are as follows:

A. HVAC:

				KVA
	165,000 SF	@12.5/SF	=	2062.5

B. Plumbing/Fire Protection

	165,000 SF	@1.0/SF	=	165.0

C. Site Lighting:

	Lot @ 4kW		=	4.0

D. Interior Lighting:

	165,000 SF	@.5 W/SF	=	82.5

E. General Power:

	165,000 SF	@1.5 W/SF	=	247.5

F. Elevator

	1 @ 30HP		=	37.5

G. EV Charging Station

	16 @ 7.2 kW		=	115.2

H. Kitchen

	165,000 SF	@.8W/SF	=	132.0

Connected Load Summary

A.	=	2062.5
B.	=	165.0
C.	=	4.0
D.	=	82.5
E.	=	247.5
F.	=	37.5
G.	=	115.2
H	=	132.0
Total	**=**	**2846.2**

2846.2 kVA @ 277/480V, 3Ø, 4W = 3425.0 Amps

Two (2)Standard 2000 Ampere Service was selected for building service.

Secondary conductors will consist of (5) sets of 4 #600 KCM copper in (5) 4" conduits, and (1) 4" spare conduit for each service.

Provisions will be made on site to accommodate a future photovoltaic array (Roof). The proposed meter shall be capable of net metering.

We intend to participate in the incentive programs that you are offering. Please provide a contact.

We would like to schedule a site meeting with you and your engineer at your earliest convenience to coordinate incoming service.

If there is any other information required or if you have questions, please feel free to call.

Very truly yours,

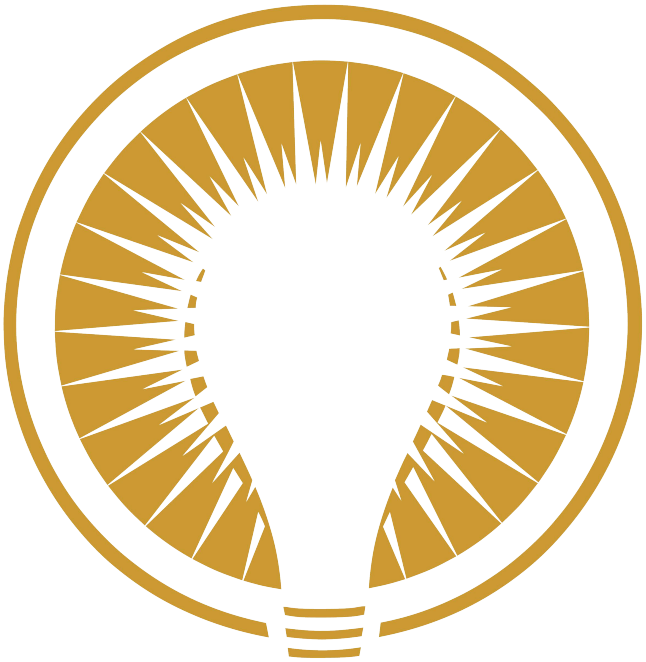
GGD Consulting Engineers, Inc.

Jorge Rosa

JR:jfm

Enc.

Cc: Bryce Taft, Dore + Whittier
Rani Philip, Dore + Whittier
Tyler Vieira, GGD Consulting Engineers, Inc.
David M. Pereira, PE, GGD Consulting Engineers, Inc.



Appendix M – RMLD

LOAD DATA SHEET

RMLD

RMLD LOAD DATA SHEET

UAN#_____

Sheet ____ of ____

Please Attach Two Copies of Site Plan | One Per Building/Lot | Please be as specfic as possible

Facility Name: Wilmington Elementary School Date: _____

Address: 320 Salem Street City/State/Zip: Wilmington MA 01887

---- ELECTRIC SERVICE DATA ---

Service Request Type: [X] New Construction [ ] Existing [ ] Overhead to Underground Conversion

Construction: [ ] Single Family [ ] Multi-Family [ ] Apartment [ ] URD [ ] Commercial [ ] Industrial [X] Other

Electric Main: [ ] 100 A [ ] 200 A [ ] 400 A [ ] 800 A [X] 400A

Number of Meters at this address: One Unit ID: _____

Anticipated Service Date: April 2027 Temporary Electric Service: [X] Yes [ ] No

Electric Service Type: [ ] Overhead [X] Underground Primary [X] Underground Secondary

Entrance Size (Amps): 4000 A Conduit #/Dia: 2 / 4" Conductor #/Size: 10 / 4" (AWG/kcm)

Metering Comments: 600 KCMIL

Facility Has a Total of 165,000 Sq-Ft of Floor Area on _____ Floors of Which _____ Sq-Ft is Area Comfort Conditioned

Basement/Attic/Other Living Space Not Included Above: [ ] No [ ] Yes (_____Sq-Ft Finished, _____Sw-Ft Unfinished)

Facility Heated With: [ ] Gas [ ] Electric Facility Has _____ Tons of Cooling Capacity Using _____ Unit(s)

Service Entrance Pipe Size: _____ Inches

---- VOLTAGE AND LOAD DATA ---

Requested Service Voltage/Type	OH	UG
[ ] 120/240V 1-Phase, 3 Wire	Yes	Yes
[ ] 208/120V 3-Phase, 4-wire	Yes	Yes
[ ] 240/120V 3-Phase, 4-wire	Yes	Yes
[X] 480/277V 3-Phase, 4-wire	Yes	Yes
Other _____	Yes	Yes

Data for the Largest Motor

HP: 30 Voltage: 480 Phase: 3

FLA: 40A LRA: 240A

Reduced Voltage Starting: [X] Yes [ ] No (List Type If Yes)

(Type Reduced Start) [ ] Part Winding: (Ratio _____ - _____)

[X] Solid State (Ramp Setting _____% Current Limit _____%)

Connected Loads	1-Phase kW	3-Phase kW	Office Use Only
Space Heating			
A/C/Heat Pump		2062.5	
Air Handlers			
Lighting	86.5		
Water Heating		165.0	
Cooking	132.0		
Refrigeration			
~~Welding~~** EV	115.2		
Misc. / Recept.	247.5	37.5 (elevator)	
TOTAL:	581.2	2265.0	

** May Require Special Consideration

[ ] Wye-Delta [ ] Autotransformer (Tap Setting _____%)

[ ] Other, Describe: _____

---- CONTACT INFORMATION ---

*** Load Data Sheet Completed By: (sign below)**

Name: Jorge Rosa

Address: GGD Consulting Engineers, Inc.

Address: 375 Faunce Corner Road, Suite D

Cell Phone: _____ Alt: 508-998-5700

Owner/Developer

Name: Town of Wilmington

Address: _____

Address: _____

Cell Phone: _____ Alt: _____

Electrical Contractor Daytime Phone: _____

Name: TBD

Address: _____

Alt: _____

City: _____ State: _____

ZIP: _____

---- COMMENTS/ ADDITIONAL INFORMATION ---

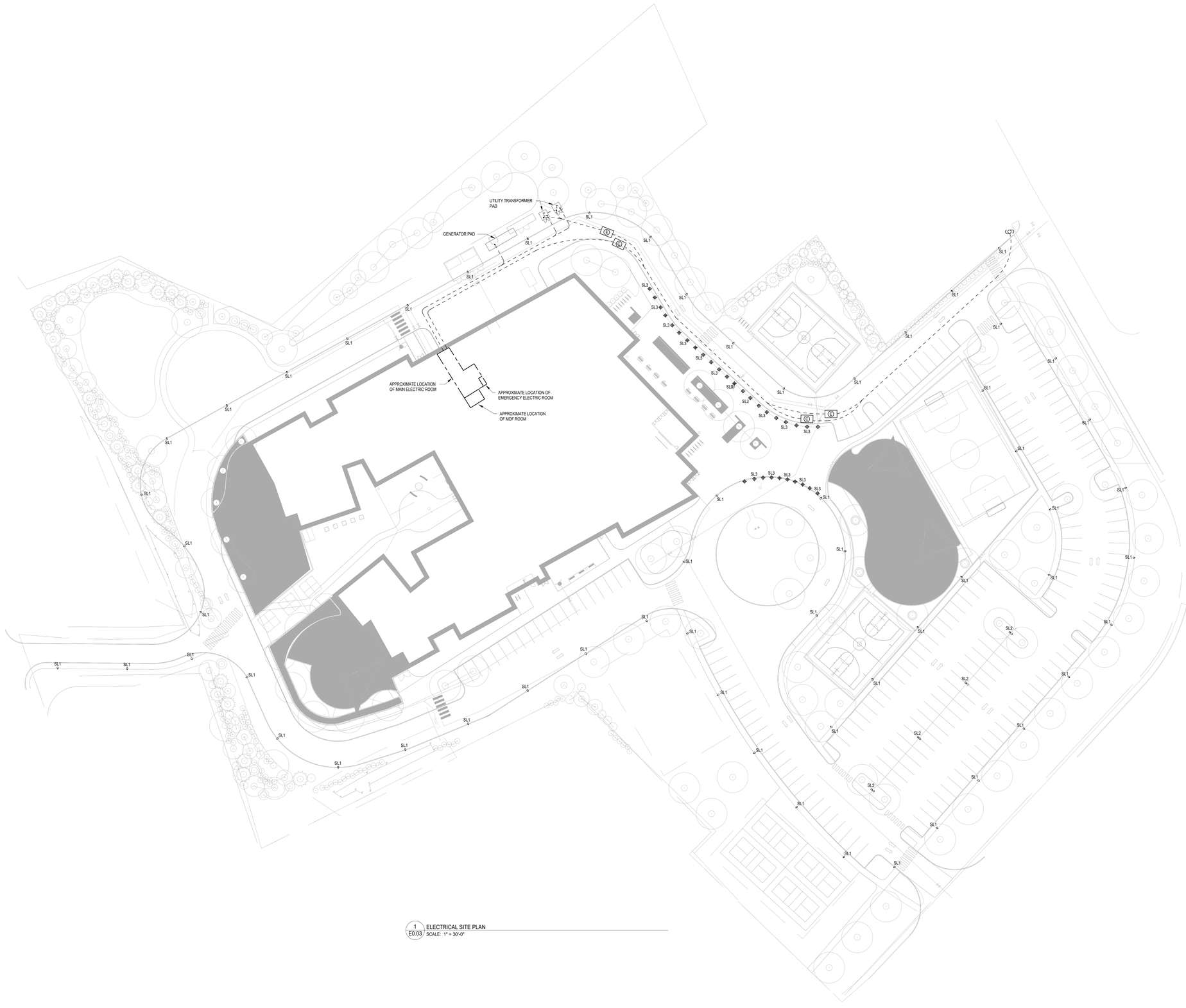
Comments: EV Charging Stations

*Completed By: _____ Date: _____

Return To: RMLD
230 Ash St
Reading, MA 01867

Evaluated By: _____
Phone #: _____
RMLD Return Letter Date: _____

RETAIN THIS SHEET, FILE IT WITH COMPLETED WORK ORDER (PERMANENT FILE)



1 E0.03 ELECTRICAL SITE PLAN
SCALE: 1" = 30'-0"

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BURLINGTON, VT 05401
P: (802) 863-1428

WILMINGTON ELEMENTARY SCHOOL

320 SALEM ST.
WILMINGTON, MA 01887

PROJECT NUMBER: 23-0847

SEAL AND SIGNATURE:

REVISIONS:

NO.	DATE	TITLE

ISSUE TITLE AND DATE:

SCHEMATIC DESIGN PRICING SET
2/20/2025

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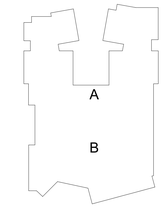
KEY PLAN



ORIENTATION AND SCALE:

N
TRUE NORTH
PROJECT NORTH
0 4' 8' 16'
SCALE: 1/8"=1'-0" GRAPHIC SCALE

SHEET TITLE:
ELECTRICAL SITE PLAN

SHEET NUMBER:
E0.03

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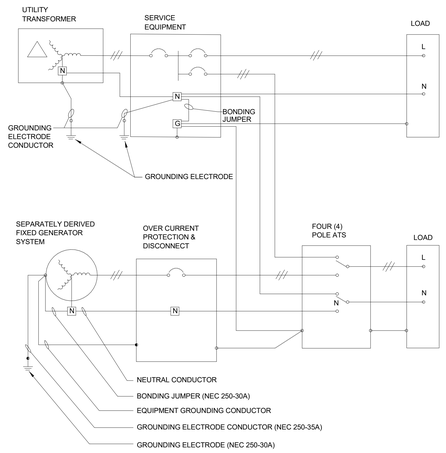
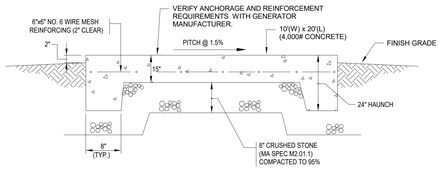


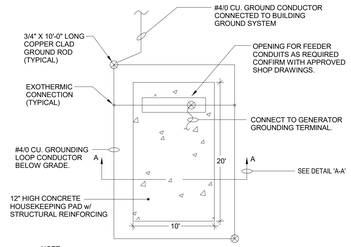
SEPARATELY DERIVED GENERATOR SYSTEM

SCALE: NTS



GENERATOR PAD DETAIL 'A-A'

SCALE: N.T.S.

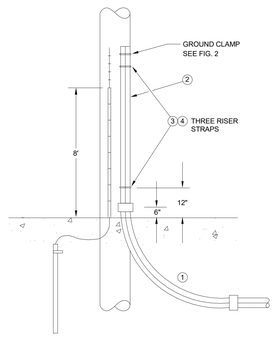


NOTE:

1. PAD SHALL BE PROVIDED IN ACCORDANCE WITH APPROVED SHOP DRAWINGS. PAD SHALL BE PROVIDED BY G.C.
2. PAD DIMENSIONS ARE APPROXIMATE. PROVIDE 12" OF PAD ALL AROUND GENERATOR.

F3 GENERATOR PAD DETAIL

SCALE: NTS



NOTES:

1. RISER CONDUITS SHALL BE LOCATED ON THE STREET QUARTER OF THE POLE, AND, WHEN POSSIBLE ON THE QUARTER AWAY FROM APPROACHING TRAFFIC.
2. SPARE CONDUIT SHALL BE CAPPED 6" ABOVE GRADE.

CODE NUMBERS FOR PIPE SIZES OF:	
ITEM	DESCRIPTION
1	3' RADIUS
2	CONDUIT-10' GALVANIZED STEEL
3	RISER STRAPS
4	LAG SCREWS 3/8" x 3"
5	RISER PIPE CONNECTOR
6	#6 COPPER SOLID BARE (24" LONG)

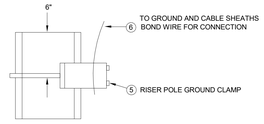
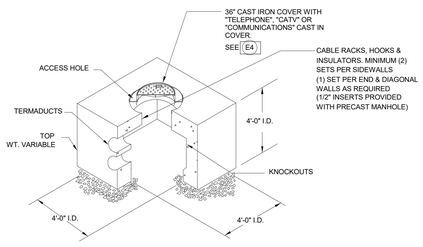


FIGURE 2 - RISER GROUND CLAMP

INSTALL GROUND CLAMP AS SHOWN. CONNECT TO POLE EQUIPMENT GROUNDING CONDUCTOR. INSTALL GROUND ROD AND RUN MINIMUM #6 SOLID COPPER UP POLE AND CONNECT TO COMMON NEUTRAL. INSTALL 8 FEET OF MOULDING OVER WIRE AND CONNECT RISER GROUND CLAMP TO GROUND WIRE ABOVE MOULDING AS SHOWN.

F5 POLE RISER DETAIL

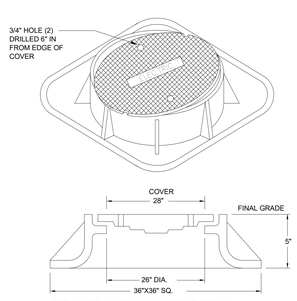
SCALE: NTS



ELECTRICAL, TELEPHONE & C.A.T.V. & COMMUNICATIONS HANDHOLE

TMH # TVMH # CMH # FMH #

D1 SCALE: NTS



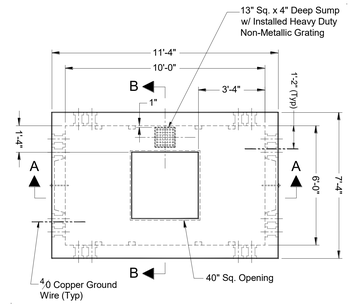
FRAME AND COVER DETAIL

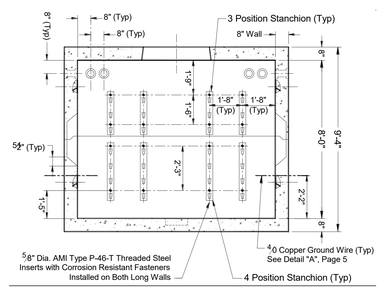
E4 SCALE: NTS

NOTES:

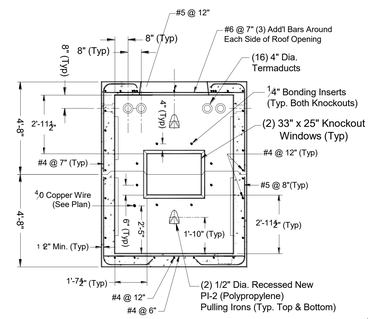
1. COVERS WILL HAVE "ELECTRIC", "TELEPHONE", OR "CATV" CAST IN THEM IN 3 INCH LETTERS.
2. FRAME AND COVER TO SUPPORT H2O WHEEL LOAD.
3. NO VAULT MANHOLE SHALL BE BURIED DEEPER THAN 18" BELOW FINISHED GRADE.
4. COVER SHALL BE FLUSH TO FINAL GRADE (CONCRETE, ASPHALT, GRAVEL, GRASS, ETC.)

	SUPPLIER & CATALOG#	STOCK CODE
FRAME	NACIP AE 124 LEBARON LE-28SL OR APPROVED EQUAL	07-29-229
COVER	NACIP LEBARON LE-28C5 ELECTRIC OR APPROVED EQUAL	07-15-530





SECTION A-A



SECTION B-B

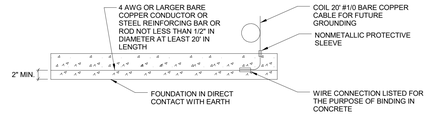
D6 PRIMARY MANHOLE

SCALE: NTS

EMH

NOTES:

1. CONCRETE - 5,000 P.S.I. MIN. STRENGTH @ 28 DAYS.
2. STEEL REINFORCEMENT - ASTM A-615, GRADE 60.
3. COVER TO STEEL - 1" MINIMUM
4. VAULTS ARE DESIGNED TO MEET ASTM C857 AND ACI 318 WITH AASHTO HS20-44 LOADING.
5. CONSTRUCTION JOINT - SEALED WITH BUTYL RUBBER RESIN OR EQUIVALENT.
6. PROVIDE WATERPROOFING TO ALL OUTSIDE SURFACES
7. ALL MANHOLES TO HAVE CONNECTORS TO DRAINAGE SYSTEM.
8. EXACT MANHOLE SIZE AND CONSTRUCTION SHALL BE PER UTILITY COMPANY STANDARDS.



C6 SLAB GROUNDING DETAIL

SCALE: NTS

NOTE:
PROVIDE NEW SLAB GROUNDING IN NEW SLAB.

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P: (802) 863-1428

WILMINGTON ELEMENTARY SCHOOL

320 SALEM ST.
WILMINGTON, MA 01887

PROJECT NUMBER: 23-0847

SEAL AND SIGNATURE:

REVISIONS:

NO.	DATE	TITLE

ISSUE TITLE AND DATE:

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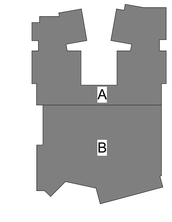
KEY PLAN



ORIENTATION AND SCALE:

PROJECT NORTH

SHEET TITLE:

ELECTRICAL SITE DETAILS

SHEET NUMBER:

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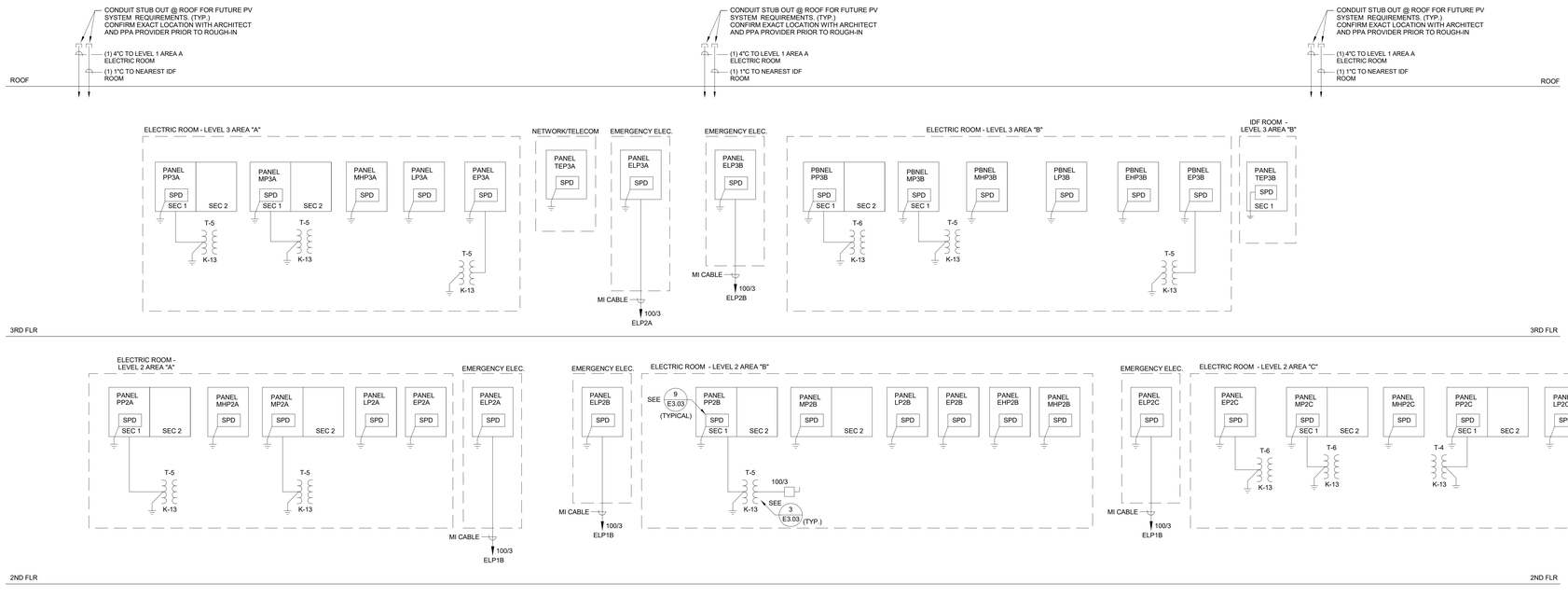

1 E3.01 ONE LINE RISER DIAGRAM
SCALE: N.T.S.

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WILMINGTON ELEMENTARY SCHOOL

320 SALEM ST.
WILMINGTON, MA 01887

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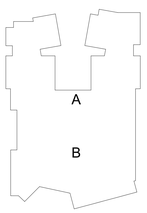
KEY PLAN



ORIENTATION AND SCALE:

PROJECT NORTH

SHEET TITLE:

ELECTRICAL ONE LINE RISER

SHEET NUMBER:

E3.01

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12/26/2025 11:03:47 AM

SECURITY & VISUAL ACCESS REQUIREMENTS P

SECURITY AND VISUAL ACCESS REQUIREMENTS

The safety and security strategy for the Wilmington Elementary School continues to build upon the multi-layered approach established during the previous phase. The design team has met with and will continue to be advised by several members of the District's emergency response network, including the Superintendent of Schools, the Town Public Buildings Superintendent, the District's security advisor (CISA), and Wilmington public safety officials. These meetings have reviewed topics such as access to the site, entry points to the building, safety glazing strategies, and electronic access control systems to inform the building design. The design team will continue to coordinate with the District, security consultants, and public safety officials to refine the specific technology systems and operational protocols associated with the building's safety and security infrastructure.

The District has established emergency procedures for each school within Wilmington Public Schools, which will be further refined and customized for the opening of the new facility. The building design supports these operational protocols through building layout, site organization, and the integration of appropriate technology infrastructure.

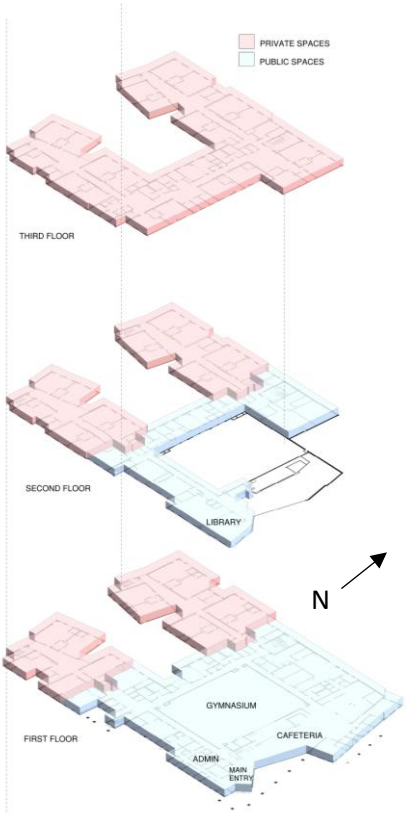
Security and visual access for the proposed facility are addressed through a layered strategy that integrates passive architectural design principles with active security technologies. The site and building design incorporate principles of Crime Prevention Through Environmental Design (CPTED), including territorial reinforcement, natural access control, and natural surveillance.

Figure: Site plan showing territorial reinforcement and natural surveillance

Territorial reinforcement is achieved through the use of fencing, sidewalks, landscaping, and site signage that clearly define the school property and reinforce the distinction between public and secured areas of the campus. Strategically located vehicular gates, crash-rated fences and site circulation strategies help control access to portions of the site at certain times. Landscaping elements and site features such as bollards, benches, and planters are integrated into the design to prevent vehicular access to pedestrian areas while maintaining a welcoming and cohesive site environment.

Natural access control strategies guide visitors toward the primary entrance while minimizing access to other entry points. Pedestrian paths, entry drives, drop-off areas, and the entry plaza are organized to lead visitors to the clearly identifiable main entrance, which serves as the focal point of the site.

vehicular access to the perimeter of the building is maintained to provide multiple locations for emergency responders to access the facility.



The building incorporates a secure main entry sequence consisting of an exterior video intercom and controlled entry doors that lead to a secure vestibule with a check-in window for visitor verification prior to entry into the building. Intrusion-resistant glazing is incorporated at the entrance to enhance protection while maintaining transparency. The fire alarm control panel will be located within the main entrance vestibule to support visibility and access for emergency responders.

Exterior doors are equipped with automatic locking hardware and programmable card reader access, allowing faculty and staff to enter the building while enabling the District to monitor and control entry points. All exterior doors and windows will be clearly numbered and coordinated with building plans and fire alarm documentation provided to local police and fire departments to assist first responders in locating specific areas of the building quickly during an emergency. Knox boxes will be located at in coordination with the fire department.

Figure: Graphic showing separation of public and private spaces

The organization of the building supports natural access control within the facility by separating public-use areas such as the gymnasium, library and cafeteria from the academic classroom wings. This zoning allows portions of the building to be used for community events while maintaining security for the remainder of the school. Security thresholds within the building allow portions of the facility to be secured independently during after-hours events or emergency situations.

Natural surveillance is reinforced through building orientation and space planning. The administration offices are prominently located at the front of the school, providing visual oversight of the main entry drive, playground and sports field, parking areas, and building entrance. Classroom windows provide views to exterior courtyards and play areas, while low shrubs and carefully maintained landscaping maintain clear sightlines to building entries and parking areas. Selective interior glazing between classrooms and adjacent learning spaces supports visibility and supervision while fostering an open and inclusive educational environment. Shading devices at interior glazing and exterior windows allow visual connectivity to be reduced when necessary during shelter-in-place situations.

Mechanical access control and surveillance systems support and enhance these passive design strategies. Security cameras are planned throughout the interior of the school and around the perimeter of the building, providing coverage of entrances, circulation areas, playgrounds, and shared spaces such as the library, gymnasium, and cafeteria. Infrastructure will also be provided to support additional future cameras in if needed. Additional security systems planned are intrusion alarms and a mass notification system with both audible and visual messaging capabilities.

Emergency panic buttons located in the main office and key administrative areas will provide silent communication directly with emergency responders. Access to restricted areas within the building will be managed through the card-based access control system.

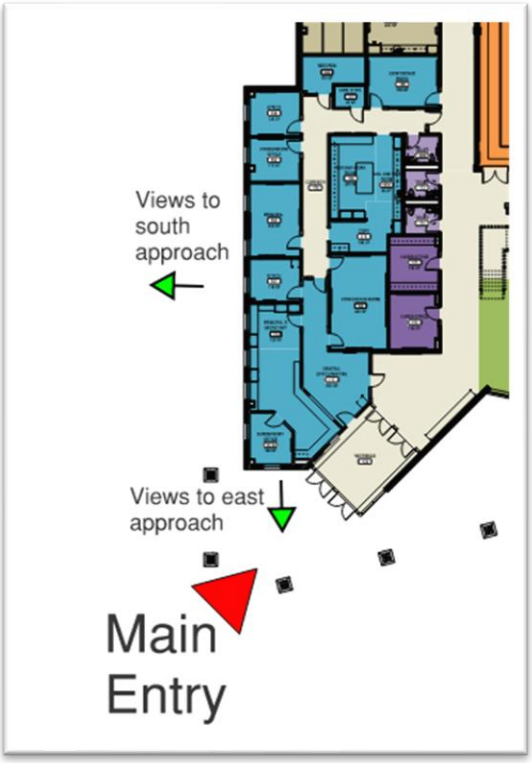


Figure: Cropped area of floor plan at Main Entry – showing views and secure vestibule

Additional design strategies support emergency preparedness and response, including limiting the number of exterior doors while maintaining code-required egress, classroom lockset hardware that allows doors to be locked quickly from the inside, and egress planning that supports efficient evacuation protocols.

Through the integration of these passive and active security strategies, the proposed Wilmington Elementary School will provide a safe, secure, and welcoming facility that supports the educational mission of the district while serving as an important community resource. Specific security systems and operational protocols will continue to be refined in coordination with the District and public safety partners as the project progresses into the Construction Documents phase.

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FACILITY MAINTENANCE REQUIREMENTS Q

FACILITY MAINTENANCE REQUIREMENTS

Dore + Whittier has held ongoing meetings with maintenance staff at both the elementary school and district level throughout all design phases. In addition, the Town's Public Buildings Superintendent participates actively in the Leadership Group and School Building Committee meetings. Additional meetings to review specific details of custodial and maintenance spaces have included custodial and grounds staff to ensure practical and operational needs are addressed.

High durability, longevity, and resistance to abuse have been prioritized in selecting finishing materials. Terrazzo, linoleum flooring, and wainscoting have been incorporated in high-traffic areas to support long-term performance and minimize maintenance needs.

Training

Given the complexity of the proposed building systems, comprehensive training is essential for effective operation and long-term performance. Training methods and minimum hours are outlined in the project specifications and include both in-person and video-recorded sessions in accordance with Dore + Whittier standards. In-person training will be coordinated with the Owner as part of the project closeout and building turnover process.

- End users (teachers, administrators, and staff) will receive training on the day-to-day operation of systems such as lighting controls, communication systems, and classroom technology.
- Administrators and facilities personnel will receive advanced training on programmed systems, including building security, emergency operations, lighting management, and motorized window shades.
- Facilities staff will also be trained in proper cleaning methods using approved green products, ongoing maintenance procedures, and the use of the Building Management System (BMS) to monitor and report on plumbing, HVAC, and electrical systems for proactive facility management.

HVAC and Building Management Systems

HVAC systems are complex, and the District recognizes the need for properly trained personnel and professional service providers for routine maintenance. The building automation system ensures compliance with energy codes while allowing efficient operation.

An automation consultant is part of the project team, acting as a liaison between the Owner, controls contractor, mechanical engineer, commissioning agent, and facilities staff. During Construction Documents, they will meet with facilities staff to review the sequence of operations, zones, and intended functionality.

Lighting Fixtures and Controls

The maintenance staff are familiar with contemporary electrical systems and have requested lighting controls be intuitive and user-friendly. The design team will continue to review proposed lighting and controls with facilities personnel to ensure ease of use while meeting code requirements, daylighting, occupancy sensing, and scheduled lighting for common and exterior areas.

Cleaning and General Maintenance

Flooring materials are selected for durability and ease of maintenance. Weekly cleaning will utilize ride-on floor scrubbers, with dry mopping as needed. No flooring requires stripping or waxing.

Small custodial rooms are located throughout the building, each equipped with mop basins, storage for cleaning products and equipment, and water access. A "back-of-house" hub adjacent to the kitchen includes receiving, central storage, recycling/trash, and custodial office. This hub is strategically located near the main mechanical and electrical rooms for efficient monitoring and maintenance of the facility.

Plumbing Systems

Facility staff identified preferred plumbing fixtures during design review. Auto-flush toilets and sensor faucets are provided in all bathrooms, with manually operated faucets elsewhere. Irrigation systems are provided for the natural turf athletic areas. Fixture selection and operation will be revisited during the Construction Documents phase.

Roof Access

The low-slope membrane roof supports rooftop HVAC units, plumbing vents, exhaust fans, and drains. The design provides:

- Stair access to the roof level per District request
- Ship's ladder access at the maintenance/receiving area
- Vertical ladders connecting roof levels for continuous access
- Walk mats leading from ladders to equipment and roof areas for safety

This arrangement ensures safe and efficient access for maintenance, inspection, and operational needs.

QUALITY CONTROL NARRATIVE R

QUALITY CONTROL NARRATIVE

SUMMARY

Dore + Whittier Architects and our consultants utilize various coordination and quality control measures throughout the design process. Most prevalent is use of BIM (Building Information Modeling) to coordinate the building, systems, infrastructure and equipment in one cohesive digital environment. The use of digital media augments more conventional teleconferencing as well as face to face meetings as the project progresses to provide complete and coordinated documents. Additionally, every project at D+W has an Operations Director assigned to specifically serve in a Quality Assurance / Quality Control oversight capacity. These individuals are senior staff tasked with reviewing documents for coordination, code and accessibility compliance, and compliance with bidding and regulatory requirements.

PROJECT SPECIFIC QA / QC INITIATIVES

1. **Ceiling Clearances and Coordination:** In order to allow for adequate space for all the above-ceiling systems and equipment, a floor-to-floor / floor-to-roof deck height of 14’-8” at all levels is provided. Ceilings in some public spaces – such as the Cafeteria and Media Center – will be higher. The Gym and some back-of-house spaces will incorporate exposed mechanical and structural components.

   Dore + Whittier develops BIM models using “live linking” with all major consulting engineers. Meaning that Architectural, Structural, Mechanical, Electrical, Fire Protection, and Plumbing team members are, effectively, working in the same model and seeing changes in real time. Architectural ceiling plans are developed and populated with equipment while continued development with MEPFP consultants is ongoing. This allows the team to see which components have been added to consultant models and where they may conflict with the architectural design intent. The view below is an example of conditions where modeled elements (consultant items in pink, blue, or green vs. architectural items in black) are not yet coordinated; these issues would be noted and discussed during coordination meetings through the duration of the project.

   Model conflict reports are developed at later phases of the project to pick up smaller, less obvious conflicts between ducts, piping, and beams that would be obscured from a strictly visual review.

2. **UTILITY ROOM AND MECHANICAL SHAFT SIZES:** Utility room sizes and locations were coordinated during Schematic Design with the MEPFP and Technology consultants. Proposed equipment layouts have been developed by consultants, service clearances and access needs have been confirmed, and piping strategies have been planned and discussed. Shafts and chases for ductwork, piping, and principal electrical routing have been located and sized based on the current coordination with the appropriate consultants.

3. **COORDINATION OF SPECIFICATIONS AND DRAWINGS:** Refer to narrative below.

4. **TRADE CONTRACTOR SUB-BID WORK:** The specifications include Trade Contractor Sub-bid Summary sections enumerating the Trade Contractor Sub-bid scopes of work, such that they can be clearly identified and accounted for and all parties understand who is responsible for the respective scopes of work. These summaries will continue to be developed as specific scoping requirements are incorporated.

5. **Scheduling:** Scheduled items in the drawings are typically generated through BIM software (Revit). Project components such as doors have parameters which are edited when the elements are added to the model; when these components are scheduled, the specified parameters reflect the assigned characteristics of each scheduled item. If the parameters of a component are edited as the project develops, its scheduled characteristics are updated automatically as they change.

6. **Equipment and Power:** At this stage in the project, all major pieces of mechanical equipment have been located on the plans. Ongoing coordination with ducts, terminations and coordination between disciplines is in progress. Power connections serving these major pieces of equipment are shown on Electrical drawings.

7. **Existing and New Construction:** The new school building will be constructed on the same site as the existing building. Coordination of existing and new construction entails ensuring that all existing school operations and utilities will be maintained while the new school is constructed, and the site is developed. Existing utilities have been identified and project phasing is being developed to ensure that these services are maintained.

8. **Phasing:** The project will require phasing of construction operations to allow the new school to be constructed while the existing school continues to operate on the same site. To this end, three major project phases are being developed, with sub-phases to coordinate sequencing within phases. The first phase consists of mobilization, temporary utility work required to maintain operation of the existing school building during construction, and site clearing and preparation for building and utility construction. The second phase consists of the new building and associated utility construction, while maintaining operation of the existing school building. Following relocation of the students and staff to the new school, the third phase consists of the demolition of the existing school building and the construction of the remainder of the site.

DRAWINGS & SPECIFICATIONS COORDINATION AND QC OVERSIGHT

Drawing documentation through BIM provides several distinct advantages over traditional drafting methods:

- In contrast to AutoCAD or hand drafting, project creation in BIM involves building a three-dimensional digital model of the building using actual sizes of architectural materials and elements, equipment, ductwork, piping, and structural elements.
- All consultants build their respective systems withing the same model environment, which is shared and referenced across the project team.

- Major consulting engineers are “live linking” in the same model. Backgrounds are shared with all other consultants on a regular basis.
- AutoCAD backgrounds by non-Revit using consultants are also exported weekly.
- Monitoring features within the software allow each consultant to be alerted when specific model content related to their work changes. These alerts provide specific locations to project team members, so that they can evaluate what response is appropriate to each situation.

Collaboration within the model and virtual ownership of various building elements (walls, columns, floor slabs, plumbing fixtures, etc.) is complex and requires close coordination, particularly with MEPFP equipment and devices that are exposed to view, such as light fixtures, speakers, and other terminal electrical devices. To clarify roles and responsibilities by each team member, Dore + Whittier creates a BIM Implementation Plan for each project. This plan defines the following:

- Identification of milestone deadlines throughout the design process, and specific deliverables at each milestone.
- Identification of project team leaders within each design consultant firm, and their respective project responsibilities.
- Identification of specific physical building content and features required to be fully modeled (as opposed to represented with drafting elements or linework).
- Identification of specific models planned for use throughout the project, including the central “working” models for each design discipline, coordination, energy usage, construction, and record models. Each model type has specific requirements for linking consultant information to prepare the required data output, so procedures may vary for each planned use of the model data.
- Identification of authorship and ownership for each type of model content, and how they are to be linked or monitored across models. Some content is driven by the architecture, such as initial floor slabs, suggested column locations, and plumbing fixture layouts. Once developed to a degree of reliability, those features are handed off to the consultant who becomes the owner of that item. These hand-offs happen at various points of the project.
- Identification of procedures for the exchange of and collaboration on models, and expectations of each consultant. Each consultant is required to continuously coordinate their work with all other design disciplines and eliminate conflicts as they are encountered during design.
- Identification of the preferred project team workflow for each phase of the design process.
- Identification of the procedures and practices to document the building as construction progresses to maintain up to date 3D model data for any revisions.

Project details are also created in Revit and, although typically drafted using 2D components, they are drafted over live views of actual modeled content; this live view serves as an underlay to the detail, and if any model content changes or shifts, the change in condition is immediately apparent to the drafter or reviewer.

In addition to these procedures, Dore + Whittier also conducts our own in-house third-party review of the documents to assure proper architectural technology is being exercised that BIM software will not evaluate. This evaluation is conducted by the most experienced Dore + Whittier staff members and includes categories such as proper use of flashings, roofing systems, exterior wall technology as well as building code and accessibility and procurement regulations. This review occurs throughout the design process as new drawing content is created, with comments being returned to the project team on a daily or weekly basis. The project reviewers attend regular project meetings to keep up to date with design and programming information and guide the process.

Specifications are created using RIB SpecLink (RIB) software. This software maintains a single database of all project-related specifications. BSD provides regular updates to the master specifications to maintain a current database that reflects current trends in product technologies and changes in the manufacturer sources. These updates are provided quarterly and are automatically incorporated into all project specifications.

RIB allows smart linking of information within a specification section or between related sections so that when changes are made to one section, required changes in related work in other sections are either automatically made, or alerted to the specification writer. RIB also allows the modeled content in the BIM to link to the specifications and reference specific products that are included in the model.

The RIB software is customizable, allowing the introduction of notes for specific sections to provide coordination reminders to the writer, including content or annotation that should appear on drawings, why specific features are included, etc. These notes are used to help build a project checklist for specification coordination.

In addition to leveraging the technical features of RIB, all project specifications are prepared by our in-house dedicated spec writer in coordination with the Project Manager, Project Architect, Job Captain, and Interior Designer. The same in-house third-party reviewers that review the drawing content also review the specifications for quality and coordination with the drawings. Like drawing review, specification sections are reviewed as they are prepared, and regular meetings occur with the project staff to confirm scope and discuss coordination between specifications and drawing content.

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SPACE SUMMARY

Signed Copies of the Educational Space Summary

Overview

The space summary on the following pages contains an itemization of the proposed spaces needed to deliver the District's educational program for grades PreK-5 using the MSBA's elementary space summary template.

The District and the Design Team worked together to align proposed spaces with MSBA square footage guidelines for individual program areas and the total gross square footage to the greatest extent possible. Some deviations were necessary either to accommodate building geometry and/or MEP/Structural coordination, or to improve functionality as it relates the District's educational program. These revisions are explained in more detail on the pages following the space summary.

Dore + Whittier's Design Development drawings and the updated space summary demonstrate the successful implementation and integration of the educational program. The total gross square footage remains the same as was developed at schematic design. Deviations from the schematic design submission are due to on-going input from end users and adjustments resulting from design efforts and refinement of mechanical chases, structural framing, plumbing chases, and other design development refinements. The essence of the overall building planning and individual spatial relationships have remained intact.

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Proposed Space Summary - PK-5 Elementary School

PreK-5th Configuration - Revised 3/12/2026

Date: 3/12/2026 Design Development Submittal

Wilmington Public Schools Wildwood Early Childhood Center	Existing Totals	PROPOSED PROGRAM									VARIATION TO MSBA GUIDELINES			MSBA GUIDELINES (DO NOT MODIFY) (Refer to Educational Facility Planning for additional information)			
		EXISTING TO REMAIN / RENOVATED			NEW CONSTRUCTION			TOTAL									
ROOM TYPE		ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	COMMENTS
CORE ACADEMIC	45,245			0			47,526			47,526			13,476			34,050	STE Guidelines Policy
(List rooms of different sizes separately)																	
Kindergarten Classroom with Toilet				0	varies	7	8,103	varies	7	8,103	varies	0	-297	1,200	7	8,400	1,100 NSF (minimum size) - 1,300 NSF (maximum size); Minimum of (2) sinks required per Kindergarten Classroom
Rm. 134 + 134A					1153												
Rm. 135 + 135A					1158												
Rm. 137 + 137A					1161												
Rm. 138 + 138A					1162												
Rm. 140 + 140A					1159												
Rm. 143 + 143A					1155												
Rm. 145 + 145A					1155												
General Classroom (Grades 1-6)				0	varies	30	27,037	varies	30	27,037	varies	3	1,387	950	27	25,650	900 NSF (minimum size) - 1,000 NSF (maximum size); Minimum of (2) sinks required per General Classroom
Rm. 206					901												
Rm. 208					899												
Rm. 211					906												
Rm. 213					899												
Rm. 215					899												
Rm. 216					906												
Rm. 233					903												
Rm. 234					899												
Rm. 236					898												
Rm. 237					903												
Rm. 242					902												
Rm. 244					901												
Rm. 309					901												
Rm. 311					901												
Rm. 314					905												
Rm. 316					899												
Rm. 318					899												
Rm. 319					908												
Rm. 336					903												
Rm. 337					899												
Rm. 339					898												
Rm. 340					903												
Rm. 345					902												
Rm. 347					901												
Rm. 351					893												
Rm. 353					906												
Rm. 355					901												
Rm. 359					897												
Rm. 363					901												
Rm. 365					904												
Science, Technology, Engineering (STE) Room (Grades 3-6) Rm. 256				0	1,074	1	1,074	1,074	1	1,074	-6	1	1,074	1,080	0	-	1,080 NSF (minimum size); Refer to the 2018 STE Guidelines for additional information.
STE Storage Room - Rm. 256A				0	117	1	117	117	1	117	-3	1	117	120	0	-	Minimum of (1) 120 NSF STE Storage Room required per STE Room; Refer to the 2018 STE Guidelines for additional information.
ELL Classroom				0			890	varies	0	890	varies	0	890				
RM 146					447	1				0							
RM 348					443	1				0							
Teacher Collaboration				0			2,651	varies	0	2,651	varies	0	2,651				
Rm 125					881	1		varies	1	0			0				
Rm 224					884	1		varies	1	0			0				
Rm 327					886	1		varies	1	0			0				
Extended Learning K																	
Rm. 131A					40	1	40	40	1	40	40	1	40				
Rm. 131B					158	1	158	158	1	158	158	1	158				
Rm. 131C					122	1	122	122	1	122	122	1	122				

Proposed Space Summary - PK-5 Elementary School

PreK-5th Configuration - Revised 3/12/2026

Date: 3/12/2026 Design Development Submittal

Wilmington Public Schools Wildwood Early Childhood Center	Existing Totals	PROPOSED PROGRAM									VARIATION TO MSBA GUIDELINES			MSBA GUIDELINES (DO NOT MODIFY) (Refer to Educational Facility Planning for additional information)			
		EXISTING TO REMAIN / RENOVATED			NEW CONSTRUCTION			TOTAL									
ROOM TYPE		ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	COMMENTS
Rm. 131D					170	1	170	170	1	170	170	1	170				
Rm. 131E					150	1	150	150	1	150	150	1	150				
Rm. 131F					80	1	80	80	1	80	80	1	80				
Extended Learning 1st-5th				0													
Rm. 205A					56	1	56	56	1	56	56	1	56				
Rm. 205B					249	1	249	249	1	249	249	1	249				
Rm. 205C					163	1	163	163	1	163	163	1	163				
Rm. 205D					299	1	299	299	1	299	299	1	299				
Rm. 205E					209	1	209	209	1	209	209	1	209				
Rm. 230A					41	1	41	41	1	41	41	1	41				
Rm. 230B					274	1	274	274	1	274	274	1	274				
Rm. 230C					140	1	140	140	1	140	140	1	140				
Rm. 230D					254	1	254	254	1	254	254	1	254				
Rm. 230E					153	1	153	153	1	153	153	1	153				
Rm. 230F					171	1	171	171	1	171	171	1	171				
Rm. 301A					360	1	360	360	1	360	360	1	360				
Rm. 301B					359	1	359	359	1	359	359	1	359				
Rm. 302A					43	1	43	43	1	43	43	1	43				
Rm. 302B					255	1	255	255	1	255	255	1	255				
Rm. 302C					164	1	164	164	1	164	164	1	164				
Rm. 302D					229	1	229	229	1	229	229	1	229				
Rm. 333A					42	1	42	42	1	42	42	1	42				
Rm. 333B					305	1	305	305	1	305	305	1	305				
Rm. 333C					179	1	179	179	1	179	179	1	179				
Rm. 333D					296	1	296	296	1	296	296	1	296				
Rm. 333E					137	1	137	137	1	137	137	1	137				
Rm. 333F					50	1	50	50	1	50	50	1	50				
Rm. 350A					522	1	522	522	1	522	522	1	522				
Reading Specialists				0			0			0	0	0	0				
RM 141					201	1	201	201	1	201			201				
RM 209					200	1	200	200	1	200			200				
RM 240					199	1	199	199	1	199			199				
RM 312					200	1	200	200	1	200			200				
RM 325					195	1	195	195	1	195			195				
RM 343					200	1	200	200	1	200			200				
Math Tutors				0			0	0	0	0	0	0	0				
RM 147					197	1	197	197	1	197			197				
RM 222					196	1	196	196	1	196			196				
RM 349					196	1	196	196	1	196			196				
RM 360					200	1	200	200	1	200			200				
SPECIAL EDUCATION	**9,553**			**0**			**19,010**			**19,010**			**9,950**			**9,060**	Special Education spaces require DESE review and approval.
(List rooms of different sizes separately)																	
Self-Contained Special Education Classroom				0	varies	10	9,592	Varies	10	9,592	Varies	-2	3,892	950	6	5,700	900 NSF (minimum size) - 1,300 NSF; equal to the size of the proposed General Classrooms that serve the same student population.
Strides Program PK-K				0				0	0								
Rm 107					1100	1											
Rm 115					1100	1											
Rm 132					1100	1											
Strides Program 1st-2nd				0				0	0								
Rm 231					900	1											
Strides Program 3rd-5th				0				0	0								
Rm 334					898	1											
Rm 357					900	1											
Stages Program 1st-2nd - Rm 218				0	897	1		897	1								
Stages Program 3rd-5th - Rm 321				0	897	1		897	1								
Language-Based Program 1st-2nd - Rm 239				0	898	1		898	1								

Proposed Space Summary - PK-5 Elementary School

PreK-5th Configuration - Revised 3/12/2026

Date: 3/12/2026 Design Development Submittal

Wilmington Public Schools Wildwood Early Childhood Center	Existing Totals	PROPOSED PROGRAM							VARIATION TO MSBA GUIDELINES			MSBA GUIDELINES (DO NOT MODIFY) (Refer to Educational Facility Planning for additional information)			
		EXISTING TO REMAIN / RENOVATED			NEW CONSTRUCTION			TOTAL							
ROOM TYPE		ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	COMMENTS
Language-Based Program 3rd-5th - Rm 342				0	902	1		902	1								
Self-Contained Special Education Toilet Room				0	varies	8	832	varies	8	832	varies	26	472	60	6	360	
Strides Program PK-K Toilet				0													
Rm 107B					102	1											
Rm 115B					102	1											
Rm 132B					113	1											
Strides Program 1st-2nd Toilet - Rm 231B				0	117	1											
Strides Program 3rd-5th Toilet - Rm 334B				0	114	1											
Rm 357B					114	1											
Stages Program 1st-2nd Toilet - Rm 218B				0	84	1											
Stages Program 3rd-5th Toilet - Rm 321B				0	86	1											
Learning Center				0	varies	6	1,195	varies	6	1,195	varies	2	-805	500	4	2,000	1/2 size of a General Classroom
Rm 142					201	1											
Rm 210					198	1											
Rm 241					200	1											
Rm 306					198	1											
Rm 313					198	1											
Rm 344					200	1											
Small Group Room				0		26	3,905	varies	26	3,905	varies	24	2,905	500	2	1,000	1/2 size of a General Classroom
Rm 111				0	152	1											
Rm 113				0	151	1											
Rm 133				0	151	1											
Rm 136				0	151	1											
Rm 139				0	151	1											
Rm 144				0	151	1											
Rm 207				0	150	1											
Rm 212				0	150	1											
Rm 214				0	150	1											
Rm 217				0	150	1											
Rm 232				0	150	1											
Rm 235				0	150	1											
Rm 238				0	150	1											
Rm 243				0	150	1											
Rm 310				0	150	1											
Rm 315				0	150	1											
Rm 317				0	150	1											
Rm 320				0	150	1											
Rm 335				0	150	1											
Rm 338				0	150	1											
Rm 341				0	147	1											
Rm 346				0	150	1											
Rm 352				0	150	1											
Rm 356				0	151	1											
Rm 358				0	150	1											
Rm 364				0	150	1											
Calming				0		8	813	0	8	813	varies	8	813				
Rm 107A					101	1											
Rm 115A					101	1											
Rm 132A					100	1											
Rm 218A					104	1											
Rm 231A					100	1											
Rm 321A					105	1											
Rm 334A					100	1											
Rm 357A					102	1											
OT Classroom/Office - Rm 193				0	251	1	251	251	1	251	251	1	251				
PT Classroom Rm 192				0	1,002	1	1,002	1,002	1	1,002	1,002	1	1,002				
School Psychologists				0		2	298	varies	2	298	varies	2	298				
Rm 108					150	1											
Rm 326					148	1											

Proposed Space Summary - PK-5 Elementary School

PreK-5th Configuration - Revised 3/12/2026

Date: 3/12/2026 Design Development Submittal

Wilmington Public Schools Wildwood Early Childhood Center	Existing Totals	PROPOSED PROGRAM									VARIATION TO MSBA GUIDELINES			MSBA GUIDELINES (DO NOT MODIFY) (Refer to Educational Facility Planning for additional information)			
		EXISTING TO REMAIN / RENOVATED			NEW CONSTRUCTION			TOTAL									
ROOM TYPE		ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	COMMENTS
BCBA Office/Team Chairs - Rm 245				0	320	1	320	320	1	320	320	1	320				
Speech & Language				0		4	802	varies	4	802	varies	4	802				
Rm 103					198	1											
Rm 109					204	1											
Rm 354					200	1											
Rm 361					200	1											
Public Day Education Spaces (List rooms separately below)																	
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
Collaborative Program Spaces (List rooms separately below)																	
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
ART & MUSIC	**5,655**			**0**			**5,064**			**5,064**			**-11**			**5,075**	
Art Classroom (25 seats) - Rm 116				0	973	1	973	973	1	973	-27	-1	-1,027	1,000	2	2,000	Assumed schedule: 2 times per week per student
Art Workroom with Storage and Kiln - Rm 116A				0	154	1	154	154	1	154	4	-1	-146	150	2	300	
General Music / Chorus (25-50 seats) - Rm 106				0	983	1	983	983	1	983	-217	-1	-1,417	1,200	2	2,400	Assumed schedule: 2 times per week per student
General Music Storage - Rm 106A				0	147	1	147	147	1	147	72	-4	-228	75	5	375	
Music Practice / Ensemble				0	0	0	0	0	0	0	0	0	0				
Instrumental Music - Rm 163				0	702	1	702	702	1	702	702	1	702				
Instrumental Storage - Rm 163A				0	243	1	243	243	1	243	243	1	243				
Flex Classrom - Music - Rm 171				0	891	1	891	891	1	891	891	1	891				
Flex Classrom - Art - Rm 257				0	971	1	971	971	1	971	971	1	971				
HEALTH & PHYSICAL EDUCATION	**8,913**			**0**			**12,237**			**12,237**			**5,937**			**6,300**	Excess Physical Education Spaces Policy
Gymnasium - Rm 194				0	11943	1	11,943	11,943	1	11,943	5,943	0	5,943	6,000	1	6,000	
Gym Storeroom - Rm 194A				0	176	1	176	176	1	176	26	0	26	150	1	150	
PE Office ~~with Shower and Toilet~~ - Rm 195				0	118	1	118	118	1	118	-32	0	-32	150	1	150	
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
MEDIA CENTER	**2,265**			**0**			**4,096**			**4,096**			**28**			**4,068**	
Media Center / Reading Room - Rm 252				0	3,897	1	3,897	3,897	1	3,897	-170	0	-170	4,068	1	4,068	
Librarian Workroom - Rm 252A				0	199	1	199	199	1	199	199	1	199				
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
							10,058										
DINING & FOOD SERVICE	**13,620**			**0**			**10,058**			**10,058**			**600**			**9,458**	
Cafeteria / Dining - Rm 168 and Rm 168A				0	5,199	1	5,199	5,199	1	5,199	-464	0	-464	5,663	1	5,663	Based on 2 lunch seatings - 15 NSF per seat
Stage - Rm 169					1,000	1	1,000	1,000	1	1,000	0	0	0	1,000	1	1,000	
Chair / Table / Equipment Storage Rm 153				0	447	1	447	447	1	447	-5	0	-5	452	1	452	
Kitchen - Rm 162				0	2,260	1	2,260	2,260	1	2,260	205	0	205	2,055	1	2,055	1,600 NSF for first 300 students + 1 NSF per additional student
Dry Storage - Rm 162E					259	1	259	259	1	259	259	1	259				

Proposed Space Summary - PK-5 Elementary School

PreK-5th Configuration - Revised 3/12/2026

Date: 3/12/2026 Design Development Submittal

Wilmington Public Schools Wildwood Early Childhood Center	Existing Totals	PROPOSED PROGRAM									VARIATION TO MSBA GUIDELINES			MSBA GUIDELINES (DO NOT MODIFY) (Refer to Educational Facility Planning for additional information)			
		EXISTING TO REMAIN / RENOVATED			NEW CONSTRUCTION			TOTAL									
ROOM TYPE		ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	COMMENTS
Kitchen Office - Rm 161				0	72	1	72	72	1	72	72	1	72				
Kitchen Office - Rm 161A				0	73	1	73	73	1	73							
Staff Lunch Room - Rm 251				0	284	1	284	284	1	284	-5	0	-5	289	1	289	20 NSF per student
Quiet Café Area				0	varies	3	464	varies	3	464	varies	3	464				
Rm 164				0	150	1		150	1		150	1	0				
Rm 165				0	148	1		148	1		148	1	0				
Rm 166				0	166	1		166	1		166	1	0				
MEDICAL	**603**			**0**			**698**			**698**			**-12**			**710**	
Medical Suite Toilet - Rm 190C				0	58	1	58	58	1	58	-2	0	-2	60	1	60	
Nurses' Office / ~~Waiting Room~~ Exam - Rm 190A				0	100	1	100	100	1	100	-150	0	-150	250	1	250	
Examination Room / ~~Resting~~ Office - Rm 190B				0	97	1	97	97	1	97	-3	-3	-303	100	4	400	
Medical / Waiting Area / Resting Area - Rm 190				0	443	1	443	443	1	443	443	1	443				
~~Resting Area~~				0	0	0	0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
[Enter room type here]				0			0	0	0	0	0	0	0				
ADMINISTRATION & GUIDANCE	**4,127**			**0**			**3,587**			**3,587**			**697**			**2,890**	
General Office / Waiting Room with Toilet - Rm 177				0	605	1	605	605	1	605	78	0	78	528	1	528	
Teachers' Mail and Time Room - Rm 189A				0	96	1	96	96	1	96	-4	0	-4	100	1	100	
Copy Room - Rm 179				0	149	1	149	149	1	149	-1	0	-1	150	1	150	
Records Room - Rm 186				0	111	1	111	111	1	111	1	0	1	110	1	110	
Principal's Office with Conference Area - Rm 182				0	203	1	203	203	1	203	-172	0	-172	375	1	375	
Principal's Secretary / Waiting - Rm 177A				0	126	1	126	126	1	126	1	0	1	125	1	125	
Assistant Principal's Office - Rm 223, Rm 305				0		2	396	varies	2	396	varies	1	276	120	1	120	
Rm 223					196												
Rm 305					200												
Supervisory / Spare Office				0		2	224	0	2	224	-120	1	104	120	1	120	
Rm 181					116												
Rm 177B					108	1											
Conference Room				0	varies	2	492	varies	2	492	242	1	242	250	1	250	
Conference Room - Rm 180					296	1											
Conference Room - Rm 188					196	1											
School / Adjustment Counselors -Rm 104, Rm 246, Rm 362				0		3	591	0	3	591	-150	0	141	150	3	450	
Rm 104					201												
Rm 246					199												
Rm 362					191												
Guidance Storeroom - Rm 187				0	36	1	36	36	1	36	1	0	1	35	1	35	
Teachers' Work Room - Rm 189				0	201	1	201	201	1	201	-327	0	-327	528	1	528	
IT Technician Office - Rm 148				0	120	1	120	120	1	120	120	1	120				
Literacy Coordinator - Rm 183				0	117	1	117	117	1	117	117	1	117				
STEM Coordinator - Rm 184				0	120	1	120	120	1	120	120	1	120				
[Enter room type here]				0			0	0	0	0	0	0	0				
CUSTODIAL & MAINTENANCE	**486**			**0**			**2,344**			**2,344**			**-11**			**2,355**	
Custodian's Office - Rm 155C				0	167	1	167	167	1	167	17	0	17	150	1	150	
Custodian's Workshop				0	0	0	0	0	0	0	-375	-1	-375	375	1	375	
Custodian's Storage - Rm 155B				0	203	1	203	203	1	203	-172	0	-172	375	1	375	
Recycling Room / Trash - Rm 155A				0	414	1	414	414	1	414	14	0	14	400	1	400	
Receiving and General Supply Rm 155				0	1,157	1	1,157	1,157	1	1,157	805	0	805	352	1	352	
Storeroom				0	0	0	0	0	0	0	-503	-1	-503	503	1	503	
Network / Telecom Room -Rm 149				0	201	1	201	201	1	201	1	0	1	200	1	200	
					202	1	202	202	1	202	202	1	202				
[insert room type here]				0			0	0	0	0	0	0	0				
OTHER	**2,650**			**0**			**5,459**			**5,459**			**5,459**			**0**	

Proposed Space Summary - PK-5 Elementary School

PreK-5th Configuration - Revised 3/12/2026

Date: 3/12/2026 Design Development Submittal

Wilmington Public Schools **Wildwood Early Childhood Center**	Existing Totals	PROPOSED PROGRAM									VARIATION TO MSBA GUIDELINES			MSBA GUIDELINES (DO NOT MODIFY) (Refer to Educational Facility Planning for additional information)			
		EXISTING TO REMAIN / RENOVATED			NEW CONSTRUCTION			TOTAL									
ROOM TYPE		ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	COMMENTS
(List rooms separately below)																	
Pre-Kindergarten Classroom with Toilet (if applicable)				0	varies	3	3,491	varies	3	3,491	varies	3	3,491	1,200	0	-	1,100 NSF (minimum size) - 1,300 NSF (maximum size)
Rm 110 + 100A					1161												
Rm 112 +112A					1165												
Rm 114 +114A					1165												
Extended Learning PK				0	varies	5	786	varies	5	786	varies	5	786				
Rm 105A					42												
Rm 105B					232												
Rm 105C					140												
Rm 105D					217												
Rm 105E					155												
CARES program Coorinator Office - Rm 175				0	144	1	144	144	1	144	144	1	144				
CARES Site Coorinator Office - Rm 176					143	1	143	143	1	143	143	1	143				
Health Classroom - Rm 204				0	895	1	895	895	1	895	895	1	895				
[Enter room type here]				0			0	0	0	0	0	0	0				
Total Building Net Floor Area (NFA)	**93,117**			**0**			**110,079**			**110,079**			**36,114**			**73,965**	**Total Building Net Floor Area (NFA)**
Proposed Student Capacity / Enrollment														# of Grades	6	**755**	**Total Enrollment (Enter Design Enrollment)**
														K	1	**126**	Kindergarten Enrollment
														Grade 1	1	**252**	Lower Elementary School Enrollment (Grades 1-2)
														Grade 2	1	**378**	Upper Elementary School Enrollment (Grades 3-6)
														Grade 3	1		
														Grade 4	1		
														Grade 5	1		
														Grade 6	0		
NON-PROGRAMMED SPACES			% of GFA	**0**		% of GFA	**54,956**		% of GFA	**54,956**							Complete this category with Schematic Design Submittal
Other Occupied Rooms (List rooms separately below)																	
PT Storage Rm 192A		-	#DIV/0!		-	0.2%	**253**	-	0.2%	253							
CARES Storage - Rm 154		-	#DIV/0!		-	0.3%	500	-	0.3%	500							
Flex Storage - Rm 171A		-	#DIV/0!		-	0.1%	**104**	-	0.1%	104							
Flex Storage - Rm 257A		-	#DIV/0!		-	0.0%	**60**	-	0.0%	60							
Teacher Wellness Room					-	0.2%	284		0.2%	284							
Rm 125A							**94**										
Rm 224A							**95**										
Rm 327A							**95**										
[Enter room type here]		-	#DIV/0!		-	0.0%		-	0.0%	0							
Unoccupied MEP / FP Spaces		-	#DIV/0!		-	2.2%	3,682	-	2.2%	3,682							
Unoccupied Closets, Supply Rooms, and Storage Rooms		-	#DIV/0!		-	0.4%	673	-	0.4%	673							
Toilet Rooms		-	#DIV/0!		-	2.9%	4,740	-	2.9%	4,740							
Circulation (corridors, stairs, ramps and elevators)		-	#DIV/0!		-	17.6%	29,036	-	17.6%	29,036							
Remaining[3]		-	#DIV/0!	**0**	-	9.3%	**15,340**	-	9.5%	**15,624**							
Total Building Gross Floor Area (GFA)[2]	**138,614**			**0**			**165,035**			**165,035**			**55,560**			**109,475**	**Total Building Gross Floor Area (GFA)[2]**
Grossing Factor (GFA / NFA)				**#DIV/0!**			**1.50**			**1.50**			**0.02**			**1.48**	**Grossing Factor (GFA / NFA)**

	PDP	PSR	SD	DD	Difference
[1] **Individual Room Net Floor Area (NFA)**	167,900	163,573	165,035	165,035	0

[2] **Total Building Gross Floor Area (GFA)**

[3] **Remaining**

Architect Certification

Proposed Space Summary - PK-5 Elementary School

PreK-5th Configuration - Revised 3/12/2026

Date: 3/12/2026 Design Development Submittal

Wilmington Public Schools Wildwood Early Childhood Center	Existing Totals	PROPOSED PROGRAM									VARIATION TO MSBA GUIDELINES			MSBA GUIDELINES (DO NOT MODIFY) (Refer to Educational Facility Planning for additional information)			
		EXISTING TO REMAIN / RENOVATED			NEW CONSTRUCTION			TOTAL									
ROOM TYPE		ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	ROOM NFA[1]	# OF ROOMS	AREA TOTALS	COMMENTS

I hereby certify that all of the information provided in this "Proposed Space Summary" is true, complete and accurate and, except as agreed to in writing by the Massachusetts School Building Authority, in accordance with the guidelines, rules, regulations and policies of the Massachusetts School Building Authority to the best of my knowledge and belief. A true statement, made under the penalties of perjury.

Name of Architecture Firm: Dore + Whittier Architects, Inc.

Name of Principal Architect: Lee Dore, Principal

Signature of Principal Architect:

Date: March 13, 2026

Deviations From MSBA Guidelines – 775 K-5 Students + 100 PreK

The proposed space summary identifies a need of 165,035 GSF at a net to gross multiplier of 1.5 to serve the educational program, a deviation of 55,560* GSF from the MSBA guidelines for K-5th grade population of 755 students + approximately 100 PreK students.

The table below communicates the evolution of the Wilmington Wildwood Elementary School space summary since its inception for the Preliminary Design Program. The space summary template contains the total NSF for each of the building's program areas and the proposed total GSF for the project. Individual spaces within various categories have been adjusted as the design has progressed and those are described in detail in the following narrative.

* It is important to note that the MSBA Space Summary Template for this enrollment is based on a net to gross multiplier of only 1.48.

	Existing Wildwood, Woburn St and North Int. Schools Combined	PDP	Preferred Schematic Report	Schematic Design Report	Design Development Report
Program Area	TOTAL NSF	TOTAL NSF	TOTAL NSF	TOTAL NSF	TOTAL NSF
Core Academic	36,096	45,700	45,700	47,700	47,526
Special Education	11,300	19,010	19,010	19,010	19,010
Art & Music	6,315	4,040	4,040	5,075	5,064
Health & Physical Education	9,772	12,300	12,300	12,300	12,237
Media Center	2,265	4,068	4,068	4,068	4,096
Dining & Food Service	13,620	9,458	9,458	10,058	10,058
Medical	603	710	710	710	698
Administration & Guidance	5,582	5,308	5,308	3,548	3,587
Custodial & Maintenance	2,654	2,355	2,355	2,355	2,344
Other	2,764	6,100	6,100	5,500	5,459
TOTAL NSF	90,972	110,240	110,240	110,324	110,079
TOTAL GSF	138,614	163,573	163,573	165,035	165,035

CORE ACADEMIC

The Core Academic program category totals 47,526 NSF, which represents an onerall decrease of 174 NSF since the Schematic Design phase. There have not been any notable design changes within the Core Academic category. In some instances, spatial geometries have been adjusted to accommodate structural braced frames, column enclosures, mechanical chases, and other building components through coordination with other disciplines.

SPECIAL EDUCATION

The special education program category totals 19,010 NSF, no change since the schematic design phase. The only notable design change in this category since the submission of the schematic design package is the configuration of the Strides 3rd-5th room and associated spaces. The spatial geometries have been adjusted to accommodate structural bracing and grid alignment.

SCHEMATIC DESIGN STRIDES 3RD-5TH

DESIGN DEVELOPMENT STRIDES 3RD-5TH

ART & MUSIC

The art and music program category totals 5,064 NSF, which represents a decrease of 11 NSF since the Schematic Design phase. One notable design change occurred since the submission of the schematic design package. With flex classrooms now assigned to art and music with designated and improved storage layouts, the design team shifted the Flex Music classroom north to strengthen its adjacency to the Instrumental Music Room. This adjustment supports improved program relationships while maintaining close proximity to the main entrance and cafeteria, allowing the spaces to function effectively for after-hours and community use. This shift also improved the overall exterior massing, simplifying exterior wall construction.

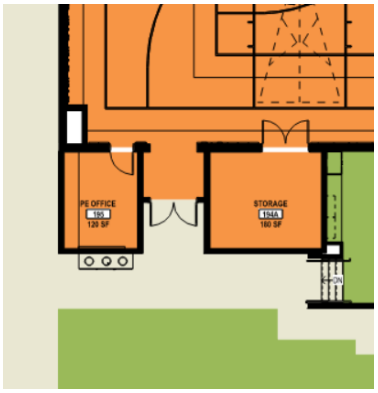
SCHEMATIC DESIGN FLEX-MUSIC ROOM AND INSTRUMENTAL

DESIGN DEVELOPMENT FLEX-MUSIC ROOM AND INSTRUMENTAL

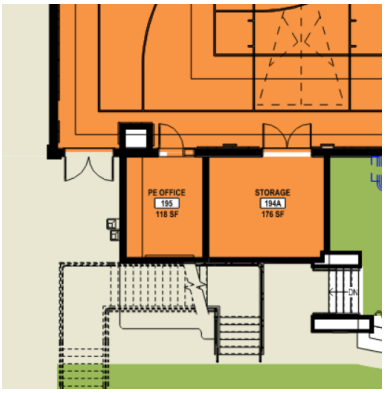
HEALTH & PHYSICAL EDUCATION

The Health and Physical Education program category totals 12,237 NSF, representing a decrease of 63 NSF since the Schematic Design phase. Adjustments to the adjacent Cafeteria layout resulted in modifications to the Gymnasium entry, PE office, and Gym Storage configuration. While not originally anticipated, these changes improved the efficiency of the southeast Gymnasium entry, which is now directly accessible from the corridor. In some areas, spatial geometry was refined

through coordination with structural, mechanical, and other building systems to accommodate column enclosures, mechanical chases, and related building components.



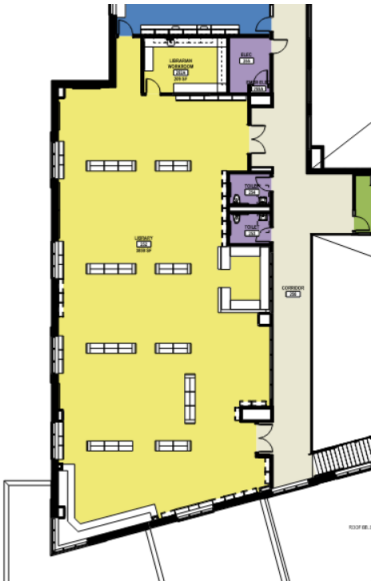
SCHEMATIC DESIGN GYMNASIUM ENTRY



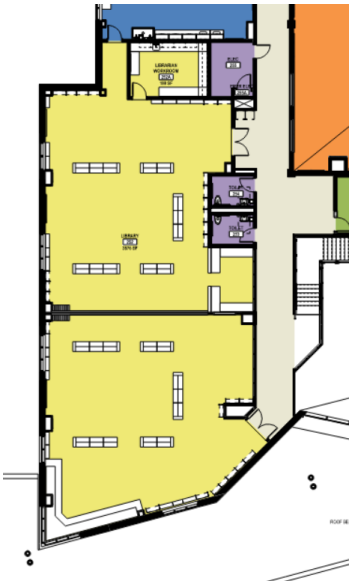
DESIGN DEVELOPMENT GYMNAISUM ENTRY

MEDIA CENTER

The Media Center program category totals 4,096 NSF, representing an increase of 26 NSF since the Schematic Design phase. Notable design refinements include adjustments to the spatial geometry along the eastern facade and the addition of an acoustical partition to allow the space to be subdivided when needed. In several areas, the room geometry was also refined through coordination with the structural, mechanical, and other building systems to accommodate column enclosures, mechanical chases, and related building components.



SCHEMATIC DESIGN MEDIA CENTER



DESIGN DEVELOPMENT MEDIA CENTER

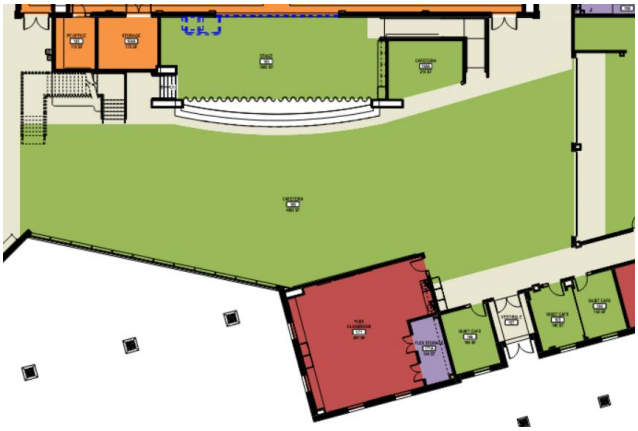
DINING & FOOD SERVICE

The Dining and Food Services program category totals 10,058 NSF, with no change since the Schematic Design phase. Layout refinements were made following the relocation of the adjacent flex classroom, creating a more prominent entry into the school through the cafeteria with a large curtain wall and the relocation of the open stair within the space. The adjacency of the quiet cafés was also adjusted to improve acoustics. The proscenium opening was widened to improve viewing during band performances, and a curved platform was introduced to reflect the angular geometry of the exterior curtain wall.

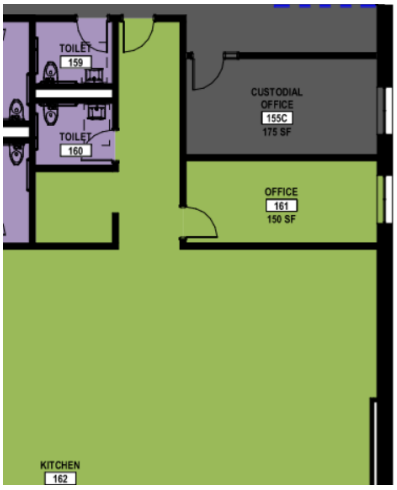
At the request of the district, the 150 SF Kitchen Office was subdivided into two smaller offices to allow the Kitchen Manager and administrative staff to work simultaneously in support of the larger student and food service staff population.

In general, room geometries were refined to coordinate with structural and building systems.

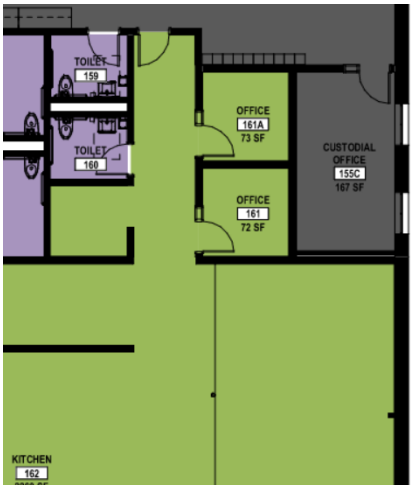
SCHEMATIC DESIGN CAFETERIA, PLATFORM, QUIET CAFES



DESIGN DEVELOPMENT CAFETERIA, PLATFORM, QUIET CAFES



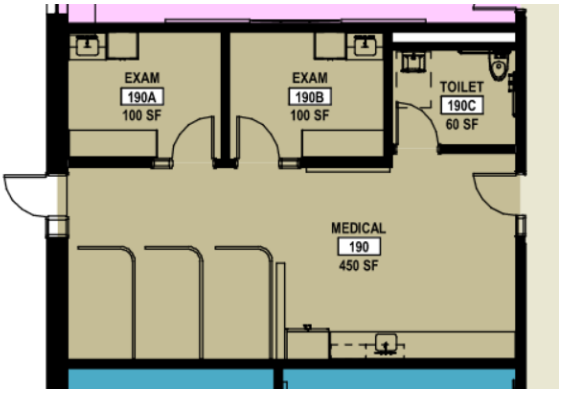
SCHEMATIC DESIGN KITCHEN OFFICE



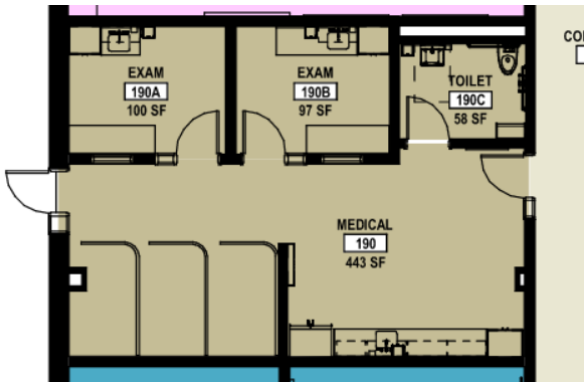
DESIGN DEVELOPMENT KITCHEN OFFICES

MEDICAL

The medical program category totals 698 NSF, reflecting a decrease of 12 NSF since the schematic design phase. The layout has not been reconfigured since the schematic design submission, and overall space sizes have remained generally consistent. In certain areas, spatial geometry has been adjusted to accommodate structural requirements, column enclosures, mechanical chases, and other building components, coordinated across all trades.



SCHEMATIC DESIGN MEDICAL

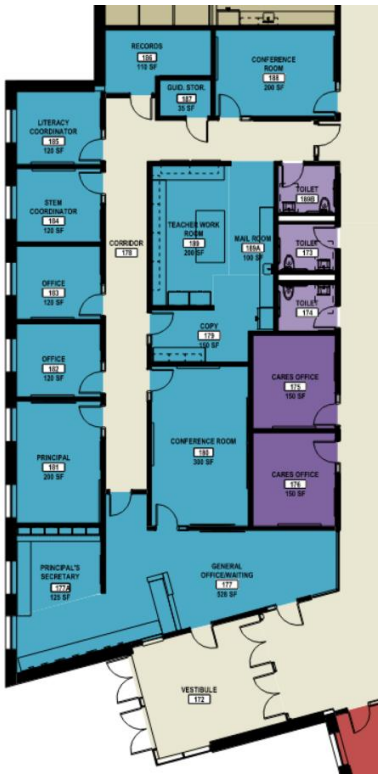


DESIGN DEVELOPMENT MEDICAL

ADMINISTRATION & GUIDANCE

The administration & guidance program category totals 3,587 NSF, reflecting an increase of 40 NSF since the Schematic Design phase. Layout refinements were made following the relocation of the flex classroom, resulting in a more prominent main entry that responds effectively to the site access points. Coordination with the district and town on security and workflow considerations led

to adjustments in office layouts and the positioning of administrative assistants relative to the workroom and waiting area.



SCHEMATIC DESIGN ADMIN AREA

DESIGN DEVELOPMENT ADMIN AREA

CUSTODIAL AND MAINTENANCE

The custodial and maintenance program category totals 2,344 NSF, which represents a decrease of 11 NSF since the Schematic Design phase. The only adjustment in spatial layout of the custodial office was rotated 90 degrees to accommodate necessary space for Kitchen office rooms. Refer to Dining and Food Service narrative in this section.

OTHER

The other program category totals 5,459 NSF, representing a decrease of 41 SF from the Schematic Design Phase. This category remains unchanged from the Schematic Design submission. In certain areas, spatial geometry has been adjusted to accommodate structural requirements, column enclosures, mechanical chases, and other building components, coordinated across all trades.

NON-PROGRAMMED SPACES

The other program category totals 54,956 NSF, representing an increase of 245 SF from the Schematic Design Phase. This category remains unchanged from the Schematic Design submission. In certain areas, spatial geometry has been adjusted to accommodate structural requirements, column enclosures, mechanical chases, and other building components, coordinated across all trades.

SUMMARY

In summary, the Town, District and Design Team are proposing 110,079 NSF and 165,035 GSF to meet the educational program requirements of the Wilmington Wildwood Elementary School project, which serves 755 K–5 students and 100 PreK students. This net square footage is 245 NSF below MSBA guidelines, while the gross square footage remains unchanged.

Space Measurement Analysis

Dore & Whittier uses Building Information Modelling (BIM) technology beginning with the feasibility study phase. This technology measures net square feet to the inside face of interior walls, to the exterior face of exterior walls for gross square feet and rounded to the nearest square foot. This data is then exported and translated into the space summary template.

Our in-house methodology measures exterior square feet according to instructions provided by the MSBA. Everything from the exterior face of exterior walls is included in the calculation for gross square feet including all wall thicknesses, mechanical and plumbing enclosures, the elevator shaft on the lowest level, heating/cooling plant rooms, and all MEP closets. Our methodology also includes the entire stair on the first floor. Areas open-to-below of occupied spaces are excluded from the GSF calculation.

What follows are colored confirmation drawings similar to those provided in the DESE submission. These drawings communicate room usage and current square foot area. These square foot measurements align with the MSBA space summary provided above.

Dore & Whittier certifies that all programmed areas plus all other areas as described in the preceding methodology equals the total gross square foot area of the project.

Lee P. Dore, Assoc. AIA, LEED AP, Principal

PROJECT APPROVALS

The project has received approval of DESE (see Appendix 14), and MHC (Appendix 15). Refer to the attached local action and approvals certificate as well as the Permit Tracking matrix. The design team is coordinating with officials on local utilities to review the project relative to basic utility connections (water, sewer, electricity, cable/tel). Permitting approvals have been coordinated with the OPM's project schedule.

Site Planning Approvals Update

Civil Engineering consultant CDW and Landscape Architects TerraInk continue to move forward with design development activities after informational meetings with the Wilmington Planning and Conservation department staff (Valerie Gingrich), Conservation Commission staff (Cameron Lynch), Town Engineering (Paul Alunni), DPW (Jamie Migaldi), and the Building Inspector (Al Spaulding). Information and feedback are incorporated in the permit submission drawings, calculations, and specifications submitted on March 11th and 12th, 2026 to the Planning Board and Conservation Commission.

Traffic Study Update

A traffic study update evaluated existing conditions, projected background growth, and new trips generated by the school during peak arrival and dismissal times. While traffic will increase during these periods, most nearby intersections are expected to operate adequately with the proposed design.

The site plan separates buses, parent drop-off, and staff parking into distinct access points and includes a dedicated drop-off loop to improve safety and reduce congestion. Two intersections, Salem Street at Middlesex Avenue and Route 62 at Middlesex Avenue/High Street, were identified for improvements due to higher projected volumes. These impacts can be mitigated through targeted measures such as signal timing adjustments and potential geometric upgrades.

Overall, the study concludes that traffic impacts are manageable. The project will proceed with its internal circulation strategy, while the Town advances design and evaluation of off-site intersection improvements to support future conditions.

The full traffic study document is included in this report under Appendix X-4.

Permitting Update

Wetlands Protection Act (310 CMR 10.00)

LEC Environmental Consultants. Inc delineated wetlands at the project site which were located on the survey provided by Nitsch Engineering. There are two wetland areas, one along the western side of

the site and the other along the southwestern property line. Meetings with the local conservation agent and a site visit in the early Fall of 2025 with wetlands consultant LEC determined the southwestern resource areas is a bordered vegetated wetland. The design team, including CDW and TerraInk, reviewed the planned wetland buffer incursions and mitigation strategies with the Conservation Agent at meetings as late as February 2, 2026. The design team submitted a Notice of Intent on March 12, 2026 to Wilmington Conservation.

Stormwater Bylaw and Regulations

As noted above, CDW reviewed the planned stormwater calculations and design strategies with the Town Planner and Conservation Agent at the February 2nd meeting, and incorporate any feedback garnered to complete the permitting drawings and documents before the submission on March 11, 2026.

Bylaw and Regulations

The Town of Wilmington Zoning Bylaw indicates site plan application requirements in section 6.5.2 and the design team continues ongoing communication and coordination with the Town Engineer, Fire and Police Departments, Building Inspector, Department of Public Works, Planning and Zoning, and Conservation Commission.

In addition to the Town Regulations, new work proposed on-site will be required to meet the MassDEP Stormwater Standards. The project expects to meet all these requirements.

Wellhead Protection Area

The North Intermediate is located within the Zone II Groundwater Protection District (entire site). There are additional stormwater water quality requirements for groundwater infiltration that can be accommodated, and are not generally a constraint issue. Main impacts from a Wellhead area would affect an on-site septic system, but the site is connected to sewer, so a non-issue for septic/sewer. Requirements were reviewed as part of the site plan permitting meeting with the Town Engineer and if the project meets the MassDEP Stormwater Standards, which it expects to do, the project will comply with the Zone II Groundwater Protection District requirements. The design team submitted for a Special Permit on March 11, 2026 to Wilmington Planning and Zoning.

Natural Heritage & Endangered Species Program

No changes; not applicable.

Massachusetts Environmental Protection Act (MEPA)

The MA State Permit Tracking Worksheet is included in this section of the report, following this summary. Note that there are no triggers indicating the requirement for a MEPA permit.

Floodplain

Based on the FEMA Flood Insurance Rate Maps for Wilmington (Community Panel No. 25017C0283F), the Site does not fall into a regulated Flood Zone.

Prime Farmland Soil

No changes; not applicable.

USEPA NPDES

Because the land disturbance for the Project is anticipated to be greater than one acre, it is anticipated that a Notice of Intent (NOI) will need to be filed with the EPA.

Historical Resources

As expected, the approved Project Notification Forms from the Massachusetts Historical Commission (MHC) arrived just after the submission of the Schematic Design Report. MHC has approved the demolition of the North Intermediate School and agrees with the assessment that they are of no special historical, architectural, or aesthetic value. The response form from the MHC is included after this summary.

Zoning Analysis

The lot is located within the Residential-20 (R-20) zoning district. Zoning analysis and review with Town Officials determined the project meets the requirements as a municipal project.

Municipal Open Space Status

The existing North Intermediate School site has a Municipal Open Space designation with "Limited Protection". The Town of Wilmington's Open Space and Recreation Plan (2021) explains the following regarding Open Space protected through Town Ownership (Page 51, Page 54):

"The next level of open space protection is through ownership by the Town of Wilmington… Land under the general control of the Town provides some level of protection. Development by the Town of parcels under its control will, in most instances, require the expenditure of Town funds and be subject to a majority vote of Town Meeting."

The site use will not change with the project and continue as a town property used for educational purposes. The project received a 62% majority vote by the Town for the project to move forward at a special Town Meeting on September 13, 2025 and Special Town Election on September 16, 2025.

Permitting table timeline

Permit	Permitting Preparer	Permitting Authority	(Anticipated) Filing Date	Hearing Date	Anticipated Review (Approval Date)
Site Design Development and Traffic Study review	CDW, Nitsch	Town of Wilmington (Engineering, DPW)	NA	No hearing required	Comments received in meetings or via emails.
Special Permit – Groundwater	CDW	Town of Wilmington Planning Board	March 11, 2026	TBD	8- to 10- weeks after submittal
Notice of Intent	CDW	Town of Wilmington Conservation Commission	March 12, 2026	April 2026	8- to 10- weeks after submittal
Wilmington DPW (Roadway, driveway, and general utility layout)	CDW	Wilmington DPW	After 75% DD until 100% CD	On-going Review after 100% DD	8- to 10- weeks after submittal
National Pollutant Discharge Elimination System (NPDES) with EPA Notice of Intent (NOI)	Contractor	Environmental Protection Agency (EPA)	Two weeks before construction starts	No hearing required	Once Submitted to EPA; Close NOI at end of Construction.
Building Permit	Town of Wilmington Building Commissioner (AHJ)	100% CD: October 2026	Anticipate October - November 2026		

DESIGNER'S CONSTRUCTION COST ESTIMATE 6A.3.4

Design Development Cost Estimate

Wildwood Elementary School

Wilmington, MA

MSBA Project ID Number: 202003420015

PM&C LLC
20 Downer Ave, Suite 5
Hingham, MA 02043
(T) 781-740-8007

Prepared for:

Dore + Whittier

March 10, 2026

PM&C

Wildwood Elementary School
Wilmington, MA

10-Mar-26

Design Development Cost Estimate

MAIN CONSTRUCTION COST SUMMARY

	Construction Start	Gross Floor Area	$/sf	Estimated Construction Cost
TRADE COSTS	Dec-26			
NEW BUILDING		165,035	$530.89	$87,615,317
DEMOLITION		55,541	$10.00	$555,410
HAZARDOUS MATERIAL ABATEMENT[1]				$1,476,600
SITEWORK				$15,139,053
SUB-TOTAL		165,035	$634.93	$104,786,380
DESIGN AND PRICING CONTINGENCY	5.0%			$5,239,319
ESCALATION	4.5%			$4,715,387
SUB-TOTAL				$114,741,086
NON TRADES SUB BONDS	1.25%			$705,604
GENERAL CONDITIONS				$5,733,391
GENERAL REQUIREMENTS				$5,681,683
PHASING				NR
BONDS	0.695%			$881,689
GENERAL LIABILITY INSURANCE	1.095%			$1,398,791
BUILDERS RISK	0.193%			$249,245
POLLUTION INSURANCE				$65,674
PERMIT				WAIVED
SUB-TOTAL				$129,457,163
CM FEE				$2,720,000
GMP Contingency	2.5%			$3,236,429
TOTAL OF ALL CONSTRUCTION		165,035	$820.51	**$135,413,592**

BASIS OF ESTIMATE

This Design Development cost estimate was produced from drawings and specifications prepared by Dore + Whittier and their design team dated February 6, 2026. Design and engineering changes occurring subsequent to the issue of these documents have not been incorporated in this estimate.

This estimate includes all direct construction costs, construction managers overhead and profit and design contingency. Cost escalation assumes start dates indicated.

Bidding conditions are expected to be public bidding under 149a of the Massachusetts General Laws to pre-qualified construction managers, and pre-qualified sub-contractors, open specifications for materials and manufacturers.

The estimate is based on prevailing wage rates for construction in this market and represents a reasonable opinion of cost. It is not a prediction of the successful bid from a contractor as bids will vary due to fluctuating market conditions, errors and omissions, proprietary specifications, lack or surplus of bidders, perception of risk, etc. Consequently the estimate is expected to fall within the range of bids from a number of competitive contractors or subcontractors, however we do not warrant that bids or negotiated prices will not vary from the final construction cost estimate.

ITEMS NOT CONSIDERED IN THIS ESTIMATE

Items not included in this estimate are:

- All professional fees and insurance
- Building Permit costs
- Land acquisition, feasibility, and financing costs
- All Furnishings, Fixtures and Equipment
- Items identified in the design as Not In Contract (NIC)
- Items identified in the design as by others
- Owner supplied and/or installed items (e.g. draperies, furniture and equipment)
- Rock excavation; special foundations (unless indicated by design engineers)
- Utility company back charges, including work required off-site
- Work to City streets and sidewalks, (except as noted in this estimate)
- Construction or occupancy phasing or off hours' work, (except as noted in this estimate)

CONSTRUCTION COST SUMMARY IN CSI FORMAT

		BUILDING		*SITEWORK*		*TOTAL*	
		Subtotal	*Total*	*Subtotal*	*Total*	*Subtotal*	*Total*
TOTAL PROJECT CSI SUMMARY							
DIV. 2	**EXISTING CONDITIONS**				**$2,032,010**		**$2,032,010**
024116	Structure Demolition			$555,410		$555,410	
028213	Abatement			$1,476,600		$1,476,600	
DIV. 3	**CONCRETE**		**$4,487,744**		**$123,443**		**$4,611,187**
033000	Cast-in-Place Concrete	$4,479,106		$123,443		$4,602,549	
033500	Concrete Finishes	$8,638				$8,638	
DIV. 4	**MASONRY**		**$7,151,235**				**$7,151,235**
040001	**Unit Masonry - FSB**	$7,151,235				$7,151,235	
DIV. 5	**METALS**		**$10,686,623**		**$56,875**		**$10,743,498**
050001	**Metal Fabrications - FSB**	$1,914,264		$56,875		$1,971,139	
051200	Structural Steel Framing	$8,772,359				$8,772,359	
DIV. 6	**WOODS & PLASTICS**		**$1,789,447**				**$1,789,447**
061000	Rough Carpentry	$475,440				$475,440	
061800	Heavy Timber Construction	$810,000				$810,000	
064100	Architectural Woodwork	$504,007				$504,007	
DIV. 7	**THERMAL & MOISTURE PROTECTION**		**$7,082,092**				**$7,082,092**
070001	**Waterproofing, Dampproofing and Caulking - FSB**	$1,186,004				$1,186,004	
070002	**Roofing and Flashing - FSB**	$2,572,390				$2,572,390	
072100	Thermal Insulation	$444,485				$444,485	
076400	Cladding	$2,044,010				$2,044,010	
078100	Fireproofing	$670,168				$670,168	
078400	Firestopping	$165,035				$165,035	
DIV. 8	**DOORS & WINDOWS**		**$4,429,440**				**$4,429,440**
080001	**Windows**	$3,182,405				$3,182,405	
080002	**Glass and Glazing - FSB**	$169,500				$169,500	
081113	Doors, Frames and Hardware	$531,235				$531,235	
083100	Access Doors and Frames	$10,000				$10,000	
083323	Overhead Coiling Doors	$10,000				$10,000	
083326	Coiling Grilles	$47,150				$47,150	
087100	Door Hardware	$474,900				$474,900	
089000	Louvers	$4,250				$4,250	
DIV. 9	**FINISHES**		**$13,628,220**				**$13,628,220**
090002	**Tiling - FSB**	$1,303,186				$1,303,186	
090003	**Acoustical Ceilings - FSB**	$1,405,278				$1,405,278	
090005	**Resilient Flooring - FSB**	$949,456				$949,456	
090007	**Painting - FSB**	$587,826				$587,826	
092900	Gypsum Board Assemblies	$7,034,929				$7,034,929	
096400	Wood Flooring	$438,590				$438,590	
096620	**Terrazzo - FSB**	$1,036,600				$1,036,600	
096700	Fluid-Applied Flooring	$235,430				$235,430	
096810	Carpet	$56,455				$56,455	
098316	Acoustic Spray						
098400	Acoustic Room Components	$580,470				$580,470	
DIV 10	**SPECIALTIES**		**$2,098,348**				**$2,098,348**
101100	Visual Display Surfaces	$287,910				$287,910	
101200	Display Cases						
101400	Signage	$325,328				$325,328	
102100	Toilet Compartments and Cubicles	$103,500				$103,500	
102200	Operable Partitions	$126,760				$126,760	
102226	Operable Glass Partitions						
102600	Wall Protection	$5,000				$5,000	
102800	Toilet Accessories	$87,300				$87,300	
104300	Fire Protection Specialties	$20,500				$20,500	
105000	Lockers	$8,050				$8,050	
108213	Equipment Enclosure	$1,134,000				$1,134,000	
DIV. 11	**EQUIPMENT**		**$1,336,570**				**$1,336,570**
113100	Appliances	$35,000				$35,000	
114000	Food Service Equipment	$876,120				$876,120	
115213	Projection Screens	$20,000				$20,000	
116200	Theatre Equipment	$75,000				$75,000	
116600	Athletic Equipment	$320,450				$320,450	
117900	Miscellaneous Equipment	$10,000				$10,000	

PM&C

Wildwood Elementary School
Wilmington, MA

10-Mar-26

Design Development Cost Estimate

GFA 165,035

CONSTRUCTION COST SUMMARY IN CSI FORMAT

		BUILDING		*SITEWORK*		*TOTAL*	
		Subtotal	*Total*	*Subtotal*	*Total*	*Subtotal*	*Total*
TOTAL PROJECT CSI SUMMARY							
DIV. 12	**FURNISHINGS**		**$3,071,617**				**$3,071,617**
122113	Window Treatments	$114,152				$114,152	
123200	Fixed Casework and Equipment	$2,677,740				$2,677,740	
124813	Entrance Mats and Frames	$54,725				$54,725	
126100	Fixed Audience Seating	$225,000				$225,000	
DIV. 13	**SPECIAL CONSTRUCTION**						
DIV. 14	**CONVEYING SYSTEMS**		**$270,000**				**$270,000**
142000	**Passenger Elevators - FSB**	$270,000				$270,000	
DIV. 21	**FIRE SUPPRESSION**		**$1,194,885**		**$225,657**		**$1,420,542**
210000	**Fire Protection - FSB**	$1,194,885		$225,657		$1,420,542	
DIV. 22	**PLUMBING**		**$3,471,797**				**$3,471,797**
220000	**Plumbing - FSB**	$3,471,797				$3,471,797	
DIV. 23	**HVAC**		**$14,263,824**				**$14,263,824**
230000	**HVAC - FSB**	$14,263,824				$14,263,824	
DIV. 26	**ELECTRICAL**		**$11,311,920**		**$1,226,500**		**$12,538,420**
260000	**Electrical**	$11,311,920		$1,226,500		$12,538,420	
DIV. 31	**EARTHWORK**		**$1,341,555**		**$4,107,741**		**$5,449,296**
311000	Site Preparation			$1,369,874		$1,369,874	
312000	Earthwork	$1,341,555		$2,607,557		$3,949,112	
312500	Erosion and Sedimentation Control			$130,310		$130,310	
DIV. 32	**EXTERIOR IMPROVEMENTS**				**$7,543,116**		**$7,543,116**
321000	Pavings			$2,394,783		$2,394,783	
323000	Site Improvements			$4,077,711		$4,077,711	
329900	Landscaping			$1,070,622		$1,070,622	
DIV. 33	**UTILITIES**				**$1,855,721**		**$1,855,721**
331000	Water Utilities			$30,000		$30,000	
333000	Sanitary Utilities			$171,100		$171,100	
334000	Storm Utilities			$1,654,621		$1,654,621	
SUBTOTAL DIRECT (TRADE) COST			**$87,615,317**		**$17,171,063**		**$104,786,380**

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Wildwood Elementary School 10-Mar-26
Wilmington, MA

Design Development Cost Estimate GFA 165,035

CONSTRUCTION COST SUMMARY

BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*
BUILDING + SITE SUMMARY				
A10	**FOUNDATIONS**		**$4,547,942**	$27.56
A1010	Standard Foundations	$2,522,197		
A1020	Special Foundations	$0		
A1030	Lowest Floor Construction	$2,025,745		
B10	**SUPERSTRUCTURE**		**$11,530,686**	$69.87
B1010	Upper Floor Construction	$5,664,767		
B1020	Roof Construction	$5,865,919		
B20	**EXTERIOR CLOSURE**		**$15,830,694**	$95.92
B2010	Exterior Walls	$13,269,059		
B2020	Windows	$2,361,740		
B2030	Exterior Doors	$199,895		
B30	**ROOFING**		**$3,015,490**	$18.27
B3010	Roof Coverings	$3,002,990		
B3020	Roof Openings	$12,500		
C10	**INTERIOR CONSTRUCTION**		**$10,287,740**	$62.34
C1010	Partitions	$6,587,675		
C1020	Interior Doors	$1,727,388		
C1030	Specialties/Millwork	$1,972,677		
C20	**STAIRCASES**		**$1,019,325**	$6.18
C2010	Stair Construction	$701,000		
C2020	Stair Finishes	$318,325		
C30	**INTERIOR FINISHES**		**$6,472,032**	$39.22
C3010	Wall Finishes	$1,998,267		
C3020	Floor Finishes	$2,496,569		
C3030	Ceiling Finishes	$1,977,196		
D10	**CONVEYING SYSTEMS**		**$274,620**	$1.66
D1010	Elevator	$274,620		

Wildwood Elementary School 10-Mar-26
Wilmington, MA

Design Development Cost Estimate GFA 165,035

CONSTRUCTION COST SUMMARY

BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*
BUILDING + SITE SUMMARY				
D20	**PLUMBING**		**$3,651,297**	$22.12
D2000	Plumbing	$3,651,297		
D30	**HVAC**		**$14,081,074**	$85.32
D3000	HVAC	$14,081,074		
D40	**FIRE PROTECTION**		**$1,198,135**	$7.26
D4000	Fire Protection	$1,198,135		
D50	**ELECTRICAL**		**$11,311,920**	$68.54
D5010	Service & Distribution	$3,018,392		
D5020	Lighting & Power	$3,435,073		
D5030	Communication & Security Systems	$4,302,179		
D5040	Other Electrical Systems	$556,276		
E10	**EQUIPMENT**		**$1,377,470**	$8.35
E1010	Equipment	$1,377,470		
E20	**FURNISHINGS**		**$3,016,892**	$18.28
E2010	Fixed Furnishings	$3,016,892		
E2020	Movable Furnishings			
F10	**SPECIAL CONSTRUCTION**		**$0**	$0.00
F1000	Special Construction	$0		
F20	**DEMOLITION & HAZMAT REMOVALS**		**$0**	$0.00
F2010	Building Elements Demolition	$0		
F2020	Hazardous Components Abatement	$0		
TOTAL DIRECT BUILDING COST (Trade Costs)			**$87,615,317**	$530.89

Wildwood Elementary School 10-Mar-26
Wilmington, MA

Design Development Cost Estimate GFA 165,035

CONSTRUCTION COST SUMMARY

BUILDING SYSTEM	*SUB-TOTAL*	*TOTAL*	*$/SF*
BUILDING + SITE SUMMARY			
G10 SITE PREPARATION		**$3,031,358**	
G20 SITE IMPROVEMENTS		**$8,350,676**	
G30 SITE MECHANICAL UTILITIES		**$2,351,549**	
G40 SITE ELECTRICAL UTILITIES		**$1,405,470**	
TOTAL DIRECT SITE COST (Trade Costs)		**$15,139,053**	$91.73
TOTAL DIRECT PROJECT COST (Trade Costs)		**$102,754,370**	$622.62

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST

Building Detail

GROSS FLOOR AREA CALCULATION

1st Floor	**78,595**	sf	
2nd Floor	**45,065**	sf	
3rd Floor	**43,820**	sf	
TOTAL GROSS FLOOR AREA (GFA)			**167,480** ***sf***

	A10	***FOUNDATIONS***					
	A1010	**STANDARD FOUNDATIONS**					
033000	*CONCRETE*						
	Strip Footings		*189*	*CY*			
	Foundation Walls		*463*	*CY*			
	Spread Footings		*1,186*	*CY*			
	Piers		*44*	*CY*			
	Elevator Pit		*30*	*CY*			
		Total Foundation Concrete	*1,912*	*CY*			
	Strip footings/Grade Beams						
	Formwork		**4,050**	sf	18.00	72,900	
	Re-bar		**20,250**	lbs.	2.25	45,563	
	Concrete material; 4,500 psi		**189**	cy	170.00	32,130	
	Placing concrete		**189**	cy	120.00	22,680	
	Foundation walls						
	Formwork		**18,440**	sf	22.00	405,680	
	Re-bar		**47,600**	lbs.	2.25	107,100	
	Concrete material; 4,500 psi		**463**	cy	170.00	78,710	
	Placing concrete		**463**	cy	120.00	55,560	
	Form shelf		**1,915**	lf	12.00	22,980	
	Column Footings						
	Formwork		**13,160**	sf	18.00	236,880	
	Re-bar		**82,651**	lbs.	2.25	185,965	
	Concrete material		**1,186**	cy	170.00	201,620	
	Placing concrete		**1,186**	cy	120.00	142,320	
	Set anchor bolts grout plates		**176**	ea	165.00	29,040	
	Piers						
	Formwork		**2,240**	sf	24.00	53,760	
	Re-bar, 300 lbs/cy		**13,200**	lbs	2.25	29,700	
	Concrete material		**44**	cy	170.00	7,480	
	Placing concrete		**44**	cy	120.00	5,280	
	Formed openings for utilities		**1**	ls	25,000.00	25,000	
	Elevator Pits; 12" walls/footing/slab		**1**	ea			
	Formwork		**480**	sf	26.00	12,480	
	Re-bar		**288**	lbs	2.25	648	
	Concrete material		**10**	cy	170.00	1,700	
	Placing concrete		**10**	cy	120.00	1,200	
	Slab, complete		**20**	cy	290.00	5,800	
	Sump pit premium		**1**	ea	1,500.00	1,500	
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Bituminous dampproofing at brick shelf		**3,830**	sf	4.00	15,320	
	Waterproofing at elevator pits		**340**	sf	18.00	6,120	
072100	*THERMAL INSULATION*						
	Insulation, 2"		**11,110**	sf	3.50	38,885	
312000	*EARTHWORK*						
	Strip footings						
	Excavation		**2,026**	cy	14.00	28,364	
	Store onsite, screen to make up levels		**2,026**	cy	22.00	44,572	
	Backfill with imported material		**1,793**	cy	55.00	98,615	
	Spread footings						
	Excavation		**5,395**	cy	14.00	75,530	
	Store onsite, screen to make up levels		**5,395**	cy	22.00	118,690	
	Backfill with imported material		**4,209**	cy	55.00	231,495	
	Miscellaneous						
	Gravel fill beneath footings, 12"		**926**	cy	55.00	50,930	
	Perimeter drain		**1,915**	lf	22.00	NR	

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
Building Detail							
	Allowance for dewatering	**1**	ls	30,000.00	30,000		
	SUBTOTAL					**2,522,197**	
A1020	**SPECIAL FOUNDATIONS**						
	No Work in this section						
	SUBTOTAL					-	
A1030	**LOWEST FLOOR CONSTRUCTION**						
033000	*CONCRETE*						
	New Slab on grade, 5" thick	*78,595*	*sf*				
	Vapor barrier	**78,595**	sf	1.50	117,893		
	Mesh reinforcing 15% lap	**90,384**	sf	1.85	167,210		
	Concrete - 5" thick	**1,284**	cy	170.00	218,280		
	Placing concrete	**1,284**	cy	120.00	154,080		
	MVR admixture	**1,284**	cy	75.00	96,300		
	Finishing and curing concrete	**78,595**	sf	4.00	314,380		
	Control joints - saw cut	**78,595**	sf	0.10	7,860		
	Misc.						
	Equipment pads, allowance	**1**	ls	5,000.00	5,000		
	Ramp @ Platform	**180**	sf	35.00	6,300		
072100	*THERMAL INSULATION*						
	Insulation, 2"	**78,595**	sf	3.50	275,083		
312000	*EARTHWORK*						
	Slab on grade						
	Cut - over excavated 5' of fill beneath building				NR		
	Stockpile - process (for reuse on site fills outside of building) - removed from landfill disposal below				NR		
	Fill - import structural - 25% swell	**3,678**	cy	55.00	202,290		
312000	*SOIL DISPOSAL - conversion factor 1.7 to tons*						
	Load excess soils for disposal - soil above impacted soils per PEER's report				w/ G10		
	Clean non-regulated				w/ G10		
312000	*SOIL DISPOSAL - conversion factor 1.7 to tons*						
	Load excess soils for disposal - impacted soils				w/ G10		
	Landfill				w/ G10		
	Compact existing sub-grade	**78,595**	sf	0.50	39,298		
	Compacted granular fill, 12"	**3,056**	cy	48.00	146,688		
	Underslab drainage	**78,595**	sf	2.00	157,190		
	Radon system	**78,595**	sf	3.00	w/ plumbing		
	Plumbing E&B	**78,595**	sf	1.50	117,893		
	SUBTOTAL					**2,025,745**	
	TOTAL - FOUNDATIONS						**$4,547,942**
B10	***SUPERSTRUCTURE***	$6,682	per ton				
		1,434	TNS TOTAL FLOORS AND ROOF				
		17.1	/SF				
B1010	**FLOOR CONSTRUCTION**						
033000	*CONCRETE*						
	Concrete on Metal Deck	*88,885*	*sf*				
	WWF reinforcement	**102,218**	sf	1.85	189,103		
	Concrete topping to metal decking, 5-1/4" thick; light weight	**1,512**	cy	200.00	302,400		
	MVR admixture	**1,512**	cy	75.00	113,400		
	Place and finish concrete	**88,885**	sf	4.00	355,540		
	Rebar to decks	**26,666**	lbs	2.25	59,999		
	Acoustic isolation system above gymnasium	**4,790**	sf	30.00	143,700		
051200	*STRUCTURAL STEEL FRAMING*						
	Structural steel, 15 psf	**667**	tns	5,000.00	3,335,000		
	Premium for floor over gym, 5 psf	**12**	tns	5,000.00	60,000		
	Metal deck 3"	**88,885**	sf	7.00	622,195		
	Premium for cellular acoustic deck at gym				NR		

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
Building Detail							
	Shear studs	**19,752**	ea	3.50	69,132		
	Moment connections	**4**	ea	800.00	3,200		
	Beam penetrations, allow	**1**	ls	50,000.00	50,000		
	CW support	**1**	ls	50,000.00	50,000		
078400	*FIREPROOFING/FIRESTOPPING*						
	Fireproofing at steel, 1 hour (2 hour rating at specific locations)	**88,885**	sf	3.50	311,098		
	SUBTOTAL					**5,664,767**	
B1020	**ROOF CONSTRUCTION**						
033000	*CONCRETE*						
	WWF reinforcement	**12,690**	sf	1.85	23,477		
	Concrete topping to metal decking, 5-1/4" thick; light weight at gym	**131**	cy	200.00	26,200		
	Concrete topping to metal decking, 7" thick; normal weight at RTUs	**75**	cy	170.00	12,750		
	Place and finish concrete - Gym roof and RTUs	**11,035**	sf	4.00	44,140		
	Rebar to decks	**3,311**	lbs	2.25	7,450		
051200	*STRUCTURAL STEEL FRAMING*						
	Structural steel, 15 psf; typical	**555**	tns	5,000.00	2,775,000		
	Premium for gym roof, 5 psf	**19**	tns	5,000.00	95,000		
	DLT roof at cafeteria and library, 10 psf total	**34**	tns	5,000.00	170,000		
	Canopies, 20 psf	**45**	tns	5,000.00	225,000		
	Roof edge, bent plate, etc.				incl		
	Shear studs	**2,452**	ea	3.50	8,582		
	Expansion joints	**1**	ls	15,000.00	15,000		
	Roof deck 'N' 3"	**74,020**	sf	7.00	518,140		
	Premium for cellular acoustic deck at gym				NR		
	Moment connections	**38**	ea	800.00	30,400		
	Roof deck @ canopies	**4,530**	sf	7.00	31,710		
	Roof screen support, 15psf	**102**	tn	7,000.00	714,000		
061800	*HEAVY TIMBER CONSTRUCTION*						
	DLT - acoustic 2x8 dowel laminated timber paneling with 3/4" t&g exposure, 1" plywood and GLB	**6,750**	sf	120.00	810,000		
078400	*FIREPROOFING/FIRESTOPPING*						
	Fireproofing at steel and deck, 1 hour	**74,020**	sf	3.50	259,070		
	Intumescent fireproofing, at gymnasium	**1**	ls	100,000.00	100,000		
	SUBTOTAL					**5,865,919**	
	TOTAL - SUPERSTRUCTURE						**$11,530,686**
B20	***EXTERIOR CLOSURE***	*75,760*	*sf*				
B2010	**EXTERIOR WALLS**	64,880	sf				
042000	*MASONRY*						
	Brick veneer; including detailing	**45,145**	sf	52.00	2,347,540		
	Premium for glazed brick	**3,200**	sf	10.00	32,000		
	CUVM	**7,540**	sf	70.00	527,800		
	Cast stone panels	**8,870**	sf	160.00	1,419,200		
	Cast stone banding/sill, G6/A6.60; 1'-3 5/8"	**980**	lf	200.00	196,000		
	Cast stone sill, 3 & H7/A6.70; 8"	**2,345**	lf	140.00	328,300		
	Cast stone window head	**1,025**	lf	120.00	123,000		
	CMU back up, 8"	**6,240**	sf	38.00	237,120		
	CMU back up, 12"	**505**	sf	42.00	21,210		
	4" rigid insulation polyiso	**64,880**	sf	5.00	324,400		
	Miscellaneous flashings	**64,880**	sf	1.00	64,880		
	Staging to exterior wall	**75,760**	sf		incl		
	Brick Roof Screen						
	Brick veneer; including detailing	**1,980**	sf	52.00	102,960		
	Cast stone cap w/ drip	**165**	lf	200.00	33,000		
	Canopies						

		DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
		Building Detail						
191		Brick at column	**1,080**	sf	55.00	59,400		
192		CUVM at column	**900**	sf	80.00	72,000		
193		Cast stone trim	**180**	lf	120.00	21,600		
194		4" rigid insulation polyiso	**1,980**	sf	5.00	9,900		
195		Mockup	**1**	ls	50,000.00	50,000		
196								
197	*055000*	*MISC. METALS*						
198		Brick relieving angle				w/ B10		
199		Misc. metals at masonry including loose lintels	**74,630**	sf	1.50	111,945		
200								
201	*070001*	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
202		Air barrier	**64,880**	sf	9.00	583,920		
203		Air barrier at roof edge/overhang	**21,475**	sf	9.00	193,275		
204		Air barrier at canopy columns and soffits	**7,963**	sf	9.00	71,667		
205		Miscellaneous sealants to closure	**64,880**	sf	0.75	48,660		
206		Air barrier/flashing at windows	**5,595**	lf	7.00	39,165		
207								
208	*072100*	*THERMAL INSULATION*						
209		6" Batt insulation in stud backup	**58,640**	sf	5.00	293,200		
210		Insulation at window openings	**5,595**	lf	7.00	39,165		
211								
212	*076400*	*CLADDING*						
213		MCM roof edge and soffit	**17,000**	sf	110.00	1,870,000		
214		4" rigid insulation	**16,106**	sf	5.00	80,530		
215		Prefinished metal siding at duct enclosure	**500**	sf	90.00	45,000		
216		Canopies						
217		MCM roof edge and soffit	**1,843**	sf	70.00	129,010		
218		4" rigid insulation	**1,843**	sf	5.00	9,215		
219								
220	*090003*	*ACOUSTICAL TILE*						
221		Linear metal ceiling	**4,475**	sf	50.00	223,750		
222		4" rigid insulation	**4,475**	sf	5.00	22,375		
223								
224	*092900*	*GYPSUM BOARD ASSEMBLIES*						
225		Framing and sheathing at roof edge and soffits	**21,475**	sf	24.00	515,400		
226		Framing to canopy columns and soffits	**7,963**	sf	24.00	191,112		
227		CMFS - 6-8"	**58,640**	sf	18.00	1,055,520		
228		CMFS - 4" at duct enclosure	**500**	sf	18.00	9,000		
229		Gypsum Sheathing	**58,640**	sf	4.50	263,880		
230		Drywall lining to interior face of stud backup	**58,640**	sf	5.00	293,200		
231		Brick Roof Screen						
232		CMFS - 6"	**2,256**	sf	18.00	40,608		
233		1/2" sheathing	**2,256**	sf	4.50	10,152		
234								
235	*101400*	*SIGNAGE*						
236		Exterior signage, allow	**1**	ls	25,000.00	25,000		
237								
238	*108213*	*EQUIPMENT ENCLOSURE*						
239		Metal panel roof screen, acoustic; 12'	**11,340**	sf	100.00	1,134,000		
240		SUBTOTAL					**13,269,059**	
241								
242	**B2020**	**WINDOWS**	*10,880*	*sf*				
243								
244	*061000*	*ROUGH CARPENTRY*						
245		Wood blocking at openings	**5,595**	lf	12.00	67,140		
246								
247	*070001*	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
248		Backer rod & double sealant	**5,595**	lf	10.00	55,950		
249								
250	*080001*	*METAL WINDOWS*						
251		Aluminum framed windows, triple glazed	**6,200**	sf	155.00	961,000		
252		Aluminum Curtainwall, triple glazed	**4,680**	sf	185.00	865,800		
253		Premium for ballistic glazing	**1,413**	sf	200.00	282,600		

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
Building Detail							
	Sunshades at South elevation windows	**1**	ls	100,000.00	100,000		
	Mockup	**1**	ls	25,000.00	25,000		
089000	*LOUVERS*						
	Louvers , allow	**50**	sf	85.00	4,250		
	SUBTOTAL					**2,361,740**	
B2030	**EXTERIOR DOORS**						
081110	*HOLLOW METAL*						
	Frame						
	Single	**4**	ea	600.00	2,400		
	Double	**4**	ea	800.00	3,200		
	Sidelight	**11**	sf	70.00	770		
	Door						
	F, flush	**4**	ea	1,000.00	4,000		
	FG, 2 glass panels	**8**	ea	1,500.00	12,000		
083323	*OVERHEAD DOOR*						
	Coiled doors, motorized						
	10' x 10'	**1**	ea	10,000.00	10,000		
084410	*CURTAINWALL*						
	Glazed aluminum entrance door and hardware in CW frame; pair	**5**	pr	16,000.00	80,000		
	Premium for IG-4A, security glazing to doors	**105**	sf	75.00	7,875		
087100	*DOOR HARDWARE*						
	Exterior door hardware	**12**	ea	1,400.00	16,800		
	Auto openers	**9**	lvs	5,000.00	45,000		
080002	*GLASS AND GLAZING*						
	Glass in doors and sidelights - IG8	**107**	sf	150.00	16,050		
090007	*PAINTING*						
	Paint doors and frames	**12**	ea	150.00	1,800		
	SUBTOTAL					**199,895**	
	TOTAL - EXTERIOR CLOSURE						**$15,830,694**
B30	***ROOFING***						
B3010	**ROOF COVERINGS**	*85,300*	*SF*				
050001	*MISCELLANEOUS METALS*						
	Roof ladders	**3**	ea	5,000.00	15,000		
	Stair grate and landing	**1**	ea	7,500.00	7,500		
	Safety railing	**1**	lf	250,000.00	250,000		
061000	*ROUGH CARPENTRY*						
	Roof blocking	**85,300**	sf	2.00	170,600		
070002	*ROOFING AND FLASHING*	85,300	*total area*				
	TPO - coverboard, minimum 9" rigid insulation, AVB	**80,770**	sf	28.00	2,261,560		
	Premium for FR deck sheathing at R1.1	**55,565**	sf	2.00	111,130		
	Canopies	**4,530**	sf	25.00	113,250		
	Miscellaneous Roofing						
	Miscellaneous flashings and sealants	**85,300**	sf	0.50	42,650		
	Walkway pads	**3,130**	sf	10.00	31,300		
	Roof Edge Cladding/Fascia						
	MCM roof edge detail				w/ B2010		
	SUBTOTAL					**3,002,990**	
B3020	**ROOF OPENINGS**						
070002	*ROOFING AND FLASHING*						

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
Building Detail							
	Roof hatch	**2**	ea	5,000.00	10,000		
	Elevator vent	**1**	ea	2,500.00	2,500		
	SUBTOTAL					**12,500**	
	TOTAL - ROOFING						**$3,015,490**
C10	***INTERIOR CONSTRUCTION***						
C1010	**PARTITIONS**						
040001	*MASONRY*						
	E/E1; 8" CMU	**13,276**	sf	40.00	531,040		
	G: 12" CMU	**14,230**	sf	45.00	640,350		
	H; 6" CMU	**1,907**	sf	5.00	9,535		
	Premium for polished ground faced CMU at stair shafts	**7,770**	sf		NR		
	Premium for acoustic block at gym	**612**	sf		NR		
050001	*MISCELLANEOUS METALS*						
	Seismic clips to CMU	**525**	ea	300.00	157,500		
	Misc. metals & lintels at CMU partitions	**29,413**	sf	2.00	58,826		
061000	*ROUGH CARPENTRY*						
	Wood blocking and misc. rough carpentry as req'd in partitions	**165,035**	gsf	1.00	165,035		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Miscellaneous sealants at partitions	**206,187**	sf	0.75	154,640		
078400	*FIRESTOPPING*						
	Firestopping at partitions	**165,035**	gsf	1.00	165,035		
080001	*METAL WINDOWS*						
	Interior Curtainwall	**79**	sf	165.00	13,035		
	Interior Storefront	**747**	sf	135.00	100,845		
	Premium for ballistic glazing	**256**	sf	200.00	51,200		
	Premium for 60 min FR	**323**	sf	350.00	113,050		
080002	*GLASS AND GLAZING*						
	Borrowed lights	**952**	sf	50.00	47,600		
	Transaction window	**1**	ls	7,500.00	7,500		
081113	*HOLLOW METAL DOORS & FRAMES*						
	Borrowed lights	**952**	sf	35.00	33,320		
092900	*GYPSUM BOARD ASSEMBLIES*	*206,187*	*sf*				
	A - 6" MS, 1 layer GWB b/s, insulation	**21,785**	sf	20.50	446,593		
	A2/A2A - 6" MS, 2 layers GWB b/s, insulation	**98,582**	sf	25.50	2,513,841		
	BR - 6" MS, 1 layer GWB b/s, BR fiberglass o/s, insulation	**734**	sf	70.50	51,747		
	F4- 3-5/8" MS, 1 layer GWB o/s, insulation	**65,428**	sf	13.50	883,278		
	F5- 3-5/8" MS, 2 layers GWB o/s, insulation	**4,108**	sf	16.00	65,728		
	F6- 6" MS, 1 layer GWB o/s, insulation	**7,848**	sf	15.50	121,644		
	F7- 6" MS, 2 layers GWB o/s, insulation	**1,614**	sf	18.00	29,052		
	F8- 7/8" hat channel, 1 layer GWB o/s	**3,301**	sf	8.50	28,059		
	S7 - shaft wall	**2,787**	sf	26.00	72,462		
102200	*OPERABLE PARTITIONS*						
	12' x 8'	**1**	ea	11,520.00	11,520		
	23' x 8'	**3**	ea	22,080.00	66,240		
	35' x 10'	**1**	ea	49,000.00	49,000		
	SUBTOTAL					**6,587,675**	
C1020	**INTERIOR DOORS**						
061000	*ROUGH CARPENTRY*						
	Wood blocking at openings	**4,939**	lf	4.00	19,756		

		DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Building Detail							
	070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
		Backer rod & double sealant	**4,939**	lf	3.50	17,287		
	080002	*GLASS AND GLAZING*						
		Sidelight	**1,967**	sf	50.00	98,350		
		Premium for ballistic glazing	**1,905**	sf	200.00	381,000		
	081113	*HOLLOW METAL DOORS & FRAMES*						
		Single	**247**	ea	450.00	111,150		
		Double	**37**	ea	600.00	22,200		
		Sidelight	**1,967**	sf	35.00	68,845		
	081400	*WOOD DOORS*						
		Type F	**226**	ea	650.00	146,900		
		Type FG, 2 glazed panels	**9**	ea	850.00	7,650		
		Type G, glazed panel	**68**	ea	800.00	54,400		
		Type N, vision panel	**18**	ea	800.00	14,400		
		premium for STC 53 acoustic door systems	**4**	lvs	10,000.00	40,000		
		premium for ballistic doors	**4**	lvs	2,500.00	10,000		
	083110	*ACCESS DOORS AND FRAMES*						
		Access doors	**1**	ls	10,000.00	10,000		
	083323	*OVERHEAD GRILLES*						
		OHG 20'-4" x 11'-5"	**2**	ea	23,575.00	47,150		
	084110	*ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS*						
		Aluminum door, dbl leaf full lite w/ hardware	**4**	pr	14,000.00	56,000		
		Aluminum door, dbl leaf full lite w/ hardware, 60 min FR	**3**	pr	25,000.00	75,000		
		premium for ballistic doors	**7**	lvs	10,000.00	70,000		
	087100	*DOOR HARDWARE*						
		Hardware; includes install	**321**	set	1,100.00	353,100		
		Auto openers	**12**	lvs	5,000.00	60,000		
	090007	*PAINTING*						
		Paint door & frame	**321**	ea	200.00	64,200		
		SUBTOTAL					**1,727,388**	
	C1030	**SPECIALTIES / MILLWORK**						
	055000	*MISCELLANEOUS METALS*						
		Misc. metals as req'd throughout, allowance	**165,035**	gsf	3.50	577,623		
		Handrail at ramp	**70**	lf	150.00	10,500		
		Glass railing at open to below areas	**55**	lf	650.00	35,750		
	061000	*ROUGH CARPENTRY*						
		Backer panels in electrical closets	**1**	ls	10,000.00	10,000		
		Rough carpentry & blocking as req'd throughout, allowance	**165,035**	gsf	0.26	42,909		
	064020	*INTERIOR ARCHITECTURAL WOODWORK*						
		Window sills; solid surface	**1,240**	lf	60.00	74,400		
		Media						
		Circulation desk	**1**	ls	14,100.00	14,100		
		Custom window seats	**1**	ea	19,800.00	19,800		
		Perimeter bookcase, metal BB02-24	**3**	ea	500.00	1,500		
		Perimeter bookcase, metal BB02-27	**1**	ea	562.50	563		
		Perimeter bookcase, metal BB02-30	**1**	ea	625.00	625		
		Perimeter bookcase, metal BB02-33	**1**	ea	687.50	688		
		Perimeter bookcase, metal BB02-36	**13**	ea	750.00	9,750		
		Perimeter bookcase, metal TBO-2772	**3**	ea	1,125.00	3,375		
		Perimeter bookcase, metal TBO-3072	**5**	ea	1,250.00	6,250		
		Perimeter bookcase, metal TBO-3372	**8**	ea	1,375.00	11,000		
		Perimeter bookcase, metal TBO-3672	**9**	ea	1,500.00	13,500		

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Building Detail						
	Freestanding mobile bookcase,BC3-36 double sided	**26**	ea	1,500.00	39,000		
	Bookcase end unit bookcase, metal BC3-EP	**20**	ea	400.00	8,000		
	Wood veneer panels at bookcase - top and side; 14"	**235**	lf	120.00	28,200		
	Wood veneer panels at mobile bookcase - top; 28"	**78**	lf	240.00	18,720		
	Admin						
	Mail box cubbies	**1**	ls	10,000.00	10,000		
	Extended Learning						
	Bench w/ storage	**57**	lf	500.00	28,500		
	Stair 5						
	Built-in seating, allow	**1**	ea	15,000.00	15,000		
	Display cases, allow	**1**	ls	30,000.00	30,000		
	Feature at Stair 5	**1**	ls	10,000.00	10,000		
	Lego wall	**4**	ea	4,140.00	16,560		
	Miscellaneous wood trim and millwork throughout	**165,035**	gsf	0.75	123,776		
101100	*VISUAL DISPLAY SURFACES*						
	Markerboards	**4,677**	sf	30.00	140,310		
	Tackboards	**5,904**	sf	25.00	147,600		
101400	*SIGNAGE*						
	Room signage	**293**	loc	175.00	51,275		
	Code and wayfinding signage	**165,035**	gsf	0.50	82,518		
	Dedication plaque	**1**	ea	1,500.00	1,500		
	Custom graphics	**165,035**	gsf	1.00	165,035		
102110	*TOILET COMPARTMENTS*						
	Toilet partition - standard	**34**	ea	1,900.00	64,600		
	Toilet partition - ADA	**14**	ea	2,500.00	35,000		
	Toilet partition - urinal screen	**1**	ea	900.00	900		
	Curtain at nurse	**3**	loc	1,000.00	3,000		
102800	*TOILET ACCESSORIES*						
	Gang bathrooms	**14**	rms	3,000.00	42,000		
	Individual bathrooms	**36**	rms	1,200.00	43,200		
	Custodial closet accessories	**7**	rms	300.00	2,100		
102600	*CORNER GUARDS*						
	Corner guards	**1**	ls	5,000.00	5,000		
104400	*FIRE PROTECTION SPECIALTIES*						
	Fire extinguisher cabinets	**56**	ea	350.00	19,600		
	AED cabinets - allowance	**2**	ea	450.00	900		
105000	*LOCKERS*						
	Staff lockers, single	**23**	ope	350.00	8,050		
	SUBTOTAL					**1,972,677**	
	TOTAL - INTERIOR CONSTRUCTION						**$10,287,740**
C20	***STAIRCASES***						
C2010	**STAIR CONSTRUCTION**						
033000	*CONCRETE*						
	Concrete to stairs	**4**	flt	4,000.00	16,000		
055000	*MISCELLANEOUS METALS*						
	Stairs 1 & 3	**4**	flt	65,000.00	260,000		
	Stair 2	**2**	flt	65,000.00	130,000		
	Stair 4	**3**	flt	75,000.00	225,000		
	Stair 5, Cafeteria w/ glass guardrail	**1**	flt	65,000.00	65,000		
	Stair 6, 3 treads	**1**	ls	5,000.00	5,000		
	SUBTOTAL					**701,000**	
C2020	**STAIR FINISHES**						

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
Building Detail							
090005	*RESILIENT FLOORS*						
	Rubber tread/riser	**600**	lf	45.00	27,000		
	Raised rubber flooring	**1,245**	sf	25.00	31,125		
	Steps at stage; wood riser and tread	**90**	lf	120.00	10,800		
090007	*PAINTING*						
	Paint to stairs	**10**	flt	3,500.00	35,000		
966620	*TERRAZZO FLOORING*						
	Precast terrazzo treads, Stairs 2, 4 & 5	**828**	lf	225.00	186,300		
	Terrazzo at intermediate landings	**562**	sf	50.00	28,100		
	SUBTOTAL					**318,325**	
	TOTAL - STAIRCASES						**$1,019,325**
C30	***INTERIOR FINISHES***						
C3010	**WALL FINISHES**						
064020	*INTERIOR ARCHITECTURAL WOODWORK*						
	Wood wall panel - Cafeteria	**230**	sf	90.00	20,700		
090002	*TILE*						
	Corridors, cafeteria, etc.; 52"	**16,648**	sf	34.00	566,032		
	Kitchen; full height	**2,670**	sf	34.00	90,780		
	Bathroom tile	**17,975**	sf	34.00	611,150		
	Custodian wainscot; 48"	**1,036**	sf	34.00	35,224		
090007	*PAINTING*						
	Paint to GWB	**347,335**	sf	0.90	312,602		
	Paint to CMU	**63,159**	sf	1.25	78,949		
098400	*ACOUSTIC ROOM COMPONENTS*						
	AWP-1; Wood fiber acoustic wall panel						
	Gymnasium	**2,210**	sf	28.00	61,880		
	AWP-2; Fabric wrapped acoustical wall panel						
	Music, allow	**300**	sf	45.00	13,500		
	Media/Lobby	**500**	sf	45.00	22,500		
	Acoustic Wood Slat						
	Cafeteria	**1,965**	sf	90.00	176,850		
	Pre-K Lobby	**90**	sf	90.00	8,100		
	SUBTOTAL					**1,998,267**	
C3020	**FLOOR FINISHES**						
003300	*CONCRETE FINISHES*						
	Sealed Concrete	**3,455**	sf	2.50	8,638		
090005	*RESILIENT FLOORS*						
	LIN - Linoleum sheet; Forbo up to 10 colors	**93,393**	sf	7.00	653,751		
	RAF- Rubber Athletic Flooring	**4,260**	sf	18.00	76,680		
	RSF - Rubber sheet	**3,510**	sf	14.00	49,140		
	RST - Rubber tile	**1,050**	sf	16.00	16,800		
	QTZ - Quartz tile	**3,390**	sf	6.00	20,340		
	SDT-1, Static dissipative tile	**385**	sf	12.00	4,620		
	Rubber base	**1**	ls	70,000.00	70,000		
096400	*WOOD FLOORING*						
	Wood athletic flooring at Gym	**11,670**	sf	32.00	373,440		
	Ventilating cove base	**435**	lf	10.00	4,350		
	ST-1 , stage	**2,000**	sf	25.00	50,000		
966620	*TERRAZZO FLOORING*						
	Terrazzo	**17,875**	sf	40.00	715,000		
	Terrazzo base	**2,680**	lf	40.00	107,200		

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Building Detail						
	096700 *EPOXY FLOORING*						
	EPX-1, resinous epoxy w/ integral base	**9,055**	sf	26.00	235,430		
	096820 *CARPETING+ WOM*						
	Carpet tile	**8,065**	sf	7.00	56,455		
	124810 *ENTRANCE FLOOR MAT AND FRAMES*						
	Walkoff Mat - Interior Foot Grille	**995**	sf	55.00	54,725		
	SUBTOTAL					**2,496,569**	
C3030	**CEILING FINISHES**						
	090003 *ACOUSTICAL TILE*						
	ACP-1a, 2, 2a, 6a, 24x24 tile - Armstrong Ultima High NRC	**97,145**	sf	7.00	680,015		
	ACP-5a, 24x24 tile - Ceramaguard	**5,935**	sf	7.50	44,513		
	WD-1, Woodworks linear ceiling	**6,950**	sf	50.00	347,500		
	WD-2, Woodworks linear ceiling; custom finish to match Glulam	**1,825**	sf	60.00	109,500		
	090007 *PAINTING*						
	Paint to GWB ceilings	**10,850**	sf	1.00	10,850		
	Paint all exposed structure, deck & mep/fp systems to be painted, incl at Tectum ceilings	**33,770**	sf	2.50	84,425		
	092900 *GYPSUM BOARD ASSEMBLIES*						
	GWB ceiling (GWB-1)	**10,850**	sf	18.00	195,300		
	GWB ceiling, 2 hour rated	**40**	sf	20.00	800		
	GWB soffits throughout	**165,035**	gsf	1.50	247,553		
	098400 *ACOUSTIC ROOM COMPONENTS*						
	Tectum panels attached to underside of deck	**11,670**	sf	22.00	256,740		
	Acoustibuilt cloud assemblies				NR		
	SUBTOTAL					**1,977,196**	
	TOTAL - INTERIOR FINISHES						**$6,472,032**
D10	***CONVEYING SYSTEMS***						
D1010	**ELEVATOR**						
	Passenger elevator, 3 stop	**1**	ea	270,000.00	270,000		
	Pit ladders	**1**	ea	1,620.00	1,620		
	Sill angles	**1**	ea	3,000.00	3,000		
	SUBTOTAL					**274,620**	
	TOTAL - CONVEYING SYSTEMS						**$274,620**
D20	***PLUMBING***						
D2000	**PLUMBING, GENERALLY**						
	Equipment						
	Domestic water service and meter - submeter SM-1	**1**	ea	15,000.00	15,000		
	Reduced pressure backflow preventer, 4"	**1**	ea	8,500.00	8,500		
	Domestic water heater EWH-1/2, 120 gal. / 90 KW	**2**	ea	40,000.00	80,000		
	Domestic water heater EWH-3, 120 gal. / 54 KW	**1**	ea	32,000.00	32,000		
	SM-2,3, 2 1/2" Submeters, domestic hot water, kitchen hot water	**2**	ea	5,500.00	11,000		
	SM-4, 1 1/2" Submeter, irrigation	**1**	ea	3,500.00	3,500		
	Thermostatic mixing valve	**2**	ea	3,500.00	7,000		
	Expansion tank, 35 gal.	**2**	ea	2,500.00	5,000		
	Recirc. Pump	**2**	ea	1,800.00	3,600		
	Interior grease interceptor	**2**	ea	4,200.00	8,400		
	Exterior grease interceptor - by div 33, connections by PC	**1**	ea	5,000.00	5,000		
	Elevator sump pump with oil separator	**1**	ea	11,000.00	11,000		
	Domestic water booster system				NR		
	Water softening system - allow	**1**	ls	15,000.00	15,000		
	Plumbing Fixtures & Specialties				-		

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Building Detail						
648	Water closet P-1A, P-1B wall/manual	**84**	ea	1,900.00	159,600		
649	Urinal P-2, P-2A, manual	**8**	ea	1,850.00	14,800		
650	Lavatory P-3, P-3A, P-3B, wall/sensor	**76**	ea	2,100.00	159,600		
651	Countertop sink P-5, P-5A, w/ bubbler	**133**	ea	1,845.00	245,385		
652	Electric water cooler with bottle fill P-6, bi-level	**7**	ea	4,450.00	31,150		
653	Mop sink P-7	**8**	ea	1,750.00	14,000		
654	Art room sink P-8, 8A w/solids interceptor	**2**	ea	2,100.00	4,200		
655	Emergency shower & eyewash stations	**2**	ea	1,725.00	3,450		
656	Floor drain FD1	**15**	ea	1,100.00	16,500		
657	Floor drain FD2	**8**	ea	1,200.00	9,600		
658	Trap primer	**10**	ea	950.00	9,500		
659	Roof drain RD1	**22**	ea	1,800.00	39,600		
660	Overflow drain OD1	**22**	ea	1,800.00	39,600		
661	Downspout nozzle	**15**	ea	1,500.00	22,500		
662	Hose bibb HB	**14**	ea	450.00	6,300		
663	Freezeproof wall hydrant WH	**12**	ea	550.00	6,600		
664	Ice makers, refrigerator connections, misc.	**1**	ls	12,000.00	12,000		
665	Fixture rough ins	**318**	ea	300.00	95,400		
666	Domestic Water Type L Copper Pipe				-		
667	4" Domestic water piping with fittings & hangers	**280**	lf	75.00	21,000		
668	3" Domestic water piping with fittings & hangers	**220**	lf	65.00	14,300		
669	Domestic water, branch & distribution piping with fittings & hangers	**17,490**	lf	40.00	699,600		
670	Valve assemblies, specialties and trim	**1**	ls	146,980.00	146,980		
671	Rough-in & connection to kitchen equipment/fixtures	**1**	ls	25,000.00	25,000		
672	Sanitary W&V, Cast Iron Pipe				-		
673	4" Sanitary waste pipe with fittings below grade	**2,060**	lf	75.00	154,500		
674	3" Sanitary waste pipe with fittings below grade	**260**	lf	65.00	16,900		
675	2" Sanitary waste pipe with fittings below grade	**340**	lf	55.00	18,700		
676	4" Sanitary waste pipe with fittings & hangers above grade	**2,352**	lf	75.00	176,400		
677	2" Sanitary waste pipe with fittings & hangers above grade	**6,552**	lf	50.00	327,600		
678	Rough-in & connection to kitchen equipment/fixtures	**1**	ls	25,000.00	25,000		
679	Storm Drainage, Cast Iron Pipe				-		
680	12" Storm piping with fittings, below grade	**220**	lf	125.00	27,500		
681	10" Storm piping with fittings, below grade	**560**	lf	115.00	64,400		
682	8" Storm piping with fittings, below grade	**270**	lf	105.00	28,350		
683	6" Storm piping with fittings, below grade	**310**	lf	90.00	27,900		
684	4" Storm piping with fittings, below grade	**220**	lf	75.00	16,500		
685	8" Storm piping with fittings, above grade	**90**	lf	105.00	9,450		
686	6" Storm piping with fittings, above grade	**2,031**	lf	90.00	182,790		
687	4" Storm piping with fittings, above grade	**390**	lf	75.00	29,250		
688	Pipe Insulation				-		
689	Domestic water pipe insulation	**17,990**	lf	9.00	161,910		
690	Stormwater pipe insulation, horizontal	**1,900**	lf	24.00	45,600		
691	Radon Mitigation System				-		
692	Radon ventilation fan	**15**	ea	1,000.00	15,000		
693	4" PVC (Below grade perforated)	**3,800**	lf	35.00	133,000		
694	4" PVC (Sched 40) Roof stacks	**15**	ea	1,500.00	22,500		
695	Misc. Radon Mitigation accessories	**1**	ls	9,000.00	9,000		
696	Miscellaneous				-		
697	Project management, coordination and BIM	**1**	ls	99,432.45	99,432		
698	Testing and flushing	**1**	ls	13,800.00	13,800		
699	Coring, cutting, sleeves & sealing	**1**	ls	18,800.00	18,800		
700	Hydraulic lifts/rigging	**1**	ls	15,000.00	15,000		
701	Commissioning Support	**1**	ls	10,350.00	10,350		
702	Fees & permits				waived		
703	SUBTOTAL					**3,651,297**	
704							
705	***TOTAL - PLUMBING***						**$3,651,297**
706							
707	***D30 HVAC***						

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Building Detail						
	D3000 HVAC, GENERALLY						
	Heating & Cooling Equipment						
	Heat pump chillers ASHP-1/2 (375 gsf/ton)	**480**	ton	3,400.00	1,632,000		
	EB-1, 2, Electric hot water boilers, based on Fulton, 1,633 mbh, 480kW	**2**	ea	58,788.00	117,576		
	HX-1, 2, Plate & frame heat exchangers	**2**	ea	28,500.00	57,000		
	Pumps P-1 through P-10 w/VFD	**10**	ea	18,000.00	180,000		
	BP-1,2, Boiler pumps w/VFD	**2**	ea	8,500.00	17,000		
	Expansion Tanks ET-1A/1B/2A/2B	**4**	ea	7,600.00	30,400		
	Buffer Tanks (500 gallon)	**4**	ea	12,250.00	49,000		
	Air Separator AS-AS-1/2/3/4/5/6	**6**	ea	5,600.00	33,600		
	Chemical Shot Feeder	**2**	ea	3,500.00	7,000		
	Glycol feeder units GF-1/2	**2**	ea	9,600.00	19,200		
	FCU, Fan coil units	**3**	ea	3,500.00	10,500		
	Radiant panels - hydronic	**4,800**	lf	145.00	696,000		
	Unit heaters - hydronic	**5**	ea	1,800.00	9,000		
	Cabinet unit heaters - hydronic	**14**	ea	2,400.00	33,600		
	Electric unit heaters	**1**	ea	2,000.00	2,000		
	WRU, wall radiation units	**90**	lf	125.00	11,250		
	DC-1 through 10, Ductless split systems	**10**	ea	12,500.00	125,000		
	Air Distribution Equipment						
	RTU-A, w/HW coil, CHW coil, ERW	**17,000**	cfm	24.00	408,000		
	RTU-B, w/HW coil, CHW coil, ERW	**20,000**	cfm	24.00	480,000		
	RTU-C, w/HW coil, CHW coil, ERW	**17,000**	cfm	24.00	408,000		
	RTU-D, w/HW coil, CHW coil, ERW	**13,000**	cfm	24.00	312,000		
	RTU-E, w/HW coil, CHW coil, ERW	**3,225**	cfm	24.00	77,400		
	RTU-F, w/HW coil, CHW coil, ERW	**10,000**	cfm	24.00	240,000		
	RTU-G, w/HW coil, CHW coil, ERW	**3,000**	cfm	24.00	72,000		
	RTU-H, w/HW coil, CHW coil, ERW	**4,000**	cfm	24.00	96,000		
	RTU-I, w/HW coil, CHW coil, ERW	**2,000**	cfm	24.00	48,000		
	MAU-1, Roof mounted w/ HW coil, CHW coil	**4,500**	cfm	20.00	90,000		
	Roof curbs	**10**	ea	6,000.00	60,000		
	Exhaust Fans						
	EF-1 through 4, Miscellaneous exhaust fans	**4**	ea	2,500.00	10,000		
	Kitchen hood exhaust fan	**1**	ea	8,500.00	8,500		
	Sheet Metal & Accessories						
	Galvanized steel ductwork and accessories	**157,157**	lb	18.00	2,828,826		
	Phenolic roof duct	**4,400**	lb	28.00	123,200		
	Welded kitchen duct	**6,500**	lb	20.00	130,000		
	Registers, grilles & diffusers	**345**	ea	250.00	86,250		
	Displacement diffusers	**180**	ea	350.00	63,000		
	VAV terminal unit	**150**	ea	1,455.00	218,250		
	CVR-1 through 8, Constant volume damper	**8**	ea	900.00	7,200		
	PEV, Penthouse elevator vent	**1**	ea	1,500.00	1,500		
	Sound attenuators	**19**	ea	5,500.00	104,500		
	Duct accessories, misc. dampers, etc.	**165,035**	gsf	0.50	82,518		
	Hydronic Piping						
	Hot/chilled water mains	**12,200**	lf	75.00	915,000		
	Hot/chilled water branch & distribution piping	**18,337**	lf	45.00	825,165		
	Hot/chilled water fittings, valves and accessories	**1**	ls	313,229.70	313,230		
	Refrigerant Piping						
	Refrigerant piping - split system	**1,650**	lf	45.00	74,250		
	Condensate Drain Piping						
	Condensate piping with fittings & hangers	**500**	lf	35.00	17,500		
	Insulation						
	Duct insulation	**117,868**	sf	5.00	589,340		
	Fire wrap, kitchen duct	**4,225**	sf	9.00	38,025		
	Hydronic pipe insulation	**30,537**	lf	14.00	427,518		
	Condensate drain pipe insulation	**500**	lf	10.00	5,000		
	Refrigerant pipe insulation	**1,650**	lf	9.00	14,850		
	Automatic Temperature Controls						
	Automatic temperature controls DDC	**165,035**	gsf	8.15	1,345,035		
	Balancing						
	System testing & balancing	**165,035**	gsf	0.85	140,280		

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Building Detail						
	Miscellaneous						
	Testing and start-up	**1**	ls	18,400.00	18,400		
	Coring, cutting, sleeves & sealing	**1**	ls	23,000.00	23,000		
	Hydraulic lifts/rigging	**1**	ls	68,452.32	68,452		
	Project Management / Shop drawings / BIM / As-Builts / Closeout	**1**	ls	205,356.95	205,357		
	Glycol & chemical treatment	**1**	ls	61,601.85	61,602		
	Commissioning Support	**1**	ls	13,800.00	13,800		
	Fees and Permits				waived		
	SUBTOTAL					**14,081,074**	
	TOTAL - HVAC						**$14,081,074**
	D40 FIRE PROTECTION						
D4000	**FIRE PROTECTION, GENERALLY**						
	Equipment						
	8" Fire service	**1**	ea	15,000.00	15,000		
	8" Double check valve assembly	**1**	ea	10,000.00	10,000		
	6" Wet alarm check valve assembly	**1**	ea	6,650.00	6,650		
	2 1/2" dry alarm check valve assembly & compressor	**1**	ea	5,800.00	5,800		
	Electric bell	**1**	ea	800.00	800		
	Fire department connection	**1**	ea	2,650.00	2,650		
	Zone control valve assembly	**4**	ea	2,800.00	11,200		
	Fire department valve with cabinet	**16**	ea	1,200.00	19,200		
	Misc. Fire Protection valves, fittings & trim	**1**	ls	7,130.00	7,130		
	Sprinkler Heads & Distribution Piping						
	Sprinkler heads - Concealed pendant	**1,150**	ea	115.00	132,250		
	Sprinkler heads - Uprights	**225**	ea	95.00	21,375		
	Sprinkler heads - Dry	**22**	ea	110.00	2,420		
	Sprinkler heads - Sidewall	**10**	ea	90.00	900		
	6" Main piping	**780**	lf	60.00	46,800		
	4" Main piping	**3,200**	lf	55.00	176,000		
	2 1/2"" Main piping	**440**	lf	50.00	22,000		
	Premium for custom color heads in specified areas	**1**	ls	3,250.00	3,250		
	Distribution & branch piping	**15,477**	lf	40.00	619,080		
	Miscellaneous						
	Project management, coordination and BIM	**1**	ls	66,150.30	66,150		
	Hydraulic calculations	**1**	ls	6,600.00	6,600		
	Coring, cutting, sleeves & sealing	**1**	ls	9,200.00	9,200		
	Hydraulic lifts/rigging	**1**	ls	10,000.00	10,000		
	Commissioning Support	**1**	ls	3,680.00	3,680		
	Fees & permits				waived		
	SUBTOTAL					**1,198,135**	
	TOTAL - FIRE PROTECTION						**$1,198,135**
	D50 ELECTRICAL						
D5010	**SERVICE & DISTRIBUTION**						
	Gear & Distribution						
	Normal Power						
	2500A 277/480V main switchboard	**2**	ea	210,000.00	420,000		
	Submetering	**1**	ls	40,000.00	40,000		
	Meter socket	**2**	ea	350.00	700		
	MHP 277/480V panelboard	**7**	ea	3,500.00	24,500		
	MHP 277/480V double tub panelboard	**1**	ea	7,000.00	7,000		
	LP 277/480V panelboard	**7**	ea	1,825.00	12,775		
	75KVA K-13 type transformer	**3**	ea	9,090.00	27,270		
	45KVA K-13 type transformer	**10**	ea	6,850.00	68,500		
	30KVA K-13 type transformer	**2**	ea	5,906.00	11,812		
	400A 120/208V double tub panelboard	**5**	ea	7,000.00	35,000		
	150A 120/208V double tub panelboard	**7**	ea	5,000.00	35,000		
	150A 120/208V panelboard	**1**	ea	2,500.00	2,500		
	100A 120/208V double tub panelboard	**2**	ea	3,500.00	7,000		
	Emergency power off station	**2**	ea	350.00	700		

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Building Detail						
838	TVSS	**34**	ea	425.00	14,450		
839	Reconciliation adjustment	**1**	ls	200,000.00	200,000		
840	*Note: riser & closet layout do not match. Riser information incomplete*						
841	Feeders						
842	400A CU feed	**1,220**	lf	197.45	240,889		
843	225A CU feed	**100**	lf	85.74	8,574		
844	125A CU feed	**1,230**	lf	51.61	63,480		
845	225A CU feed	**110**	lf	85.74	9,431		
846	150A CU feed	**680**	lf	56.14	38,175		
847	100A CU feed	**2,110**	lf	39.51	83,366		
848	60A CU feed	**250**	lf	27.36	6,840		
849	*Note: Riser information incomplete. Feeders allowed*						
850	Generator Power						
851	Generator package, Milton Cat materials allowance	**1**	ls	350,000.00	350,000		
852	Installation labor package items:						
853	600KW diesel fueled generator set in weatherproof enclosure and 100kw integral load bank, and exterior camlock	**1**	ls	25,000.00	25,000		
854	Exterior quick connect with camlock & switches	**1**	ea	2,500.00	2,500		
855	1000A 3 pole automatic transfer switch	**1**	ea	2,500.00	2,500		
856	200A 3 pole automatic transfer switch	**1**	ea	1,200.00	1,200		
857	Docking station	**1**	ea	1,500.00	1,500		
858	Remote annunciator panel	**1**	ea	750.00	750		
859	1000A 480/277V distribution panelboard	**1**	ea	90,000.00	90,000		
860	225A 277/480V panelboard	**1**	ea	2,850.00	2,850		
861	Kitchen 277/480V panelboard	**1**	ea	3,500.00	3,500		
862	ELP 277/480V panelboard	**11**	ea	1,825.00	20,075		
863	OLP 277/480V panelboard	**1**	ea	1,825.00	1,825		
864	TEP 277/480V panelboard	**6**	ea	1,825.00	10,950		
865	225KVA K-13 type transformer	**1**	ea	27,400.00	27,400		
866	75KVA K-13 type transformer	**2**	ea	9,090.00	18,180		
867	45KVA K-13 type transformer	**2**	ea	6,850.00	13,700		
868	EV: 800A 120/208V distribution panelboard	**1**	ea	60,000.00	60,000		
869	400A 120/208V panelboard	**2**	ea	3,300.00	6,600		
870	150A 120/208V panelboard	**2**	ea	2,320.00	4,640		
871	TVSS	**24**	ea	425.00	10,200		
872	UPS 24KW 30KVA	**1**	ea	17,000.00	17,000		
873	100A disconnect	**1**	ea	1,106.00	1,106		
874	EPO	**1**	ea	350.00	350		
875	*Note: riser & closet layout do not match. Riser information incomplete*						
876	Feeders						
877	1200A CU feed	**120**	lf	507.86	60,943		
878	400A CU feed	**60**	lf	197.45	11,847		
879	125A CU feed	**1,240**	lf	51.61	63,996		
880	100A CU feed	**730**	lf	39.51	28,842		
881	800A CU feed	**30**	lf	394.12	11,824		
882	400A CU feed	**60**	lf	197.45	11,847		
883	225A CU feed	**60**	lf	85.74	5,144		
884	150A CU feed	**240**	lf	56.14	13,474		
885	125A CU feed	**60**	lf	51.51	3,091		
886	100A CU feed	**150**	lf	39.51	5,927		
887	100A MI feed	**950**	lf	79.00	75,050		
888	*Note: Riser information incomplete. Feeders allowed*						
889	Photovoltaic System						
890	PV system including disconnect switch & in-line meter	**Future**			NIC		
891	Infrastructure for future system, allow: 3-4" & 3-1" conduit runs from electric room to roof	**1**	ls	10,000.00	10,000		
892	Grounding and Lightning Protection						
893	Grounding	**1**	ls	35,000.00	35,000		
894	Telecom closet grounding				Included above		
895	Lightning protection system	**165,035**	sf	0.50	82,518		
896	Equipment Wiring						
897	ASHP feed, connection & safety switch WP, allow	**2**	ea	4,000.00	8,000		
898	BP feed, connection & safety switch & connection to VFD, allow	**2**	ea	2,200.00	4,400		
899	CP feed, connection & safety switch, allow	**2**	ea	1,600.00	3,200		
900	CUH feed, connection & safety switch, allow	**14**	ea	1,465.00	20,510		
901	DCUc feed, connection & safety switch WP, allow	**10**	ea	1,950.00	19,500		
902	DCUe feed & connection allow	**10**	ea	1,585.00	15,850		

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Building Detail						
903	DDC system power	**1**	ls	3,000.00	3,000		
904	Door motor 20A feed, connection, TS & LV to 2 push plates	**12**	ea	1,900.00	22,800		
905	EB BOILER feed, connection & safety switch, allow	**2**	ea	1,575.00	3,150		
906	EF feed, connection & safety switch, allow	**3**	ea	1,735.00	5,205		
907	EF feed, connection & safety switch WP, allow	**1**	ea	1,950.00	1,950		
908	Elevator cab 20A feed, connection & 30A FSS, allow	**1**	ea	2,230.00	2,230		
909	Elevator feed, connection & 100A FSS, allow	**1**	ea	4,650.00	4,650		
910	EWH 30A feed, connection & 30A NFSS	**3**	ea	1,800.00	5,400		
911	EUH feed, connection & safety switch, allow	**1**	ea	1,800.00	1,800		
912	FCU feed, connection & safety switch, allow	**6**	ea	1,800.00	10,800		
913	GF feed, connection & safety switch, allow	**2**	ea	1,850.00	3,700		
914	KEF feed, connection & safety switch WP, allow	**1**	ea	2,300.00	2,300		
915	Kiln 50A feed, connection, 60A FSS & special purpose receptacle	**1**	ls	3,000.00	3,000		
916	MAU-1 feed, connection & safety switch WP, allow	**1**	ea	3,200.00	3,200		
917	MLC feed, connection & power to 3 sets of shades	**2**	loc	2,500.00	5,000		
918	MV 20A feed, connection & TS	**2**	ea	1,575.00	3,150		
919	OMP 20A feed, connection & TS	**1**	ea	1,575.00	1,575		
920	Overhead door feed, connection & FSS	**1**	ea	1,900.00	1,900		
921	Projection screen feed, connection & LV to control station, allow	**1**	ls	2,000.00	2,000		
922	Pumps with VFD connection feed, connection & safety switch, allow	**10**	ea	2,500.00	25,000		
923	RP circulation pump 20A TS	**2**	ea	1,600.00	3,200		
924	RP radiant heating panel feed & connection	**3**	ea	1,600.00	4,800		
925	RTU feed, connection & safety switch WP, allow	**9**	ea	4,000.00	36,000		
926	SP CP 20A feed, connection & TS	**1**	ea	1,575.00	1,575		
927	SP Elevator sump pump feed & connection, allow	**1**	ea	1,600.00	1,600		
928	VAV feed & connection, allow count *per mechanical*	**150**	ea	600.00	90,000		
929	UH feed, connection & safety switch, allow	**5**	ea	1,580.00	7,900		
930	Kitchen:						
931	150A feed, connection & 200A FSS	**1**	ea	4,575.00	4,575		
932	20A feed & connection	**60**	ea	780.00	46,800		
933	20A feed, connection & 30A FSS	**2**	ea	1,245.00	2,490		
934	20A feed, connection & 30A NFSS	**3**	ea	1,155.00	3,465		
935	20A feed, connection & TS	**4**	ea	855.00	3,420		
936	30A feed & connection	**5**	ea	825.00	4,125		
937	50A feed & connection	**1**	ea	945.00	945		
938	50A feed, connection & 60A NFSS	**3**	ea	1,620.00	4,860		
939	Freezer feed, connection & NFSS	**1**	ea	4,500.00	4,500		
940	Gymnasium:						
941	Motorized back stop feed, connection, FSS & LV to control station	**6**	ea	1,750.00	10,500		
942	Motorized curtain feed, connection, FSS & LV to control station	**2**	ea	1,650.00	3,300		
943	Scoreboard with controls and shot clock feed, connection, FSS & LV key switch	**2**	ea	2,000.00	4,000		
944	Fairplay scoreboard with shot clocks including installation labor	**2**	ea	12,000.00	24,000		
945	Equipment wiring not yet detailed, allow	**165,035**	sf	0.75	123,776		
946	SUBTOTAL					**3,018,392**	
947							
948	**D5020 LIGHTING & POWER**						
949	Lighting						
950	Boston Light Source budget pricing: *Note fixture schedule preliminary, for budgeting only*	**1**	ls	484,434.00	484,434		
951	Deduct of SL1 + Sl2 fixtures, pricing moved to site	**1**	ls	(110,200.00)	(110,200)		
952	Type LR2	**24**	ea	540.00	12,960		
953	Type LR4	**254**	ea	430.00	109,220		
954	Type LR6	**107**	ea	650.00	69,550		
955	Type LR6T	**3**	ea	650.00	1,950		
956	Type LR8	**70**	ea	864.00	60,480		
957	Type LR8T	**4**	ea	864.00	3,456		
958	Type LRS	**138**	lf				
959	Type LS2	**6**	ea	300.00	1,800		
960	Type LS4	**20**	ea	430.00	8,600		
961	Type LS6	**15**	ea	650.00	9,750		
962	Type LS8	**33**	ea	865.00	28,545		
963	Type SL3	**60**	ea	300.00	18,000		
964	Site Fixture SL1	**57**	ea	2,500.00	142,500		
965	Site Fixture SL2	**4**	ea	3,000.00	12,000		
966	Installation labor budgeted fixtures:						
967	Fixture	**596**	ea	125.00	74,500		

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Building Detail						
968	Linear fixture	**138**	lf	25.00	3,450		
969	Site fixture	**61**	ea		See Site Lighting		
970	Light fixtures Estimator budget pricing:						
971	Type LC1	**101**	lf	90.00	9,090		
972	Type LDC	**27**	ea	350.00	9,450		
973	Type LK22	**40**	ea	350.00	14,000		
974	Type LP2	**1**	ea	200.00	200		
975	Type LP4	**43**	ea	350.00	15,050		
976	Type LP6	**39**	ea	450.00	17,550		
977	Type LP8	**349**	ea	650.00	226,850		
978	Type LP12	**1**	ea	850.00	850		
979	Type LPG	**30**	ea	400.00	12,000		
980	Type PC1	**92**	ea	350.00	32,200		
981	Type PC2	**143**	ea	350.00	50,050		
982	Type PC3	**81**	ea	350.00	28,350		
983	Type RC1	**87**	ea	300.00	26,100		
984	Type RC2	**97**	ea	300.00	29,100		
985	Type RC4	**20**	ea	300.00	6,000		
986	Type SL4	**5**	ea	350.00	1,750		
987	Type UC	**366**	lf	70.00	25,620		
988	Rooftop fixture, allow	**9**	ea	300.00	2,700		
989	Elevator pit light, allow	**2**	ea	250.00	500		
990	Exit	**48**	ea	180.00	8,640		
991	Installation labor budgeted fixtures:						
992	Fixture	**1,066**	ea	125.00	133,250		
993	Linear fixture	**467**	lf	25.00	11,675		
994	Exit sign	**48**	lf	85.00	4,080		
995	Site fixture				See Site Lighting		
996	Lighting not yet detailed, allow	**165,035**	sf	0.95	156,783		
997	Lighting Control						
998	Lighting control system	**165,035**	sf	1.35	222,797		
999	Occupancy sensor	**478**	ea	225.00	107,550		
1000	Daylight sensor	**42**	ea	225.00	9,450		
1001	Single pole LV switch	**293**	ea	65.00	19,045		
1002	Single pole switch	**18**	ea	35.00	630		
1003	Single pole switch WP, allow	**10**	ea	45.00	450		
1004	LTS local touch screen	**8**	ea	250.00	2,000		
1005	OSH	**21**	ea	250.00	5,250		
1006	PS partition sensor	**2**	ea	150.00	300		
1007	Photocell	**1**	ea	225.00	225		
1008	Lighting control not yet detailed, allow	**165,035**	sf	0.13	21,455		
1009	Lighting Circuitry						
1010	Device plate	**30**	ea	5.60	168		
1011	Device Box	**2,614**	ea	32.00	83,648		
1012	3/4" EMT	**8,400**	lf	10.00	84,000		
1013	#12 THHN	**50,400**	lf	1.10	55,440		
1014	12/2 MC	**25,200**	lf	5.65	142,380		
1015	Cat cabling	**42,200**	lf	2.00	84,400		
1016	Branch Devices						
1017	Duplex receptacle	**830**	ea	29.00	24,070		
1018	Double duplex receptacle	**241**	ea	58.00	13,978		
1019	Double duplex receptacle in floor box	**2**	ea	58.00	116		
1020	GFI duplex receptacle	**147**	ea	45.00	6,615		
1021	Special purpose receptacle, telecom closets	**48**	ea	75.00	3,600		
1022	Connection to electric bell	**1**	ea	110.00	110		
1023	Connection to panel	**9**	ea	110.00	990		
1024	Connection to restroom sink	**62**	ea	90.00	5,580		
1025	Connection to flush valve transformer	**80**	ea	110.00	8,800		
1026	Cord reel	**6**	ea	1,200.00	7,200		
1027	Floor box	**4**	ea	650.00	2,600		
1028	Branch devices not yet detailed, allow	**165,035**	sf	0.55	90,769		
1029	Branch Circuitry						
1030	WP device plate	**17**	ea	21.70	369		
1031	Device plate	**1,245**	ea	5.60	6,972		
1032	Device Box	**1,420**	ea	32.00	45,440		
1033	3/4" EMT	**6,500**	lf	10.00	65,000		

		DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
		Building Detail						
1034		3/4" PVC in slab, allow to floor boxes	**120**	lf	10.00	1,200		
1035		#12 THHN	**38,500**	lf	1.10	42,350		
1036		MC cable	**19,200**	lf	5.65	108,480		
1037		4" sleeve	**8**	ea	250.00	2,000		
1038		2" sleeve	**122**	ea	150.00	18,300		
1039		1" sleeve	**122**	ea	100.00	12,200		
1040		Branch circuitry not yet detailed, allow	**165,035**	sf	1.50	247,553		
1041		Performance Lighting:						
1042		Barbizon Light Budget Price:	**1**	ls	110,000.00	110,000		
1043		Echo DMX scene controller	**1**	ls		Included above		
1044		Installation labor	**1**	ea	1,500.00	1,500		
1045		Echo room controller	**1**	ls		Included above		
1046		Touch screen station	**1**	ea		Included above		
1047		Console	**1**	ls		Included above		
1048		Type TH1	**16**	ea		Included above		
1049		Type TR1	**60**	lf		Included above		
1050		DT-01+02+03+04	**4**	ea	assumed redundant with TRI track			
1051		Installation labor	**4**	ea	500.00	2,000		
1052		DMX input station	**1**	ea				
1053		Rough-in						
1054		20A circuit	**400**	lf	15.00	6,000		
1055		Back box	**4**	ea	65.00	260		
1056		3/4" EMT	**700**	lf	10.00	7,000		
1057		Belden cabling	**800**	lf	2.25	1,800		
1058		#16/#14 THHN	**200**	lf	1.00	200		
1059		SUBTOTAL					**3,435,073**	
1060	**D5030**	**COMMUNICATION & SECURITY SYSTEMS**						
1061		Telecommunications						
1062		Head-end: network switch electronics/PBX/system equipment - Cisco proprietary						
1063		Network switches, allowance	**1**	ls	500,000.00	500,000		
1064		Telephone system, allowance	**1**	ls	85,000.00	85,000		
1065		P phone	**163**	ea		Included above		
1066		MDF fit-out	**1**	ea	17,000.00	17,000		
1067		IDF fit-out	**2**	ea	7,500.00	15,000		
1068		1 Port data device	**23**	ea	25.50	587		
1069		2 Port data device	**120**	ea	51.00	6,120		
1070		2 Port data device in floor box	**5**	ea	51.00	255		
1071		2 Port tel/data device	**1**	ea	51.00	51		
1072		3 Port tel/data device	**168**	ea	76.50	12,852		
1073		3 Port tel/data device in floor box	**2**	ea	76.50	153		
1074		4 Port data device	**1**	ea	102.00	102		
1075		4 Port data device in floor box	**2**	ea	102.00	204		
1076		AP wireless access point	**192**	ea	1,000.00	192,000		
1077		AV	**209**	ea	51.00	10,659		
1078		AV in floor box	**4**	ea	51.00	204		
1079		Telephone port	**117**	ea	25.50	2,984		
1080		WAP 2-port ceiling	**183**	ea	51.00	9,333		
1081		WAP 2-port wall	**9**	ea	51.00	459		
1082		Backbone cabling	**350**	lf	35.00	12,250		
1083		Cat cabling	**260,000**	lf	2.00	520,000		
1084		Rough-in						
1085		MDF rough-in	**1**	ea	4,000.00	4,000		
1086		IDF rough-in	**2**	ea	2,500.00	5,000		
1087		Device box with 2-1" conduit stub per detail T2.01	**814**	ea	250.00	203,500		
1088		Device box with 1" & 1.25" conduit stub	**209**	ea	275.00	57,475		
1089		3/4" PVC in slab, allow to floor boxes	**60**	lf	10.00	600		
1090		4" EMT, 2 runs from MDF to the IDFs	**600**	lf	62.00	37,200		
1091		4" EMT sleeve	**26**	ea	250.00	6,500		
1092		Cable tray	**170**	lf	55.00	9,350		
1093		Backboard	**3**	ea	750.00	2,250		
1094		Telecommunications not yet detailed, allow	**165,035**	sf	0.25	41,259		
1095		Public address/Master clock system						
1096		Head-end	**1**	ls	25,000.00	25,000		
1097		Clock	**167**	ea	127.50	21,293		
1098		Clock 16"	**2**	ea	165.00	330		
1099		Speaker, ceiling mount	**267**	ea	212.50	56,738		

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Building Detail						
1100	Speaker, wall mount	**36**	ea	212.50	7,650		
1101	Speaker TB talk back, ceiling mount	**66**	ea	250.00	16,500		
1102	Speaker V volume controlled, ceiling mount	**127**	ea	250.00	31,750		
1103	Speaker V volume controlled, wall mount	**1**	ea	250.00	250		
1104	Speaker WP	**13**	ea	500.00	6,500		
1105	CB call button	**58**	ea	120.00	6,960		
1106	Speaker cabling	**28,400**	lf	2.00	56,800		
1107	Rough-in						
1108	Speaker back box	**460**	ea	65.00	29,900		
1109	1 gang device box with 1" conduit stub	**277**	ea	170.00	47,090		
1110	MC circuitry, clock	**10,000**	lf	5.25	52,500		
1111	Audio/Visual						
1112	Audio Visual equipment, installation labor & LV cabling: Pro AV budget allowance	**1**	ls	500,000.00	500,000		
1113	Cafetorium Performance audio/visual package, allow	**1**	ls		Included above		
1114	Gym audio system, allow	**1**	ls		Included above		
1115	Classroom speech reinforcement system: equipment with installation labor, LV cabling & testing: Lightspeed Topcat proprietary	77	loc		Included above		
1116	SR: classroom speech reinforcement system	77	ea		Included above		
1117	AVRK: audio visual system rack	**1**	ea		Included above		
1118	CI camera input plate	**1**	ea		Included above		
1119	Mic: microphone input	**12**	ea		Included above		
1120	PC	**2**	ea		Included above		
1121	Projector	**4**	ea		Included above		
1122	S2: speaker wall mount	**2**	ea		Included above		
1123	S2: speaker ceiling mount	**3**	ea		Included above		
1124	S3: speaker wall mount	**1**	ea		Included above		
1125	S3: speaker ceiling mount	**1**	ea		Included above		
1126	W ass lis mic ant	**2**	ea		Included above		
1127	WA ass lis mic ant	**1**	ea		Included above		
1128	Rough-in:						
1129	Speaker ceiling mount back box, allow	**4**	ea	65.00	260		
1130	1 gang device box with conduit stub, sizing not identified allow 1"	**3**	ea	170.00	510		
1131	1 gang device box with 1" conduit stub	**3**	ea	170.00	510		
1132	Rough-in not yet identified to device, allow	**12**	ea	170.00	2,040		
1133	Caf additional AV Rough-in, allow for not yet detailed	**1**	ls	3,000.00	3,000		
1134	Gym additional AV Rough-in, allow for not yet detailed	**1**	ls	3,000.00	3,000		
1135	Classroom AV Rough-in, allow	77	ea	800.00	61,600		
1136	Digital signage Rough-in, allow	**1**	ls	20,000.00	20,000		
1137	Two-Way Communications						
1138	Area of refuge system, allow	**1**	ls	6,000.00	6,000		
1139	Rough-in				Included above		
1140	Bi-directional amplification system						
1141	Cell repeater system, allow	**1**	lsum	250,000.00	250,000		
1142	BDA/DAS system	**165,035**	sf	0.80	132,028		
1143	Annunciator	**1**	ea		Included above		
1144	Antenna	**2**	ea		Included above		
1145	Console	**2**	ea		Included above		
1146	LPSU	**2**	ea		Included above		
1147	Splitter	**12**	ea		Included above		
1148	Rough-in				Included above		
1149	Fire alarm system						
1150	Fire alarm control panel w/mass notification	**1**	ea	20,000.00	20,000		
1151	Fire alarm remote annunciator	**3**	ea	2,125.00	6,375		
1152	Terminal cabinet	**5**	ea	1,402.50	7,013		
1153	MNS local operator console	**2**	ea	2,975.00	5,950		
1154	MNS message board	**8**	ea	637.50	5,100		
1155	Master box	**1**	ea	1,445.00	1,445		
1156	Exterior beacon	**2**	ea	255.00	510		
1157	Exterior bell	**1**	ea	255.00	255		
1158	Knox box	**4**	ea	297.50	1,190		
1159	Manual pull station	**16**	ea	136.00	2,176		
1160	Smoke detector	**159**	ea	153.00	24,327		
1161	CO detector	**12**	ea	153.00	1,836		
1162	Duct smoke detector, allow	**18**	ea	637.50	11,475		
1163	Speaker/light, ceiling	**210**	ea	136.00	28,560		
1164	Visual device, wall mount	**35**	ea	119.00	4,165		
1165	Combo FA Mass not speaker/visual, wall mount	**42**	ea	165.00	6,930		

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Building Detail						
	Mass not wall mount	**35**	ea	136.00	4,760		
	Mass not visual, ceiling mount	**205**	ea	136.00	27,880		
	Magnetic door holder	**4**	ea	165.00	660		
	FP equipment connection	**17**	ea	212.50	3,613		
	Kitchen connection	**1**	ea	212.50	213		
	Elevator recall connection	**2**	ea	297.50	595		
	Connections to public address, AV etc.	**1**	ls	2,125.00	2,125		
	Monitoring/control module	**60**	ea	212.50	12,750		
	Testing and programming	**1**	ls	1,000.00	1,000		
	Device Box	**850**	ea	32.00	27,200		
	1" EMT	**600**	lf	14.20	8,520		
	3/4" EMT	**8,400**	lf	10.00	84,000		
	FA cable	**27,300**	lf	1.28	34,944		
	FAMC	**28,600**	lf	5.30	151,580		
	Security systems						
	Head-end	**1**	ls	75,000.00	75,000		
	CCTV camera	**23**	ea	1,250.00	28,750		
	CCTV camera 360	**54**	ea	1,750.00	94,500		
	CCTV camera 360 wp	**3**	ea	2,000.00	6,000		
	CCTV camera WP	**27**	ea	1,750.00	47,250		
	CR Card reader	**61**	ea	650.00	39,650		
	DC Door contact	**104**	ea	250.00	26,000		
	PB Push button,	**15**	ea	150.00	2,250		
	AI video intercom door station	**15**	ea				
	PIR Motion detector	**61**	ea	200.00	12,200		
	REX connection at door, 1/door contact per detail on T2.08	**104**	ea	100.00	10,400		
	Security circuitry	**28,000**	lf	2.00	56,000		
	Additional security equipment not yet detailed	**165,035**	sf	1.35	222,797		
	Rough-in:						
	Head-end, antenna etc. rough-in	**1**	ls	5,000.00	5,000		
	3 gang door junction box with 2x 1" EMT to accessible ceiling	**61**	ea	220.00	13,420		
	1 gang device box with 1" conduit stub	**76**	ea	170.00	12,920		
	1 gang device box with conduit stub	**259**	ea	120.00	31,080		
	Rough-in not yet detailed	**165,035**	sf	0.25	41,259		
	SUBTOTAL					**4,302,179**	
D5040	**OTHER ELECTRICAL SYSTEMS**						
	Common Work Results for Electrical						
	Reconciliation adjustment	**1**	ls	63,723.00	63,723		
	Temporary power and lights	**165,035**	gsf	1.50	247,553		
	Spare parts/attic stock: Lighting, fire alarm, lighting controls	**1**	ls	10,000.00	10,000		
	Coordination, management, BIM & support	**1**	ls	100,000.00	100,000		
	Testing, studies & commissioning	**1**	ls	60,000.00	60,000		
	Seismic, labelling, firestopping, cutting & patching etc.	**1**	ls	75,000.00	75,000		
	Fees and permits				waived		
	SUBTOTAL					**556,276**	
	TOTAL - ELECTRICAL						**$11,311,920**
E10	***EQUIPMENT***						
114000	*FOODSERVICE EQUIPMENT*						
	Food service equipment, Crabtree & McGrath 1/6/26	**1**	ls	876,120.00	876,120		
110000	*EQUIPMENT*						
	Residential appliances, allow	**1**	ls	35,000.00	35,000		
	Art						
	Kiln	**2**	ea	5,000.00	10,000		
	Gym						
	Basketball backstops	**6**	ea	14,000.00	84,000		
	Volleyball sleeves	**1**	ls	5,000.00	5,000		
	Climbing wall, 36' x 8'	**1**	ea	43,200.00	43,200		
	Climbing wall, 32' x 8'	**1**	ea	38,400.00	38,400		
	Cargo nets	**1**	ls	2,500.00	2,500		
	Climbing rope system	**1**	ls	5,000.00	5,000		

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
Building Detail							
	Score board in Gym	**2**	loc	20,000.00	40,000		
	Divider curtain @ gym	**1**	ea	30,000.00	30,000		
	Wall pads - gym	**1,215**	sf	30.00	36,450		
	Wall pads - Calm rooms	**2,560**	sf	30.00	76,800		
115213	*PROJECTION SCREENS*						
	Projection screens - Cafeteria & Gymnasium	**2**	ea	10,000.00	20,000		
116100	*THEATRICAL EQUIPMENT*						
	Rigging equipment, allowance - Cafeteria & Gymnasium	**1**	loc	75,000.00	75,000		
	SUBTOTAL					**1,377,470**	
	TOTAL - EQUIPMENT						**$1,377,470**
E20	***FURNISHINGS***						
E2010	**FIXED FURNISHINGS**						
122100	*WINDOW TREATMENT*						
	Window treatment, roller shades @ Exterior windows	**6,200**	sf	9.00	55,800		
	Motorized shades, allow	**1**	ls	35,000.00	35,000		
	Manual blackout shades at interior sidelights and borrowed lights	**2,919**	sf	8.00	23,352		
123000	*CASEWORK*						
	Cubbies						
	TSC-1; 36" x 80"	**71**	ea	2,100.00	149,100		
	TSC-2; 36" x 45"	**168**	ea	1,500.00	252,000		
	Pre-K	**3**	rms		-		
	Base cabinet, SSM countertop	**24**	lf	550.00	13,200		
	Base cabinet, p'lam countertop	**27**	lf	500.00	13,500		
	Base cabinet, p'lam countertop; open shelves	**18**	lf	425.00	7,650		
	Wall cabinet	**24**	lf	300.00	7,200		
	Teacher's wardrobe, 24"	**3**	ea	1,600.00	4,800		
	Tall storage, 36"	**12**	ea	2,400.00	28,800		
	Kindergarten	**7**	rms		-		
	Base cabinet, SSM countertop	**56**	lf	550.00	30,800		
	Base cabinet, p'lam countertop	**63**	lf	500.00	31,500		
	Base cabinet, p'lam countertop; open shelves	**42**	lf	425.00	17,850		
	Wall cabinet	**56**	lf	300.00	16,800		
	Teacher's wardrobe, 24"	**7**	ea	1,600.00	11,200		
	Tall storage, 36"	**28**	ea	2,400.00	67,200		
	Strides/Stages Classrooms	**7**	rms		-		
	Base cabinet, SSM countertop	**56**	lf	550.00	30,800		
	Base cabinet, p'lam countertop	**42**	lf	500.00	21,000		
	Base cabinet, p'lam countertop; open shelves	**42**	lf	425.00	17,850		
	Wall cabinet	**77**	lf	300.00	23,100		
	Teacher's wardrobe, 24"	**7**	ea	1,600.00	11,200		
	Tall storage, 21"	**7**	ea	1,400.00	9,800		
	Tall storage, 36"	**21**	ea	2,400.00	50,400		
	1st Grade Classroom	**6**	rms		-		
	Base cabinet, SSM countertop	**48**	lf	550.00	26,400		
	Base cabinet, p'lam countertop	**90**	lf	500.00	45,000		
	Base cabinet, p'lam countertop; open shelves	**21**	lf	425.00	8,925		
	Wall cabinet	**48**	lf	300.00	14,400		
	Teacher's wardrobe, 24"	**6**	ea	1,400.00	8,400		
	Tall storage, 36"	**30**	ea	2,400.00	72,000		
	2nd, 3rd, 4th Grade Classroom	**18**	rms		-		
	Base cabinet, SSM countertop	**144**	lf	550.00	79,200		
	Base cabinet, p'lam countertop	**234**	lf	500.00	117,000		
	Base cabinet, p'lam countertop; open shelves	**108**	lf	425.00	45,900		

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Building Detail						
1293	Wall cabinet	**342**	lf	300.00	102,600		
1294	Tall storage, 36"	**54**	ea	2,400.00	129,600		
1295	5th Grade Classroom	**6**	rms		-		
1296	Base cabinet, SSM countertop	**126**	lf	550.00	69,300		
1297	Base cabinet, p'lam countertop	**78**	lf	500.00	39,000		
1298	Base cabinet, p'lam countertop; open shelves	**39**	lf	425.00	16,575		
1299	Wall cabinet	**48**	lf	300.00	14,400		
1300	Teacher's wardrobe, 24"	**6**	ea	1,600.00	9,600		
1301	Tall storage, 36"	**30**	ea	2,400.00	72,000		
1302	STE Classroom	**1**	rms		-		
1303	Base cabinet, SSM countertop	**23**	lf	550.00	12,650		
1304	Base cabinet, SSM countertop; open shelves	**16**	lf	475.00	7,600		
1305	Adjustable shelving, 3 tier	**5**	lf	225.00	1,125		
1306	Tall storage, 36" w/ drawers	**2**	ea	2,800.00	5,600		
1307	Teacher's wardrobe, 24" w/ markerboard surface	**1**	ea	1,750.00	1,750		
1308	Tall storage, 48" w/ markerboard surface	**5**	ea	3,600.00	18,000		
1309	Flex Classroom	**2**	rms		-		
1310	Base cabinet, SSM countertop	**16**	lf	550.00	8,800		
1311	Base cabinet, p'lam countertop; open shelves	**46**	lf	425.00	19,550		
1312	Adjustable shelving, 3 tier	**16**	lf	225.00	3,600		
1313	Tall storage, 36"	**4**	ea	2,400.00	9,600		
1314	Music/Music Storage	**1**	rms		-		
1315	Base cabinet, p'lam countertop; open shelves	**39**	lf	425.00	16,575		
1316	Teacher's wardrobe, 48"	**1**	ea	3,200.00	3,200		
1317	Tall storage, 36"	**8**	ea	2,400.00	19,200		
1318	Music storage	**20**	lf	800.00	16,000		
1319	Pre-K/K ELA	**2**	rms		-		
1320	Base cabinet, SSM countertop	**16**	lf	550.00	8,800		
1321	Instrumental Music/Music Storage	**1**	rms		-		
1322	Base cabinet, SSM countertop	**8**	lf	550.00	4,400		
1323	Base cabinet, p'lam countertop; open shelves	**15**	lf	425.00	6,375		
1324	Teacher's wardrobe, 48"	**1**	ea	3,200.00	3,200		
1325	Tall storage, 36"	**2**	ea	2,400.00	4,800		
1326	Music storage	**13**	lf	800.00	10,400		
1327	Health Classroom	**1**	rms		-		
1328	Base cabinet, SSM countertop	**8**	lf	550.00	4,400		
1329	Base cabinet, p'lam countertop	**18**	lf	500.00	9,000		
1330	Wall cabinet	**8**	lf	300.00	2,400		
1331	Teacher's wardrobe, 48"	**1**	ea	3,200.00	3,200		
1332	Tall storage, 36"	**7**	ea	2,400.00	16,800		
1333	PT/OT						
1334	Base cabinet, SSM countertop	**16**	lf	550.00	8,800		
1335	Base cabinet, p'lam countertop	**15**	lf	500.00	7,500		
1336	Base cabinet, p'lam countertop; open shelves	**9**	lf	425.00	3,825		
1337	Wall cabinet	**17**	lf	300.00	5,100		
1338	Teacher's wardrobe, 39"	**1**	ea	2,640.00	2,640		
1339	Teacher's wardrobe, 45"	**1**	ea	3,000.00	3,000		
1340	Tall storage, 33"	**1**	ea	2,200.00	2,200		
1341	Tall storage, 36"	**5**	ea	2,400.00	12,000		
1342	Art	**1**	rms		-		
1343	Base cabinet, SSM countertop	**35**	lf	550.00	19,250		
1344	Base cabinet, SSM countertop; open shelves	**8**	lf	475.00	3,800		
1345	Wall cabinet	**17**	lf	300.00	5,100		
1346	Teacher's wardrobe, 48"	**1**	ea	3,200.00	3,200		
1347	Tall storage, 36"	**1**	ea	2,400.00	2,400		
1348	Flex CR 257	**1**	rms		-		
1349	Base cabinet, SSM countertop	**12**	lf	550.00	6,600		

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Building Detail						
1350	Base cabinet, p'lam countertop	**18**	lf	500.00	9,000		
1351	Base cabinet, SSM countertop; open shelves	**6**	lf	425.00	2,550		
1352	Wall cabinet	**12**	lf	300.00	3,600		
1353	Teacher's wardrobe, 48"	**5**	ea	3,200.00	16,000		
1354	Tall storage, 36"	**1**	ea	2,400.00	2,400		
1355	ELL	**2**	rms		-		
1356	Base cabinet, SSM countertop	**31**	lf	550.00	17,050		
1357	Teacher's wardrobe, 24"	**2**	ea	1,600.00	3,200		
1358	Tall storage, 36"	**1**	ea	2,400.00	2,400		
1359	Teacher Collaboration	**3**	rms		-		
1360	Base cabinet, SSM countertop	**81**	lf	550.00	44,550		
1361	Wall cabinet	**33**	lf	300.00	9,900		
1362	Staff lunch	**1**	rms		-		
1363	Base cabinet, SSM countertop	**11**	lf	550.00	6,050		
1364	Wall cabinet	**11**	lf	300.00	3,300		
1365	Nurses Suite	**1**	rms		-		
1366	Base cabinet, SSM countertop	**22**	lf	550.00	12,100		
1367	Wall cabinet	**14**	lf	300.00	4,200		
1368	Tall storage, 27"	**2**	ea	2,000.00	4,000		
1369	Tall storage, 36"	**1**	ea	2,400.00	2,400		
1370	Library Workroom	**1**	rms		-		
1371	Base cabinet, SSM countertop	**13**	lf	550.00	7,150		
1372	Solid surface work counter	**26**	lf	200.00	5,200		
1373	Wall cabinet	**13**	lf	300.00	3,900		
1374	Adjustable shelves, 3 rows	**12**	lf	150.00	1,800		
1375	Stage	**1**	rms		-		
1376	Base cabinet, p'lam countertop	**9**	lf	500.00	4,500		
1377	Wall cabinet	**8**	lf	300.00	2,400		
1378	Tall storage, 36"	**1**	ea	2,400.00	2,400		
1379	Small Group	**26**	rms		-		
1380	Base cabinet, p'lam countertop	**143**	lf	500.00	71,500		
1381	Wall cabinet	**195**	lf	300.00	58,500		
1382	Tall storage, 36"	**26**	ea	2,400.00	62,400		
1383	Admin Work Space						
1384	Base cabinet, SSM countertop	**48**	lf	550.00	26,400		
1385	Solid surface work counter	**30**	lf	200.00	6,000		
1386	Wall cabinet	**48**	lf	300.00	14,400		
1387	Math	**2**	rms		-		
1388	Base cabinet, p'lam countertop	**30**	lf	500.00	15,000		
1389	Tall storage, 36"	**1**	ea	2,400.00	2,400		
1390	Read						
1391	Base cabinet, p'lam countertop	**45**	lf	500.00	22,500		
1392	Teacher's wardrobe, 24"	**5**	ea	1,600.00	8,000		
1393	Learning Center						
1394	Base cabinet, p'lam countertop	**45**	lf	500.00	22,500		
1395	Teacher's wardrobe, 24"	**5**	ea	1,600.00	8,000		
1396	Adjustment						
1397	Base cabinet, p'lam countertop	**25**	lf	500.00	12,500		
1398	Teacher's wardrobe, 24"	**2**	ea	1,600.00	3,200		
1399	Tall storage, 36"	**2**	ea	2,400.00	4,800		
1400	Speech & Language						
1401	Base cabinet, p'lam countertop	**33**	lf	500.00	16,500		
1402	Wall cabinet	**8**	lf	300.00	2,400		
1403	Teacher's wardrobe, 24"	**1**	ea	1,600.00	1,600		
1404	Tall storage, 36"	**1**	ea	2,400.00	2,400		
1405	IT Office						
1406	Base cabinet, p'lam countertop	**9**	lf	500.00	4,500		

		DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
		Building Detail						
1407		Wall cabinet	**9**	lf	300.00	2,700		
1408		Tall storage, 36"	**1**	ea	2,400.00	2,400		
1409		Corridors						
1410		Tall storage, 33"	**3**	ea	2,200.00	6,600		
1411		Tall storage, 36"	**26**	ea	2,400.00	62,400		
1412		Base cabinet, SSM countertop	**16**	lf	550.00	8,800		
1413		Wall cabinet	**236**	lf	300.00	70,800		
1414								
1415	*126100*	*FIXED AUDIENCE SEATING*						
1416		Bleacher, motorized telescoping, 600 seat capacity	**1**	ls	225,000.00	225,000		
1417		SUBTOTAL					**3,016,892**	
1418								
1419	**E2020**	**MOVABLE FURNISHINGS**						
1420		All movable furnishings to be provided and installed by owner				NIC		
1421		SUBTOTAL					-	
1422								
1423		***TOTAL - FURNISHINGS***						**$3,016,892**
1424								
1425								
1426	***F10***	***SPECIAL CONSTRUCTION***						
1427								
1428	**F1000**	**SPECIAL CONSTRUCTION**						
1429		No items in this section						
1430		SUBTOTAL					-	
1431								
1432		***TOTAL - SPECIAL CONSTRUCTION***						
1433								
1434								
1435	***F20***	***SELECTIVE BUILDING DEMOLITION***						
1436								
1437	**F2010**	**BUILDING ELEMENTS DEMOLITION**						
1438		See summary						
1439		SUBTOTAL					-	
1440								
1441	**F2020**	**HAZARDOUS COMPONENTS ABATEMENT**						
1442		See summary						
1443		SUBTOTAL					-	
1444								
1445		***TOTAL - SELECTIVE BUILDING DEMOLITION***						

CODE	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Site Detail						
	G10 SITE PREPARATION						
G1010	**SITE CLEARING**						
311000	*GENERAL CONDITIONS*						
	Mobilization & Demobilization	**1**	ea	80,000.00	80,000		
	Temporary signs	**1**	ls	20,000.00	20,000		
	Wheel wash rack	**1**	ls	20,000.00	20,000		
	Engineering/layout	**1**	ls	50,000.00	50,000		
	As-builts	**1**	ls	5,000.00	5,000		
	Concrete pump staging areas	**2**	loc	10,000.00	20,000		
	Concrete washout area	**1**	ea	2,500.00	2,500		
	Dewatering allowance	**1**	ea	25,000.00	25,000		
	Snow removal - allowance	**1**	ls		GR's		
	Winter conditions - allowance	**1**	ls		GR's		
	Police details	**1**	ls		GR's		
	Site security	**1**	ls		GR's		
	Job site construction trailer	**1**	ls		GR's		
	Temp utilities for job trailer	**1**	ls		GR's		
311000	*PHASING*						
	6' high site construction fence	**3,743**	lf	30.00	112,290		
	Site construction fence maintenance	**3,743**	lf	10.00	37,430		
	6' high site construction fence sliding gate	**1**	loc	10,000.00	10,000		
	Site construction entrance and removal/restoration	**1**	loc	12,000.00	12,000		
	Site construction fence maintenance	**3,743**	lf	8.00	29,944		
	Relocate play equipment and site furnishings and furnish to owner	**1**	ls	25,000.00	25,000		
	Remove existing irrigation from fields	**1**	ls	10,000.00	10,000		
	Provide extended sidewalk for pedestrian access during construction	**1**	ls	25,000.00	25,000		
	Provide connection to Salem street - sewer	**1**	ls	50,000.00	50,000		
	Temporary paving; 2" thick - staging area	*32,315*	*sf*				
	Cut and prep	**239**	cy	15.00	3,585		
	gravel base; 6" thick	**598**	cy	48.00	28,704		
	Binder pavement	**32,315**	sf	2.00	64,630		
	geotextile	**32,315**	sf	0.55	17,773		
311000	*SITE SALVAGE ITEMS*						
	Salvage soccer field plaque for relocation	**1**	ls	500.00	500		
	Salvage playground memorial signage for relocation	**1**	ls	2,500.00	2,500		
	Salvage bench	**1**	ea	500.00	500		
311000	*SITE DEMOLITION AND RELOCATIONS*						
	Demolish existing paving	**72,239**	sf	1.25	90,299		
	Demolish existing concrete	**8,040**	sf	3.00	24,120		
	Demolish existing mulch	**5,458**	sf	2.00	10,916		
	Demolish curbing	**1,619**	lf	6.00	9,714		
	Demolish steps	**221**	lf	20.00	4,420		
	Demolish fencing	**952**	lf	5.00	4,760		
	Demolish existing handrails	**78**	lf	25.00	1,950		
	Demolish existing school sign	**1**	loc	2,500.00	2,500		
	Demolish existing irrigation pumphouse	**1**	loc	5,000.00	5,000		
	Miscellaneous site demolition; furnishings, concrete pads, signs etc.	**1**	ls	25,000.00	25,000		
311000	*UTILITY DEMOLITION*						
	Demolish existing utility lines	**1,730**	lf	25.00	43,250		
	Demolish existing utility structures	**12**	ea	500.00	6,000		
	Removal of unforeseen septic system conditions	**1**	ls	70,000.00	70,000		
	Demolish existing AC units	**5**	ea	500.00	2,500		
	Cut/cap utility lines	**1**	ls	25,000.00	25,000		
311000	*ROADWAY WORK*						
	Sawcut	**831**	lf	8.25	6,856		
	Remove pavement	**321**	sf	3.50	1,124		
	Temp pavement patching	**321**	sf	8.00	2,568		
	Steel plates	**1**	ls	2,500.00	2,500		
	Police details	**5**	dy	850.00	4,250		
	Permanent pavement patch	**321**	sf	10.00	3,210		
311000	*VEGETATION & TOPSOIL MANAGEMENT*						
	Clear and grub	**9**	acre	5,000.00	45,000		
	Remove existing trees - allowance	**1**	ls	250,000.00	250,000		
	Remove infield mix	**18,514**	sf	0.50	9,257		

CODE	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
Site Detail							
	Strip + dispose topsoil	**9,054**	cy	6.00	54,324		
	Strip + stockpile topsoil	**7,000**	cy	10.00	70,000		
312000	*SOIL DISPOSAL - conversion factor 1.7 to tons*						
	Load excess soils for disposal	**9,054**	cy	2.50	22,635		
	Disposal in Leicester	**15,392**	tn	15.00	230,880		
	Street sweeping allowance during hauling	**12**	dys	1,500.00	18,000		
312000	*EROSION & SEDIMENT CONTROL*						
	Silt Fence; installation and removal - shown on C1.00	**2,703**	lf	20.00	54,060		
	Silt Sacks; installation and removal	**5**	ea	250.00	1,250		
	Street sweeping & dust control allowance	**1**	ls	50,000.00	50,000		
	Erosion Control monitoring & maintenance	**1**	ls	25,000.00	25,000		
	SUBTOTAL					1,828,699	
312000	*BUILDING SOILS*						
	SOIL DISPOSAL - conversion factor 1.7 to tons						
	Load excess soils for disposal				NR		
	Disposal in Leicester				NR		
312000	*SOIL DISPOSAL - conversion factor 1.7 to tons*						
	Load excess soils for disposal				NR		
	Disposal in Leicester				NR		
312000	*SITE EARTHWORK*						
	Site cut to design subgrade - phase 1	*3,168*	*cy*				
	Cut	**3,168**	cy	8.00	25,344		
	Stockpile - process	**3,168**	cy	10.00	31,680		
	Site fill to design subgrade - phase 1	*8,263*	*cy*				
	Fill - using site cut soils	**3,168**	cy	10.00	31,680		
	Fill - using building cut soils	**3,000**	cy	10.00	30,000		
	Fill - imported; swell 25%	**2,619**	cy	48.00	125,712		
	Site cut to design subgrade - phase 2	*3,697*	*cy*				
	Cut	**3,697**	cy	8.00	29,576		
	Stockpile - process	**3,697**	cy	10.00	36,970		
	Site fill to design subgrade - phase 2	*3,667*	*cy*				
	Fill - using cut soils	**3,697**	cy	10.00	36,970		
312000	*SOIL DISPOSAL FOR SUBSURFACE SYSTEMS*						
	SOIL DISPOSAL - conversion factor 1.7 to tons						
	Load excess soils for disposal	**7,289**	cy	2.50	18,223		
	Clean non-regulated	**12,391**	tn	18.00	223,038		
312000	*SOIL ALLOWANCES*						
	Allowance for unsuitables	**500**	cy	100.00	50,000		
	Allowance for arsenic soil disposal - premium - allowance for dump site if Leicester isn't an option	**1**	ls	250,000.00	250,000		
312000	*ESTABLISHING GRADE*						
	Sub grade establishment	**596,164**	sf	0.15	89,425		
	Fine grading throughout the site	**596,164**	sf	0.25	149,041		
312000	*HAZARDOUS MATERIALS*						
	Contaminated soil allowance - disposal	**100**	cy	250.00	25,000		
	UST removal allowance	**1**	ls	50,000.00	50,000		
	SUBTOTAL					1,202,659	
	TOTAL - SITE PREPARATION						**$3,031,358**
G20	***SITE IMPROVEMENTS***						
G2010	**ROADWAYS**						
321000	***ROADWAYS AND PARKING LOTS***						
	Asphalt Paving; parking lots and roadway	*141,523*	*sf*				
	dense grade; 18" thick - per geotech	**7,862**	cy	50.00	393,100		
	asphalt top; 1.5" thick	**1,353**	tns	200.00	270,600		

	CODE	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
	Site Detail							
132		asphalt binder; 3" thick	**2,706**	tns	190.00	514,140		
133	*320000*	*CURBING*						
134		VGC	**4,783**	lf	65.00	310,895		
135		PCC	**3,020**	lf	40.00	120,800		
136		ADA Curb cuts	**21**	ea	850.00	17,850		
137	*320000*	*ROAD MARKINGS AND SIGNS*						
138		Parking spot	**190**	ea	85.00	16,150		
139		Parking spot ADA	**6**	ea	250.00	1,500		
140		Sign allowance	**1**	ls	25,000.00	25,000		
141		Pavement markings allowance	**1**	ls	20,000.00	20,000		
142		Crosswalk hatching	**11**	loc	2,500.00	27,500		
143		SUBTOTAL					1,717,535	
144								
145	*321000*	***PEDESTRIAN PAVING***						
146		Concrete sidewalks	*43,967*	*sf*				
147		gravel base; 18" thick - per geotech	**2,443**	cy	50.00	122,150		
148		Broom finish concrete paving; 6" thick	**43,967**	sf	14.00	615,538		
149		Concrete pads	*1,224*	*sf*				
150		gravel base; 18" thick - per geotech	**68**	cy	50.00	3,400		
151		Broom finish concrete paving; 8" thick	**1,224**	sf	19.00	23,256		
152		Concrete unit pavers	*9,397*	*sf*				
153		gravel base; 18" thick - per geotech	**522**	cy	50.00	26,100		
154		Concrete slab paving; 4" thick	**9,397**	sf	9.00	84,573		
155		Concrete pavers	**9,397**	sf	28.00	263,116		
156		Geotextiles	**9,397**	sf	0.55	5,168		
157		SUBTOTAL					1,143,301	
158								
159	*323000*	***SITE IMPROVEMENTS***						
160		*SITE FURNISHINGS*						
161		Bollards - steel	**46**	ea	1,200.00	55,200		
162		School sign	**2**	ea	25,000.00	50,000		
163		Bike racks	**23**	ea	1,057.00	24,311		
164		Raised planters	**6**	ea	2,500.00	15,000		
165		Flagpole	**2**	ea	7,000.00	14,000		
166		Flagpole foundation	**2**	ea	4,500.00	9,000		
167		Trash and Recycling receptacles	**7**	ea	1,953.00	13,671		
168		Log seating - recycled logs	**4**	ea	1,200.00	4,800		
169		Benches - circular	**2**	ea	4,500.00	9,000		
170		Benches - sculptural	**2**	ea	5,500.00	11,000		
171		Benches - curved	**4**	ea	4,500.00	18,000		
172		Benches - free form - twig by landscape forms	**4**	ea	10,435.95	41,744		
173		Benches -D1	**7**	ea	4,789.40	33,526		
174		Modular block seats - movable	**17**	ea	1,200.00	20,400		
175		Tables with integral seats	**3**	ea	11,732.00	35,196		
176		Tables with integral seats - ADA	**2**	ea	11,485.60	22,971		
177		Lightpost foundations	**60**	ea	875.00	52,500		
178		Shade sails with engineered footings	**2**	ea	45,000.00	90,000		
179		Prefab shed	**1**	ea	12,000.00	12,000		
180		Soccer goals	**2**	ea	4,500.00	9,000		
181		Allowance to install salvaged items	**1**	ls	10,000.00	10,000		
182		Freight - Forms + Surfaces	**1**	ls	15,283.13	15,283		
183	*320000*	*SPORTS COURTS*						
184		Pavement areas	*11,172*	*sf*				
185		gravel base; 8" thick	**277**	cy	50.00	13,850		
186		asphalt top; 1.5" thick	**105**	tns	225.00	23,625		
187		asphalt binder; 1.5" thick	**105**	tns	200.00	21,000		
188		Basketball hoops	**4**	ea	6,700.00	26,800		
189		Basketball court color coating	**11,172**	sf	3.00	33,516		
190		Allowance for painted games	**1**	ls	25,000.00	25,000		
191		Player bench	**2**	ea	3,500.00	7,000		

CODE	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
Site Detail							
	PLAY AREAS						
	Playgrounds	25,937	*sf*				
	gravel base; 12" thick	**961**	cy	50.00	48,050		
	Play surfacing	**25,937**	sf	36.00	933,732		
	Drainage allowance	**25,937**	sf	4.00	103,748		
	Allowance for play equipment	**1**	ls	1,024,380.00	1,024,380		
	Allowance to reinstall salvaged play equipment	**1**	ls	150,000.00	150,000		
	Synthetic lawn - gathering area	8,891	*sf*				
	Synthetic lawn system	**8,891**	sf	25.00	222,275		
	Synthetic lawn edging - CIP curb with nailer board per spec	**1,189**	lf	80.00	w_landscape		
	FENCING						
	4' Ht - Chain link fence	**618**	lf	65.00	40,170		
	4' Ht - Chain link double gate	**3**	ea	2,500.00	7,500		
	4' Ht - Ornamental - crash rated at playground - carried steel fencing	**590**	lf	390.00	230,100		
	4' Ht - Ornamental single gate	**2**	ea	2,800.00	5,600		
	4' Ht - Ornamental double gate	**2**	ea	3,800.00	7,600		
	6' ht - utility screen fence	**145**	lf	1,150.00	166,750		
	6' Ht - Ornamental double gate	**3**	ea	10,000.00	30,000		
	10' Ht - Chain link fence - sport courts	**599**	lf	125.00	74,875		
	10' Ht - Chain link double gate	**2**	ea	4,000.00	8,000		
	Wood privacy fence	**500**	lf	65.00	32,500		
	Vehicular gate	**3**	ea	8,500.00	25,500		
329900	*SITE WALLS*						
	Monolithic granite seatwall - slab footer - 1.5' ht.	*140*	*lf*				
	Granite seatwall	**140**	lf	1,500.00	210,000		
	Concrete - below grade and to frost	**140**	lf	90.00	12,600		
	Excavation	**29**	cy	100.00	2,900		
	Backfill - (assume using onsite soils)	**9**	cy	25.00	225		
	Wall drain	**140**	lf	22.00	3,080		
	Cast-in-place seat wall - 1.5' ht.	*81*	*lf*				
	Concrete	**81**	lf	153.00	12,393		
	Excavation	**17**	cy	100.00	1,700		
	Backfill - (assume using onsite soils)	**5**	cy	35.00	175		
	Veneer	**292**	sf	65.00	18,980		
	Wall cap	**81**	lf	125.00	10,125		
	Wall drain	**81**	lf	22.00	1,782		
	Segmental Wall- 4' ht. - between parking lot and basketball - per civil plans	*175*	*lf*				
	Large block wall	**875**	sf	55.00	48,125		
	Excavate and prepare wall base	**39**	cy	100.00	3,900		
	Backfill wall - crushed stone	**26**	cy	65.00	1,690		
	Backfill-controlled placement; above grade - on-site soils no geogrid	**104**	cy	35.00	3,640		
	Geotextiles	**1,313**	sf	2.50	3,283		
	Wall drain	**175**	lf	22.00	3,850		
	Wall cap	**175**	lf	100.00	17,500		
	Guardrail - grouted into cap	**175**	lf	325.00	56,875		
	SUBTOTAL					4,240,996	
	Landscaping						
329900	*TOPSOIL*						
	Screen topsoil	**7,000**	cy	7.50	52,500		
	Export tailings from screening process - assume clean rock	**2,100**	cy	8.50	17,850		
	Amend/Place	**4,900**	cy	20.00	98,000		
	Topsoil - imported 6" thick; swell 25%	**4,351**	cy	65.00	Removed		
	Soil and mulch at planting areas; 12" thick	**629**	cy	110.00	69,190		
	Drip strip allowance	*756*	*sf*				
	Crushed top stone; 1.5" thick	**1**	cy	100.00	100		
	gravel base; 6" thick	**14**	cy	50.00	700		
	Edging	**504**	lf	18.00	9,072		
329900	*LAWN AND SEED - included size of septic field in seeding*	*169,903*	*sf*				
	Topsoil required - imported 6" thick	**3,146**	cy		incl. above		

CODE	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
Site Detail							
	Scarify subgrade	**169,903**	sf	0.25	42,476		
	General lawn seed mix - non irrigated	**98,157**	sf	0.35	34,355		
	Shade lawn mix - non-irrigated	**5,465**	sf	0.35	1,913		
	Low grow wildflower and grass mix - non-irrigated	**16,428**	sf	0.55	9,035		
	Native wood mix - non-irrigated	**13,492**	sf	0.55	7,421		
	Multi-use athletic field seed mix - non-irrigated	**36,361**	sf	0.55	19,999		
	Landscape curbing - concrete (A8)	**1,270**	lf	80.00	101,600		
	Landscape curbing -granite (A9)	**622**	lf	150.00	93,300		
	Tree grates	**3**	ea	5,000.00	15,000		
320000	*ATHLETIC LANDSCAPING*	*13,491*	*sf*				
	Topsoil 8" thick - required	**335**	cy		incl. above		
	Clean fill	**250**	cy	60.00	15,000		
	Scarify subgrade	**13,491**	sf	0.25	3,373		
	Planting maintenance - 1 year	**1**	ls	15,000.00	15,000		
	Softball	*13,491*	*sf*				
	Lawn seeding	**13,491**	sf	0.35	4,722		
	Double washed stone; 6" thick	**250**	cy	80.00	20,000		
329900	*TREES*						
	Deciduous trees; 2-2.5" cal.	**16**	ea	2,000.00	32,000		
	Deciduous trees; 2.5-3" cal.	**21**	ea	2,200.00	46,200		
	Deciduous trees; 3-3.5" cal.	**31**	ea	2,500.00	77,500		
	Deciduous trees; 6-7' ht.	**3**	ea	2,500.00	7,500		
	Deciduous trees; 14-16' ht.	**3**	ea	3,500.00	10,500		
	Evergreen trees; 8-10' ht.	**7**	ea	1,300.00	9,100		
	Evergreen trees; 10-12' ht.	**21**	ea	1,500.00	31,500		
	Increased budget at recon from sub feedback	**1**	ls	170,000.00	170,000		
329900	*SHRUBS*						
	Shrubs - #1 container	**49**	ea	30.00	1,470		
	Shrubs - #3 container	**40**	ea	35.00	1,400		
	Shrubs - #5 container	**14**	ea	75.00	1,050		
	Shrubs - 2.5-3'	**24**	ea	75.00	1,800		
	Shrubs - 3'-4'	**48**	ea	125.00	6,000		
	Shrubs - #7 container	**47**	ea	125.00	5,875		
	Shrubs - #10 container	**37**	ea	375.00	13,875		
329900	*GROUNDCOVERS - GRASSES/PERENNIALS/VINES*						
	Groundcovers - 1 qt.	**536**	ea	8.00	4,288		
	Groundcovers - 2 qt.	**32**	ea	8.00	256		
	Groundcovers - #1 container	**187**	ea	18.00	3,366		
329900	*MAINTENANCE*						
	1-yr plant maintenance	**1**	ls	42,368.00	42,368		
	1-yr lawn maintenance	**1**	ls	10,000.00	10,000		
	Irrigation to establish lawn areas	**1**	ls	50,000.00	50,000		
328400	*IRRIGATION*						
	Irrigation point of connection	**1**	loc	10,000.00	10,000		
	Rotary Nozzle Sprinklers	**24**	ea	575.00	13,800		
	Controller	**1**	ea	5,000.00	5,000		
	Zone Valves and Valve Boxes	**4**	ea	875.00	3,500		
	Quick Couplers and Valve Boxes	**4**	ea	2,500.00	10,000		
	Schematic water supply pipe	**644**	lf	30.00	19,320		
	Irrigation mainline	**440**	lf	18.00	7,920		
	PVC Sleeves with Electrical Conduit	**650**	lf	28.00	18,200		
	1-1/2" Master Valve	**1**	ea	1,200.00	1,200		
	Grounding Equipment	**1**	ea	3,250.00	3,250		
	SUBTOTAL					1,248,844	
	TOTAL - SITE IMPROVEMENTS						**$8,350,676**
G30	***SITE MECHANICALS***						
G3010	**WATER SUPPLY**						

CODE	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
Site Detail							
210000	*FIRE PROTECTION*						
	8" CLDI	**2,352**	lf	67.50	158,760		
	6" CLDI	**99**	lf	49.64	4,914		
	Fire department connection	**1**	ea	2,500.00	2,500		
	Gate valve - 6"	**7**	ea	1,850.00	12,950		
	Gate valve - 8"	**5**	ea	1,850.00	9,250		
	Fire hydrant	**4**	ea	6,500.00	26,000		
	Thrust blocks	**18**	ea	500.00	9,000		
331000	*WATER UTILITIES*						
	6" CLDI	**46**	lf	49.64	2,283		
331000	*CONNECTIONS*						
	Connect to existing water line; 6" connection	**1**	ea	10,000.00	10,000		
	Connect to existing water line; 10" connection	**1**	ea	20,000.00	20,000		
312000	*EXCAVATION & BACKFILL*	*2,497*	*lf*				
	DI gravity piping excavation	**2,220**	cy	46.75	103,785		
	Trench bedding	**499**	cy	38.50	19,212		
	Pressure test & chlorinate	**2,497**	lf	5.00	12,485		
	Allowance for temporary support of existing utilities	**1**	ea	15,000.00	NR		
	SUBTOTAL					391,139	
G3020	**SANITARY SEWER**						
333000	*SANITARY SEWER*						
	8" PVC	**1,300**	lf	45.00	58,500		
	SMH - 0-5' deep	**12**	ea	4,800.00	57,600		
	Grease trap - 5,000 gal.	**1**	ea		w/ plumbing		
333000	*CONNECTIONS*						
	Connect to existing structure (inside site)	**1**	ea	5,000.00	5,000		
312000	*EXCAVATION & BACKFILL - Gravity*	*1,300*	*lf*				
	PVC gravity piping excavation	**1,156**	cy	46.75	54,043		
	Trench bedding	**385**	cy	38.50	14,823		
	Pressure testing	**1,300**	lf	4.00	5,200		
	Video Inspection	**1**	ls	10,000.00	NR		
	Grease trap; 5,000 gal. (e/b only) incl. shoring	**1**	ea	10,000.00	10,000		
	Allowance for temporary support of existing utilities	**1**	ea	15,000.00	NR		
	SUBTOTAL					205,166	
G3030	**STORM SEWER**						
334000	*STORM DRAINAGE*						
	18" HDPE	**172**	lf	100.00	17,200		
	15" HDPE	**778**	lf	90.00	70,020		
	12" HDPE	**1,885**	lf	70.00	131,950		
	4' Dia. DMH - 0-5' deep	**19**	ea	4,800.00	91,200		
	4' Dia. DMH - 5-12' deep	**8**	ea	5,000.00	40,000		
	DMH - 0-5' doghouse	**3**	ea	8,000.00	24,000		
	WQS	**2**	ea	20,000.00	40,000		
	OCS	**2**	ea	8,000.00	16,000		
	CO	**2**	ea	1,200.00	2,400		
	CB - 4' Dia.	**28**	ea	4,200.00	117,600		
	Roof drain	**95**	lf	35.00	3,325		
	Roof drain connections	**4**	ea	500.00	2,000		
	Underdrainage at planted areas on irrigation plans	**13,640**	sf	2.00	27,280		
334000	*CONNECTIONS*						
	Connect to existing structure for phasing	**1**	ea	5,000.00	5,000		
334000	*SUBSURFACE DRAINAGE SYSTEMS*						
	Underground recharger	*14,035*	*sf*				
	Cultech 330 HD Chambers	**400**	ea	750.00	300,000		
	Cultech 330 HD end cap and installation	**40**	ea	350.00	14,000		
	Excavate	**3,119**	cy	15.00	46,785		
	Load excess soils for disposal	**3,119**	cy	2.50	w_G10		
	Clean non-regulated	**5,302**	tn	18.00	w_G10		
	Install stone base; 12" thick	**858**	tn	65.00	55,770		
	Fine grade base	**14,035**	sf	0.25	3,509		
	Back-fill infiltration bed with 1-2" crushed stone; 2.3 cy/ea	**1,150**	cy	60.00	69,000		

CODE	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
Site Detail							
	Geotextile fabrics	**35,088**	sf	0.75	26,316		
	Temporary drainage						
	Temporary drainage line for existing parking	**263**	lf	80.00	21,040		
	Infiltration System	*6,936*	*sf*				
	36" HDPE	**1,680**	lf	100.00	168,000		
	Excavate - assume 8' to remove buried organics	**3,083**	cy	15.00	46,245		
	Load excess soils for disposal	**3,083**	cy	2.50	w_G10		
	Clean non-regulated	**5,241**	tn	18.00	w_G10		
	Install sand backfill for over-ex; 36" thick	**963**	cy	50.00	48,150		
	Install stone base; 12" thick	**321**	cy	55.00	17,655		
	Fine grade base	**6,936**	sf	0.25	1,734		
	Back-fill infiltration bed with 1-2" crushed stone	**1,089**	cy	50.00	54,450		
	Geotextile fabrics	**17,340**	sf	0.75	13,005		
	Provide protection for system once installed	**6,936**	sf	3.00	20,808		
	Infiltration System	*4,891*	*sf*				
	36" HDPE	**1,260**	lf	100.00	126,000		
	Excavate	**1,087**	cy	15.00	16,305		
	Load excess soils for disposal	**1,087**	cy	2.50	w_G10		
	Clean non-regulated	**1,848**	tn	18.00	w_G10		
	Install sand backfill for over-ex; 36" thick	**679**	cy	50.00	33,950		
	Install stone base; 12" thick	**226**	cy	55.00	12,430		
	Fine grade base	**4,891**	sf	0.25	1,223		
	Back-fill infiltration bed with 1-2" crushed stone	**941**	cy	50.00	47,050		
	Geotextile fabrics	**12,228**	sf	0.75	9,171		
	Provide protection for system once installed	**4,891**	sf	3.00	14,673		
	SUBTOTAL					1,755,244	
G3060	**FUEL DISTRIBUTION**						
220001	*NATURAL GAS*						
	No work in this section						
	SUBTOTAL					-	
	TOTAL - SITE MECHANICAL UTILITIES						**$2,351,549**
G40	***SITE ELECTRICAL UTILITY***						
G40	**ELECTRICAL**						
	Civil						
	Concrete:						
	Ductbank AA: Primary/Comm 9-4" PVC	**470**	lf	45.00	21,150		
	Ductbank BB: Primary 4-4" PVC	**160**	lf	30.00	4,800		
	Ductbank DD: Secondary 6-4" PVC	**80**	lf	40.00	3,200		
	Ductbank EE: Secondary 12-4" PVC	**60**	lf	45.00	2,700		
	Ductbank FF: Secondary/Gen 16-4" PVC	**130**	lf	45.00	5,850		
	Ductbank CC: Comm 5-4" PVC	**360**	lf	35.00	12,600		
	Concrete pad	**2**	ea	2,500.00	5,000		
	Light pole base	**61**	ea	550.00	33,550		
	Bollard base	**32**	ea	300.00	9,600		
	Excavation & Backfill:						
	Ductbank AA: Primary/Comm 9-4" PVC	**470**	lf	25.00	11,750		
	Ductbank BB: Primary 4-4" PVC	**160**	lf	20.00	3,200		
	Ductbank DD: Secondary 6-4" PVC	**80**	lf	22.00	1,760		
	Ductbank EE: Secondary 12-4" PVC	**60**	lf	25.00	1,500		
	Ductbank FF: Secondary/Gen 16-4" PVC	**130**	lf	25.00	3,250		
	Ductbank CC: Comm 5-4" PVC	**360**	lf	20.00	7,200		
	Lighting/Security/misc. circuitry, allow	**6**	lf	10.00	60		
	EV conduit	**3,700**	lf	14.00	51,800		
	Power						
	Power riser pole- connect to existing	**1**	ea	2,500.00	2,500		
	Manhole, new	**2**	ea	8,500.00	17,000		
	Ductbank AA: Primary/Comm 9-4" PVC	**470**	lf	225.00	105,750		
	Ductbank BB: Primary 4-4" PVC	**160**	lf	125.00	20,000		
	Primary cabling	**630**	lf	100.00	63,000		

	CODE	DESCRIPTION	QTY	UNIT	UNIT COST	COST	SUBTOTAL COST	TOTAL COST
		Site Detail						
441		Transformer	**1**	ls	200,000.00	200,000		
442		Transformer grounding (transformer by Util Co)	**1**	ls	1,000.00	1,000		
443		Ductbank DD: Secondary 6-4" PVC with 2000A feed	**80**	lf	550.00	44,000		
444		Ductbank EE: Secondary 12-4" PVC with 2x 2000A feed	**60**	lf	1,050.00	63,000		
445		Ductbank FF: Secondary/Gen 16-4" PVC with 2x 2000A feed & 4-4", 2x 1.5"PVC 1200A + 125A feeders with control wiring	**130**	lf	1,350.00	175,500		
446		Ductbank: Generator 4-4", 2x 1.5"PVC 1200A + 125A feeders with control wiring	**60**	lf	330.00	19,800		
447		Generator grounding	**1**	ls	1,000.00	1,000		
448		Receptacle at Utility shed	**1**	ea	500.00	500		
449		Site power connection Entry sign	**2**	ea	500.00	1,000		
450		Sign/shed circuitry	**140**	lf	10.00	1,400		
451		Telecommunications						
452		Comm pole- connect to existing	**1**	ea	1,500.00	1,500		
453		Manhole, new	**4**	ea	8,500.00	34,000		
454		Ductbank CC: Comm 5-4" PVC	**360**	lf	125.00	45,000		
455		Comm cabling				NIC		
456		Photovoltaic				NIC		
457		Electric Vehicle Stations						
458		Dual EV stations	**8**	ea		Future		
459		EV pull box	**10**	ea	750.00	7,500		
460		Conduit for future EV stations, allow home run to main electric room from each pull box with 100A feeder	**3,700**	lf	22.00	81,400		
461		Security						
462		Site cameras with conduit & wiring, allow	**1**	ls	20,000.00	20,000		
463		Site lighting						
464		Site Fixture SL1	**57**	ea	1,800.00	102,600		
465		Site Fixture SL2	**4**	ea	1,900.00	7,600		
466		Installation labor budgeted fixtures:						
467		Site Fixture SL1	**57**	ea	1,000.00	57,000		
468		Site Fixture SL2	**4**	ea	1,500.00	6,000		
469		Light fixtures Estimator budget pricing with installation labor						
470		Fixture SL3 bollard	**16**	ea	1,800.00	28,800		
471		Fixture SL3B bollard	**16**	ea	1,800.00	28,800		
472		Fixture SL6 flagpole light	**6**	ea	650.00	3,900		
473		Fixture grounding	**93**	ea	150.00	13,950		
474		Pull box	**4**	ea	750.00	3,000		
475	260000	Site lighting circuitry: 50A in 1" PVC	**7,000**	lf	10.00	70,000		
476		SUBTOTAL					1,405,470	
477								
478								
479		***TOTAL - SITE ELECTRICAL UTILTIES***						**$1,405,470**

PROJECT COORDINATION 6A.3.7

6A.3.7 Project Coordination	Project Team Response(s)
Verify the submittal is coordinated with any early-bid packages, if applicable.	The current DD submittal has been prepared in a manner to reflect the early release packages planned for the Project. However, the DD set will not be utilized for an early release package. The 60% CD set will be utilized for early site enabling and sitework scope procurement and award. For additional information on early release work and logic, please refer to Appendix 10 of this report.
All room names and numbers are coordinated between all disciplines.	Yes, this has been coordinated. However, an additional detailed review is planned for the 60% CD set with the Owner to establish that all construction document room identification room numbers are in alignment and will become the final room numbers utilized for building identification room signage.
The structural, mechanical, or other disciplines, do not conflict with architectural plans or specifications.	Coordination between the architectural, structural, civil, and MEP disciplines has been undertaken as part of the Design Development phase to align structural systems, building layouts, building code requirements, building systems, and equipment locations. This includes coordination of structural grids and dimensions with the architectural drawings, alignment of column locations and bearing conditions with other building systems, coordination of fire and smoke-rated assemblies with the building code analysis, and review of building systems and equipment locations to minimize potential spatial conflicts. In addition, finish grade elevations, roof access and equipment service clearances, mechanical equipment locations and power requirements, and utility connections for building systems and kitchen equipment are being coordinated between the respective disciplines. These coordination efforts will continue to be refined as the design progresses through the 60%, 90%, and 100% Construction Documents phases in conjunction with ongoing document reviews by the Commissioning Agent, OPM, CM and the Designers internal quality control team.
The finish grade elevations coordinated between all disciplines.	
Structural dimensions match Architectural drawings.	
Column grid lines and column orientation match Architectural drawings.	
Column locations and bearing walls coordinated with all other disciplines.	
Seismic detailing coordinated with Architectural drawings.	
Beams and columns are not protruding horizontally and vertically into stairwells, and other interior spaces.	
Verify modular dimensions at vertical masonry construction.	
Verify that architectural wall/partition type smoke and fire rating requirements are coordinated with the building code analysis floor plan information.	
Room wall/floor/ceiling construction coordinated with architectural finishes.	
Mechanical equipment power requirements and physical locations, including special information as to who mounts, connects, tests, etc.	
Verify potential spatial conflicts in mechanical equipment.	
Indicate adequate access to all roof surfaces, with roof protection to all equipment that requires maintenance.	
Equipment plan coordinates with architectural plans.	

All kitchen equipment with utility systems indicated.	
The Designer confirms that the project continues to comply with the MSBA High School Science Lab Guidelines and/or Recommendations of Best Practices for K-12 STEM Learning Spaces	The project complies with the MSBA High School Science Lab Guidelines and/or Recommendations of Best Practices for K-12 STEM Learning Spaces