City of Cambridge

MASSACHUSETTS

BOARD OF ZONING APPEAL

831 Mass Avenue, Cambridge, MA.
(617) 349-6100

2020 JUL 17 AM 11:12

OFFICE OF THE CITY CLERK
CAMBRIDGE, MASSACHUSETTS

TO: Board of Zoning Appeal
(Specify Local Board or Agency)

NOTICE OF FILING OF A COMPREHENSIVE PERMIT APPLICATION

REGARDING: 402 Rindge Avenue
(Address of Property)

Please be informed that an application for a Comprehensive Permit for the development of low or moderate income housing at the above referenced property has been filed with the Cambridge Board of Zoning Appeals, and is scheduled for a hearing at _____p.m., on Thursday, _____, at the Senior Center, 806 Mass Avenue, Cambridge, MA. 1st Floor Ballroom.

A copy of the Comprehensive Permit application is attached. The relief requested In the application includes: Relief from dimensional requirements concerning FAR (§§5.11, 5.31,11.203.5(a)), Minimum lot area (§§ 5.11, 5.31, 11.203.5(b)), front setback (§§ 5.11, 5.31, 20.64.1(1)), side setback (§§ 5.11, 5.31), height (§§ 5.11, 5.31, 20.64.2), building facade (§§ 20.64.3(1), 20.64.3(3)), mechanical equipment (§ 20.67(1)) open space (§§ 5.22.1, 5.31, 20.66.4(1), front yard driveway (§§ 20.64.1(2)-(3), parking (§§ 6.31, 6.35.1(3), 6.36.1(g), 6.36.3(d)(5), 6.36.4(d)), bike parking (§§ 6.107.2, 6.107.3), parking design (§§ 6.44.1(c), 6.34, 6.48.1(g), 20.66.2, 20.66.3(1)-(4)), curb cut modification (§ 20.66.1), Office Use (§ 4.34(d)), Green Building (§ 22.23.1(b), stormwater retention & phosphorous mitigation

In acting on Comprehensive Permit applications, the Board of Zoning Appeals has the power to grant any permits or approvals, which would otherwise be required from other local agencies. The Board requests that _____ and other applicable agencies and boards appear at this hearing to make recommendations relative to this application, and/or that written recommendations be submitted to the Board prior to that hearing date.
Please contact the Zoning Specialist at (617) 349__6100, to receive further information on this Comprehensive Permit proceeding.

COMPREHENSIVE PERMIT APPLICATION

PETITIONER: Just-A-Start Corporation

PETITIONER'S ADDRESS: 1035 Cambridge Street #12, Cambridge, MA 02141

PETITIONER'S TELEPHONE: 617-918-7540

NAME, ADDRESS, AND PHONE NUMBER OF CONTACT PERSON
(If different from Petitioner): Craig Nicholson

LOCATION OF SITE: 402 Rindge Avenue

DESCRIPTION OF PROJECT: Rindge Commons is the creation of 101 units of affordable housing on the site of the Rindge Tower Apartments which has 273 affordable apartments. The project consists of 2 buildings which will be built in phases. Phase I will include 24 units of housing and 42,500 sf of commercial space. Phase II will include 77 units of housing.

SPECIFY LOCAL REGULATIONS OR REQUIRMENTS FROM WHICH RELIEF IS REQUESTED:

Relief Requested:	Applicable Local Board or Authority:
	See Attachment A

1. Please specify whether Petitioner is:

   ( ) A public agency
   (X) A non-profit organization
   ( ) A limited divided organization

2. Is the proposed project new construction? Yes If not, please explain. _____

3. Does the Petitioner own and control the site? Yes If not, please describe the anticipated circumstances and time frames under which the Petitioner will acquire ownership and control of the site. If there are additional owners, please identify each owner, including name, address and the ownership interest for each owner identified. Please ATTACH a copy of the deed, purchase and sale agreement or option agreement.

Please see the attached option agreement. The owner of the property, Rindge Tower Apartments LLC, is a controlled entity of Just-A-Start.

4. What are the sources of the public subsidy for the proposed project? Please ATTACH project eligibility letter, site approval letter, or other evidence of subsidy for this project.

Phase I public subsidy includes 4% Low Income Housing Tax Credits, anticipated funds from the Cambridge Affordable Housing Trust and New Market Tax Credits. Phase II public subsidy will include 4% & 9% LIHTC, MA Housing Tax Credits, DHCD Sources (AHT, CBH, HOME, HSF) and anticipated funds from the City's Affordable Housing Trust.

5. Total number of dwelling units proposed: 374
Total number of affordable rental units: 374
Total number of affordable home ownership units: 0

6. Please describe the eligibility standards for low and moderate income occupants and the duration of the affordability restrictions for the project. If you refer to program regulations or guidelines, please attach copies.

All units will initially be subject to the LIHTC eligibility guidelines wtih 10% of the units reserved for households below 30% AMI, the remaining units will be for households below 80% AMI with the majority being below 60% AMI. All units will also be subject to a mortgage covenant from the City and will be permanently affordable at or below 80% AMI.

7. How will this project meet local needs for low income and moderate income housing?

The addition of 101 permanently affordable apartments will have a significant impact on the housing crisis in Cambridge. While this will not address all of the City's needs, it will expand the affordable housing opportunities within the thriving community that already exists at 402 Rindge Ave. The site's access to public transportation, shopping and recreation areas make this an ideal location for additional housing.

8. Please provide a complete description of the proposed project, and include with this Comprehensive Permit Application, each of the following items:

a. Site Development Plans – site development plans showing locations and outlines of proposed buildings; the proposed locations, general dimensions for streets, drives, parking areas, walks and paved areas; and proposed landscaping improvements and open areas within the site; (1 copy)

b. Report on Existing Site Conditions – a summary of conditions in the surrounding areas, showing the location and nature of existing buildings, existing street elevations, traffic patterns and character of open areas, if any, in the neighborhood;

c. Drawings – scaled, architectural drawings, including typical floor plans, typical elevations and sections, and identifying construction type and exterior finish. All projects of five or more units must have site development plans signed by a registered architect;

d. Building Tabulations – a tabulation of proposed buildings by type, size (number of bedrooms, floor area) and ground coverage, and a summary showing the percentage of the tract to be occupied by buildings, by parking and other paved vehicular areas, and by open areas; (1 copy)

e. Subdivision Plan – where a subdivision of land is involved, a preliminary subdivision plan; (1 copy)

f. Utilities Plan – a preliminary utilities plan showing the proposed location and types of sewage, drainage, and water facilities, including hydrants;

g. Dimensional Form – provided with application; (1 copy)

h. Photographs – photographs of site and existing buildings;

i. Assessor's Plat – available at City of Cambridge, Engineering Department, 147 Hampshire Street, Cambridge, MA.;

j. Ownership Certificate – 1 original notarized copy, provided with application.

I certify that the information contained herein is true and accurate to the best of my knowledge and belief.

Petitioner's Signature

Craig Nicholson

Print Petitioner's Name

April 22, 2020

Date

City of Cambridge

MASSACHUSETTS

BOARD OF ZONING APPEAL

831 Mass Avenue, Cambridge, MA.
(617) 349-6100

COMPREHENSIVE PERMIT APPLICATION PROCESS

ADDRESS OF PROPERTY: 402 Rindge Avenue, Cambridge

A copy of the proposed plan with description of the project be submitted to the following City Agencies. Please provide evidence of submission to these agencies. Upon completion, this sheet must be submitted to the Board Zoning Appeals case file.

Signature and Date	City Department/Address
_____	Community Development Department, *344 Broadway*
_____	Conservation Commission, *147 Hampshire Street*
_____	Fire Department, *491 Broadway*
_____	Historical Department, *831 Massachusetts Avenue*
_____	Law Department, *795 Massachusetts Avenue*
_____	Public Works Department, *147 Hampshire Street*
_____	Traffic and Parking Department, *344 Broadway*

City of Cambridge

MASSACHUSETTS

BOARD OF ZONING APPEAL

831 Mass Avenue, Cambridge, MA.
(617) 349-6100

TO:

FROM:

RE:

PETITIONER:

The Petitioner has applied to the Cambridge Zoning Board of Appeals for a comprehensive Permit to create affordable/low income housing at the above referenced property.

Pursuant to Chapter 774 of the Massachusetts General Laws, the Zoning Board of Appeals by the Comprehensive permit process is empowered to grant all necessary permits and licenses that are normally granted by other City agencies or Boards.

If any city agency or board is interested in this case or normally they would grant relief for this development, they should forward all correspondence to the Board of Zoning Appeal before the scheduled hearing dated, as there will be no other hearings will be scheduled for this case.

If you have any questions, please call Ranjit, or Maria at (617) 349-6100.

DIMENSIONAL FORM

LOCATION: 402 Rindge Avenue, Cambridge ZONE: C-2, Parkway Overlay

APPLICANT: Just-A-Start Corp. REQUESTED USE/OCCUPANCY: Multi-family & Business

PHONE: 617-494-0444 PRESENT USE/OCCUPANCY: Multi-family

		EXISTING CONDITIONS	REQUESTED CONDITIONS	ORDINANCE REQUIREMENTS[1]
TOTAL GROSS FLOOR AREA:		264,168 sf	425,211 sf	346,778 sf
LOT SIZE:		155,591 sf	155,591 sf	155,591 sf
RATIO OF TOTAL FLOOR AREA TO LOT AREA:[2]		1.697	2.73	2.229
MINIMUM LOT AREA FOR EACH DWELLING UNIT:		569.93	416.02	461.54
SIZE OF LOT:	WIDTH	257'-2"	--	--
	LENGTH	638'-4"	--	--
(setbacks in feet):	FRONT - Rindge	233'-2"	A: 32', B: 467'-6"	10' Min A: (68.33+113.33)/4= 45.42', B:(78.5'+192.5')/4=67.75'
	FRONT - Alewife	153'-3"	A: 5'-9", B: 4'-8"	Primary facade 25' A: (68.33=164.17)/4=58.13' B: (78.5+78.83)/4=39.33'
	LEFT SIDE	225'-7"	A: 404'-10" B: 53'-1"	A: (68.33+113.33)/5 = 36.33' B: (78.5+206)/5 = 56.9'
	RIGHT SIDE	86'-6"	A: 76'-11" B: 47'-3"	A: (68.33+164.17)/5 = 46.50' B: (78.5+90.58)/5 = 33.82'
SIZE OF BLDG.:	HEIGHT	193'	A: 68'-4", B: 78'-7"	Parkway: 55' then step back to 85' C-2: 85'
	LENGTH	199'-6""	A: 164'-2",B: 244'-2"	
	WIDTH	58'-0"	A: 113'-4", B: 85'	
RATIO OF USABLE OPEN SPACE TO LOT AREA:[3]		10%	13%	15%
NO. OF DWELLING UNITS:		273	374	337
NO. OF PARKING SPACES:		273	220	446 or 392 w/ Shared Use
NO. OF LOADING AREAS:		1	3	
NO. BIKE PARKING SPACES:		26	134 LT (A: 38, B: 96, TOWER: 0) 48 ST (A: 12, B: 10, TOWER: 26)	403 LT, 48 ST
OTHER OCCUPANCIES ON SAME LOT:		N/A	Business & Multifamily	Zoned for Multifamily
DISTANCE TO NEAREST BLDG.:		N/A	A: 53'-9", B: 47'-10"	A: 43.5', B: 44.5'
SIZE OF BLDGS. ADJACENT ON SAME LOT:		See Above	See Above	
TYPE OF CONSTRUCTION:[4]		Concrete & Brick	Brick, Wood & Concrete	

SUBMIT: PLOT PLAN:_____ PARKING PLAN:_____ BUILDING PLAN:_____

1. SEE CAMBRIDGE ZONING ORDINANCE ARTICLE 5.000, SECTION 5.30 (DISTRICT OF DIMENSIONAL REGULATIONS).
2. TOTAL GROSS FLOOR AREA (INCLUDING BASEMENT 7'-3" IN HEIGHT AND ATTIC AREAS GREATER THAN 5') DIVIDED BY LOT AREA.
3. OPEN SPACE SHALL NOT INCLUDE PARKING AREAS, WALKWAYS OR DRIVEWAYS AND SHALL HAVE A MINIMUM DIMENSION OF 15'.
4. E.G., WOOD FRAME, CONCRETE, BRICK, STEEL, ETC.

*The Tower is the existing structure, the 2 new structures are referred to as Building A & Building B

Rindge Commons

Comprehensive Permit - Attachment A

Relief Requested:		Sections:	Applicable Board or Authority:
1	FAR / Total Gross Floor Area	§§ 5.11, 5.31, 11.203.5(a)	Board of Zoning Appeal
2	Minimum Lot Area / Max # of Dwelling Units	§§ 5.11, 5.31, 11.203.5(b)	Board of Zoning Appeal
3	Front Setback	§§ 5.11, 5.31, 20.64.1(1)	Board of Zoning Appeal
4	Side Setback	§§ 5.11, 5.31	Board of Zoning Appeal
5	Height	§§ 5.11, 5.31, 20.64.2	Board of Zoning Appeal
6	Building Façade	§§ 20.64.3(1), 20.64.3(3)	Board of Zoning Appeal
7	Mechanical Equipment	§ 20.67(1)	Board of Zoning Appeal
8	Open Space	§§ 5.22.1, 5.31, 20.66.4(1)	Board of Zoning Appeal
9	Front Yard Driveway	§ 20.64.1(2), 20.64.1(3)	Board of Zoning Appeal
10	Parking	§§ 6.31, 6.35.1(3), 6.36.1(g), 6.36.3(d)(5), 6.36.4(d)	Traffic and Parking Department
11	Parking Design	§§ 6.44.1(c), 6.34, 6.48.1(g), 20.66.2, 20.66.3(1)-(4)	Traffic and Parking Department
12	Bicycle Parking	§§ 6.107.2	Community Development Department
13	Use	§ 4.34(d)	Planning Board
14	Curb cut modification	§ 20.66.1	Department of Public Works / BZA
15	Green Building	§§ 22.000, 22.23.1(b)	Board of Zoning Appeal
16	Storm Water Retention	DPW Regulations	Department of Public Works
17	Phosphorous Mitigation	DPW Regulations	Department of Public Works

OPTION AGREEMENT
[Rindge Commons Phase 1]

For consideration paid, RINDGE TOWER APARTMENTS LLC, a Massachusetts limited liability company with an address of 1035 Cambridge Street, #12, Cambridge, Massachusetts 02141 (the "Seller"), hereby agrees to sell, and JUST-A-START CORPORATION, a Massachusetts nonprofit corporation with an address of 1035 Cambridge Street, #12, Cambridge, Massachusetts 02141, or its nominee or assignee ("Buyer"), agrees to purchase, the Property (as defined below) upon the terms and conditions specified in this Option Agreement ("Agreement").

1. **Subject of Agreement**. This Agreement relates to the property commonly known as the "Rindge Commons Phase 1 Unit" of the Rindge Commons Condominium to be declared by the Seller on a portion of the undeveloped land located at 402 Rindge Avenue in Cambridge, MA (the "Property"). The Property shall be sold in "as is, where is" condition, with no representations and warranties whatsoever except as specifically set forth herein. Seller has agreed to sell the Property to Buyer in order for Buyer to develop the Property as a mixed-use residential and commercial project.

2. **Agreement to Sell:** Upon the exercise by Buyer of the option granted hereunder, and subject to the terms and conditions hereinafter set forth, Seller agrees to sell and Buyer agrees to accept title to the Property.

3. **Consideration:** In consideration of the option granted hereunder, Buyer shall pay to Seller a non-refundable option fee of $10 (the "Option Fee") upon the execution of this Option, the receipt and sufficiency of which is hereby acknowledged.

   In addition to the Option Fee, Buyer agrees that it shall pay (a) the Massachusetts transfer taxes and deed stamps, (b) all costs of recording the deed and any other documents necessary to be recorded at Closing, and (c) all other customary closing costs (whether or not customarily paid by buyer or seller), other than Seller's attorney's fees, which shall be Seller's sole responsibility. The structure of the sale and purchase price for the Property shall be determined by the parties acting in good faith upon the Purchaser's exercise of the option and incorporated into a mutually acceptable purchase and sale agreement.

4. **Deed.** The real property which is part of the Property shall be conveyed by delivery of a good and sufficient quitclaim deed running to Buyer, or, at Buyer's sole option, to an affiliate of Buyer as Buyer's nominee, which deed shall convey a good and clear, record and marketable and insurable title to such property free and clear of all occupants, tenants, leases, liens, municipal betterments and assessments, and any easements, restrictive covenants, restrictions and encumbrances of any nature whatsoever, except:

   (a) provisions of existing building and zoning laws of Cambridge, Massachusetts;

(b) such real estate taxes, applicable to the Property, for the then current year as are not due and payable on the date of delivery of the deed; and

(c) restrictions of record which do not materially interfere with Buyer's intended use of the Property.

5. **Condition for Exercise of Option**. Notwithstanding anything to the contrary contained in this Agreement, Seller acknowledges and agrees that while this Agreement confers upon the Buyer, a right to acquire the Property subject and pursuant to the conditions set forth in this Agreement, it does not commit the Buyer to do so, and Buyer shall not exercise the option in any event prior to completion of any environmental review required by a funding source (including but not limited to review under the National Environmental Protection Act ("NEPA") with respect to any federal funding source) and this Agreement shall not be deemed a "choice limiting action" with respect to any such funding source.

6. **Closing**. Subject to Section 5, the deed and related documentation shall be delivered on or prior to the June 30, 2021 or at such later date mutually agreed to by the parties (the "Closing"). It is agreed that time is of the essence of this Agreement.

7. **Seller's Representations and Covenants**. Seller represents warrants and covenants that:

(a) Seller is the sole owner of the Property;

(b) Seller has not entered into and will not enter into, and to the best of Seller's knowledge the Property is not subject to, any leases (other than residential leases of individual dwelling units with a term of one year or less), mortgages, liens, restrictions or encumbrances under which any person or entity, not a party to this Agreement, has, will have or will obtain any rights, interest or claim that impairs Seller's ability to perform hereunder;

(c) Seller has not entered into and will not enter into, and to the best of Seller's knowledge the Property is not the subject of any outstanding agreements with any party pursuant to which any such party may acquire an interest in the Property other than the tenants' leasehold interests; and

(d) Seller has received no notice of taking or condemnation with respect to the Property.

If any of the representations or warranties in this Section 7 is materially inaccurate, when made or on the Date of Closing, Buyer may terminate this Agreement and the Option Fee shall be forthwith refunded and all other obligations of the parties hereto shall cease and this Agreement shall be void without recourse to the parties hereto.

8. **Possession and Condition of the Property**. Full possession of the Property, free from any

occupants, and in the same condition as it is now, reasonable wear and tear excepted, is to be delivered at the time of delivery of the deed. Seller covenants and agrees that it will take no action, or allow others claiming under it to take such action, as would (a) adversely affect the condition of the Property, (b) violate, or increase or expand any existing violation of, any safety, health, wetlands, environmental or zoning laws or regulations, or (c) violate the provisions of any instrument of record affecting the Property. Seller warrants and represents that it has no knowledge of and has received no notice of any violations of any safety, health, wetlands, environmental or zoning laws or regulations and that it has no knowledge of a violation of any easement, covenant, restriction, or other instrument of record affecting the Property, which warranty and representation shall survive the delivery of the deed. If any of the representations or warranties in this Section 8 is materially inaccurate, when made or on the date of Closing, Buyer may terminate this Agreement and the Option Fee shall be forthwith refunded and all other obligations of the parties hereto shall cease and this Agreement shall be void without recourse to the parties hereto.

9. **Insurance**. Seller shall maintain until Closing, fire and extended coverage insurance on the Property in an amount equal to the replacement cost thereof.

10. **Extension to Perfect Title or Make Property Conform**. If Seller shall be unable to give title or to make conveyance, or to deliver possession of the Property all as herein stipulated, or if at the time of the delivery of the deed the Property does not conform with the provisions hereof, then, at Buyer's sole option and at Buyer's expense, Seller shall be required to use all reasonable efforts to remove any defects in title, or to make the Property conform to the provisions hereof, and, in such event, the time for performance hereof shall be extended for such reasonable period of time (not to exceed 90 days) as the parties reasonably determine is required for Seller to conform the Property to the requirements hereof.

11. **Failure to Perfect Title or Make Property Conform**. If at the original or any extended time for performance set forth in the paragraph above, Seller shall have failed to so remove any defects in title or make the Property conform, as the case may be, Buyer may terminate this Agreement and the Option Fee shall be forthwith refunded and all other obligations of the parties hereto shall cease and this Agreement shall be void without recourse to the parties hereto.

12. **Acceptance of Title by Buyer**. Buyer shall have the election, at either the original or any extended time for performance, to accept such title as Seller can deliver to the Property in its then condition and to pay therefore the Option Fee without deduction, in which case Seller shall convey such title.

13. **Acceptance of the Deed**. The acceptance of the deed by Buyer, or its nominee as the case may be, shall be deemed to be a full performance and discharge of every agreement and obligation of Seller herein contained or expressed, except such as are, by the terms hereof, to be performed after the delivery of the deed.

14. **Adjustments.** All real estate taxes, charges and assessments affecting the Property and all charges for water, electricity, sewer, oil, gas, telephone and all other utilities shall be prorated on a per diem basis as of the date of Closing.

15. **Right of Entry**. Buyer shall have the right, from time to time during the term of this Agreement, at Buyer's sole cost, expense, risk and hazard and after reasonable notice to Seller, without damage being imposed upon any portion of the Property, to enter upon the Property to make, or cause to be made, engineering and architectural findings in respect thereto, including (without limitation) (a) surveying, (b) conducting test borings in order to determine subsoil conditions, (c) conducting engineering tests, including testing for the presence of hazardous materials, and (d) in general conducting all other tests, analyses and studies of the Property as Buyer deems necessary or desirable.

16. **No Real Estate Broker**. Each party represents and warrants to the other that no broker has been engaged or is entitled to a fee in connection with this transaction. Each party agrees to indemnify, defend and hold harmless the other from any loss or damage in connection with any claim for brokerage fees as a result of such party's conduct.

17. **Seller's Documents**. Seller has provided to Buyer or will provide Buyer, promptly upon execution hereof, copies of the following to the extent same are in Seller's possession: (i) any and all surveys, plot plans, maps, or other representations of the Property or any part thereof, (ii) any title related documents, including title searches, title insurance policies, and copies of any deeds, easements or other documents affecting title, (iii) any reports or other documents relating to any environmental, physical, geotechnical or other inspection of the Property, and (iv) all notices from any governmental authority or body with respect to the Property.

18. **Additional Closing Documents**. Seller agrees to furnish to Buyer, and to Buyer's mortgage lender(s) and title insurance company, at the time of delivery of the deed: (a) an affidavit verifying the nonexistence of mechanics' and materialmens' liens and lien rights and certifying that no basis for the same exists; and (b) an affidavit verifying that there are no parties in possession or other persons entitled to rights of possession.

19. **Notices.** Any and all written notices required hereunder shall be deemed properly given upon the earlier of (i) two business days after deposit with the United States Postal Service if sent by registered or certified mail, return receipt requested, postage prepaid, (ii) tender if delivered by hand or courier to the addresses set forth below, or (iii) receipt, in each case addressed or delivered to the address set forth herein. Either party may change its address for receipt of notice by giving written notice as set forth above. Contemporaneous copies of all notices to either party shall be sent to Klein Hornig LLP, 101 Arch Street, Suite 1101, Boston, MA 02110, Attention: Wataru Matsuyasu.

20. **Miscellaneous**. This instrument, executed in multiple originals, is to be construed as a Massachusetts contract, is to take effect as a sealed instrument, sets forth the entire contract

between the parties, is binding upon and inures to the benefit of the parties hereto and their respective successors and assigns, and may be cancelled, modified or amended only by a written instrument executed by both Seller and Buyer. The captions are used only as a matter of convenience and are not to be considered a part of this Agreement or to be used in determining the intent of the parties to it. Buyer may, at its option, make an assignment of its rights and obligations under this Agreement.

IN WITNESS WHEREOF Seller and Buyer have caused this Option Agreement to be signed under seal as of the October 31, 2019.

Seller:

RINDGE TOWER APARTMENTS LLC

By: Rindge Tower Apartments JAS LLC, its managing member

By: Just-A-Start Corporation, its managing member

By: _____
Carl Nagy-Koechlin, Executive Director

Buyer:

JUST-A-START CORPORATION

By: _____
Carl Nagy-Koechlin, Executive Director

RINDGE COMMONS BUILDING TABULATION TABLE

PROPOSED

	Tower (Existing)	Building A	Building B		Totals
Site Details					
Building Size (SF)	264,168	70,968	90,075		425,211
Footprint (SF)	11,739	9,156	2,505		23,400
Height (Feet)	193'	68.33'	78.5'		
% Bldg Coverage	7.54%	5.88%	1.61%		15.04%
% Parking Coverage	36.14%	9.71%	12.32%		58.18%
Open Space					
Overall	24,777	6,656	8,448		39,882
Permeable	14,930	4,011	5,091		24,032
% Permable (1)	10.66%	2.86%	3.64%		17.16%
Private	11,588	3,113	3,951		18,653
% Private (1)	8.28%	2.22%	2.82%		13.32%

Units					
Type					Totals
Studio	21	0	0		21
1-BR	84	10	16		110
2-BR	168	14	39		221
3-BR	0	0	22		22
Total Units	**273**	**24**	**77**		**374**
Size					Average
Studio	335				335
1-BR	578	750	693		610
2-BR	701	920	863		743
3-BR			1041		1041

(1) Based on the lot size associated with residential uses

Rindge Commons

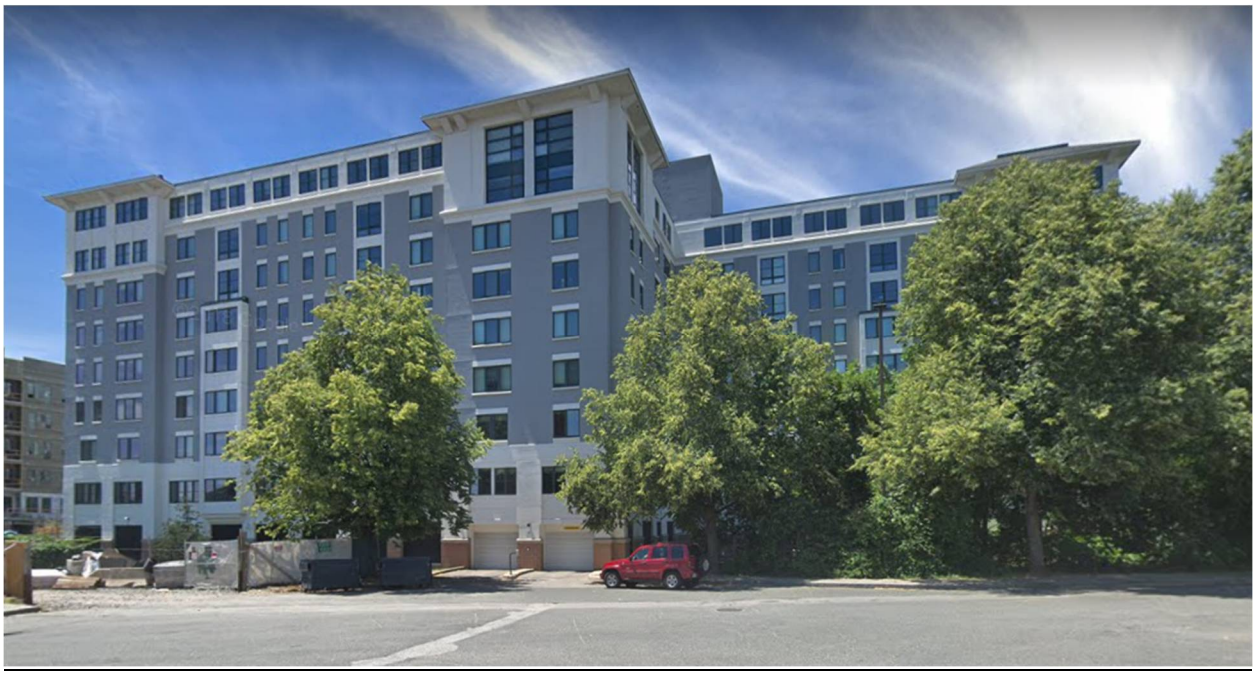
Neighborhood Photos

Existing building from Southeast

Existing Building Front Entry and Patio

View of parking

Abutting Condominiums



Apartments across Alewife Brook Parkway

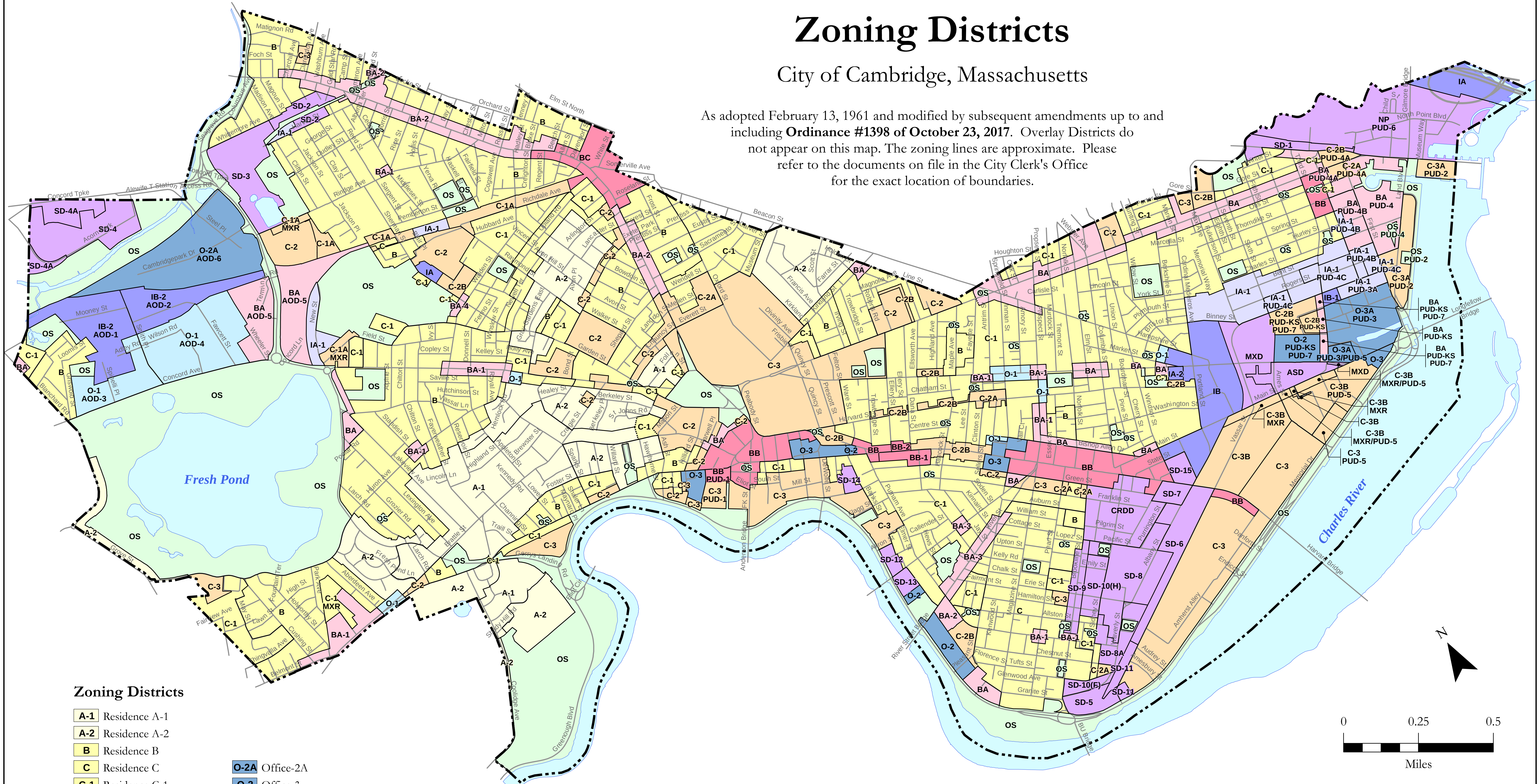
View from Alewife Brook Parkway

View down Rindge Ave from Alewife Brook Parkway

Zoning Districts

City of Cambridge, Massachusetts

As adopted February 13, 1961 and modified by subsequent amendments up to and including **Ordinance #1398 of October 23, 2017**. Overlay Districts do not appear on this map. The zoning lines are approximate. Please refer to the documents on file in the City Clerk's Office for the exact location of boundaries.



Zoning Districts

A-1	Residence A-1
A-2	Residence A-2
B	Residence B
C	Residence C
C-1	Residence C-1
C-1A	Residence C-1A
C-2	Residence C-2
C-2A	Residence C-2A
C-2B	Residence C-2B
C-3	Residence C-3
C-3A	Residence C-3A
C-3B	Residence C-3B
O-1	Office-1
O-2	Office-2
O-2A	Office-2A
O-3	Office-3
O-3A	Office-3A
BA	Business A
BA-1	Business A-1
BA-2	Business A-2
BA-3	Business A-3
BA-4	Business A-4
BB	Business B
BB-1	Business-1
BB-2	Business 2
BC	Business C
BC-1	Business C-1
IA-1	Industry A-1
IA-2	Industry A-2
IA	Industry A
IB-1	Industry B-1
IB-2	Industry B-2
IB	Industry B
IC	Industry C
MXD	Mixed Use Development
ASD	Ames Street District
AOD	Alewife Overlay District
PUD	Planned Unit Development Overlay
MXR	Mixed Use Residential Overlay
NP	North Point District
CRDD	Cambridgeport Revitalization Development District
SD-1	Special District-1
SD-2	Special District-2
SD-3	Special District-3
SD-4	Special District-4
SD-4A	Special District-4A
SD-5	Special District-5
SD-6	Special District-6
SD-7	Special District-7
SD-8	Special District-8
SD-8A	Special District-8A
SD-9	Special District-9
SD-10(F)	Special District-10(F)
SD-10(H)	Special District-10(H)
SD-11	Special District-11
SD-12	Special District-12
SD-13	Special District-13
SD-14	Special District-14
SD-15	Special District-15
OS	Open Space

This map was prepared by the Community Development Department on December 7, 2017 and reflects the latest changes to zoning boundaries.

Map prepared by Brendan Monroe on December 7, 2017. CDD GIS C:\Projects\Zoning\Zoning11x17.mxd

District	Max. FAR	Min. Lot Area/DU	Min. Setback Front Yard	Min. Setback Side Yard	Min. Setback Rear Yard	Max. Height	Min. OS Ratio	General range of allowed uses
A-1	0.50	6,000	25	15 sum to 35	25	35	50%	single-family detached dwellings
A-2	0.50	4,500	20	10 sum to 25	25	35	50%	
B	0.50	2,500	15	7.5 sum to 20	25	35	40%	single- and two-family detached dwellings townhouse dwellings (by special permit)
C	0.60	1,800	(H+L) ÷ 4 at least 10	(H+L) ÷ 5 ≥7.5, sum ≥20	(H+L) ÷ 4 at least 20	35	36%	single- and two-family detached dwellings townhouse dwellings multifamily dwellings (apartments, condos) limited institutional uses
C-1	0.75	1,500	(H+L) ÷ 4 at least 10	(H+L) ÷ 5 at least 7.5	(H+L) ÷ 4 at least 20	35	30%	
C-1A	1.25	1,000	10	(H+L) ÷ 7	(H+L) ÷ 5	45	15%	single- and two-family detached dwellings townhouse dwellings multifamily dwellings (apartments, condos) some institutional uses
C-2	1.75	600	(H+L) ÷ 4 at least 10	(H+L) ÷ 5	(H+L) ÷ 4 at least 20	85	15%	
C-2A	2.50	300	(H+L) ÷ 5 at least 5	(H+L) ÷ 6	(H+L) ÷ 5 at least 20	60	10%	
C-2B	1.75	600	(H+L) ÷ 4 at least 10	(H+L) ÷ 5	(H+L) ÷ 4 at least 20	45	15%	
C-3	3.00	300	(H+L) ÷ 5 at least 5	(H+L) ÷ 6	(H+L) ÷ 5 at least 20	120	10%	
C-3A	3.00	300	(H+L) ÷ 5 at least 5	(H+L) ÷ 6	(H+L) ÷ 5 at least 20	120	10%	
C-3B	3.00/4.00	300	10	no min	no min	120	10%	
O-1	0.75	1,200	(H+L) ÷ 4 at least 10	(H+L) ÷ 5	(H+L) ÷ 4 at least 20	35	15%	most types of residential dwellings most institutional uses offices and laboratories
O-2	1.50/2.00	600	(H+L) ÷ 4 at least 10	(H+L) ÷ 5	(H+L) ÷ 4 at least 20	70/85	15%	
O-2A	1.25/1.50	600	(H+L) ÷ 4 at least 10	(H+L) ÷ 5	(H+L) ÷ 4 at least 20	60/70	15%	
O-3	2.00/3.00	300	(H+L) ÷ 5 at least 5	(H+L) ÷ 6	(H+L) ÷ 5 at least 20	90/120	10%	
O-3A	2.00/3.00	300	(H+L) ÷ 5 at least 5	(H+L) ÷ 6	(H+L) ÷ 5 at least 20	90/120	10%	
BA	1.00/1.75	600	no min	no min	(H+L) ÷ 5 at least 20	35/45	no min	most types of residential dwellings most institutional uses offices and laboratories most retail uses
BA-1	1.00/0.75	1,200	no min	no min	(H+L) ÷ 5 at least 20	35	no min	
BA-2	1.00/1.75	600	5	10	20	45	no min	
BA-3	0.75	1,500	(H+L) ÷ 4 at least 10	(H+L) ÷ 5	(H+L) ÷ 4 at least 20	35	30%	
BA-4	1.00/1.75 2.00 w/limitations	600	(H+L) ÷ 4 10′ w/limitations	(H+L) ÷ 5 10′ w/limitations	(H+L) ÷ 5 10′ w/limitations	35 or 44 w/limitation	no min	
BB	2.75/3.00	300	no min	no min	no min	80	no min	
BB-1	1.50/3.25	300	no min	no min	no min	55/90	15%	
BB-2	1.50/3.00	300	no min	no min	no min	45	15%	
BC	1.25/2.00	500	no min	no min	20	55	no min	
BC-1	2.75/3.00	450	no min	no min	20	50	no min	
IA-1	1.25/1.50	700	no min	no min	no min	45	no min	most types of residential dwellings most institutional uses offices and laboratories some retail uses most light industrial uses some heavy industrial uses
IA-2	2.75/4.00	no min	no min	no min	no min	70	no min	
IA	1.25/1.50	no min	no min	no min	no min	45	no min	
IB-1	1.50/3.00	no min	no min	no min	no min	60/70	no min	
IB-2	0.75	1,200	15	no min	no min	35	15%	
IB	2.75/4.00	no min	no min	no min	no min	120	no min	
IC	1.00	no min	no min	no min	no min	45	no min	
OS	0.25	N/A	25	15	25	35	60%	open space, religious, or civic uses

Notes on Zoning Regulations Table

Max. FAR = maximum allowed ratio of gross floor area on a parcel divided by the total land area of the parcel ("floor area ratio"). Where a **slash (/)** separates two figures, the first applies to non-residential and the second to residential & dormitory uses.

Min. Lot Area/DU = minimum allowed ratio of a parcel's lot area, expressed in feet, divided by the number of dwelling units on that parcel.

Min. Setback = minimum required distance between a parcel's lot line (front, side, or rear) and the wall of a building, in feet. The symbol **(H+L)** in a formula represents the height of the building plus the length of the building parallel to that lot line.

Max. Height = maximum allowed building height on a parcel, in feet. A **slash (/)** has the same meaning as under Max. FAR (see above).

Min. OS Ratio = minimum required ratio of usable open space on a parcel (not including parking) to total land area, expressed as a percentage.

General range of allowed uses gives an overview of the types of uses permitted by zoning in that district, but does not refer to specific allowed uses. *See Article 4 of the Zoning Ordinance for the detailed Table of Use Regulations.*

Special District	Brief Description and Overview of District Regulations *(except where otherwise noted, detailed regulations are in Article 17 of the Zoning Ordinance)*
MXD (incl. ASD)	Mixed Use Development District: Cambridge Center. Allows a mix of light industry, office, biotechnology manufacturing, retail, residential, hotel, entertainment, and institutional uses. Entire district has a limit on aggregate gross floor area and a minimum open space requirement. Includes "Ames Street District" (ASD). *See Article 14 of the Zoning Ordinance.*
CRDD	Cambridgeport Revitalization Development District. Allows a mix of light industry, office, retail, residential, hotel, and entertainment uses. Aggregate gross floor area of the entire district limited to 1,900,000 square feet of non-residential and 400,000 square feet (or 400 units) of residential. Limits on FAR and building heights vary. At least 100,000 square feet reserved for open space. *See Article 15 of the Zoning Ordinance.*
NP	North Point Residence, Office and Business District. Allows certain residential, office, laboratory, retail, and institutional uses. Maximum FAR 1.0, height 40 feet. *See Article 16 of the Zoning Ordinance.* Greater development density allowed through PUD-6 regulations: S*ee Article 13 of the Zoning Ordinance.*
SD-1	Along Monsignor O'Brien Highway in East Cambridge. Regulations similar to Industry A-1 with exceptions.
SD-2	Along Linear Park in North Cambridge. Regulations similar to Residence B with exceptions. Conversion to housing is encouraged.
SD-3	Near Alewife Station. Allows residential, office, institutional, and limited retail uses. Aggregate gross floor area of the entire district limited to 782,500 square feet not including MBTA facilities or existing residential buildings.
SD-4 SD-4A	Along Acorn Park in North Cambridge. Regulations similar to Office 2 with exceptions. Preservation of open space is encouraged.
SD-5	Along Memorial Drive in southern Cambridgeport. Regulations similar to Office 2 with exceptions.
SD-6	Along railroad tracks between Cambridgeport and MIT Campus Area. Regulations similar to Residence C-3 with exceptions.
SD-7	Along Massachusetts Avenue in Cambridgeport. Regulations similar to Business B (as modified by Central Square Overlay District) with exceptions.
SD-8	Between Albany and Sidney Streets in Cambridgeport. Regulations similar to Industry A-1 with exceptions.
SD-8A	Around Fort Washington Park in Cambridgeport. Regulations similar to Residence C-1A with exceptions. Conversion to housing is encouraged.
SD-9	Along Brookline Street in Cambridgeport. Regulations similar to Residence C with exceptions. Conversion to housing is encouraged.
SD-10(F) SD-10(H)	Two locations in southern Cambridgeport near Henry Street, Brookline Street, Sidney Street. Regulations similar to Residence C with exceptions. Conversion to housing is encouraged.
SD-11	Along railroad tracks and Memorial Drive in southeastern Cambridgeport / MIT Campus Area. Regulations similar to Office 2 with exceptions.
SD-12	Along Memorial Drive in Riverside. Regulations similar to Residence C-2B with exceptions. Creation of open space is encouraged.
SD-13	Along Memorial Drive in Riverside. Regulations similar to Residence C-2 with exceptions.
SD-14	Near Grant and Cowperthwaite Streets in Riverside. Regulations similar to Residence C-1 with exceptions. Preservation of neighborhood character is encouraged.
SD-15	At Massachusetts Ave and Albany Street. Regulations similar to Industry B with allowances for additional FAR and height.

City of Cambridge Zoning Reference Sheet

CAUTIONARY NOTE. This sheet is intended to serve as a quick reference to dimensional standards and use regulations defined in the Cambridge Zoning Ordinance. This sheet does not serve as a substitute for the Cambridge Zoning Ordinance, and the City of Cambridge does not guarantee that this sheet is fully consistent with the Zoning Ordinance. The print version of the Zoning Ordinance, together with any amendments adopted by the City Council subsequent to the most recent update to the print version, remains the official version of the Ordinance. If any discrepancies exist between the print version of the Zoning Ordinance and this sheet, then the print version of the Ordinance, together with any City Council amendments, shall be considered correct.

The full Zoning Ordinance is available online at www.cambridgema.gov/CDD/zoninganddevelopment/Zoning

Planned Unit Development (PUD) Districts

PUD overlay districts provide flexible zoning standards for multi-site phased development with a variety of land uses and densities. A developer may choose to conform to PUD controls in lieu of the base district requirements, but must receive a special permit from the Planning Board. *See Articles 12 and 13 of the Zoning Ordinance.*

PUD-KS	Kendall Square. Mixed use with office, residential, retail, and a required public park. Max FAR 3.0 with restrictions. Max heights 65′-250′, with limitations adjacent to public open space.
PUD-1	Charles Square near Harvard. Medium density mixed use with commercial, office and residential. Max FAR 3.0. Max height 60′ with conditional increases to 110′.
PUD-2	East Cambridge Riverfront. Office, retail and residential. Max FAR 3.0, or 4.0 for residential uses. Max height 120′.
PUD-3 PUD-3A	Kendall Square, near riverfront. Mixed use with office, retail and residential. Max FAR 2.0-3.0. Max height 120′-230′, with conditions and allowances.
PUD-4 PUD-4A PUD-4B PUD-4C	East Cambridge along First and Binney Streets. Mix of retail, office, and residential. Max FAR 2.0-3.0 and max height 65′-85′, with conditions and allowances.
PUD-5	MIT at Kendall Square. Office and institutional development with required housing and ground floor retail. Total FAR 3.9. Heights allowed to 250′ for non-residential and 300′ for residential uses.
PUD-6	North Point. Residential with retail and office uses, community services, and public open space. Max FAR 3.0, incentives to encourage housing and development near transit. Max heights 85′-250′, some areas limited to 65′.
PUD-7	Kendall Square, "Volpe Center Parcel." Mix of commercial office/lab and residential with required open space, ground-floor active uses, and community space. Up to 3.25 million square feet of floor area. Max heights 250′-350′, one building up to 500′.

Alewife Overlay Districts (AOD-1,2,3,4,5,6)

These overlays modify the dimensional provisions of the base districts, generally allowing greater height and FAR by special permit from the Planning Board, but also imposing additional requirements for open space, permeability, setbacks, etc. *For details see Section 20.90 of the Zoning Ordinance.*

BLOCK 268B

Cambridge GIS maps available online at: cambridgema.gov/GIS

135
913211

269 Rindge Ave

30
33686

268C

32
43236

36
10699

57
174750

17
20000

55
169204

265D

265B

60
302836

18
944

Alewife Brook Pkwy

46
8447

7
3500

8
6218

41
0

34
3324

35
1675

14
4825

15
9699

16
8057

45
155863

268B

47
398644

Clifton Cir

47
136500

40
0

268A

265C

25
731150

FY 2020

City of Cambridge
Assessing Department

795 Massachusetts Ave.
Cambridge, MA 02139

Buildings
Lot Line
Block Line
City Boundary
Water
Sub-Parcel Line
Easement
Railway

10 Lot Number
268B Block Number
10 Street Number
(125.0) Deed Dimension
100 Parcel size in Sq. Ft.
44.0LC Land Court Dimension
65.0 Survey Dimensions

N

0 20 40 80 Feet

1 inch = 100 feet

Parcel Block Map

268B

OWNERSHIP INFORMATION FOR BOARD OF ZONING APPEAL RECORD

(To be completed by **OWNER**, signed before a notary, and returned to Secretary of Board of Appeal).

I/We Rindge Tower Apartments LLC
(OWNER)

Address: 135 Cambridge Street, #12, Cambridge, MA 02141

State that I/We own the property located at 402 Rindge Avenue which is

the subject of this zoning application.

The record title of this property is in the name of Rindge Tower Apartments LLC

*Pursuant to a deed of duly recorded in the date 12/22/2015, Middlesex South County Registry of Deeds at Book 66573, Page 239; or Middlesex Registry District of Land Court, Certificate No. _____ Book _____ Page _____.

SIGNATURE BY LAND OWNER OR AUTHORIZED TRUSTEE, OFFICER OR AGENT

Commonwealth of Massachusetts, County of Middlesex

The above-name Carl Nagy-Koechlin personally appeared before me, this 30th of January, ~~199~~ 2020, and made oath that the above statement is true.

Notary

My commission expires 4/10/26 (Notary Seal).

ROBERT W. MACARTHUR
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
April 10, 2026

* If ownership is not shown in recorded deed, e.g. if by court order, deed, or inheritance, please include documentation.

FEDERAL IDENTIFICATION
NO. 237121174

MP
Examiner

RE
Name
Approved

The Commonwealth of Massachusetts

William Francis Galvin
Secretary of the Commonwealth
One Ashburton Place, Boston, Massachusetts 02108-1512

0866 073 068

RESTATED ARTICLES OF ORGANIZATION
(General Laws, Chapter 180, Section 7)

We, John Henn , *President / *Vice President,

and Ruby Pierce Donohue , *Clerk / *Assistant Clerk,

of Just-A-Start Corporation ,
(Exact name of corporation)

located at 1035 Cambridge St., Cambridge, MA 02141 ,
(Street address of corporation in Massachusetts)

do hereby certify that the following Restatement of the Articles of Organization was duly adopted at a meeting

held on December 7 , 20 10 , by a vote of: _____ members,

7 directors, or _____ shareholders**,

☐ Being at least two-thirds of the members or directors legally qualified to vote in meetings of the corporation where there is no amendment to the Articles of Organization; OR

☐ Being at least two-thirds of its members legally qualified to vote in meetings of the corporation where there is an amendment to the Articles of Organization; OR

☒ Being at least two-thirds of its directors where there are no members pursuant to General Laws, Chapter 180, Section 3 and there is an amendment to the Articles of Organization; OR

☐ In the case of a corporation having capital stock, by the holders of at least two-thirds of the capital stock having the right to vote therein where there is an amendment to the Articles of Organization.

C ☐
P ☐
M ☐
R.A. ☐

9
P.C.

**Delete the inapplicable words.*
***Check only one box that applies.*
Note: If the space provided under any article or item on this form is insufficient, additions shall be set forth on one side only of separate 8 1/2 x 11 sheets of paper with a left margin of at least 1 inch. Additions to more than one article may be made on a single sheet as long as each article requiring each addition is clearly indicated.

6/1/10

ARTICLE I

The name of the corporation is:

Just-A-Start Corporation

ARTICLE II

The purpose of the corporation is to engage in the following activities:

See attached Continuation Sheet II

ARTICLE III

A corporation may have one or more classes of members. If it does, the designation of such classes, the manner of election or appointments, the duration of membership and the qualification and rights, including voting rights, of the members of each class, may be set forth in the by-laws of the corporation or may be set forth below:

The Corporation shall have no members.

ARTICLE IV

**Other lawful provisions, if any, for the conduct and regulation of the business and affairs of the corporation, for its voluntary dissolution, or for limiting, defining, or regulating the powers of the corporation, or of its directors or members, or of any class of members, are as follows:

See attached Continuation Sheet IV

***If there are no provisions, state "None".*

Note: The preceding four (4) articles are considered to be permanent and may ONLY be changed by filing appropriate Articles of Amendment.

ATTACHMENT II

JUST-A-START CORPORATION

Article II: Purposes of the Corporation

The Corporation is organized and shall be operated exclusively for charitable and educational purposes within the meaning of section 501(c)(3) of the Internal Revenue Code of 1986, as now in effect or as it may hereafter be amended, or under any successor section thereto (the "Code"), and regulations promulgated thereunder. The purposes of this Corporation include, but are not limited to, the following:

(a) To undertake civic, recreational, athletic, educational, counseling and other similar programs with the object and purpose of improving the quality of daily life and housing in the Cambrige community and the metropolitan Boston area;

(b) To develop and implement community self-help activities within the Wellington-Harrington area and within other parts of Cambridge and the metropolitan Boston area;

(c) To employ teen-agers and adult residents;

(d) To provide decent housing that is affordable to low- and moderate-income people in the Cambridge and metropolitan Boston areas;

(e) To formulate and implement economical, direct and effective solutions to housing, recreation and service needs;

(f) To improve educational capacities of children, youth and adults in Cambridge and the metropolitan Boston area;

(g) To involve and inform the residents in community improvement efforts;

(h) To provide temporary recreational facilities;

(i) To provide an opportunity for participants from the community and from different backgrounds to work together in an active rehabilitation and community service program;

(j) To raise funds necessary to sustain the foregoing activities and to expend such funds exclusively for the Corporation's charitable and educational purposes;

(k) To engage in any lawful act or activity in furtherance of the foregoing and in furtherance of the charitable and educational purposes of the Corporation as are permitted under Chapter 180 of the Massachusetts General Laws; and

(l) To engage in and carry on any other activities not inconsistent with these purposes, which are permitted to a corporation organized under Chapter 180 of the

Massachusetts General Laws, but only to the extent that such activities shall not preclude classification of the Corporation as an organization exempt under section 501(c)(3) of the Code.

The foregoing clauses shall be construed as both purposes and powers, and the enumeration of specific powers therein shall not be held to limit or restrict in any manner the general powers of the Corporation as are permitted under Chapter 180 of the Massachusetts General Laws.

ATTACHMENT IV

JUST-A-START CORPORATION

Article IV : Additional Provisions

1. The Corporation shall have in furtherance of its corporate purposes all of the powers specified in section 6 of Chapter 180 and in sections 9 and 9A of Chapter 156B of the Massachusetts General Laws (except those provided in paragraph (m) of section 9) as now in force or as hereafter amended; *provided, however,* that no such power shall be exercised in a manner inconsistent with said Chapter 180 or any other chapter of the Massachusetts General Laws or inconsistent with the exemption from federal income tax to which the Corporation shall be entitled under section 501(a).

2. Notwithstanding any other provision of these Articles, the Corporation is organized to and shall only carry on activities permitted to be carried on by a corporation exempt from federal income taxation under section 501(a) of the Code as an organization described in section 501(c)(3) of the Code, contributions to which are deductible under sections 170(a), 2055(a) and 2522 of the Code. All powers of this Corporation shall be exercised only in such manner as will assure the operation of this Corporation exclusively for charitable and educational purposes, as defined in sections 170(c) and 501(c) of the Code, it being the intention that this Corporation shall be exempt from federal income taxation under section 501(a) of the Code as an organization described in section 501(c)(3) of the Code, contributions to which are deductible pursuant to sections 170(a), 2055(a), and 2522 of the Code, and all purposes and powers herein shall be interpreted and exercised consistent with this intention.

3. No part of the Corporation's net earnings (profit) inure to the benefit of any member, founder, contributor, or individual. Notwithstanding the foregoing, the Corporation shall be authorized to pay reasonable compensation for services rendered and to make payments and distributions in furtherance of its purposes as set forth in Article II. No substantial part of the activities of the Corporation shall consist of the carrying on of propaganda or otherwise attempting to influence legislation, provided further that the Corporation shall not make any taxable expenditures as defined in section 4945(d) of the Code. In connection with such activities, the Corporation may choose to make an election to apply the expenditure test as provided under section 501(h) of the Code. The Corporation shall not directly or indirectly participate in or intervene in (including the publishing or distribution of statements) any political campaign on behalf of, or in opposition to, any candidate for public office. It is intended that the Corporation shall be entitled to exemption from federal income tax under section 501(c)(3) of the Code, and shall not be a private foundation under section 509(a) of the Code.

4. If and so long as the Corporation is a private foundation (as that term is defined in section 509 of the Code), then notwithstanding any other provisions of these Articles of Organization or the By-laws of the Corporation, the following provisions shall apply:

(A) the Corporation shall at all times conduct its affairs in conformity with the provisions of Chapter 68A of the Massachusetts General Laws;

(B) the income of the Corporation for each taxable year shall be distributed at such time and in such manner as not to subject the Corporation to the tax on undistributed income imposed by section 4942 of the Code; and

(C) the Corporation shall not engage in any act of self-dealing (as defined in section 4941(d) of the Code), nor retain any excess business holdings (as defined in section 4943(c) of the Code), nor make any investments in such manner as to subject the Corporation to tax under section 4944 of the Code, nor make any taxable expenditures (as defined in section 4945(d) of the Code).

5. The Corporation shall not discriminate on the basis of race, religion, national origin, sex, sexual orientation, age, income, culture or physical ability in administering its policies and programs.

6. Except as may be otherwise required by law or by the By-Laws of the Corporation, these Articles of Organization may be amended from time to time by an affirmative vote of at least two-thirds of the directors of the Corporation entitled to vote thereon; *provided, however,* that no such amendment shall in any way authorize or permit the Corporation to be operated other than exclusively for charitable and educational purposes, or for any purpose or in any manner that would deprive the Corporation of its status as an organization described in section 501(c)(3) of the Code.

7. No officer or director of the Corporation shall be personally liable to the Corporation for monetary damages for, or arising out of, a breach of fiduciary duty as an officer or director of the Corporation notwithstanding any provision of law imposing such liability; *provided, however,* that this provision shall not eliminate or limit the liability of an officer or director, to the extent that such liability is imposed by applicable law, (i) for any breach of the officer's or director's duty of loyalty to the Corporation, (ii) for any act of self-dealing (as defined in section 4941(d) of the Code), (iii) for acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law, or (iii) for any transaction from which the officer or director derived an improper personal benefit. This provision shall not eliminate or limit the liability of an officer or director for any act or omission occurring prior to the date upon which this provision becomes effective. No amendment to or repeal of this provision shall apply to or have any effect on the liability or alleged liability of any officer or director for or with respect to any acts or omissions of such officer or director occurring prior to such amendment or repeal.

8. The directors may make, amend, or repeal the By-laws of the Corporation in whole or in part by an affirmative vote of at least a majority of the directors of the Corporation entitled to vote thereon. No adoption, amendment, or repeal of the By-laws shall in any way authorize or permit the Corporation to be operated other than exclusively for charitable and educational purposes or for any other purpose or in any manner that would deprive the Corporation of its status as an organization described in section 501(c)(3) of the Code.

9. Except as may be otherwise required by law or by the By-Laws of the Corporation, the Corporation may, at any time, authorize a petition for its dissolution to be filed with the Supreme Judicial Court of the Commonwealth of Massachusetts pursuant to section 11A of Chapter 180 of the Massachusetts General Laws; *provided, however,* that in the event of any liquidation, dissolution, termination or winding up of the Corporation (whether voluntary, involuntary or by operation of the law), the property or assets of the Corporation remaining after providing for the payment of its debts and obligations shall be conveyed, transferred, distributed and set over in accordance with section 11A of Chapter 180 of the Massachusetts General Laws to such other charitable or educational institutions or organizations, created and organized for nonprofit purposes similar to those of the Corporation, contributions to which nonprofit institutions or organizations are deductible under section 170 of the Code and which qualify as exempt from income tax under section 501(c)(3) of the Code, as at least a majority of the directors of the Corporation may by vote designate and in such proportions and in such manner as may be determined in such vote; *provided, further,* that the Corporation's property may be applied to charitable or educational purposes in accordance with the doctrine of *cy pres* in all respects as a court having jurisdiction in the premises may direct.

ARTICLE V

The effective date of the Restated Articles of Organization of the corporation shall be the date approved and filed by the Secretary of the Commonwealth. If a *later* effective date is desired, specify such date which shall not be more than thirty days after the date of filing.

ARTICLE VI

The information contained in Article VI is not a permanent part of the Articles of Organization.

a. The street address (post office boxes are not acceptable) of the principal office of the corporation *in Massachusetts* is:

1035 Cambridge St., Cambridge, MA 02141

b. The name, residential address and post office address of each director and officer of the corporation is as follows:

	NAME	RESIDENTIAL ADDRESS	POST OFFICE ADDRESS
President:	John Henn	155 Seaport Blvd., Boston, MA 02110	
Treasurer:	Anna Casey	621 Mass Ave., Arlington, MA 02476	
Clerk:	Ruby Pierce Donohue	27 Cedar St., Cambridge, MA 02140	
Directors:	Paul Parravano	77 Mass Ave., Cambridge, MA 02139	
(or officers	Eileen Bacci	149 Willow St., Cambridge, MA 02141	
having the	Paul Parravano	77 Mass Ave., Cambridge, MA 02139	
powers of	Anna Casey	621 Mass Ave., Arlington, MA 02476	
directors)	Ruby Pierce Donohue	27 Cedar St., Cambridge, MA 02140	
	Catherine Simmons	34 Gale St., Malden, MA 02140	
	Thomas Lucey	77 Brattle St., Cambridge, MA 02138	
	Chandra Banks	4 Mullins Ct., Cambridge, MA 02138	
	John Henn	155 Seaport Blvd., Boston, MA 02110	
	Anita Reed	402 Ringe Ave., Cambridge, MA 02140	

c. The fiscal year of the corporation shall end on the last day of the month of: June

d. The name and business address of the resident agent, if any, of the corporation is:

****We further certify that the foregoing Restated Articles of Organization affect no amendments to the Articles of Organization of the corporation as heretofore amended, except amendments to the following articles. Briefly describe amendments below:**

ARTICLE II is amended to specify that the Corporation's purposes are charitable and educational purposes within the meaning of IRC Sec. 501(c)(3) and include any Ch. 180 purposes meeting that classification.
ARTICLE III is amended to provide that the Corporation will not have members.
ARTICLE IV is amended to specify in detail requirements of compliance with IRC Sec. 501(c)(3) and with Ch. 180 dissolution requirements.
ARTICLE VI is being amended to update the directors and officers.

SIGNED UNDER THE PENALTIES OF PERJURY, this 17th day of January, 2011,

_____, *President / *Vice President,

Ruby Pierce Donohue, *Clerk / *Assistant Clerk.

*Delete the inapplicable words. **If there are no such amendments, state "None".

0992

THE COMMONWEALTH OF MASSACHUSETTS

RESTATED ARTICLES OF ORGANIZATION

(General Laws, Chapter 180, Section 7)

I hereby approve the within Restated Articles of Organization and, the filing fee in the amount of $ 35 having been paid, said articles are deemed to have been filed with me this 10 day of Feb, 20 11.

Effective Date: February 10 2011

William Francis Galvin

1136408

WILLIAM FRANCIS GALVIN
Secretary of the Commonwealth

SECRETARY OF THE COMMONWEALTH
2011 FEB 10 AM 11:15
CORPORATIONS DIVISION

TO BE FILLED IN BY CORPORATION
Contact information:

Just-A-Start Corporation

1035 Cambridge St., Cambridge, MA 02141

Attn: Lauren Curry

Telephone: 617-494-0444 x 312

Email: laurencurry@justastart.org

A copy this filing will be available on-line at www.state.ma.us/sec/cor once the document is filed.

RINDGE COMMONS

Traffic/ Parking / Transportation

Today, 402 Rindge Ave is Car Centric –

- Tall building in center of large parking lot
- Reads as entry to highway
- Streets dominated by cars
- Built before Alewife T-Station

Our Vision for Rindge Commons –

- Pedestrian Scale with the new building at Street Corner creating a sense of neighborhood
- Emphasis on multiple modes of transportation
- Advancing our goals of:
    - Reducing our carbon footprint with less dependence on cars
    - Reducing congestion
    - Creating an inviting Site with interconnected spaces and a sense of place where people walk and ride bikes

RINDGE COMMONS

TRAFFIC

Rindge Avenue, the North boundary of the site, is a heavily congested street with significant delays heading west into the intersection with Alewife Brook Parkway. Recognizing this concern, JAS engaged Vanasse Associates to undertake a Traffic Study of the site and the proposed project.

The study completed in December 2019 concluded that the project will have minimal impact on the traffic at Rindge Ave. The project was evaluated using 43 measurements of impact to City traffic and only one measurement was directly exceeded as a result of the new development at the site.

Just-A-Start nonetheless recognizes how important it is to address issues around traffic congestion and reliance on cars. The project will undertake several of measures to mitigate the impacts, including measures highlighted below to limit the use of single occupancy vehicles and encourage use of other modes of transportation (TDM measures). Additionally we will be creating a safer entry and exit from the site by moving the driveway approximately 60 feet further east, away from the intersection with Alewife Brook Parkway.

ARTICLE 19 SPECIAL PERMIT CRITERIA ANALYSIS SUMMARY

43 measurements were analyzed in applying the five indicators to the proposed Project with the following outcomes:

- **Indicator 1: Project Vehicle – Trip Generation** The Project satisfies the City standards for Indicator 1
- **Indicator 2: Project Vehicle – Level-Of-Service** The Project satisfies the City standards for Indicator 2
- **Indicator 3: Traffic on Residential Streets** 1 exceedance - During the weekday morning peak hour 53 new vehicles are anticipated to use Rindge Avenue which exceed the criteria of 40 new vehicles.
- **Indicator 4: Lane Queue** The Project satisfies the City standards for Indicator 4
- **Indicator 5: Lack of Sufficient Pedestrian and Bicycle Facilities** A total of four measurements related to pedestrian level of service are exceeded under existing conditions, with or without the Project. The Project itself does not exacerbate the existing exceedances. The Project will, however, provide the following benefits to the relevant areas.
    - The Project will eliminate one of the curb cuts on Rindge Avenue near the Rindge Avenue/Alewife Brook Parkway intersection.
    - The Project will provide a city-standard level-crossing at the remaining curb cut.
    - The Project will give an easement to the City in order to provide an extra wide, pedestrian friendly sidewalk in front of Building A with street trees and landscaping along the Rindge Avenue frontage.

PARKING

Car Parking

402 Rindge Ave was built in a car-centric era when City neighborhoods were sacrificed to make way for highways. Parking demand was set for the site 15 years before the Alewife T Station was built. The Tower includes 273 parking spaces for a 1 : 1 ratio to dwelling units. The abundance of parking currently allows many residents to have second and third vehicles. The current situation encourages a car use strategy that is contrary to the City's goals.

RINDGE COMMONS

Just-A-Start is committed to the goal of moving away from our reliance on cars. The project takes full advantage of our proximity to Alewife T-Station and to actively encourage other modes of transportation. The proposal also balances our parking supply; to limit the availability of easy parking which will encourage people to buy new cars, while still providing the parking for existing residents many of whom rely on their cars for work.

Just-A-Start is proposing to reduce parking at Rindge Commons to 220 spaces for a parking ratio of 0.59 spaces per residential dwelling unit, which is consistent with the existing ratio for 1st vehicles at 402 Rindge Ave. The 220 spaces will also be utilized for parking for the commercial uses in Building A. During standard work hours, the commercial parking needs will be accommodated through the sharing of available spaces which revert back to residential use for the evening and overnight hours.

The availability of residential spaces for sharing has been documented in the Urban Land Institute's publication *Shared Parking* which indicates that between 20% and 35% of residential parking is typically vacant during standard work hours. Parking counts conducted at Rindge Commons indicate that only 48% of the spaces are utilized during the day equaling 124 spaces available for shared use within the proposed number of 220 spaces.

Parking will be comprised of a mix of covered and open parking spaces and will include 12 accessible spaces. Pickup and loading zones will be available for ride share, Carpool/vanpool drop off and pickup, and deliveries. Electric Vehicle charging stations will also be provided.

The following table compares existing to our proposed parking operation:

	Parking Spaces				Parking Ratio
	Residential	Commercial	Vacant	Total	Residential
Existing (273 Units)					
Daytime Usage	126	N/A	147	273	0.46
Nighttime Usage [A]	176	N/A	97	273	0.64
Proposed (374 Units)					
Daytime Usage	106	18 [B]	106	220	0.48
Nighttime Usage	220	0	0	220	0.59

A. First car usage only
B. Assumes special permit for shared use parking

RINDGE COMMONS

Bicycle Parking

134 new long-term bike parking spaces will be provided including 38 in Building A and 96 in Building B. There will also be 22 new short-term parking spaces added to the existing 26 spaces provided on site. The existing Tower requires 286 long-term bike parking spaces of which zero currently exist. The absorption of space in the Tower to accommodate bicycle parking is infeasible within the existing structure. Consequently, we will install a BlueBike Station with 24 docks next to the entry to the existing Tower as mitigation measure for the lack of long-term spaces.

	Tower		Building A		Building B		Total	
	Req'd	Existing	Req'd	Plan	Req'd	Plan	Req'd	Plan
Long Term	286	0	37	38	80	96	403	134
Short Term	27.3	26	12.6	12	7.7	10	47.6	48

TRANSPORATION DEMAND MANAGEMENT (TDM)

To complement the proposed site improvements, Just-A-Start will implement a number of measures aimed at reducing the reliance on cars through a Transportation Demand Management Program.

Goals

- Reduce congestion on Rindge Ave, at the Rindge/ Alewife Intersection, and throughout the City & Region
- Reduce our carbon footprint and combat climate change
- Pedestrians make for friendlier & safer streets
- Encourage buying locally
- Improvements to health and happiness through walking and biking

Strategies for achieving these goals will focus on reducing the use of SOVs by encouraging the use of public transportation, car/vanpooling, bicycle commuting, and pedestrian travel. Measures will include the following:

- **BlueBike Bikeshare:** Discounted memberships for residents

- **Resident Biking Education:** Just-A-Start will organize orientation sessions with resident to teach biking rules, safe biking measures, basic maintenance and repairs and help identify bike routes to various locations

- **Resident Education (Transit):** JAS will provide transit orientations for new residents to familiarize them with transit and walking options for work, schools, medical clinics and other amenities. Charlie Cards will be handed out to residents at that time

- **Transit Promotion:** JAS will install a Transitscreen® system in the lobby of the existing tower and new buildings to make transit use more transparent and simpler to access with real time information

- **Employer Transit Incentive:** Just-A-Start Corporation will occupy ~17,000 square feet of the project and will subsidize 100% of the cost of a MBTA transit pass for its employees or $240 annual reimbursement for bike maintenance for employees who choose to commute by bike

- **Car Sharing Service:** The project will set aside parking spaces to serve car sharing services

- **Car/Vanpool:** JAS and the property management team will develop a carpool board for residents and students at the site. Also, the project will coordinate with the Alewife TMA to identify resources available to residents, students, and employees

- **Transportation Coordinator:** JAS will staff a Transportation Coordinator within our property management team. This position will oversee the implementation of the programs aimed at achieving our goals

The following items, while not technically TDM measures, are important components to achieving our goal of reducing reliance on single occupant vehicles and reducing the carbon footprint of Rindge Commons. Some of these items are required by zoning and others are tied to broader goals for Cambridge and the Alewife area.

- **Bike Parking Facilities:** 134 long term bike parking spaces will be provided in the two new buildings as well as 48 short term spaces situated at various locations throughout the site. Bike repair tools will also be available to our residents

- **Improved pedestrian environment:** JAS will provide a wide and well-lit pedestrian connection from the Rindge Commons property to the Alewife Brook Parkway and Rindge Avenue intersection

- **Electric Car Charging Stations**: While not necessarily reducing the number of SOV's, promotion of electric cars is an active step toward our goal of reducing our carbon footprint

- **Long-term**: Just-A-Start is participating in a study commissioned by the Cambridge Redevelopment Authority to look at the connectivity for pedestrians and bikes and the potential of adding paths that would serve the residents of Rindge Commons, the adjacent Rindge Towers, Jefferson Park and the neighborhood at large. The concept of adding a path along the railroad right of way with possible connections west to Cambridge Park Drive passing under the Alewife Brook Parkway bridge and east to Sherman Street and even the possibility of a pedestrian bridge providing access to Fresh Pond Mall and Danehy Park are being look at for feasibility as long-term initiatives

Just-A-Start Corporation
1035 Cambridge Street, #12 | Cambridge, MA 02141 | T: 617-494-0444 | www.justastart.org

April 23, 2020

Constantine Alexander, Chair
Board of Zoning Appeal
City of Cambridge
831 Massachusetts Avenue
Cambridge, MA 02139

Re: Comprehensive Permit Application for Rindge Commons

Chairman Alexander:

Just-A-Start is pleased to submit this comprehensive permit application in connection with the proposed Rindge Commons project, the construction of 2 new buildings at 402 Rindge Avenue. The site currently consists of a 22-story masonry tower with 273 affordable apartments. The new buildings will create 101 additional affordable apartments along with approximately 42,000 square feet of commercial office space as an ancillary use. This comprehensive permit application is submitted in accordance with Massachusetts General Laws Chapter 40(b), Section 20-23.

The sponsor of the project is Just-A-Start (JAS), a Massachusetts non-profit community development corporation. JAS has developed over 600 affordable rental apartments in Cambridge, along with over 130 affordable homeownership units. The organization has a long track record of working with the City of Cambridge, state funding agencies, and other funding agents to successfully develop and maintain quality affordable housing.

JAS proposes to develop 101 new affordable apartments on JAS's previously developed 402 Rindge Avenue site. JAS is proposing the creation of new income-restricted housing to help address the city's affordability crisis, as there continues to be a significant need for affordable housing in Cambridge. Based on the standard that housing costs should not exceed 35% of a tenant's income, a household would need an annual salary over $105,000 to afford the average 1-bedroom apartment in Cambridge. A household with 2 working adults earning the Cambridge Living Wage would need to work 60 hours per week to afford this apartment. In addition to the increase in desperately needed affordable housing, JAS will build over 42,000 square feet of office space which will house Just-A-Start's Education & Training programs and other community-oriented service providers.

The site is located in the Alewife neighborhood of the city, with easy access to public transit, schools, restaurants, shopping, and job opportunities. The area also offers residents ample outdoor amenities, with multiple parks within a short walk of the site. The neighborhood contains a robust mix of uses: office buildings along Cambridgepark Drive, affordable housing with the Fresh Pond Apartments and Cambridge Housing Authority's Jefferson Park development, new market-rate housing, and older properties consisting of triple-deckers and single family homes.

The proposed development will occur in two phases. The first phase will consist of the commercial office space and 24 affordable apartments. The second phase will consist of 77 affordable apartments. The proposed new units will be a mix of 1, 2 and 3-bedroom apartments, with over 20% of the new apartments being 3 bedrooms and over 70% of the new units being family-sized. Overall, 65% of the new Rindge Commons apartments will be family-sized, providing a much-needed increase in housing opportunities for larger families.

All of the new units will be permanently reserved for tenants whose incomes are at or below 80% of Area Median Income. Initially, the apartments will be subject to the requirements of the Low Income Housing Tax Credit program. The affordability of all new apartments will be secured through a mortgage covenant with the City, as well as MassHousing and the Massachusetts Department of Housing and Community Development.

The site for Rindge Commons was originally developed in the early 1970s prior to the construction of the Alewife MBTA Station. The previous automobile-centric design provided 273 parking spaces for its 273 apartments. Due to the design and placement of the proposed buildings, there will be a reduction in the number of spaces to 230, resulting in a parking ratio of 0.61 spaces per residential unit. This ratio is consistent with the current usage for existing residents parking their primary car on site. It is also higher than the 0.50 parking ratio JAS has been experiencing for new applications within its portfolio. The proposed project will also add 134 long term covered bike parking spaces, along with 22 short term spaces and a BlueBike station. This increased capacity for bicycle riders will be created in conjunction with other transportation demand management (TDM) measures.

The proposed new buildings will be exceptionally energy efficient and sustainable, with the aim of achieving Passive House certifications for both buildings. JAS plans to incorporate an energy-efficient building envelope, high performance mechanical systems, low flow water fixtures, and photovoltaic solar panels. Additionally, 5% of the Rindge Commons apartments will be accessible, and compliant with all Mass. Architectural Access Board guidelines.

JAS has conducted an extensive community outreach process for Rindge Commons. JAS first met with residents to discuss the project on April 29, 2019, and subsequently met six more times with neighbors and residents throughout the summer and fall in order to gather feedback on the proposed plans. For each meeting, JAS canvassed the abutting properties and posted notices about the meeting via the Rindge Commons website, JAS website, and social media platforms to ensure ample notice and participation. Additionally, JAS has met with several community groups, including the North Cambridge Stabilization Committee and the Cambridge Economic Opportunity Committee. Feedback from all meetings was collected and incorporated into the plans to the fullest extent possible.

Letters of support from Senator Patricia Jehlen and the Cambridge Redevelopment Authority will be submitted under separate cover. The Cambridge Affordable Housing Trust will submit a letter of support for the project, however, due to scheduling conflicts, has yet to take a vote on the funds requested by JAS for the affordable housing portion of Phase I.

The Rindge Commons site sits in a C-2 residential district with a portion of the property falling under the Parkway Overlay District. JAS is seeking relief from the Board of Zoning Appeals through the Comprehensive Permit application for Floor Area Ratio (FAR), maximum number of units, lot area per unit, height, setbacks, building façade, parking, bike parking, private open space, curb cut modification, storm water management, and a use variance.

JAS has submitted funding applications to the Department of Housing and Community Development (DHCD). However, zoning relief will be required before DHCD consider and commit funding to the project. If zoning is approved, and anticipated state funding sources are committed, JAS anticipates closing the financing components on the project in late 2020 or early 2021. Construction would begin soon thereafter.

This application is being submitted in conformance with M.G.L. Chapter 40(b), Sections 20-23. The provisions of this statue empower the Board of Zoning Appeals to grant exemptions from local ordinances and act on behalf of all local boards in this regard if the proposed housing is reasonable and consistent with local needs. Because the proposed project fits the design goals published in the City's Envision Cambridge Alewife plan and will provide 101 new affordable apartments and expanded commercial space from which JAS's job training programs will run, JAS believes that this project meets those standards.

Approval of this comprehensive permit application by the Board is critical to the project, since all other financing commitments will be contingent on zoning approval. We sincerely hope that the Board looks favorably upon this request, which will allow us to create vitally needed quality affordable housing and expanded job training opportunities to promote economic security in Cambridge.

Sincerely,

Craig Nicholson
Director of Real Estate Acquisitions

TRANSPORTATION IMPACT STUDY

RINDGE COMMONS
CAMBRIDGE, MASSACHUSETTS

Prepared for:

JUST-A-START CORPORATION
Cambridge, Massachusetts

December 2019

Prepared by:

VANASSE & ASSOCIATES, INC.
Transportation Engineers & Planners
35 New England Business Center Drive
Suite 140
Andover, MA 01810

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EXECUTIVE SUMMARY

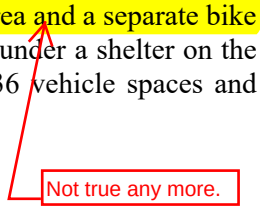
INTRODUCTION

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Study (TIS) for a proposed residential expansion to be known as Rindge Commons and located at 402 Rindge Avenue in Cambridge. The property currently provides a 22-story residential building containing 273 apartment units. The property owner (the "Proponent") is proposing to construct an expansion of two new buildings containing 103 residential units, a 14,000 square foot (sf) office/educational and training space, and up to 21,450 sf of medical clinic space (collectively, the "Project"). This study reviews the potential transportation impacts, defines site access requirements, and recommends mitigation measures necessary to accommodate the Project. This TIS also reviews the Project with respect to the City of Cambridge Special Permit Criteria regarding traffic impacts, is in accordance with the City's guidelines for TISs, and follows the scoping determination dated September 13, 2018. The following summarizes the study findings.

PROJECT DESCRIPTION

The property at 402 Rindge Avenue provides approximately 273 apartment units in one 22-story building. The Project proposes constructing two new buildings on site containing 103 new apartment units, a 14,000 sf office/educational and training space, and a 21,450 sf medical clinic.

Currently parking is provided on site for 273 vehicles. The site is currently accessed via one existing curb cut onto Rindge Avenue. Based on discussions with city staff, the Project will relocate vehicle access from the current main driveway to a secondary driveway approximately 60 feet to the east on Rindge Avenue. This driveway will be reconstructed to provide a Uber/Lyft/TNC pick-up/drop-off area and a separate bike lane on-site. Bicycle parking is provided for 26 bicycles via 13 bike racks located under a shelter on the east side of the existing building. The Project proposes to decrease parking to 236 vehicle spaces and increase bicycle parking to 138 spaces (22 short-term and 116 long-term spaces).



EXISTING CONDITIONS

A field inventory of existing study area roadways was conducted to document traffic conditions in the current 2019 analysis year. Items collected regarding the study area roadways and intersections include roadway geometrics, traffic control devices, traffic signal timing plans, traffic volumes, vehicle queues, pedestrian crossing volumes, bicycle volumes, and safety data for the roadways in the vicinity of the Site. Transportation information and data used in this study were collected during June and October 2018.

PROJECT-GENERATED TRAFFIC

The Project involves the construction of two new buildings containing 103 new apartment units, a 14,000 sf office/educational and training space, and a 21,450 sf medical clinic. Residential vehicle trips were calculated using trip rates based on counts conducted at the site driveway in October 2018. Office and clinic vehicle trips were calculated using Institute of Transportation Engineers (ITE) trip generation information[1] and Land Use Code (LUC) 710, General Office Building, and LUC 630, Clinic. Person trips for residential, office, and medical were calculated using ITE trip generation information and LUC 222, Multifamily Housing (High-Rise), LUC 710, General Office Building, and LUC 630, Clinic and mode split data gathered from a residential survey conducted at 402 Rindge Avenue in October 2018 and supplemented in February 2019 and from a 2018 Parking and Transportation Demand Management (PTDM) report for the Discovery Park office development in west Cambridge.

The Project is expected to generate 928 new vehicle trips on an average weekday (two-way, 24-hour volume), with 85 new vehicle trips (54 vehicles entering and 31 exiting) expected during the weekday morning peak-hour. During the weekday evening peak hour the Project is expected to generate 72 new vehicle trips (25 vehicles entering and 47 exiting). Trip distribution for the Project was based on a review of local traffic patterns.

ARTICLE 19 PROJECT REVIEW SPECIAL PERMIT CRITERIA ANALYSIS

As required by Section 19.20 of the Cambridge Zoning Ordinance, the Project has been evaluated against the five Project Review Special Permit Criteria indicators as measurements of the Project's expected impact on City traffic. Of the 43 measurements analyzed in connection with the five indicators, only one was exceeded as a result of the Project. Indicator three, traffic on residential streets, was exceeded during the weekday morning peak hour. However, the trip distribution is based on the existing travel patterns from the site driveway which indicates that the existing vehicles are avoiding Alewife Brook Parkway due to exiting congestion and using Rindge Avenue instead. Therefore, this exceedance is more a product of the existing congestion on Alewife Brook Parkway than it is a product of the project itself. A total of four other measurements are exceeded under existing conditions, with or without the Project. As detailed in this TIS, the Project will not exacerbate any of the pre-existing exceedances. The Applicant is also committed to the implementation of the Project mitigation strategies described in this TIS in order to lessen any potential impact of the Project on City traffic. Accordingly, the Project is not expected to have a substantial adverse impact on City traffic and issuance of a Project Review Special Permit is appropriate with respect to potential traffic impacts

TRAFFIC OPERATIONS ANALYSIS

In order to assess the impact of the Project on the roadway network, traffic operations and vehicle queue analyses were performed at the study intersections under 2019 Existing, 2019 Build and 2024 Build conditions. The analysis indicates that the Project will not have a significant effect on operating conditions at the area intersections.

PARKING ANALYSIS

Currently, the site provides 273 parking spaces for 273 residential units at a 1 to 1 ratio. Each dwelling unit is allowed 1 space at no charge and secondary spaces may be purchased at 50 dollars per month if spaces are available. As of October 2018, 190 spaces were provided to residents free of charge and 52 secondary spaces were purchased. In future conditions, the secondary spaces would be removed from availability as

[1] *Trip Generation Manual, 10th Edition;* ITE; Washington, D.C.; 2017.

Aren't we suing a lower number?

236/306 =.77 (??)

they are only provided if space is available. Currently the site has a parking demand of 190 spaces which is a rate of 0.70 spaces per unit. At this rate the proposed site would require 263 spaces for the residential use. The office/educational training space requires 32 spaces and the medical clinic requires 11 spaces, resulting in a total of 306 spaces required for the proposed project, based on demand. The Project proposes to provide 236 spaces. It should be noted that the Applicant is committed to implementing typical TDM measures to further reduce the demand for parking.

Currently, the site provides 26 long-term bicycle spaces for 273 residential units at a rate of 0.095 spaces per unit. The Project is providing 116 long-term spaces and 22 short-term spaces to satisfy requirements for the new residential units, the office/education space, and the medical clinic space. This results in a total of 164 bike spaces on-site. Five of the spaces will be sized to accommodate tandem bicycles and/or trailers. Also, under discussion is the installation of a BLUEbikes station to be located on the north side of Building A adjacent to Rindge Avenue. This would be a 19-dock station and would be open to the public as well as the residents and employees of the Project.

PROJECT MITIGATION

As demonstrated within this TIS, the Project is not expected to generate any substantial adverse impacts on traffic or area roadway networks. However, the Applicant is committed to implementing the mitigation efforts described below in order to improve current traffic impacts. The Project's location near Alewife Station significantly encourages transit use by employees, visitors and area residents to the proposed Project. Mitigation efforts are therefore geared towards a low single occupant vehicle (SOV) mode of transportation.

Transportation Demand Management Program

Reducing the amount of traffic generated by the Project is an important component of the transportation mitigation plan. The goal of the proposed traffic reduction strategy is to reduce the use of SOVs by encouraging the use of public transportation, car/vanpooling, bicycle commuting, and pedestrian travel. The following measures will be implemented as a part of the proposed project and by the property management team in an effort to reduce the number of vehicle trips generated by the project:

Ask Noah for site that provides real time info on transit

- Public transit schedules will be posted in centralized locations for new residents, employees and visitors of the medical clinic and office space. The pedestrian nature of the site will also be emphasized, as will the proximity of the Alewife Station.

- When training events are held in the office/educational space, use of alternative transportation will be encouraged. Staff and employees will be advised that parking is limited on site in an effort to limit the use of personal vehicles.

JAS Staff will be provided with stipend for T pass and Bluebikes???

- In order to encourage car/vanpooling, the property management team will coordinate with the Alewife Transportation Management Associations (TMA) to identify car/vanpool resources that may be available to new residents and employees/visitors of the medical clinic and office space. This information will be posted in centralized locations in the new buildings.

Contact to see if we can join

- The property management team will provide information on available pedestrian and bicycle facilities including BLUEbikes stations, multi-use paths, and bicycle racks in the vicinity of the project site and local destinations. This information will be posted in centralized locations on site.

The Applicant will investigate the implementation of these traffic reduction strategies and will work with the City, the TMA, and area businesses to implement these programs.

On-Site Parking

The

Approximately 37 parking spaces will be lost due to construction of the new buildings on site. However, the proponent believes that constraining the parking supply will have an overall positive effect on the living experience at Rindge Commons. By not providing parking spaces at the current demand rates, the site will effectively appeal to two types of potential residents: those residents without vehicles or those residents willing to forego their personal vehicles.

Parking spaces will be shared between uses, e.g. no reserved spaces for the office/educational space or medical clinic space. These are expected to operate in a shared parking analysis arrangement since the daytime residential demand is typically 60 percent of peak demand and the clinic and office/educational space is not expected to be open during the evening when peak residential demand occurs. In addition, the employees/students attending the office/educational space will be instructed to use alternatives to personal vehicles and will be informed that parking will not be provided for their vehicles on site. Most of the employee/students currently use public transportation and other transit means for commuting and this is not expected to change.

Can we really say this?

Bicycle Parking

The Proponent is adding long-term bike parking spaces and short-term bike parking spaces to meet requirements for the Project under zoning. To encourage the use of bicycling to and from the site, the Proponent is also reviewing the installation of a BLUEbikes station. This 19-dock station would further the City's goals of additional BLUEbikes stations throughout the City but especially along multi-use paths and residential neighborhoods in highly congested areas. The station will be installed on the north side of Building A, adjacent to the Rindge Avenue sidewalk in this area. From this point, connections to the Linear Park, Minuteman Bikeway, and other multi-use paths are available.

CONCLUSION

As required by Section 19.20, the Project has been evaluated against the five indicators as measurements of the Project's expected impact on City traffic. Of the 43 measurements analyzed in connection with the five indicators, only 1 was directly exceeded as a result of the Project. A total of four measurements are exceeded under existing conditions, with or without the Project. The Applicant is committed to the implementation of the above Project mitigation strategies in order to lessen any potential impact of the Project on City traffic. Accordingly, the Project is not expected to have a substantial adverse impact on City traffic such that issuance of a Project Review Special Permit is appropriate with respect to potential traffic impacts. This TIS finds that the Project can be accommodated within the existing area infrastructure and on the roadway network with minimal effects, resulting in the ability to modify the site associated with the Project as planned. This project is an expansion of existing residential development with limited parking in order to reduce private vehicle trip generation. The project proponent is committed to a project which is sensitive to the area and minimizes the impact to the neighborhood.

INTRODUCTION

VAI has conducted a TIS for a proposed expansion of the residential complex located at 402 Rindge Avenue in Cambridge, Massachusetts. This study reviews the potential transportation impacts, defines site access requirements, and recommends mitigation measures necessary to accommodate redevelopment of the site. In addition, the study reviews the project with respect to the City of Cambridge Special Permit Criteria regarding traffic impacts, is in accordance with the City's guidelines for TIS and follows the scoping determination dated September 13, 2018.

The following table outlines the existing and proposed characteristics of the Project.

Table 1.a.1
PROJECT CHARACTERISTICS

Characteristics	Existing Site	Proposed Project
Apartment Units	273	376
Occupied Units	268	--
Office/Classroom Space, approximate sf	0	14,000
Medical Clinic, approximate sf	0	21,450
Parking Spaces	273	236
Bicycle Spaces	26	164

Based on discussions with city staff, the Project will relocate vehicle access from the current main driveway to a secondary driveway approximately 60 feet to the east on Rindge Avenue. This driveway will be reconstructed to provide a Uber/Lyft/TNC pick-up/drop-off area and a separate bike lane on-site. The proposed site plan with points of vehicle and pedestrian access is shown on Figure 1.a.1.

A survey plan of the existing conditions of the site is shown in Figure 1.a.2 including property lines, abutting parcels, and property ownership with easements, as requested in the Scoping Letter.

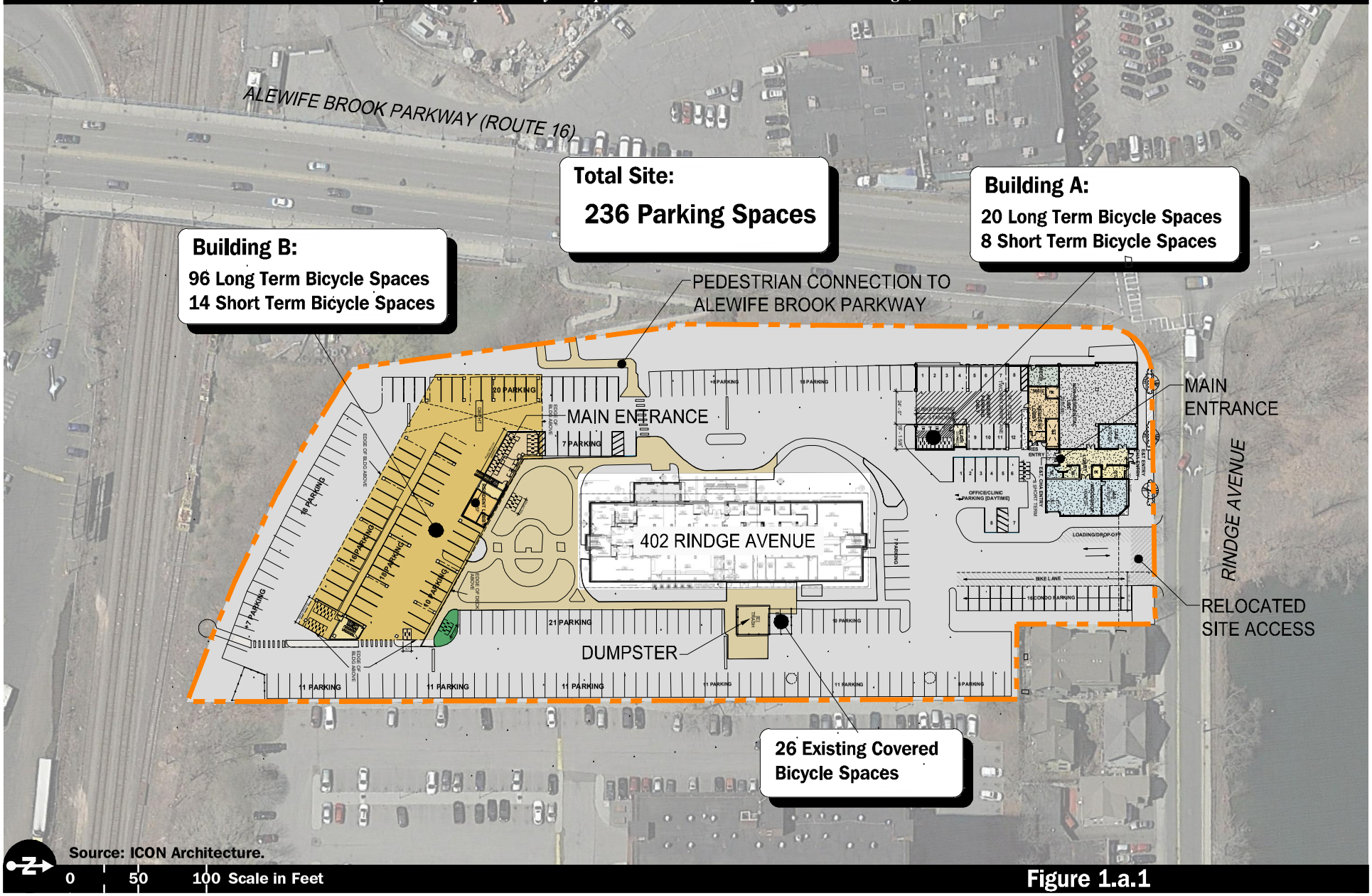


Figure 1.a.1

Proposed Site Plan

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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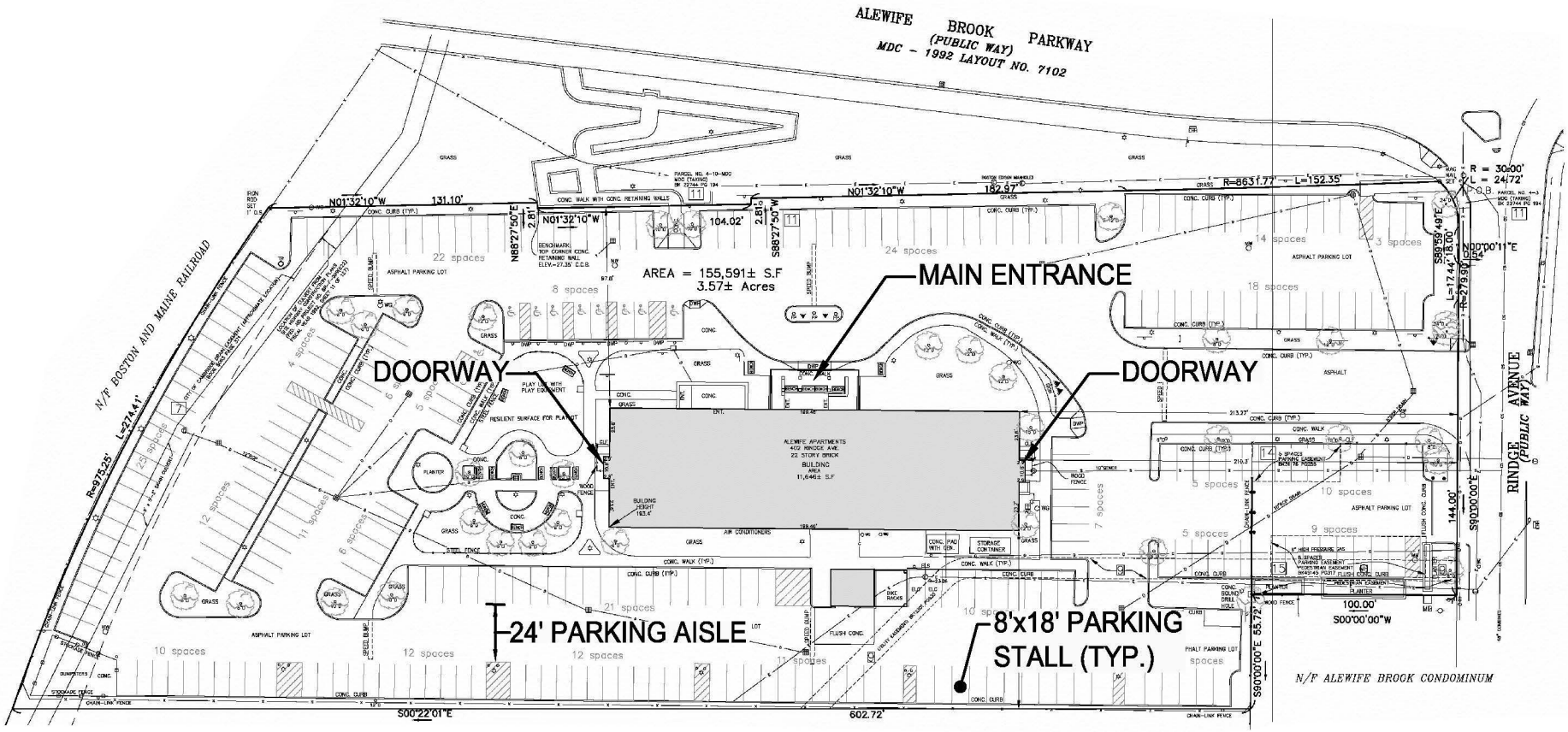


Source: R.E. Cameron & Associates, Inc.

0 40 80 Scale in Feet

Figure 1.a.2

Existing Conditions

Vanasse & Associates, Inc.
Transportation Engineers & Planners

1.0 EXISTING CONDITIONS

1.1 EXISTING TRAFFIC CONDITIONS

A field inventory of existing study area roadways was conducted to document baseline traffic conditions. Items collected regarding the study area roadways and intersections include roadway geometrics, traffic control devices, traffic signal timing plans, traffic volumes, vehicle queues, pedestrian crossing volumes, bicycle volumes, and safety data for the roadways in the vicinity of the site. Traffic volumes were measured by means of automatic traffic recorder counts (ATRs) and substantiated by manual turning-movement counts (TMCs) and vehicle-classification counts. Other transportation-related data inventoried include area parking supply and regulations, transit stop and services, and provision of bicycle and pedestrian facilities.

1.2 DESCRIPTION OF PROJECT STUDY AREA

The project study area was determined in consultation with City transportation officials. The study area was confirmed in the September 13, 2018 Scoping Determination from the City to VAI. The study area is listed below:

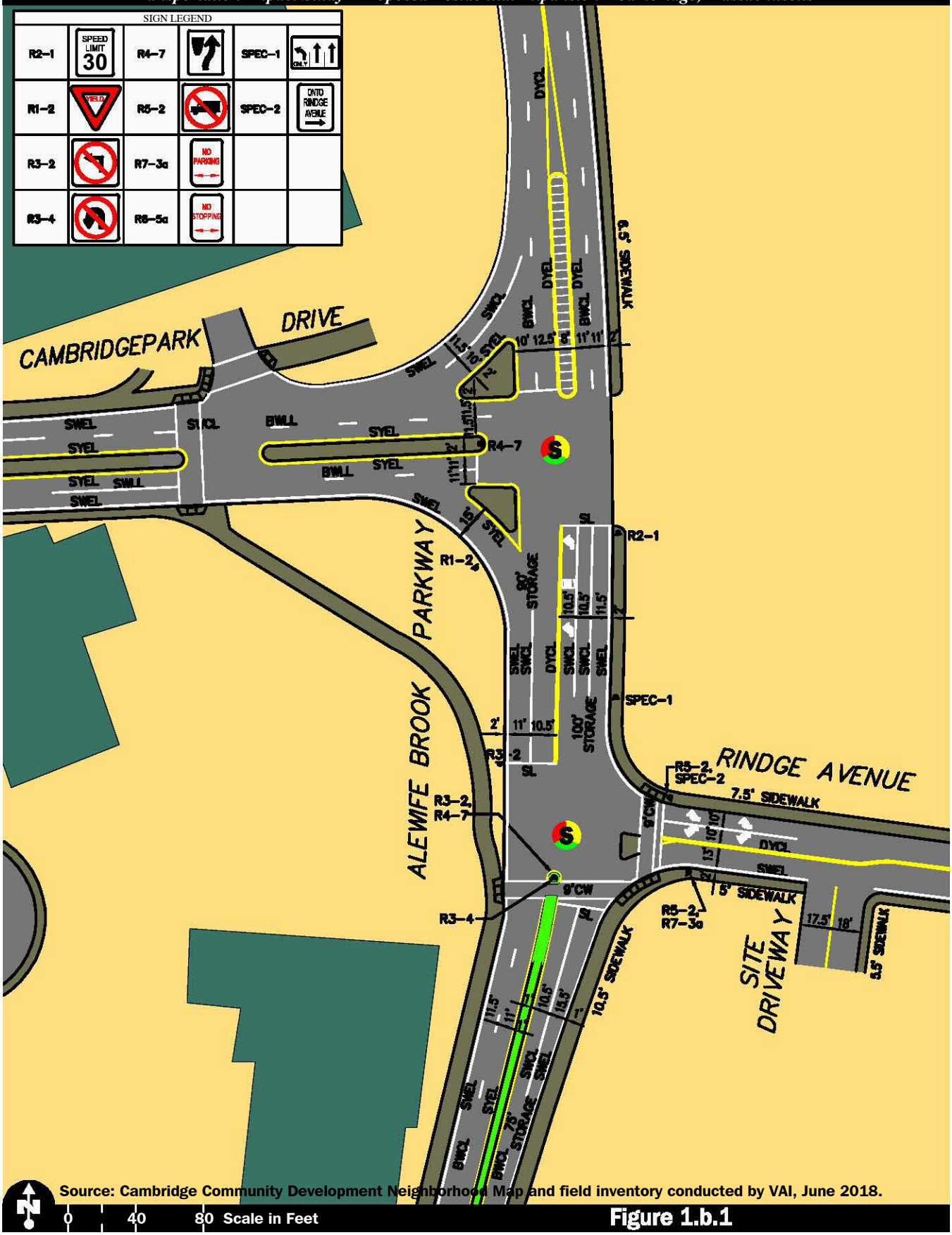
1. Alewife Brook Parkway at Cambridgepark drive
2. Alewife Brook Parkway at Rindge Avenue
3. Rindge Avenue at Site Driveway

Transportation Network

Regional access to the area is provided via Route 2 to the west and Alewife Brook Parkway to the east, north and south. In the immediate vicinity of the site, local access is provided from Rindge Avenue.

Geometric and Traffic Control

Intersection geometry and lane usage was obtained from field inventory and observations conducted by VAI in June 2018. A graphical depiction of intersection characteristics of the study area intersections is shown in Figure 1.b.1. Sidewalks and wheelchair ramps along Rindge Avenue and Alewife Brook Parkway are in fair to good condition.



Source: Cambridge Community Development Neighborhood Map and field inventory conducted by VAI, June 2018.

0 40 80 Scale in Feet

Figure 1.b.1

Intersection Inventory
Alewife Brook Parkway at
Rindge Avenue,
Cambridge Park Drive and
Site Driveway at Rindge Avenue

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Transportation Engineers & Planners

1.3 PARKING AND LOADING FACILITIES

Figure 1.c.1 depicts the existing surface vehicle parking and sheltered bicycle parking for the site.

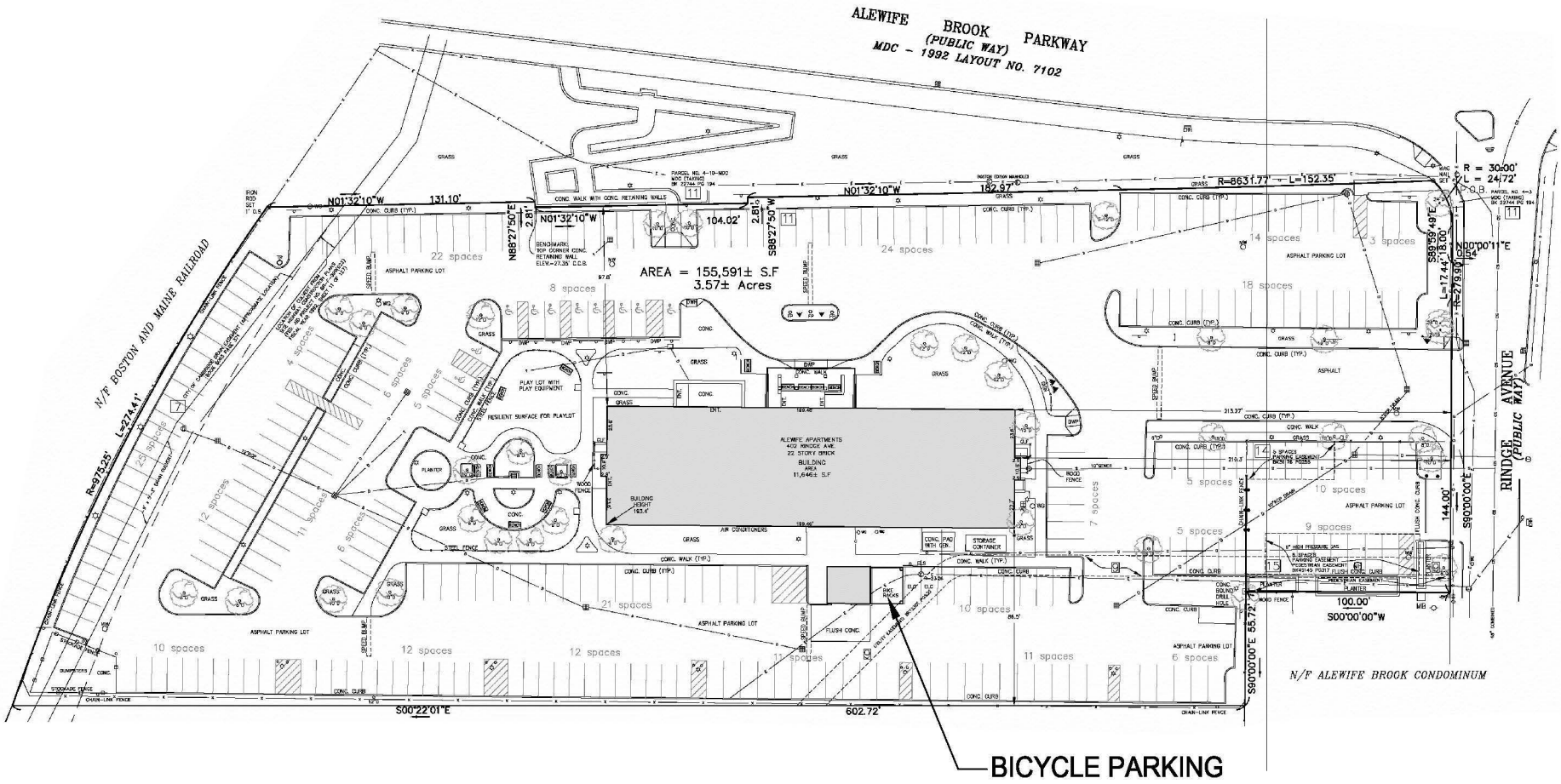
1.4 TRANSIT SERVICES

Figure 1.d.1 provides a graphical depiction of the regional public and private transportation services available in the area. Figure 1.d.2 provides a Carsharing and Ridesharing Services Map highlighting nearby locations of taxi stands and car-sharing services such as Zipcar. Figure 1.d.3 provides a Bike-sharing Station Map that identifies locations of BLUEbikes stations in the area. A bicycle route and multi-use path map is provided in Figure 1.d.4, which depicts the existing and future bicycle and multi-use path connections in the area. A bicycle route access map is provided in Figure 1.d.5, which depicts the routes to the site from streets and the public right-of-way.

1.5 LAND USE

Land uses in the vicinity of the site were researched and inventoried in October 2018 and are shown in Figure 1.e.1.

Parking Supply:
273 Parking Spaces
26 Bicycle Spaces



Source: R.E. Cameron & Associates, Inc.

0 40 80 Scale in Feet

Figure 1.c.1

Existing Parking Plan

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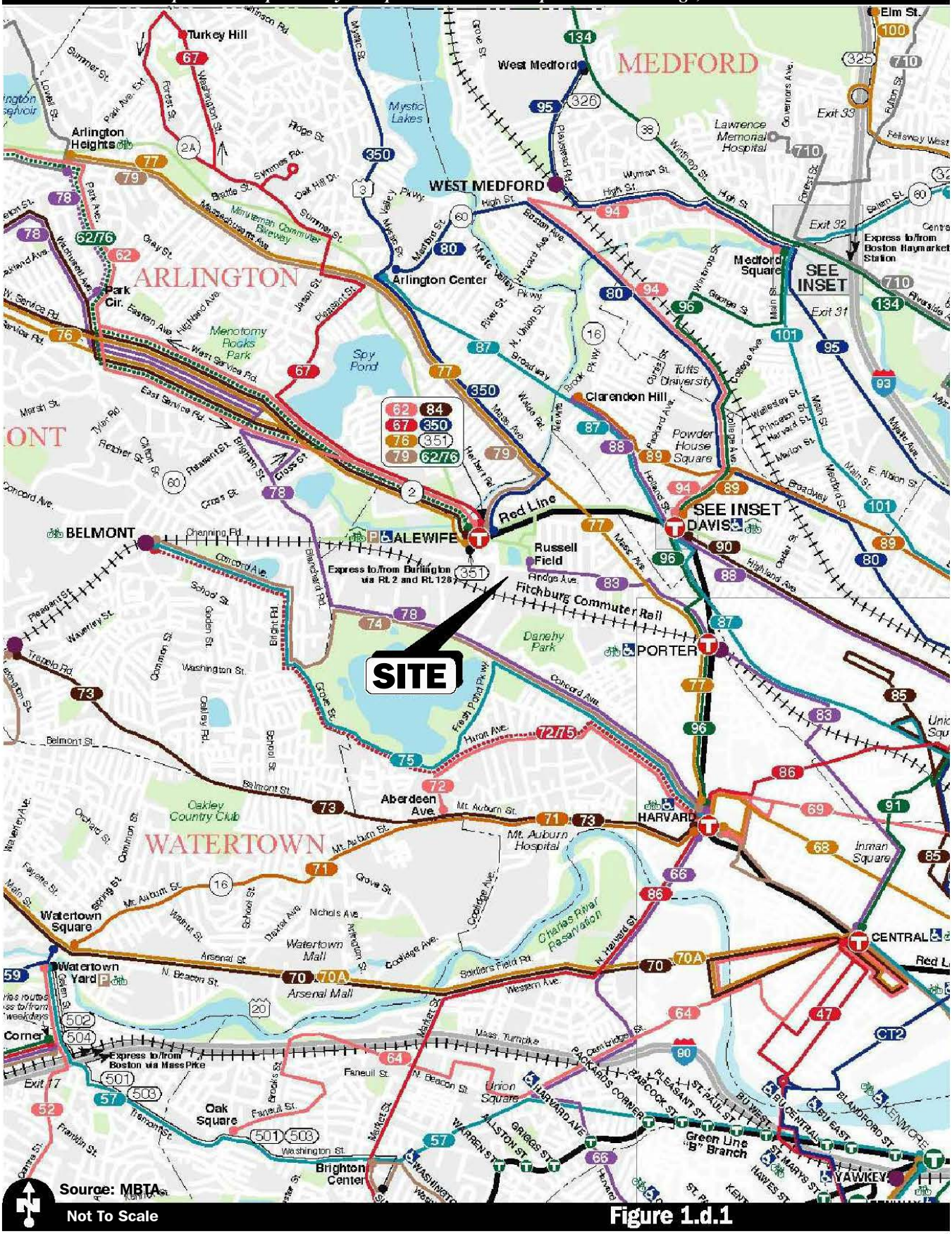

Figure 1.d.1

Transit Map

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Transportation Engineers & Planners

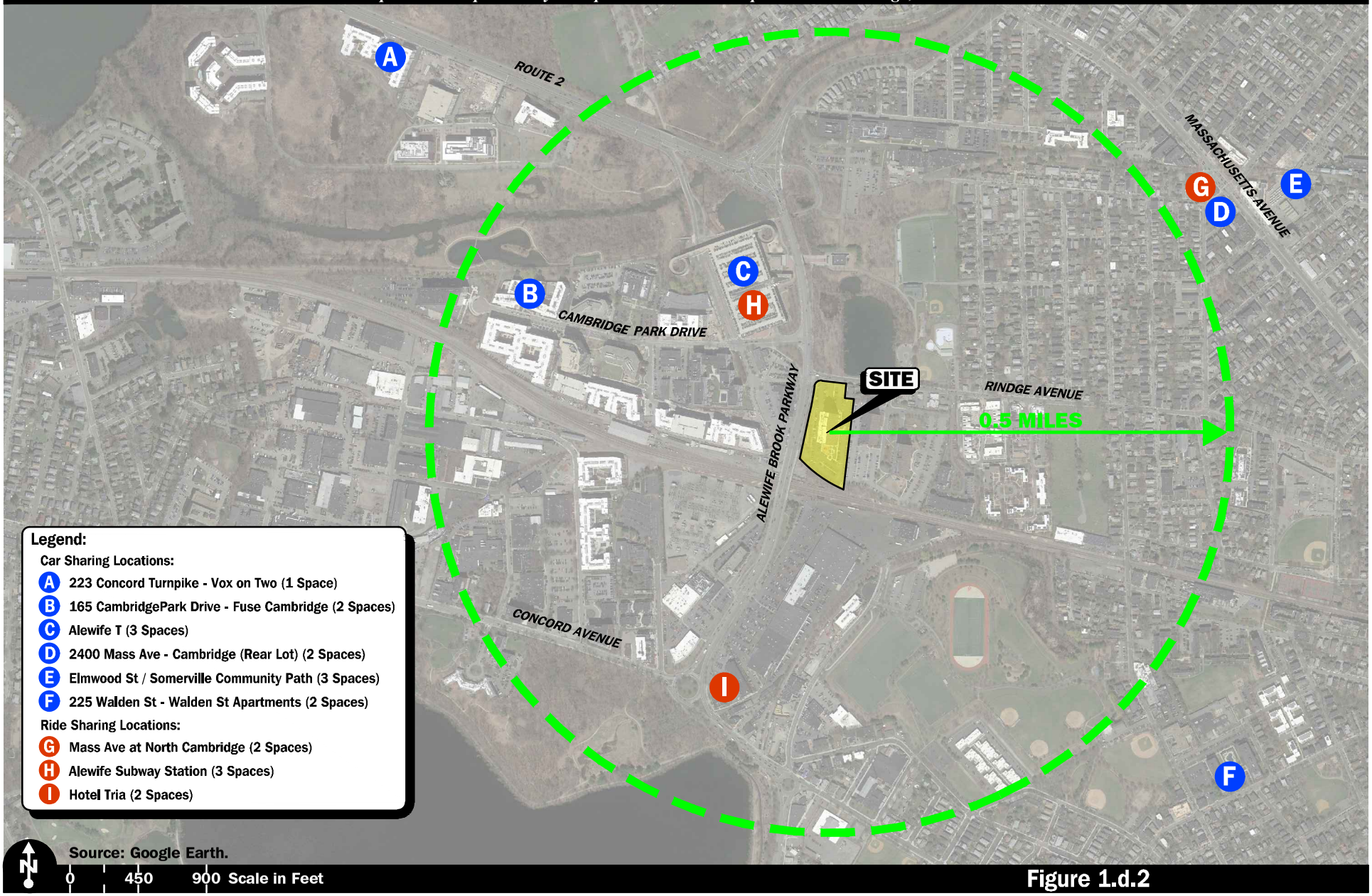

Figure 1.d.2

Car Sharing and Ride Sharing Service Map

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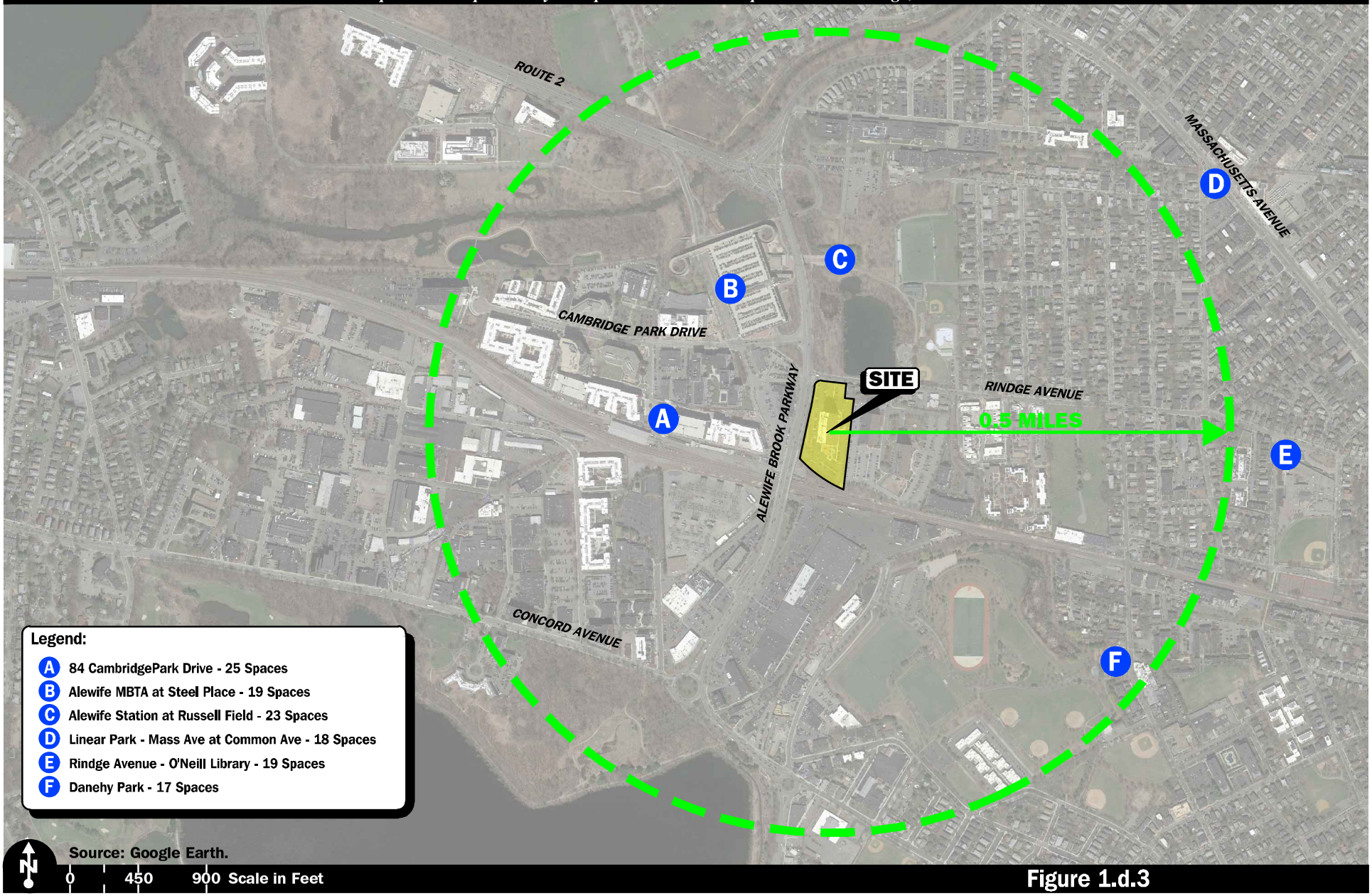

Figure 1.d.3

Blue Bike / Bike Sharing Stations Map

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Transportation Engineers & Planners

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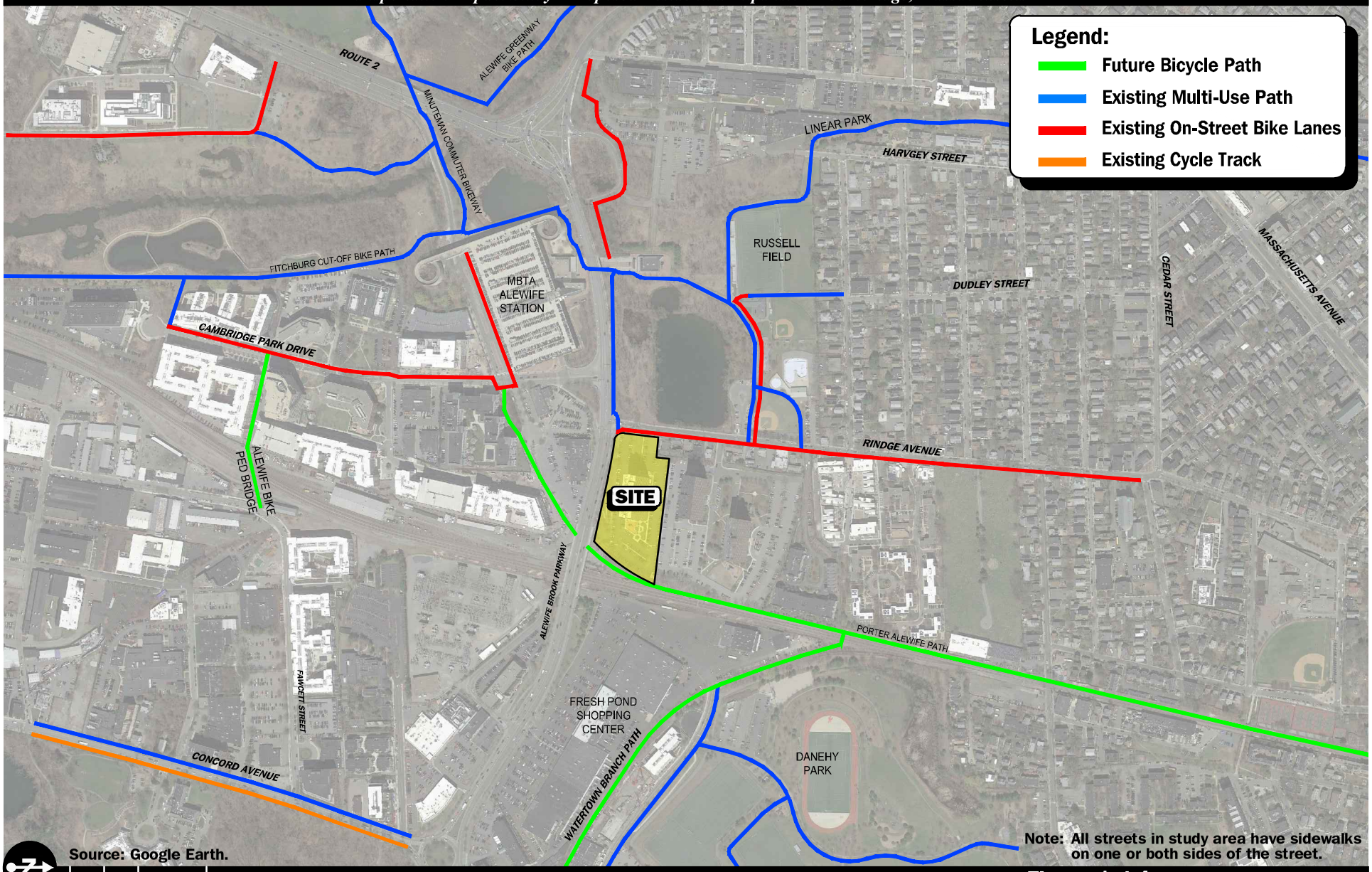

Figure 1.d.4

Existing and Future Bicycle and Multi-Use Path Connections

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Transportation Engineers & Planners

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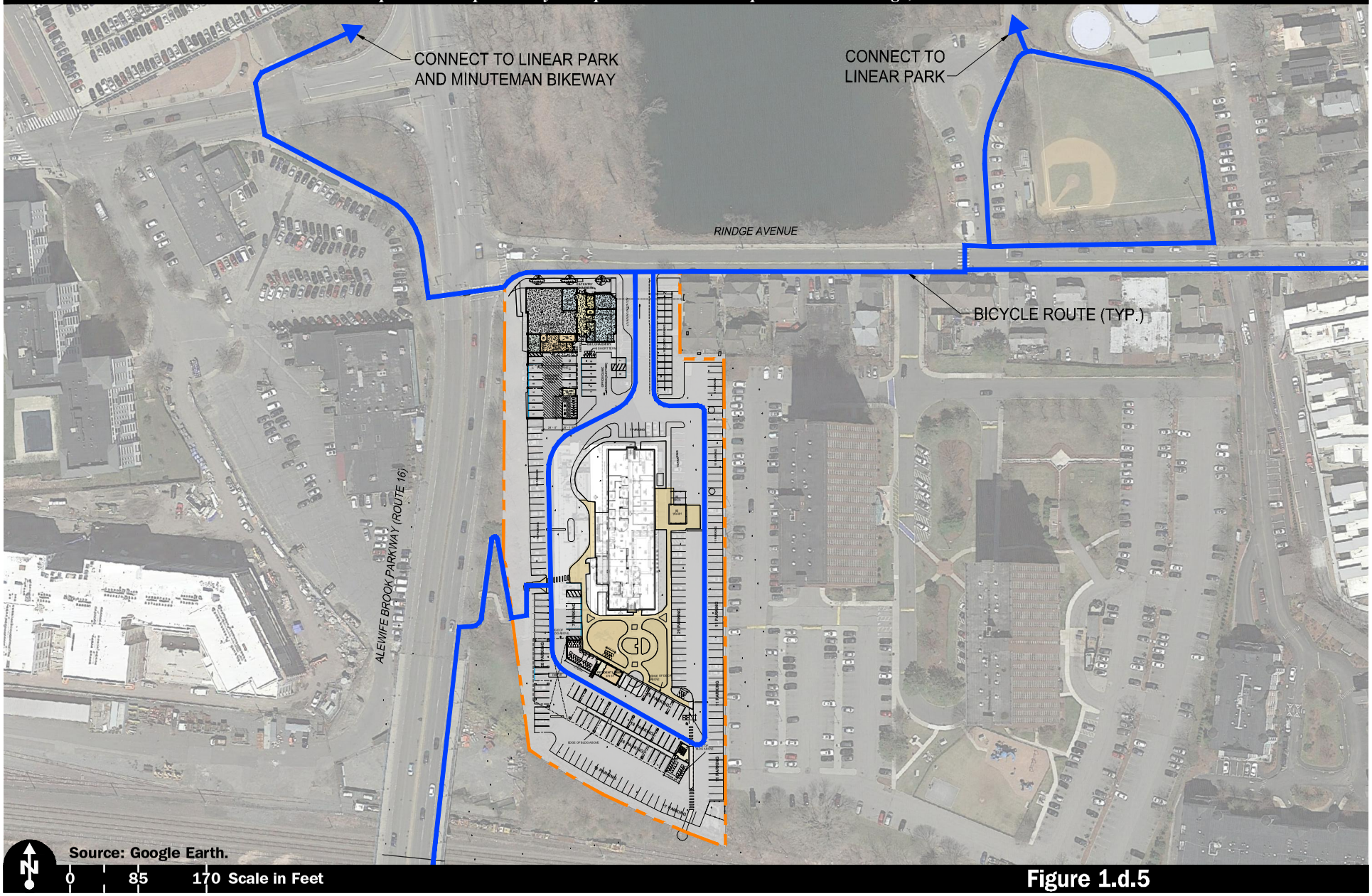

Figure 1.d.5

Bicycle Route Access Map

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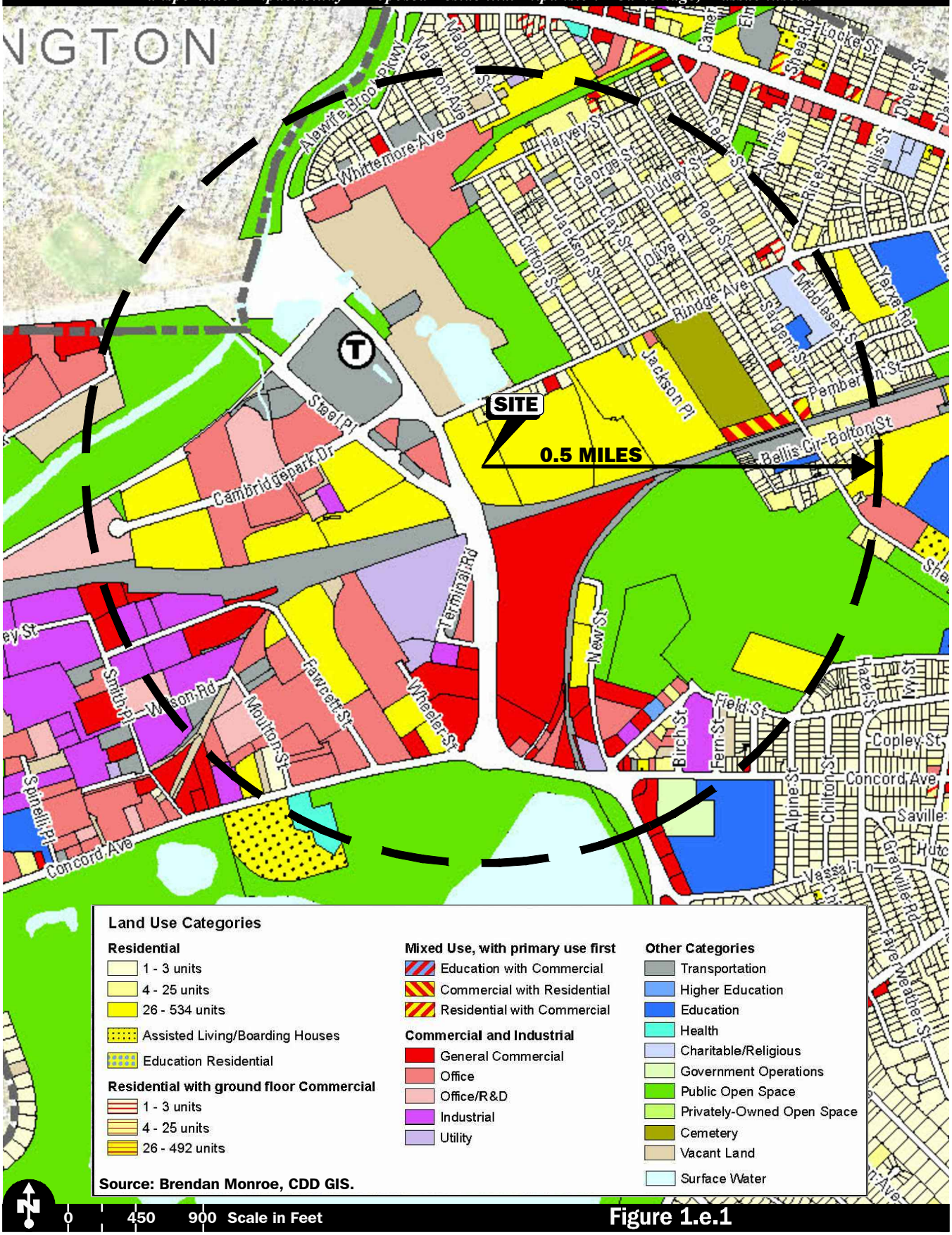

Figure 1.e.1

Land Use Map

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2.0 DATA COLLECTION

2.1 AUTOMATIC TRAFFIC RECORDER COUNTS

To establish existing traffic conditions within the study area, ATR counts and manual turning movement and vehicle classification (TMC) counts were conducted in October 2018 when colleges and public schools were in regular session. The 2018 traffic volumes were adjusted upward by 0.5 percent to develop the 2019 traffic volumes used in this analysis. The traffic count data sheets are provided in the Appendix. A summary of the ATR data is provided in Table 2.a.1, while the average hourly directional volumes recorded at the ATR locations are summarized in Table 2.a.2.

Table 2.a.1
2019 BASELINE TRAFFIC VOLUMES

		Morning Peak Hour			Evening Peak Hour			Saturday
Location	Weekday ADT[a]	Vehicles Per Hour	K Factor[b]	Directional Distribution[c]	Vehicles Per Hour	K Factor	Directional Distribution	ADT
Alewife Brook Parkway, north of Rindge Avenue	52,800	2,884	5.5	53%, NB	2,738	5.2	52%, SB	42,900
Rindge Avenue, east of Alewife Brook Parkway	11,350	813	7.2	85%, WB	864	7.6	78%, WB	10,050
Site Driveway, south of Rindge Avenue	990	76	7.7	64% NB	64	6.5	58% SB	920

[a]Average daily traffic in vehicles per day (vpd) based on ATR counts collected by VAI in October 2018.
[b]Percent of daily volume in peak hour.
[c]Percent traveling in the peak direction.

Table 2.a.2
AVERAGE HOURLY TRAFFIC VOLUMES AT ATR LOCATIONS[a]

	Alewife Brook Parkway, north of Rindge Avenue						Rindge Avenue, east of Alewife Brook Parkway						Site Driveway, south of Rindge Avenue					
	Weekday			Saturday			Weekday			Saturday			Weekday			Saturday		
Start Time	NB	SB	Total	NB	SB	Total	EB	WB	Total	EB	WB	Total	NB	SB	Total	NB	SB	Total
12:00 AM	257	124	381	879	235	1114	43	34	77	84	95	179	5	12	17	8	21	29
1:00	127	74	201	295	149	444	30	24	54	44	47	91	2	5	7	2	9	11
2:00	68	53	121	207	93	300	13	15	28	38	26	64	2	8	10	6	5	11
3:00	63	62	125	104	74	178	6	20	26	23	19	42	2	1	3	1	4	5
4:00	80	256	336	75	113	188	8	23	31	8	26	34	6	2	8	2	0	2
5:00	350	1099	1449	135	314	449	33	139	172	25	53	78	15	2	17	8	6	14
6:00	1007	2011	3018	310	510	820	93	348	441	43	121	164	27	7	34	15	3	18
7:00	2082	1788	3870	652	686	1338	363	395	758	79	159	238	53	15	68	19	3	22
8:00	1955	1437	3392	898	934	1832	404	389	793	139	273	412	36	31	67	28	11	39
9:00	1635	1678	3313	1159	1109	2268	253	403	656	186	374	560	26	17	43	29	12	41
10:00	1282	1713	2995	1486	1170	2656	209	317	526	236	443	679	23	26	49	30	15	45
11:00	1447	1504	2951	1481	1273	2754	235	346	581	279	405	684	29	28	57	28	23	51
12:00 PM	1627	1417	3044	1510	1426	2936	230	375	605	332	418	750	23	26	49	26	33	59
1:00	1659	1275	2934	1538	1489	3027	270	327	597	316	390	706	25	25	50	24	26	50
2:00	1775	1316	3091	1547	1421	2968	276	405	681	298	415	713	39	35	74	29	22	51
3:00	1725	1507	3232	1506	1373	2879	347	430	777	303	395	698	37	40	77	43	39	82
4:00	1665	1514	3179	1424	1446	2870	376	453	829	314	375	689	30	31	61	32	31	63
5:00	1454	1481	2935	1393	1542	2935	353	441	794	336	336	672	27	34	61	25	41	66
6:00	1516	1478	2994	1262	1593	2855	340	473	813	328	337	665	24	28	52	19	24	43
7:00	1624	1240	2864	1146	1121	2267	245	414	659	250	281	531	22	34	56	15	29	44
8:00	1381	840	2221	970	794	1764	206	316	522	189	243	432	14	28	42	15	23	38
9:00	1237	645	1882	846	656	1502	181	240	421	155	205	360	14	21	35	23	32	55
10:00	906	471	1377	745	514	1259	122	157	279	138	193	331	13	18	31	14	24	38
11:00	619	278	897	849	382	1231	101	107	208	95	146	241	9	25	34	18	20	38
Total[b]	27541	25261	52802	22417	20417	42834	4737	6591	11328	4238	5775	10013	503	499	1002	459	456	915

[a]Volumes based on ATR counts conducted by VAI in October 2018; expressed in vph.
[b]Daily volumes expressed in vpd.

2.2 INTERSECTION TURNING MOVEMENT COUNTS

Intersection turning movement counts were conducted at the study area intersections for the weekday morning (7:30 to 9:30 AM) and weekday evening (4:30 to 6:30 PM) time periods. Total cars, trucks, buses, pedestrians by movement, bicycles, and vehicle queues were recorded. The 2018 vehicular traffic volumes were grown by 0.5 percent to develop 2019 vehicular traffic volumes. The 2019 Existing weekday morning and weekday evening peak-hour traffic-volume networks are depicted on Figure 2.c.1. The pedestrian volumes are depicted in Figure 2.c.2 for the weekday morning and weekday evening peak-hour periods. Bicycle volumes are provided in Figure 2.c.3 for the weekday morning and weekday evening peak-hour periods.

2.3 EXISTING VEHICLE QUEUES

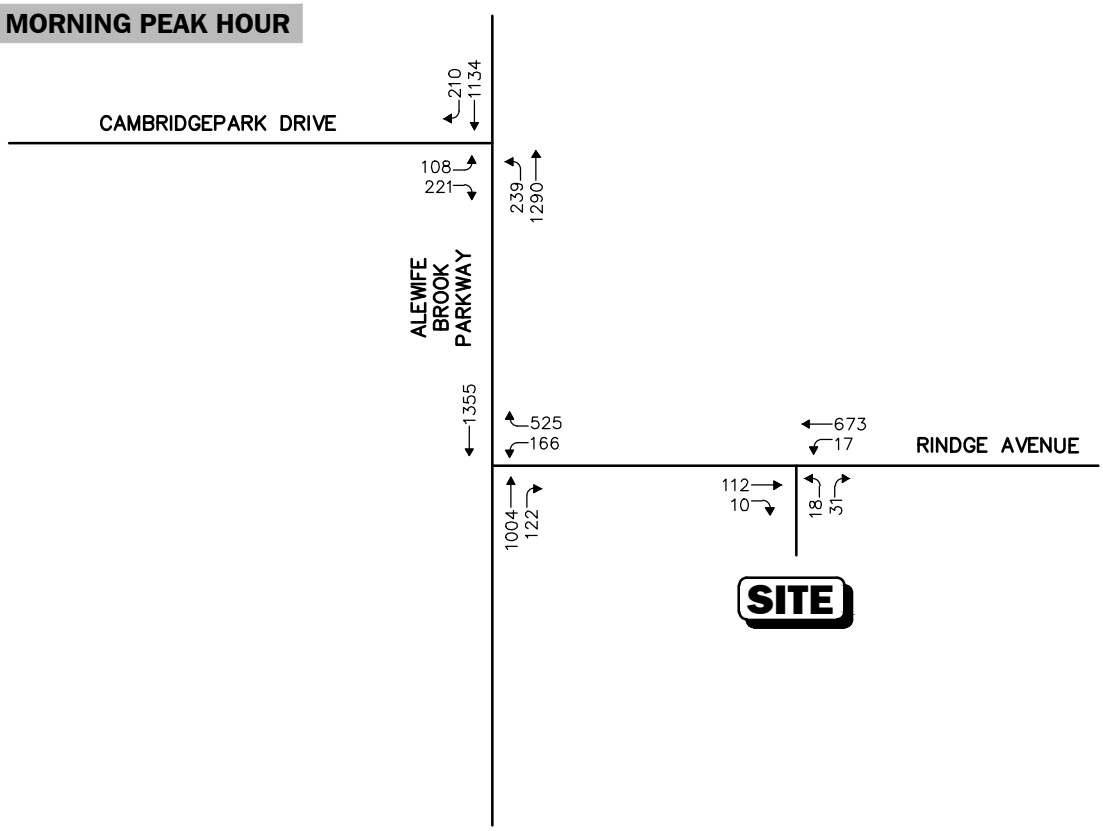
Vehicle queues were observed at the signalized intersections within the study area. Table 2.c.1 summarizes the vehicle queue observations by intersection approach and lane.

Table 2.c.1
EXISTING QUEUE OBSERVATIONS[a]

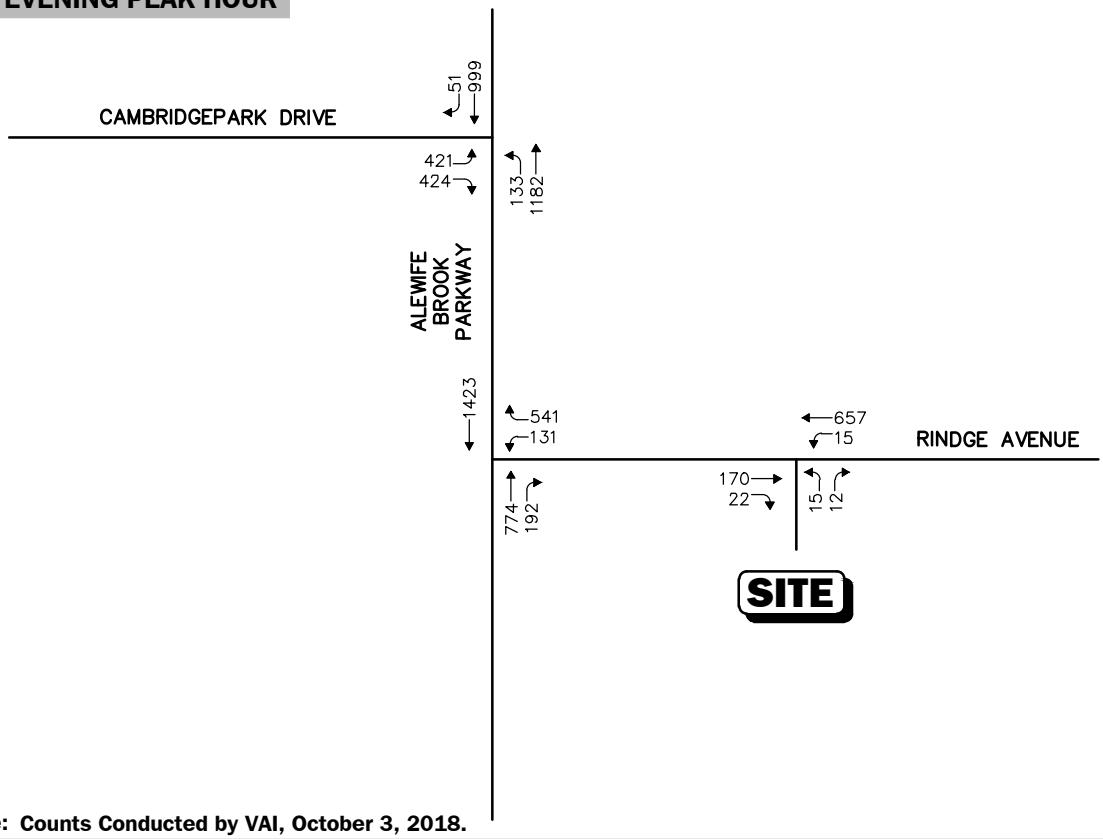
	Weekday Morning Peak Hour		Weekday Evening Peak Hour	
Intersection/Lane[b]	Average Queue	Maximum Queue	Average Queue	Maximum Queue
Alewife Brook Parkway at Rindge Avenue:				
Rindge Avenue WB LT	5	11	3	9
Rindge Avenue WB RT	22	23	18	23
Alewife Brook Parkway NB TH	17	17	17	17
Alewife Brook Parkway NB TH/RT	17	17	17	17
Alewife Brook Parkway SB TH[c]	3	9	4	8
Alewife Brook Parkway SB TH[c]	3	6	5	6
Alewife Brook Parkway at Cambridgepark Drive:				
Cambridgepark Drive EB LT	2	4	6	10
Cambridgepark Drive EB LT	1	5	2	7
Alewife Brook Parkway NB LT[d]	7	9	3	8
Alewife Brook Parkway NB TH[d]	6	8	6	8
Alewife Brook Parkway NB TH[d]	6	8	7	8
Alewife Brook Parkway SB TH	20	20	16	20
Alewife Brook Parkway SB TH	20	20	17	20

[a]Source: Based upon observations conducted by VAI in October 2018.
[b]EB = eastbound; WB = westbound; NB = northbound; SB = southbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.
[c]Does not include southbound queue on Alewife Brook Parkway at Cambridgepark Drive.
[d]Does not include northbound queue on Alewife Brook Parkway at Rindge Avenue.

WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR



Note: Counts Conducted by VAI, October 3, 2018.

Not To Scale

Figure 2.c.1

2019 Existing
Peak Hour Traffic Volumes

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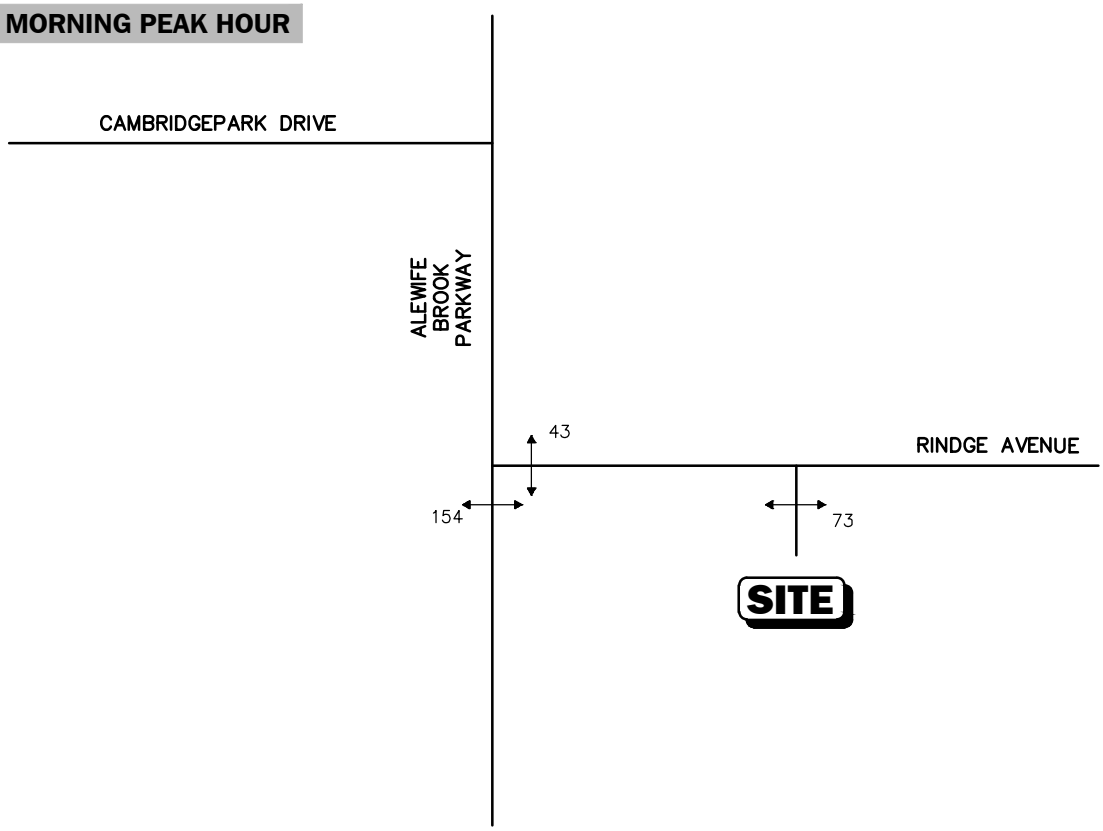
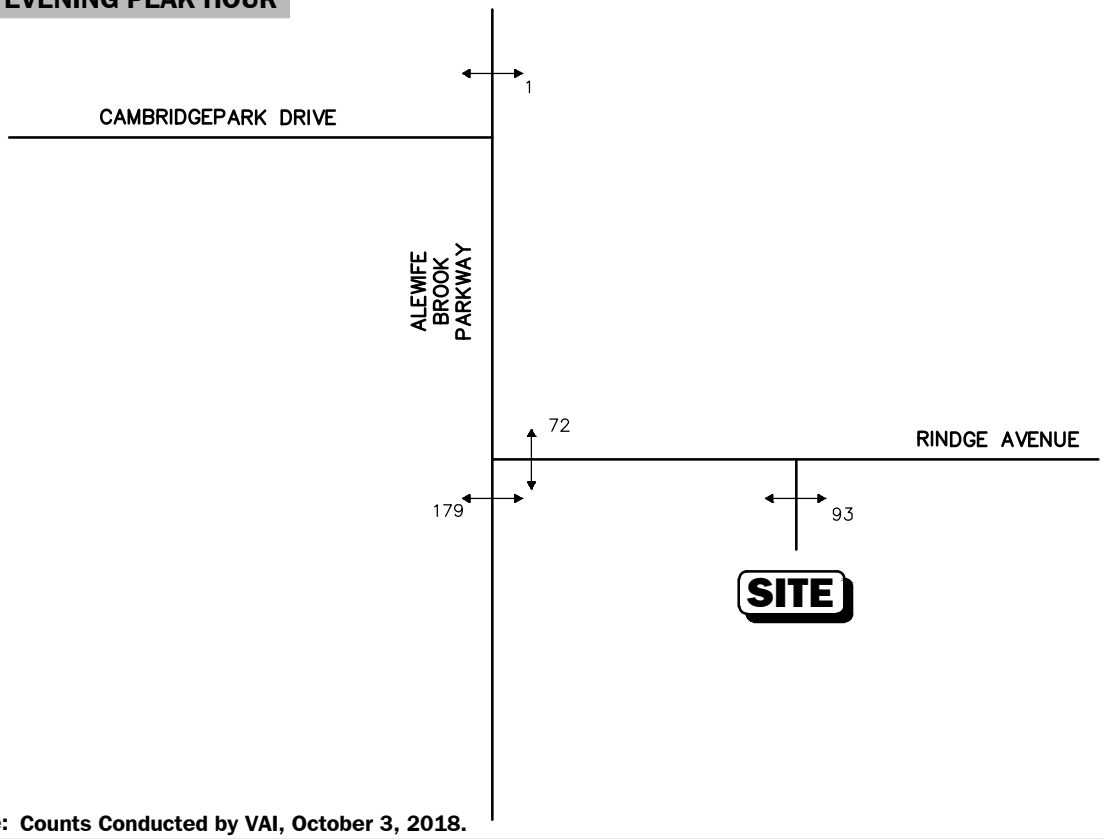
Transportation Engineers & Planners

WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR



Note: Counts Conducted by VAI, October 3, 2018.

Not To Scale

Figure 2.c.2

2019 Existing
Peak Hour Pedestrian Volumes

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Transportation Engineers & Planners

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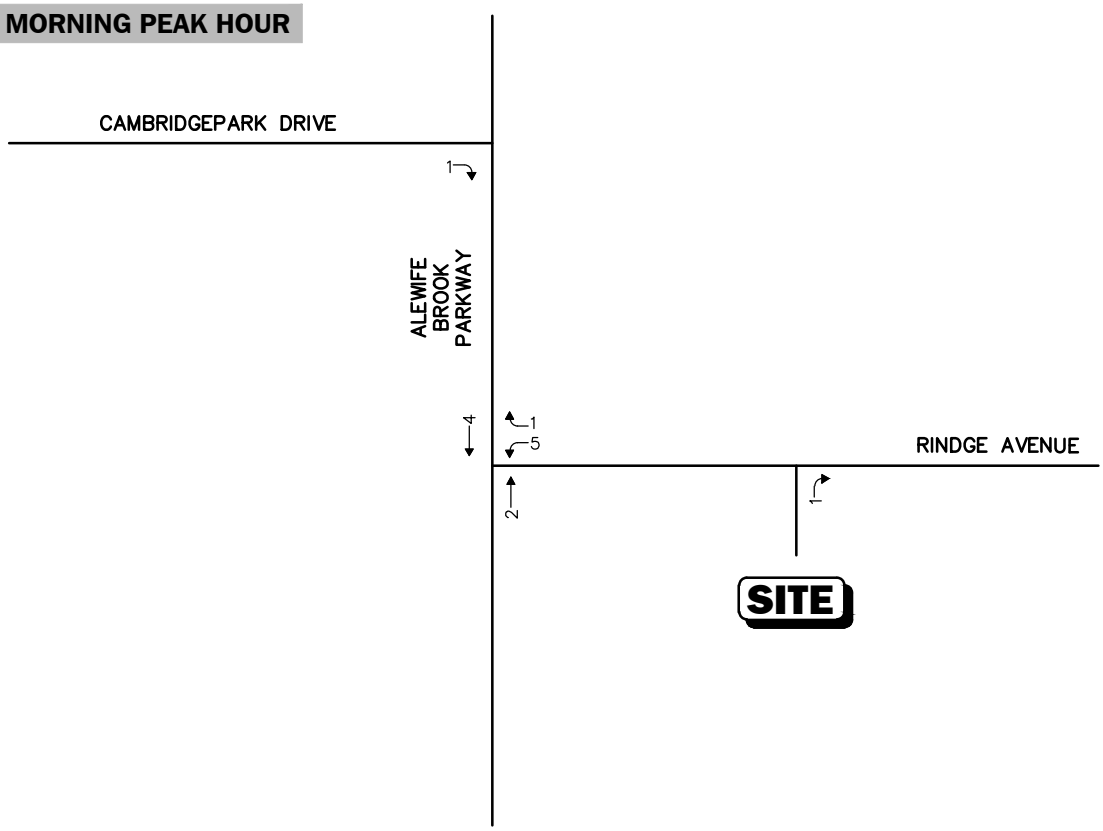
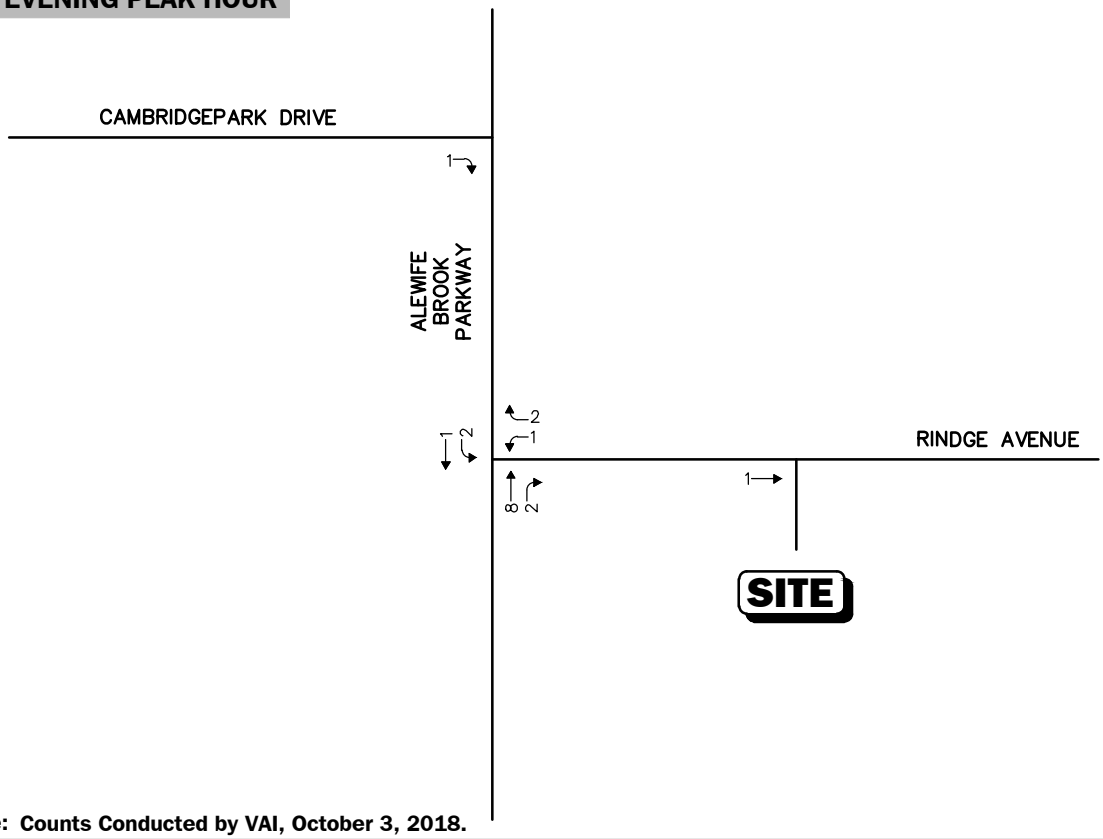
WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR



Note: Counts Conducted by VAI, October 3, 2018.

Not To Scale

Figure 2.c.3

2019 Existing
Peak Hour Bicycle Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners

2.4 MOTOR VEHICLE CRASH DATA

Motor vehicle crash data was obtained from the MassDOT Safety Management/Traffic Operations Unit for the most recent three-year period available (2014-2016) in order to examine motor vehicle crash trends occurring within the study area. This data is summarized in Table 2.d.1. Separate tables are provided that identify summaries of crashes between vehicles and pedestrians in Table 2.d.2 and crashes between vehicles and bicyclists in Table 2.d.3.

The crash summary indicates the intersection of Alewife Brook Parkway at Rindge Avenue has the highest crash total of the locations in the study area with an average of 11 crashes per year over the three-year study period. Approximately 61 percent of these crashes were rear-end type crashes, common with highly congested locations. The involvement of two pedestrians and zero bicyclists was noted in the crash data at this location, which is under the jurisdiction of the Department of Conservation and Recreation (DCR). The intersection of Alewife Brook Parkway and Cambridgepark Drive was noted to have an average of 5.67 crashes per year. No pedestrian or bicyclists crashes were noted in the crash data at this location, which is under the jurisdiction of the DCR. The intersection of Rindge Avenue at the Site Driveway was noted to have an average of 0.67 crashes per year. The one crash involved a bicyclist at this location, which is under the jurisdiction of the DCR.

None of the intersections were noted to have a crash rate higher than the Massachusetts Department of Transportation (MassDOT) District 6 average for intersections, currently noted at 0.71 crashes per million entering vehicles (mev) for signalized intersections and 0.52 crashes per mev for unsignalized intersections.

Table 2.d.1
VEHICLE CRASH DATA SUMMARY[a]

	Alewife Brook Parkway at Cambridgepark Drive	Alewife Brook Parkway at Rindge Avenue	Rindge Avenue at Site Driveway
Year:			
2014	7	13	0
2015	6	7	1
2016	4	11	0
Total	17	31	1
Average[a]	5.67	11.00	0.67
Crash Rate[b]	0.25	0.51	0.16
Significant[c]	No/No	No/No	No/No
Type:			
Angle	4	3	0
Rear-End	8	20	0
Head-On	0	1	0
Sideswipe	1	1	1
Fixed Object	4	6	0
Other/Unknown	0	0	0
Total	17	31	1
Time:			
Weekday 7 to 9 AM	0	5	1
Weekday 4 to 6 PM	6	5	0
Remainder of Day	11	21	0
Total	17	31	1
Pavement Conditions:			
Dry	12	24	0
Wet	4	2	1
Snow	1	3	0
Icy	0	0	0
Other	0	1	0
Unknown	0	1	0
Total	17	31	1
Day of Week:			
Monday through Friday	12	24	1
Saturday and Sunday	5	7	0
Total	17	31	1
Severity:			
Property Damage Only	14	26	0
Personal Injury	3	3	0
Fatal Crashes	0	0	0
Other/Unknown	0	2	1
Total	17	31	1

[a]Source: MassDOT Crash Data.
[b]Average crashes over three-year period. Includes crashes with pedestrians and/or bicyclist involvement show in Table 2.d.2 and Table 2.d.3.
[c]Crash Rate in crashes per million entering vehicles (mev). Includes crashes with pedestrian and/or bicyclist involvement shown in Table 2.d.2 and Table 2.d.3.
[d]Crash Rate noted as significant if rate exceeds 2018 MassDOT District 6/statewide averages of 0.71/0.78 and 0.52/0.57 for signalized and unsignalized intersections, respectively.

Table 2.d.2
CRASH DATA SUMMARY:
VEHICLE TO PEDESTRIAN[a]

	Alewife Brook Parkway at Rindge Avenue
Year:	
2014	0
2015	1
2016	1
Total	2
Average[a]	0.67
Time:	
Weekday 7 to 9 AM	1
Weekday 4 to 6 PM	0
Remainder of Day	1
Total	2
Pavement Conditions:	
Dry	2
Wet	0
Snow	0
Icy	0
Other	0
Unknown	0
Total	2
Day of Week:	
Monday through Friday	2
Saturday and Sunday	0
Total	2
Severity:	
Property Damage Only	0
Personal Injury	2
Fatal Crashes	0
Other/Unknown	0
Total	2

[a]Source: MassDOT Crash Data.
[b]Average crashes over three-year period.

Table 2.d.3
CRASH DATA SUMMARY:
VEHICLE TO BICYCLIST[a]

	Rindge Avenue at Site Driveway
Year:	
2014	0
2015	0
2016	1
Total	1
Average[a]	0.33
Time:	
Weekday 7 to 9 AM	0
Weekday 4 to 6 PM	0
Remainder of Day	1
Total	1
Pavement Conditions:	
Dry	1
Wet	0
Snow	0
Icy	0
Other	0
Unknown	0
Total	1
Day of Week:	
Monday through Friday	1
Saturday and Sunday	0
Total	1
Severity:	
Property Damage Only	0
Personal Injury	1
Fatal Crashes	0
Other/Unknown	0
Total	1

[a]Source: MassDOT Crash Data.
[b]Average crashes over three-year period.

2.5 EXISTING PUBLIC TRANSIT SYSTEM

The Site is located near Alewife Station, which is a terminating stop on the MBTA Red Line subway system. The Red Line continues to Park Street, where connections to the Green Line can be made; to Downtown Crossing, where connections to the Orange Line are possible; and to South Station, where connections to commuter rail services are available. Bus routes connect to each of these stations as well as to the Alewife Station, which is also the terminus for MBTA Bus Route 62, 67, 76, 79, 84, 350, and 351. The Russell Field entrance is approximately 100 feet east of the site driveway and is the terminus for MBTA Bus Route 83. Table 2.e.1 summarizes the most recent Red Line headway and boarding data for the Alewife Square station available from the MBTA.

Table 2.e.1
MBTA RED LINE SERVICE SUMMARY

Station	Rush Hour Headways (minutes)[b]	Daily Line Flow	Boarding Counts[a]			
			Weekday Morning Peak Hour		Weekday Evening Peak Hour	
			Boarding	Alighting	Boarding	Alighting
Alewife	8-9	23,607	2,374	646	887	2,315

[a]Source: MBTA composite of station passenger entry and ridership data, 2016 to 2018.
[b]Based on MBTA schedule.

Table 2.e.2 summarizes the peak-hour headways and capacity information for the 7 bus routes servicing the Alewife Station supplied by the MBTA and for Bus Route 83 which stops at Russell Field off of Rindge Avenue.

Table 2.e.2
MBTA BUS SERVICE SUMMARY[a]

Route No.	Route	Hours of Operation	Peak-Hour Headway (minutes)	Peak-Hour Peak-Direction Planning Capacity[b]	Daily Ridership	Estimated Daily Capacity
62	Bedford VA Hospital – Alewife Station	5:47 AM to 9:04 PM	6-35	162	1,370	2,592
67	Turkey Hill – Alewife Station	5:53 AM to 8:32 PM	22-35	108	640	2,484
76	Hanscom/Lincoln Lab – Alewife Station	6:00 AM to 10:39 PM	21-36	162	1,000	2,430
79	Arlington Heights – Alewife Station	6:35 AM to 10:03 PM	18-40	108-162	1,054	3,240
84	Arlmont Village – Alewife Station	6:42 AM to 6:59 PM	20-34	54-108	389	1,188
350	North Burlington – Alewife Station	6:04 AM to 11:00 PM	12-35	270-324	1,761	3,078
351	EMD Serono/Bedford Woods – Alewife Station	6:15 AM to 7:01 PM	46-62	108	161	432
83	Rindge Avenue – Central Square, Cambridge	5:10 AM to 1:20 AM	20-35	162	1,848	4,428

[a]Source: MBTA composite day ridership data, 2017 and 2018.
[b]Planning capacity is 54 passengers per bus.

2.6 EXISTING PARKING UTILIZATION

A review of parking utilization of the site was conducted in October 2018. A summary of the utilization data is provided in Table 2.f.1.

Table 2.f.1
PARKING UTILIZATION SUMMARY[a]

	Weekday		
Time	Number of Parking Spaces	Number of Occupied Spaces	Utilization
4:00 AM	273	215	79%
12:00 PM	273	125	46%
10:00 PM	273	165	60%
Surplus Spaces at Peak		58	
Max Percent Utilization			79%

[a]Based on parking counts conducted by VAI in October 2018.

The maximum utilization is 79 percent and occurs at 4:00 AM. There are 58 surplus spaces during the peak utilization.

2.7 BICYCLE PARKING

Bicycle parking is also provided on site. Long-term bicycle parking for 26 bicycles is provided in a shelter on the east side of the main building. The location of the existing bicycle parking was previously shown on Figure 1.a.1.

2.8 EXISTING PARKING OPERATIONS AND RATE SCHEDULE

Currently, each residential unit is allowed one parking space at no cost and an additional spot may be purchased for 50 dollars per month only if space is available. As of October 2018, 190 parking spaces were provided at no cost and an additional 52 were provided for the 50 dollars per month fee.

2.9 EXISTING LOADING AND TRASH OPERATIONS

The site is accessed from Rindge Avenue. The main building is presently serviced through one loading area at the back of the building. No changes are proposed to this area as a result of the Project. There is one trash dumpster located in the back of the building that is emptied twice per week. This was shown previously on Figure 1.a.1.

3.0 PROJECT TRAFFIC

3.1 TRIP GENERATION

The Project involves the construction of two new buildings on site. The buildings will contain 103 apartment units, a 14,000 sf office/educational and training area, and up to 21,450 sf of medical clinic space. Building A located at the north end of the site will contain residential and the commercial space, while the building to the south, Building B, will contain residential units only.

Residential Trip Generation

The proposed residential vehicle trips were based on vehicle trips rates calculated from the ATR placed on the site driveway in October 2018. Table 3.a.1 summarizes the proposed residential vehicle trip generation.

Table 3.a.1
EMPIRICAL RESIDENTIAL VEHICLE TRIP GENERATION SUMMARY

Time Period/ Directional Distribution	Existing Vehicle Trips[a]	Vehicle Trip Rate[b]	New Residential Vehicle Trips[c]
Weekday:			
Entering	499	1.84	190
Exiting	503	1.84	190
Total	1002	3.68	380
Weekday Morning Peak Hour:			
Entering	28	0.10	10
Exiting	51	0.19	20
Total	79	0.29	30
Weekday Evening Peak Hour:			
Entering	33	0.12	12
Exiting	29	0.11	12
Total	62	0.23	24

[a]Based on ATR counts conducted by VAI at the site driveway in October 2018.
[b]Based on existing trips divided by the number of existing residential units, 273 units.
[c]Based on vehicle trip rates multiplied by proposed number of new residential units, 103 units.

While the vehicle trips expected to be generated by the Project were based on empirical (observed) rates, a different approach was used to develop the non-vehicle based person trips expected to be generated by the

Project. These trips were calculated using Institute of Transportation Engineers (ITE)[2] Land Use Code (LUC) 222, Multifamily Housing (High-Rise) and the independent variable of 103 units. The ITE vehicle trips were converted to person trips using residential mode split data collected from a resident survey that was conducted at the existing site in October 2018 and supplemented in February 2019. Vehicle occupancy and census data from the American Community Survey[3] (ACS) including Average Vehicle Occupancy (AVO) data were also used to develop person trips. Mode split characteristics of the existing site that was obtained from the resident survey are provided in Table 3.a.2. Table 3.a.3 summarizes the proposed residential person trip generation.

Table 3.a.2
402 RINDGE AVENUE - RESIDENTIAL MODE SPLIT CHARACTERISTICS

Mode Split Characteristics	402 Rindge Avenue[a]
Single Occupancy Vehicle (SOV)	39
High Occupancy Vehicle (HOV)	6
Transit	32
Pedestrian	20
Bicycle	1
Other	2
TOTAL	100

[a]Based on 2018 survey conducted at the 402 Rindge Avenue residential development.

[2] *Trip Generation Manual, 10th Edition;* ITE; Washington, D.C.; 2017.
[3] *2012-2016 American Community Survey, 5-year Estimates.*

Table 3.a.3
RESIDENTIAL PERSON TRIP GENERATION SUMMARY

Time Period/ Directional Distribution	ITE Vehicle Trips[a]	Person Trips[b]						
	Residential	Residential Total Trips[c]	SOV[d] (39%)	HOV[d] (6%)	Transit (32%)	Pedestrian (20%)	Bicycle (1%)	Other (2%)
Weekday Daily:								
Entering	309	328	128	20	105	66	3	6
Exiting	309	328	128	20	105	66	3	6
Total	618	656	256	40	210	132	6	12
Weekday Morning Peak Hour:								
Entering	10	11	4	1	3	2	0	0
Exiting	32	34	13	2	11	7	0	1
Total	42	45	17	3	15	9	0	1
Weekday Evening Peak Hour:								
Entering	27	29	11	2	9	6	0	1
Exiting	17	18	7	1	6	4	0	0
Total	44	47	18	3	15	10	0	1

[a]Based on ITE LUC 222 – Multifamily Housing (High-Rise), 103 units.
[b]Mode splits based on 2018 survey conducted at the 402 Rindge Avenue residential development.
[c]ITE vehicle trips converted to person trips based on rate of 1.06 persons per vehicle, from the 2012-2016 American Community Survey 5-Year Estimates for the United States.
[d]Auto trips not used in analysis.

Office Trip Generation

The office/educational and training space trips were calculated using ITE trip generation information, LUC 710, General Office Building, and the independent variable of 60 employees. These baseline office trips were then adjusted to Cambridge-specific trips using 2018 mode split data from Discovery Park, a nearby North Cambridge-area office development, and AVO data from ACS for the nation as a whole and for Census Tract 3549, the census tract in which the site is located. Cambridge CDD provided the 2018 PTDM monitoring report that was prepared for the Discovery Park office development near 402 Rindge Avenue. Mode split characteristics of the Discovery Park office development obtained from the PTDM report are provided in Table 3.a.4. Table 3.a.5 summarizes the proposed office/educational and training space trip generation.

Table 3.a.4
NORTH CAMBRIDGE - AREA OFFICE MODE SPLIT CHARACTERISTICS

Mode Split Characteristics	Discovery Park[a]
Single Occupancy Vehicle (SOV)	52
High Occupancy Vehicle (HOV)	3
Transit	26
Pedestrian	4
Bicycle	7
Other	8
TOTAL	100

[a]Based on 2018 PTDM survey conducted at the Discovery Park office development.

Table 3.a.5
OFFICE TRIP GENERATION SUMMARY

Time Period/ Directional Distribution	ITE Vehicle Trips[a]	Person Trips[b]							
	Office	Office Total Trips[c]	SOV (52%)	HOV (3%)	Transit (26%)	Pedestrian (4%)	Bicycle (7%)	Other (8%)	Proposed Vehicle Trips[d]
Weekday Daily:									
Entering	99	105	55	3	27	4	7	9	53
Exiting	99	105	55	3	27	4	7	9	53
Total	198	210	110	6	54	8	14	18	106
Weekday Morning Peak Hour:									
Entering	18	19	10	1	5	1	1	1	10
Exiting	4	4	2	0	1	0	0	1	2
Total	22	23	12	1	6	1	1	2	12
Weekday Evening Peak Hour:									
Entering	5	5	3	0	1	0	0	1	3
Exiting	19	20	10	1	5	1	1	2	10
Total	24	25	13	1	6	1	1	3	13

[a]Based on ITE LUC 710 – General Office Building, 60 employees.
[b]Mode splits based on 2018 PTDM monitoring report for Discovery Park.
[c]ITE vehicle trips converted to person trips based on rate of 1.06 persons per vehicle, from the 2012-2016 American Community Survey 5-Year Estimates for the United States.
[d]SOV and HOV person trips converted to vehicle trips based on rate of 1.10 persons per vehicle, from the 2012-2016 American Community Survey 5-Year Estimates for Census Tract 3549.

Medical Trip Generation

The project may also include the development of a medical clinic. This clinic would be open to the general public, not just to residents of the site. Therefore, trips associated with the medical clinic were calculated using ITE trip generation information, LUC 630, Clinic, and the independent variable of 21,450 sf. The ITE vehicle trips were converted to person trips using medical mode split data collected from the resident survey that was conducted at 402 Rindge Avenue in October 2018 and supplemented in February 2019, and vehicle occupancy and census data from the ACS. AVO was determined from ACS for the nation as a whole and for Census Tract 3549, the census tract in which the site is located. The mode-split data obtained from the resident survey are provided in Table 3.a.6. Table 3.a.7 summarizes the proposed medical clinic trip generation.

Table 3.a.6
402 RINDGE AVENUE - MEDICAL MODE SPLIT CHARACTERISTICS

Mode Split Characteristics	402 Rindge Avenue[a]
Single Occupancy Vehicle (SOV)	47
High Occupancy Vehicle (HOV)	9
Transit	33
Pedestrian	9
Bicycle	0
Other	2
TOTAL	100

[a]Based on 2018 survey conducted at the 402 Rindge Avenue residential development.

Table 3.a.7
MEDICAL TRIP GENERATION SUMMARY

Time Period/ Directional Distribution	ITE Vehicle Trips[a]	Person Trips[b]							
	Medical	Office Total Trips[c]	SOV (47%)	HOV (9%)	Transit (33%)	Pedestrian (9%)	Bicycle (0%)	Other (2%)	Proposed Vehicle Trips[d]
Weekday Daily:									
Entering	409	434	204	39	143	39	0	9	221
Exiting	409	434	204	39	143	39	0	9	221
Total	818	868	408	78	286	78	0	18	442
Weekday Morning Peak Hour:									
Entering	62	65	31	6	21	6	0	1	34
Exiting	17	18	8	2	6	1	0	1	9
Total	79	83	39	8	27	7	0	2	43
Weekday Evening Peak Hour:									
Entering	19	20	9	2	7	2	0	0	10
Exiting	46	49	23	5	16	4	0	1	25
Total	65	69	32	7	23	6	0	1	35

[a]Based on ITE LUC 630 – Clinic, 21,450 sf.
[b]Mode splits based on 2018 survey conducted at the 402 Rindge Avenue residential development.
[c]ITE vehicle trips converted to person trips based on rate of 1.06 persons per vehicle, from the 2012-2016 American Community Survey 5-Year Estimates for the United States.
[d]SOV and HOV person trips converted to vehicle trips based on rate of 1.10 persons per vehicle, from the 2012-2016 American Community Survey 5-Year Estimates for Census Tract 3549.

The total new vehicle trip generation for the site is summarized in Table 3.a.8 while the total new person trip generation is summarized in table 3.a.9.

Table 3.a.8
TOTAL NEW VEHICLE TRIP GENERATION SUMMARY

Time Period/ Directional Distribution	Proposed Residential Vehicle Trips[a]	Proposed Office Vehicle Trips[b]	Proposed Medical Vehicle Trips[b]	Total New Vehicle Trips
Weekday:				
Entering	190	53	221	464
Exiting	190	53	221	464
Total	380	106	442	928
Weekday Morning Peak Hour:				
Entering	10	10	34	54
Exiting	20	2	9	31
Total	30	12	43	85
Weekday Evening Peak Hour:				
Entering	12	3	10	25
Exiting	12	10	25	47
Total	24	13	35	72

[a]From Table 3.a.1.
[b]From Table 3.a.5.
[c]From Table 3.a.7

Table 3.a.9
TOTAL NEW PERSON TRIP GENERATION SUMMARY[a]

Time Period/ Directional Distribution	Total Transit Trips	Total Pedestrian Trips	Total Bicycle Trips	Total Other Trips
Weekday:				
Entering	275	109	10	24
Exiting	275	109	10	24
Total	550	218	20	48
Weekday Morning Peak Hour:				
Entering	30	9	1	2
Exiting	18	8	0	3
Total	48	17	1	5
Weekday Evening Peak Hour:				
Entering	17	8	0	2
Exiting	27	9	1	3
Total	44	17	1	5

[a]From Table 3.a.3, Table 3.a.5, and Table 3.a.7

As can be seen in Table 3.a.8, the Project is expected to generate 928 new vehicle trips on an average weekday (two-way, 24-hour volume), with 85 new vehicle trips (54 vehicles entering and 31 exiting) expected during the weekday morning peak-hour. During the weekday evening peak hour the Project is expected to generate 72 new vehicle trips (25 vehicles entering and 47 exiting).

As can be seen in Table 3.a.9, the Project is expected to generate 550 new transit trips on an average weekday (two-way, 24-hour volume), with 48 new transit trips expected during the weekday morning peak-hour. During the weekday evening peak hour the Project is expected to generate 44 new transit trips. The Project is expected to generate 218 new pedestrian trips on an average weekday, with 17 new pedestrian trips expected during the weekday morning peak-hour. During the weekday evening peak hour the Project is expected to generate 17 new pedestrian trips. The Project is expected to generate 20 new bicycle trips on an average weekday, with 1 new bicycle trips expected during the weekday morning peak-hour. During the weekday evening peak hour the Project is expected to generate 1 new bicycle trip. The Project is expected to generate 48 new other trips on an average weekday, with 5 new other trips expected during the weekday morning peak-hour. During the weekday evening peak hour the Project is expected to generate 5 new other trips.

3.2 TRIP DISTRIBUTION

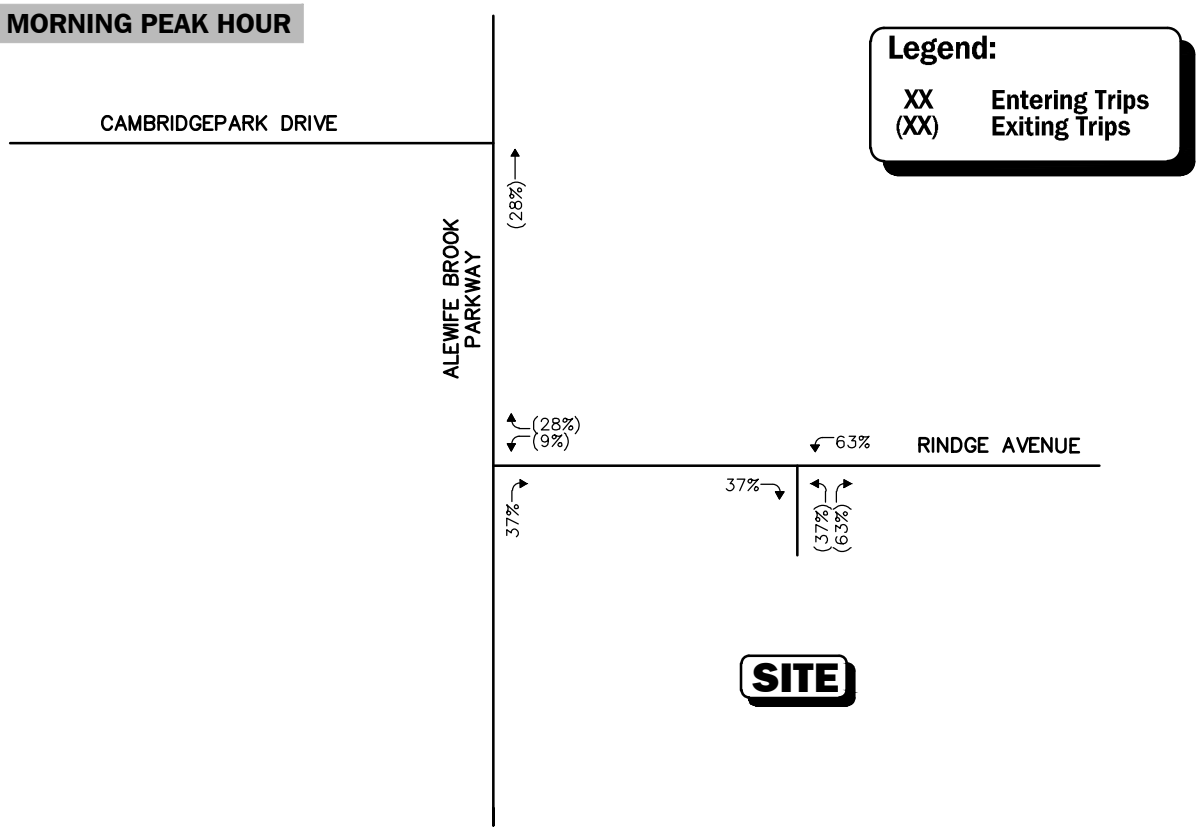
The new vehicle trips were distributed based on existing traffic patterns and movements at the site driveway and study area intersections. The new vehicle trip distributions for the weekday morning and weekday evening peak hours are shown in Table 3.b.1.

Table 3.b.1
VEHICLE TRIP-DISTRIBUTION SUMMARY

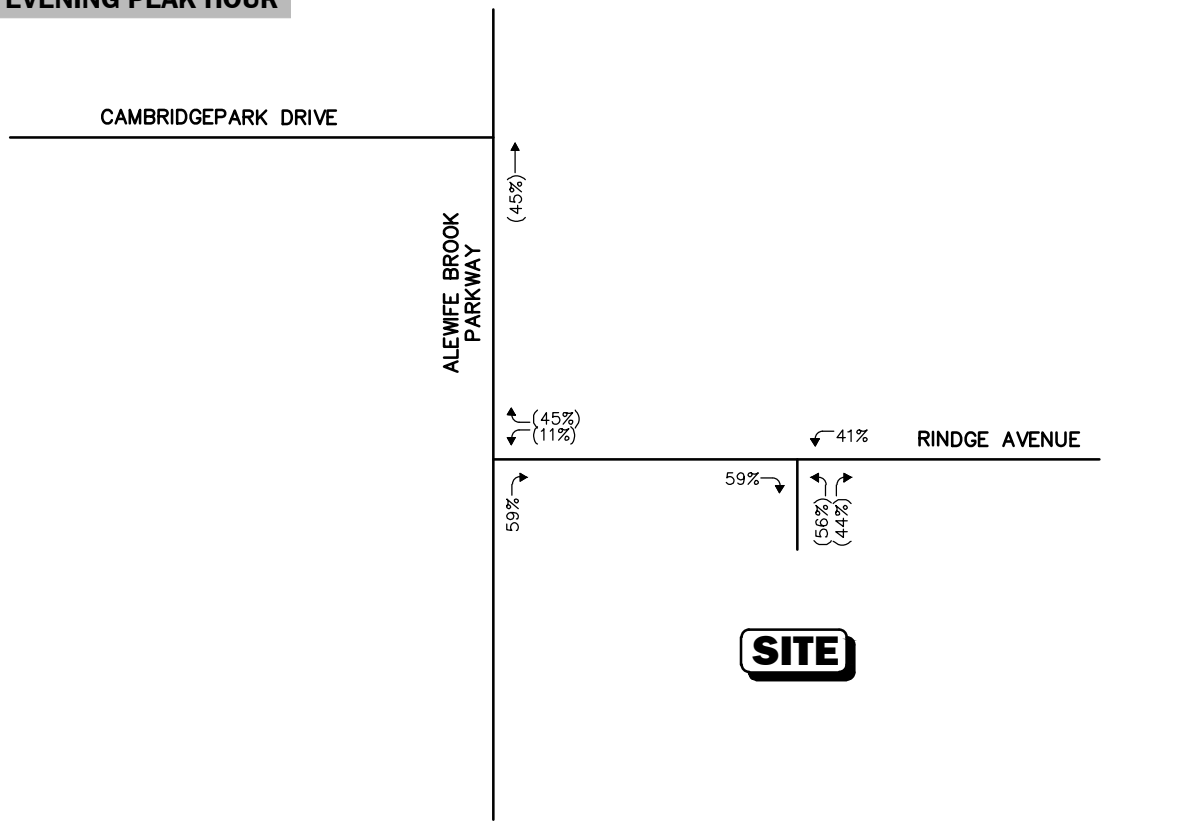
		Weekday Morning Peak Hour		Weekday Evening Peak Hour	
Route	Direction	Percentage From Direction to Site	Percentage To Direction from Site	Percentage From Direction to Site	Percentage To Direction from Site
Alewife Brook Parkway	North	0	28	0	45
Alewife Brook Parkway	South	37	9	59	11
Rindge Avenue	East	63	63	41	44
TOTAL		100	100	100	100

The trip distribution is also shown on Figure 3.a.1. The office trips for the weekday morning and weekday evening peak-hour time periods are shown on Figure 3.a.2. The residential trips for the same time periods are shown on Figure 3.a.3. The medical trips for the same time periods are shown on Figure 3.a.4, and the resulting New Site Generated vehicle trips are shown on Figure 3.a.5, for the same respective time periods.

WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR



Not To Scale

Figure 3.a.1

Trip Distribution Map

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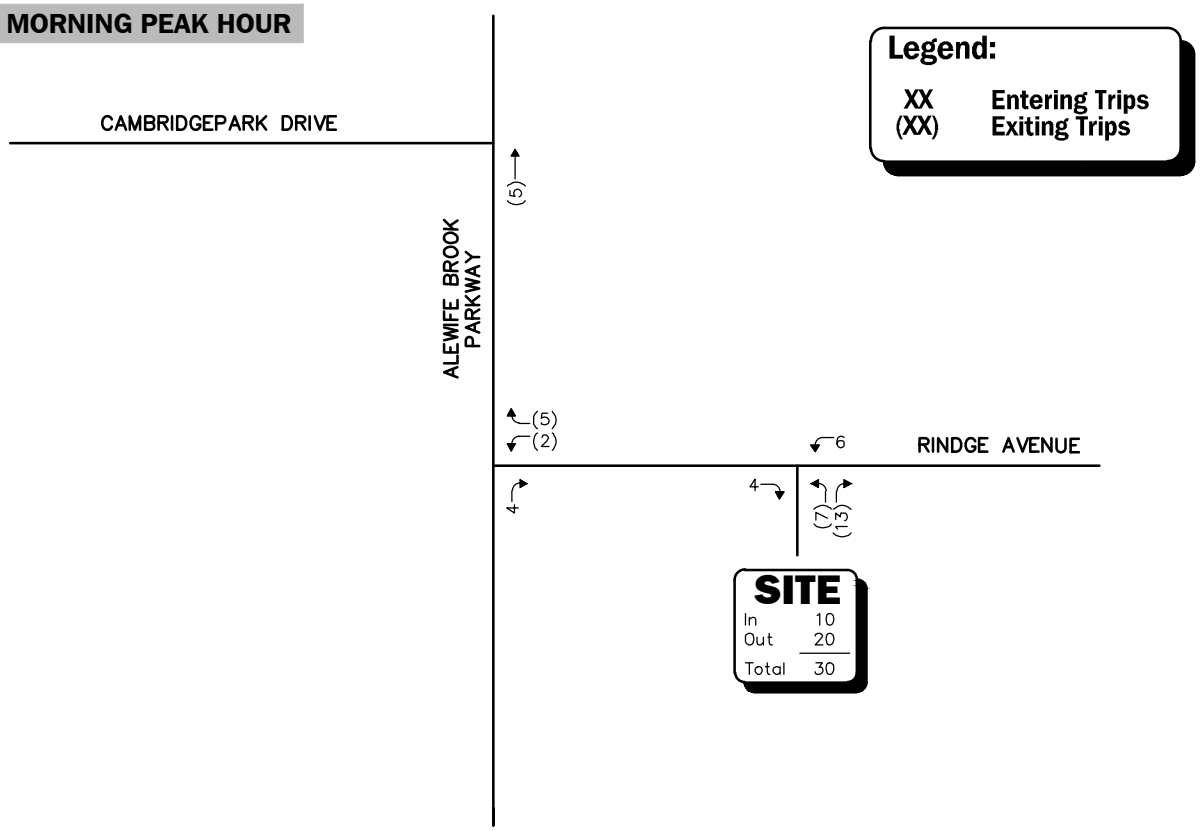
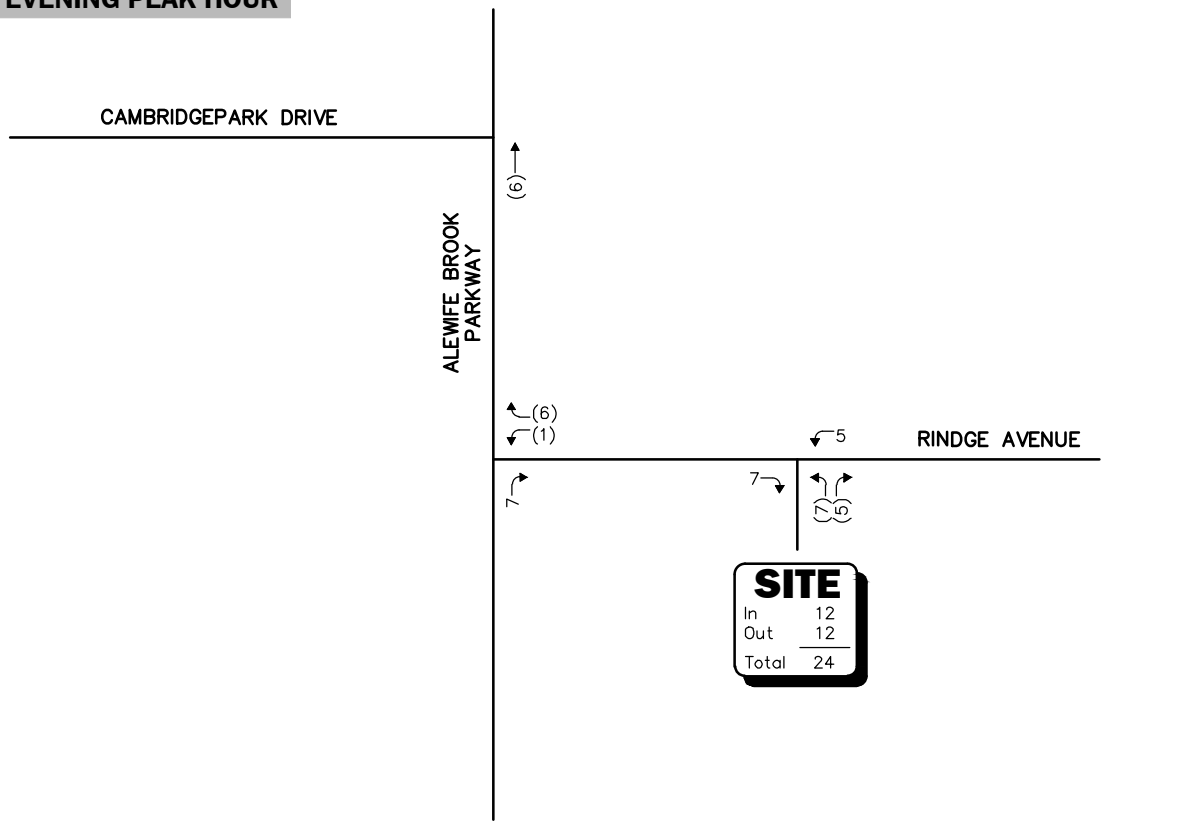
WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR



Not To Scale

Figure 3.a.2

Proposed Residential Trips
Peak Hour Traffic Volumes

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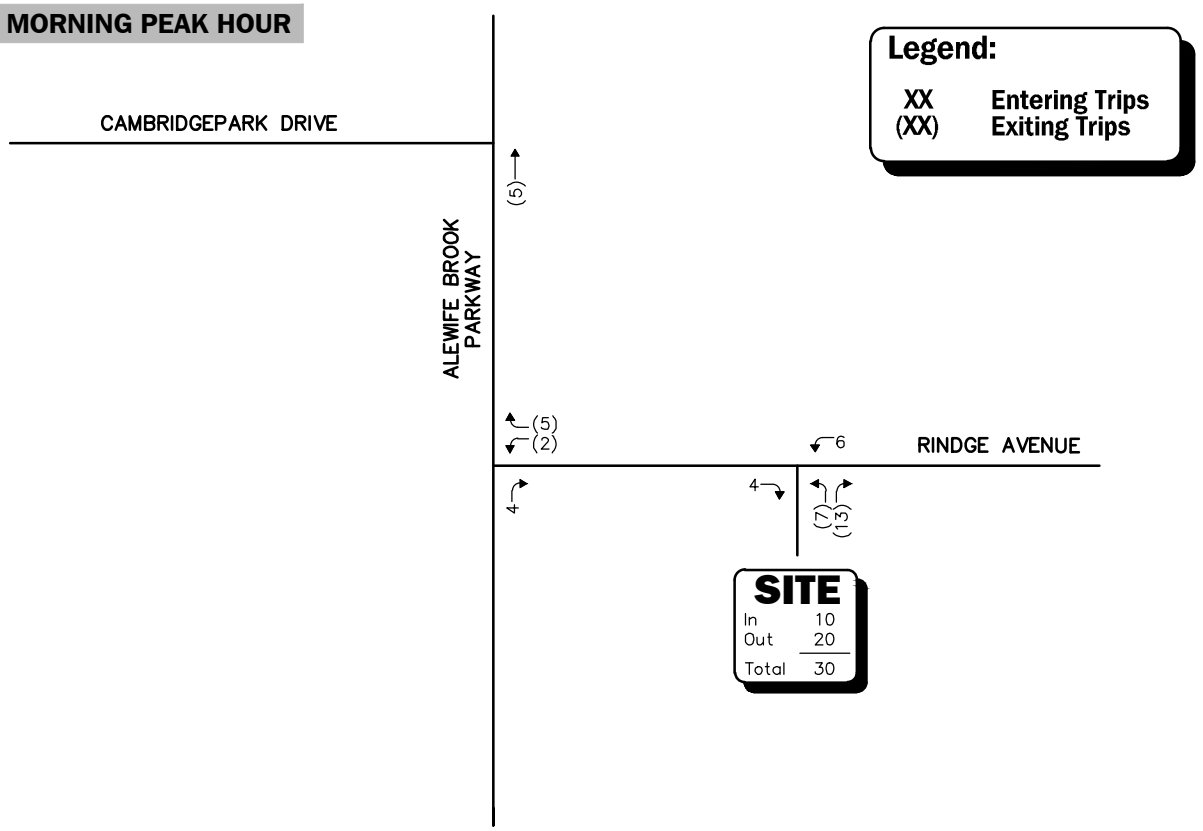
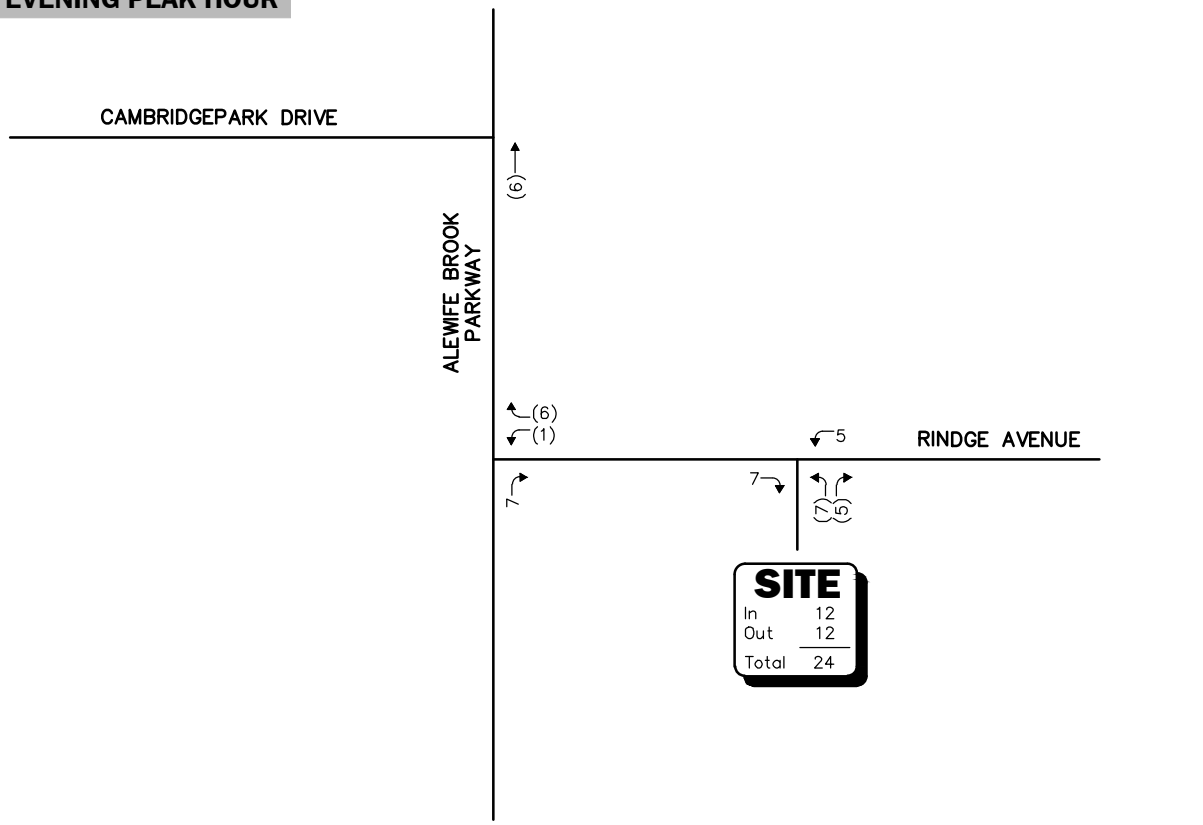
Transportation Engineers & Planners

WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR



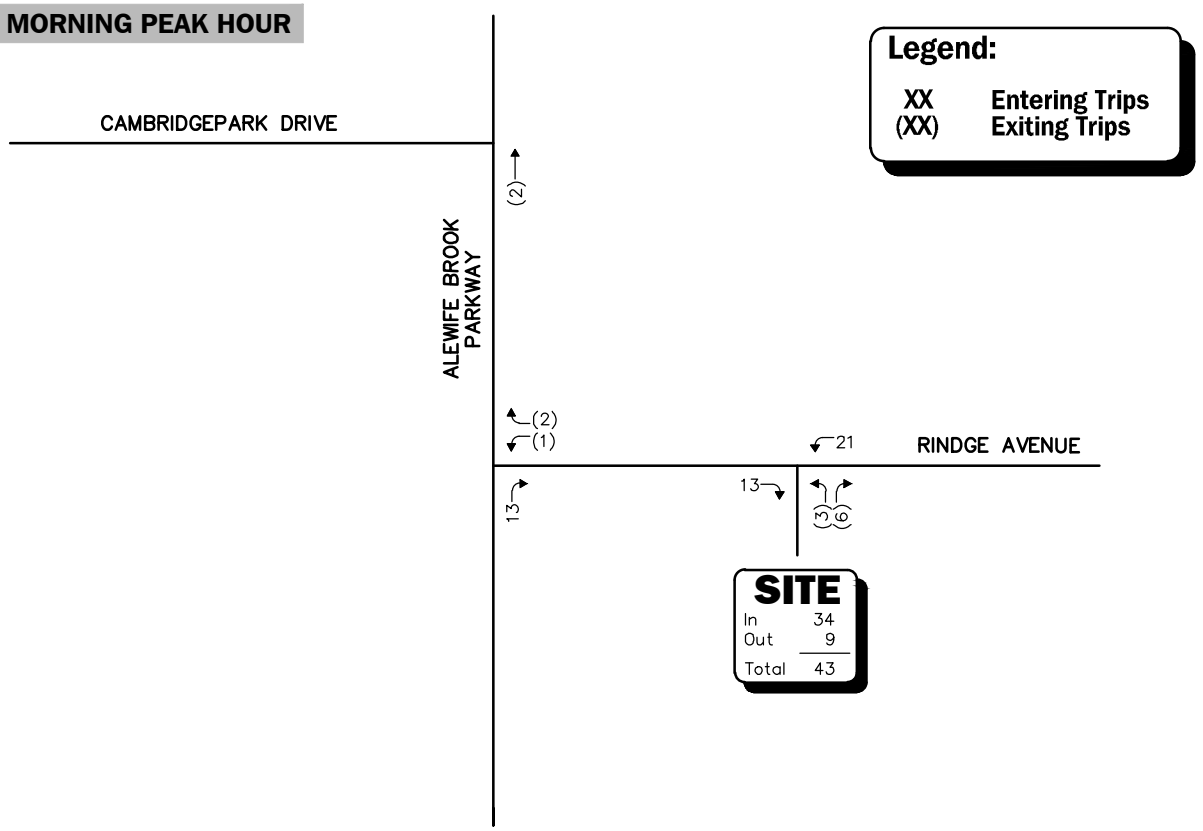
Not To Scale

Figure 3.a.3

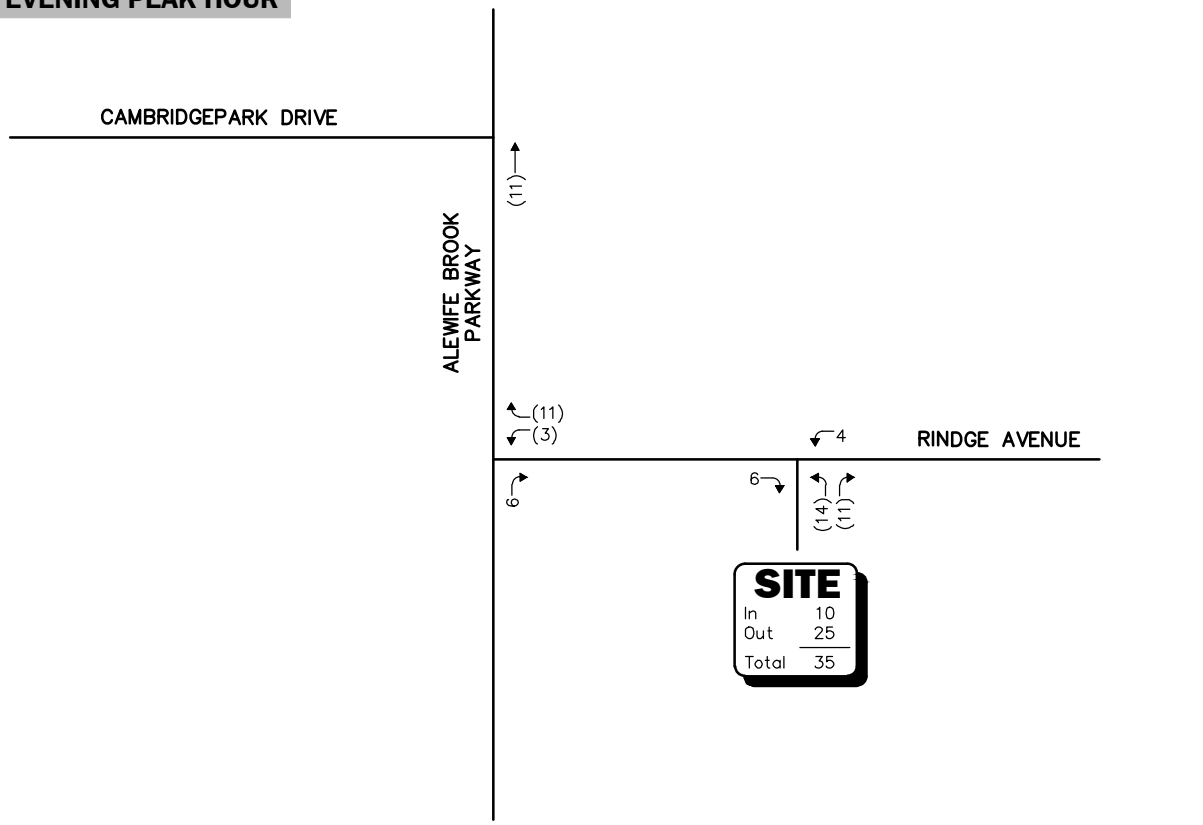
Proposed Residential Trips
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners

WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR



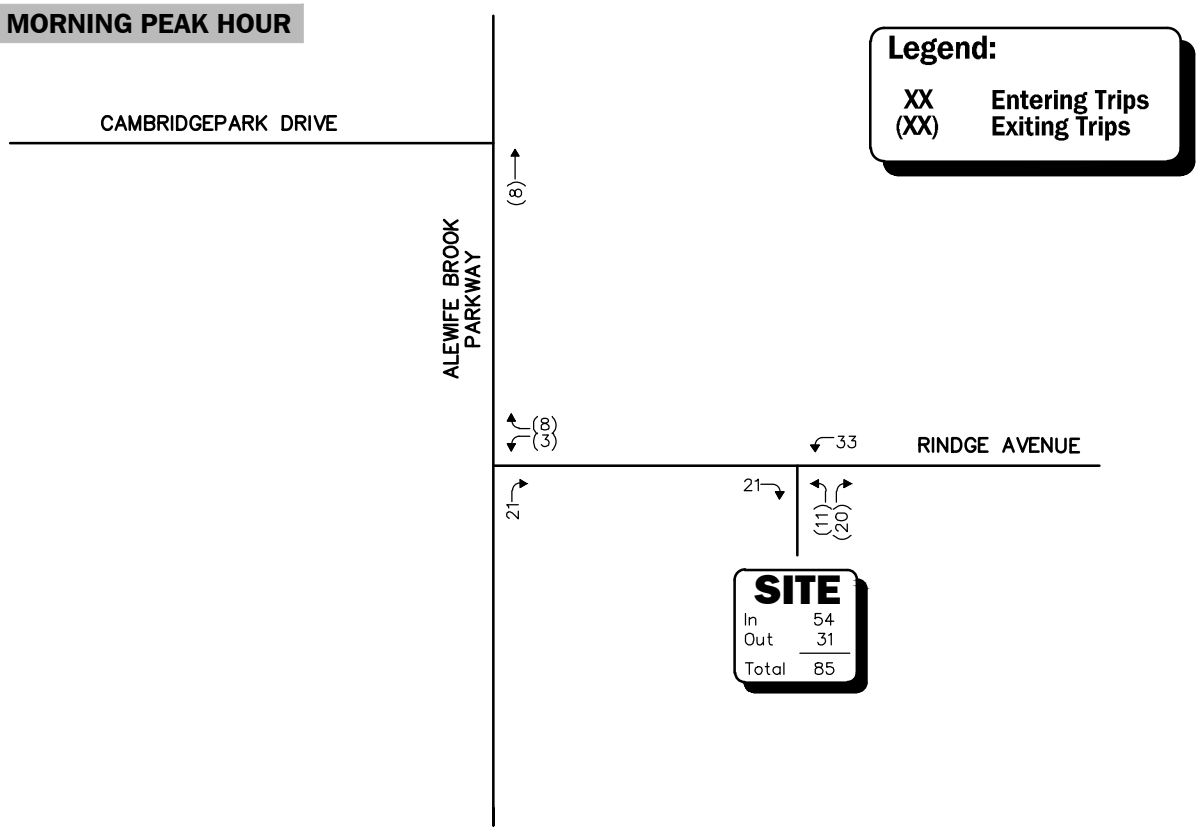
Not To Scale

Figure 3.a.4

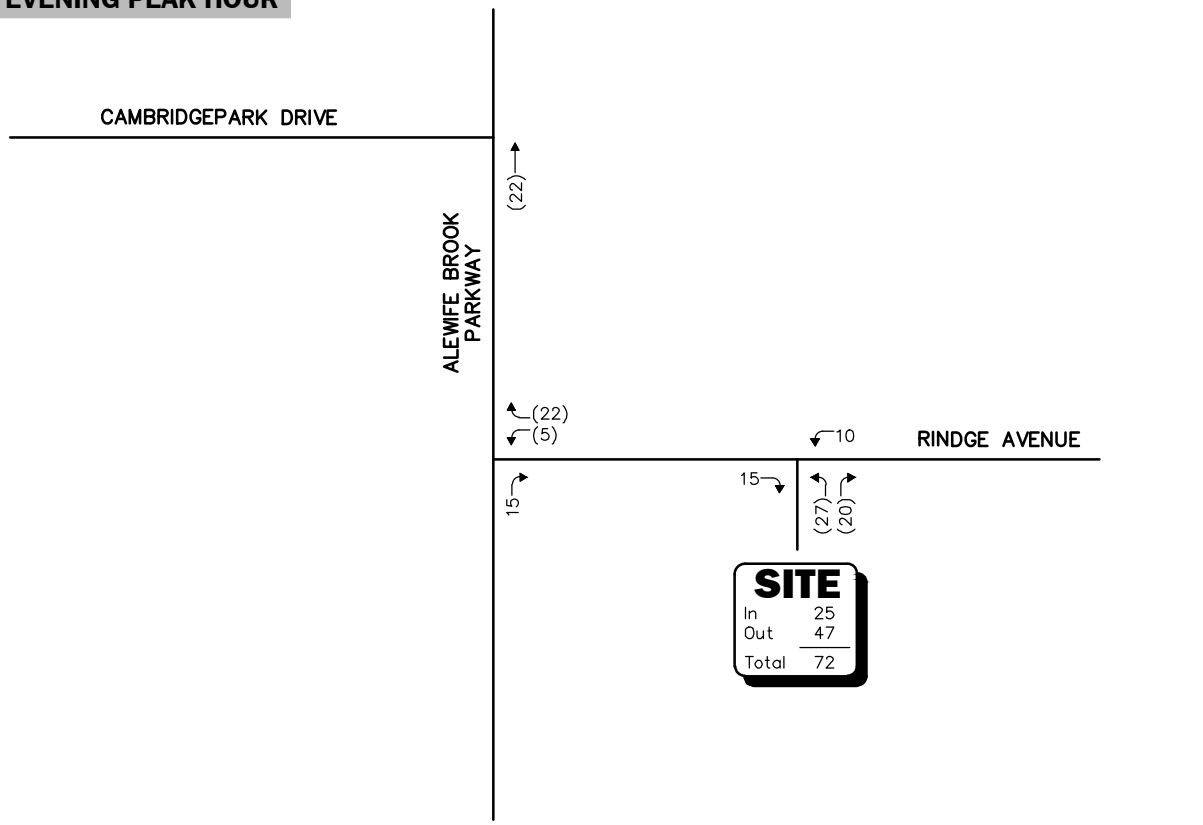
Proposed Medical Trips
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners

WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR



Not To Scale

Figure 3.a.5

New Site Generated Peak Hour Traffic Volumes

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3.3 PROJECT SERVICE AND LOADING

Deliveries and trash are expected to follow current practice. Trash will be contained in trash areas in separate rooms for each building and wheeled out to the dumpster outside the main building twice per week. Recycling will be contained in the trash rooms and wheeled out with trash.

Move-in periods will be scheduled with building management and moving vehicles are expected to occupy areas of the parking lot as is current practice.

Office and medical clinic truck trips are typically limited to package pickup and delivery carried out using single-unit or delivery trucks. These trips are expected to total less than ten vehicles per day (less than 20 daily truck trips), accounting for the various courier and delivery services expected.

4.0 BACKGROUND TRAFFIC

Traffic volumes in the study area were projected to the year 2024, which reflects a five-year planning horizon consistent with City traffic study guidelines and the traffic study scope issued by the City TPT Department. Traffic volume conditions would include increases due to development projects approved or under construction and not yet occupied and increases to general background traffic levels, assumed to increase at 0.5 percent per year.

As indicated in the Scoping Letter, the following projects were identified for inclusion in the Future 2024 condition:

- *180R/88 Cambridgepark Drive*
- *35 Cambridgepark Drive*
- *195/211 Concord Turnpike*
- *75 New Street*
- *605 Concord Avenue*
- *55 Wheeler Street*
- *87-95 Fawcett Street*
- *50 Cambridgepark Drive*
- *671-675 Concord Avenue*

In addition, the following project was added which started the Special Permit process after receipt of the scoping letter from the TPT Department:

- *101 Cambridgepark Drive*

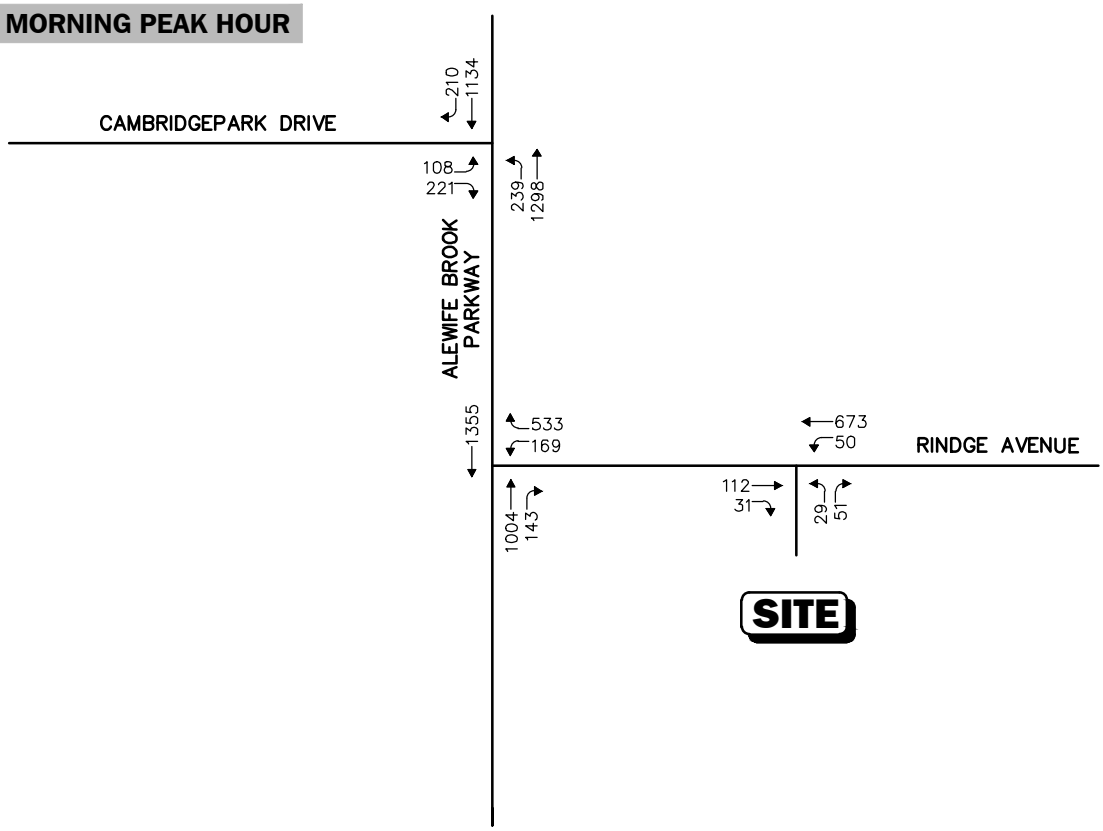
5.0 TRAFFIC ANALYSIS

5.1 SITE ASSIGNMENT

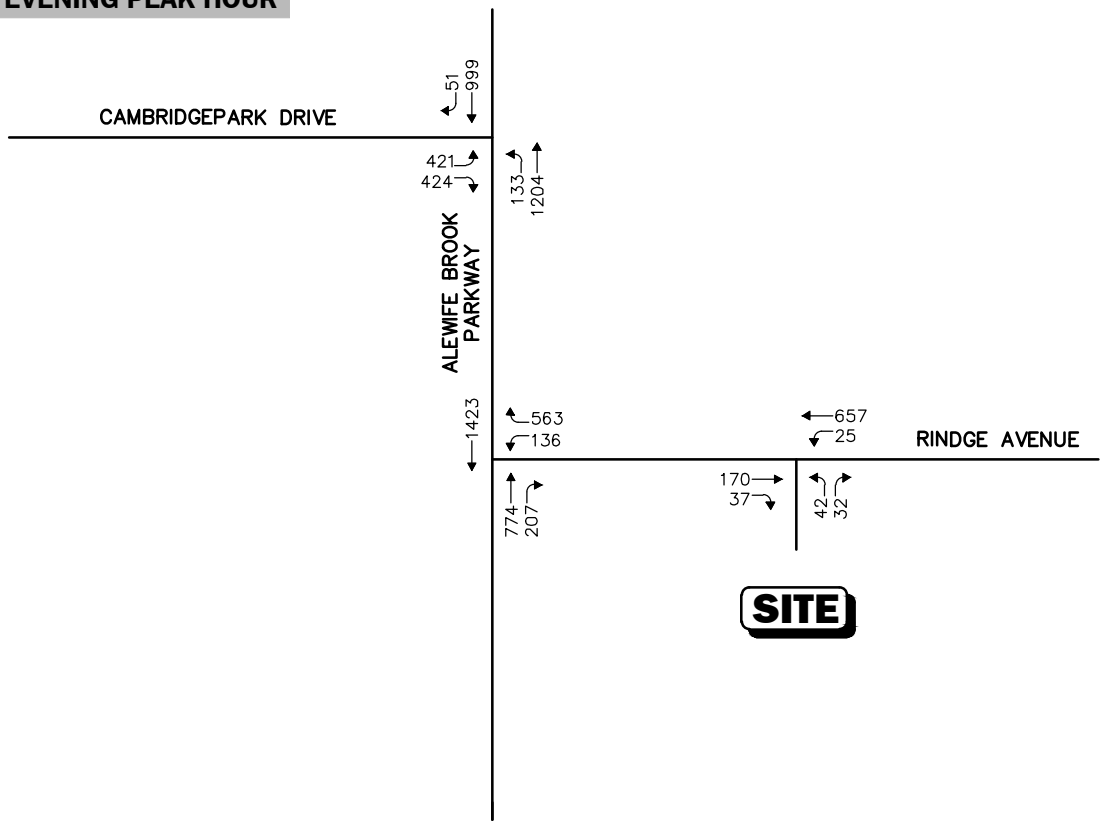
Existing Condition (2019) traffic volumes were combined with the New Site Generated traffic volumes to derive the 2019 Build condition networks, shown on Figure 5.b.1 for the weekday morning and weekday evening peak hour time periods. Figure 5.b.2 represents the projected 2019 Build weekday morning and weekday evening peak-hour pedestrian volumes.

The Future 2024 traffic volume condition includes the traffic volumes from the identified background developments, the increases resulting from the 0.5 percent per year annual growth rate that were applied to the 2019 Existing conditions traffic volumes, and the new traffic associated with the Project. These traffic volume networks are shown on Figure 5.d.1 for the weekday morning and weekday evening peak-hour traffic volumes.

WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR



Not To Scale

Figure 5.b.1

2019 Build
Peak Hour Traffic Volumes

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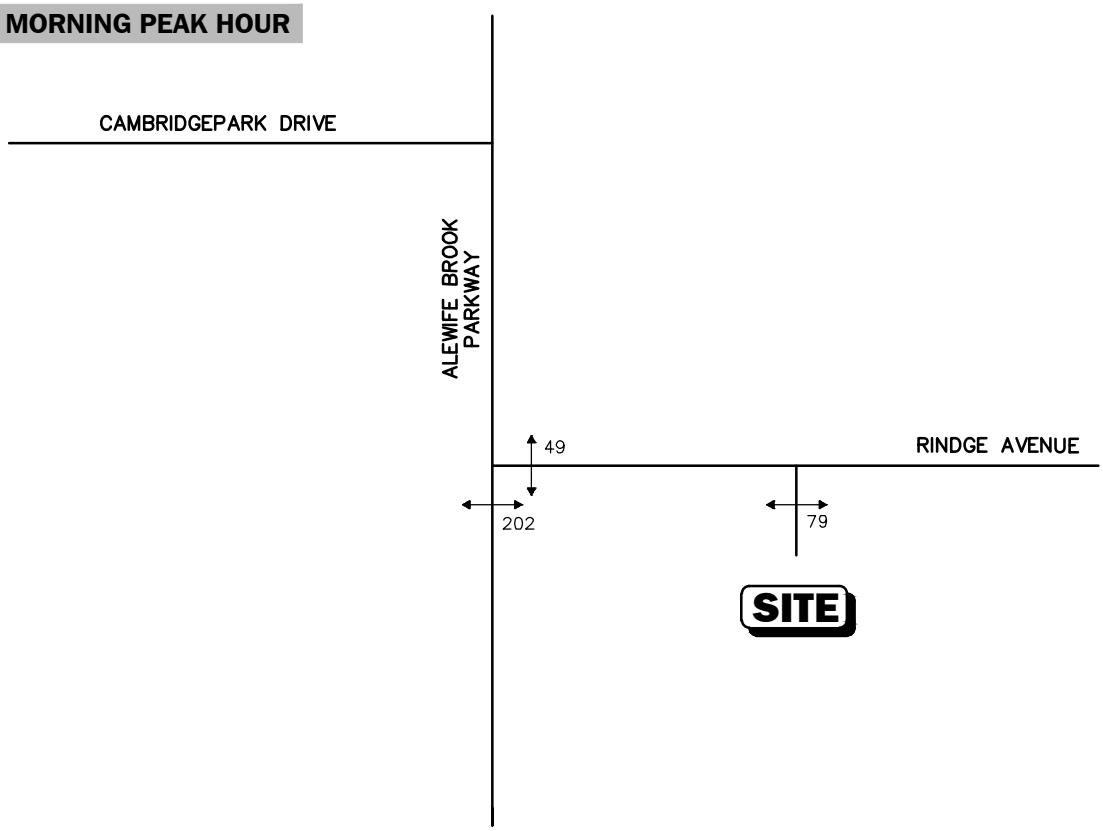
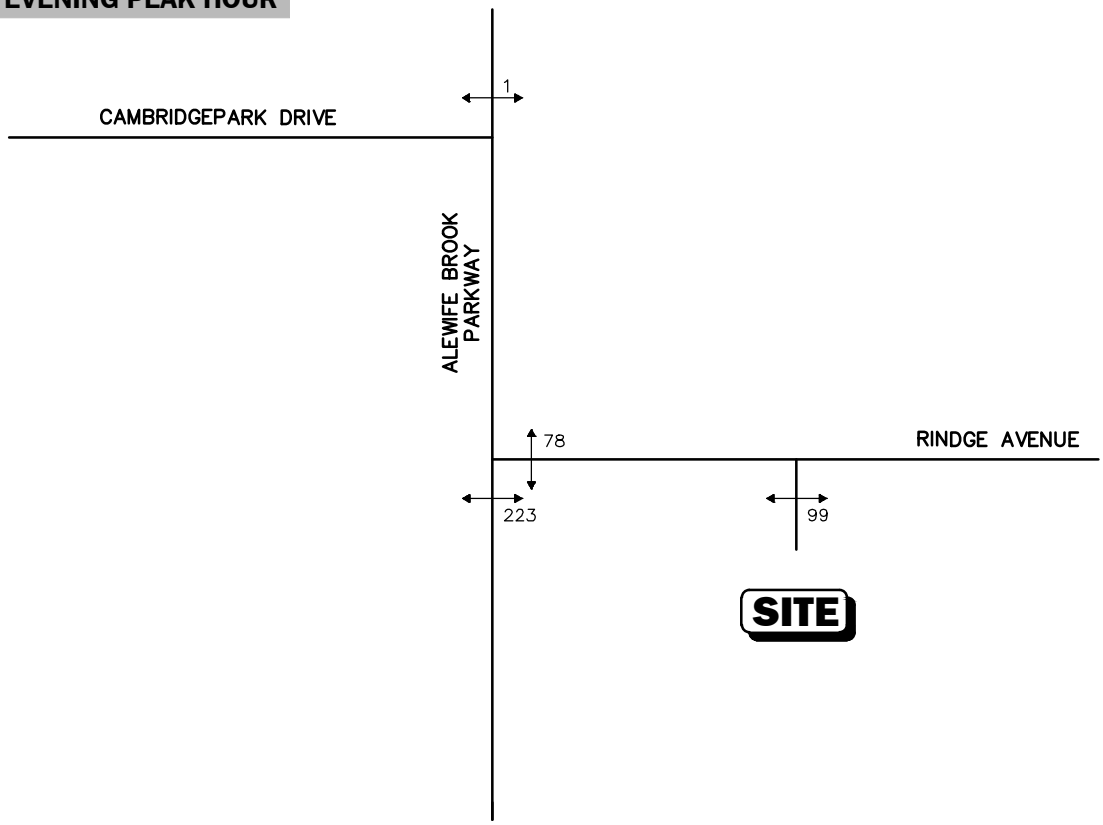
WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR



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Not To Scale

Figure 5.b.2

2019 Build
Peak Hour Pedestrian Volumes

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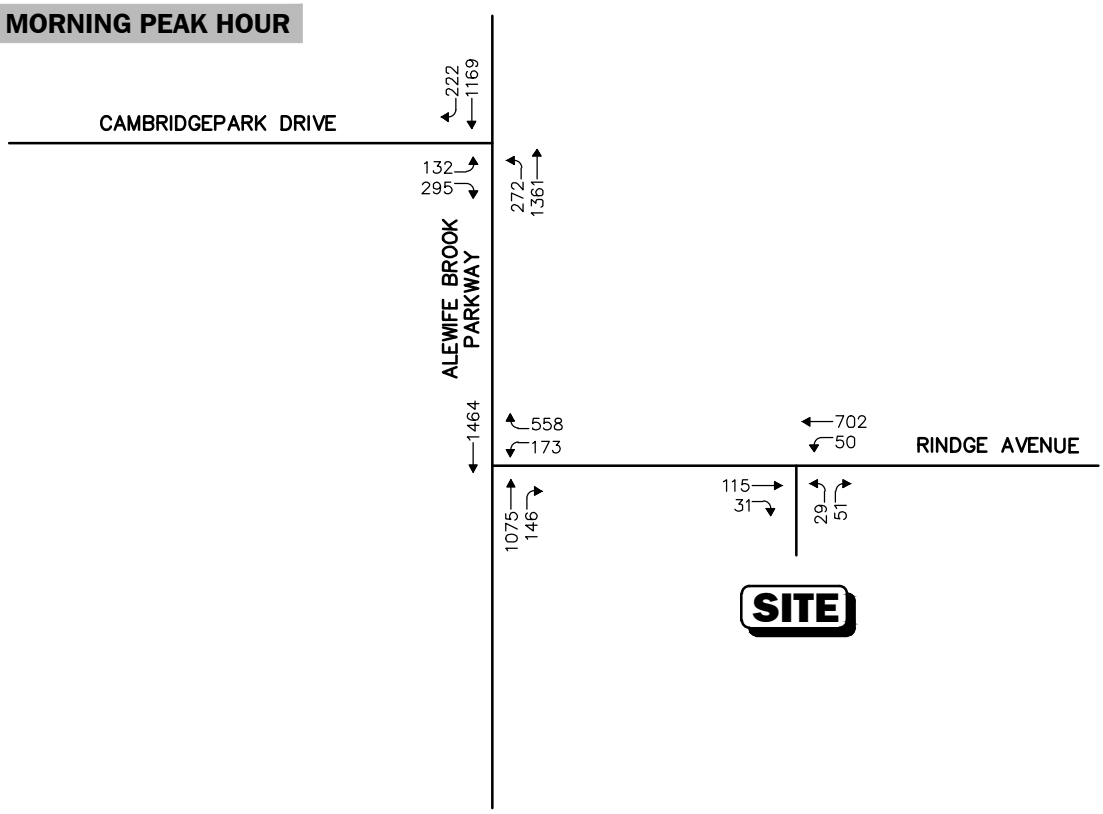
WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR

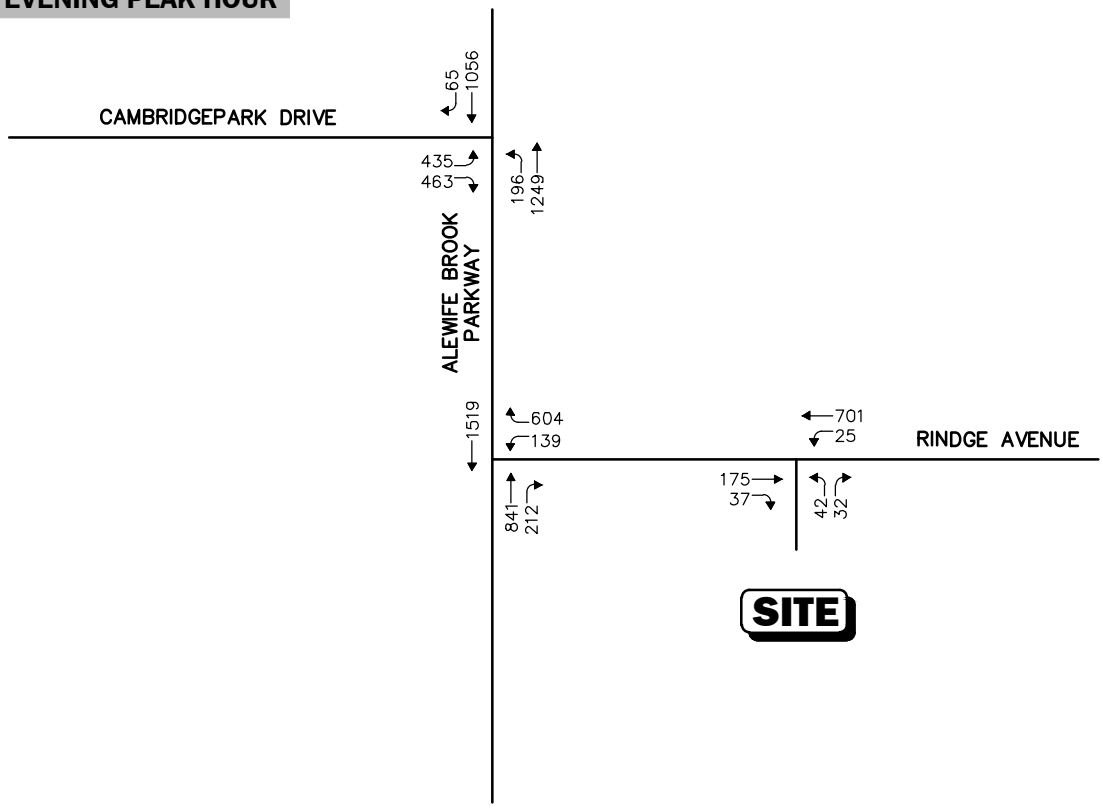


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Figure 5.d.1

2024 Future
Peak Hour Traffic Volumes

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6.0 CAPACITY ANALYSIS

Using the 2019-and 2024-year traffic-volume networks, Vehicle Level-of-Service (LOS) analyses were conducted for the 2019 Existing, 2019 Build, and 2024 Future conditions with the results shown in Tables 6.1 and 6.2 for signalized and unsignalized intersections, respectively. These analyses were conducted using Synchro analysis software, calibrated to match the vehicle queue observations which affect the intersection models, and supplemented with data and analysis results from other area reports. The analysis worksheets are contained in the Appendix.

Table 6.1
VEHICLE LEVEL-OF-SERVICE SUMMARY – SIGNALIZED INTERSECTIONS

Intersection/Peak Hour/Movement	2019 Existing V/C[a]	2019 Existing Delay[b]	2019 Existing LOS	2019 Build V/C	2019 Build Delay	2019 Build LOS	Delay Increase	2024 Future V/C	2024 Future Delay	2024 Future LOS
Alewife Brook Parkway at Cambridgepark Drive										
Weekday Morning Peak Hour:										
Cambridgepark Drive EB LT/RT	0.21	31	C	0.21	31	C	--	0.35	33	C
Alewife Brook Parkway NB LT	1.11	115	F	1.11	114	F	--	1.49	266	F
Alewife Brook Parkway NB TH	0.86	16	B	0.87	16	B	--	0.90	15	B
Alewife Brook Parkway SB TH	1.25	161	F	1.25	161	F	--	1.28	173	F
Alewife Brook Parkway SB RT	0.19	28	C	0.19	28	C	--	0.22	28	C
Overall	--	**80**	**F**	--	**80**	**F**	0	--	**94**	**F**
Weekday Evening Peak Hour:										
Cambridgepark Drive EB LT/RT	0.99	48	D	0.99	48	D	--	1.16	80	E
Alewife Brook Parkway NB LT	0.82	66	E	0.82	65	E	--	1.29	195	F
Alewife Brook Parkway NB TH	0.75	19	B	0.76	19	B	--	0.79	19	B
Alewife Brook Parkway SB TH	1.12	105	F	1.12	105	F	--	1.18	128	F
Alewife Brook Parkway SB RT	0.04	27	C	0.04	27	C	--	0.06	27	C
Overall	--	**58**	**E**	--	**58**	**E**	0	--	**81**	**F**
Alewife Brook Parkway at Rindge Avenue										
Weekday Morning Peak Hour:										
Rindge Avenue WB LT	0.88	90	F	0.90	93	F	--	0.92	98	F
Rindge Avenue WB RT	1.84	450	F	1.88	471	F	--	2.11	571	F
Alewife Brook Parkway NB TH/RT	0.75	24	C	0.76	24	C	--	0.82	27	C
Alewife Brook Parkway SB TH	1.05	34	C	1.05	34	C	--	1.11	65	E
Overall	--	**93**	**F**	--	**97**	**F**	4	--	**126**	**F**
Weekday Evening Peak Hour:										
Rindge Avenue WB LT	0.37	41	D	0.39	41	D	--	0.40	42	D
Rindge Avenue WB RT	0.78	34	C	0.81	37	D	--	0.90	46	D
Alewife Brook Parkway NB TH/RT	0.74	28	C	0.75	28	C	--	0.81	30	C
Alewife Brook Parkway SB TH	1.09	60	E	1.09	60	E	--	1.19	101	F
Overall	--	**45**	**D**	--	**45**	**D**	0	--	**68**	**E**

[a]Volume to capacity ratio. Highest lane use V/C value for each approach.
[b]Average control delay per vehicle (in seconds) for the critical movements.
[c]Level of service.
NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

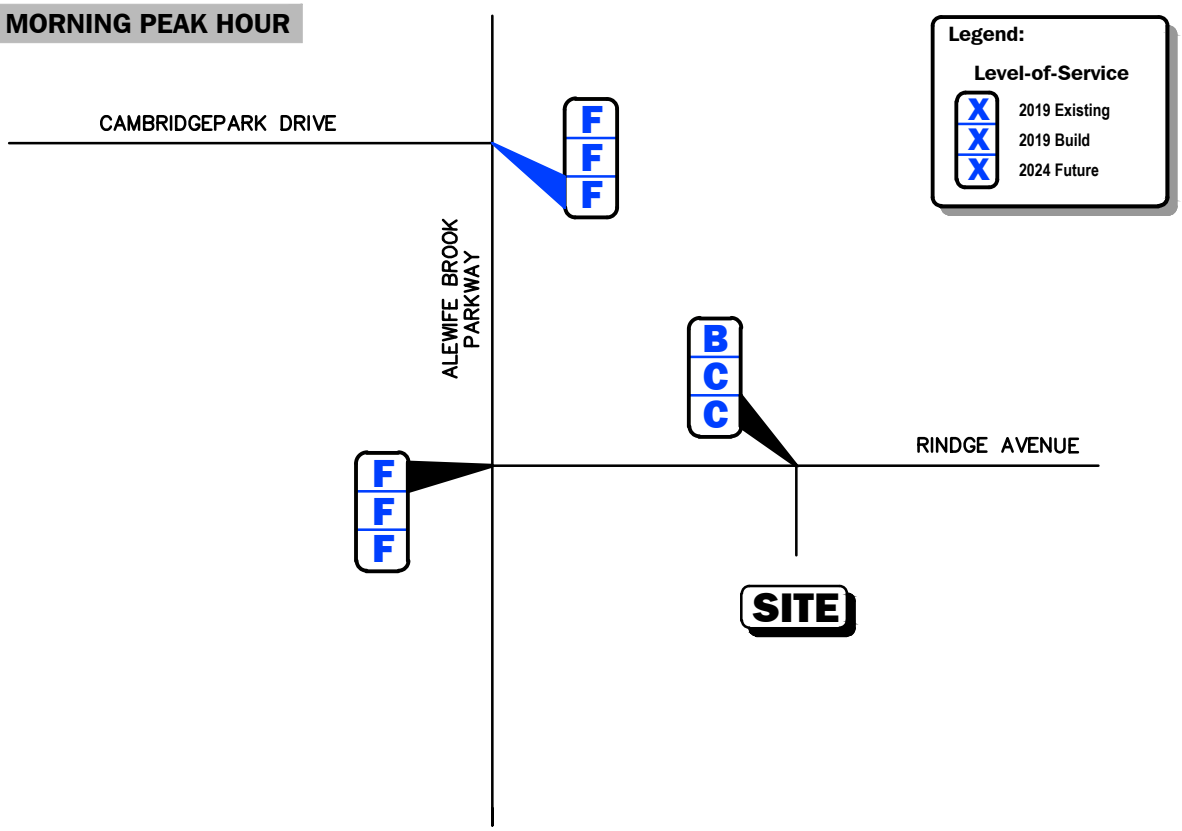
Table 6.2
VEHICLE LEVEL-OF-SERVICE SUMMARY - UNSIGNALIZED INTERSECTIONS

Unsignalized Intersection/	2019 Existing			2019 Build			Delay	2024 Future		
Critical Movement/Peak Hour	Demand[a]	Delay[b]	LOS[c]	Demand	Delay	LOS	Increase	Demand	Delay	LOS
Rindge Avenue at Site Driveway										
All movements from Site Driveway NB:										
Weekday Morning	49	14	B	80	16	C	2	80	17	C
Weekday Evening	27	15	C	74	18	C	3	74	20	C

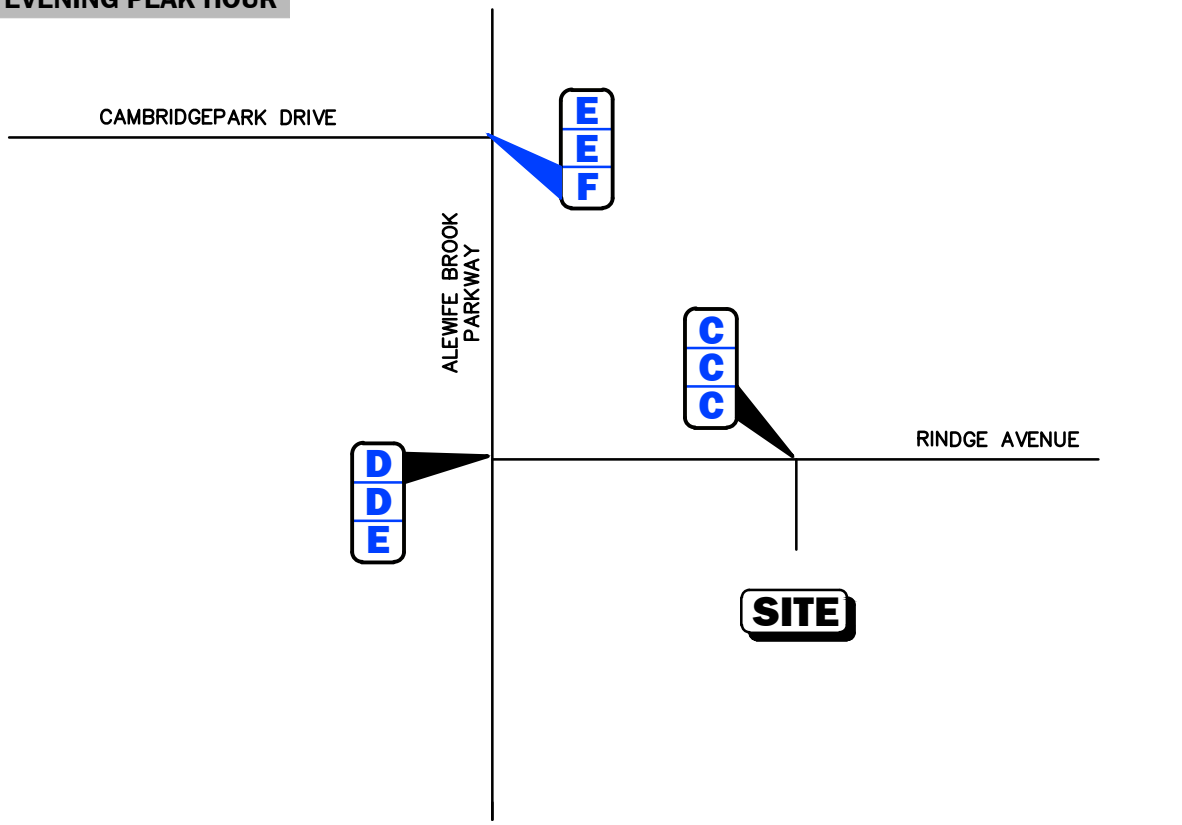
[a]Demand (in vehicles per hour) for the critical movements.
[b]Average control delay per vehicle (in seconds) for the critical movements.
[c]Level of service.
NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

Figure 6.a.1 depicts the vehicle LOS summaries in a graphical map format for the weekday morning and weekday evening peak hours. Figure 6.b.1 provides a graphical map of vehicle delay changes at the study area intersections for the weekday morning and weekday evening peak hours. These delay change maps depict the change in delay from Existing to Build and from Existing to Future conditions.

WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR



Not To Scale

Figure 6.a.1

Vehicle Level-of-Service Map

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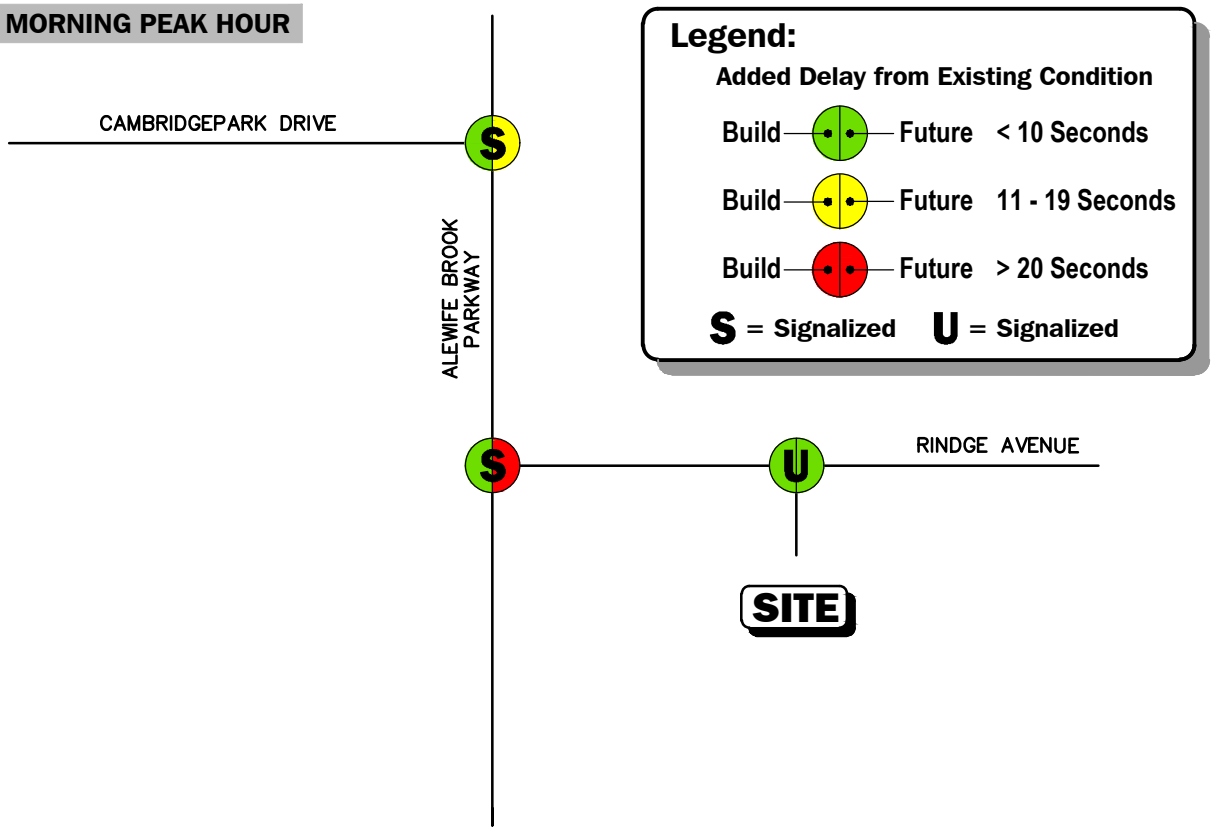
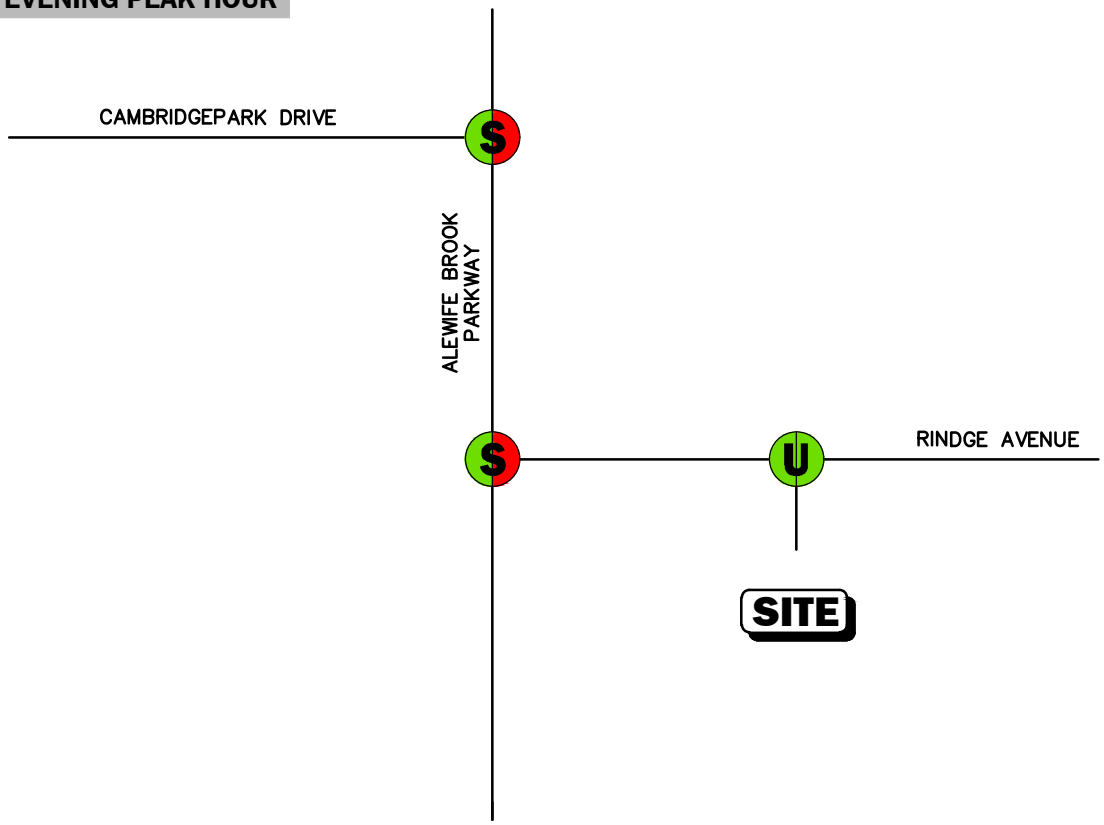
WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR



Not To Scale

Figure 6.b.1

Vehicle Delay Change Map

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7.0 QUEUE ANALYSIS

Vehicle queues were calculated for each approach of the signalized study area intersections using Synchro analysis software. The analyses were calibrated to observed queues in an attempt to match the results of the queue observations. Table 7 summarizes the 2019 Existing observed, 2019 Existing calculated, 2019 Build calculated, and 2024 Future calculated vehicle queues.

Table 7
QUEUE ANALYSIS RESULTS[a]

Intersection/Lane[b]	Weekday Morning Peak Hour					Weekday Evening Peak Hour				
	2019 Observed	2019 Existing Calculated	2019 Build Calculated	Increase	2024 Future Calculated	2019 Observed	2019 Existing Calculated	2019 Build Calculated	Increase	2024 Future Calculated
Alewife Brook Parkway at Cambridgepark Drive:										
Cambridgepark Drive EB LT	2	3	3	0	4	6	5	5	0	5
Cambridgepark Drive EB LT	1	3	3	0	4	2	5	5	0	5
Alewife Brook Parkway NB LT	7[c]	11	11	0	17	3[c]	4	4	0	8
Alewife Brook Parkway NB TH	6[c]	24	24	0	22	6[c]	11	12	1	12
Alewife Brook Parkway NB TH	6[c]	24	24	0	22	7[c]	11	12	1	12
Alewife Brook Parkway SB TH	20	36	36	0	38	16	22	22	0	23
Alewife Brook Parkway SB TH	20	36	36	0	38	17	22	22	0	23
Alewife Brook Parkway at Rindge Avenue:										
Rindge Avenue WB LT	5	7	7	0	7	3	3	3	0	4
Rindge Avenue WB RT	22	20	21	1	24	18	12	13	1	15
Alewife Brook Parkway NB TH	17	19	20	1	23	17	14	14	0	16
Alewife Brook Parkway NB TH/RT	17	19	20	1	23	17	14	14	0	16
Alewife Brook Parkway SB TH	3[d]	42	42	0	47	4[d]	31	31	0	36
Alewife Brook Parkway SB TH	3[d]	42	42	0	47	5[d]	31	31	0	36

[a]All queues calculated using Synchro methodology and calibrated volume conditions with observations and calculations from other area studies. Queue in vehicles per lane.
[b]EB = eastbound; WB = westbound; NB = northbound; SB = southbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.
[c]Does not include northbound queue on Alewife Brook Parkway at Rindge Avenue.
[d]Does not include southbound queue on Alewife Brook Parkway at Cambridgepark Drive.

8.0 RESIDENTIAL STREET VOLUME ANALYSIS

The Project is located in an area of both residential and commercial uses. Residential streets will be subject to some measure of traffic to and from the Project. These locations and the indicators for the increases in traffic on residential streets are summarized in Table 8.

Table 8
TRAFFIC ON RESIDENTIAL STREETS

Roadway	Reviewed Segment	Amount of Residential	Existing Two-Way Traffic	Increase due to Project	Above Criteria
Morning Peak Hour:					
Rindge Avenue	Alewife Brook Parkway to Clifton Street	1/2 or more	833	53	Yes
Evening Peak Hour:					
Rindge Avenue	Alewife Brook Parkway to Clifton Street	1/2 or more	854	30	No

9.0 PARKING ANALYSIS

9.1 PROJECTED PARKING DEMAND

A parking analysis was conducted to determine future parking demands. The demand analysis is based upon the City of Cambridge Zoning Ordinance Article 6 – Off Street Parking and Loading Requirements and Nighttime Curfew on Large Commercial through Trucks. Table 9.1 summarizes the zoning parking requirements for the project, as well as the estimated parking demand. The demand analysis is based upon research into residential parking use rates in Cambridge along with expected employee population and mode split assumptions from the trip generation analysis.

Table 9.1
PARKING ANALYSIS

Analysis Type	Use	Size	Zoning Rate		Required Spaces	
			Maximum	Minimum	Maximum	Minimum`
Zoning	Residential	376 Units	1.0/unit[a]	1.0/unit	376	376
	Office	14,000 sf	1.0/400 sf[b]	1.0/800 sf	35	18
	Medical	21,450 sf	1.0/400 sf[c]	1.0/400 sf	54	54
Total					465	448

	Use	Size	Rate	Demand
Demand	Residential	376 units	0.70/unit	263
	Office/Education Population[d]	60 emp.	0.54[e]	32
	Medical	21,450 sf	0.52[f]	11
Total				306
	Total Spaces Provided			**236**

[a]Based on Land Use Category 6.36.1 -- Residential Uses, subcategory g. Multifamily Dwelling.
[b]Based on Land Use Category 6.36.4 – Office and Laboratory Use, subcategory d. General office use.
[c]Based on Land Use Category 6.36.3 – Institutional Uses, subcategory d.4 Clinic not affiliated with any other institution.
[d]Based on expected training population of 60 staff/employees.
[e]Calculated as SOV rate (43 percent) plus ½ of HOV rate (4 percent) for office category of 402 Rindge mode split survey.
[f]Calculated as SOV rate (47 percent) plus ½ of HOV rate (9 percent) for medical category of 402 Rindge mode split survey.

Currently, the site provides 273 parking spaces for 273 residential units at a 1 to 1 ratio. Each dwelling unit is allowed 1 space at no charge and secondary spaces may be purchased at 50 dollars per month if spaces are available. As of October 2018, 190 spaces were provided to residents free of charge and 52 secondary spaces were purchased. In future conditions, the secondary spaces may be eliminated as they are only provided if space is available. Currently the site has a parking demand of 190 spaces which is a rate of 0.70 spaces per unit. At this rate the proposed site would require 263 spaces for the residential use. As seen in Table 9.1, the office/educational training space requires 32 spaces by demand and the medical clinic requires 11 spaces. Including these spaces results in a total of 306 spaces required for the Project. The Project is proposing to provide 236 spaces. It should be noted that the Applicant is committed to implementing typical TDM measures to further reduce the demand for parking, including encouragement of public transit and bicycles for the office/educational training attendees. More discussion regarding on-site parking is provided in the Conclusions section.

9.2 BICYCLE PARKING

A bicycle parking analysis was conducted to determine future long-term and short-term bicycle parking demands. The Project complies with City Zoning requirements for bicycle parking. The main building does provide 26 covered bicycle spaces in the rear.

Table 9.2 documents the Project bicycle parking demand based upon the City of Cambridge Zoning Ordinance Article 6 – Off Street Parking and Loading Requirements and Nighttime Curfew on Large Commercial through Trucks.

Table 9.2
BICYCLE PARKING ANALYSIS[a]

Use	Size (ksf or units)	Long Term Spaces[b]	Short Term Spaces[c]	Total Spaces
Office	14	4.20	0.84	5.04
Medical Office	21.45	4.29	10.73	15.02
Residential	103	107.00	10.30	117.30
TOTAL		115.49	21.87	137.36
		Say 116	Say 22	Say 138

[a]Source: City of Cambridge Zoning Ordinance Article 6 – Off Street Parking and Loading Requirements and Nighttime Curfew on Large Commercial Though Trucks.
[b]Based on Section 6.107.2 (Schedule of Long-Term Bicycle Parking Requirements)
[c]Based on Section 6.107.3 (Schedule of Short-Term Bicycle Parking Requirements)

A bicycle parking key plan is shown in Figure 9.1, while detailed plans (1 inch = 10 feet) for long-term bicycle parking are shown in Figure 9.2 through Figure 9.5. Short-term bicycle parking is also shown on these exhibits. Of the bike spaces, five are required to be tandem and these are shown on the exhibits.

Also under discussion is the installation of a BLUEbikes station to be located on the north side of Building A adjacent to Rindge Avenue. This would be a 19-dock station and would be open to the public as well as the residents and employees of the Project.

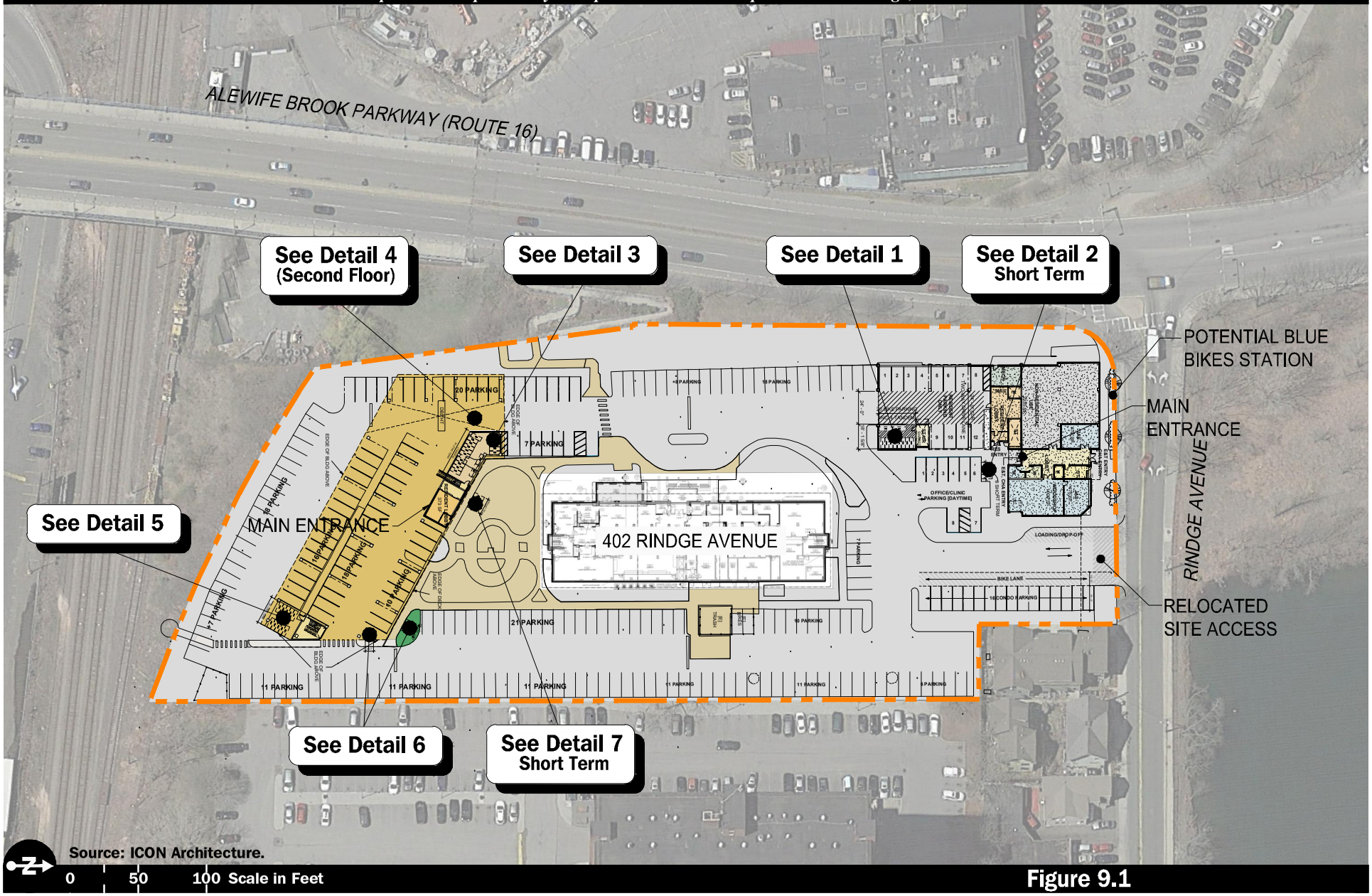

Figure 9.1

Bicycle Parking Key Plan

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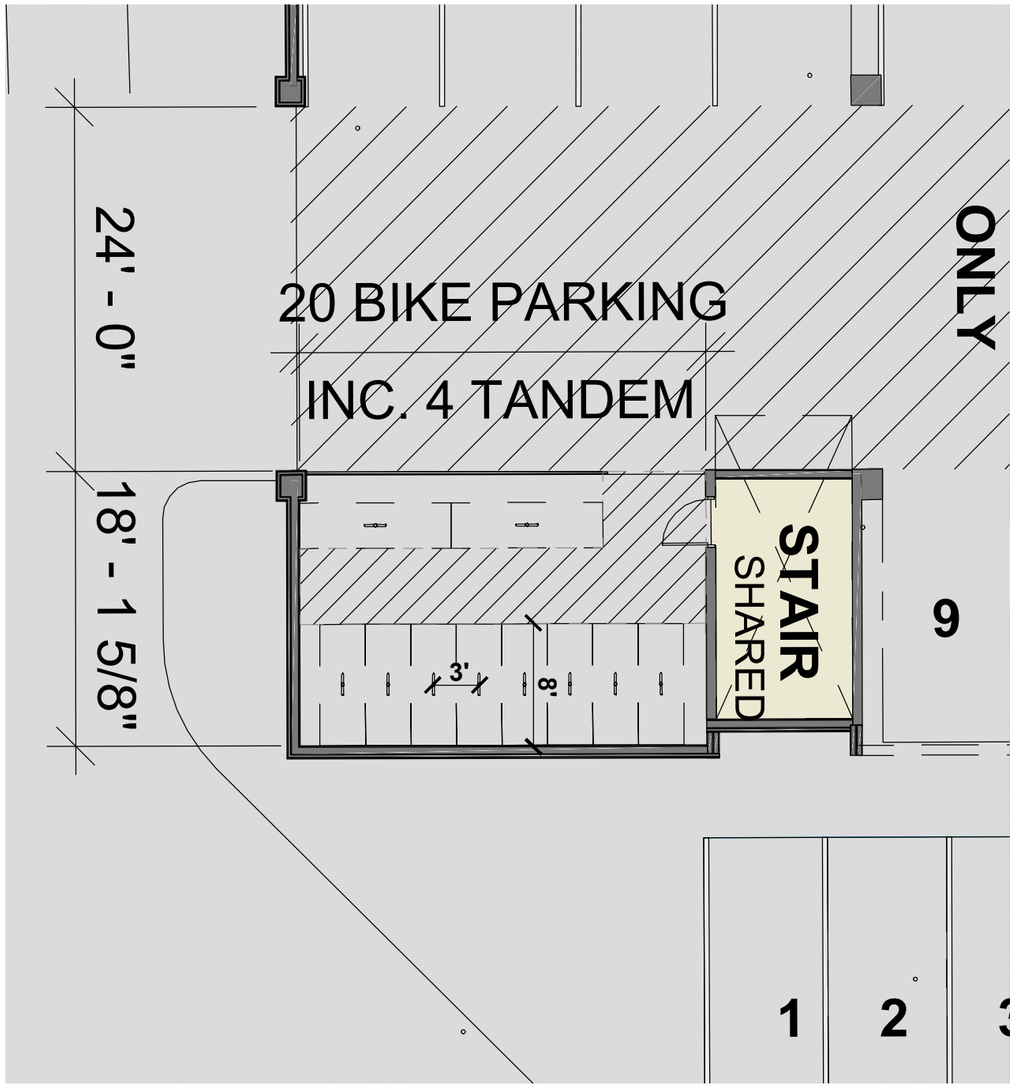
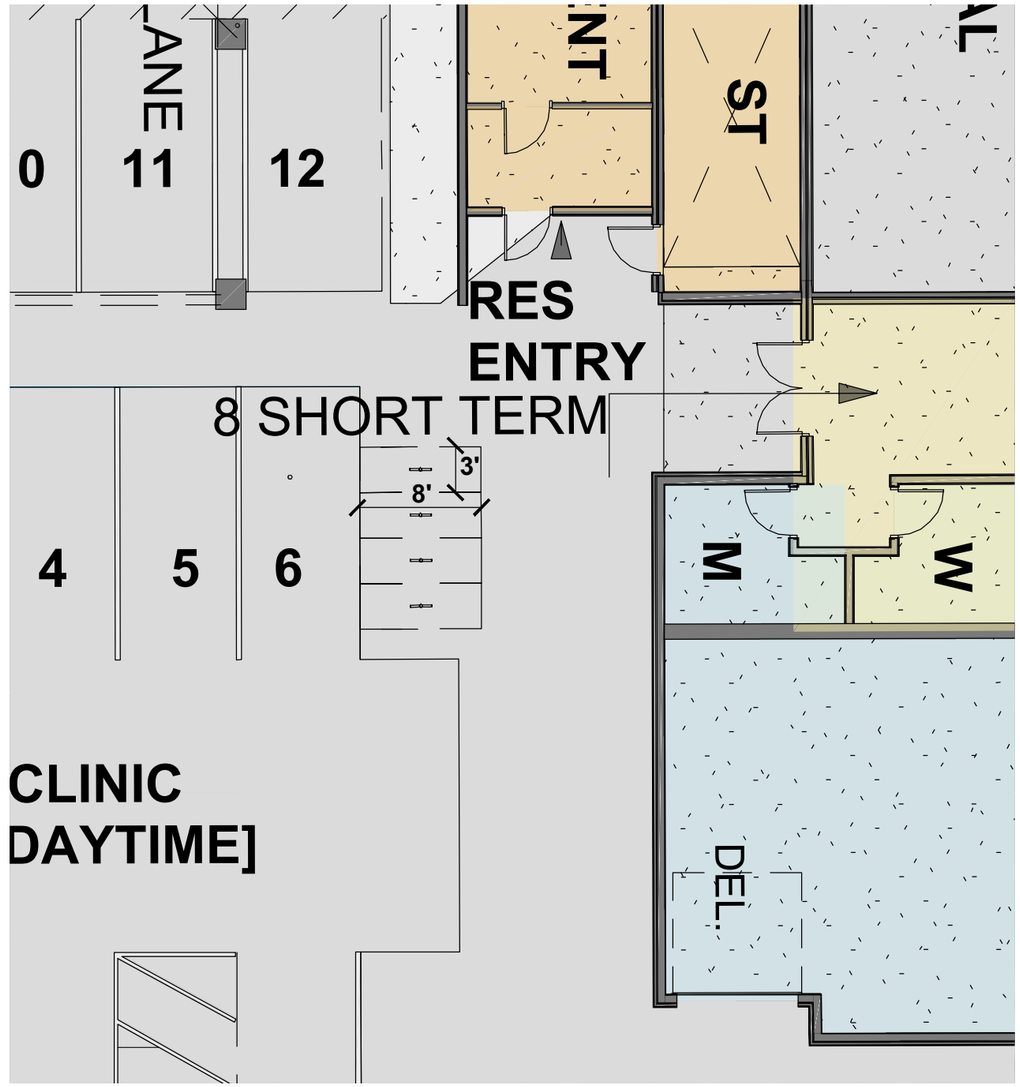
R:\7794\December 2019\7794 BIKE KEY.dwg, 12/20/2019 8:35:55 AM



Detail 1 - Ground Floor - Building A



Detail 2 - Ground Floor - Building A

Source: ICON Architecture

0 5 10 Scale in Feet

Figure 9.2

Proposed Bicycle Parking

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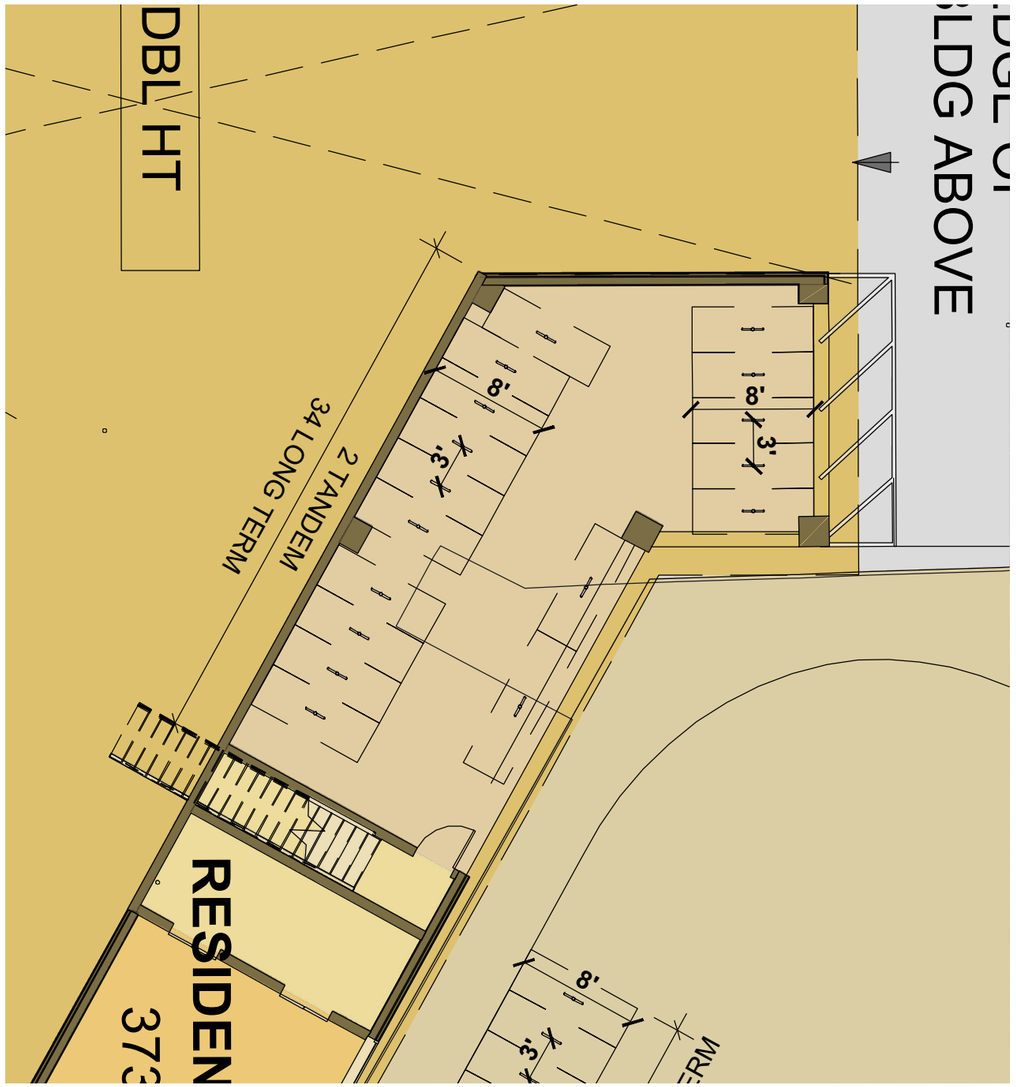
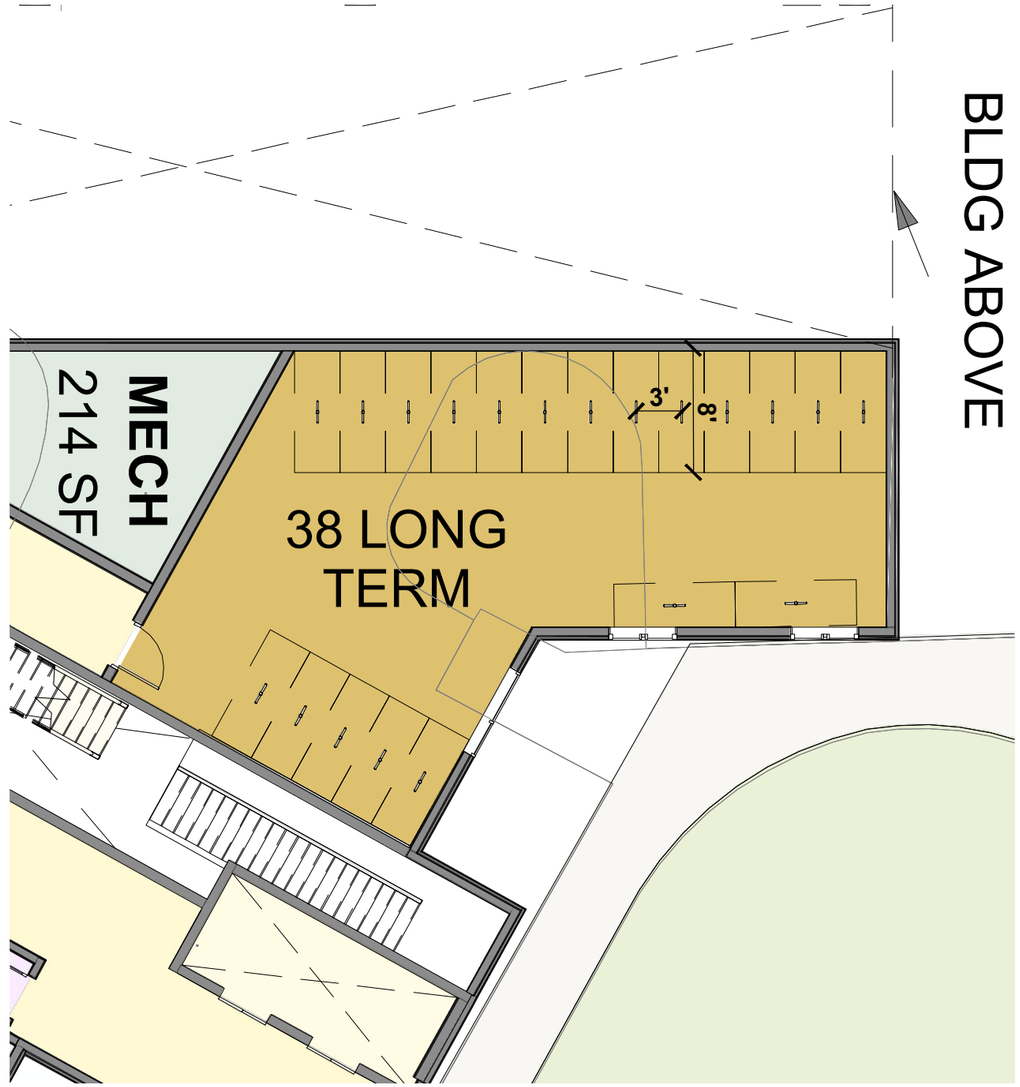


Detail 3 - Ground Floor - Building B



Detail 4 - Second Floor - Building B

Source: ICON Architecture

0 5 10 Scale in Feet

Figure 9.3

Proposed Bicycle Parking

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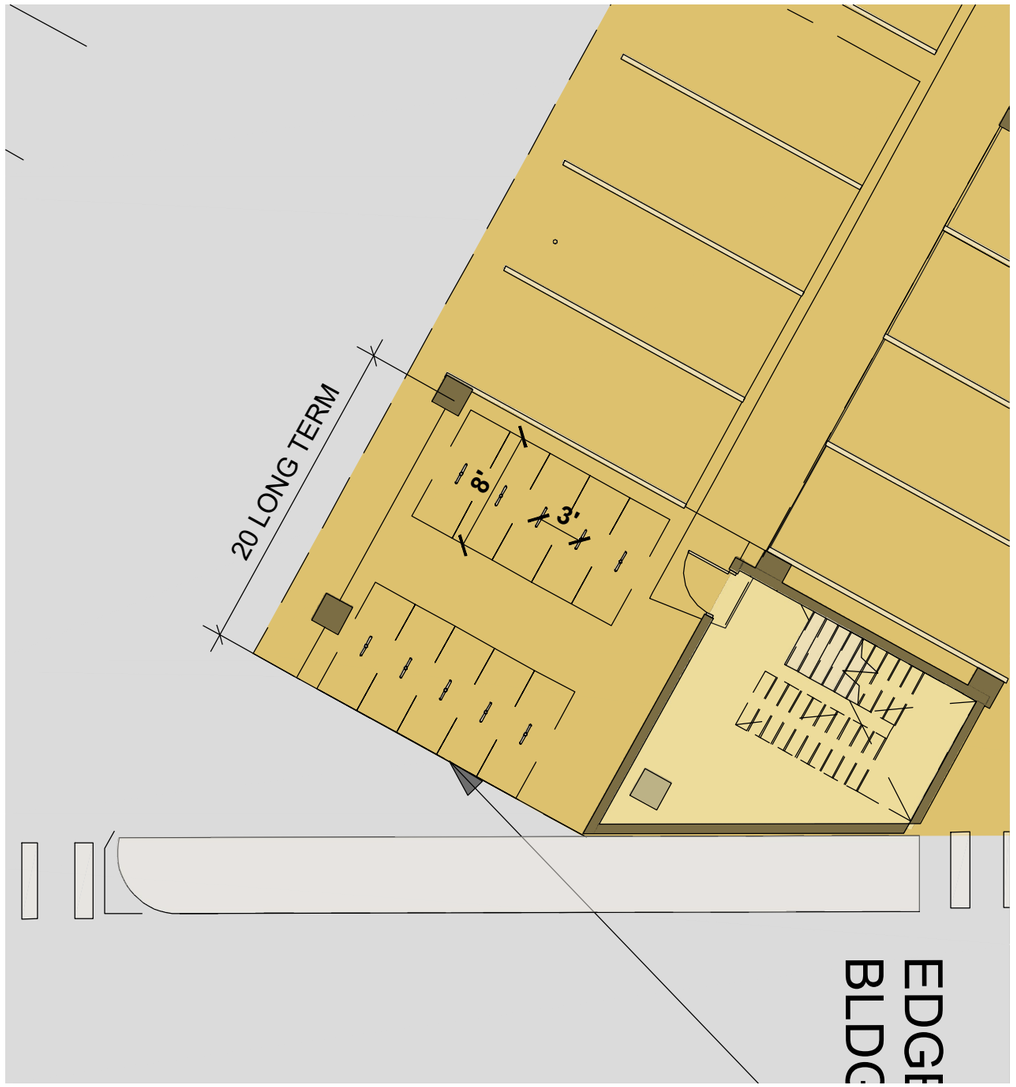
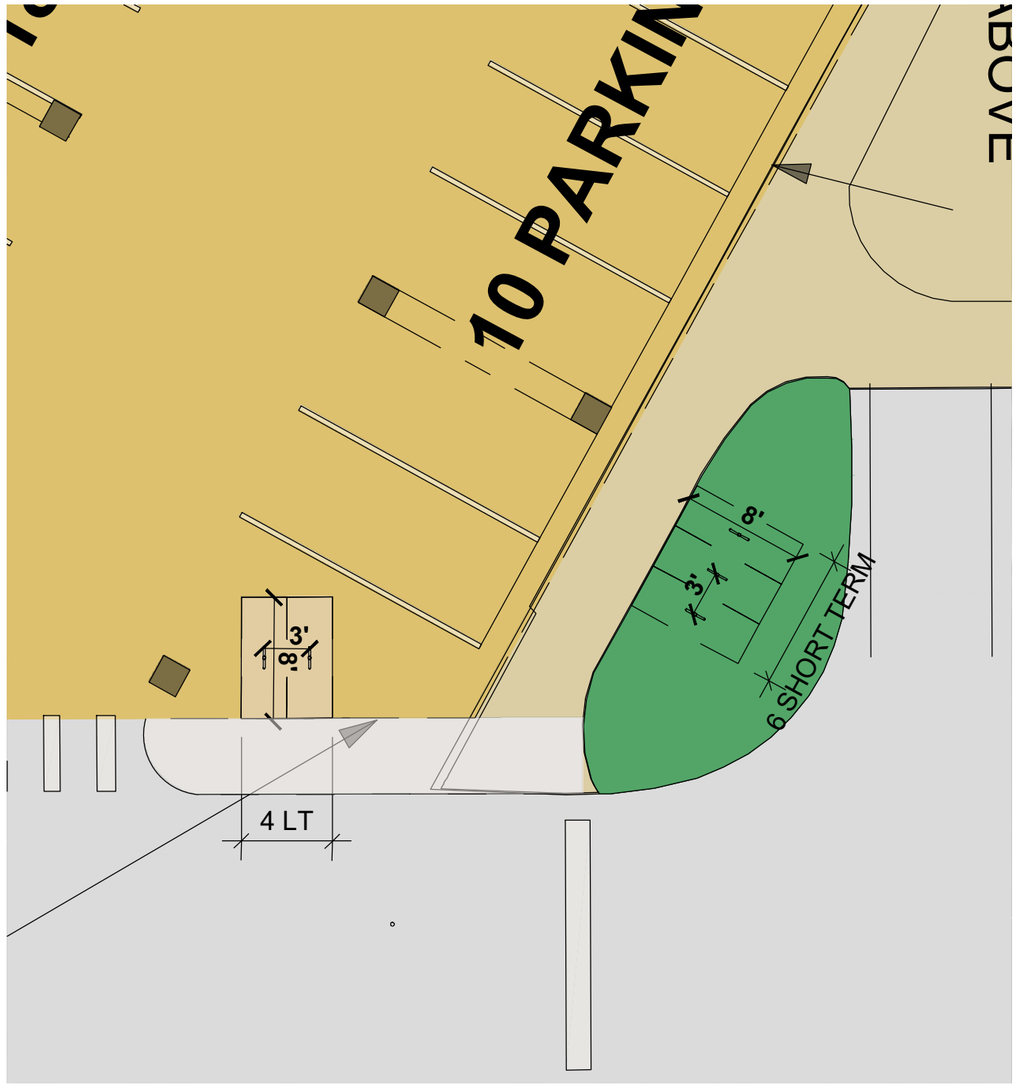


Detail 5 - Ground Floor - Building B



Detail 6 - Ground Floor - Building B

Source: ICON Architecture

0 5 10 Scale in Feet

Figure 9.4

Proposed Bicycle Parking

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Detail 7 - Ground Floor - Building B

Source: ICON Architecture

0 5 10 Scale in Feet

Figure 9.5

Proposed Bicycle Parking

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Short-term bicycle racks are the DERO post-and-ring bike hitch, model number BH-FT-EPX-X, powder coated in black or silver which accommodate two bikes each. Long-term racks are the wave-rack type, painted white or black.

10.0 TRANSIT ANALYSIS

10.1 PROJECT TRANSIT DISTRIBUTION

An analysis of transit usage was conducted to determine impacts that might be recognized under Build conditions. There are a total of eight bus routes and one subway line that are available for residents at the Site. The distribution on the transit routes is shown in Table 10.1.

Table 10.1
TRANSIT SYSTEM TRIP DISTRIBUTION[a]

Time Period/Directional Distribution	Project Transit Trips[b]	Red Line Distribution[c]	Alewife Station Bus Distribution[d]	MBTA Bus Route 83 Distribution[e]
Weekday Daily:				
Entering	275	162	88	25
Exiting	275	162	88	25
Total	550	324	176	50
Peak Hour Headways (Minutes)	--	8-9	6-62	20-35
Weekday Morning:				
Entering	30	18	10	2
Exiting	18	10	6	2
Total	48	28	16	4
Weekday Evening:				
Entering	17	10	5	2
Exiting	27	16	9	2
Total	44	26	14	4

[a]Based on resident survey conducted at 402 Rindge Avenue in October 2018 and supplemented in February 2019 and MBTA daily bus ridership data from Table 2.e.3.
[b]From Table 3.a.9.
[c]59 percent assignment.
[d]32 percent assignment, split among all 7 bus routes that stop at Alewife Station.
[e]9 percent assignment.

The peak-hour headways listed in Table 10.1 indicate between six and eight trains arrive/depart the Alewife station during the peak hours. The peak-hour passenger loading from the proposed project of 26 to 28 peak-hour person trips directed towards the Red Line can easily be accommodated without a noticeable increase in operating characteristics. Detailed analysis of transit ridership impacts due to the project is provided in Table 10.2 for the Red Line subway loadings and Table 10.3 for the bus loadings, respectively. Relevant capacity information was obtained from the MBTA for the Red Line and Bus Routes 62, 67, 76, 79, 84, 350, 351, and 83.

10.2 SUMMARY OF ANALYSIS RESULTS

Tables 10.2 and 10.3 demonstrate that sufficient capacity exists on the bus routes and subway lines to accommodate the expected ridership increases due to the Project. Increases in volume-to-capacity (v/c) ratios pertaining to line volume are at or below 0.02 for all affected bus routes and the Red Line subway systems.

Seating and lighted shelters are available at the Alewife station and the Route 83 bus stop, Rindge Avenue at Russell Field.

10.3 FUTURE TRANSIT CONDITIONS

The MBTA is in the process of replacing the 218 cars on the Red Line, with plans to replace all cars by 2023 and add an additional 34 cars to bring the fleet to 252 cars. Upgrades to signal switching equipment is also proposed. Together, these improvements are is expected to increase overall capacity by 50 percent by raising the current number of trains per hour from 13 to 20 and allowing a three-minute peak-hour headway for trains, which is a reduction from the current four-and-a-half minute peak-hour headway. It should be noted that the ridership data from the MBTA are based on aggregated counts from Fall 2016 which may not reflect peak train ridership occurring during one or two specific hours of one day.

10.4 MBTA #83 BUS CONDITIONS

As indicated in the scoping letter, the MBTA #83 bus is reported to have difficulties turning around in the parking lot by Comeau Field. One idea raised involves adding a bus stop, layover area, and turn-around in the parking lot at 402 Rindge Avenue.

The Service Planning section of the MBTA was contacted to discuss this issue and the potential inclusion of the #83 bus into the site. The MBTA noted that while they do travel onto private property in some cases, these are typically sites with defined travel aisles and bus stop locations. The MBTA buses do not typically travel through parking lots without any definition, such as would be the case at the site. The bus would have to traverse the entire site and there is no available area for a vehicle the size of a city bus to layover without restricting circulation or parking. In addition, the proponent has concerns regarding a vehicle the size of a city bus and its ability to navigate the site while other vehicles and pedestrians are also circulating through the site. For these reasons, relocation of the #83 bus to travel internally within the site parking lot is not recommended.

Table 10.2
MBTA RED LINE SUBWAY PEAK HOUR RIDERSHIP IMPACTS

Train Line	Time Period	Directional Flow	No. of Trains[a]	No. of Cars per Train	Standard Load per Car[b]	OTP Factor[c]	Hourly Capacity[d]	Existing		Proposed with Project		Ridership Increase	
								Ridership[e]	V/C[f]	Ridership	V/C	Percent	V/C
Red Line	Morning Peak Hour[e]	Outbound	13	6	167	0.89	11,594	646	0.06	656	0.06	1.5	0.00
		Inbound	13	6	167	0.89	11,594	2,567	0.22	2,585	0.22	0.7	0.00
	Evening Peak Hour[e]	Outbound	13	6	167	0.89	11,594	2,315	0.20	2,331	0.20	0.7	0.00
		Inbound	13	6	167	0.89	11,594	916	0.08	926	0.08	1.1	0.00

[a]Based on average headway of 4.5 minutes over one hour.
[b]Defined on the basis of MBTA design standards.
[c]On-Time Performance Factor from MBTA Dashboard for past 30 days as of this writing.
[d]Based on standard passenger load per car, number of cars per trains, number of trains per hour, and the OTP Factor.
[e]From MBTA ridership count results fall 2016.
[f]Volume-to-capacity ratio.

Table 10.3
MBTA BUS ROUTE PEAK HOUR RIDERSHIP IMPACTS

Weekday Morning Peak Hour:

Route No.	Route Headway[a]	Maximum Load[b]	Hourly Capacity	Existing		Proposed with Project		Ridership Increase	
				Ridership[c]	V/C[d]	Ridership	V/C	Percent	V/C
62	20 minutes	54	324	211	0.65	215	0.66	1.9	0.01
67	30 minutes	54	216	105	0.49	107	0.50	1.9	0.01
76	30 minutes	54	216	135	0.63	138	0.64	2.2	0.01
79	30 minutes	54	216	76	0.35	77	0.36	1.3	0.01
84	30 minutes	54	216	87	0.40	89	0.41	2.2	0.01
350	20 minutes	54	324	179	0.55	182	0.56	1.7	0.01
351	30 minutes	54	108	49	0.45	50	0.46	2.0	0.01
83	20 minutes	54	324	34	0.10	38	0.12	11.8	0.02

Weekday Evening Peak Hour:

Route No.	Route Headway[a]	Maximum Load[b]	Hourly Capacity	Existing		Proposed with Project		Ridership Increase	
				Ridership[c]	V/C[d]	Ridership	V/C	Percent	V/C
62	17 minutes	54	378	208	0.55	212	0.56	1.9	0.01
67	24 minutes	54	270	69	0.26	70	0.26	1.4	0.00
76	30 minutes	54	216	117	0.54	119	0.55	1.7	0.01
79	20 minutes	54	324	106	0.33	108	0.33	1.9	0.00
84	20 minutes	54	324	86	0.27	87	0.27	1.2	0.00
350	20 minutes	54	324	161	0.50	164	0.51	1.9	0.01
351	60 minutes	54	54	27	0.50	28	0.52	3.7	0.02
83	24 minutes	54	270	22	0.08	26	0.10	18.2	0.02

[a]Based on current MBTA schedule.
[b]Defined on the basis of MBTA design standards.
[c]Based on MBTA Ridership Data for composite years 2017 and 2018.
[d]Volume-to-capacity ratio.

11.0 PEDESTRIAN ANALYSIS

A pedestrian impact analysis was conducted at the study area intersections under 2019 Existing, 2019 Build, and 2024 Future conditions, as required in the scoping letter. For signalized intersections, the pedestrian level-of-service (PLOS) calculations measure the adequacy of the pedestrian phases (exclusive or concurrent) for sufficient time to cross major or minor streets. The analysis methodology was based on procedures outlined in the 2000 HCM for signalized intersections, and is provided in the Appendix. Table 11.1 summarizes the results of the pedestrian analysis at the signalized intersections. The PLOS ratings for the intersections are shown graphically on Figure 11.a.1 for the weekday morning peak hour and the weekday evening peak hours.

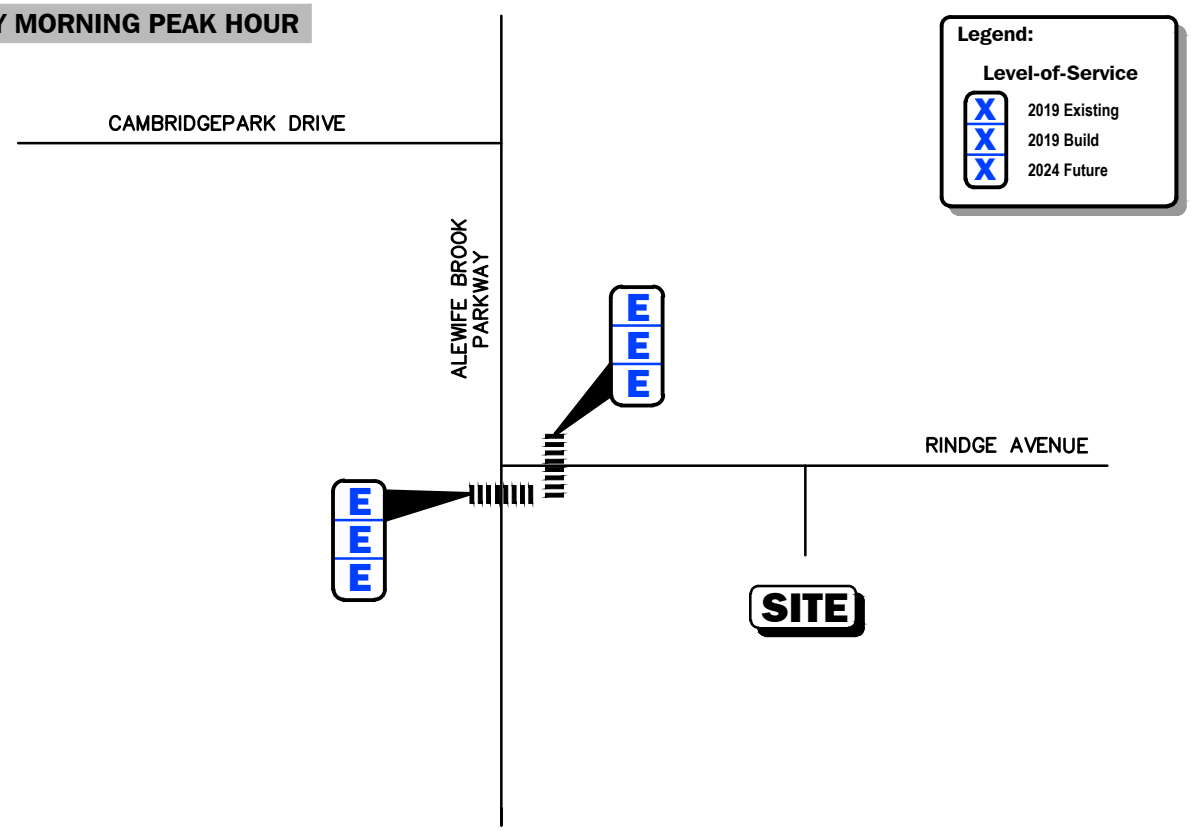
As can be seen from Table 11.1 the Project does not change the PLOS of any of the crosswalks studied.

Table 11.1
PEDESTRIAN LEVEL-OF-SERVICE SUMMARY – SIGNALIZED INTERSECTIONS

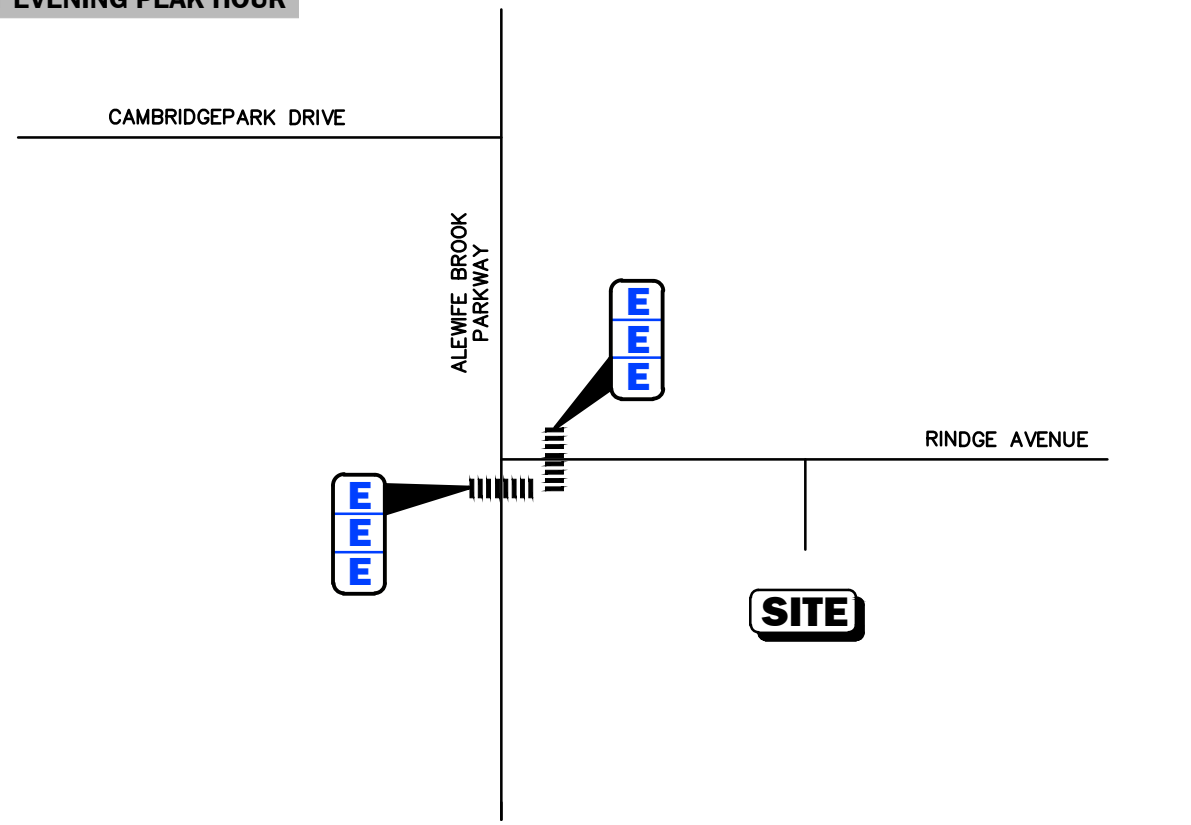
Intersection/Time Period/Crossing Path	2019 Existing			2019 Build				2024 Future		
	Demand[a]	Delay[b]	LOS[c]	Demand	Delay	LOS	Delay Increase	Demand	Delay	LOS
Alewife Brook Parkway at Rindge Avenue										
Weekday Morning:										
Crossing Alewife Brook Parkway (South)	154	46	E	202	46	E	0	202	46	E
Crossing Rindge Avenue	43	46	E	49	46	E	0	49	46	E
Weekday Evening:										
Crossing Alewife Brook Parkway (South)	179	46	E	223	46	E	0	223	46	E
Crossing Rindge Avenue	72	46	E	78	46	E	0	78	46	E

[a]Demand in pedestrians per hour.
[b]Average delay per pedestrian (in seconds).
[c]Pedestrian Level of Service.

WEEKDAY MORNING PEAK HOUR



WEEKDAY EVENING PEAK HOUR



N

Not To Scale

Figure 11.a.1

Pedestrian Level-of-Service Map

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12.0 BICYCLE ANALYSIS

A review of bicycle conditions was conducted at the affected intersections and street segments. None of the study area intersection or road segments provide bicycle facilities.

12.1 VEHICLE TURNING VOLUME CONFLICTS

City guidelines require identification of conflicting vehicle-turning volumes at intersections impacted by the Project where bicycle facilities are present or where peak-hour bicycle volumes exceed 10 bicycles on any approach. The locations meeting these criteria are listed in Table 12.1 for Existing and Build conditions.

Table 12.1
BICYCLE-VEHICLE VOLUME CONFLICTS

Roadway/Intersecting Street/Time Period	Approach Bicycle Volume	Conflicting Vehicles Turning Volume			
		2019 Existing		2019 Build	
		Advancing Volume	Opposing Volume	Advancing Volume	Opposing Volume
Alewife Brook Parkway at Rindge Avenue					
Weekday Morning	NB -- <10	--	--	--	--
	SB -- <10	--	--	--	--
	WB – <10	--	--	--	--
Weekday Evening	NB -- 10	966	0	981	0
	SB -- <10	--	--	--	--
	WB -- <10	--	--	--	--
Alewife Brook Parkway at Cambridgepark Drive					
Weekday Morning	NB -- <10	--	--	--	--
	SB -- <10	--	--	--	--
	EB – <10	--	--	--	--
Weekday Evening	NB -- <10	--	--	--	--
	SB -- <10	--	--	--	--
	EB – <10	--	--	--	--
Rindge Avenue at Site Driveway					
Weekday Morning	NB -- <10	--	--	--	--
	EB – <10	--	--	--	--
	WB -- <10	--	--	--	--
Weekday Evening	NB -- <10	--	--	--	--
	EB – <10	--	--	--	--
	WB -- <10	--	--	--	--

NOTE: NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; LT = Left Turn movement; TH = Through movement; RT = Right Turn movement.

12.2 FUTURE BICYCLE CONNECTIONS

The scoping letter requested information on how the Project could advance future pedestrian and bicycle paths adjacent to the railroad and over the railroad at the south end of the site. However, the railroad property abuts the site and there is minimal space to provide any additional paths within the site property. Any future paths would need to secure property rights from the MBTA and/or other owners of the railroad properties.

It should also be noted that the Proponent is a non-profit community organization working to increase the availability of affordable housing in the area. Any large-scale infrastructure improvements such as pedestrian bridges are beyond the scope and means of this development project.

13.0 ARTICLE 19 SPECIAL PERMIT CRITERIA ANALYSIS

Under Section 19.25.1, the Planning Board shall only grant a Section 19.20 Project Review Special Permit upon finding that the Project will have no substantial adverse impact on City traffic within the study area analyzed in the TIS. Substantial adverse impact is measured by reference to the Special Permit Criteria, which consist of five traffic impact indicators used to evaluate Project impacts. The indicators are: (1) project vehicle trip generation weekdays for a twenty-four hour period and AM and PM peak vehicle trips generated; (2) change in level of service at identified intersections; (3) increased volume of trips on residential streets; (4) increase of length of vehicle queues at identified signalized intersections; and (5) lack of sufficient pedestrian and bicycle facilities. The methodology for the analysis of the traffic impact indicators is from the Cambridge "Guidelines for Presenting Information to the Planning Board", approved November 27, 2001, and revised in 2004. Referenced in the guidelines are capacity analysis procedures presented in the *Highway Capacity Manual* (HCM) and summarized in the Appendix. Exceedance of one or more indicators suggests a potentially substantial adverse impact on City traffic; however, the Planning Board should also consider proposed Project mitigation in making its finding. The following section summarizes the 43 measurements analyzed in applying the five indicators to the proposed Project and the proposed Project mitigation. As demonstrated below, our analysis shows that Indicator 3 is exceeded during the weekday morning peak hour. However, the trip distribution is based on the existing travel patterns from the site driveway which indicates that the existing vehicles are avoiding Alewife Brook Parkway due to exiting congestion and using Rindge Avenue instead. Therefore, this exceedance is more a product of the existing congestion on Alewife Brook Parkway than it is a product of the project itself. Also, while the existing conditions at the intersection of Alewife Brook Parkway and Ridge Avenue produce minimal measurements under Indicator 5 that exceed City standards, this is an existing condition that is not exacerbated by the Project. The Project is not expected to exceed any other indicators. Therefore, the Project is not expected to have a substantial adverse impact on City traffic.

Indicator 1: Project Vehicle – Trip Generation

As shown on Table 13.a, the Project satisfies the City standards for Indicator 1 regarding vehicle trip-generation as demonstrated by the 3 measurements detailed below.

Indicator 2: Project Vehicle – Level-Of-Service

As shown on Table 13.b, the Project satisfies the City standards for Indicator 2 regarding vehicle LOS as demonstrated by the 4 measurements detailed below.

Indicator 3: Traffic on Residential Streets

As shown on Table 13.c, the Project satisfies the City standards for Indicator 3 regarding traffic on residential streets during the weekday evening peak hour. During the weekday morning peak hour 53 new vehicle are anticipated to use Rindge Avenue which exceed the criteria of 40 new vehicles. However, the trip distribution is based on the existing travel patterns from the site driveway which indicates that the existing vehicles are avoiding Alewife Brook Parkway due to exiting congestion and using Rindge Avenue instead. Therefore, this exceedance is more a product of the existing congestion on Alewife Brook Parkway than it is a product of the project itself.

Indicator 4: Lane Queue

As shown on Table 13.d, the Project satisfies the City standards for Indicator 4 regarding lane queues as demonstrated by the 26 measurements detailed below.

Indicator 5: Lack of Sufficient Pedestrian and Bicycle Facilities

As shown on Tables 13.e.1 and 13.e.2, the Project satisfies the City standards for Special Permit Criteria 5 regarding pedestrian and bicycle facilities. Of the 8 measurements analyzed in connection with Criteria 5, none were exceeded as a result of the Project. A total of four measurements are exceeded under existing conditions, with or without the Project. The Project itself neither exacerbates the existing exceedances nor makes any changes to the relevant areas.

Table 13.a
INDICATOR 1
PROJECT VEHICLE-TRIP GENERATION

Weekday =	928	AM Peak Hour =	85	PM Peak Hour =	72	Exceeds Criteria? [Y/N]	N/N/N

Table 13.b
INDICATOR 2
PROJECT VEHICLE-LEVEL-OF-SERVICE

Intersection	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
	Existing	With Project	Exceeds Criteria?	Existing	With Project	Exceeds Criteria?
Alewife Brook Parkway at Cambridge Park Drive	F	F	N	E	E	N
Alewife Brook Parkway at Rindge Avenue	F	F	N	D	D	N

Table 13.c
INDICATOR 3 – TRAFFIC VOLUME INCREASE ON RESIDENTIAL STREETS

Street Segment	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
	Existing Volume	With Project	Exceeds Criteria?	Existing Volume	With Project	Exceeds Criteria?
Rindge Avenue, Alewife Brook Parkway Street to Clifton Street (Amount of residential = ½ or more)	833	886	Y	854	884	N

Table 13.d
INDICATOR 4 – QUEUE ANALYSES

Intersection	No. of Lanes Analyzed	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
		Existing	With Project	Exceeds Criteria?	Existing	With Project	Exceeds Criteria?
Alewife Brook Parkway at Cambridgepark Drive:	7						
Cambridgepark Drive EB LT		3	3	N	5	5	N
Cambridgepark Drive EB LT		3	3	N	5	5	N
Alewife Brook Parkway NB LT[d]		11	11	N	4	4	N
Alewife Brook Parkway NB TH[d]		24	24	N	11	12	N
Alewife Brook Parkway NB TH[d]		24	24	N	11	12	N
Alewife Brook Parkway SB TH		36	36	N	22	22	N
Alewife Brook Parkway SB TH		36	36	N	22	22	N
Alewife Brook Parkway at Rindge Avenue:	6						
Rindge Avenue WB LT		7	7	N	3	3	N
Rindge Avenue WB RT		20	21	N	12	13	N
Alewife Brook Parkway NB TH		19	20	N	14	14	N
Alewife Brook Parkway NB TH/RT		19	20	N	14	14	N
Alewife Brook Parkway SB TH[c]		42	42	N	31	31	N
Alewife Brook Parkway SB TH[c]		42	42	N	31	31	N

Table 13.e.1
INDICATOR 5A – PEDESTRIAN LEVEL OF SERVICE

Intersection	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
	Existing PLOS	With Project	Exceeds Criteria?	Existing PLOS	With Project	Exceeds Criteria?
Alewife Brook Parkway at Rindge Avenue						
Crossing Alewife Brook Parkway (South)	E	E	Y	E	E	Y
Crossing Rindge Avenue	E	E	Y	E	E	Y

Table 13.e.2
INDICATOR 5B AND 5C – PEDESTRIAN AND BICYCLE FACILITIES

Adjacent Street or Public Right-of-Way	Sidewalks or Walkways Present?	Exceeds Criteria?	Bicycle Facilities or Right-of-Ways Present?	Exceeds Criteria?
Alewife Brook Parkway	Y	N	Y	**N**
Rindge Avenue	Y	N	Y	N

14.0 PROJECT MITIGATION AND CONCLUSION

14.1 PROJECT MITIGATION

Generally, the Project's location near Alewfie Station significantly encourages transit use by residents, employees, and visitors to the proposed Project. Mitigation efforts are therefore geared towards a low single occupant vehicle (SOV) mode of transportation. As detailed below, the Project proposes implementation of a TDM Plan.

14.2 TRANSPORTATION DEMAND MANAGEMENT PROGRAM

Reducing the amount of traffic generated by the Project is an important component of the transportation mitigation plan. The goal of the proposed traffic reduction strategy is to reduce the use of SOVs by encouraging the use of public transportation, car/vanpooling, bicycle commuting, and pedestrian travel. The following measures will be implemented as a part of the proposed project and by the property management team in an effort to reduce the number of vehicle trips generated by the project:

- Public transit schedules will be posted in centralized locations for new residents, employees and visitors of the medical clinic and office space. The pedestrian nature of the site will also be emphasized, as will the proximity of the Alewife Station.

- When training events are held in the office/educational space, use of alternative transportation will be encouraged. Staff and employees will be advised that parking is limited on site in an effort to limit the use of personal vehicles.

- In order to encourage car/vanpooling, the property management team will coordinate with the Alewife TMA to identify car/vanpool resources that may be available to new residents and employees/visitors of the medical clinic and office space. This information will be posted in centralized locations in the new buildings.

- The property management team will provide information on available pedestrian and bicycle facilities including BLUEbikes stations, multi-use paths, and bicycle racks in the vicinity of the project site and local destinations. This information will be posted in centralized locations on site.

The Applicant will investigate the implementation of these traffic reduction strategies and will work with the City, the TMA, and area businesses to implement these programs.

14.3 ON-SITE PARKING

Approximately 37 parking spaces will be lost due to construction of the new buildings on site. However, the proponent believes that constraining the parking supply will have an overall positive effect on the living experience at Rindge Commons. By not providing parking spaces at the current demand rates, the site will effectively appeal to two types of potential residents: those residents without vehicles or those residents willing to forego their personal vehicles.

Parking spaces will be shared between uses, e.g. no reserved spaces for the office/educational space or medical clinic space. These are expected to operate in a shared parking analysis arrangement since the daytime residential demand is typically 60 percent of peak demand and the clinic and office/educational space is not expected to be open during the evening when peak residential demand occurs. In addition, the employees/students attending the office/educational space will be instructed to use alternatives to personal vehicles and will be informed that parking will not be provided for their vehicles on site. Most of the employee/students currently use public transportation and other transit means for commuting and this is not expected to change.

14.4 BICYCLE PARKING

The Proponent is adding long-term bike parking spaces and short-term bike parking spaces to meet requirements for the Project under zoning. To encourage the use of bicycling to and from the site, the Proponent is also reviewing the installation of a BLUEbikes station. This 19-dock station would further the City's goals of additional BLUEbikes stations throughout the City but especially along multi-use paths and residential neighborhoods in highly congested areas. The station will be installed on the north side of Building A, adjacent to the Rindge Avenue sidewalk in this area. From this point, connections to the Linear Park, Minuteman Bikeway, and other multi-use paths are available.

14.5 CONCLUSIONS

As required by Section 19.20, the Project has been evaluated against the five indicators as measurements of the Project's expected impact on City traffic. Of the 43 measurements analyzed in connection with the five indicators, only 1 was directly exceeded as a result of the Project. A total of four measurements are exceeded under existing conditions, with or without the Project. The Applicant is committed to the implementation of the above Project mitigation strategies in order to lessen any potential impact of the Project on City traffic. Accordingly, the Project is not expected to have a substantial adverse impact on City traffic such that issuance of a Project Review Special Permit is appropriate with respect to potential traffic impacts.

This TIS finds that the Project can be accommodated within the existing area infrastructure and on the roadway network with minimal effects, resulting in the ability to modify the site associated with the Project as planned. This project is an expansion of existing residential development with limited parking in order to reduce private vehicle trip generation. The project proponent is committed to a project which is sensitive to the area and minimizes the impact to the neighborhood.

Vanasse & Associates, Inc.
Transportation Engineers & Planners

35 New England Business Center Drive
Suite 140
Andover, MA 01810-1071
Office 978-474-8800
Fax 978-688-6508

TRANSMITTAL LETTER

To: Mr. Adam Shulman
City of Cambridge
Traffic, Parking, and Transportation Dept.
344 Broadway
Cambridge, MA 02139

From: Scott W. Thornton, P.E. SWT

Date: December 20, 2019
Project No.: 7794
Re: Transportation Impact Study
Rindge Commons

via Federal Express

Enclosed please find four (4) full copies of the Transportation Impact Study (TIS) for the above referenced project. Also enclosed is a memory stick with the TIS, TIS Figures, TIS Appendix, Planning Board and Special Permit Summary Sheets, Synchro files, and traffic count data in spreadsheet format.

cc: File

Just-A-Start Corporation
1035 Cambridge Street, #12 | Cambridge, MA 02141 | T: 617-494-0444 | www.justastart.org

COMPREHENSIVE PERMIT APPLICATION

EVIDENCE OF NEED FOR AFFORDABLE HOUSING

Rindge Commons

402 Rindge Ave
Cambridge, MA 02140

Affordable Housing Waiting Pools

Based on the waiting lists of qualified applicants for existing JAS developments, Cambridge has a clear need for more affordable housing. In November 2019, JAS had over 1,200 households on its existing property waitlists.

As of March, 2020, there are 3,742 applicants in the City's Rental Applicant Pool of households seeking affordable rental units marketed by CDD. The Cambridge Housing Authority's waitlist in March, 2019 was over 19,000 households.

Cambridge Affordability Ladder

The skyrocketing monthly rents and sales prices in Cambridge confirm the rapidly rising cost of living in the City. Low Income Housing Tax Credit (LIHTC) unit affordability is defined by U.S. Department of Housing and Urban Development income limits. Most of the new units at Rindge Commons will be eligible for renters at or below 60% of Area Median Income (AMI), or up to $71,100 for a family of four while some will go as high as 80% AMI.

Market Information

Per the Massachusetts Executive Office of Labor and Workforce Development, the unemployment rate in Cambridge is 1.9% as of November 2019. The city-wide rental vacancy rate is **4.5%,** according to the 2019 Cambridge Housing Profile.

Based on Zillow and CoStar data, the median and average rents in November, 2019 are:

Size	Average	Median
1-bedroom	$3,089	$2,525
2-bedroom	$3,775	$3,176
3-bedroom	$4,748	$3,500

The median price of homes currently listed in Cambridge is $1,377,500 as of November 2019.

NEW ECOLOGY
Community-Based Sustainable Development

15 Court Square, Suite 420
Boston, MA 02108

Article 22 Permit Issue Compliance

Rindge Commons

401 Rindge Ave
Cambridge, MA

Submitted To:

Just a Start Corporation
June 5, 2020

I. Project Description

402 Rindge Avenue development (Rindge Commons) complies with the Special Permit application requirements as defined in Article 22: Sustainable Design and Development ordinance in the City of Cambridge. The project will be designed and constructed under the guidelines of Passive House Institute U.S. (PHIUS). Each building in the development will meet the design, construction, and testing requirements of the certification program and will be certified as a Passive House.

The property owner has committed to creating efficient and healthy living environment for its tenants as well as a welcoming design for the neighborhood. The project will address climate change vulnerability items including voluntary compliance with the 2070 Sea Level Rise and Storm Surge Flooding level for a 100-year Storm Event per Cambridge Climate Vulnerability Projections, raised occupied living spaces, elevated mechanical equipment installation, and reduced heat island effect measures.

The project comprises of 2 buildings on a previously developed site:

- Building A will be certified using PHIUS+ Core for residential and commercial portions of the building.
    - Residential – 27,600 sf includes 27 residential units and the supporting equipment and areas such as elevator, laundry, and corridors.
    - Non-Residential – 36,300 sf includes training and community rooms as well as early education and healthcare facilities.
- Building B will be certified using PHIUS+ Core.
    - Residential – 84,000

Integral to a PHIUS Certification is compliance with Energy Star New Construction, Indoor AirPLUS, WaterSense, and Zero Energy Ready Homes certifications. In combination with third party RESNET approved quality assurance and quality control testing (NEI will be serving in the role of a Passive House Verifier) the building will exceed the Cambridge Green Building Requirements as outlined in Article 22.20.

II. Project Narrative

Passive House Background

PHIUS+ is a “high-performance building standard” – it challenges the building industry to construct buildings that can maintain a comfortable indoor environment with very low operating energy. Since the operating energy of a building over its lifetime far exceeds the embodied energy to construct the building, the PHIUS+ standard focuses on reducing operating energy and does not specifically address the environmental impacts of the building materials and construction process.

PHIUS+ is a pass-fail standard for building energy performance, with additional requirements for quality assurance inspections, and for low-moisture-risk design.

The particular focus of PHIUS+ is on reducing heating and cooling energy using passive measures. In addition to an overall limit on energy use for all purposes, it features limits on heating and cooling energy, in both the annual-total and peak-power sense. The targets for these heating and cooling "loads" are climate-specific and have been set based on consideration of the best that can be achieved "cost-competitively".[(1)]

PHIUS+ Core is a currently available certification pathway through PHIUS and Rindge Commons will follow this pathway for buildings A and B for commercial and residential areas.

PHIUS+ Core has been developed for high density, multi-family residential and commercial buildings; this certification pathway retains PHIUS+ 2018's conservation target, but enables project teams to certify utilizing only on-site measures. Specifically, the PHIUS+ Core includes:

- On-site renewable energy offset is calculated based on coincident production and use (utilization fraction)
- Source Energy limit is applied to the calculated net of the estimated utilization fraction of on-site PV or other renewable electricity generation
- Off-site renewable energy generation is not counted.

Project Specific Criteria and Requirements

Rindge Commons includes plans for variety of programs that result in a unique approach through PHIUS. Building B is a residential building and will follow the PHIUS pathway for such buildings. Building A, however, contains both residential and commercial, educational, and health facilities. Therefore Building A will plan for and receive two PHIUS certifications: PHIUS+ Core Residential and PHIUS+ Core Commercial. This results in 3 separate certifications and the climate and building specific targets and current performance metrics are summarized for each in Tables 1-3.

Table 1: Building A Residential Requirements and Building Specific Performance

	Building Target	Building Performance
Heating Demand	3.8 kBtu/ft^2*yr	2.61 kBtu/ft^2*yr
Cooling Demand	6 kBtu/ft^2*yr	3.37 kBtu/ft^2*yr
Heating Load	3.7 Btu/hr*ft^2	3.4 Btu/hr*ft^2
Cooling Load	3.1 Btu/hr*ft^2	2.98 Btu/hr*ft^2
Source Energy	5,500 kWh/Person*yr	5,288 kWh/Person*yr

[1] *PHIUS+ 2018 Passive Building Standard Certification Guidebook*; Version 2.1; June 2019

Table 2 Building A Commercial Requirements and Building Specific Performance

	Building Target	Building Performance
Heating Demand	3.8 kBtu/ft²*yr	1.16 kBtu/ft²*yr
Cooling Demand	8.2 kBtu/ft²*yr	3.54 kBtu/ft²*yr
Heating Load	4.4 Btu/hr*ft²	3.67 Btu/hr*ft²
Cooling Load	3.5 Btu/hr*ft²	3.31 Btu/hr*ft²
Source Energy	50 kBtu/ft²*yr	48.68 kBtu/ft²*yr (2)

Table 3: Building B Residential Requirements and Building Specific Performance

	Building Target	Building Performance
Heating Demand	4 kBtu/ft²*yr	1.99 kBtu/ft²*yr
Cooling Demand	7.2 kBtu/ft²*yr	3.17 kBtu/ft²*yr
Heating Load	3.8 Btu/hr*ft²	2.46 Btu/hr*ft²
Cooling Load	2.5 Btu/hr*ft²	2.41 Btu/hr*ft²
Source Energy	5,500 kWh/Person*yr	4,905 kWh/Person*yr

PHIUS Certification builds on established building science principals and guidelines as shown in Figure 1: PHIUS Staircase.

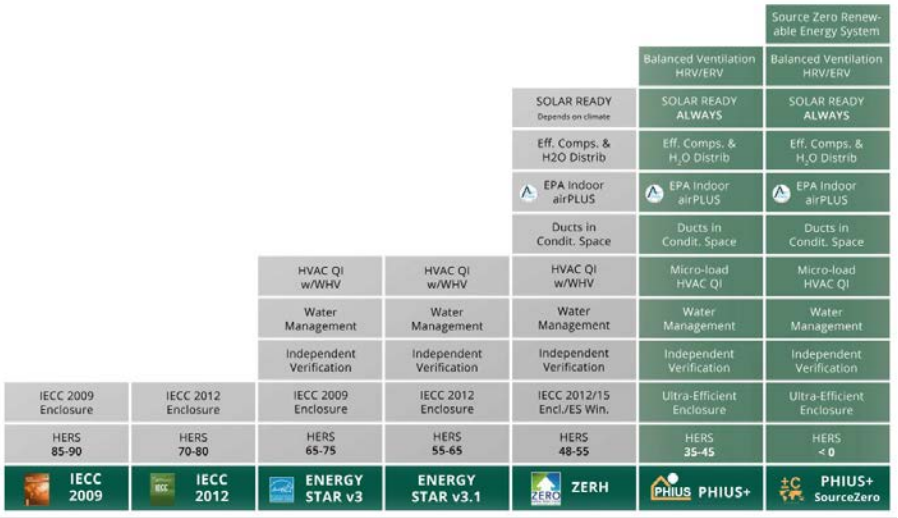


Figure 1: PHIUS Staircase[3]

Rindge Commons will complete the following minimum criteria:

- ENERGY STAR Certification for building B and will follow all applicable principles for Building A Residential.[4] For reference, these principles are summarized in the following checklists:

[2] For buildings containing programs (such as wood shop, laboratory space, health clinics) that require unusual process loads, PHIUS reviews such projects and establishes appropriate performance targets. This review has not occurred at this time; the project will meet or exceed the PHIUS targets once they are known.

[3] https://www.phius.org/media/W1siZiIsIjIwMTcvMDMvMDkvcnp5eDcxbmNuX1BISVVTX1N0YWlyY2FzZV9GaW5hbC5naWYiXV0?sha=0b997e91

[4] ENERGY STAR certification is not available for buildings where residential areas are less than 50% of total building area.

    - National Rater Field Checklist
    - National HVAC Design Report
    - National Rater Design Review Checklist
    - National Water Management System Requirements Checklist
    - National HVAC Functional Testing Checklist

  In addition, the residential portions of the project will be modeled using RESNET protocols and will receive a Home Energy Rating Score (HERS).
- EPA Indoor airPLUS certification for building B and will follow all applicable principles for Building A Residential. For reference, these principles are summarized in the following documents:
    - Indoor airPLUS Construction Specifications
    - Indoor airPLUS Verification Checklist
- Zero Energy Ready Homes (ZERH) certification for Building B and all applicable principles for Building A Residential[5]. For reference, these principles are summarized in the following:
    - DOE Zero Energy Ready Home National Program Requirements
    - DOE Zero Energy Ready Home PV-Ready Checklist
- WaterSense principles. While WaterSense certification is not a PHIUS requirement, Rindge Commons will complete applicable requirements as outlined in the following:
    - WaterSense® Labeled New Home Inspection Checklist
    - WaterSense® Program Guidelines Version 5.3

Description of Technical and Design Approaches

Rindge Commons design will follow a performance path using WUFI Passive modeling software to guide the material, assemblies, and equipment selection as required to meet the certification metrics. The information below is an accurate estimation of the design and assumptions made by the design team at this very early stage of the process and is likely to change based on the design development. Once complete, the success of the design, construction, and compliance with City of Cambridge Article 22 will be measured by:

- Results of the WUFI Passive energy model during design
- Registration with and precertification by PHIUS (acceptance of the design)
- Performance testing by a PHIUS Verifier (New Ecology) and update to energy model based on results
- Certification by PHIUS (acceptance of design and construction)

The project has implemented the following approaches to comply with Article 22 and PHIUS requirements.

Envelope

In order to reduce heating and cooling loads of the building, 2-1/2" of exterior continuous insulation will be installed with 5-1/2" of cavity insulation. A sheet applied weather resistive

[5] ZERH rating is not available for commercial buildings.

barrier will be used to help in meeting the very rigorous infiltration criteria of 0.080 CFM_{50}/ft^2 and to control bulk water and vapor drive. Roof insulation will be above deck and will have a R-Value of 40. Where slab on grade is present, it will be fully insulated with a R-Value of 15. Units located above parking will benefit from R-30 insulation below their floors. Windows will be casement type to further reduce infiltration and will achieve a U-value of 0.18 while the SHGC and shading devices will be dictated by the modeling requirements. Finally, the project team will look carefully at eliminating thermal bridging throughout.

Heating, Cooling, and Ventilation

Heating and cooling will be designed to meet efficiency requirements dictated by the model and will be provided by an all-electric air source heat pump type system (VRF) throughout. The system will be centralized, which will allow for fewer outdoor units (condensers), resulting in more roof area available for solar PV system. Domestic hot water will be generated using a central, gas-fired system and will be recirculated throughout the building. Ventilation will be provided using centralized energy recovery ventilators (ERVs) meeting ASHRAE 62.2-2016 and 62.1-2016 in residential and common/commercial areas respectively. To meet PHIUS requirements, outdoor air will be delivered to every living area and bedroom and exhaust air will be removed from kitchens and bathrooms. The system will be balanced and will have a very high heat recovery efficiency.

Passive Features and Renewables

While the orientation of each building is predetermined by the site, solar exposure will be controlled by using shading devices as necessary and by controlling the solar gain through glazing. PHIUS certification does not require solar PV installation, however, often the source energy targets can only be met by deploying solar panels at the project site. To the extent required, the project will use solar PV to meet PHIUS certification. At this early design phase, the planned system is approximately 40kW.

Attached Report Description

NEI completed preliminary WUFI modeling to guide the project's inputs and to demonstrate to COC and the team that the project can and will be designed and constructed to passive house standards. The resulting work is best summarized through a set of reports generated by the WUFI Passive software. In addition, NEI includes in this submission its own Summary Report to simplify and interpret the multi-page WUFI reports. Each report provides separate set of information.

Summary report:

NEI's summary report is a two-page synopsis of the most critical information provided in the 26 pages generated by WUFI Passive. It shows the starting point for the design, Reference Building, and the changes that will bring the project to PHIUS compliance, PHIUS+ Core. The critical items for compliance are summarized in sections (a) WUFI Passive Results and (b) Site Energy Results.

WUFI Energy Compliance Report:
WUFI Passive's 16-page report details inputs and performance of the building and its components such as HVAC, envelope, and renewables. The first two pages summarize compliance. It is important to note that WUFI Passive does not currently include PHIUS+ Core standards, and therefore the source energy criteria is shown as failing. In fact, 5,550 kWh/person*yr is correct for residential buildings demonstrating PHIUS+ Core is met. Similarly for the commercial component of Building A, the report shows a failure to reach the target threshold for source energy; this is due to the fact that programs such as lab space, wood shop, or health facilities are considred to generate process loads that require the PHIUS to create unique standards that are generated once the project is submitted for review. In preliminary discussions with PHIUS, NEI understands that the threshold will be 50 kBtu/ft^2*yr, which is curerntly met.

REM-Rate report:
In order to generate accurate results, NEI created building assamblies that reflect currect design. This report summarizes the envelope assembly inputs

Attached as appendices are the following reports:

- Pathway to Net Zero Emissions
- Building A Residential Summary Report
- Building A Non-Residential Summary Report
- Building B Summary Report
- Building A Residential WUFI Energy Compliance Report
- Building A Non-Residential WUFI Energy Compliance Report
- Building B WUFI Energy Compliance Report
- Building A Residential REM-Rate Report
- Building A Non-Residential REM-Rate Report
- Building B REM-Rate Report

III. Affidavit

As the Certified Passive House Consultant (CPHC) I have reviewed the preliminary project documents and consulted with the Owner and Design and Construction team to confirm that, to the best of my knowledge, those documents indicate that the project is being designed to achieve the requirements of Section 22.24 under Article 22.20 of the Cambridge Zoning Ordinance. CDD. Furthermore, I will oversee the design development and will be responsible for submission of the documentation to PHIUS for precertification at design completion and final certification at construction completion.

Sincerely,

Maciej Konieczny, CEM, CPHC and CPHB #2642
Senior Project Manager
New Ecology, Inc.

IV. Appendices

CERTIFIED BUILDER

2642

Professional Number

3/20/2018

Date Issued

7/15/2021

Valid Through

The Passive House Institute US Certifies

Maciej Konieczny

has fulfilled the requirements for becoming a

PHIUS CERTIFIED BUILDER

This certificate hereby attests that the above-named Builder has completed training provided by Passive House Institute US (PHIUS) relating to construction of buildings that can meet the criteria of PHIUS' Passive Building Standards for North American climate zones and has passed PHIUS' examination.

Buildings designed, modeled and constructed to meet Passive Building Standards are ultra-efficient and characterized by superior indoor air quality, thermal comfort and durability.

The minimized energy demands of passive houses and buildings reduce building operating costs permanently, while also mitigating the impact of energy price increases over time. The low power requirements provide resilience during outages and help avoid time-of-use surcharges.

Buildings successfully constructed and quality assured to Passive Building Standards can achieve carbon neutrality with the addition of a small renewable generation system, thereby putting owners and occupants firmly on the path to a carbon-neutral lifestyle.

PHIUS is the leading North American organization conducting research, training and certification relating to passive buildings. PHIUS' training is the most comprehensive in the industry. Builders who complete PHIUS' training and pass its rigorous examination are prepared to construct buildings maximizing energy efficiency.

Executive Director

PHIUS

Passive House Institute US

CPHC®

2642

Professional Number

4/5/2019

Date Issued

7/15/2022

Valid Through

Maciej Konieczny

has fulfilled the requirements for becoming a

PHIUS CERTIFIED PASSIVE HOUSE CONSULTANT

This certificate hereby attests that the above-named Consultant has completed training provided by PHIUS relating to construction of buildings that can meet the criteria of the PHIUS+ Passive Building Standard for North American climate zones and has passed PHIUS' examination.

Buildings designed, modeled and constructed to meet the PHIUS+ Passive Building Standard are ultra-efficient and characterized by superior indoor air quality, thermal comfort and durability.

The minimized energy demands of passive houses and buildings reduce building operating costs permanently, while also mitigating the impact of energy price increases over time. The low power requirements provide resilience during outages and help avoid time-of-use surcharges.

Buildings successfully designed and quality assured to the PHIUS+ Passive Building Standard can achieve carbon neutrality with the addition of a small renewable generation system, thereby putting owners and occupants firmly on the path to a carbon-neutral lifestyle.

PHIUS is the leading North American organization conducting research, training and certification relating to passive buildings. PHIUS' training is the most comprehensive in the industry. Consultants who complete PHIUS' training and pass its rigorous examination are prepared to design buildings maximizing energy efficiency.

Executive Director

PHIUS

NEW ECOLOGY
Community-Based Sustainable Development

402 Rindge Ave
Cambridge, MA

Just A Start Corporation

June 6, 2020

Introduction

The City of Cambridge continues to lead the way to an efficient and low carbon future by setting aggressive goals and guidelines. Understanding that close to 80% of its greenhouse gas emissions result from building operations, in June 2015, Cambridge unanimously adopted the Net Zero 25-year Action Plan. The plan clearly outlines proposed policy goals for new construction by sector type with the goal to neutralize greenhouse gas emissions in Cambridge by 2050; by 2022, Cambridge, in cooperation with the local industry and stakeholders.

402 Rindge Avenue development (Rindge Commons) will not be a net zero building; however, significant thought and planning has been dedicated by the development team to align the project with the City's goals. As outlined below, cost effective and practical steps will be taken to make each building efficient include solar PV system. Most importantly, Rindge Commons is committed to passive house certification through the Passive House Institute US, one of the most rigorous energy efficiency programs available in the world. To aid the City in its path to net zero emissions in residential new construction, technically viable options are presented below.

Pathway to Net Zero Emissions

Building Summary

2 buildings:

- Building A:
  - 27,600 gsf residential (27 units), 36,300 gsf commercial
  - WWR: 19.9%[1]
- Building B:
  - 84,000 gsf, 77 units
  - WWR: 13.8%[2]

Baseline Conditions

Rindge Commons buildings' energy performance has been integrated into all aspects of the design and engineering. As demonstrated below, high performance envelope assemblies, very efficient mechanical systems including energy recovery ventilation, and on-site renewable energy are included.

Wall	Wall cavity filled with cellulose plus 3.5" continuous rigid mineral wool board exterior of sheathing

[1] Windows/Storefront: 8,035 sf; Walls: 32,300 sf; Total: 40,335 sf.
[2] Windows/Storefront: 9,500 sf; Walls: 59,000 sf; Total: 68,400 sf.

Roof	Continuous R-40 rigid insulation board above the roof deck
Slab	Continuous R-10 rigid insulation below the slab
Windows	Casement, U-0.18
Lighting	High efficiency LED lighting; occupancy and daylight sensor controls in common spaces; bi-level lighting in hallways and stairs; permanent fixtures throughout units
Heating and Cooling System	Central simultaneous variable refrigerant flow (VRF) air-source heat pumps in each unit and common areas; indoor VRF heat pump units will be ducted vertical type; outdoor condensing units located on the roof will serve groups of indoor heat pump units
DHW System	Central gas-fired high efficiency condensing hot water heaters and storage tanks
Ventilation System	Central energy recovery ventilators with balanced supply and exhaust air ventilation
Ranges	Electric ranges
Refrigerators	High efficiency ENERGY STAR rated
Dishwashers	High efficiency ENERGY STAR rated
Clothes Dryers	High efficiency electric dryers (design team will explore condensing clothes dryers in place of conventional electric clothes dryers)
Clothes Washers	High efficiency ENERGY STAR rated

<u>Energy Performance</u>

Building A Residential — Baseline Assumptions attached in appendix 1

	Building Target (PHIUS)	Building Performance
Heating Demand	3.8 kBtu/ft^2*yr	2.61 kBtu/ft^2*yr
Cooling Demand	6 kBtu/ft^2*yr	3.37 kBtu/ft^2*yr
Heating Load	3.7 Btu/hr*ft^2	3.4 Btu/hr*ft^2
Cooling Load	3.1 Btu/hr*ft^2	2.98 Btu/hr*ft^2
Source Energy	5,500 kWh/Person*yr	5,288 kWh/Person*yr
EUI		18.0 kBtu/sf
Source EUI		42.0 kBtu/sf [3]
GHG Emissions (CO_2 equivalent)		20.3 Ton/yr

Building A Commercial — Baseline Assumptions attached in appendix 1

	Building Target (PHIUS)	Building Performance
Heating Demand	3.8 kBtu/ft^2*yr	1.16 kBtu/ft^2*yr
Cooling Demand	8.2 kBtu/ft^2*yr	3.54 kBtu/ft^2*yr
Heating Load	4.4 Btu/hr*ft^2	3.67 Btu/hr*ft^2
Cooling Load	3.5 Btu/hr*ft^2	3.31 Btu/hr*ft^2
Source Energy	50 kBtu/ft^2*yr	48.68 kBtu/ft^2*yr [4]
EUI		24.0 kBtu/sf
Source EUI		48.7 kBtu/sf [5]
GHG Emissions (CO_2 equivalent)		34.8 Ton/yr

[3] Includes 1.9kBtu/sf of onsite solar PV

[4] For buildings containing programs (such as wood shop, laboratory space, health clinics) that require unusual process loads, PHIUS reviews such projects and establishes appropriate performance targets. This review has not occurred at this time; the project will meet or exceed the PHIUS targets once they are known.

[5] Includes 3.6kBtu/sf of onsite solar PV

Building B

Baseline Assumptions attached in appendix 1

	Building Target (PHIUS)	Building Performance
Heating Demand	4 kBtu/ft^2*yr	1.99 kBtu/ft^2*yr
Cooling Demand	7.2 kBtu/ft^2*yr	3.17 kBtu/ft^2*yr
Heating Load	3.8 Btu/hr*ft^2	2.46 Btu/hr*ft^2
Cooling Load	2.5 Btu/hr*ft^2	2.41 Btu/hr*ft^2
Source Energy	5,500 kWh/Person*yr	4,905 kWh/Person*yr
EUI		20.0 kBtu/sf
Source EUI		45.2 kBtu/sf
GHG Emissions (CO_2 equivalent)		70.5 Ton/yr

Net Zero Emissions Pathway

The pathway to net zero emissions for Rindge Commons is to replace gas-fired equipment with high efficiency electric alternatives, maximize the electricity generated on site, and then purchase green energy or carbon offsets to offset the emissions from the remaining electric load.

HVAC System

The planned system is high efficiency and all electric. No additional improvements are needed.

Replace DHW System

The planned system is a centralized gas fired DHW generation system with recirculation. To meet net zero requirements this system will have to be electrified preferably using a heat pump, refrigerant based equipment. Therefore, a central storage, electric based system may be installed. Commercially sized heat pump DHW systems are available on the market and may be utilized, although challenges remain to industry wide implementation. One of the critical items for heat pump water heaters, especially ones that are centralized, is the slow recovery during peak use periods. A slow recovery results in either the requirement for a significantly larger storage than otherwise necessary or for the use of electric resistance backup which is the most costly way to heat water for domestic production.

In certain situations, a solar thermal DHW system may be considered to augment the electric based system, but significant roof real area is required and this type of system directly completes with a solar PV system.

On-Site Renewables

Roof will be designed to accommodate the planned solar PV system and the available area, excluding for other building systems, will be covered by solar PV.

Parking canopies will be explored, but the viable space may be limited due to existing and planned buildings.

Off-Site Renewables/RECs

In high density developments it may not be possible to meet net zero goals on site. For such circumstances, Renewable Energy Credits may be considered. The value of RECs varies significantly, generally by the

location of the source. Green-e Energy Certification Program is most commonly used in the US to track RECs.

PHIUS does offer a higher level of certification called PHIUS Source Zero that allows for the use of RECs to meet requirements. The RECs are discounted by 80% and must meet 20 years of net energy consumption after other on-site renewables are counted.

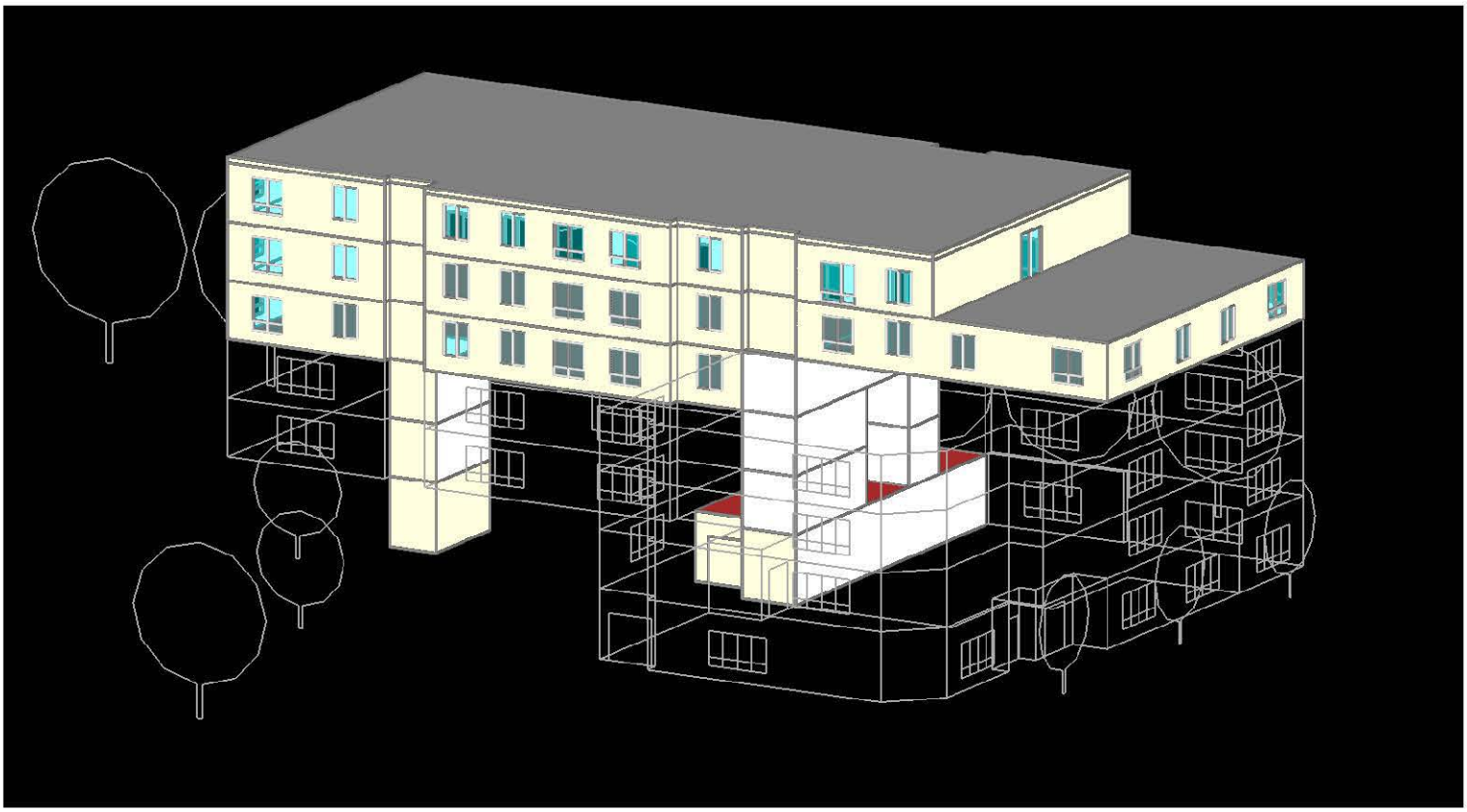
Utility programs

MassSave program currently offers significant incentives to teams pursuing Passive House certification and the project team is utilizing the following:

- Feasibility Study: $5,000
- Modeling Incentive: $20,000
- Pre-certification: $500/unit
- Certification: $2,500/unit
- Performance bonus
    - $0.75/kWh
    - $7.50/therm

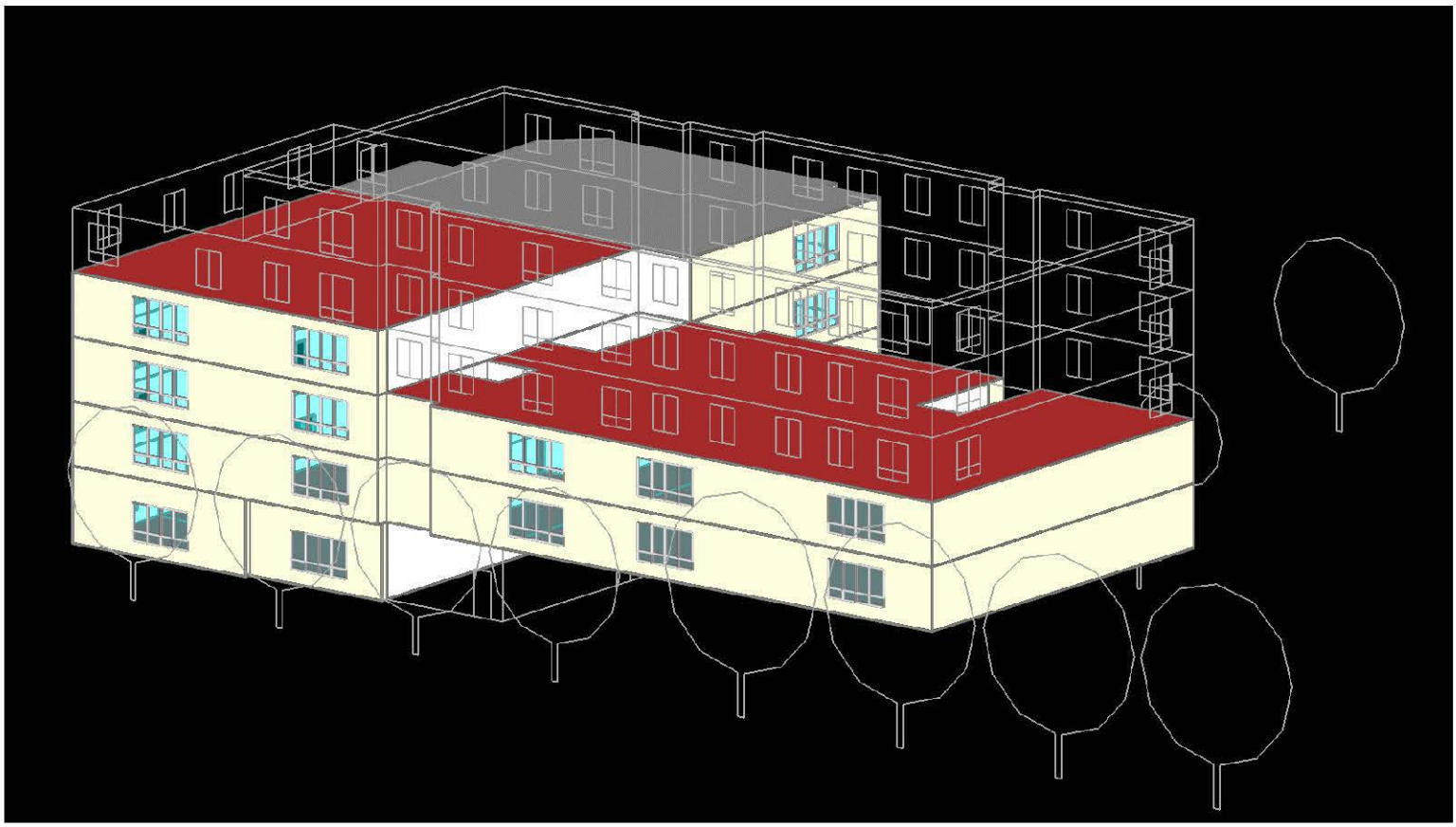
NEW ECOLOGY Community-Based Sustainable Development	Project Name:		Rindge Commons Building A (Residential)	
	Climate		Boston Logan International Airport	
	Case		Reference Building (VRF Option)	PHIUS+ Core
Change from the Reference Building **Meets PHIUS Target** **Misses PHIUS Target**	Notes		Baseline envelope provided in drawings, VRF Heating & Cooling, Central Gas-Fired DHW	Upgraded envelope from reference building with added Solar PV to meet PHIUS+ Core requirements. VRF Heating and Cooling, Central Gas-Fired DHW
WUFI PASSIVE RESULTS	**Units**	**Target**		
Heating Demand	kBtu/ft2.yr	3.80	**7.07**	**2.61**
Cooling Demand	kBtu/ft2.yr	6.00	**2.70**	**3.37**
Heating Load	Btu/hr.ft2	3.70	**7.20**	**3.40**
Cooling Load	Btu/hr.ft2	3.10	**3.20**	**2.98**
SITE ENERGY RESULTS	**Units**	**Target**		
Source Energy	kWh/person.yr	5,500	**6,427**	**5,288**
Site Energy Use Index	kBtu/ft2.yr	-	**21**	**18**
Site Energy Consumption	kWh/yr	-	**166,980**	**142,104**
Geometry	**Units**			
Interior Conditioned Floor Area (iCFA)	ft2		26,524	26,524
Net Volume	ft3		236,651	236,651
Envelope Area	ft2		25,936	25,936
Average Window-to-Wall Ratio	%		16%	16%
Exterior Envelope	**Units**			
Roof	R		50	50
Exterior Wall (1F)	R (effective)		21	21
Exterior Wall (4-6F)	R (effective)		28	28
Slab	R		15	15
Window	U		0.27	0.18
	SHGC		0.3	0.3
Glazed Door	U		0.33	0.33
	SHGC		0.4	0.4
Opaque Door	R		4	4
Airtightness	**Units**			
Air changes per hour at 50 Pa	ACH50		**3.00**	**0.63**
Lighting Assumptions	**Units**			
Lighting	kWh/yr		31,069	31,069
Plug Loads	**Units**			
Miscellaneous Electric Loads	kWh/yr		26,668	26,668
Occupancy	**Units**			
Bedrooms	#		38	38
Average Occupancy	# Bedrooms + 1		62	62
Appliances	**Units**			
Refrigerator	kWh/year/unit		423	423
Dishwasher	kWh/year/unit		260	260
Clothes Washer	kWh/year/unit		116	116
Clothes Dryer	Energy Factor		3.4	3.4
Electric Cooktop	kWh/use		0.2	0.2
Ventilation	**Units**			
Dryer Exhaust	cfm		125	125
ERV Ventilation	cfm		1,630	1,630
ERV Power	W/cfm		1.0	0.8
ERV Recovery Effiency	%		80%	80%
Mechanical Systems	**Units**			

Heat Pumps	Heating COP	3.56	3.56
	Cooling COP	5.6	5.6
Domestic Hot Water	**Units**		
Water Heater Thermal Efficiency	%	88%	88%
DHW Pump	kW	0.20	0.20
Recirculation Pump	kW	0.05	0.05
Renewable Generation	**Units**		
Solar PV	kWh/yr	0	15,000



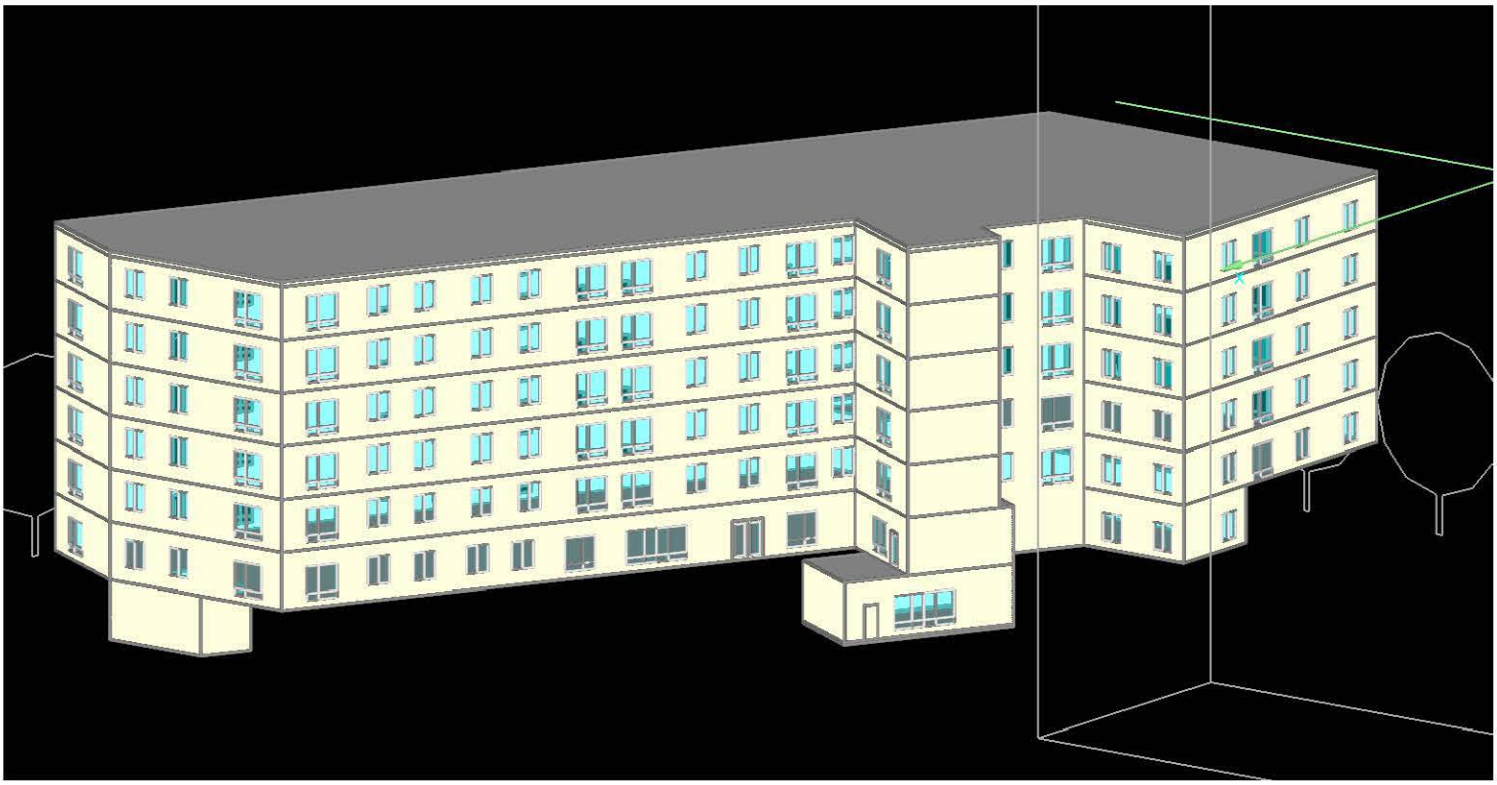
NEW ECOLOGY Community-Based Sustainable Development	Project Name:		**Rindge Commons Building A (Non-Residential)**	
	Climate		Boston Logan International Airport	
	Case		Reference Building (VRF Option)	PHIUS+ Core
Change from the Reference Building **Meets PHIUS Target** **Misses PHIUS Target**	Notes		Baseline envelope provided in drawings, VRF Heating & Cooling, Central Gas-Fired DHW	Upgraded envelope from reference building with added Solar PV to meet PHIUS+ Core requirements. VRF Heating and Cooling, Central Gas-Fired DHW
WUFI PASSIVE RESULTS	**Units**	**Target**		
Heating Demand	kBtu/ft2.yr	3.80	**3.82**	**1.16**
Cooling Demand	kBtu/ft2.yr	8.20	**4.06**	**3.54**
Heating Load	Btu/hr.ft2	4.40	**7.76**	**3.67**
Cooling Load	Btu/hr.ft2	3.50	**3.91**	**3.31**
SITE ENERGY RESULTS	**Units**	**Target**		
Source Energy	kBtu/ft2.yr	38.0	**57.2**	**37.5**
Site Energy Use Index	kBtu/ft2.yr	-	**31**	**24**
Site Energy Consumption	kWh/yr	-	**344,224**	**261,561**
Geometry	**Units**			
Interior Conditioned Floor Area (iCFA)	ft2		37,656	37,656
Net Volume	ft3		351,849	351,849
Envelope Area	ft2		32,785	32,770
Average Window-to-Wall Ratio	%		13%	13%
Exterior Envelope	**Units**			
Roof	R		50	50
Exterior Wall (1F)	R (effective)		21	21
Exterior Wall (2-4F)	R (effective)		28	28
Exterior Floor	R		30	30
Slab	R		15	15
Window	U		0.27	0.18
	SHGC		0.3	0.3
Opaque Door	R		4	4
Airtightness	**Units**			
Air changes per hour at 50 Pa	ACH50		**3.00**	**0.49**
Lighting Assumptions	**Units**			
Education Facility Lighting	W/ft2		0.8	0.6
Health Facility Lighting	W/ft2		1.5	1.0
Auxiliary Space Lighting	W/ft2		0.5	0.5
Annual Lighting	kWh/yr		79,860	55,123
Plug Loads	**Units**			
Miscellaneous Electric Loads	kWh/yr		26,053	26,053
Process Loads	kWh/yr		54,000	44,000
Occupancy	**Units**			
Average Occupancy	#		225	225
Appliances	**Units**			
Refrigerator	kWh/year/unit		423	423
Dishwasher	kWh/year/unit		260	260
Electric Cooktop	kWh/use		0.2	0.2
Ventilation	**Units**			
ERV Ventilation	cfm		5,200	5,200
ERV Power	W/cfm		1.0	0.8
ERV Recovery Effiency	%		80%	80%
Mechanical Systems	**Units**			

Heat Pumps	Heating COP	3.56	3.56
	Cooling COP	5.6	5.6
Domestic Hot Water	**Units**		
Water Heater Thermal Efficiency	%	88%	88%
DHW Pump	kW	0.26	0.26
Recirculation Pump	kW	0.06	0.06
Renewable Generation	**Units**		
Solar PV	kWh/yr	0	40,000



NEW ECOLOGY Community-Based Sustainable Development	Project Name:		**Rindge Commons Building B (Residential)**	
	Climate		Boston Logan International Airport	
	Case		Reference Building (VRF Option)	PHIUS+ Core
Change from the Reference Building **Meets PHIUS Target** **Misses PHIUS Target**	Notes		Baseline envelope provided in drawings, VRF Heating & Cooling, Central Gas-Fired DHW	Upgraded envelope from reference building with added Solar PV to meet PHIUS+ Core requirements. VRF Heating and Cooling, Central Gas-Fired DHW
WUFI PASSIVE RESULTS	**Units**	**Target**		
Heating Demand	kBtu/ft2.yr	4.00	**7.07**	**1.99**
Cooling Demand	kBtu/ft2.yr	7.20	**2.43**	**3.17**
Heating Load	Btu/hr.ft2	3.80	**6.82**	**2.46**
Cooling Load	Btu/hr.ft2	2.50	**2.67**	**2.41**
SITE ENERGY RESULTS	**Units**	**Target**		
Source Energy	kWh/person.yr	5,500	**5,378**	**4,905**
Site Energy Use Index	kBtu/ft2.yr	-	**21**	**20**
Site Energy Consumption	kWh/yr	-	**545,505**	**507,698**
Geometry	**Units**			
Interior Conditioned Floor Area (iCFA)	ft2		87,754	87,754
Net Volume	ft3		799,891	799,891
Envelope Area	ft2		74,848	74,848
Average Window-to-Wall Ratio	%		19%	19%
Exterior Envelope	**Units**			
Roof	R		50	50
Exterior Wall (1F)	R (effective)		21	21
Exterior Wall (2-6F)	R (effective)		28	28
Slab	R		15.0	15.0
Window	U		0.27	0.18
	SHGC		0.3	0.3
Glazed Door	U		0.33	0.33
	SHGC		0.4	0.4
Opaque Door	R		4	4
Airtightness	**Units**			
Air changes per hour at 50 Pa	ACH50		**3.00**	**0.34**
Lighting Assumptions	**Units**			
Lighting	kWh/yr		85,426	85,426
Plug Loads	**Units**			
Miscellaneous Electric Loads	kWh/yr		84,695	84,695
Occupancy	**Units**			
Bedrooms	#		160	160
Average Occupancy	# Bedrooms + 1		237	237
Appliances	**Units**			
Refrigerator	kWh/year/unit		423	423
Dishwasher	kWh/year/unit		260	260
Clothes Washer	kWh/year/unit		116	116
Clothes Dryer	Energy Factor		3.4	3.4
Electric Cooktop	kWh/use		0.2	0.2
Ventilation	**Units**			
Dryer Exhaust	cfm		125	125
ERV Ventilation	cfm		5,500	5,500
ERV Power	W/cfm		1.0	0.8
ERV Recovery Effiency	%		80%	80%
Mechanical Systems	**Units**			

Heat Pumps	Heating COP	3.56	3.56
	Cooling COP	5.6	5.6
Domestic Hot Water	**Units**		
Water Heater Thermal Efficiency	%	88%	88%
DHW Pump	kW	0.58	0.58
Recirculation Pump	kW	0.10	0.10
Renewable Generation	**Units**		
Solar PV	kWh/yr	0	0



Rindge Commons Building A (Residential)

BUILDING INFORMATION

Category:	**Residential**
Status:	**In planning**
Building type:	**New construction**
Year of construction:	
Units:	**24**
Number of occupants:	**62 (Design)**
Occupant density:	**427.8** ft²/Person

Boundary conditions

Climate: **MA - BOSTON LOGAN INT ARPT (AMeDAS standard year)**

Internal heat gains:	**1.1** Btu/hr ft²
Interior temperature:	**68** °F
Overheat temperature:	**77** °F

Building geometry

Enclosed volume:	**292,459.4** ft³
Net-volume:	**236,651** ft³
Total area envelope:	**25,935.6** ft²
Area/Volume Ratio:	**0.1** 1/ft
Floor area:	**26,524** ft²
Envelope area/iCFA:	**0.978**

PASSIVEHOUSE REQUIREMENTS

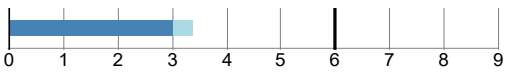
Certificate criteria: PHIUS+ 2018

Heating demand

specific:	**2.61** kBtu/ft²yr
target:	**3.8** kBtu/ft²yr
total:	69,348.92 kBtu/yr

Cooling demand

sensible:	**3** kBtu/ft²yr
latent:	**0.38** kBtu/ft²yr
specific:	**3.37** kBtu/ft²yr
target:	**6** kBtu/ft²yr
total:	89,413.82 kBtu/yr

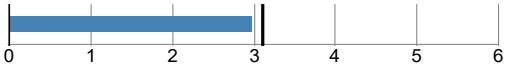


Heating load

specific:	**3.4** Btu/hr ft²
target:	**3.7** Btu/hr ft²
total:	90,079.64 Btu/hr

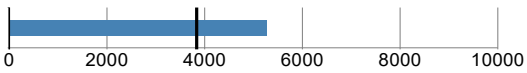
Cooling load

specific:	**2.98** Btu/hr ft²
target:	**3.1** Btu/hr ft²
total:	78,952.14 Btu/hr



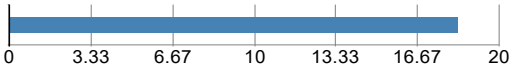
Source energy

total:	**327,885.39**	kWh/yr
specific:	**5,288**	kWh/Person yr
target:	**3,840**	kWh/Person yr
total:	**1,118,680.97**	kBtu/yr
specific:	42.18	kBtu/ft²yr



Site energy

total:	484,680.29	kBtu/yr
specific:	18.28	kBtu/ft²yr
total:	142,059.79	kWh/yr
specific:	5.36	kWh/ft²

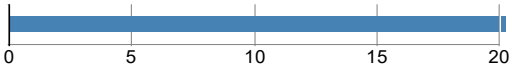


Air tightness

ACH50:	**0.63**	1/hr
CFM50 per envelope area:	**0.06**	cfm/ft²
target:	**0.63**	1/hr
target CFM50:	**0.06**	cfm/ft²

PASSIVEHOUSE RECOMMENDATIONS

Sensible recovery efficiency:	**78.4**	%
Frequency of overheating: Cooling system is required	**33.5**	%



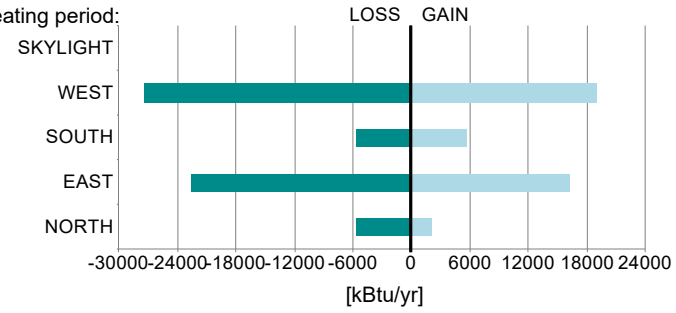
Frequency of overheating only applies if there is not a [properly sized] cooling system installed.

BUILDING ELEMENTS

Windows

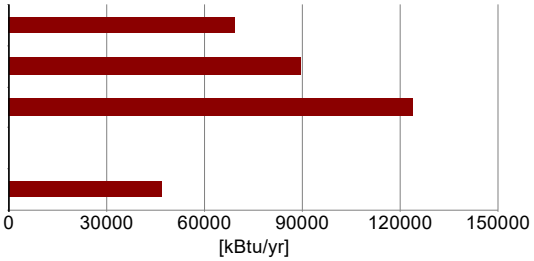
Average SHGC:	**0.46**	
Average solar reduction factor heating:	**0.38**	
Average solar reduction factor cooling:	**0.4**	
Average U-value:	**0.203**	Btu/hr ft² °F
Total glazing area:	**1,237.1**	ft²
Total window area:	**2,148.6**	ft²

Heat gain/loss heating period:



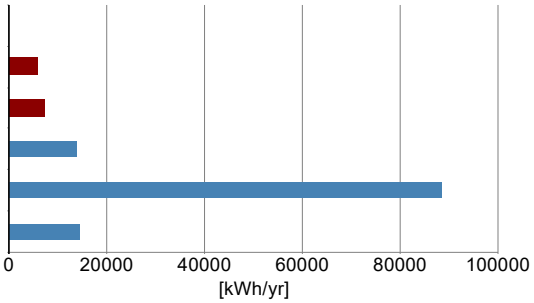
HVAC

Total heating demand:	**69,349**	kBtu/yr
Total cooling demand:	**89,414**	kBtu/yr
Total DHW energy demand:	**124,114**	kBtu/yr
Solar DHW contribution:	**0**	kBtu/yr
Auxiliary electricity:	**46,869**	kBtu/yr



Electricity

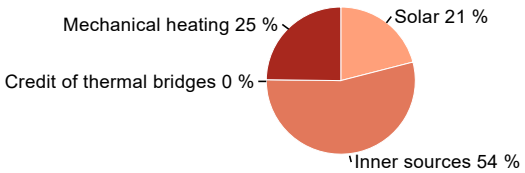
Direct heating / DHW:	**0**	kWh/yr
Heatpump heating:	**5,710**	kWh/yr
Cooling:	**7,274**	kWh/yr
HVAC auxiliary energy:	**13,737**	kWh/yr
Appliances:	**88,632**	kWh/yr
Renewable generation, coincident production and use:	**14,400**	kWh/yr
Total electricity demand:	**100,953**	kWh/yr



HEAT FLOW - HEATING PERIOD

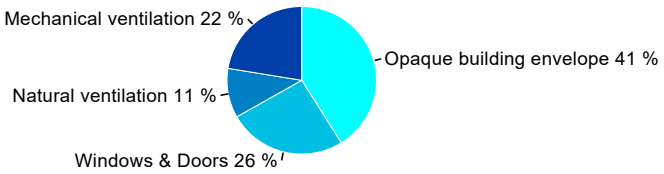
Heat gains

Solar:	**53,001**	kBtu/yr
Inner sources:	**137,295**	kBtu/yr
Credit of thermal bridges:	**0**	kBtu/yr
Mechanical heating:	**69,349**	kBtu/yr



Heat losses

Opaque building envelope:	**106,757**	kBtu/yr
Windows & Doors:	**66,587**	kBtu/yr
Natural ventilation:	**28,115**	kBtu/yr
Mechanical ventilation:	**58,186**	kBtu/yr

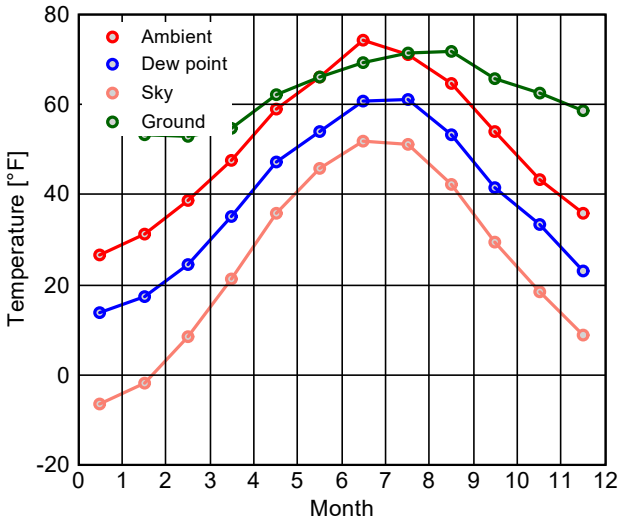


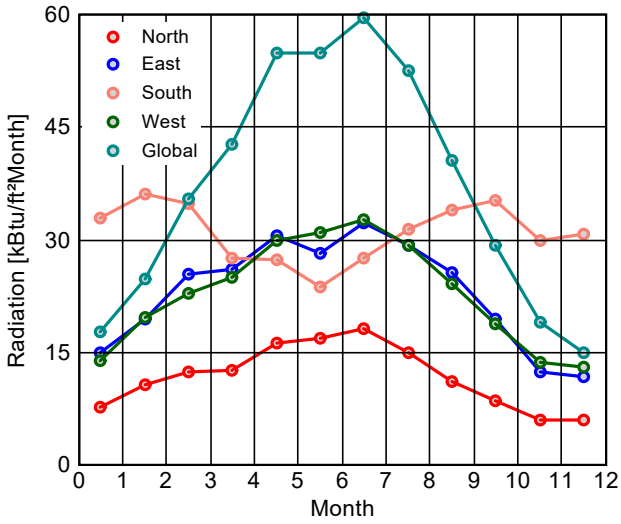
CLIMATE

Latitude:	**42.4**	°
Longitude:	**-71**	°
Elevation of weather station:	**19.7**	ft
Elevation of building site:	**2**	ft
Heat capacity air:	**0.018**	Btu/ft³F
Daily temperature swing summer:	**14.8**	°F
Average wind speed:	**13.1**	ft/s

Ground

Average ground surface temperature:	**52.8**	°F
Amplitude ground surface temperature:	**55.8**	°F
Ground thermal conductivity:	**1.2**	Btu/hr ft °F
Ground heat capacity:	**29.8**	Btu/ft³F
Depth below grade of groundwater:	**9.8**	ft
Flow rate groundwater:	**0.2**	ft/d





Calculation parameters

Length of heating period	**212**	days/yr
Heating degree hours	**140.8**	kFh/a
Phase shift months	**1.3**	mths
Time constant heating demand	**165.7**	hr
Time constant cooling demand	**0**	hr
Time constant cooling demand with night ventilation	**0**	hr

Climate for	Heating load 1	Heating load 2	Cooling
Temperature [°F]	16.9	31.6	83.5
Solar radiation North [Btu/hr ft²]	12	7.9	27.6
Solar radiation East [Btu/hr ft²]	22.8	13.3	61.5
Solar radiation South [Btu/hr ft²]	49.5	27.3	41.8
Solar radiation West [Btu/hr ft²]	22.2	11.4	53.3
Solar radiation Global [Btu/hr ft²]	26.9	16.5	101.4

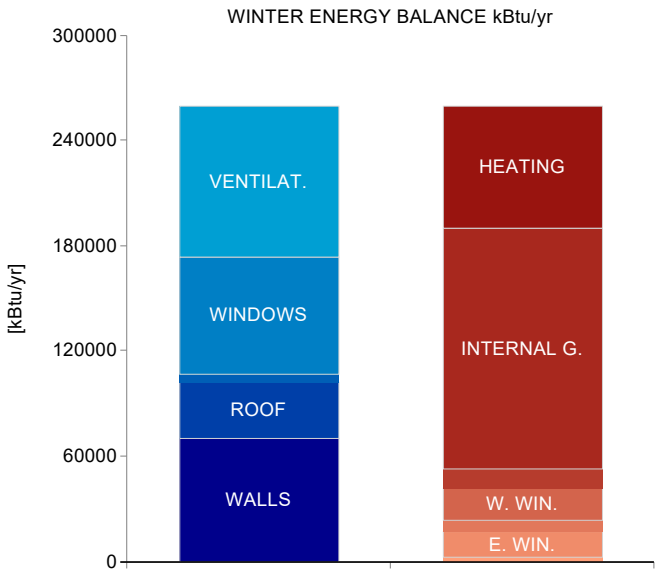
Relevant boundary conditions for heating load calculation: Heating load 1

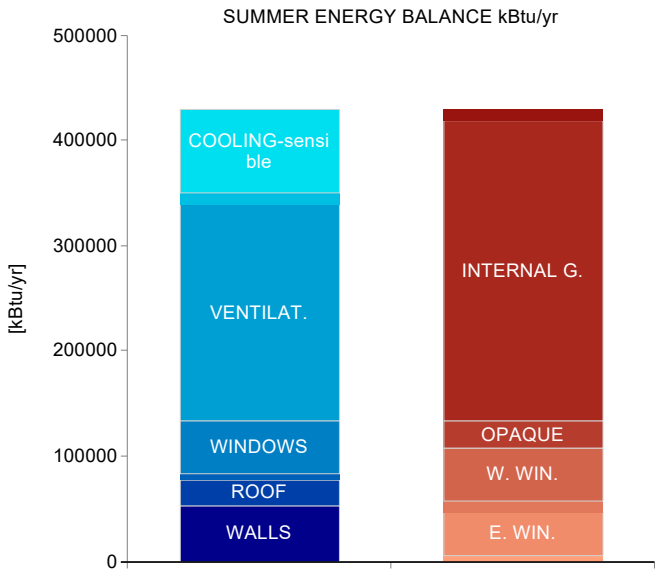
ANNUAL HEAT DEMAND

Transmission losses :	**173,344**	kBtu/yr
Ventilation losses:	**86,301**	kBtu/yr
Total heat losses:	**259,645**	kBtu/yr
Solar heat gains:	**58,556**	kBtu/yr
Internal heat gains:	**151,684**	kBtu/yr
Total heat gains:	**210,240**	kBtu/yr
Utilization factor:	**90.5**	%
Useful heat gains:	**190,296**	kBtu/yr
Annual heat demand:	**69,349**	kBtu/yr
Specific annual heat demand:	**2,614.8**	Btu/ft²yr

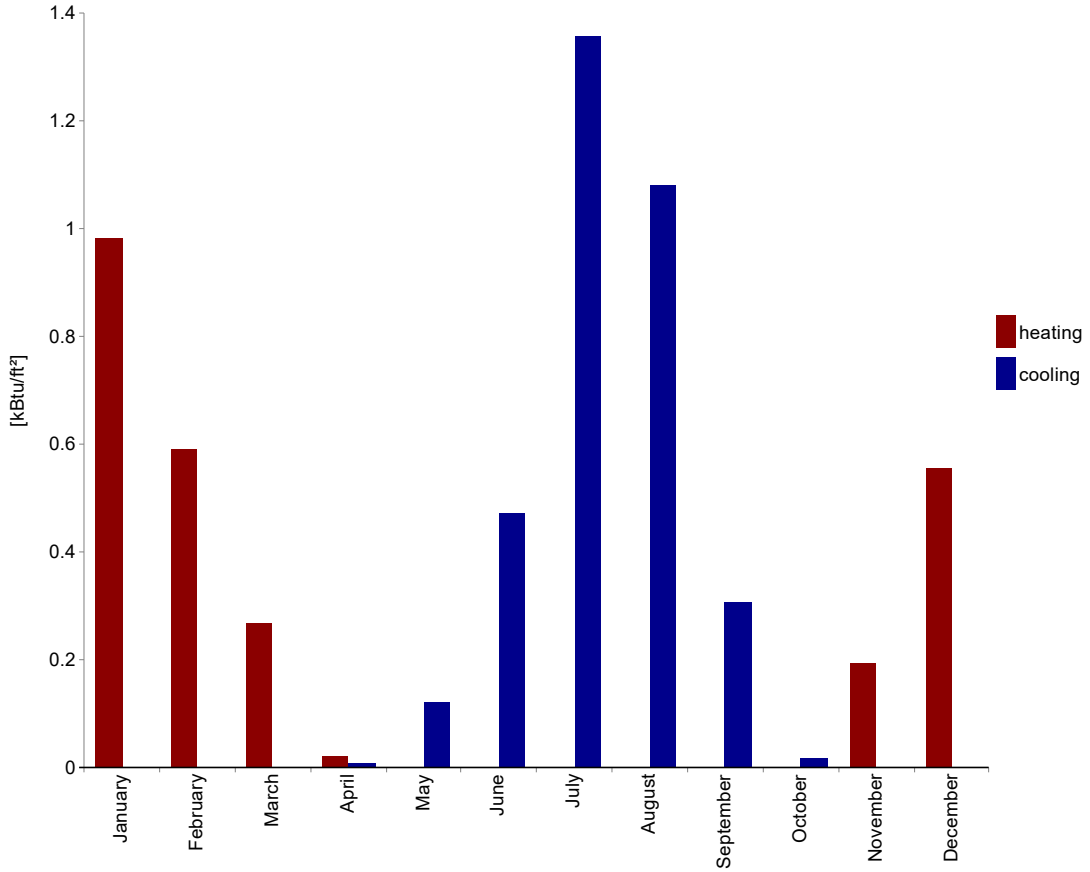
ANNUAL COOLING DEMAND

Solar heat gains:	**133,160**	kBtu/yr
Internal heat gains:	**285,905**	kBtu/yr
Total heat gains:	**419,064**	kBtu/yr
Transmission losses :	**284,374**	kBtu/yr
Ventilation losses:	**442,275**	kBtu/yr
Total heat losses:	**726,648**	kBtu/yr
Utilization factor:	**46.7**	%
Useful heat losses:	**339,616**	kBtu/yr
Cooling demand - sensible:	**79,449**	kBtu/yr
Cooling demand - latent:	**9,965**	kBtu/yr
Annual cooling demand:	**89,414**	kBtu/yr
Specific annual cooling demand:	**3.4**	kBtu/ft²yr





SPECIFIC HEAT/COOLING DEMAND MONTHLY



Month	Heating [kBtu/ft²]	Cooling [kBtu/ft²]
January	1	0
February	0.6	0
March	0.3	0
April	0	0
May	0	0.1
June	0	0.5
July	0	1.4
August	0	1.1
September	0	0.3
October	0	0
November	0.2	0
December	0.6	0

HEATING LOAD

	First climate	Second climate
Transmission heat losses:	**68,338.3** Btu/hr	**52,005.3** Btu/hr
Ventilation heat losses:	**43,051.9** Btu/hr	**30,607.2** Btu/hr
Total heat loss:	**111,390.1** Btu/hr	**82,612.5** Btu/hr
Solar heat gain:	**7,857.6** Btu/hr	**4,329.9** Btu/hr
Internal heat gain:	**13,452.9** Btu/hr	**13,452.9** Btu/hr
Total heat gains heating:	**21,310.5** Btu/hr	**17,782.8** Btu/hr
Heating load:	**90,079.6** Btu/hr	**64,829.7** Btu/hr

Relevant heating load: **90,079.6** Btu/hr

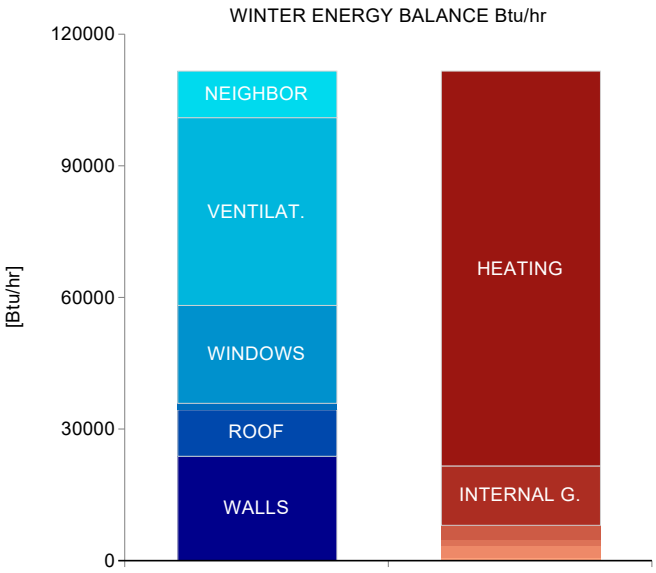
Specific heating load: **3.4** Btu/hr ft²

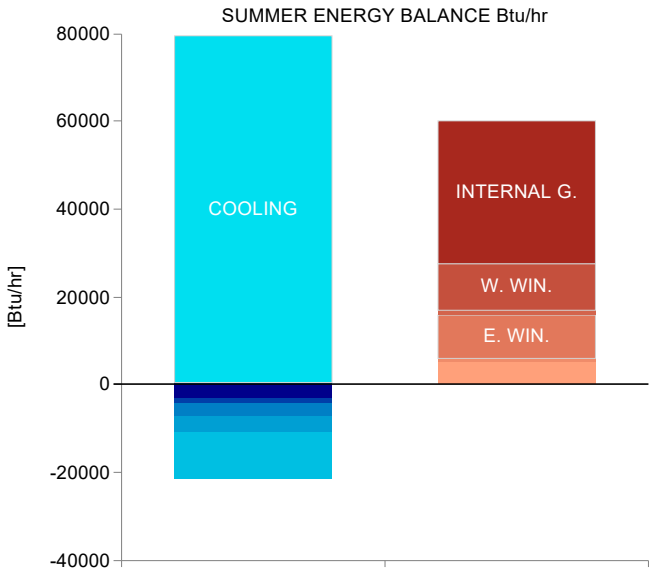
COOLING LOAD

Solar heat gain:	**27,453.1** Btu/hr
Internal heat gain:	**32,640.7** Btu/hr
Total heat gains cooling:	**60,093.8** Btu/hr
Transmission heat losses:	**-15,155.3** Btu/hr
Ventilation heat losses:	**-3,703** Btu/hr
Total heat loss:	**-18,858.4** Btu/hr
Cooling load - sensible:	**78,952.1** Btu/hr
Cooling load - latent:	**0** Btu/hr

Relevant cooling load: **78,952.1** Btu/hr

Specific maximum cooling load: **3** Btu/hr ft²





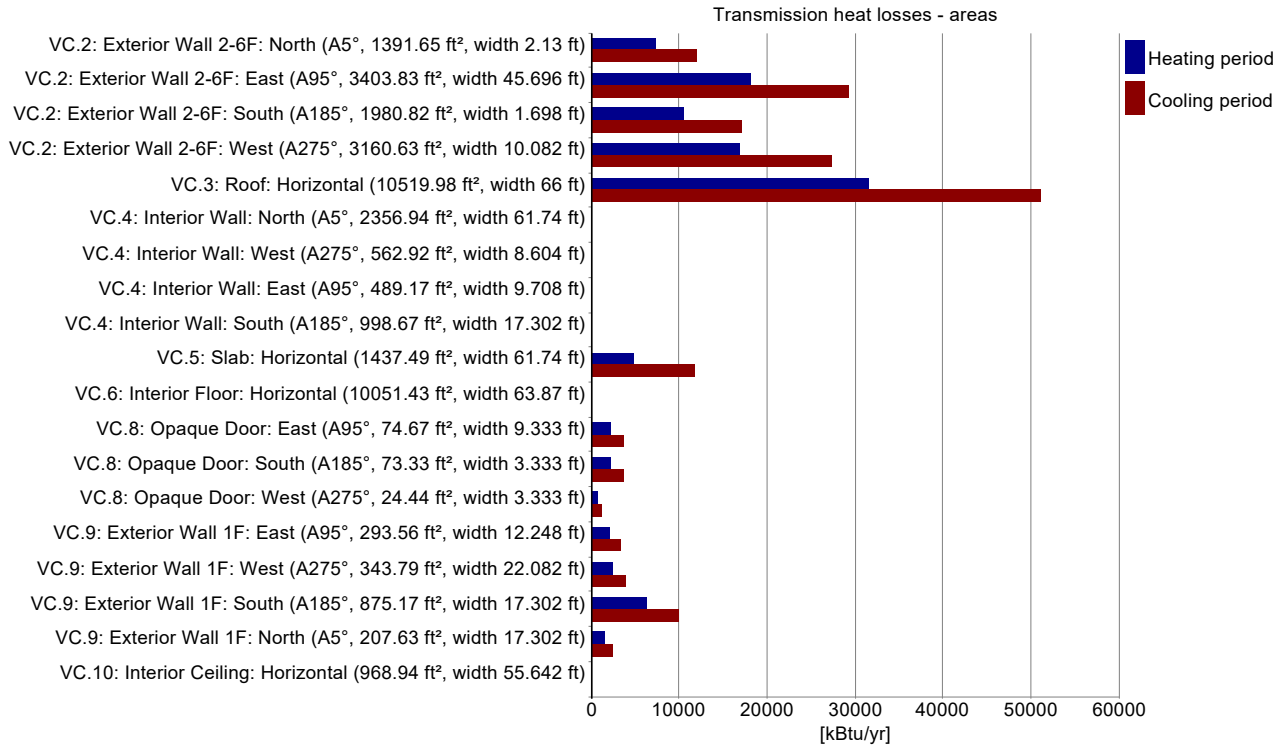
AREAS

Transmission heat losses - areas

Name	Area [ft²]	Average U-value [Btu/hr ft² °F]	Absorption coefficient	Emission coefficient	Reduction factor shading [%]	Transmission losses heating [kBtu/yr]	Transmission losses cooling [kBtu/yr]
VC.2: Exterior Wall 2-6F: North (A5°, 1391.65 ft², width 2.13 ft)	1391.6	0.035	0.4	0.9	100	7425.5	12005
VC.2: Exterior Wall 2-6F: East (A95°, 3403.83 ft², width 45.696 ft)	3403.8	0.035	0.4	0.9	100	18161.9	29363
VC.2: Exterior Wall 2-6F: South (A185°, 1980.82 ft², width 1.698 ft)	1980.8	0.035	0.4	0.9	100	10569.1	17087.4
VC.2: Exterior Wall 2-6F: West (A275°, 3160.63 ft², width 10.082 ft)	3160.6	0.035	0.4	0.9	100	16864.3	27265
VC.3: Roof: Horizontal (10519.98 ft², width 66 ft)	10520	0.02	0.4	0.9	100	31553.1	51012.9
VC.4: Interior Wall: North (A5°, 2356.94 ft², width 61.74 ft)	2356.9	0.319	0	0	0	0	0
VC.4: Interior Wall: West (A275°, 562.92 ft², width 8.604 ft)	562.9	0.319	0	0	0	0	0
VC.4: Interior Wall: East (A95°, 489.17 ft², width 9.708 ft)	489.2	0.319	0	0	0	0	0
VC.4: Interior Wall: South (A185°, 998.67 ft², width 17.302 ft)	998.7	0.319	0	0	0	0	0
VC.5: Slab: Horizontal (1437.49 ft², width 61.74 ft)	1437.5	0.063	0	0	0	4728.4	11767.9
VC.6: Interior Floor: Horizontal (10051.43 ft², width 63.87 ft)	10051.4	0.048	0	0	0	0	0
VC.8: Opaque Door: East (A95°, 74.67 ft², width 9.333 ft)	74.7	0.201	0.4	0.9	100	2291.4	3704.6
VC.8: Opaque Door: South (A185°, 73.33 ft², width 3.333 ft)	73.3	0.201	0.4	0.9	100	2250.5	3638.4
VC.8: Opaque Door: West (A275°, 24.44 ft², width 3.333 ft)	24.4	0.201	0.4	0.9	100	750.2	1212.8
VC.9: Exterior Wall 1F: East (A95°, 293.56 ft², width 12.248 ft)	293.6	0.046	0.4	0.9	100	2075.7	3355.9
VC.9: Exterior Wall 1F: West (A275°, 343.79 ft², width 22.082 ft)	343.8	0.046	0.4	0.9	100	2430.8	3930
VC.9: Exterior Wall 1F: South (A185°, 875.17 ft², width 17.302 ft)	875.2	0.046	0.4	0.9	100	6188.2	10004.6
VC.9: Exterior Wall 1F: North (A5°, 207.63 ft², width 17.302 ft)	207.6	0.046	0.4	0.9	100	1468.1	2373.5
VC.10: Interior Ceiling: Horizontal (968.94 ft², width 55.642 ft)	968.9	0.049	0	0	0	0	0

Degree hours [kFh/a]

	Heating	Cooling
Ambient heating	84.7	136.9
Ground heating	29.2	72.6



THERMAL BRIDGES

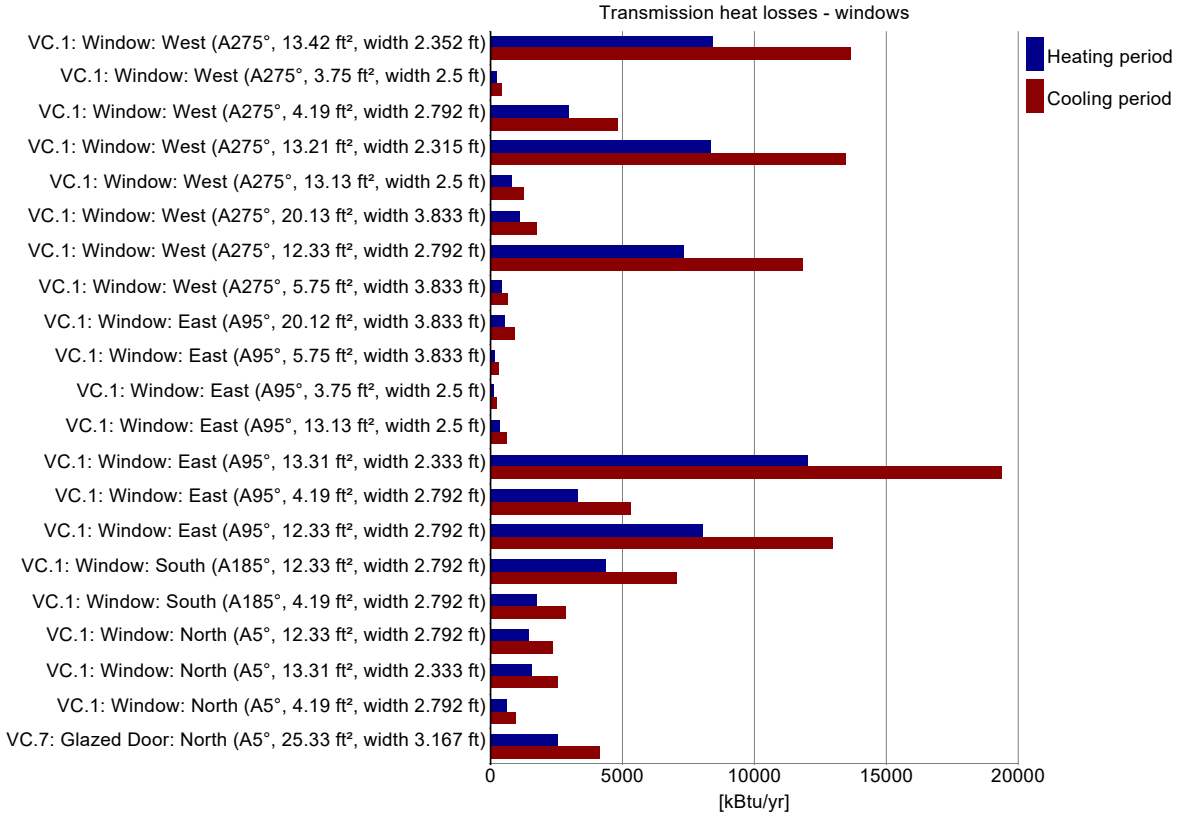
Transmission heat losses - thermal bridges

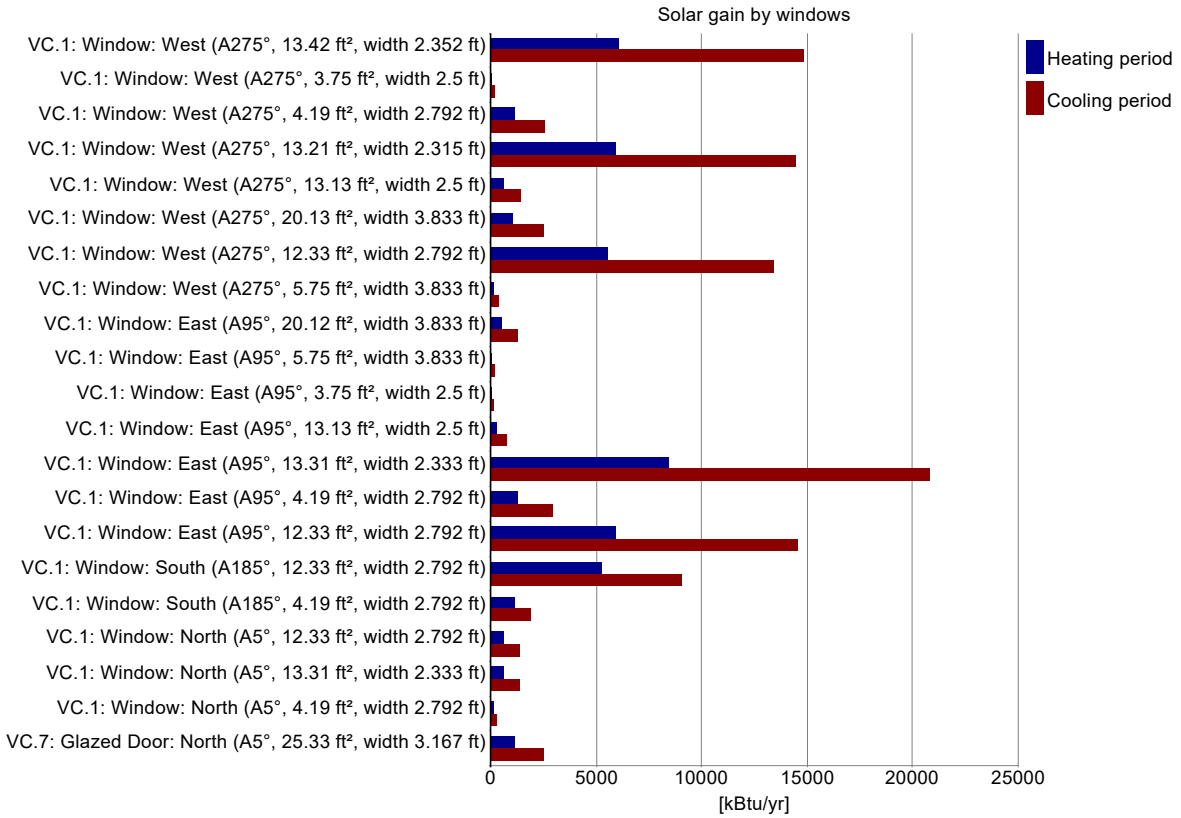
Name	Length [ft]	Psi-value [Btu/hr ft °F]	Transmission losses [kBtu/yr]	Transmission losses cooling [kBtu/yr]

WINDOWS

Transmission heat losses - windows

Name	Quan-tity	Incli-nation [°]	U-value total [Btu/hr ft² °F]	SHGC (perpen-dicular)	Reduction factor shading [%]	Reduction factor shading summer [%]	Solar gain heating [kBtu/yr]	Solar gain cooling [kBtu/yr]	Transmission losses heating [kBtu/yr]	Transmission losses cooling [kBtu/yr]
VC.1: Window: West (A275°, 13.42 ft², width 2.352 ft)	21	90	0.197	0.5	86	89.2	6,081.6	14,852.4	8,443	13,650
VC.1: Window: West (A275°, 3.75 ft², width 2.5 ft)	2	90	0.236	0.5	82.9	83.8	95.5	225.4	270	436.5
VC.1: Window: West (A275°, 4.19 ft², width 2.792 ft)	20	90	0.234	0.5	82.7	83.5	1,113.4	2,622.3	2,980.2	4,818.1
VC.1: Window: West (A275°, 13.21 ft², width 2.315 ft)	21	90	0.197	0.5	85.9	89.1	5,926.7	14,485.8	8,340.7	13,484.7
VC.1: Window: West (A275°, 13.13 ft², width 2.5 ft)	2	90	0.195	0.5	86.4	89.3	580.6	1,410	781.4	1,263.3
VC.1: Window: West (A275°, 20.13 ft², width 3.833 ft)	2	90	0.181	0.5	88.6	90.6	1,063.7	2,546.8	1,110.7	1,795.7
VC.1: Window: West (A275°, 12.33 ft², width 2.792 ft)	20	90	0.194	0.5	86.7	89.1	5,572.2	13,440.2	7,300	11,802.2
VC.1: Window: West (A275°, 5.75 ft², width 3.833 ft)	2	90	0.227	0.5	82.2	82.7	167.9	393.7	398.2	643.7
VC.1: Window: East (A95°, 20.12 ft², width 3.833 ft)	1	90	0.181	0.5	85	89.9	559.5	1,320.6	555.4	897.9
VC.1: Window: East (A95°, 5.75 ft², width 3.833 ft)	1	90	0.227	0.5	80.9	82.1	93.3	209.6	199.1	321.9
VC.1: Window: East (A95°, 3.75 ft², width 2.5 ft)	1	90	0.236	0.5	82.2	83.4	53.7	120.8	135	218.2
VC.1: Window: East (A95°, 13.13 ft², width 2.5 ft)	1	90	0.195	0.5	84.4	89	316.2	744.5	390.7	631.6
VC.1: Window: East (A95°, 13.31 ft², width 2.333 ft)	30	90	0.197	0.5	78.9	86	8,441.7	20,794.5	11,988.3	19,381.9
VC.1: Window: East (A95°, 4.19 ft², width 2.792 ft)	22	90	0.234	0.5	79.2	81.9	1,301.9	2,989.1	3,278.2	5,299.9
VC.1: Window: East (A95°, 12.33 ft², width 2.792 ft)	22	90	0.194	0.5	78.8	85.5	5,935.6	14,535.1	8,030	12,982.4
VC.1: Window: South (A185°, 12.33 ft², width 2.792 ft)	12	90	0.194	0.5	69.2	68.3	5,288.5	9,066	4,380	7,081.3
VC.1: Window: South (A185°, 4.19 ft², width 2.792 ft)	12	90	0.234	0.5	71.1	66.2	1,152.7	1,906.4	1,788.1	2,890.9
VC.1: Window: North (A5°, 12.33 ft², width 2.792 ft)	4	90	0.194	0.5	81.4	78.6	614	1,357.3	1,460	2,360.4
VC.1: Window: North (A5°, 13.31 ft², width 2.333 ft)	4	90	0.197	0.5	79.8	76.5	637.5	1,394.8	1,598.4	2,584.3
VC.1: Window: North (A5°, 4.19 ft², width 2.792 ft)	4	90	0.234	0.5	80.2	78.7	120.6	273.5	596	963.6
VC.7: Glazed Door: North (A5°, 25.33 ft², width 3.167 ft)	2	90	0.332	0.6	83.3	80.3	1,123.2	2,480.6	2,563.3	4,144.1





Summary building envelope

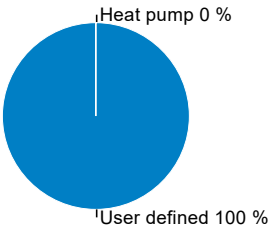
	Total area / length	Average U-value / Psi value	Transmission losses
Exterior wall ambient:	**11,829.5** ft²	**0.039** Btu/hr ft² °F	**70,475.6** kBtu/yr
Exterior wall ground:	**0** ft²	**0** Btu/hr ft² °F	**0** kBtu/yr
Basement:	**1,437.5** ft²	**0.063** Btu/hr ft² °F	**4,728.4** kBtu/yr
Roof:	**10,520** ft²	**0.02** Btu/hr ft² °F	**31,553.1** kBtu/yr
Windows:	**2,148.6** ft²	**0.203** Btu/hr ft² °F	**66,586.6** kBtu/yr
Doors:	**0** ft²	**0** Btu/hr ft² °F	**0** kBtu/yr
Thermal bridge ambient:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr
Thermal bridge perimeter:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr
Thermal bridge floor slab:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr

Shading

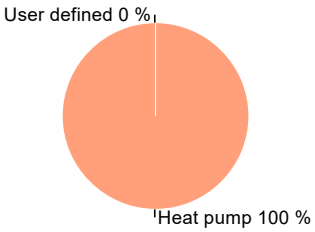
	Heating	Cooling
Reduction factor North:	**81.7** %	**78.8** %
Reduction factor East:	**79.2** %	**85.6** %
Reduction factor South:	**69.5** %	**68** %
Reduction factor West:	**86.1** %	**88.8** %
Reduction factor Horizontal:	**100** %	**100** %

System	DHW			Heating			Total		
	Covered DHW demand [%]	Estimated solar fraction [%]	Final energy demand [kBtu/yr]	Covered heating demand [%]	Estimated solar fraction [%]	Final energy demand [kBtu/yr]	Performance ratio	CO2 equivalent emissions [lb/yr]	Source energy demand [kBtu/yr]
Heat pump, Mitsubishi VRF (PURY)	0	0	0	100	0	19,480.1	0	8,559.5	54,544.3
User defined, Lochinvar Armor AWN601PM (96% Thermal Eff. Rated by .03 per PHIUS	100	0	140,249.3	0	0	0	1.1	31,952.6	154,274.3
Σ	100	0	140,249.3	100	0	19,480.1		40,512.2	208,818.6

DHW - final energy



Heating - final energy



COOLING UNITS

	sensible	latent
Air cooling:	**0** kBtu/ft²yr	**0** kBtu/ft²yr
Recirculation cooling:	**3** kBtu/ft²yr	**2.2** kBtu/ft²yr
Additional dehumidification:		**0** kBtu/ft²yr
Panel cooling:	**0** kBtu/ft²yr	
Sum:	**3** kBtu/ft²yr	**2.2** kBtu/ft²yr

VENTILATION

Energy transportable by supply air

Heating energy

transportable: **1.34** W/ft²
load: **1** W/ft²

Cooling energy

transportable: **0.8** W/ft²
load: **0.87** W/ft²

Infiltration pressure test ACH50: **0.63** 1/hr
Total extract air demand: **1,630** cfm
Supply air per person: **18** cfm
Occupancy: **62**

Average air flow rate: **1,663.28** cfm
Average air change rate: **0.42** 1/hr
Effective ACH ambient: **0.14** 1/hr
Effective ACH ground: **0** 1/hr
Energetically effective air exchange: **0.14** 1/hr
Infiltration air change rate: **0.04** 1/hr
Infiltration air change rate (heating load): **0.11** 1/hr

Type of ventilation system: **Balanced PH ventilation**
Wind screening coefficient (e): **0.07**
Wind exposure factor: **15**
Wind shield factor: **0.05**

Ventilation heat losses: **79,724.9** kBtu/yr

Devices

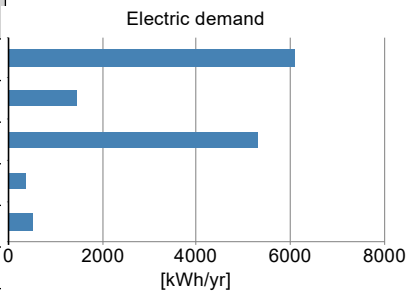
Name	Sensible recovery efficiency [-]	Electric efficiency [W/cfm]	Heat recovery efficiency SHX [-]	Effective recovery efficiency [-]
Pending MECH drawings	0.8	0.05	0	0.8
Altogether	0.8	0.04	0	0.8

SUMMER VENTILATION

ACH night ventilation: **0** 1/hr
ACH natural summer: **0** 1/hr
Mechanical ventilation summer: **0.4** 1/hr
Mechanical ventilation summer with HR: **no**
Preferred minimum indoor temperature for night ventilation: **68** °F
Overheating temperature: **77** °F

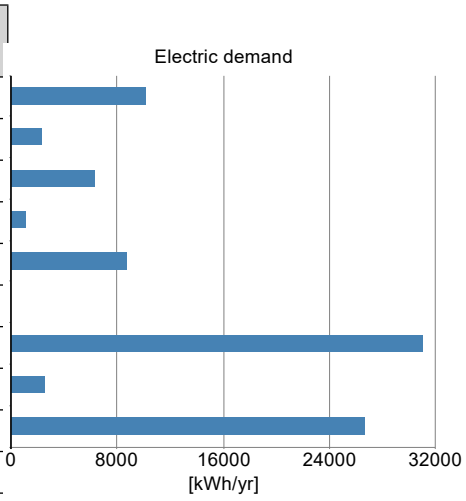
ELECTRICITY DEMAND - AUXILIARY ELECTRICITY

Type	Quantity	Indoor	Norm demand	Electric demand [kWh/yr]	Source energy [kBtu/yr]
Ventilation winter	1	no	0.8 W/cfm	6098.1	58255.5
Ventilation Defrost	1	no	7,796.6 W	1454.3	13893.2
Ventilation summer	1	no	0.8 W/cfm	5324.9	50869.4
DHW circulating pump	1	yes	48.2 W	373.9	3571.9
DHW storage load pump	1	yes	200.4 W	485.9	4641.8
Σ				13737.2	131231.9



ELECTRICITY DEMAND RESIDENTIAL BUILDING

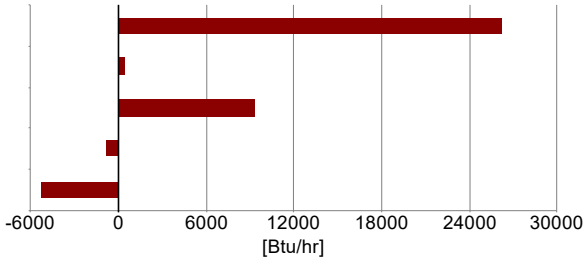
Type	Quantity	Indoor	Norm demand	Electric demand [kWh/yr]	Non-electric demand [kWh/yr]	Source energy [kBtu/yr]
Kitchen refrigerator	1	yes	1.2	10152	0	96982.6
Kitchen dishwasher	1	yes	1.2	2309.5	0	22063.2
Kitchen cooking	1	yes	0.2	6200	0	59228.9
Laundry - washer	1	yes	0.3	1078.5	0	10303.4
Laundry - dryer	1	yes	3.4	8630.6	0	82449
Energy consumed by evaporation	1	yes	3.1	0	360.5	1607.9
User defined lighting	1	yes	31,069	31069	0	296803.8
User defined lighting	1	no	2,524	2524	0	24111.9
User defined MELs	1	yes	26,668	26668	0	254760.8
Σ	9			88631.7	360.5	848311.6



INTERNAL HEAT GAINS

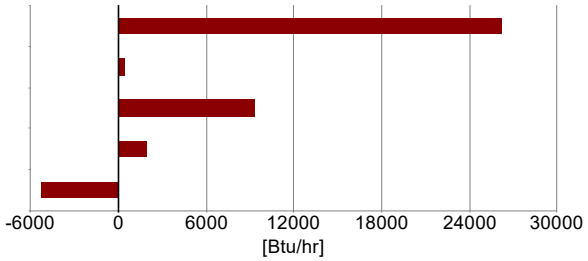
Heating season

Electricity total:	**26,236.1**	Btu/hr
Auxiliary electricity:	**432.3**	Btu/hr
People:	**9,308.3**	Btu/hr
Cold water:	**-860.7**	Btu/hr
Evaporation:	**-5,288.8**	Btu/hr
Σ:	**29,815.1**	Btu/hr
Specific internal heat gains:	**1.1**	Btu/hr ft²



Cooling season

Electricity total:	**26,236.1**	Btu/hr
Auxiliary electricity:	**432.3**	Btu/hr
People:	**9,308.3**	Btu/hr
Cold and hot water:	**1,964.9**	Btu/hr
Evaporation:	**-5,288.8**	Btu/hr
Σ:	**29,815.1**	Btu/hr
Specific internal heat gains:	**1.1**	Btu/hr ft²



DHW AND DISTRIBUTION

DHW consumption per person per day:	**6.6**	gal/Person/day
Average cold water temperature supply:	**52.8**	°F
Useful heat DHW:	**108,339.3**	kBtu/yr
Specific useful heat DHW:	**4,085**	Btu/ft²yr
Total heat losses of the DHW system:	**15,775.1**	kBtu/yr
Specific losses of the DHW system:	**594.8**	Btu/ft²yr
Performance ratio DHW distribution system and storage:	**1.1**	
Utilization ratio DHW distribution system and storage:	**0.9**	
Total heat demand of DHW system:	**124,114.4**	kBtu/yr
Total specific heat demand of DHW system:	**4,679.8**	Btu/ft²yr
Total heat losses of the hydronic heating distribution:	**0**	kBtu/yr
Specific losses of the hydronic heating distribution:	**0**	Btu/ft²yr
Performance ratio of heat distribution:	**100**	%

Region	Length [ft]	Annual heat loss [kBtu/yr]
Hydronic heating distribution pipes		
Σ	0	0
DHW circulation pipes		
In conditioned space	200	6925.4
Σ	200	6925.4
Individual pipes		
In conditioned space	750	6960.3
Σ	750	6960.3
Water storage		
Device 4 (Water storage: DHW): Lochinvar RJA120 Lock-Temp Stainless Steel 119-gallon		1889.4
Σ		1889.4

Rindge Commons Building A (Non-Residential)

BUILDING INFORMATION

Category:	**Non-residential**
Status:	**In planning**
Building type:	**New construction**
Year of construction:	
Units:	**1**
Number of occupants:	**225 (Design)**
Occupant density:	**167.4** ft²/Person

Boundary conditions

Climate: **MA - BOSTON LOGAN INT ARPT (AMeDAS standard year)**

Internal heat gains:	**2.1** Btu/hr ft²
Interior temperature:	**68** °F
Overheat temperature:	**77** °F

Building geometry

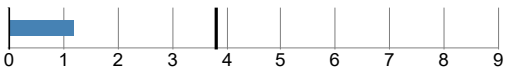
Enclosed volume:	**406,051** ft³
Net-volume:	**351,849** ft³
Total area envelope:	**32,769.8** ft²
Area/Volume Ratio:	**0.1** 1/ft
Floor area:	**37,656** ft²
Envelope area/iCFA:	**0.87**

PASSIVEHOUSE REQUIREMENTS

Certificate criteria: PHIUS+ 2018

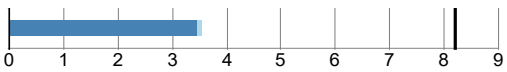
Heating demand

specific:	**1.16** kBtu/ft²yr
target:	**3.8** kBtu/ft²yr
total:	43,650.5 kBtu/yr



Cooling demand

sensible:	**3.45** kBtu/ft²yr
latent:	**0.09** kBtu/ft²yr
specific:	**3.54** kBtu/ft²yr
target:	**8.2** kBtu/ft²yr
total:	133,174.33 kBtu/yr

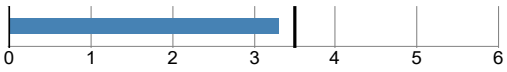


Heating load

specific:	**3.67** Btu/hr ft²
target:	**4.4** Btu/hr ft²
total:	138,287.17 Btu/hr

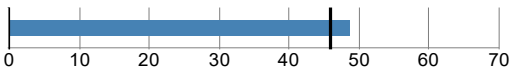
Cooling load

specific:	**3.31** Btu/hr ft²
target:	**3.5** Btu/hr ft²
total:	124,718.49 Btu/hr



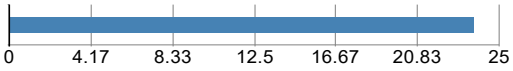
Source energy

total:	**537,203.01**	kWh/yr
specific:	**48.68**	kBtu/ft²yr
target:	**45.96**	kBtu/ft²yr
total:	**1,832,831.83**	kBtu/yr
specific:	48.68	kBtu/ft²yr



Site energy

total:	892,245.29	kBtu/yr
specific:	23.7	kBtu/ft²yr
total:	261,517.09	kWh/yr
specific:	6.94	kWh/ft²

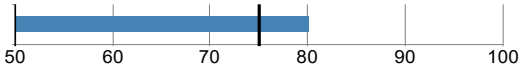


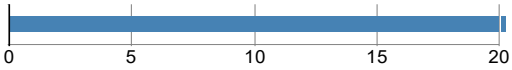
Air tightness

ACH50:	**0.49**	1/hr
CFM50 per envelope area:	**0.06**	cfm/ft²
target:	**0.49**	1/hr
target CFM50:	**0.06**	cfm/ft²

PASSIVEHOUSE RECOMMENDATIONS

Sensible recovery efficiency:	**80.1**	%
Frequency of overheating: Cooling system is required	**27.9**	%





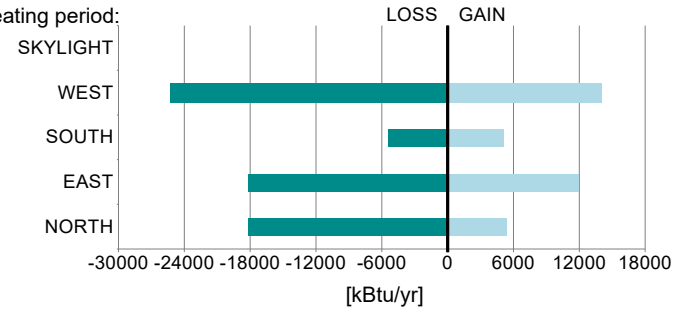
Frequency of overheating only applies if there is not a [properly sized] cooling system installed.

BUILDING ELEMENTS

Windows

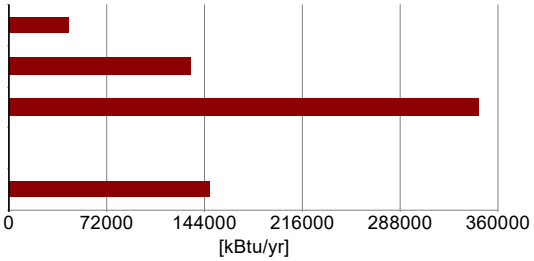
Average SHGC:	**0.46**
Average solar reduction factor heating:	**0.33**
Average solar reduction factor cooling:	**0.35**
Average U-value:	**0.206** Btu/hr ft² °F
Total glazing area:	**1,239.2** ft²
Total window area:	**2,316.9** ft²

Heat gain/loss heating period:



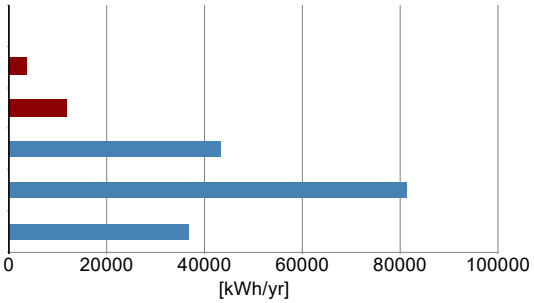
HVAC

Total heating demand:	**43,650** kBtu/yr
Total cooling demand:	**133,174** kBtu/yr
Total DHW energy demand:	**346,411** kBtu/yr
Solar DHW contribution:	**0** kBtu/yr
Auxiliary electricity:	**147,417** kBtu/yr



Electricity

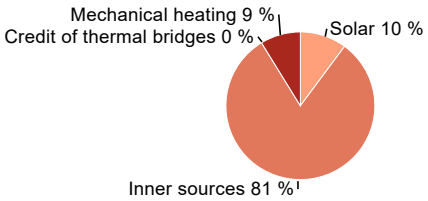
Direct heating / DHW:	**0** kWh/yr
Heatpump heating:	**3,594** kWh/yr
Cooling:	**11,607** kWh/yr
HVAC auxiliary energy:	**43,208** kWh/yr
Appliances:	**81,176** kWh/yr
Renewable generation, coincident production and use:	**36,800** kWh/yr
Total electricity demand:	**102,785** kWh/yr



HEAT FLOW - HEATING PERIOD

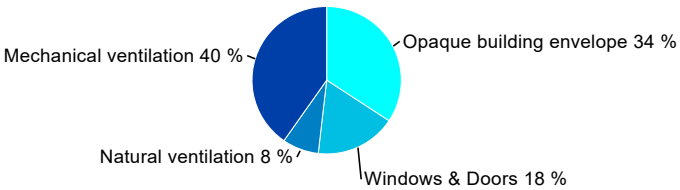
Heat gains

Solar:	**39,885** kBtu/yr
Inner sources:	**320,071** kBtu/yr
Credit of thermal bridges:	**0** kBtu/yr
Mechanical heating:	**43,650** kBtu/yr



Heat losses

Opaque building envelope:	**138,360** kBtu/yr
Windows & Doors:	**70,736** kBtu/yr
Natural ventilation:	**31,861** kBtu/yr
Mechanical ventilation:	**162,651** kBtu/yr

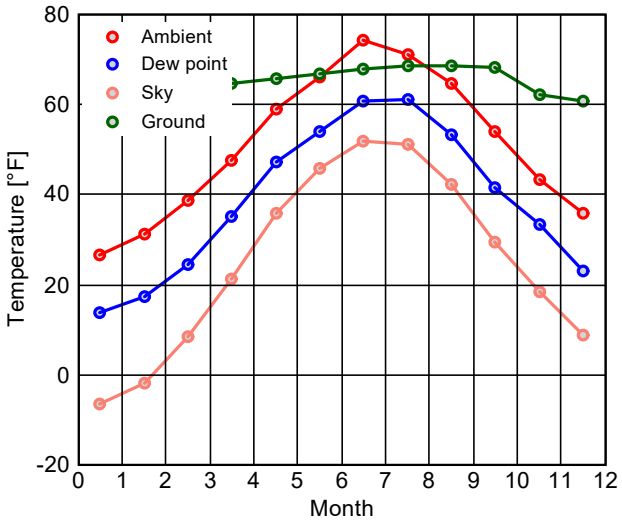


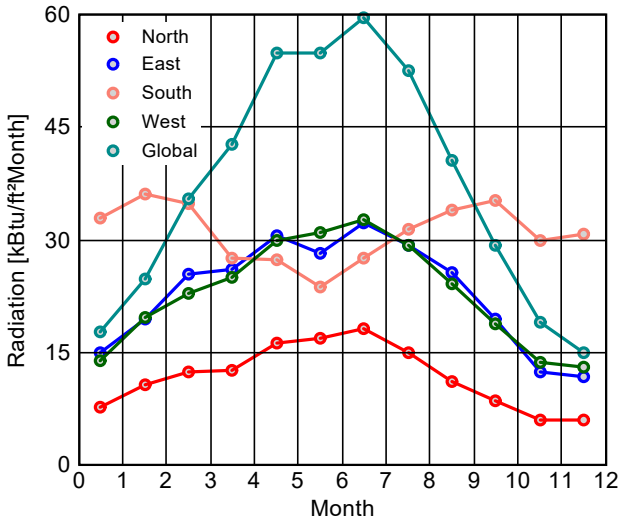
CLIMATE

Latitude:	**42.4**	°
Longitude:	**-71**	°
Elevation of weather station:	**19.7**	ft
Elevation of building site:	**2**	ft
Heat capacity air:	**0.018**	Btu/ft³F
Daily temperature swing summer:	**14.8**	°F
Average wind speed:	**13.1**	ft/s

Ground

Average ground surface temperature:	**52.8**	°F
Amplitude ground surface temperature:	**55.8**	°F
Ground thermal conductivity:	**1.2**	Btu/hr ft °F
Ground heat capacity:	**29.8**	Btu/ft³F
Depth below grade of groundwater:	**9.8**	ft
Flow rate groundwater:	**0.2**	ft/d





Calculation parameters

Length of heating period	**212**	days/yr
Heating degree hours	**140.8**	kFh/a
Phase shift months	**1.3**	mths
Time constant heating demand	**137**	hr
Time constant cooling demand	**0**	hr
Time constant cooling demand with night ventilation	**0**	hr

Climate for	Heating load 1	Heating load 2	Cooling
Temperature [°F]	16.9	31.6	83.5
Solar radiation North [Btu/hr ft²]	12	7.9	27.6
Solar radiation East [Btu/hr ft²]	22.8	13.3	61.5
Solar radiation South [Btu/hr ft²]	49.5	27.3	41.8
Solar radiation West [Btu/hr ft²]	22.2	11.4	53.3
Solar radiation Global [Btu/hr ft²]	26.9	16.5	101.4

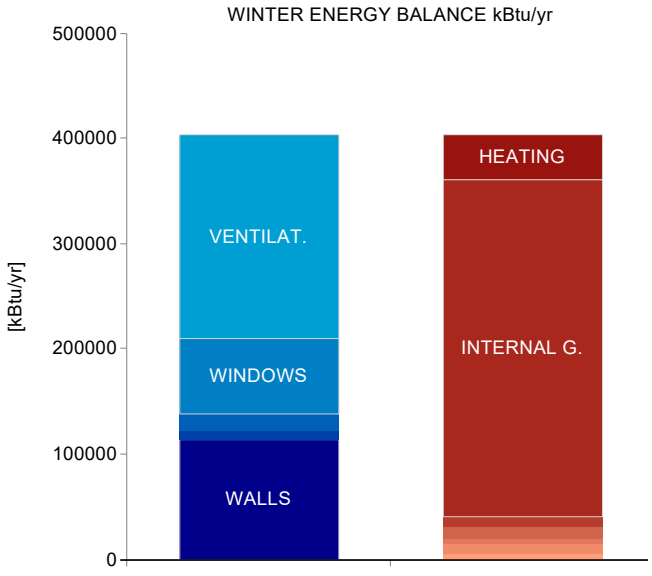
Relevant boundary conditions for heating load calculation: Heating load 1

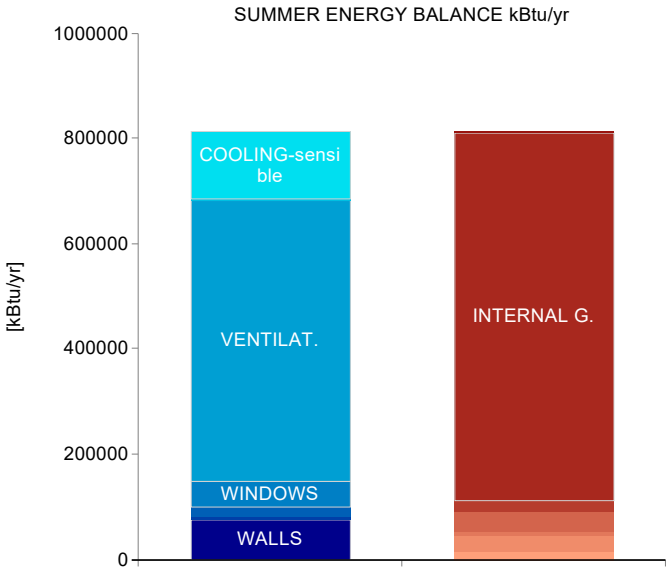
ANNUAL HEAT DEMAND

Transmission losses :	**209,095**	kBtu/yr
Ventilation losses:	**194,512**	kBtu/yr
Total heat losses:	**403,607**	kBtu/yr
Solar heat gains:	**50,520**	kBtu/yr
Internal heat gains:	**405,408**	kBtu/yr
Total heat gains:	**455,928**	kBtu/yr
Utilization factor:	**79**	%
Useful heat gains:	**359,957**	kBtu/yr
Annual heat demand:	**43,650**	kBtu/yr
Specific annual heat demand:	**1,159.3**	Btu/ft²yr

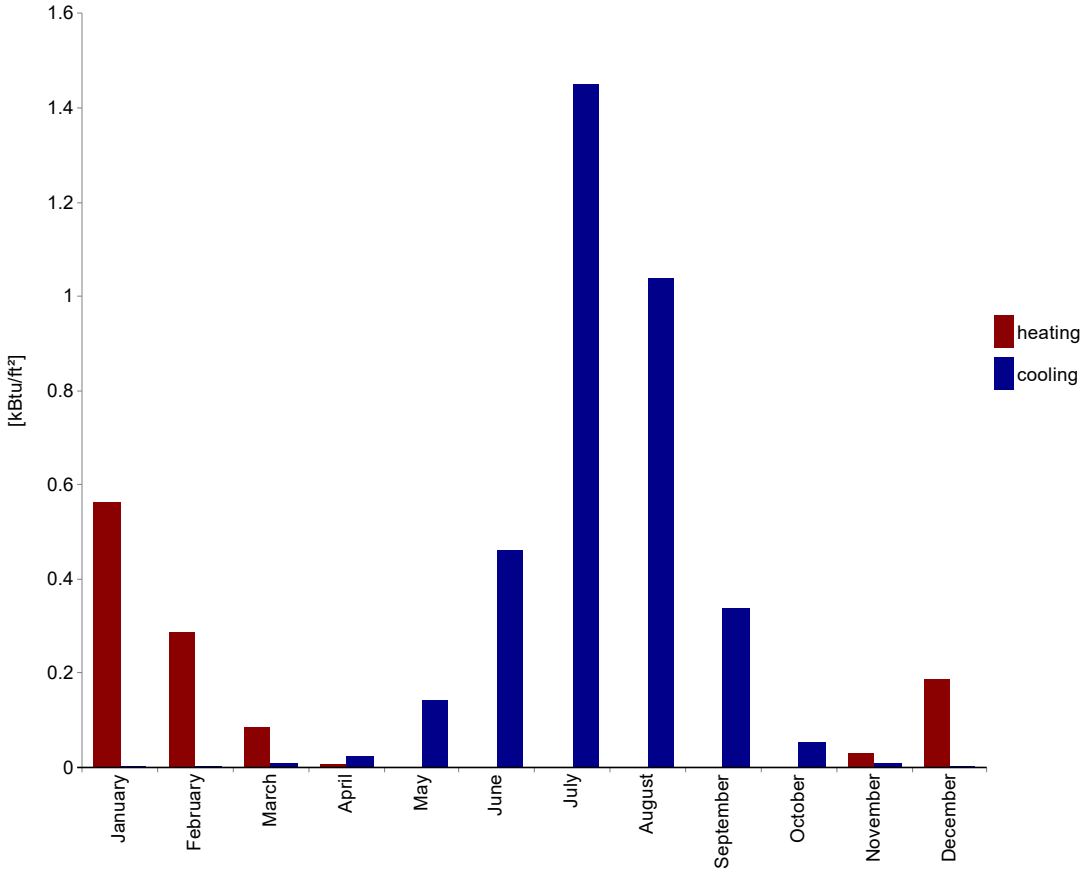
ANNUAL COOLING DEMAND

Solar heat gains:	**112,384**	kBtu/yr
Internal heat gains:	**697,991**	kBtu/yr
Total heat gains:	**810,374**	kBtu/yr
Transmission losses :	**358,648**	kBtu/yr
Ventilation losses:	**1,300,850**	kBtu/yr
Total heat losses:	**1,659,498**	kBtu/yr
Utilization factor:	**41**	%
Useful heat losses:	**680,569**	kBtu/yr
Cooling demand - sensible:	**129,806**	kBtu/yr
Cooling demand - latent:	**3,369**	kBtu/yr
Annual cooling demand:	**133,174**	kBtu/yr
Specific annual cooling demand:	**3.5**	kBtu/ft²yr





SPECIFIC HEAT/COOLING DEMAND MONTHLY



Month	Heating [kBtu/ft²]	Cooling [kBtu/ft²]
January	0.6	0
February	0.3	0
March	0.1	0
April	0	0
May	0	0.1
June	0	0.5
July	0	1.5
August	0	1
September	0	0.3
October	0	0.1
November	0	0
December	0.2	0

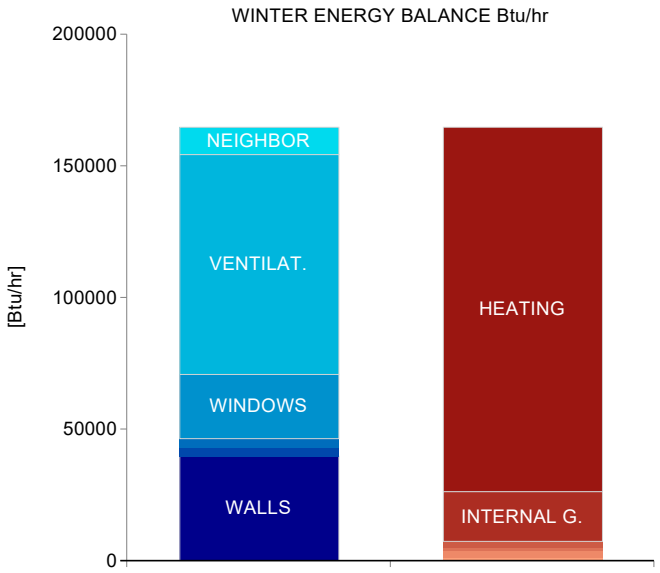
HEATING LOAD

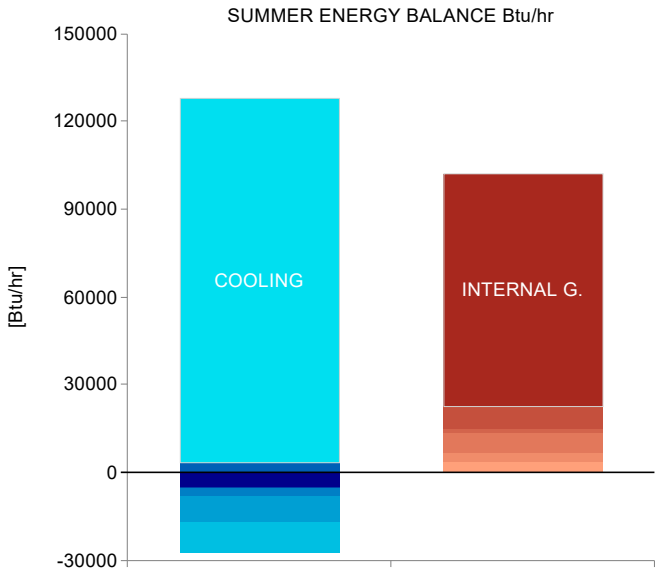
	First climate	Second climate
Transmission heat losses:	**80,906.8** Btu/hr	**61,625.3** Btu/hr
Ventilation heat losses:	**83,488.2** Btu/hr	**59,355** Btu/hr
Total heat loss:	**164,395** Btu/hr	**120,980.2** Btu/hr
Solar heat gain:	**7,008.9** Btu/hr	**3,957.8** Btu/hr
Internal heat gain:	**19,099** Btu/hr	**19,099** Btu/hr
Total heat gains heating:	**26,107.9** Btu/hr	**23,056.8** Btu/hr
Heating load:	**138,287.2** Btu/hr	**97,923.4** Btu/hr

Relevant heating load:	**138,287.2** Btu/hr
Specific heating load:	**3.7** Btu/hr ft²

COOLING LOAD

Solar heat gain:	**22,431.7** Btu/hr
Internal heat gain:	**79,687.1** Btu/hr
Total heat gains cooling:	**102,118.8** Btu/hr
Transmission heat losses:	**-14,017.9** Btu/hr
Ventilation heat losses:	**-8,581.7** Btu/hr
Total heat loss:	**-22,599.7** Btu/hr
Cooling load - sensible:	**124,718.5** Btu/hr
Cooling load - latent:	**0** Btu/hr
Relevant cooling load:	**124,718.5** Btu/hr
Specific maximum cooling load:	**3.3** Btu/hr ft²





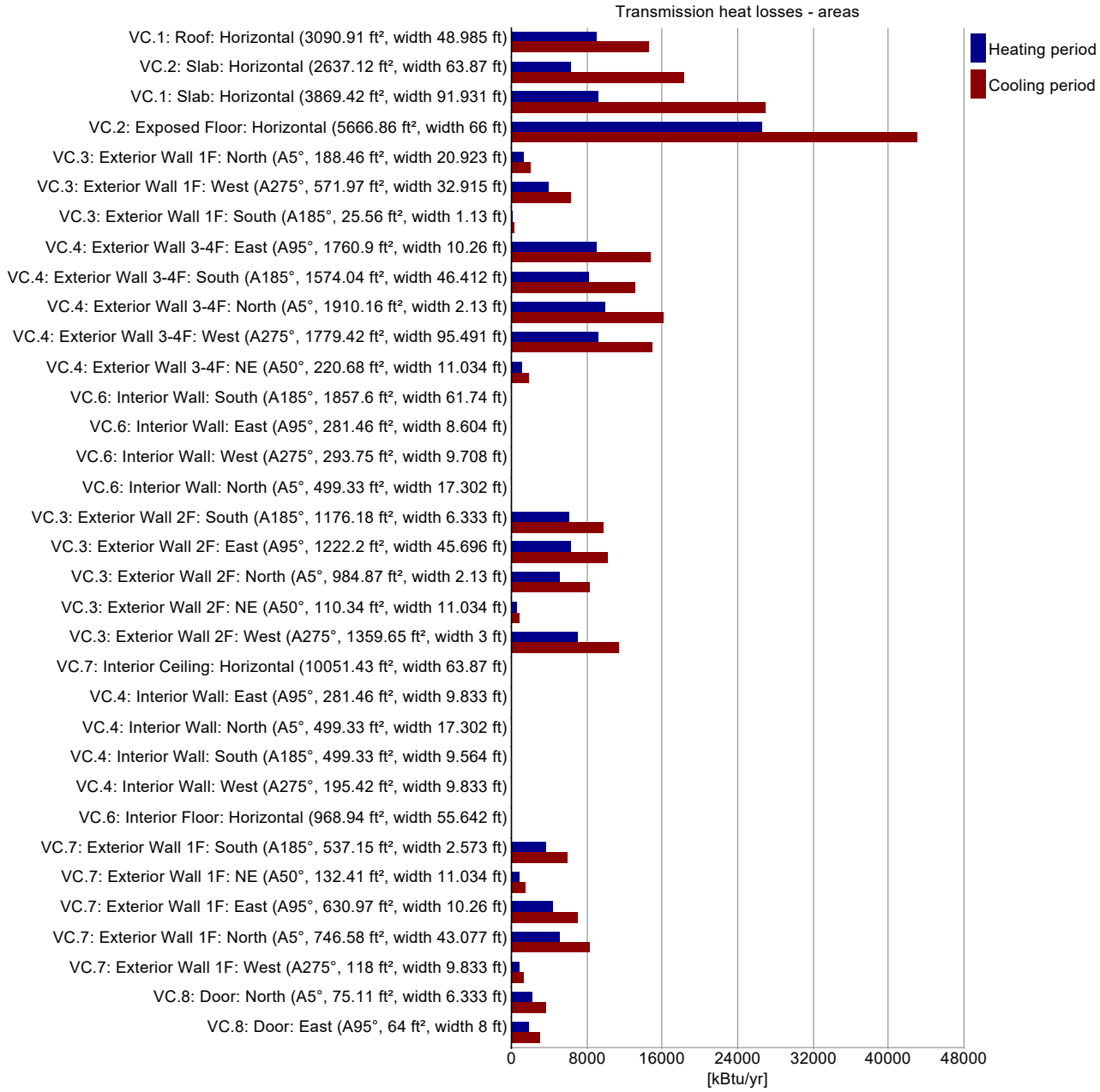
AREAS

Transmission heat losses - areas

Name	Area [ft²]	Average U-value [Btu/hr ft² °F]	Absorption coefficient	Emission coefficient	Reduction factor shading [%]	Transmission losses heating [kBtu/yr]	Transmission losses cooling [kBtu/yr]
VC.1: Roof: Horizontal (3090.91 ft², width 48.985 ft)	3090.9	0.02	0.4	0.9	100	9016.2	14597.3
VC.2: Slab: Horizontal (2637.12 ft², width 63.87 ft)	2637.1	0.063	0	0	0	6283.8	18329
VC.1: Slab: Horizontal (3869.42 ft², width 91.931 ft)	3869.4	0.063	0	0	0	9220.2	26893.9
VC.2: Exposed Floor: Horizontal (5666.86 ft², width 66 ft)	5666.9	0.032	0.4	0.9	100	26611.9	43084.7
VC.3: Exterior Wall 1F: North (A5°, 188.46 ft², width 20.923 ft)	188.5	0.046	0.4	0.9	100	1296	2098.2
VC.3: Exterior Wall 1F: West (A275°, 571.97 ft², width 32.915 ft)	572	0.046	0.4	0.9	100	3933.3	6368
VC.3: Exterior Wall 1F: South (A185°, 25.56 ft², width 1.13 ft)	25.6	0.046	0.4	0.9	100	175.8	284.6
VC.4: Exterior Wall 3-4F: East (A95°, 1760.9 ft², width 10.26 ft)	1760.9	0.035	0.4	0.9	100	9137.8	14794.1
VC.4: Exterior Wall 3-4F: South (A185°, 1574.04 ft², width 46.412 ft)	1574	0.035	0.4	0.9	100	8168.1	13224.2
VC.4: Exterior Wall 3-4F: North (A5°, 1910.16 ft², width 2.13 ft)	1910.2	0.035	0.4	0.9	100	9912.3	16048.1
VC.4: Exterior Wall 3-4F: West (A275°, 1779.42 ft², width 95.491 ft)	1779.4	0.035	0.4	0.9	100	9233.9	14949.7
VC.4: Exterior Wall 3-4F: NE (A50°, 220.68 ft², width 11.034 ft)	220.7	0.035	0.4	0.9	100	1145.1	1854
VC.6: Interior Wall: South (A185°, 1857.6 ft², width 61.74 ft)	1857.6	0.319	0	0	0	0	0
VC.6: Interior Wall: East (A95°, 281.46 ft², width 8.604 ft)	281.5	0.319	0	0	0	0	0
VC.6: Interior Wall: West (A275°, 293.75 ft², width 9.708 ft)	293.7	0.319	0	0	0	0	0
VC.6: Interior Wall: North (A5°, 499.33 ft², width 17.302 ft)	499.3	0.319	0	0	0	0	0
VC.3: Exterior Wall 2F: South (A185°, 1176.18 ft², width 6.333 ft)	1176.2	0.035	0.4	0.9	100	6103.5	9881.6
VC.3: Exterior Wall 2F: East (A95°, 1222.2 ft², width 45.696 ft)	1222.2	0.035	0.4	0.9	100	6342.3	10268.3
VC.3: Exterior Wall 2F: North (A5°, 984.87 ft², width 2.13 ft)	984.9	0.035	0.4	0.9	100	5110.8	8274.3
VC.3: Exterior Wall 2F: NE (A50°, 110.34 ft², width 11.034 ft)	110.3	0.035	0.4	0.9	100	572.6	927
VC.3: Exterior Wall 2F: West (A275°, 1359.65 ft², width 3 ft)	1359.6	0.035	0.4	0.9	100	7055.6	11423
VC.7: Interior Ceiling: Horizontal (10051.43 ft², width 63.87 ft)	10051.4	0.049	0	0	0	0	0
VC.4: Interior Wall: East (A95°, 281.46 ft², width 9.833 ft)	281.5	0.319	0	0	0	0	0
VC.4: Interior Wall: North (A5°, 499.33 ft², width 17.302 ft)	499.3	0.319	0	0	0	0	0
VC.4: Interior Wall: South (A185°, 499.33 ft², width 9.564 ft)	499.3	0.319	0	0	0	0	0
VC.4: Interior Wall: West (A275°, 195.42 ft², width 9.833 ft)	195.4	0.319	0	0	0	0	0
VC.6: Interior Floor: Horizontal (968.94 ft², width 55.642 ft)	968.9	0.048	0	0	0	0	0
VC.7: Exterior Wall 1F: South (A185°, 537.15 ft², width 2.573 ft)	537.1	0.046	0.4	0.9	100	3693.8	5980.3
VC.7: Exterior Wall 1F: NE (A50°, 132.41 ft², width 11.034 ft)	132.4	0.046	0.4	0.9	100	910.5	1474.1
VC.7: Exterior Wall 1F: East (A95°, 630.97 ft², width 10.26 ft)	631	0.046	0.4	0.9	100	4339	7024.8
VC.7: Exterior Wall 1F: North (A5°, 746.58 ft², width 43.077 ft)	746.6	0.046	0.4	0.9	100	5134.1	8312.1
VC.7: Exterior Wall 1F: West (A275°, 118 ft², width 9.833 ft)	118	0.046	0.4	0.9	100	811.5	1313.7
VC.8: Door: North (A5°, 75.11 ft², width 6.333 ft)	75.1	0.201	0.4	0.9	100	2241.8	3629.4
VC.8: Door: East (A95°, 64 ft², width 8 ft)	64	0.201	0.4	0.9	100	1910.1	3092.5

Degree hours [kFh/a]

	Heating	Cooling
Ambient heating	82.3	133.3
Ground heating	21.1	61.7



THERMAL BRIDGES

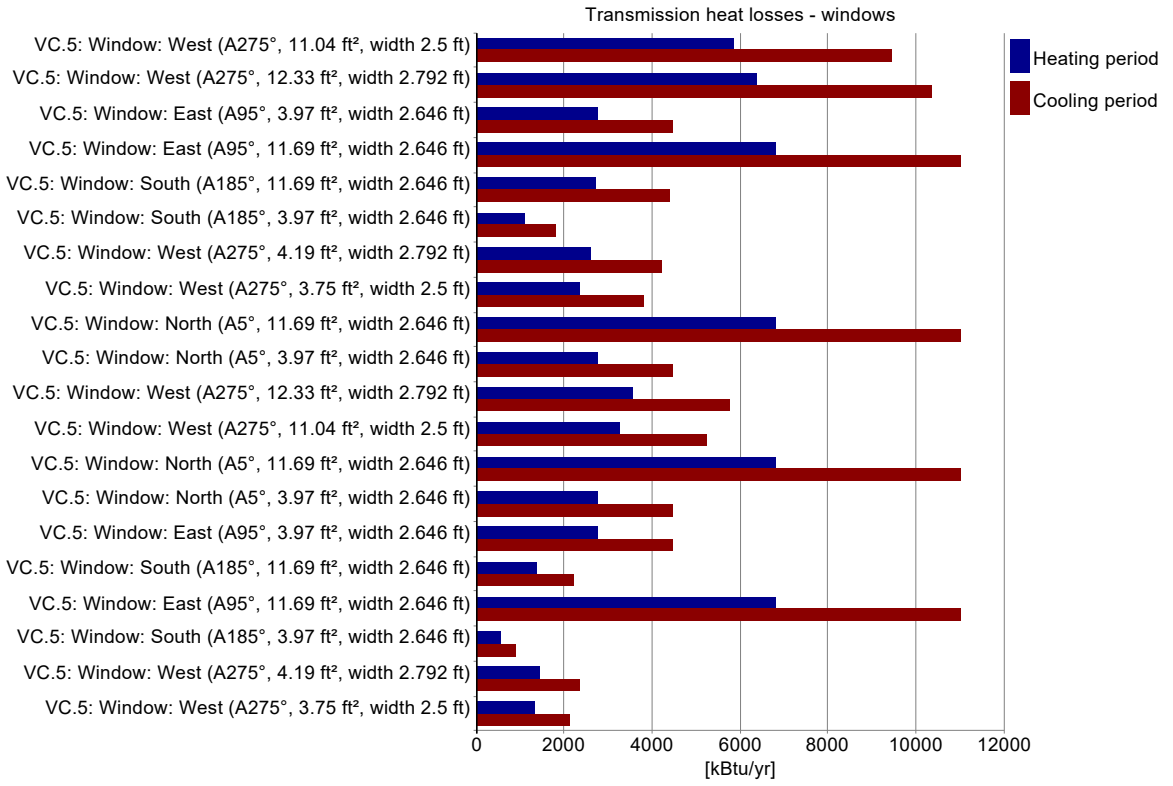
Transmission heat losses - thermal bridges

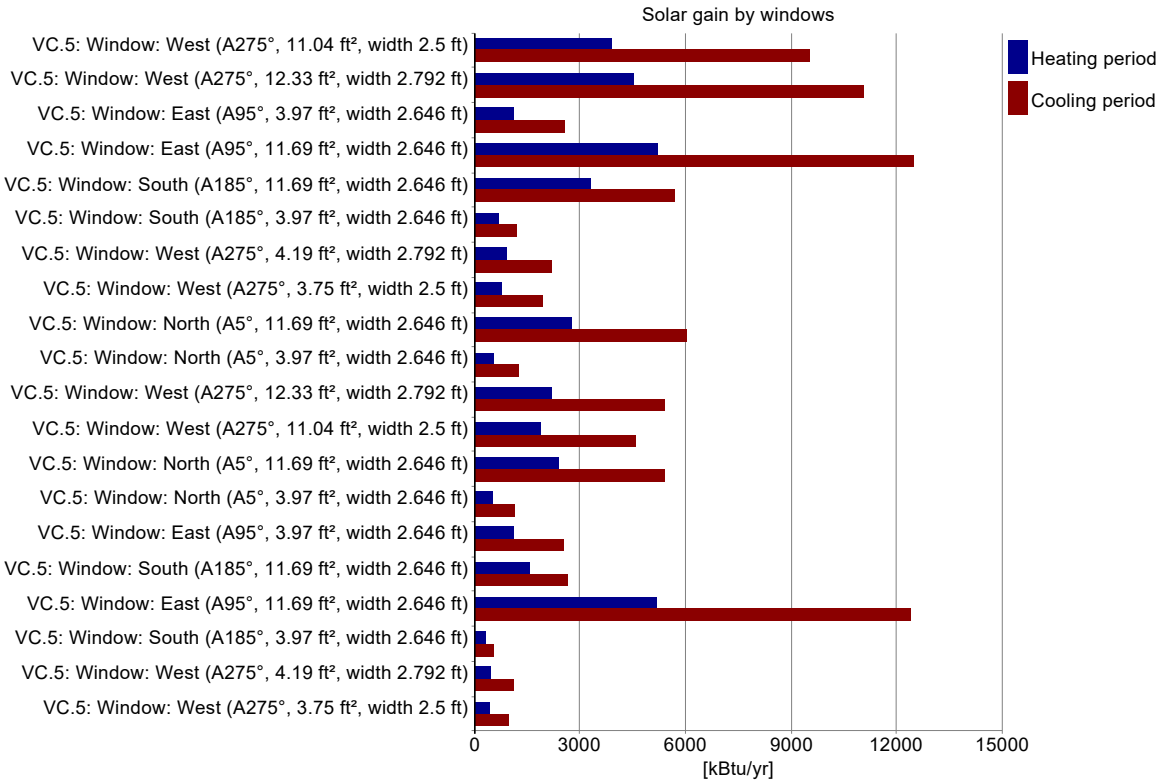
Name	Length [ft]	Psi-value [Btu/hr ft °F]	Transmission losses [kBtu/yr]	Transmission losses cooling [kBtu/yr]

WINDOWS

Transmission heat losses - windows

Name	Quan-tity	Incli-nation [°]	U-value total [Btu/hr ft² °F]	SHGC (perpen-dicular)	Reduction factor shading [%]	Reduction factor shading summer [%]	Solar gain heating [kBtu/yr]	Solar gain cooling [kBtu/yr]	Transmission losses heating [kBtu/yr]	Transmission losses cooling [kBtu/yr]
VC.5: Window: West (A275°, 11.04 ft², width 2.5 ft)	18	90	0.198	0.5	79.4	82.3	3,890.2	9,503.4	5,844.7	9,462.6
VC.5: Window: West (A275°, 12.33 ft², width 2.792 ft)	18	90	0.194	0.5	79.5	82.1	4,559.7	11,097.9	6,389.7	10,344.9
VC.5: Window: East (A95°, 3.97 ft², width 2.646 ft)	20	90	0.235	0.5	80.1	82.1	1,122.4	2,551.6	2,762	4,471.7
VC.5: Window: East (A95°, 11.69 ft², width 2.646 ft)	20	90	0.196	0.5	80.4	85.7	5,232.5	12,514.6	6,796.9	11,004.1
VC.5: Window: South (A185°, 11.69 ft², width 2.646 ft)	8	90	0.196	0.5	69.9	68.8	3,306.4	5,671.8	2,718.7	4,401.7
VC.5: Window: South (A185°, 3.97 ft², width 2.646 ft)	8	90	0.235	0.5	71	65.9	711.6	1,177.2	1,104.8	1,788.7
VC.5: Window: West (A275°, 4.19 ft², width 2.792 ft)	18	90	0.234	0.5	77.8	78.7	941	2,222.2	2,608.5	4,223.2
VC.5: Window: West (A275°, 3.75 ft², width 2.5 ft)	18	90	0.236	0.5	78.3	79.3	808.5	1,915.3	2,363.1	3,825.8
VC.5: Window: North (A5°, 11.69 ft², width 2.646 ft)	20	90	0.196	0.5	78.2	75.5	2,741.1	6,057.5	6,796.9	11,004.2
VC.5: Window: North (A5°, 3.97 ft², width 2.646 ft)	20	90	0.235	0.5	79.2	77.8	553.2	1,254.7	2,762	4,471.7
VC.5: Window: West (A275°, 12.33 ft², width 2.792 ft)	10	90	0.194	0.5	69.5	72	2,200.4	5,387.1	3,549.8	5,747.2
VC.5: Window: West (A275°, 11.04 ft², width 2.5 ft)	10	90	0.198	0.5	69.3	71.9	1,874.6	4,603.2	3,247	5,257
VC.5: Window: North (A5°, 11.69 ft², width 2.646 ft)	20	90	0.196	0.5	69.7	67.8	2,410.9	5,395.5	6,796.9	11,004.2
VC.5: Window: North (A5°, 3.97 ft², width 2.646 ft)	20	90	0.235	0.5	73.5	72.6	507.7	1,163.5	2,762	4,471.7
VC.5: Window: East (A95°, 3.97 ft², width 2.646 ft)	20	90	0.235	0.5	79.3	81.2	1,112.7	2,526.2	2,762	4,471.7
VC.5: Window: South (A185°, 11.69 ft², width 2.646 ft)	4	90	0.196	0.5	65.9	64.9	1,557.5	2,673	1,359.4	2,200.8
VC.5: Window: East (A95°, 11.69 ft², width 2.646 ft)	20	90	0.196	0.5	79.6	84.9	5,179.7	12,390.2	6,796.9	11,004.1
VC.5: Window: South (A185°, 3.97 ft², width 2.646 ft)	4	90	0.235	0.5	69.4	64.7	347.4	575.8	552.4	894.3
VC.5: Window: West (A275°, 4.19 ft², width 2.792 ft)	10	90	0.234	0.5	69.7	70.8	465.1	1,105.2	1,449.2	2,346.2
VC.5: Window: West (A275°, 3.75 ft², width 2.5 ft)	10	90	0.236	0.5	70.5	71.6	403	959.1	1,312.8	2,125.4





Summary building envelope

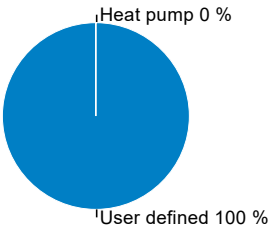
	Total area / length	Average U-value / Psi value	Transmission losses
Exterior wall ambient:	**20,855.5** ft²	**0.037** Btu/hr ft² °F	**113,839.7** kBtu/yr
Exterior wall ground:	**0** ft²	**0** Btu/hr ft² °F	**0** kBtu/yr
Basement:	**6,506.5** ft²	**0.063** Btu/hr ft² °F	**15,504.1** kBtu/yr
Roof:	**3,090.9** ft²	**0.02** Btu/hr ft² °F	**9,016.2** kBtu/yr
Windows:	**2,316.9** ft²	**0.206** Btu/hr ft² °F	**70,735.5** kBtu/yr
Doors:	**0** ft²	**0** Btu/hr ft² °F	**0** kBtu/yr
Thermal bridge ambient:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr
Thermal bridge perimeter:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr
Thermal bridge floor slab:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr

Shading

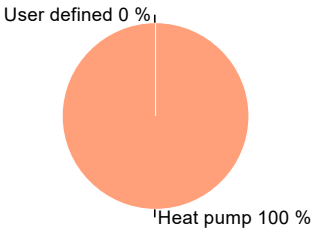
	Heating	Cooling
Reduction factor North:	**74.4** %	**72.3** %
Reduction factor East:	**79.9** %	**84.7** %
Reduction factor South:	**68.9** %	**67.2** %
Reduction factor West:	**75.7** %	**78.1** %
Reduction factor Horizontal:	**100** %	**100** %

System	DHW			Heating			Total		
	Covered DHW demand [%]	Estimated solar fraction [%]	Final energy demand [kBtu/yr]	Covered heating demand [%]	Estimated solar fraction [%]	Final energy demand [kBtu/yr]	Performance ratio	CO2 equivalent emissions [lb/yr]	Source energy demand [kBtu/yr]
Heat pump, Mitsubishi VRF (PURY)	0	0	0	100	0	12,261.4	0	5,387.7	34,332
User defined, Lochinvar Armor AWN601PM (96% Thermal Eff. Rated by .03 per PHIUS	100	0	391,444.1	0	0	0	1.1	63,239.7	430,588.5
Σ	100	0	391,444.1	100	0	12,261.4		68,627.3	464,920.5

DHW - final energy



Heating - final energy



COOLING UNITS

	sensible	latent
Air cooling:	**0** kBtu/ft²yr	**0** kBtu/ft²yr
Recirculation cooling:	**3.4** kBtu/ft²yr	**2.4** kBtu/ft²yr
Additional dehumidification:		**0** kBtu/ft²yr
Panel cooling:	**0** kBtu/ft²yr	
Sum:	**3.4** kBtu/ft²yr	**2.4** kBtu/ft²yr

VENTILATION

Energy transportable by supply air

Heating energy

transportable: **2.91** W/ft²

load: **1.08** W/ft²

Cooling energy

transportable: **1.76** W/ft²

load: **0.97** W/ft²

Infiltration pressure test ACH50: **0.49** 1/hr

Total extract air demand: **5,200** cfm

Supply air per person: **12** cfm

Occupancy: **225**

Average air flow rate: **5,200** cfm

Average air change rate: **0.89** 1/hr

Effective ACH ambient: **0.21** 1/hr

Effective ACH ground: **0** 1/hr

Energetically effective air exchange: **0.21** 1/hr

Infiltration air change rate: **0.03** 1/hr

Infiltration air change rate (heating load): **0.09** 1/hr

Type of ventilation system: **Balanced PH ventilation**

Wind screening coefficient (e): **0.07**

Wind exposure factor: **15**

Wind shield factor: **0.05**

Ventilation heat losses: **184,761.43** kBtu/yr

Devices

Name	Sensible recovery efficiency [-]	Electric efficiency [W/cfm]	Heat recovery efficiency SHX [-]	Effective recovery efficiency [-]
Pending MECH drawings	0.8	0.05	0	0.8
Altogether	0.8	0.05	0	0.8

Ducts

Name	Length (total) [ft]	Clear cross-section [ft²]	U-value [Btu/hr ft² °F]	Assigned ventilation units
ERV-1	10	2.7778	7.82	Pending MECH drawings
ERV-1	10	2.7778	7.82	Pending MECH drawings
ERV-2	10	2.7778	7.82	Pending MECH drawings
ERV-2	10	2.7778	7.82	Pending MECH drawings
Σ	40			

*length * quantity ** thermal conductivity / thickness

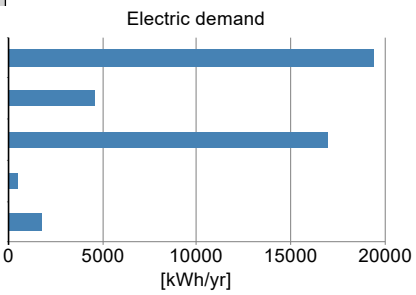
SUMMER VENTILATION

ACH night ventilation: **0** 1/hr

ACH natural summer: **0** 1/hr

ELECTRICITY DEMAND - AUXILIARY ELECTRICITY

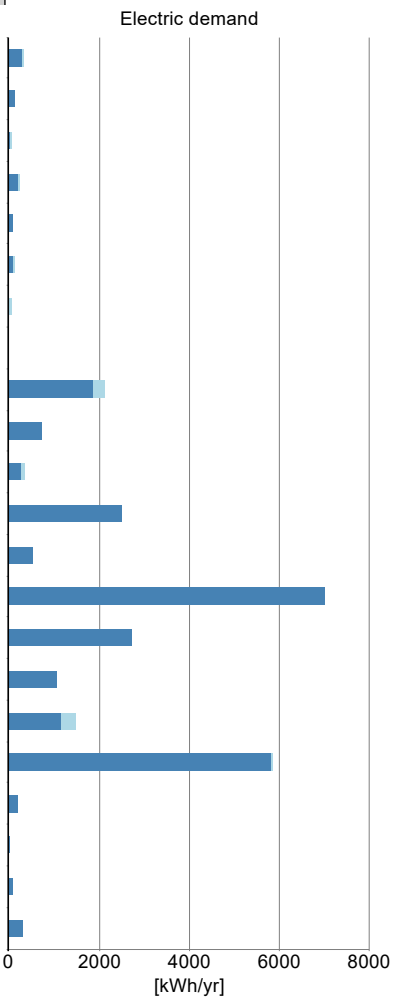
Type	Quantity	Indoor	Norm demand	Electric demand [kWh/yr]	Source energy [kBtu/yr]
Ventilation winter	1	no	0.8 W/cfm	19454.1	185845.8
Ventilation Defrost	1	no	24,375 W	4546.7	43435
Ventilation summer	1	no	0.8 W/cfm	16987.5	162282.8
DHW circulating pump	1	no	56.4 W	452.4	4322
DHW storage load pump	1	no	261.1 W	1767.2	16882.6
Σ				43208	412768.1



ELECTRICITY DEMAND NON-RESIDENTIAL BUILDING

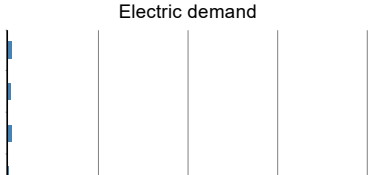
Equipment

Type	Quantity	Indoor	Utilization pattern	Power rating norm demand	Electric demand [kWh/yr]	Source energy [kBtu/yr]
PC	4	yes	Pattern 2: Classrom	80 (+30) W	302.4 (+37.8)	3249.9
Monitor	4	yes	Pattern 2: Classrom	31 (+2) W	117.2 (+2.5)	1143.5
Printer	1	yes	Pattern 2: Classrom	300 (+17) W	42 (+21.4)	605.9
PC	2	yes	Pattern 7: Workgroup Office	80 (+30) W	215.6 (+34.7)	2390.7
Monitor	2	yes	Pattern 7: Workgroup Office	31 (+2) W	83.5 (+2.3)	820.2
Printer	1	yes	Pattern 7: Workgroup Office	300 (+17) W	82.5 (+42.1)	1190.1
PC	1	yes	Pattern 6: Workshop	80 (+30) W	0 (+67.5)	644.8
Monitor	1	yes	Pattern 6: Workshop	31 (+2) W	0 (+4.5)	43
PC	25	yes	Pattern 2: Classrom	80 (+30) W	1,890 (+236.3)	20312.2
Monitor	25	yes	Pattern 2: Classrom	31 (+2) W	732.4 (+15.8)	7146.9
Printer	2	yes	Pattern 2: Classrom	1,000 (+30) W	280 (+75.6)	3397.1
User defined	1	yes		2,500 (+0) W	2,500 (+0)	23882.6
Telephone system	1	yes		60 (+0) W	525.6 (+0)	5021.1
PC	30	yes	Pattern 8: Hospital	80 (+30) W	7,008 (+0)	66947.8
Monitor	30	yes	Pattern 8: Hospital	31 (+2) W	2,715.6 (+0)	25942.3
Telephone system	2	yes		60 (+0) W	1,051.2 (+0)	10042.2
Printer	2	yes	Pattern 8: Hospital	1,000 (+30) W	1,168 (+315.4)	14170.6
Server	1	yes	Pattern 8: Hospital	1,000 (+2) W	5,840 (+5.8)	55845.6
Cooktop	1	yes	Pattern 1: Meeting, Conference	0.3 kWh/meal	187.5	1791.2
Dishwasher	1	yes	Pattern 1: Meeting, Conference	0.1 kWh/cover	41.3	394.1
Refrigerator	1	yes		0.3 kWh/d	102.2	976.3
Refrigerator	3	yes		0.3 kWh/d	306.6	2929
Σ	141				25,191.6 (+861.6)	248886.9



Lighting

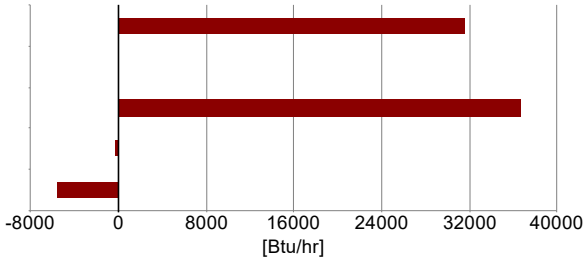
Name	Utilization pattern	Installed lighting power [W/ft²]	Daylight utilization	Lighting full load hours [hrs/yr]	Electric demand [kWh/yr]	Source energy [kBtu/yr]
Lighting 1: 101 Community Room	Pattern 1: Meeting, Conference	0.6	Good	1543.7	418.5	3998.3
Lighting 2: 102 Student Resources	Pattern 2: Classrom	0.6	Good	988.6	290.4	2773.8
Lighting 3: 103 Lobby	Pattern 3: Traffic/Circulation Area	0.6	None	770	313.1	2991.5
Lighting 4: 104 Stair	Pattern 3: Traffic/Circulation	0.6	None	770	69.6	664.8



INTERNAL HEAT GAINS

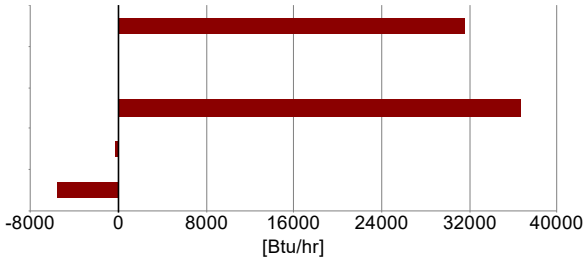
Heating season

Electricity total:	**31,571.5**	Btu/hr
Auxiliary electricity:	**0**	Btu/hr
People:	**36,793.5**	Btu/hr
Cold water:	**-292.7**	Btu/hr
Evaporation:	**-5,527.7**	Btu/hr
Σ:	**79,687.1**	Btu/hr
Specific internal heat gains:	**2.1**	Btu/hr ft²



Cooling season

Electricity total:	**31,571.5**	Btu/hr
Auxiliary electricity:	**0**	Btu/hr
People:	**36,793.5**	Btu/hr
Cold and hot water:	**-292.7**	Btu/hr
Evaporation:	**-5,527.7**	Btu/hr
Σ:	**79,687.1**	Btu/hr
Specific internal heat gains:	**2.1**	Btu/hr ft²



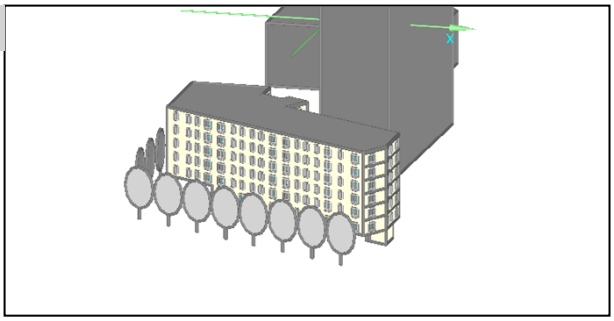
DHW AND DISTRIBUTION

DHW consumption per person per day:	**3.2**	gal/Person/day
Average cold water temperature supply:	**52.8**	°F
Useful heat DHW:	**190,776.1**	kBtu/yr
Specific useful heat DHW:	**5,066.8**	Btu/ft²yr
Total heat losses of the DHW system:	**155,634.6**	kBtu/yr
Specific losses of the DHW system:	**4,133.5**	Btu/ft²yr
Performance ratio DHW distribution system and storage:	**1.8**	
Utilization ratio DHW distribution system and storage:	**0.6**	
Total heat demand of DHW system:	**346,410.7**	kBtu/yr
Total specific heat demand of DHW system:	**9,200.3**	Btu/ft²yr
Total heat losses of the hydronic heating distribution:	**0**	kBtu/yr
Specific losses of the hydronic heating distribution:	**0**	Btu/ft²yr
Performance ratio of heat distribution:	**100**	%

Region	Length [ft]	Annual heat loss [kBtu/yr]
Hydronic heating distribution pipes		
Σ	0	0
DHW circulation pipes		
In conditioned space	50	1467.3
Σ	50	1467.3
Individual pipes		
In conditioned space	300	154167.3
Σ	300	154167.3
Water storage		
Device 4 (Water storage: DHW): Lochinvar RJA120 Lock-Temp Stainless Steel 119-gallon		0
Σ		0

Rindge Commons Building B (Residential)

BUILDING INFORMATION



Category:	**Residential**
Status:	**In planning**
Building type:	**New construction**
Year of construction:	
Units:	**77**
Number of occupants:	**237 (Design)**
Occupant density:	**370.3** ft²/Person

Boundary conditions

Climate: **MA - BOSTON LOGAN INT ARPT (AMeDAS standard year)**

Internal heat gains:	**1.1** Btu/hr ft²
Interior temperature:	**68** °F
Overheat temperature:	**77** °F

Building geometry

Enclosed volume:	**1,000,267.3** ft³
Net-volume:	**799,891** ft³
Total area envelope:	**74,848.4** ft²
Area/Volume Ratio:	**0.1** 1/ft
Floor area:	**87,754** ft²
Envelope area/iCFA:	**0.853**

PASSIVEHOUSE REQUIREMENTS

Certificate criteria: **PHIUS+ 2018**

Heating demand

specific:	**1.99** kBtu/ft²yr
target:	**4** kBtu/ft²yr
total:	174,276.52 kBtu/yr

Cooling demand

sensible:	**2.79** kBtu/ft²yr
latent:	**0.38** kBtu/ft²yr
specific:	**3.17** kBtu/ft²yr
target:	**7.2** kBtu/ft²yr
total:	277,792.38 kBtu/yr

Heating load

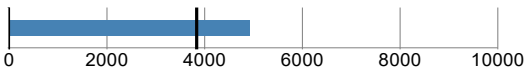
specific:	**2.46** Btu/hr ft²
target:	**3.8** Btu/hr ft²
total:	215,538.97 Btu/hr

Cooling load

specific:	**2.41** Btu/hr ft²
target:	**2.5** Btu/hr ft²
total:	211,086.33 Btu/hr

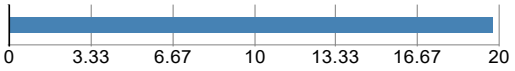
Source energy

total:	**1,162,387.25**	kWh/yr
specific:	**4,905**	kWh/Person yr
target:	**3,840**	kWh/Person yr
total:	**3,965,838.47**	kBtu/yr
specific:	45.2	kBtu/ft²yr



Site energy

total:	1,732,105.63	kBtu/yr
specific:	19.74	kBtu/ft²yr
total:	507,680.16	kWh/yr
specific:	5.79	kWh/ft²

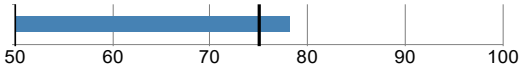


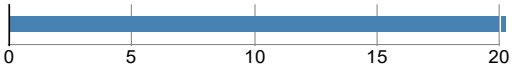
Air tightness

ACH50:	**0.34**	1/hr
CFM50 per envelope area:	**0.06**	cfm/ft²
target:	**0.34**	1/hr
target CFM50:	**0.06**	cfm/ft²

PASSIVEHOUSE RECOMMENDATIONS

Sensible recovery efficiency:	**78.2**	%
Frequency of overheating: Cooling system is required	**33.4**	%





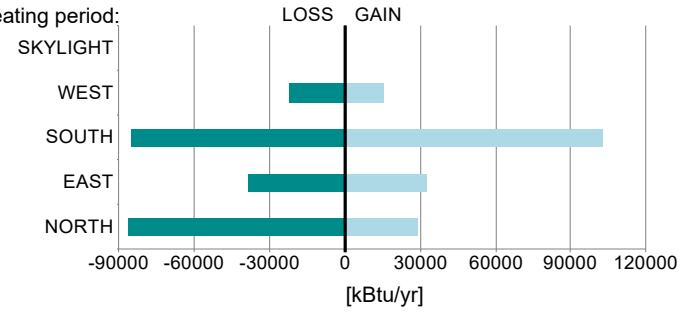
Frequency of overheating only applies if there is not a [properly sized] cooling system installed.

BUILDING ELEMENTS

Windows

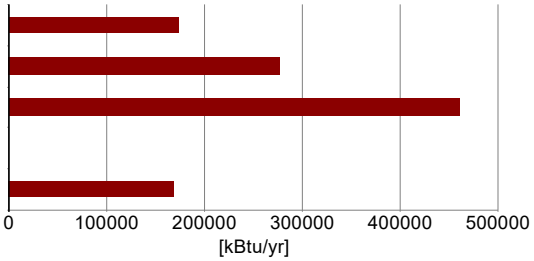
Average SHGC:	**0.37**	
Average solar reduction factor heating:	**0.45**	
Average solar reduction factor cooling:	**0.48**	
Average U-value:	**0.198**	Btu/hr ft² °F
Total glazing area:	**6,301.1**	ft²
Total window area:	**8,321.6**	ft²

Heat gain/loss heating period:



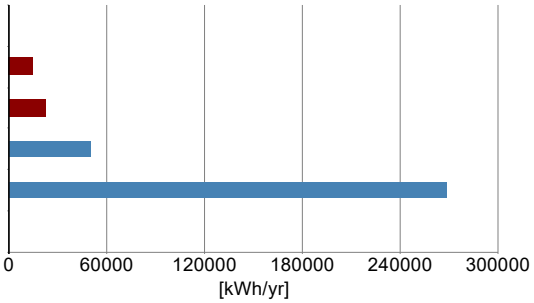
HVAC

Total heating demand:	**174,277**	kBtu/yr
Total cooling demand:	**277,792**	kBtu/yr
Total DHW energy demand:	**460,207**	kBtu/yr
Solar DHW contribution:	**0**	kBtu/yr
Auxiliary electricity:	**169,384**	kBtu/yr



Electricity

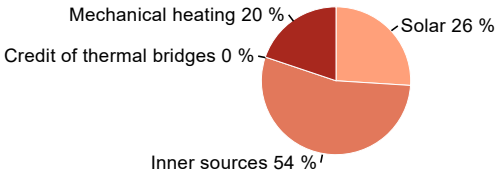
Direct heating / DHW:	**0**	kWh/yr
Heatpump heating:	**14,348**	kWh/yr
Cooling:	**22,406**	kWh/yr
HVAC auxiliary energy:	**49,646**	kWh/yr
Appliances:	**268,857**	kWh/yr
Renewable generation, coincident production and use:	**0**	kWh/yr
Total electricity demand:	**355,258**	kWh/yr



HEAT FLOW - HEATING PERIOD

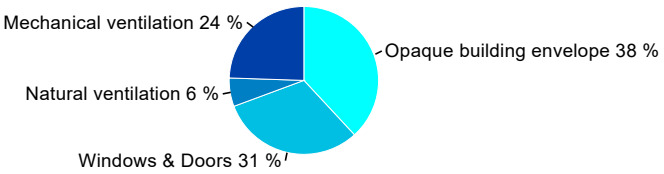
Heat gains

Solar:	**203,411**	kBtu/yr
Inner sources:	**423,853**	kBtu/yr
Credit of thermal bridges:	**0**	kBtu/yr
Mechanical heating:	**174,277**	kBtu/yr



Heat losses

Opaque building envelope:	**305,962**	kBtu/yr
Windows & Doors:	**249,501**	kBtu/yr
Natural ventilation:	**49,931**	kBtu/yr
Mechanical ventilation:	**196,145**	kBtu/yr

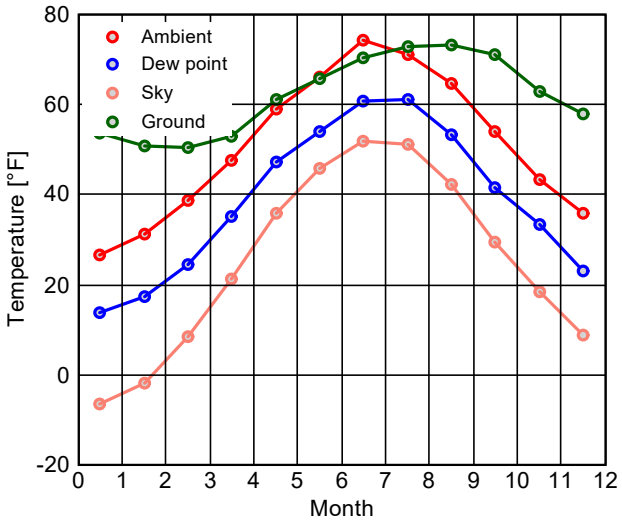


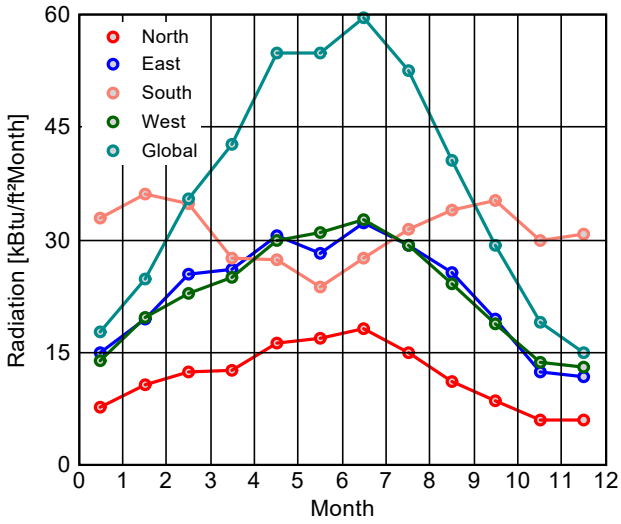
CLIMATE

Latitude:	**42.4**	°
Longitude:	**-71**	°
Elevation of weather station:	**19.7**	ft
Elevation of building site:	**2**	ft
Heat capacity air:	**0.018**	Btu/ft³F
Daily temperature swing summer:	**14.8**	°F
Average wind speed:	**13.1**	ft/s

Ground

Average ground surface temperature:	**52.8**	°F
Amplitude ground surface temperature:	**55.8**	°F
Ground thermal conductivity:	**1.2**	Btu/hr ft °F
Ground heat capacity:	**29.8**	Btu/ft³F
Depth below grade of groundwater:	**9.8**	ft
Flow rate groundwater:	**0.2**	ft/d





Calculation parameters

Length of heating period	**212**	days/yr
Heating degree hours	**140.8**	kFh/a
Phase shift months	**1.3**	mths
Time constant heating demand	**179**	hr
Time constant cooling demand	**0**	hr
Time constant cooling demand with night ventilation	**0**	hr

Climate for	Heating load 1	Heating load 2	Cooling
Temperature [°F]	16.9	31.6	83.5
Solar radiation North [Btu/hr ft²]	12	7.9	27.6
Solar radiation East [Btu/hr ft²]	22.8	13.3	61.5
Solar radiation South [Btu/hr ft²]	49.5	27.3	41.8
Solar radiation West [Btu/hr ft²]	22.2	11.4	53.3
Solar radiation Global [Btu/hr ft²]	26.9	16.5	101.4

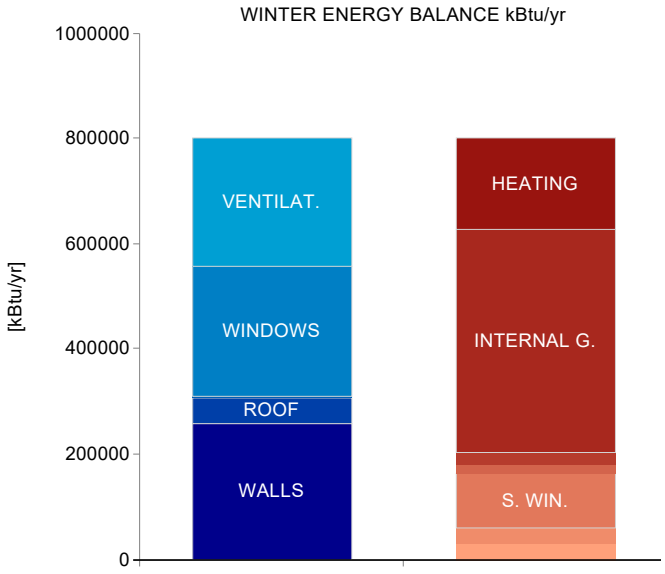
Relevant boundary conditions for heating load calculation: Heating load 1

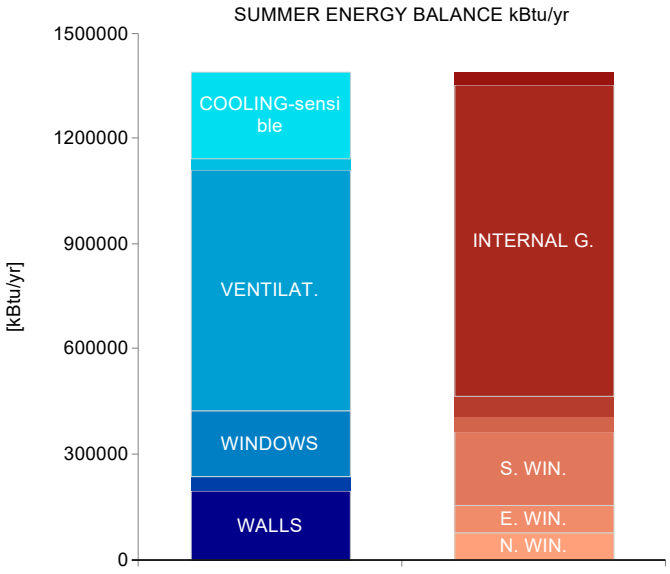
ANNUAL HEAT DEMAND

Transmission losses :	**555,464**	kBtu/yr
Ventilation losses:	**246,076**	kBtu/yr
Total heat losses:	**801,540**	kBtu/yr
Solar heat gains:	**228,953**	kBtu/yr
Internal heat gains:	**477,077**	kBtu/yr
Total heat gains:	**706,031**	kBtu/yr
Utilization factor:	**88.8**	%
Useful heat gains:	**627,264**	kBtu/yr
Annual heat demand:	**174,277**	kBtu/yr
Specific annual heat demand:	**1,986.2**	Btu/ft²yr

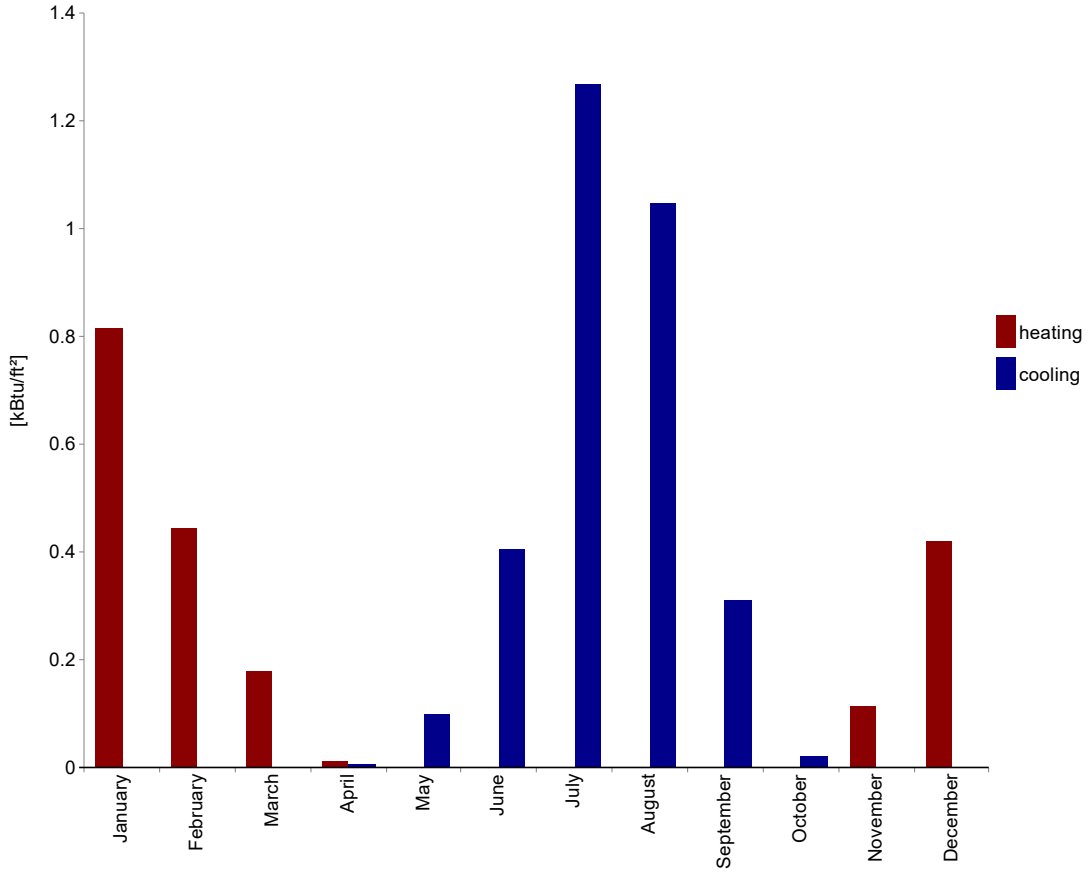
ANNUAL COOLING DEMAND

Solar heat gains:	**463,717**	kBtu/yr
Internal heat gains:	**889,768**	kBtu/yr
Total heat gains:	**1,353,485**	kBtu/yr
Transmission losses :	**890,618**	kBtu/yr
Ventilation losses:	**1,438,780**	kBtu/yr
Total heat losses:	**2,329,398**	kBtu/yr
Utilization factor:	**47.6**	%
Useful heat losses:	**1,109,103**	kBtu/yr
Cooling demand - sensible:	**244,383**	kBtu/yr
Cooling demand - latent:	**33,410**	kBtu/yr
Annual cooling demand:	**277,792**	kBtu/yr
Specific annual cooling demand:	**3.2**	kBtu/ft²yr





SPECIFIC HEAT/COOLING DEMAND MONTHLY



Month	Heating [kBtu/ft²]	Cooling [kBtu/ft²]
January	0.8	0
February	0.4	0
March	0.2	0
April	0	0
May	0	0.1
June	0	0.4
July	0	1.3
August	0	1
September	0	0.3
October	0	0
November	0.1	0
December	0.4	0

HEATING LOAD

	First climate	Second climate
Transmission heat losses:	**189,504.8** Btu/hr	**135,028.9** Btu/hr
Ventilation heat losses:	**109,591.4** Btu/hr	**77,912.7** Btu/hr
Total heat loss:	**299,096.2** Btu/hr	**212,941.6** Btu/hr
Solar heat gain:	**39,048.6** Btu/hr	**21,863.7** Btu/hr
Internal heat gain:	**44,508.6** Btu/hr	**44,508.6** Btu/hr
Total heat gains heating:	**83,557.2** Btu/hr	**66,372.3** Btu/hr
Heating load:	**215,539** Btu/hr	**146,569.3** Btu/hr

Relevant heating load: **215,539** Btu/hr

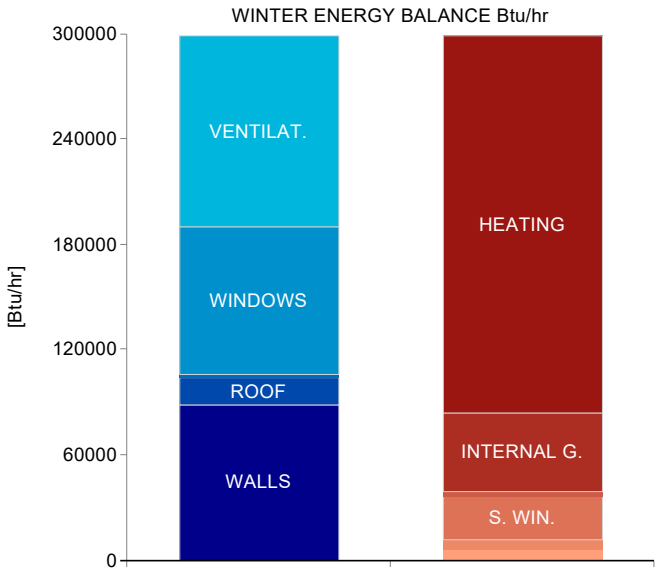
Specific heating load: **2.5** Btu/hr ft²

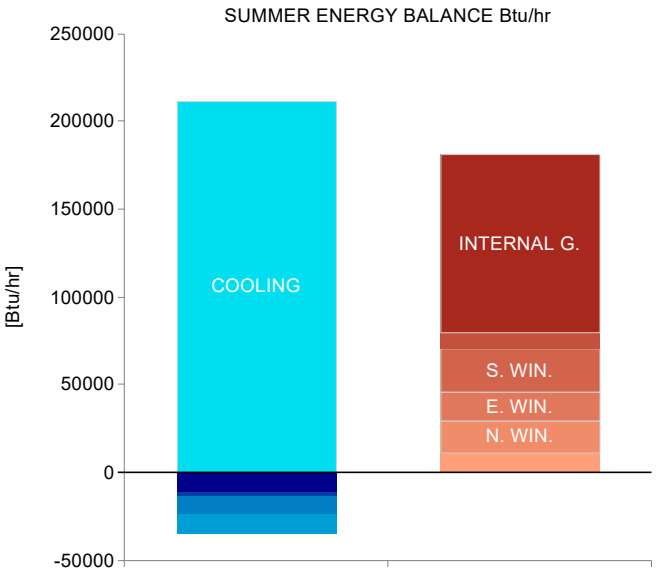
COOLING LOAD

Solar heat gain:	**79,344.4** Btu/hr
Internal heat gain:	**101,581.7** Btu/hr
Total heat gains cooling:	**180,926** Btu/hr
Transmission heat losses:	**-19,402.1** Btu/hr
Ventilation heat losses:	**-10,758.2** Btu/hr
Total heat loss:	**-30,160.3** Btu/hr
Cooling load - sensible:	**211,086.3** Btu/hr
Cooling load - latent:	**0** Btu/hr

Relevant cooling load: **211,086.3** Btu/hr

Specific maximum cooling load: **2.4** Btu/hr ft²





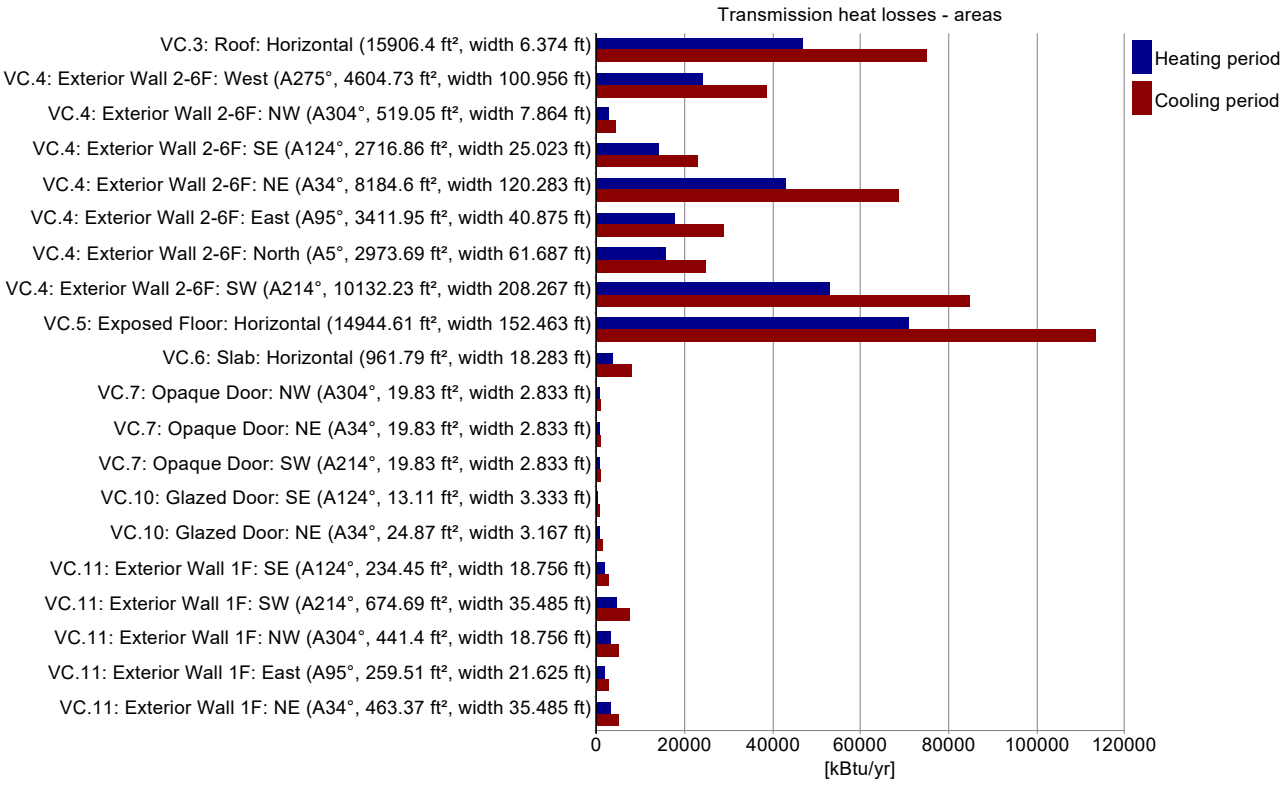
AREAS

Transmission heat losses - areas

Name	Area [ft²]	Average U-value [Btu/hr ft² °F]	Absorption coefficient	Emission coefficient	Reduction factor shading [%]	Transmission losses heating [kBtu/yr]	Transmission losses cooling [kBtu/yr]
VC.3: Roof: Horizontal (15906.4 ft², width 6.374 ft)	15906.4	0.02	0.4	0.9	100	46824.1	74881
VC.4: Exterior Wall 2-6F: West (A275°, 4604.73 ft², width 100.956 ft)	4604.7	0.035	0.4	0.9	100	24114	38563
VC.4: Exterior Wall 2-6F: NW (A304°, 519.05 ft², width 7.864 ft)	519.1	0.035	0.4	0.9	100	2718.2	4346.9
VC.4: Exterior Wall 2-6F: SE (A124°, 2716.86 ft², width 25.023 ft)	2716.9	0.035	0.4	0.9	100	14227.6	22752.8
VC.4: Exterior Wall 2-6F: NE (A34°, 8184.6 ft², width 120.283 ft)	8184.6	0.035	0.4	0.9	100	42861	68543.2
VC.4: Exterior Wall 2-6F: East (A95°, 3411.95 ft², width 40.875 ft)	3411.9	0.035	0.4	0.9	100	17867.6	28573.9
VC.4: Exterior Wall 2-6F: North (A5°, 2973.69 ft², width 61.687 ft)	2973.7	0.035	0.4	0.9	100	15572.6	24903.6
VC.4: Exterior Wall 2-6F: SW (A214°, 10132.23 ft², width 208.267 ft)	10132.2	0.035	0.4	0.9	100	53060.3	84853.9
VC.5: Exposed Floor: Horizontal (14944.61 ft², width 152.463 ft)	14944.6	0.032	0.4	0.9	100	70823.3	113260.3
VC.6: Slab: Horizontal (961.79 ft², width 18.283 ft)	961.8	0.063	0	0	0	3504.7	7926.9
VC.7: Opaque Door: NW (A304°, 19.83 ft², width 2.833 ft)	19.8	0.201	0.4	0.9	100	597.4	955.3
VC.7: Opaque Door: NE (A34°, 19.83 ft², width 2.833 ft)	19.8	0.201	0.4	0.9	100	597.4	955.3
VC.7: Opaque Door: SW (A214°, 19.83 ft², width 2.833 ft)	19.8	0.201	0.4	0.9	100	597.4	955.3
VC.10: Glazed Door: SE (A124°, 13.11 ft², width 3.333 ft)	13.1	0.201	0.4	0.9	100	394.9	631.5
VC.10: Glazed Door: NE (A34°, 24.87 ft², width 3.167 ft)	24.9	0.201	0.4	0.9	100	749.2	1198.1
VC.11: Exterior Wall 1F: SE (A124°, 234.45 ft², width 18.756 ft)	234.4	0.046	0.4	0.9	100	1627	2601.9
VC.11: Exterior Wall 1F: SW (A214°, 674.69 ft², width 35.485 ft)	674.7	0.046	0.4	0.9	100	4682.1	7487.6
VC.11: Exterior Wall 1F: NW (A304°, 441.4 ft², width 18.756 ft)	441.4	0.046	0.4	0.9	100	3063.2	4898.6
VC.11: Exterior Wall 1F: East (A95°, 259.51 ft², width 21.625 ft)	259.5	0.046	0.4	0.9	100	1800.9	2880
VC.11: Exterior Wall 1F: NE (A34°, 463.37 ft², width 35.485 ft)	463.4	0.046	0.4	0.9	100	3215.7	5142.5

Degree hours [kFh/a]

	Heating	Cooling
Ambient heating	83.1	132.9
Ground heating	32.3	73.1



THERMAL BRIDGES

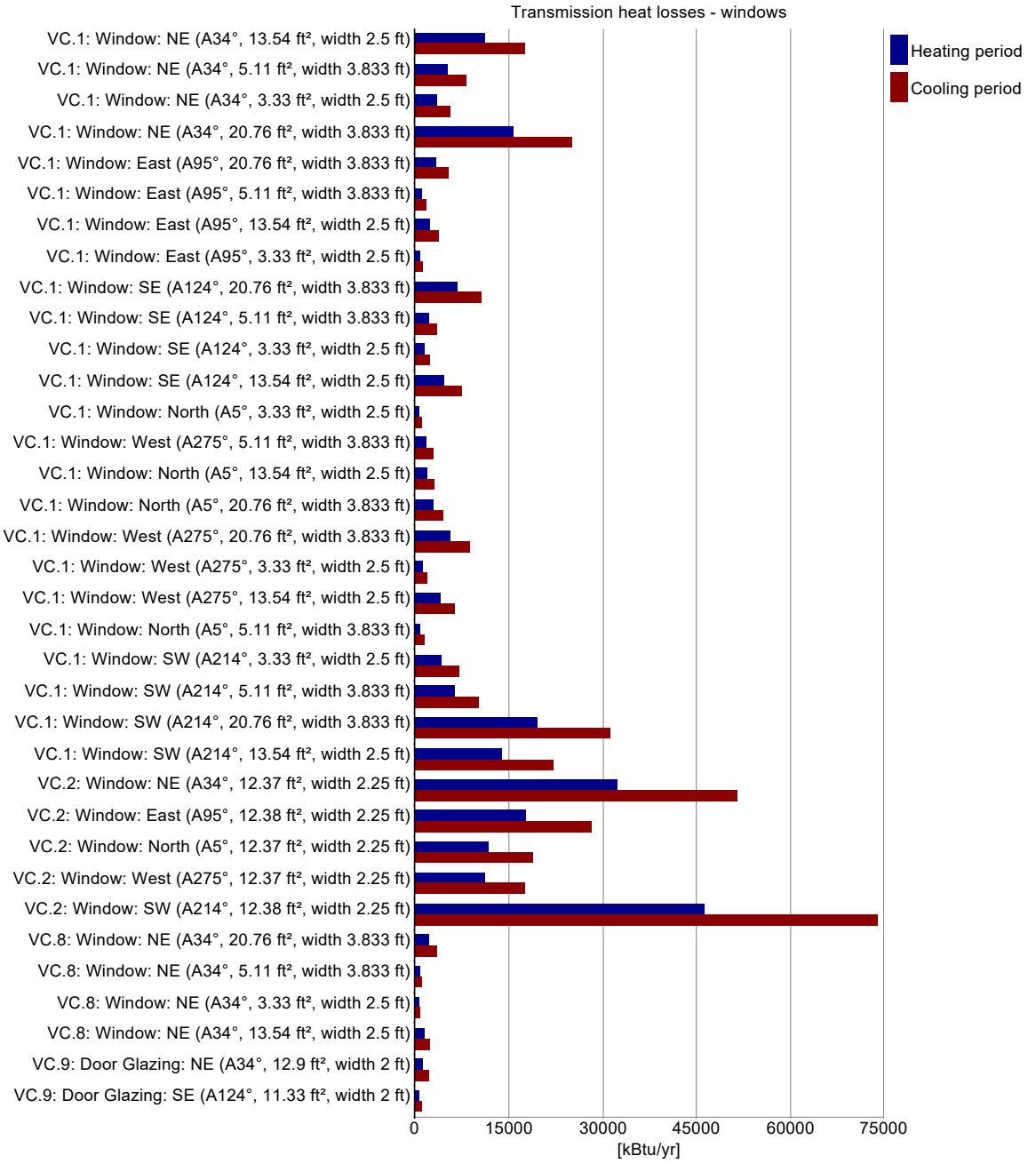
Transmission heat losses - thermal bridges

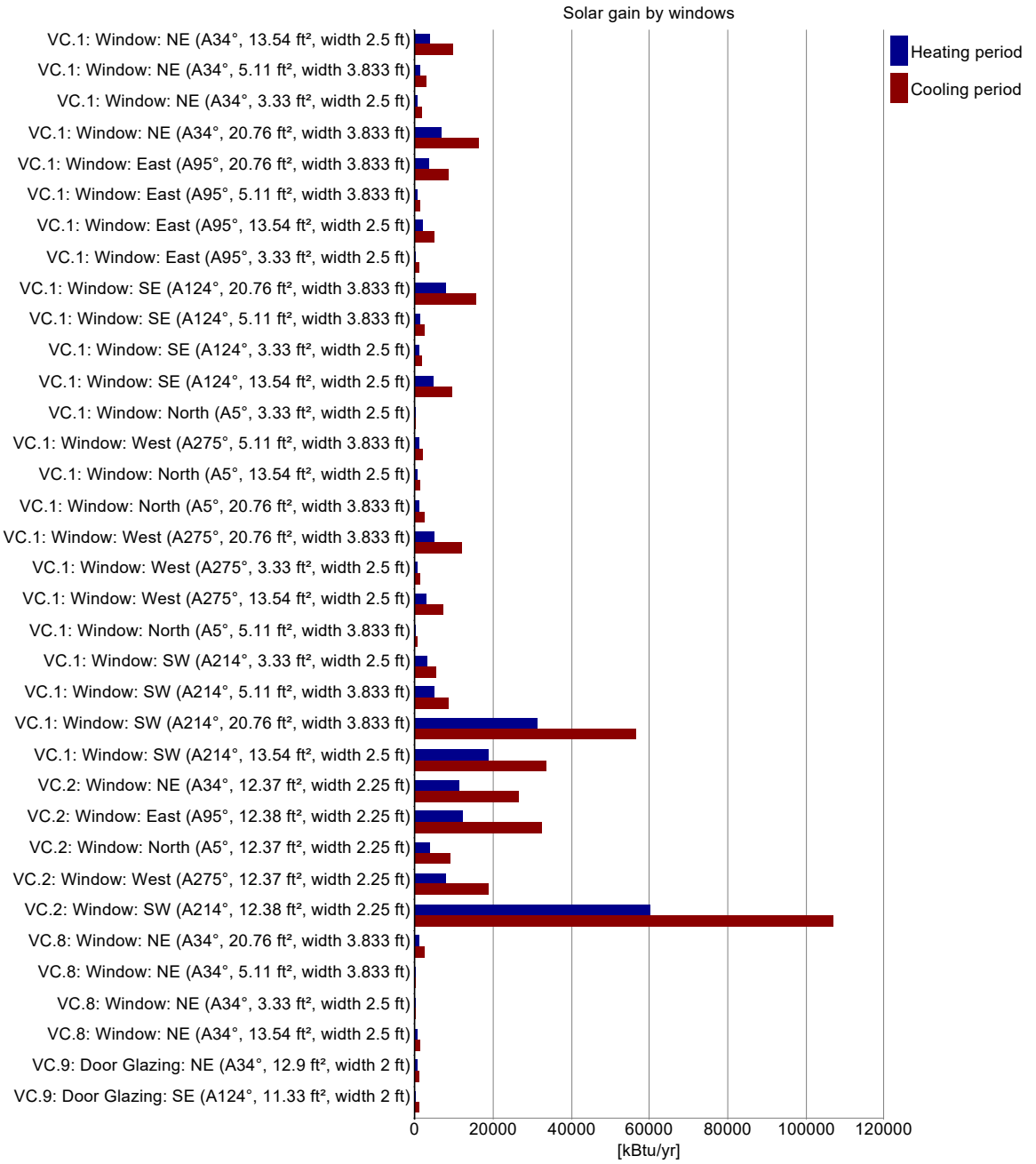
Name	Length [ft]	Psi-value [Btu/hr ft °F]	Transmission losses [kBtu/yr]	Transmission losses cooling [kBtu/yr]

WINDOWS

Transmission heat losses - windows

Name	Quan-tity	Incli-nation [°]	U-value total [Btu/hr ft² °F]	SHGC (perpen-dicular)	Reduction factor shading [%]	Reduction factor shading summer [%]	Solar gain heating [kBtu/yr]	Solar gain cooling [kBtu/yr]	Transmission losses heating [kBtu/yr]	Transmission losses cooling [kBtu/yr]
VC.1: Window: NE (A34°, 13.54 ft², width 2.5 ft)	28	90	0.194	0.4	65.3	67.4	3,916.5	9,555.1	11,007.7	17,603.4
VC.1: Window: NE (A34°, 5.11 ft², width 3.833 ft)	28	90	0.237	0.4	64	65.8	1,166.6	2,816.2	5,063.8	8,098
VC.1: Window: NE (A34°, 3.33 ft², width 2.5 ft)	28	90	0.248	0.4	63.4	64.7	711.8	1,701.2	3,458.6	5,531
VC.1: Window: NE (A34°, 20.76 ft², width 3.833 ft)	28	90	0.18	0.4	68.7	72	6,638.1	16,478.6	15,622.2	24,983
VC.1: Window: East (A95°, 20.76 ft², width 3.833 ft)	6	90	0.18	0.4	88.3	89.9	3,607.9	8,670	3,347.6	5,353.5
VC.1: Window: East (A95°, 5.11 ft², width 3.833 ft)	6	90	0.237	0.4	76.8	77	586.5	1,385.1	1,085.1	1,735.3
VC.1: Window: East (A95°, 13.54 ft², width 2.5 ft)	6	90	0.194	0.4	85.6	88.3	2,102.8	5,121.1	2,358.8	3,772.2
VC.1: Window: East (A95°, 3.33 ft², width 2.5 ft)	6	90	0.248	0.4	76.4	77.2	352.8	839.6	741.1	1,185.2
VC.1: Window: SE (A124°, 20.76 ft², width 3.833 ft)	12	90	0.18	0.4	78.2	84	8,084.5	15,521.3	6,695.2	10,707
VC.1: Window: SE (A124°, 5.11 ft², width 3.833 ft)	12	90	0.237	0.4	69.4	70.8	1,384.5	2,508.8	2,170.2	3,470.6
VC.1: Window: SE (A124°, 3.33 ft², width 2.5 ft)	12	90	0.248	0.4	69.2	70.7	841.2	1,526.1	1,482.3	2,370.4
VC.1: Window: SE (A124°, 13.54 ft², width 2.5 ft)	12	90	0.194	0.4	76	81.8	4,788.1	9,199.3	4,717.6	7,544.3
VC.1: Window: North (A5°, 3.33 ft², width 2.5 ft)	5	90	0.248	0.4	57.3	55.5	110.3	275	617.6	987.7
VC.1: Window: West (A275°, 5.11 ft², width 3.833 ft)	10	90	0.237	0.4	73	73.9	806.1	1,905.6	1,808.5	2,892.2
VC.1: Window: North (A5°, 13.54 ft², width 2.5 ft)	5	90	0.194	0.4	56.1	53.4	604.2	1,468	1,965.7	3,143.5
VC.1: Window: North (A5°, 20.76 ft², width 3.833 ft)	5	90	0.18	0.4	58	55.9	1,006	2,489.8	2,789.7	4,461.2
VC.1: Window: West (A275°, 20.76 ft², width 3.833 ft)	10	90	0.18	0.4	84.8	87.2	4,986.7	12,066.6	5,579.4	8,922.5
VC.1: Window: West (A275°, 3.33 ft², width 2.5 ft)	10	90	0.248	0.4	72.7	74.3	482.8	1,156.9	1,235.2	1,975.4
VC.1: Window: West (A275°, 13.54 ft², width 2.5 ft)	10	90	0.194	0.4	82.2	85.7	2,898.5	7,133.7	3,931.3	6,286.9
VC.1: Window: North (A5°, 5.11 ft², width 3.833 ft)	5	90	0.237	0.4	57	55.5	178.8	448.5	904.3	1,446.1
VC.1: Window: SW (A214°, 3.33 ft², width 2.5 ft)	35	90	0.248	0.4	70	64.3	3,087.6	5,281.7	4,323.3	6,913.8
VC.1: Window: SW (A214°, 5.11 ft², width 3.833 ft)	35	90	0.237	0.4	70.2	64.4	5,084	8,687.4	6,329.8	10,122.5
VC.1: Window: SW (A214°, 20.76 ft², width 3.833 ft)	35	90	0.18	0.4	83.8	82.6	31,404.7	56,526.2	19,527.8	31,228.7
VC.1: Window: SW (A214°, 13.54 ft², width 2.5 ft)	35	90	0.194	0.4	81.3	79.5	18,703	33,448.9	13,759.6	22,004.3
VC.2: Window: NE (A34°, 12.37 ft², width 2.25 ft)	88	90	0.198	0.4	64.5	65.4	11,186.2	26,554.4	32,324.3	51,692.9
VC.2: Window: East (A95°, 12.38 ft², width 2.25 ft)	48	90	0.198	0.4	75.8	82.5	12,445.5	32,252.8	17,631.4	28,196.1
VC.2: Window: North (A5°, 12.37 ft², width 2.25 ft)	32	90	0.198	0.4	59.2	55.6	3,720.7	8,876.2	11,754.3	18,797.4
VC.2: Window: West (A275°, 12.37 ft², width 2.25 ft)	30	90	0.198	0.4	81.6	84.8	7,757.1	19,011.8	11,019.6	17,622.6
VC.2: Window: SW (A214°, 12.38 ft², width 2.25 ft)	126	90	0.198	0.4	80.8	78.8	60,107	107,155.4	46,282.5	74,014.8
VC.8: Window: NE (A34°, 20.76 ft², width 3.833 ft)	4	90	0.18	0.4	68.3	72	933.2	2,338.7	2,231.7	3,569
VC.8: Window: NE (A34°, 5.11 ft², width 3.833 ft)	4	90	0.237	0.4	63.4	65.5	164.1	398.5	723.4	1,156.9
VC.8: Window: NE (A34°, 3.33 ft², width 2.5 ft)	4	90	0.248	0.4	63	64.8	100	241.4	494.1	790.1
VC.8: Window: NE (A34°, 13.54 ft², width 2.5 ft)	4	90	0.194	0.4	65	68	546	1,356.8	1,572.5	2,514.8
VC.9: Door Glazing: NE (A34°, 12.9 ft², width 2 ft)	2	90	0.361	0.6	70.4	74.6	425.5	1,074	1,392.8	2,227.4
VC.9: Door Glazing: SE (A124°, 11.33 ft², width 2 ft)	1	90	0.364	0.6	65.5	80.2	376.6	854.4	616.3	985.6


Transmission heat losses - windows
VC.1: Window: NE (A34°, 13.54 ft², width 2.5 ft)
VC.1: Window: NE (A34°, 5.11 ft², width 3.833 ft)
VC.1: Window: NE (A34°, 3.33 ft², width 2.5 ft)
VC.1: Window: NE (A34°, 20.76 ft², width 3.833 ft)
VC.1: Window: East (A95°, 20.76 ft², width 3.833 ft)
VC.1: Window: East (A95°, 5.11 ft², width 3.833 ft)
VC.1: Window: East (A95°, 13.54 ft², width 2.5 ft)
VC.1: Window: East (A95°, 3.33 ft², width 2.5 ft)
VC.1: Window: SE (A124°, 20.76 ft², width 3.833 ft)
VC.1: Window: SE (A124°, 5.11 ft², width 3.833 ft)
VC.1: Window: SE (A124°, 3.33 ft², width 2.5 ft)
VC.1: Window: SE (A124°, 13.54 ft², width 2.5 ft)
VC.1: Window: North (A5°, 3.33 ft², width 2.5 ft)
VC.1: Window: West (A275°, 5.11 ft², width 3.833 ft)
VC.1: Window: North (A5°, 13.54 ft², width 2.5 ft)
VC.1: Window: North (A5°, 20.76 ft², width 3.833 ft)
VC.1: Window: West (A275°, 20.76 ft², width 3.833 ft)
VC.1: Window: West (A275°, 3.33 ft², width 2.5 ft)
VC.1: Window: West (A275°, 13.54 ft², width 2.5 ft)
VC.1: Window: North (A5°, 5.11 ft², width 3.833 ft)
VC.1: Window: SW (A214°, 3.33 ft², width 2.5 ft)
VC.1: Window: SW (A214°, 5.11 ft², width 3.833 ft)
VC.1: Window: SW (A214°, 20.76 ft², width 3.833 ft)
VC.1: Window: SW (A214°, 13.54 ft², width 2.5 ft)
VC.2: Window: NE (A34°, 12.37 ft², width 2.25 ft)
VC.2: Window: East (A95°, 12.38 ft², width 2.25 ft)
VC.2: Window: North (A5°, 12.37 ft², width 2.25 ft)
VC.2: Window: West (A275°, 12.37 ft², width 2.25 ft)
VC.2: Window: SW (A214°, 12.38 ft², width 2.25 ft)
VC.8: Window: NE (A34°, 20.76 ft², width 3.833 ft)
VC.8: Window: NE (A34°, 5.11 ft², width 3.833 ft)
VC.8: Window: NE (A34°, 3.33 ft², width 2.5 ft)
VC.8: Window: NE (A34°, 13.54 ft², width 2.5 ft)
VC.9: Door Glazing: NE (A34°, 12.9 ft², width 2 ft)
VC.9: Door Glazing: SE (A124°, 11.33 ft², width 2 ft)
Heating period
Cooling period
0
15000
30000
45000
60000
75000
[kBtu/yr]


Solar gain by windows
VC.1: Window: NE (A34°, 13.54 ft², width 2.5 ft)
VC.1: Window: NE (A34°, 5.11 ft², width 3.833 ft)
VC.1: Window: NE (A34°, 3.33 ft², width 2.5 ft)
VC.1: Window: NE (A34°, 20.76 ft², width 3.833 ft)
VC.1: Window: East (A95°, 20.76 ft², width 3.833 ft)
VC.1: Window: East (A95°, 5.11 ft², width 3.833 ft)
VC.1: Window: East (A95°, 13.54 ft², width 2.5 ft)
VC.1: Window: East (A95°, 3.33 ft², width 2.5 ft)
VC.1: Window: SE (A124°, 20.76 ft², width 3.833 ft)
VC.1: Window: SE (A124°, 5.11 ft², width 3.833 ft)
VC.1: Window: SE (A124°, 3.33 ft², width 2.5 ft)
VC.1: Window: SE (A124°, 13.54 ft², width 2.5 ft)
VC.1: Window: North (A5°, 3.33 ft², width 2.5 ft)
VC.1: Window: West (A275°, 5.11 ft², width 3.833 ft)
VC.1: Window: North (A5°, 13.54 ft², width 2.5 ft)
VC.1: Window: North (A5°, 20.76 ft², width 3.833 ft)
VC.1: Window: West (A275°, 20.76 ft², width 3.833 ft)
VC.1: Window: West (A275°, 3.33 ft², width 2.5 ft)
VC.1: Window: West (A275°, 13.54 ft², width 2.5 ft)
VC.1: Window: North (A5°, 5.11 ft², width 3.833 ft)
VC.1: Window: SW (A214°, 3.33 ft², width 2.5 ft)
VC.1: Window: SW (A214°, 5.11 ft², width 3.833 ft)
VC.1: Window: SW (A214°, 20.76 ft², width 3.833 ft)
VC.1: Window: SW (A214°, 13.54 ft², width 2.5 ft)
VC.2: Window: NE (A34°, 12.37 ft², width 2.25 ft)
VC.2: Window: East (A95°, 12.38 ft², width 2.25 ft)
VC.2: Window: North (A5°, 12.37 ft², width 2.25 ft)
VC.2: Window: West (A275°, 12.37 ft², width 2.25 ft)
VC.2: Window: SW (A214°, 12.38 ft², width 2.25 ft)
VC.8: Window: NE (A34°, 20.76 ft², width 3.833 ft)
VC.8: Window: NE (A34°, 5.11 ft², width 3.833 ft)
VC.8: Window: NE (A34°, 3.33 ft², width 2.5 ft)
VC.8: Window: NE (A34°, 13.54 ft², width 2.5 ft)
VC.9: Door Glazing: NE (A34°, 12.9 ft², width 2 ft)
VC.9: Door Glazing: SE (A124°, 11.33 ft², width 2 ft)
Heating period
Cooling period
0
20000
40000
60000
80000
100000
120000
[kBtu/yr]

Summary building envelope

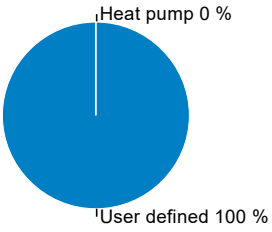
	Total area / length	Average U-value / Psi value	Transmission losses
Exterior wall ambient:	**49,561.1** ft²	**0.034** Btu/hr ft² °F	**255,633.5** kBtu/yr
Exterior wall ground:	**0** ft²	**0** Btu/hr ft² °F	**0** kBtu/yr
Basement:	**961.8** ft²	**0.063** Btu/hr ft² °F	**3,504.7** kBtu/yr
Roof:	**15,906.4** ft²	**0.02** Btu/hr ft² °F	**46,824.1** kBtu/yr
Windows:	**8,321.6** ft²	**0.198** Btu/hr ft² °F	**246,565.2** kBtu/yr
Doors:	**97.5** ft²	**0.201** Btu/hr ft² °F	**2,936.2** kBtu/yr
Thermal bridge ambient:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr
Thermal bridge perimeter:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr
Thermal bridge floor slab:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr

Shading

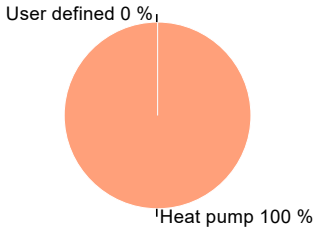
	Heating	Cooling
Reduction factor North:	**64.6** %	**65.7** %
Reduction factor East:	**77.5** %	**82.9** %
Reduction factor South:	**80.9** %	**78.8** %
Reduction factor West:	**81.9** %	**84.8** %
Reduction factor Horizontal:	**100** %	**100** %

System	DHW			Heating			Total		
	Covered DHW demand [%]	Estimated solar fraction [%]	Final energy demand [kBtu/yr]	Covered heating demand [%]	Estimated solar fraction [%]	Final energy demand [kBtu/yr]	Performance ratio	CO2 equivalent emissions [lb/yr]	Source energy demand [kBtu/yr]
Heat pump, Mitsubishi VRF (PURY)	0	0	0	100	0	48,954.3	0	21,510.5	137,072
User defined, Lochinvar Armor AWN601PM (96% Thermal Eff. Derated by .02 per PHIUS	100	0	520,033.7	0	0	0	1.1	119,543.6	572,037.1
Σ	100	0	520,033.7	100	0	48,954.3		141,054.1	709,109.1

DHW - final energy



Heating - final energy



COOLING UNITS

	sensible	latent
Air cooling:	**0** kBtu/ft²yr	**0** kBtu/ft²yr
Recirculation cooling:	**2.8** kBtu/ft²yr	**2.1** kBtu/ft²yr
Additional dehumidification:		**0** kBtu/ft²yr
Panel cooling:	**0** kBtu/ft²yr	
Sum:	**2.8** kBtu/ft²yr	**2.1** kBtu/ft²yr

VENTILATION

Energy transportable by supply air

Heating energy

transportable: **1.38** W/ft²
load: **0.72** W/ft²

Cooling energy

transportable: **0.82** W/ft²
load: **0.7** W/ft²

Infiltration pressure test ACH50: **0.34** 1/hr
Total extract air demand: **5,534** cfm
Supply air per person: **18** cfm
Occupancy: **237**

Average air flow rate: **5,661.23** cfm
Average air change rate: **0.42** 1/hr
Effective ACH ambient: **0.12** 1/hr
Effective ACH ground: **0** 1/hr
Energetically effective air exchange: **0.12** 1/hr
Infiltration air change rate: **0.02** 1/hr
Infiltration air change rate (heating load): **0.06** 1/hr

Type of ventilation system: **Balanced PH ventilation**
Wind screening coefficient (e): **0.07**
Wind exposure factor: **15**
Wind shield factor: **0.05**

Ventilation heat losses: **231,620.5** kBtu/yr

Devices

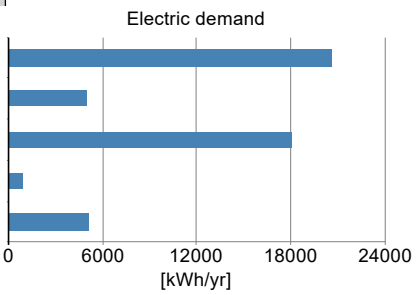
Name	Sensible recovery efficiency [-]	Electric efficiency [W/cfm]	Heat recovery efficiency SHX [-]	Effective recovery efficiency [-]
Pending MECH drawings	0.8	0.05	0	0.8
Altogether	0.8	0.04	0	0.8

SUMMER VENTILATION

ACH night ventilation: **0** 1/hr
ACH natural summer: **0** 1/hr
Mechanical ventilation summer: **0.4** 1/hr
Mechanical ventilation summer with HR: **no**
Preferred minimum indoor temperature for night ventilation: **68** °F
Overheating temperature: **77** °F

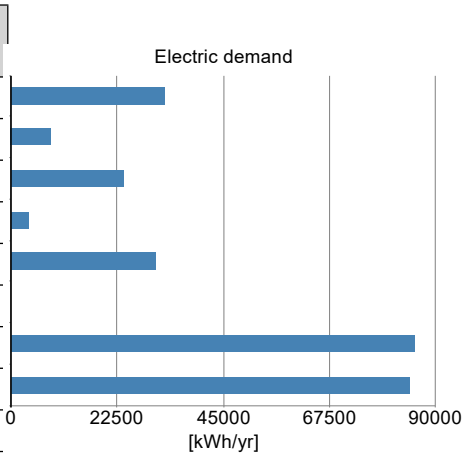
ELECTRICITY DEMAND - AUXILIARY ELECTRICITY

Type	Quantity	Indoor	Norm demand	Electric demand [kWh/yr]	Source energy [kBtu/yr]
Ventilation winter	1	no	0.8 W/cfm	20703.6	197782.8
Ventilation Defrost	1	no	26,537 W	4950	47287.5
Ventilation summer	1	no	0.8 W/cfm	18078.7	172706.3
DHW circulating pump	1	yes	99.5 W	844.2	8064.6
DHW storage load pump	1	yes	578.8 W	5070	48433.8
Σ				49646.4	474275



ELECTRICITY DEMAND RESIDENTIAL BUILDING

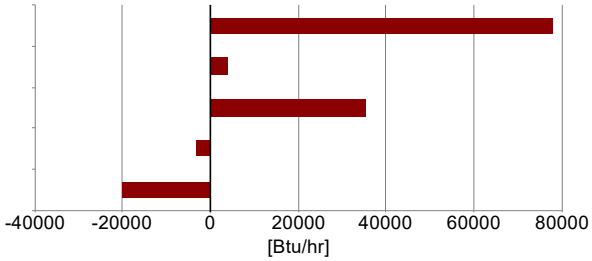
Type	Quantity	Indoor	Norm demand	Electric demand [kWh/yr]	Non-electric demand [kWh/yr]	Source energy [kBtu/yr]
Kitchen refrigerator	1	yes	1.2	32571	0	311152.5
Kitchen dishwasher	1	yes	1.2	8300.1	0	79291.4
Kitchen cooking	1	yes	0.2	23700	0	226407.4
Laundry - washer	1	yes	0.3	3795.2	0	36256.1
Laundry - dryer	1	yes	3.4	30369.9	0	290125.7
Energy consumed by evaporation	1	yes	3.1	0	1447.2	6153.7
User defined lighting	1	yes	85,426	85426	0	816079.2
User defined MELs	1	yes	84,695	84695	0	809095.9
Σ	8			268857.3	1447.2	2574561.8



INTERNAL HEAT GAINS

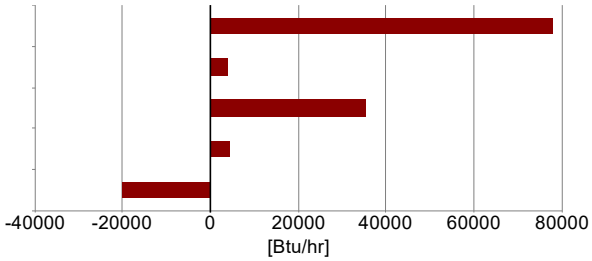
Heating season

Electricity total:	**77,842.8**	Btu/hr
Auxiliary electricity:	**3,874.8**	Btu/hr
People:	**35,581.8**	Btu/hr
Cold water:	**-3,290.1**	Btu/hr
Evaporation:	**-20,216.9**	Btu/hr
Σ:	**93,774.4**	Btu/hr
Specific internal heat gains:	**1.1**	Btu/hr ft²



Cooling season

Electricity total:	**77,842.8**	Btu/hr
Auxiliary electricity:	**3,874.8**	Btu/hr
People:	**35,581.8**	Btu/hr
Cold and hot water:	**4,517.1**	Btu/hr
Evaporation:	**-20,216.9**	Btu/hr
Σ:	**93,774.4**	Btu/hr
Specific internal heat gains:	**1.1**	Btu/hr ft²



DHW AND DISTRIBUTION

DHW consumption per person per day:	**6.6**	gal/Person/day
Average cold water temperature supply:	**52.8**	°F
Useful heat DHW:	**414,135.9**	kBtu/yr
Specific useful heat DHW:	**4,719.7**	Btu/ft²yr
Total heat losses of the DHW system:	**46,070.9**	kBtu/yr
Specific losses of the DHW system:	**525.1**	Btu/ft²yr
Performance ratio DHW distribution system and storage:	**1.1**	
Utilization ratio DHW distribution system and storage:	**0.9**	
Total heat demand of DHW system:	**460,206.8**	kBtu/yr
Total specific heat demand of DHW system:	**5,244.8**	Btu/ft²yr
Total heat losses of the hydronic heating distribution:	**0**	kBtu/yr
Specific losses of the hydronic heating distribution:	**0**	Btu/ft²yr
Performance ratio of heat distribution:	**100**	%

Region	Length [ft]	Annual heat loss [kBtu/yr]
Hydronic heating distribution pipes		
Σ	0	0
DHW circulation pipes		
In conditioned space	350	12810.2
Σ	350	12810.2
Individual pipes		
In conditioned space	2675	31263.6
Σ	2675	31263.6
Water storage		
Device 4 (Water storage: DHW): Lochinvar RJA120 Lock-Temp Stainless Steel 119-gallon		1997.1
Σ		1997.1

Rindge Commons Building A (Residential)

Property/Site

Building name: Rindge Commons Building A Residential

Property information

Owner's name:	Just-A-Start Corporation
Property address:	402 Rindge Ave
City:	Cambridge
Zip:	02140

Site information

Climate Location **MA - BOSTON LOGAN INT ARPT (AMeDAS standard year)**

Building

Building Information

Area of Conditioned Space	**26,524** ft²
Volume of conditioned space	**236,651** ft³
Number of bedrooms	**38**
Foundation Type	**Slab on grade**
Winter setpoint temperature	**68** °F
Summer setpoint temperature	**77** °F

Slab floor

Name	Area [ft²]	Assembly
Slab	1,437.5	Concrete Slab 3.5" EPS (R-15)

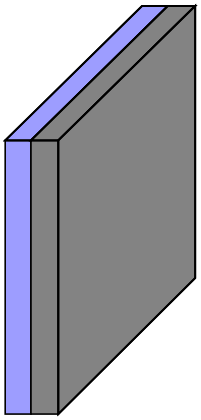
Assembly (Id.15): Concrete Slab 3.5" EPS (R-15)

Homogenous layers

Thermal resistance: 15.004 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.063 Btu/hr ft² °F

Thickness: 7.64 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Expanded Polystyrene Insulation	0.92	0.35	0.0208	3.64	
2	Concrete	131.35	0.19	0.7933	4	

Slab on grade

Floor slab area	**1,437.5** ft²
U-Value of basement slab	**0.1** Btu/hr ft² °F
Floor slab perimeter (P)	**220** ft
Total R-value of perimeter insulation	**14** hr ft² °F/Btu

Above-grade walls & Rim/band joists

Name	Orientation	Area [ft²]	Short wave radiation absorption	Assembly
Exterior Wall 2-6F	S (20 %), E (34 %), W (32 %), N (14 %)	9,936.9	0.4	Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)
Roof	Horizontal (100 %)	10,520	0.4	Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Opaque Door	S (43 %), E (43 %), W (14 %)	172.4	0.4	Door (R-4)
Exterior Wall 1F	S (51 %), E (17 %), W (20 %), N (12 %)	1,720.1	0.4	Steel Frame, 5.5" Fiberglass (R-9.17), 2.5" Mineral Wool (R-10)
Total		**22,349.5**		

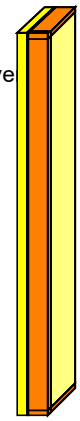
Assembly (Id.9): Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)

Inhomogenous layers

Thermal resistance: 27.581 / 29.559 hr ft² °F/Btu (EN ISO 6946 / homogenous laye

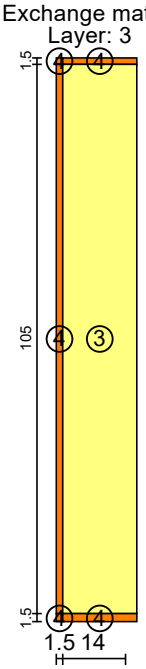
Heat transfer coefficient (U-value): 0.035 Btu/hr ft² °F

Thickness: 8.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	dena Mineral Wool (heat cond.: 0.035 W/mK)	3.75	0.2	0.0208	2.5	
2	Plywood (USA)	29.34	0.45	0.0485	0.5	
3	Fibre Glass	1.87	0.2	0.0245	5.5	
Exchange materials						
4	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.9): Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)



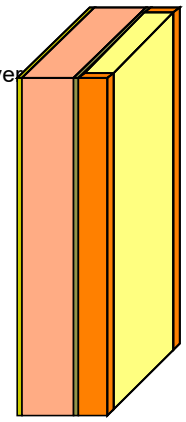
Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)

Inhomogenous layers

Thermal resistance: 50.006 / 52.321 hr ft² °F/Btu (EN ISO 6946 / homogenous layer

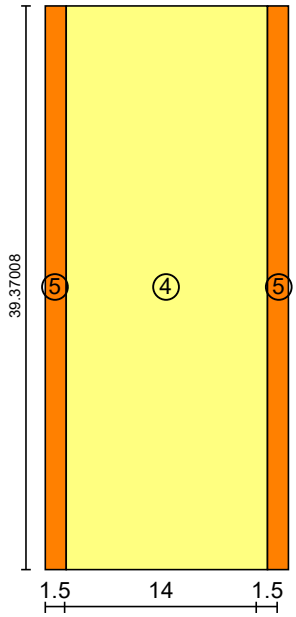
Heat transfer coefficient (U-value): 0.02 Btu/hr ft² °F

Thickness: 10.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Fiberboard	18.79	0.33	0.0285	0.5	
2	Polyisocyanurate Insulation	1.65	0.35	0.0139	6	
3	Plywood (USA)	29.34	0.45	0.0485	0.5	
4	Fibre Glass	1.87	0.2	0.0208	3.5	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Layer: 4



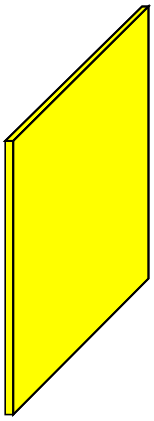
Assembly (Id.8): Door (R-4)

Homogenous layers

Thermal resistance: 4 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.201 Btu/hr ft² °F

Thickness: 1 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Cellulose Fiber (heat cond.: 0,04 W/mK)	4.37	0.33	0.0208	1	

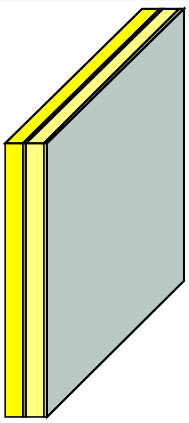
Assembly (Id.7): Steel Frame, 5.5" Fiberglass (R-9.17), 2.5" Mineral Wool (R-10)

Homogenous layers

Thermal resistance: 20.585 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.046 Btu/hr ft² °F

Thickness: 6.039 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	dena Mineral Wool (heat cond.: 0.035 W/mK)	3.75	0.2	0.0208	2.5	
2	Plywood (USA)	29.34	0.45	0.0485	0.5	
3	Fibre Glass (Steal Frame)	1.87	0.2	0.0219	2.414	
4	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	

Adiabatic walls

Name	Area [ft²]	Assembly
Interior Wall	4,407.7	Adiabatic Wall
Interior Floor	10,051.4	Adiabatic Floor (3.5" Sound Batt)
Interior Ceiling	968.9	Adiabatic Floor (3.5" Sound Batt)
Total	**15,428.1**	

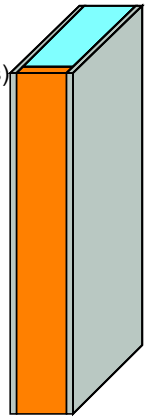
Assembly (Id.22): Adiabatic Wall

Inhomogenous layers

Thermal resistance: 2.137 / 2.012 hr ft² °F/Btu (EN ISO 6946 / homogenous layers)

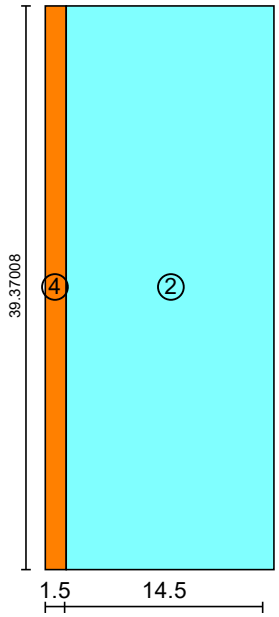
Heat transfer coefficient (U-value): 0.322 Btu/hr ft² °F

Thickness: 7.156 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
2	Air Layer 150 mm	0.08	0.24	0.5431	5.906	
3	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
Exchange materials						
4	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.22): Adiabatic Wall
Layer: 2



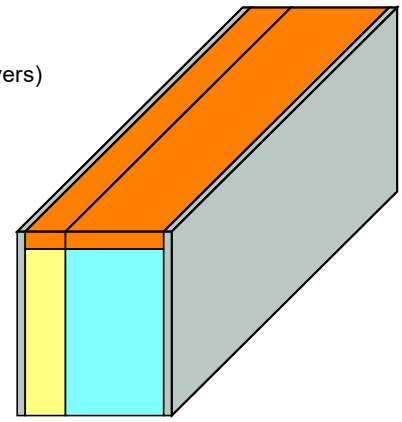
Assembly (Id.23): Adiabatic Floor (3.5" Sound Batt)

Inhomogenous layers

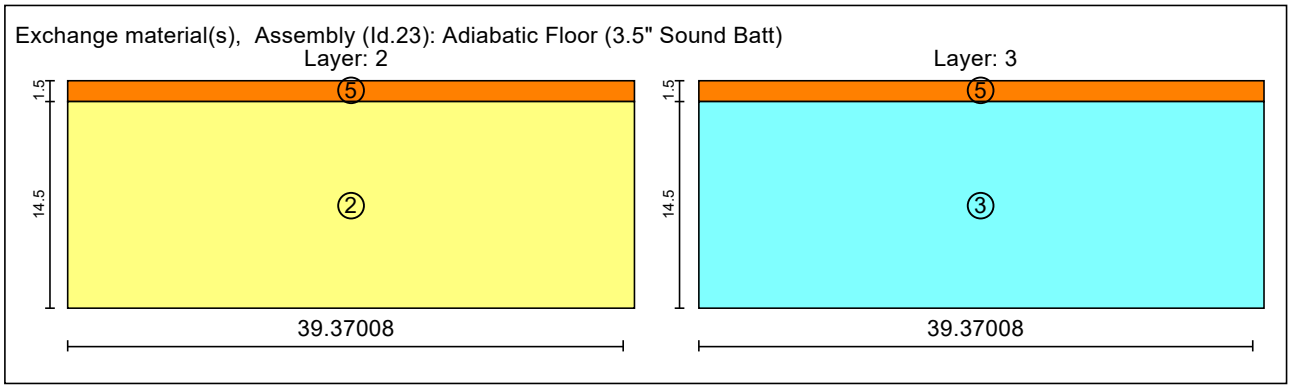
Thermal resistance: 19.442 / 19.817 hr ft² °F/Btu (EN ISO 6946 / homogenous layers)

Heat transfer coefficient (U-value): 0.048 Btu/hr ft² °F

Thickness: 13.25 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
2	Fibre Glass	1.87	0.2	0.0245	3.5	
3	Air Layer 30 mm	0.08	0.24	0.104	8.5	
4	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	



Windows and Glass Doors

Name	Orientation	Area [ft²]	Window type
Window	S (9 %), E (38 %), W (46 %), N (6 %)	2,097.9	U -.18 (Operable)
Glazed Door	N (100 %)	50.7	U - .33
Total		**2,148.6**	

Window type (Id 1): U -.18 (Operable)

Basic data

Uw -mounted [Btu/hr ft² °F]	0.1813
Frame factor	0.6884
Glass U-value [Btu/hr ft² °F]	0.132
SHGC/Solar energy transmittance (perpendicular)	0.46

Frame data

Setting	Left	Right	Top	Bottom
Frame width [in]	4.5	4.5	4.5	4.5
Frame U-value [Btu/hr ft² °F]	.15	.15	.15	.15
Glazing-to-frame psi-value [Btu/hr ft °F]	.023	.023	.023	.023
Frame-to-Wall psi-value [Btu/hr ft °F]	.029	.029	.029	.029

Solar radiation angle dependent data

Angle [°]	Total solar trans.
0	

Window type (Id 3): U - .33

Basic data

Uw -mounted [Btu/hr ft² °F]	0.3333
Frame factor	0.8198
Glass U-value [Btu/hr ft² °F]	0.27
SHGC/Solar energy transmittance (perpendicular)	0.59

Frame data

Setting	Left	Right	Top	Bottom
Frame width [in]	2.5	2.5	2.5	2.5
Frame U-value [Btu/hr ft² °F]	.37	.37	.37	.37
Glazing-to-frame psi-value [Btu/hr ft °F]	.023	.023	.023	.023
Frame-to-Wall psi-value [Btu/hr ft °F]	.029	.029	.029	.029

Solar radiation angle dependent data

Angle [°]	Total solar trans.
0	

Ceilings

Name	Area [ft²]	Short wave radiation absorption	Assembly
Roof	10,520	0.4	Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)

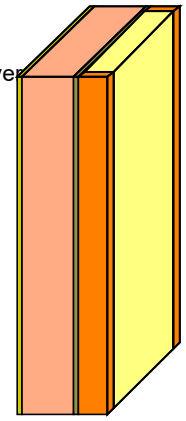
Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)

Inhomogenous layers

Thermal resistance: 50.006 / 52.321 hr ft² °F/Btu (EN ISO 6946 / homogenous layer)

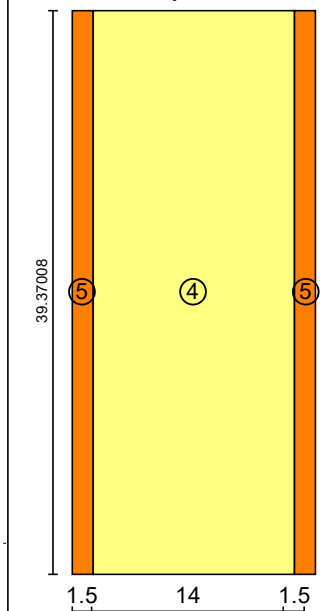
Heat transfer coefficient (U-value): 0.02 Btu/hr ft² °F

Thickness: 10.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Fiberboard	18.79	0.33	0.0285	0.5	
2	Polyisocyanurate Insulation	1.65	0.35	0.0139	6	
3	Plywood (USA)	29.34	0.45	0.0485	0.5	
4	Fibre Glass	1.87	0.2	0.0208	3.5	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Layer: 4



Space heating

Type	Performance ratio of heat generator [-]	Fuel type
Heat pump	0.28	Electricity

Space cooling

Type	Distribution	Capacity [kBtu/hr]	COP
Heat pump	| Recirculation air	288	5.57
Total		**288**	

Water heating

Type	Performance ratio of heat generator [-]	Fuel type
User defined	1.13	Natural Gas

Water storage

Nr	Capacity [gal]
4	119
Total	**119**

Infiltration/Ventilation

ACH @ 50 Pascal **0.6** 1/hr

CFM @ 50 Pascal **1,555** cfm

Nr	Sensible recovery efficiency [-]	Rate [cfm]	Electric efficiency [W/cfm]	Fan [W]	Defrost	Temperature below which defrost must be used [°F]	Subsoil heat exchanger efficiency [-]
1	0.47	959.38	0.03	767.51	yes	13.54	0
Total	**0.46**	**959.38**		**767.51**			

Lights and appliances

Type	Energy use [kWh/yr]	In conditioned space
Kitchen refrigerator	10,152	yes
Kitchen dishwasher	2,309.54	yes
Kitchen cooking	6,200	yes
Laundry - washer	1,078.54	yes
Laundry - dryer	8,630.65	yes
Energy consumed by evaporation	0 (360.5)	yes
User defined lighting	31,069	yes
User defined lighting	2,524	no
User defined MELs	26,668	yes
Ventilation winter	6,098.1	no
Ventilation Defrost	1,454.32	no
Ventilation summer	5,324.94	no
DHW circulating pump	373.9	yes
DHW storage load pump	485.9	yes
Total	**102,368.9**	

Rindge Commons Building A (Non-Residential)

Property/Site

Building name: Rindge Commons Building A Non-Residential

Property information

Owner's name:	Just-A-Start Corporation
Property address:	402 Rindge Ave
City:	Cambridge
Zip:	02140

Site information

Climate Location **MA - BOSTON LOGAN INT ARPT (AMeDAS standard year)**

Building

Building Information

Area of Conditioned Space	**37,656** ft²
Volume of conditioned space	**351,849** ft³
Number of bedrooms	**8**
Foundation Type	**Slab on grade**
Winter setpoint temperature	**68** °F
Summer setpoint temperature	**77** °F

Slab floor

Name	Area [ft²]	Assembly
Slab	2,637.1	Concrete Slab 3.5" EPS (R-15)
Slab	3,869.4	Concrete Slab 3.5" EPS (R-15)
Total	**6,506.5**	

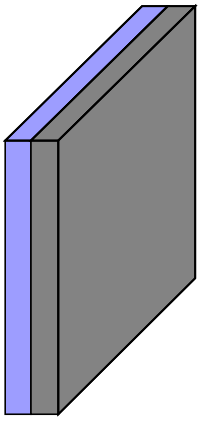
Assembly (Id.15): Concrete Slab 3.5" EPS (R-15)

Homogenous layers

Thermal resistance: 15.004 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.063 Btu/hr ft² °F

Thickness: 7.64 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Expanded Polystyrene Insulation	0.92	0.35	0.0208	3.64	
2	Concrete	131.35	0.19	0.7933	4	

Slab on grade

Floor slab area	**6,506.5** ft²
U-Value of basement slab	**0.1** Btu/hr ft² °F
Floor slab perimeter (P)	**363** ft
Total R-value of perimeter insulation	**14** hr ft² °F/Btu

Above-grade walls & Rim/band joists

Name	Orientation	Area [ft²]	Short wave radiation absorption	Assembly
Roof	Horizontal (100 %)	3,090.9	0.4	Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Exposed Floor	Horizontal (100 %)	5,666.9	0.4	Exposed Floor (R-30)
Exterior Wall 1F	S (3 %), W (73 %), N (24 %)	786	0.4	Steel Frame, 5.5" Fiberglass (R-9.17), 2.5" Mineral Wool (R-10)
Exterior Wall 3-4F	S (22 %), E (24 %), W (25 %), NE (3 %), N (26 %)	7,245.2	0.4	Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)
Exterior Wall 2F	S (24 %), E (25 %), W (28 %), NE (2 %), N (20 %)	4,853.2	0.4	Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)
Exterior Wall 1F	S (25 %), E (29 %), W (5 %), NE (6 %), N (34 %)	2,165.1	0.4	Steel Frame, 5.5" Fiberglass (R-9.17), 2.5" Mineral Wool (R-10)
Door	E (46 %), N (54 %)	139.1	0.4	Door (R-4)
Total		**23,946.4**		

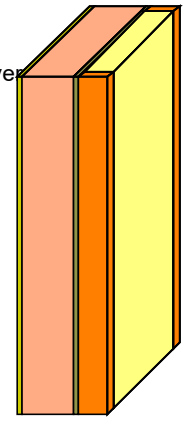
Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)

Inhomogenous layers

Thermal resistance: 50.006 / 52.321 hr ft² °F/Btu (EN ISO 6946 / homogenous layer)

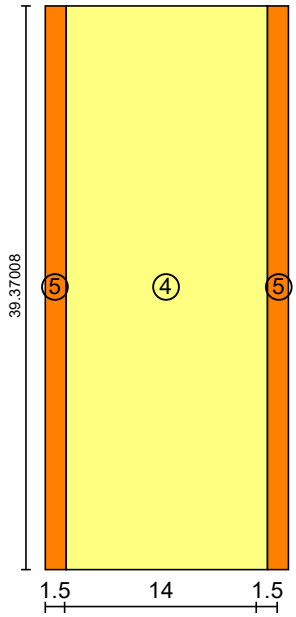
Heat transfer coefficient (U-value): 0.02 Btu/hr ft² °F

Thickness: 10.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Fiberboard	18.79	0.33	0.0285	0.5	
2	Polyisocyanurate Insulation	1.65	0.35	0.0139	6	
3	Plywood (USA)	29.34	0.45	0.0485	0.5	
4	Fibre Glass	1.87	0.2	0.0208	3.5	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Layer: 4



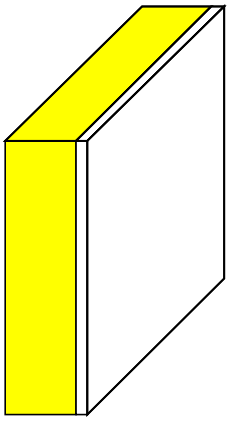
Assembly (Id.6): Exposed Floor (R-30)

Homogenous layers

Thermal resistance: 30.365 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.032 Btu/hr ft² °F

Thickness: 11.75 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Cellulose Fiber (heat cond.: 0,04 W/mK)	4.37	0.33	0.0278	10	
2	Gypcrete			0.4	1.75	

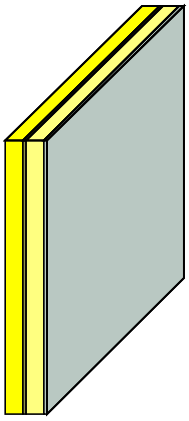
Assembly (Id.7): Steel Frame, 5.5" Fiberglass (R-9.17), 2.5" Mineral Wool (R-10)

Homogenous layers

Thermal resistance: 20.585 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.046 Btu/hr ft² °F

Thickness: 6.039 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	dena Mineral Wool (heat cond.: 0.035 W/mK)	3.75	0.2	0.0208	2.5	
2	Plywood (USA)	29.34	0.45	0.0485	0.5	
3	Fibre Glass (Steal Frame)	1.87	0.2	0.0219	2.414	
4	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	

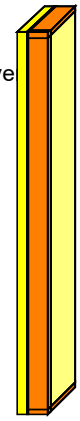
Assembly (Id.9): Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)

Inhomogenous layers

Thermal resistance: 27.581 / 29.559 hr ft² °F/Btu (EN ISO 6946 / homogenous laye

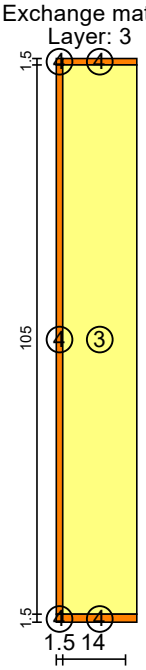
Heat transfer coefficient (U-value): 0.035 Btu/hr ft² °F

Thickness: 8.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	dena Mineral Wool (heat cond.: 0.035 W/mK)	3.75	0.2	0.0208	2.5	
2	Plywood (USA)	29.34	0.45	0.0485	0.5	
3	Fibre Glass	1.87	0.2	0.0245	5.5	
Exchange materials						
4	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.9): Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)



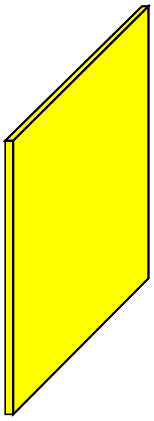
Assembly (Id.8): Door (R-4)

Homogenous layers

Thermal resistance: 4 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.201 Btu/hr ft² °F

Thickness: 1 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Cellulose Fiber (heat cond.: 0,04 W/mK)	4.37	0.33	0.0208	1	

Adiabatic walls

Name	Area [ft²]	Assembly
Interior Wall	2,932.1	Adiabatic Wall
Interior Ceiling	10,051.4	Adiabatic Floor (3.5" Sound Batt)
Interior Wall	1,475.5	Adiabatic Wall
Interior Floor	968.9	Adiabatic Floor (3.5" Sound Batt)
Total	**15,428.1**	

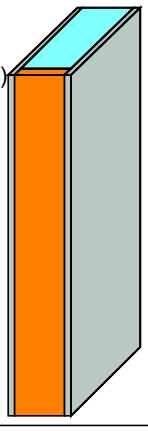
Assembly (Id.22): Adiabatic Wall

Inhomogenous layers

Thermal resistance: 2.137 / 2.012 hr ft² °F/Btu (EN ISO 6946 / homogenous layers)

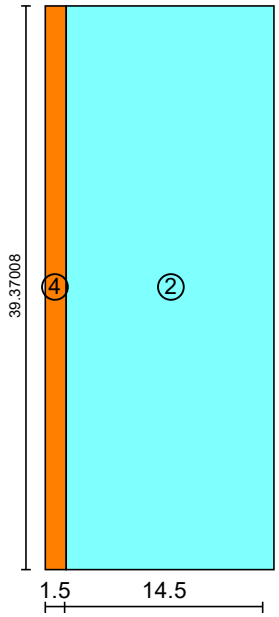
Heat transfer coefficient (U-value): 0.322 Btu/hr ft² °F

Thickness: 7.156 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
2	Air Layer 150 mm	0.08	0.24	0.5431	5.906	
3	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
Exchange materials						
4	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.22): Adiabatic Wall
Layer: 2



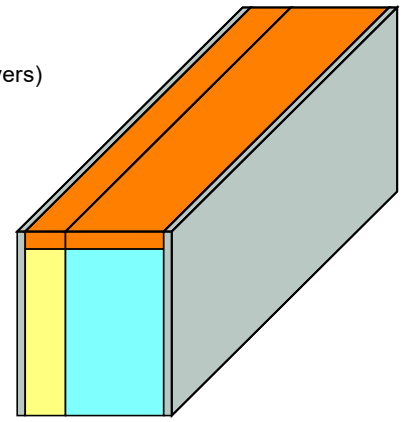
Assembly (Id.23): Adiabatic Floor (3.5" Sound Batt)

Inhomogenous layers

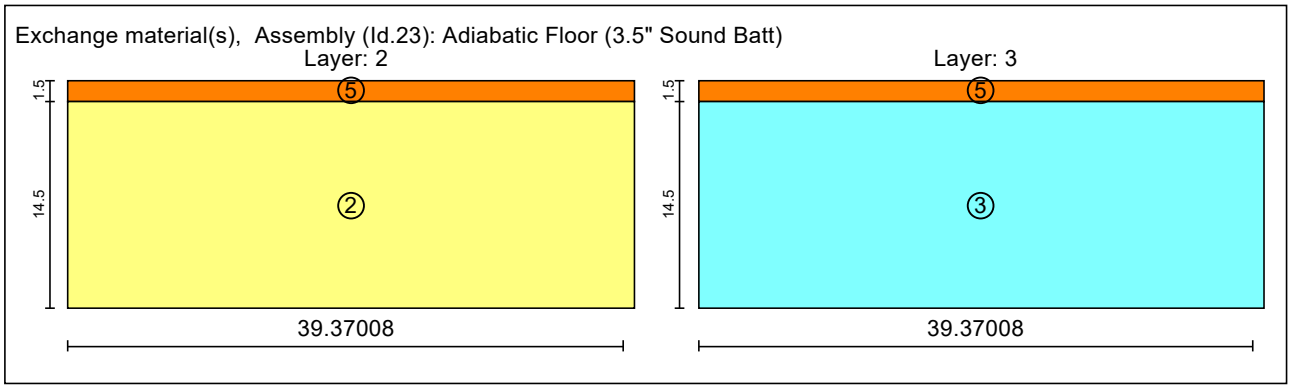
Thermal resistance: 19.442 / 19.817 hr ft² °F/Btu (EN ISO 6946 / homogenous layers)

Heat transfer coefficient (U-value): 0.048 Btu/hr ft² °F

Thickness: 13.25 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
2	Fibre Glass	1.87	0.2	0.0245	3.5	
3	Air Layer 30 mm	0.08	0.24	0.104	8.5	
4	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	



Windows and Glass Doors

Name	Orientation	Area [ft²]	Window type
Window	S (10 %), E (24 %), W (43 %), N (24 %)	1,315	U -.18 (Operable)
Window	S (6 %), E (31 %), W (31 %), N (31 %)	1,001.9	U -.18 (Operable)
Total		**2,316.9**	

Window type (Id 1): U -.18 (Operable)

Basic data

Uw -mounted [Btu/hr ft² °F]	0.1813
Frame factor	0.6884
Glass U-value [Btu/hr ft² °F]	0.132
SHGC/Solar energy transmittance (perpendicular)	0.46

Frame data

Setting	Left	Right	Top	Bottom
Frame width [in]	4.5	4.5	4.5	4.5
Frame U-value [Btu/hr ft² °F]	.15	.15	.15	.15
Glazing-to-frame psi-value [Btu/hr ft °F]	.023	.023	.023	.023
Frame-to-Wall psi-value [Btu/hr ft °F]	.029	.029	.029	.029

Solar radiation angle dependent data

Angle [°]	Total solar trans.
0	

Ceilings

Name	Area [ft²]	Short wave radiation absorption	Assembly
Roof	3,090.9	0.4	Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Exposed Floor	5,666.9	0.4	Exposed Floor (R-30)
Total	**8,757.8**		

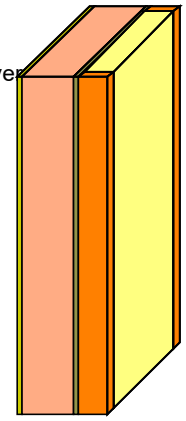
Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)

Inhomogenous layers

Thermal resistance: 50.006 / 52.321 hr ft² °F/Btu (EN ISO 6946 / homogenous layer

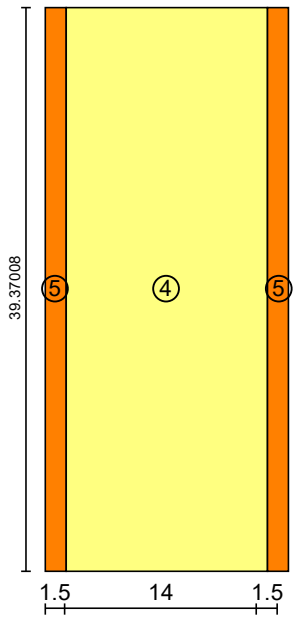
Heat transfer coefficient (U-value): 0.02 Btu/hr ft² °F

Thickness: 10.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Fiberboard	18.79	0.33	0.0285	0.5	
2	Polyisocyanurate Insulation	1.65	0.35	0.0139	6	
3	Plywood (USA)	29.34	0.45	0.0485	0.5	
4	Fibre Glass	1.87	0.2	0.0208	3.5	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Layer: 4



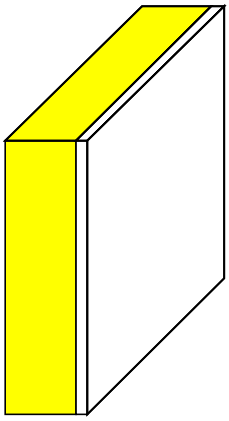
Assembly (Id.6): Exposed Floor (R-30)

Homogenous layers

Thermal resistance: 30.365 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.032 Btu/hr ft² °F

Thickness: 11.75 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Cellulose Fiber (heat cond.: 0,04 W/mK)	4.37	0.33	0.0278	10	
2	Gypcrete			0.4	1.75	

Space heating

Type	Performance ratio of heat generator [-]	Fuel type
Heat pump	0.28	Electricity

Space cooling

Type	Distribution	Capacity [kBtu/hr]	COP
Heat pump	| Recirculation air	400	5.6
Total		**400**	

Water heating

Type	Performance ratio of heat generator [-]	Fuel type
User defined	1.13	Natural Gas

Water storage

Nr	Capacity [gal]
4	119
Total	**119**

Infiltration/Ventilation

ACH @ 50 Pascal **0.5** 1/hr

CFM @ 50 Pascal **1,964.8** cfm

Nr	Sensible recovery efficiency [-]	Rate [cfm]	Electric efficiency [W/cfm]	Fan [W]	Defrost	Temperature below which defrost must be used [°F]	Subsoil heat exchanger efficiency [-]
1	0.47	1,530.3	0.03	1,224.24	yes	13.54	0
Total	**0.47**	**1,530.3**		**1,224.24**			

Lights and appliances

Type	Energy use [kWh/yr]	In conditioned space
Ventilation winter	19,454.07	no
Ventilation Defrost	4,546.71	no
Ventilation summer	16,987.53	no
DHW circulating pump	452.42	no
DHW storage load pump	1,767.24	no
Total	**43,207.97**	

Rindge Commons Building B (Residential)

Property/Site

Building name: Rindge Commons Building B

Property information

Owner's name:	Just-A-Start Corporation
Property address:	402 Rindge Ave
City:	Cambridge
Zip:	02140

Site information

Climate Location **MA - BOSTON LOGAN INT ARPT (AMeDAS standard year)**

Building

Building Information

Area of Conditioned Space	**87,754** ft²
Volume of conditioned space	**799,891** ft³
Number of bedrooms	**160**
Foundation Type	**Slab on grade**
Winter setpoint temperature	**68** °F
Summer setpoint temperature	**77** °F

Slab floor

Name	Area [ft²]	Assembly
Slab	961.8	Concrete Slab 3.5" XPS (R-15)

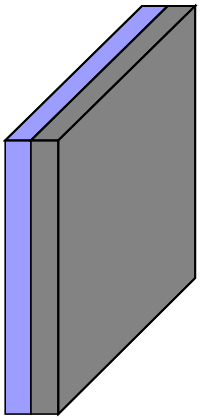
Assembly (Id.15): Concrete Slab 3.5" XPS (R-15)

Homogenous layers

Thermal resistance: 15.004 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.063 Btu/hr ft² °F

Thickness: 7.64 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Expanded Polystyrene Insulation	0.92	0.35	0.0208	3.64	
2	Concrete	131.35	0.19	0.7933	4	

Slab on grade

Floor slab area	**961.8** ft²
U-Value of basement slab	**0.1** Btu/hr ft² °F
Floor slab perimeter (P)	**180.5** ft
Total R-value of perimeter insulation	**14** hr ft² °F/Btu

Above-grade walls & Rim/band joists

Name	Orientation	Area [ft²]	Short wave radiation absorption	Assembly
Roof	Horizontal (100 %)	15,906.4	0.4	Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Exterior Wall 2-6F	SE (8 %), SW (31 %), E (10 %), W (14 %), NE (25	32,543.1	0.4	Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)
Exposed Floor	Horizontal (100 %)	14,944.6	0.4	Exposed Floor (R-30)
Exterior Wall 1F	SE (11 %), SW (33 %), E (13 %), NE (22 %), NW	2,073.4	0.4	Steel Frame, 5.5" Fiberglass (R-9.17), 2.5" Mineral Wool (R-10)
Total		**65,467.5**		

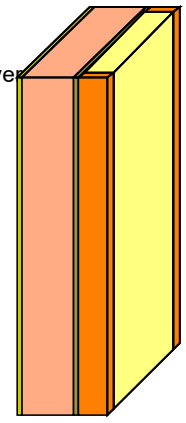
Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)

Inhomogenous layers

Thermal resistance: 50.006 / 52.321 hr ft² °F/Btu (EN ISO 6946 / homogenous layer

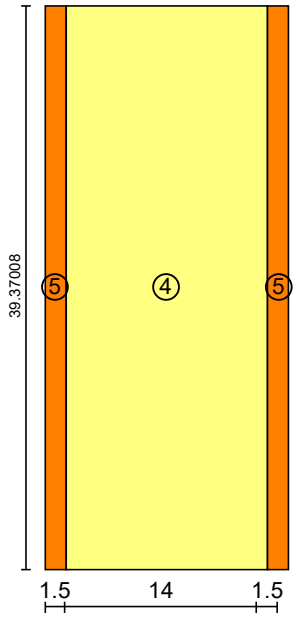
Heat transfer coefficient (U-value): 0.02 Btu/hr ft² °F

Thickness: 10.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Fiberboard	18.79	0.33	0.0285	0.5	
2	Polyisocyanurate Insulation	1.65	0.35	0.0139	6	
3	Plywood (USA)	29.34	0.45	0.0485	0.5	
4	Fibre Glass	1.87	0.2	0.0208	3.5	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Layer: 4



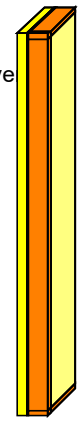
Assembly (Id.9): Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)

Inhomogenous layers

Thermal resistance: 27.581 / 29.559 hr ft² °F/Btu (EN ISO 6946 / homogenous laye

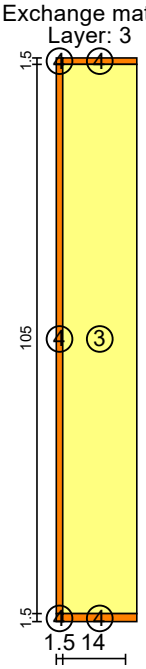
Heat transfer coefficient (U-value): 0.035 Btu/hr ft² °F

Thickness: 8.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	dena Mineral Wool (heat cond.: 0.035 W/mK)	3.75	0.2	0.0208	2.5	
2	Plywood (USA)	29.34	0.45	0.0485	0.5	
3	Fibre Glass	1.87	0.2	0.0245	5.5	
Exchange materials						
4	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.9): Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)



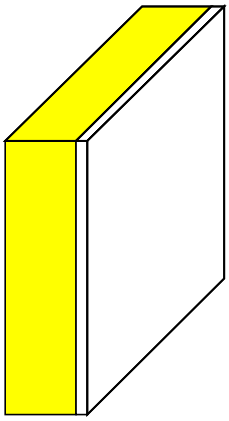
Assembly (Id.6): Exposed Floor (R-30)

Homogenous layers

Thermal resistance: 30.365 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.032 Btu/hr ft² °F

Thickness: 11.75 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Cellulose Fiber (heat cond.: 0,04 W/mK)	4.37	0.33	0.0278	10	
2	Gypcrete			0.4	1.75	

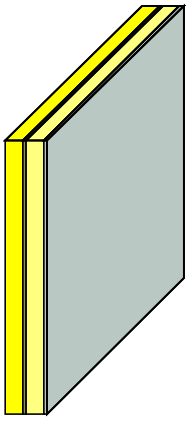
Assembly (Id.7): Steel Frame, 5.5" Fiberglass (R-9.17), 2.5" Mineral Wool (R-10)

Homogenous layers

Thermal resistance: 20.585 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.046 Btu/hr ft² °F

Thickness: 6.039 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	dena Mineral Wool (heat cond.: 0.035 W/mK)	3.75	0.2	0.0208	2.5	
2	Plywood (USA)	29.34	0.45	0.0485	0.5	
3	Fibre Glass (Steal Frame)	1.87	0.2	0.0219	2.414	
4	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	

Windows and Glass Doors

Name	Orientation	Area [ft²]	Window type
Window	SE (13 %), SW (36 %), E (6 %), W (10 %), NE (29 %), N (5 %)	4,104	U -.18 (Fixed)
Window	SW (39 %), E (15 %), W (9 %), NE (27 %), N (10 %)	4,009.5	U -.18 (Fixed)
Window	NE (100 %)	171	U -.18 (Fixed)
Door Glazing	SE (31 %), NE (69 %)	37.1	U - .33
Total		**8,321.6**	

Window type (Id 7): U -.18 (Fixed)

Basic data

Uw -mounted [Btu/hr ft² °F]	0.1805
Frame factor	0.8198
Glass U-value [Btu/hr ft² °F]	0.132
SHGC/Solar energy transmittance (perpendicular)	0.37

Frame data

Setting	Left	Right	Top	Bottom
Frame width [in]	2.5	2.5	2.5	2.5
Frame U-value [Btu/hr ft² °F]	.15	.15	.15	.15
Glazing-to-frame psi-value [Btu/hr ft °F]	.023	.023	.023	.023
Frame-to-Wall psi-value [Btu/hr ft °F]	.029	.029	.029	.029

Solar radiation angle dependent data

Angle [°]	Total solar trans.
0	

Window type (Id 3): U - .33

Basic data

Uw -mounted [Btu/hr ft² °F]	0.3333
Frame factor	0.8198
Glass U-value [Btu/hr ft² °F]	0.27
SHGC/Solar energy transmittance (perpendicular)	0.59

Frame data

Setting	Left	Right	Top	Bottom
Frame width [in]	2.5	2.5	2.5	2.5
Frame U-value [Btu/hr ft² °F]	.37	.37	.37	.37
Glazing-to-frame psi-value [Btu/hr ft °F]	.023	.023	.023	.023
Frame-to-Wall psi-value [Btu/hr ft °F]	.029	.029	.029	.029

Solar radiation angle dependent data

Angle [°]	Total solar trans.
0	

Doors

Name	Orientation	Area [ft²]	Short wave radiation absorption	Assembly
Opaque Door	SW (33 %), NE (33 %), NW (33 %)	59.5	0.4	Door (R-4)
Glazed Door	SE (35 %), NE (65 %)	38	0.4	Door (R-4)
Total		**97.5**		

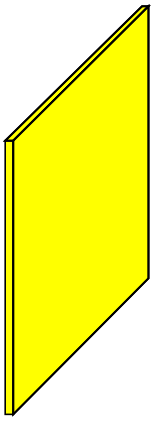
Assembly (Id.8): Door (R-4)

Homogenous layers

Thermal resistance: 4 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.201 Btu/hr ft² °F

Thickness: 1 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Cellulose Fiber (heat cond.: 0,04 W/mK)	4.37	0.33	0.0208	1	

Ceilings

Name	Area [ft²]	Short wave radiation absorption	Assembly
Roof	15,906.4	0.4	Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Exposed Floor	14,944.6	0.4	Exposed Floor (R-30)
Total	**30,851**		

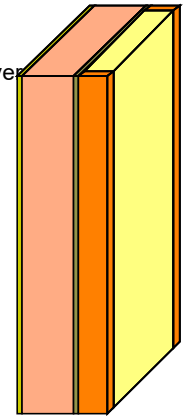
Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)

Inhomogenous layers

Thermal resistance: 50.006 / 52.321 hr ft² °F/Btu (EN ISO 6946 / homogenous layer

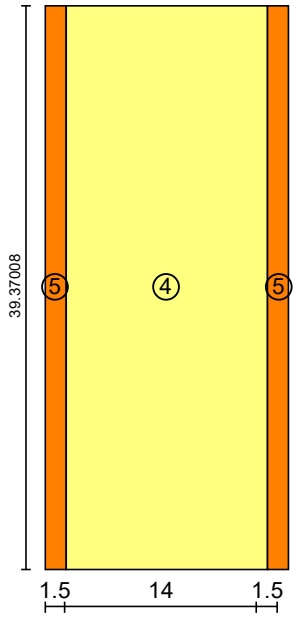
Heat transfer coefficient (U-value): 0.02 Btu/hr ft² °F

Thickness: 10.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Fiberboard	18.79	0.33	0.0285	0.5	
2	Polyisocyanurate Insulation	1.65	0.35	0.0139	6	
3	Plywood (USA)	29.34	0.45	0.0485	0.5	
4	Fibre Glass	1.87	0.2	0.0208	3.5	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Layer: 4



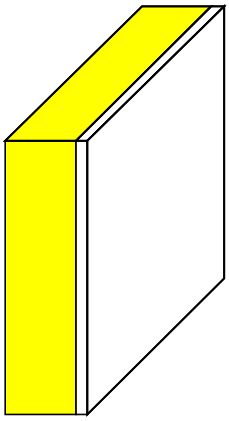
Assembly (Id.6): Exposed Floor (R-30)

Homogenous layers

Thermal resistance: 30.365 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.032 Btu/hr ft² °F

Thickness: 11.75 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Cellulose Fiber (heat cond.: 0,04 W/mK)	4.37	0.33	0.0278	10	
2	Gypcrete			0.4	1.75	

Space heating

Type	Performance ratio of heat generator [-]	Fuel type
Heat pump	0.28	Electricity

Space cooling

Type	Distribution	Capacity [kBtu/hr]	COP
Heat pump	| Recirculation air	500	5.57
Total		**500**	

Water heating

Type	Performance ratio of heat generator [-]	Fuel type
User defined	1.13	Natural Gas

Water storage

Nr	Capacity [gal]
4	119
Total	**119**

Infiltration/Ventilation

ACH @ 50 Pascal **0.3** 1/hr

CFM @ 50 Pascal **4,487.7** cfm

Nr	Sensible recovery efficiency [-]	Rate [cfm]	Electric efficiency [W/cfm]	Fan [W]	Defrost	Temperature below which defrost must be used [°F]	Subsoil heat exchanger efficiency [-]
1	0.47	1,628.59	0.03	1,302.88	yes	13.54	0
Total	**0.46**	**1,628.59**		**1,302.88**			

Lights and appliances

Type	Energy use [kWh/yr]	In conditioned space
Kitchen refrigerator	32,571	yes
Kitchen dishwasher	8,300.11	yes
Kitchen cooking	23,700	yes
Laundry - washer	3,795.23	yes
Laundry - dryer	30,369.95	yes
Energy consumed by evaporation	0 (1,447.2)	yes
User defined lighting	85,426	yes
User defined MELs	84,695	yes
Ventilation winter	20,703.62	no
Ventilation Defrost	4,949.99	no
Ventilation summer	18,078.65	no
DHW circulating pump	844.19	yes
DHW storage load pump	5,069.98	yes
Total	**318,503.72**	

NEW ECOLOGY
Community-Based Sustainable Development

15 Court Square, Suite 420
Boston, MA 02108

Article 22 Permit Issue Compliance

Rindge Commons

Cambridge, MA

Submitted To:

Just a Start Corporation
January 7, 2020

I. Project Description

Rindge Commons project complies with the Special Permit application requirements as defined in Article 22: Sustainable Design and Development ordinance in the City of Cambridge. The project will be designed and constructed under the guidelines of Passive House Institute U.S. (PHIUS). Each building of the development will meet the design and testing requirements of the certification program and will be certified as a Passive House.

The property owner has committed to creating efficient and healthy living environment for its tenants as well as a welcoming design for the neighborhood. The project will address climate change vulnerability items including voluntary compliance with the 2070 Sea Level Rise and Storm Surge Flooding level for a 100-year Storm Event per Cambridge Climate Vulnerability Projections, raised occupied living spaces, elevetaed mechanical equipment installation, and reduced heat island effect measures.

The project comprises of 2 buildings on a previously developed site:

- Building A will be certified using PHIUS+ Core for residential portion of the building and PHIUS+ 2018 for commercial portion of the building.
    - Residential – 27,600 sf includes 27 residential units and the supporting equipment and areas such as elevator, laundry, and corridors.
    - Non-Residential – 36,300 sf includes trainng and community rooms as well as potentially a health clinic.
- Building B will be certified using PHIUS+ Core.
    - Residential – 84,000

Integral to a PHIUS Certification is compliance with Energy Star New Construction, Indoor AirPlus, WaterSense, and Zero Energy Ready Homes certifications. In combination with third party RESNET approved quality assurance and quality control testing (NEI will be serving in the role of a Passive House Verifier) the building will exceed the Cambridge Green Buildign Requirements as outlined in Article 22.20.

Attached as appendicec to this document are:

- Building A Non-Residential REM-Rate Report
- Building A Non-Residential Summary Report
- Building A Non-Residential WUFI Energy Compliance Report
- Building A Residential REM-Rate Report
- Building A Residential Summary Report
- Building A Residential WUFI Energy Compliance Report
- Building B REM-Rate Report
- Building B Summary Report
- Building B WUFI Energy Compliance Report
- Pathway to Net Zero Emissions

II. Affidavit

As the Certified Passive House Consultant (CPHC) I have reviewed the preliminary project documents and consulted with the Owner and Design and Construction team to confirm that the project is feasible and can meet PHIUS certification as outlined above. Furthermore, I will oversee the design development and will be responsible for submission of the documentation to PHIUS for precertification at design completion and final certification at construction completion.

Sincerely,

Maciej Konieczny, CEM, CPHC
Senior Project Manager
New Ecology, Inc.

III. Appendices

Property/Site

Building name: Rindge Commons Building A Non-Residential

Property information

Owner's name: Just-A-Start Corporation

Property address: 402 Rindge Ave

City: Cambridge

Zip: 02140

Site information

Climate Location **MA - BOSTON LOGAN INT ARPT (AMeDAS standard year)**

Building

Building Information

Area of Conditioned Space **37,656** ft²

Volume of conditioned space **351,849** ft³

Number of bedrooms **8**

Foundation Type **Slab on grade**

Winter setpoint temperature **68** °F

Summer setpoint temperature **77** °F

Slab floor

Name	Area [ft²]	Assembly
Slab	2,637.1	Concrete Slab 3.5" EPS (R-15)
Slab	3,869.4	Concrete Slab 3.5" EPS (R-15)
Total	**6,506.5**	

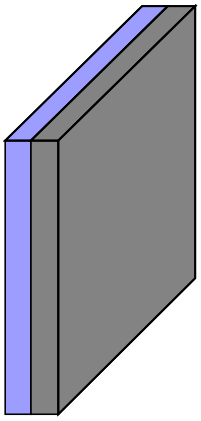
Assembly (Id.15): Concrete Slab 3.5" EPS (R-15)

Homogenous layers

Thermal resistance: 15.004 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.063 Btu/hr ft² °F

Thickness: 7.64 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Expanded Polystyrene Insulation	0.92	0.35	0.0208	3.64	
2	Concrete	131.35	0.19	0.7933	4	

Slab on grade

Floor slab area	**6,506.5** ft²
U-Value of basement slab	**0.1** Btu/hr ft² °F
Floor slab perimeter (P)	**363** ft
Total R-value of perimeter insulation	**14** hr ft² °F/Btu

Above-grade walls & Rim/band joists

Name	Orientation	Area [ft²]	Short wave radiation absorption	Assembly
Roof	Horizontal (100 %)	3,090.9	0.4	Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Exposed Floor	Horizontal (100 %)	5,666.9	0.4	Exposed Floor (R-30)
Exterior Wall 1F	S (3 %), W (73 %), N (24 %)	786	0.4	Steel Frame, 5.5" Fiberglass (R-9.17), 2.5" Mineral Wool (R-10)
Exterior Wall 3-4F	S (22 %), E (24 %), W (25 %), NE (3 %), N (26 %)	7,245.2	0.4	Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)
Exterior Wall 2F	S (24 %), E (25 %), W (28 %), NE (2 %), N (20 %)	4,853.2	0.4	Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)
Exterior Wall 1F	S (25 %), E (29 %), W (5 %), NE (6 %), N (34 %)	2,165.1	0.4	Steel Frame, 5.5" Fiberglass (R-9.17), 2.5" Mineral Wool (R-10)
Door	E (46 %), N (54 %)	139.1	0.4	Door (R-4)
Total		**23,946.4**		

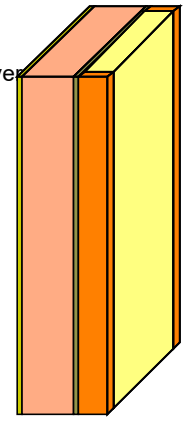
Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)

Inhomogenous layers

Thermal resistance: 50.006 / 52.321 hr ft² °F/Btu (EN ISO 6946 / homogenous layer)

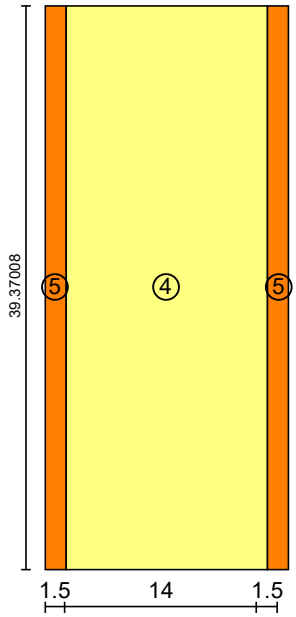
Heat transfer coefficient (U-value): 0.02 Btu/hr ft² °F

Thickness: 10.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Fiberboard	18.79	0.33	0.0285	0.5	
2	Polyisocyanurate Insulation	1.65	0.35	0.0139	6	
3	Plywood (USA)	29.34	0.45	0.0485	0.5	
4	Fibre Glass	1.87	0.2	0.0208	3.5	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Layer: 4



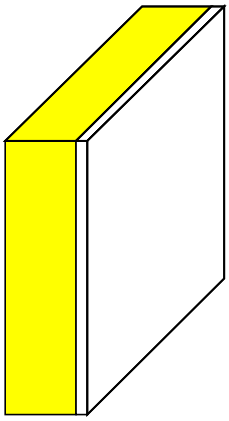
Assembly (Id.6): Exposed Floor (R-30)

Homogenous layers

Thermal resistance: 30.365 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.032 Btu/hr ft² °F

Thickness: 11.75 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Cellulose Fiber (heat cond.: 0,04 W/mK)	4.37	0.33	0.0278	10	
2	Gypcrete			0.4	1.75	

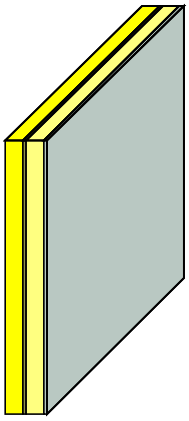
Assembly (Id.7): Steel Frame, 5.5" Fiberglass (R-9.17), 2.5" Mineral Wool (R-10)

Homogenous layers

Thermal resistance: 20.585 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.046 Btu/hr ft² °F

Thickness: 6.039 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	dena Mineral Wool (heat cond.: 0.035 W/mK)	3.75	0.2	0.0208	2.5	
2	Plywood (USA)	29.34	0.45	0.0485	0.5	
3	Fibre Glass (Steal Frame)	1.87	0.2	0.0219	2.414	
4	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	

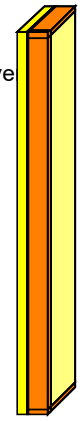
Assembly (Id.9): Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)

Inhomogenous layers

Thermal resistance: 27.581 / 29.559 hr ft² °F/Btu (EN ISO 6946 / homogenous laye

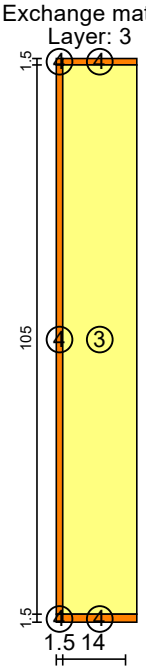
Heat transfer coefficient (U-value): 0.035 Btu/hr ft² °F

Thickness: 8.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	dena Mineral Wool (heat cond.: 0.035 W/mK)	3.75	0.2	0.0208	2.5	
2	Plywood (USA)	29.34	0.45	0.0485	0.5	
3	Fibre Glass	1.87	0.2	0.0245	5.5	
Exchange materials						
4	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.9): Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)



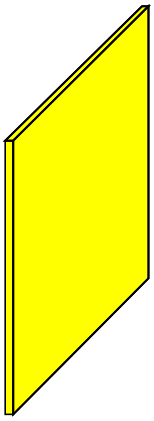
Assembly (Id.8): Door (R-4)

Homogenous layers

Thermal resistance: 4 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.201 Btu/hr ft² °F

Thickness: 1 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Cellulose Fiber (heat cond.: 0,04 W/mK)	4.37	0.33	0.0208	1	

Adiabatic walls

Name	Area [ft²]	Assembly
Interior Wall	2,932.1	Adiabatic Wall
Interior Ceiling	10,051.4	Adiabatic Floor (3.5" Sound Batt)
Interior Wall	1,475.5	Adiabatic Wall
Interior Floor	968.9	Adiabatic Floor (3.5" Sound Batt)
Total	**15,428.1**	

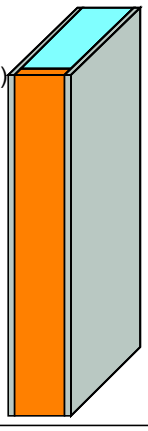
Assembly (Id.22): Adiabatic Wall

Inhomogenous layers

Thermal resistance: 2.137 / 2.012 hr ft² °F/Btu (EN ISO 6946 / homogenous layers)

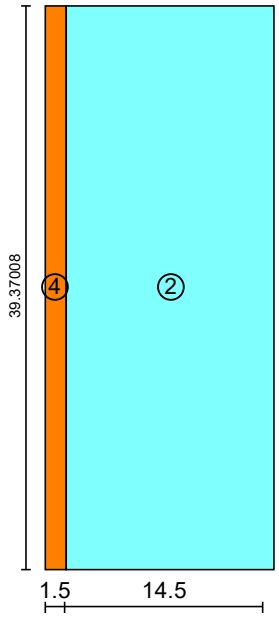
Heat transfer coefficient (U-value): 0.322 Btu/hr ft² °F

Thickness: 7.156 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
2	Air Layer 150 mm	0.08	0.24	0.5431	5.906	
3	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
Exchange materials						
4	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.22): Adiabatic Wall
Layer: 2



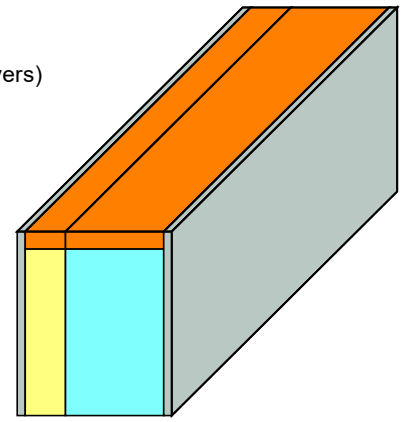
Assembly (Id.23): Adiabatic Floor (3.5" Sound Batt)

Inhomogenous layers

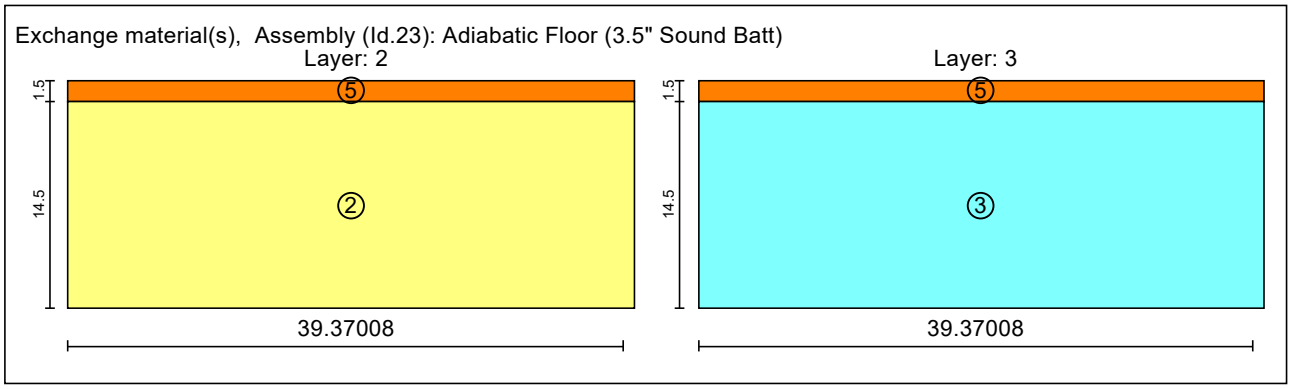
Thermal resistance: 19.442 / 19.817 hr ft² °F/Btu (EN ISO 6946 / homogenous layers)

Heat transfer coefficient (U-value): 0.048 Btu/hr ft² °F

Thickness: 13.25 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
2	Fibre Glass	1.87	0.2	0.0245	3.5	
3	Air Layer 30 mm	0.08	0.24	0.104	8.5	
4	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	



Windows and Glass Doors

Name	Orientation	Area [ft²]	Window type
Window	S (10 %), E (24 %), W (43 %), N (24 %)	1,315	U -.18 (Operable)
Window	S (6 %), E (31 %), W (31 %), N (31 %)	1,001.9	U -.18 (Operable)
Total		**2,316.9**	

Window type (Id 1): U -.18 (Operable)

Basic data

Uw -mounted [Btu/hr ft² °F]	0.1813
Frame factor	0.6884
Glass U-value [Btu/hr ft² °F]	0.132
SHGC/Solar energy transmittance (perpendicular)	0.46

Frame data

Setting	Left	Right	Top	Bottom
Frame width [in]	4.5	4.5	4.5	4.5
Frame U-value [Btu/hr ft² °F]	.15	.15	.15	.15
Glazing-to-frame psi-value [Btu/hr ft °F]	.023	.023	.023	.023
Frame-to-Wall psi-value [Btu/hr ft °F]	.029	.029	.029	.029

Solar radiation angle dependent data

Angle [°]	Total solar trans.
0	

Ceilings

Name	Area [ft²]	Short wave radiation absorption	Assembly
Roof	3,090.9	0.4	Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Exposed Floor	5,666.9	0.4	Exposed Floor (R-30)
Total	**8,757.8**		

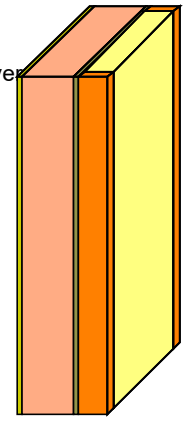
Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)

Inhomogenous layers

Thermal resistance: 50.006 / 52.321 hr ft² °F/Btu (EN ISO 6946 / homogenous layer

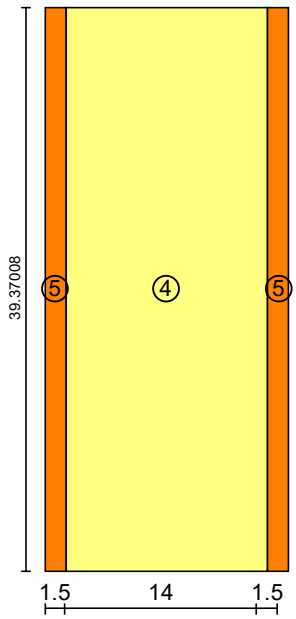
Heat transfer coefficient (U-value): 0.02 Btu/hr ft² °F

Thickness: 10.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Fiberboard	18.79	0.33	0.0285	0.5	
2	Polyisocyanurate Insulation	1.65	0.35	0.0139	6	
3	Plywood (USA)	29.34	0.45	0.0485	0.5	
4	Fibre Glass	1.87	0.2	0.0208	3.5	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Layer: 4



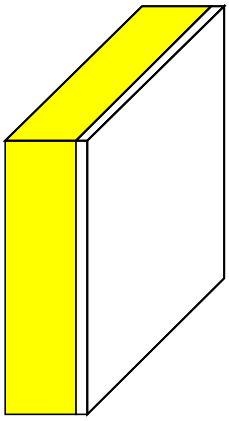
Assembly (Id.6): Exposed Floor (R-30)

Homogenous layers

Thermal resistance: 30.365 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.032 Btu/hr ft² °F

Thickness: 11.75 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Cellulose Fiber (heat cond.: 0,04 W/mK)	4.37	0.33	0.0278	10	
2	Gypcrete			0.4	1.75	

Space heating

Type	Performance ratio of heat generator [-]	Fuel type
Heat pump	0.28	Electricity

Space cooling

Type	Distribution	Capacity [kBtu/hr]	COP
Heat pump	| Recirculation air	400	5.6
Total		**400**	

Water heating

Type	Performance ratio of heat generator [-]	Fuel type
User defined	1.13	Natural Gas

Water storage

Nr	Capacity [gal]
4	119
Total	**119**

Infiltration/Ventilation

ACH @ 50 Pascal **0.5** 1/hr

CFM @ 50 Pascal **1,964.8** cfm

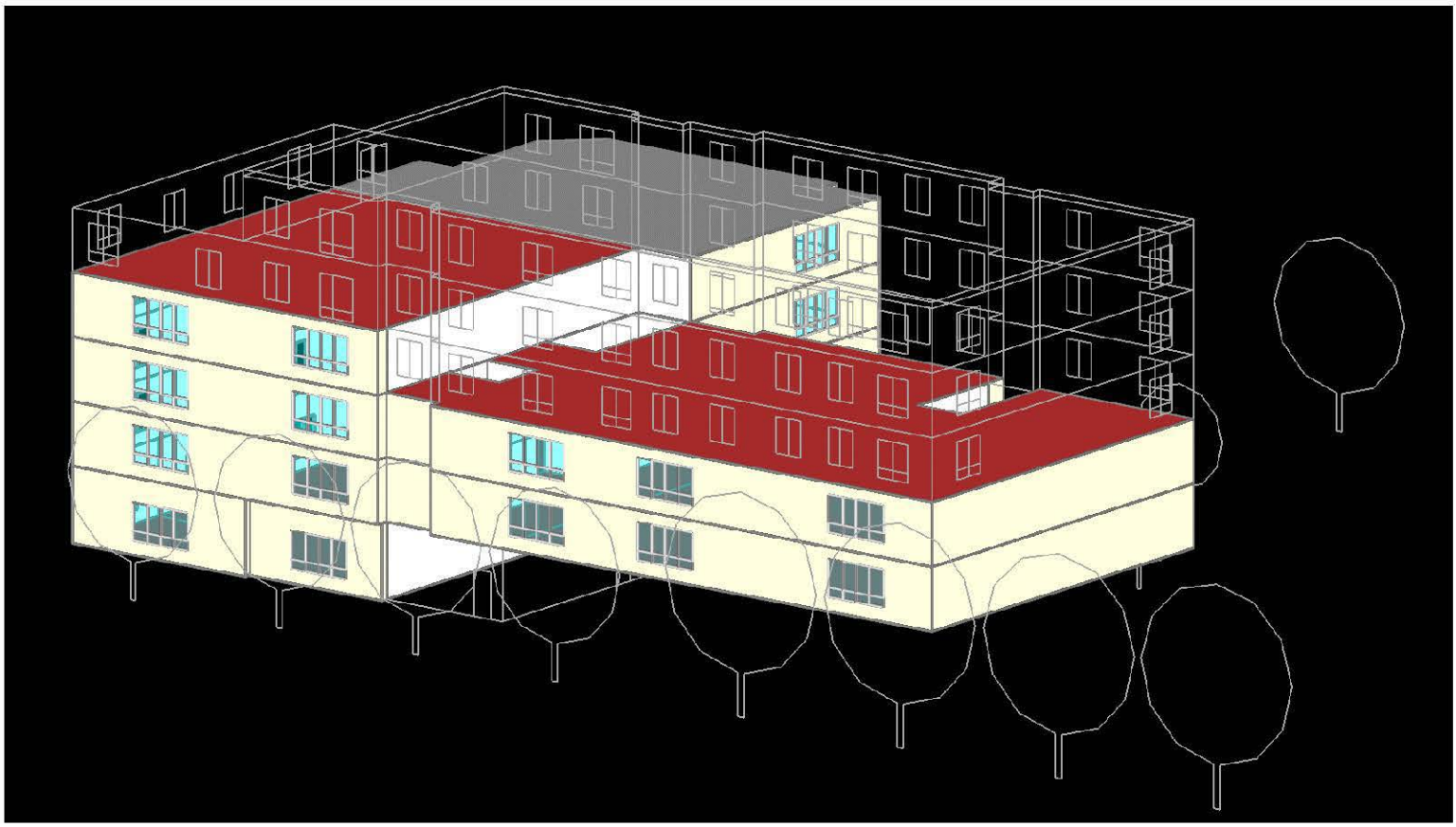
Nr	Sensible recovery efficiency [-]	Rate [cfm]	Electric efficiency [W/cfm]	Fan [W]	Defrost	Temperature below which defrost must be used [°F]	Subsoil heat exchanger efficiency [-]
1	0.47	1,530.3	0.03	1,224.24	yes	13.54	0
Total	**0.47**	**1,530.3**		**1,224.24**			

Lights and appliances

Type	Energy use [kWh/yr]	In conditioned space
Ventilation winter	19,454.07	no
Ventilation Defrost	4,546.71	no
Ventilation summer	16,987.53	no
DHW circulating pump	452.42	no
DHW storage load pump	1,767.24	no
Total	**43,207.97**	

NEW ECOLOGY Community-Based Sustainable Development	Project Name:		**Rindge Commons Building A (Non-Residential)**	
	Climate		Boston Logan International Airport	
	Case		Reference Building (VRF Option)	PHIUS+ Core
Change from the Reference Building **Meets PHIUS Target** **Misses PHIUS Target**	Notes		Baseline envelope provided in drawings, VRF Heating & Cooling, Central Gas-Fired DHW	Upgraded envelope from reference building with added Solar PV to meet PHIUS+ Core requirements. VRF Heating and Cooling, Central Gas-Fired DHW
WUFI PASSIVE RESULTS	**Units**	**Target**		
Heating Demand	kBtu/ft2.yr	3.80	**3.82**	**1.16**
Cooling Demand	kBtu/ft2.yr	8.20	**4.06**	**3.54**
Heating Load	Btu/hr.ft2	4.40	**7.76**	**3.67**
Cooling Load	Btu/hr.ft2	3.50	**3.91**	**3.31**
SITE ENERGY RESULTS	**Units**	**Target**		
Source Energy	kBtu/ft2.yr	38.0	**57.2**	**37.5**
Site Energy Use Index	kBtu/ft2.yr	-	**31**	**24**
Site Energy Consumption	kWh/yr	-	**344,224**	**261,561**
Geometry	**Units**			
Interior Conditioned Floor Area (iCFA)	ft2		37,656	37,656
Net Volume	ft3		351,849	351,849
Envelope Area	ft2		32,785	32,770
Average Window-to-Wall Ratio	%		13%	13%
Exterior Envelope	**Units**			
Roof	R		50	50
Exterior Wall (1F)	R (effective)		21	21
Exterior Wall (2-4F)	R (effective)		28	28
Exterior Floor	R		30	30
Slab	R		15	15
Window	U		0.27	0.18
	SHGC		0.3	0.3
Opaque Door	R		4	4
Airtightness	**Units**			
Air changes per hour at 50 Pa	ACH50		**3.00**	**0.49**
Lighting Assumptions	**Units**			
Education Facility Lighting	W/ft2		0.8	0.6
Health Facility Lighting	W/ft2		1.5	1.0
Auxiliary Space Lighting	W/ft2		0.5	0.5
Annual Lighting	kWh/yr		79,860	55,123
Plug Loads	**Units**			
Miscellaneous Electric Loads	kWh/yr		26,053	26,053
Process Loads	kWh/yr		54,000	44,000
Occupancy	**Units**			
Average Occupancy	#		225	225
Appliances	**Units**			
Refrigerator	kWh/year/unit		423	423
Dishwasher	kWh/year/unit		260	260
Electric Cooktop	kWh/use		0.2	0.2
Ventilation	**Units**			
ERV Ventilation	cfm		5,200	5,200
ERV Power	W/cfm		1.0	0.8
ERV Recovery Effiency	%		80%	80%
Mechanical Systems	**Units**			

Heat Pumps	Heating COP	3.56	3.56
	Cooling COP	5.6	5.6
Domestic Hot Water	**Units**		
Water Heater Thermal Efficiency	%	88%	88%
DHW Pump	kW	0.26	0.26
Recirculation Pump	kW	0.06	0.06
Renewable Generation	**Units**		
Solar PV	kWh/yr	0	40,000



BUILDING INFORMATION

Category:	**Non-residential**
Status:	**In planning**
Building type:	**New construction**
Year of construction:	
Units:	**1**
Number of occupants:	**225 (Design)**
Occupant density:	**167.4** ft²/Person

Boundary conditions

Climate: **MA - BOSTON LOGAN INT ARPT (AMeDAS standard year)**

Internal heat gains:	**2.1** Btu/hr ft²
Interior temperature:	**68** °F
Overheat temperature:	**77** °F

Building geometry

Enclosed volume:	**406,051** ft³
Net-volume:	**351,849** ft³
Total area envelope:	**32,769.8** ft²
Area/Volume Ratio:	**0.1** 1/ft
Floor area:	**37,656** ft²
Envelope area/iCFA:	**0.87**

PASSIVEHOUSE REQUIREMENTS

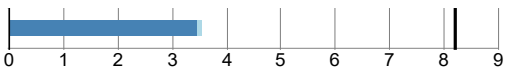
Certificate criteria: PHIUS+ 2018

Heating demand

specific:	**1.16** kBtu/ft²yr
target:	**3.8** kBtu/ft²yr
total:	43,650.5 kBtu/yr

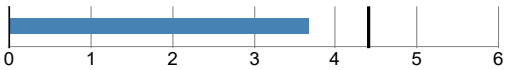
Cooling demand

sensible:	**3.45** kBtu/ft²yr
latent:	**0.09** kBtu/ft²yr
specific:	**3.54** kBtu/ft²yr
target:	**8.2** kBtu/ft²yr
total:	133,174.33 kBtu/yr



Heating load

specific:	**3.67** Btu/hr ft²
target:	**4.4** Btu/hr ft²
total:	138,287.17 Btu/hr

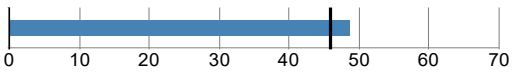


Cooling load

specific:	**3.31** Btu/hr ft²
target:	**3.5** Btu/hr ft²
total:	124,718.49 Btu/hr

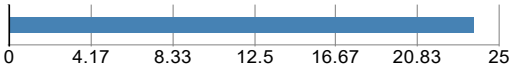
Source energy

total:	**537,203.01**	kWh/yr
specific:	**48.68**	kBtu/ft²yr
target:	**45.96**	kBtu/ft²yr
total:	**1,832,831.83**	kBtu/yr
specific:	48.68	kBtu/ft²yr



Site energy

total:	892,245.29	kBtu/yr
specific:	23.7	kBtu/ft²yr
total:	261,517.09	kWh/yr
specific:	6.94	kWh/ft²

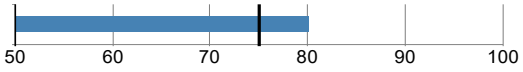


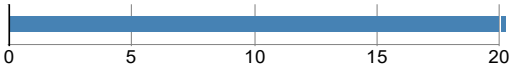
Air tightness

ACH50:	**0.49**	1/hr
CFM50 per envelope area:	**0.06**	cfm/ft²
target:	**0.49**	1/hr
target CFM50:	**0.06**	cfm/ft²

PASSIVEHOUSE RECOMMENDATIONS

Sensible recovery efficiency:	**80.1**	%
Frequency of overheating: Cooling system is required	**27.9**	%





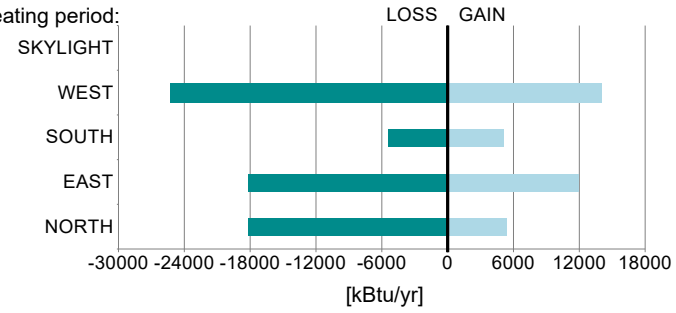
Frequency of overheating only applies if there is not a [properly sized] cooling system installed.

BUILDING ELEMENTS

Windows

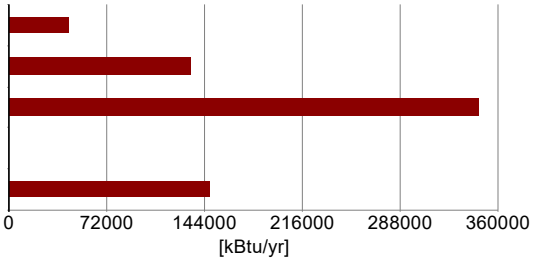
Average SHGC:	**0.46**
Average solar reduction factor heating:	**0.33**
Average solar reduction factor cooling:	**0.35**
Average U-value:	**0.206** Btu/hr ft² °F
Total glazing area:	**1,239.2** ft²
Total window area:	**2,316.9** ft²

Heat gain/loss heating period:



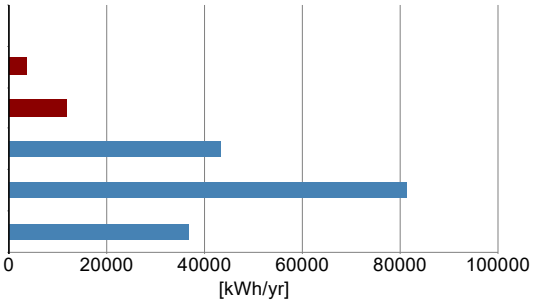
HVAC

Total heating demand:	**43,650** kBtu/yr
Total cooling demand:	**133,174** kBtu/yr
Total DHW energy demand:	**346,411** kBtu/yr
Solar DHW contribution:	**0** kBtu/yr
Auxiliary electricity:	**147,417** kBtu/yr



Electricity

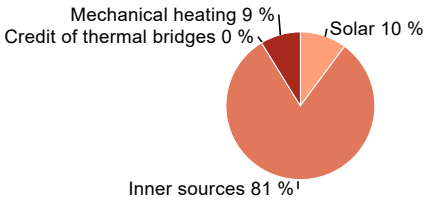
Direct heating / DHW:	**0** kWh/yr
Heatpump heating:	**3,594** kWh/yr
Cooling:	**11,607** kWh/yr
HVAC auxiliary energy:	**43,208** kWh/yr
Appliances:	**81,176** kWh/yr
Renewable generation, coincident production and use:	**36,800** kWh/yr
Total electricity demand:	**102,785** kWh/yr



HEAT FLOW - HEATING PERIOD

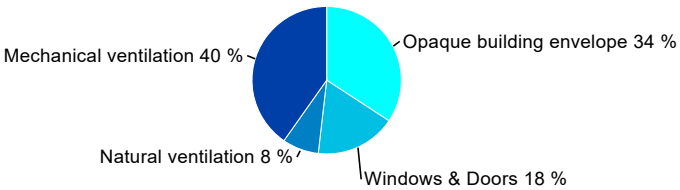
Heat gains

Solar:	**39,885** kBtu/yr
Inner sources:	**320,071** kBtu/yr
Credit of thermal bridges:	**0** kBtu/yr
Mechanical heating:	**43,650** kBtu/yr



Heat losses

Opaque building envelope:	**138,360** kBtu/yr
Windows & Doors:	**70,736** kBtu/yr
Natural ventilation:	**31,861** kBtu/yr
Mechanical ventilation:	**162,651** kBtu/yr

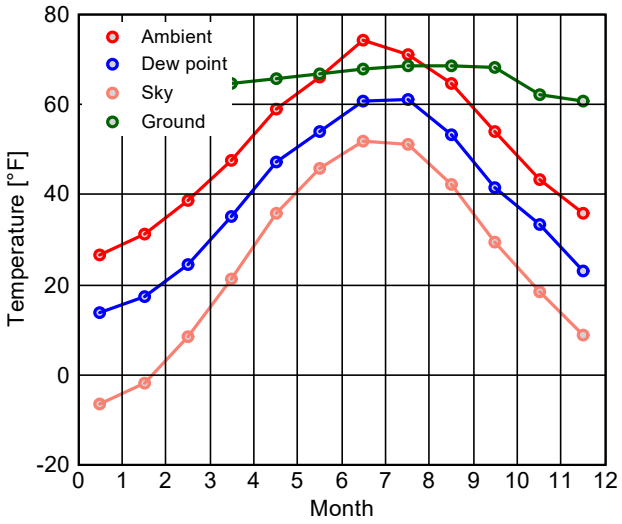


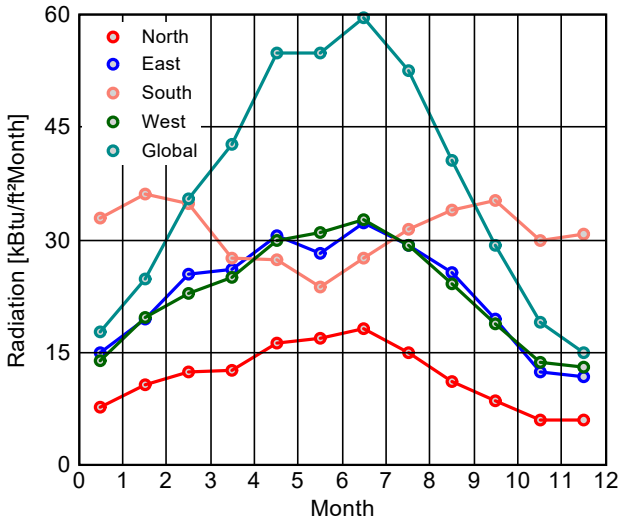
CLIMATE

Latitude:	**42.4**	°
Longitude:	**-71**	°
Elevation of weather station:	**19.7**	ft
Elevation of building site:	**2**	ft
Heat capacity air:	**0.018**	Btu/ft³F
Daily temperature swing summer:	**14.8**	°F
Average wind speed:	**13.1**	ft/s

Ground

Average ground surface temperature:	**52.8**	°F
Amplitude ground surface temperature:	**55.8**	°F
Ground thermal conductivity:	**1.2**	Btu/hr ft °F
Ground heat capacity:	**29.8**	Btu/ft³F
Depth below grade of groundwater:	**9.8**	ft
Flow rate groundwater:	**0.2**	ft/d





Calculation parameters

Length of heating period	**212**	days/yr
Heating degree hours	**140.8**	kFh/a
Phase shift months	**1.3**	mths
Time constant heating demand	**137**	hr
Time constant cooling demand	**0**	hr
Time constant cooling demand with night ventilation	**0**	hr

Climate for	Heating load 1	Heating load 2	Cooling
Temperature [°F]	16.9	31.6	83.5
Solar radiation North [Btu/hr ft²]	12	7.9	27.6
Solar radiation East [Btu/hr ft²]	22.8	13.3	61.5
Solar radiation South [Btu/hr ft²]	49.5	27.3	41.8
Solar radiation West [Btu/hr ft²]	22.2	11.4	53.3
Solar radiation Global [Btu/hr ft²]	26.9	16.5	101.4

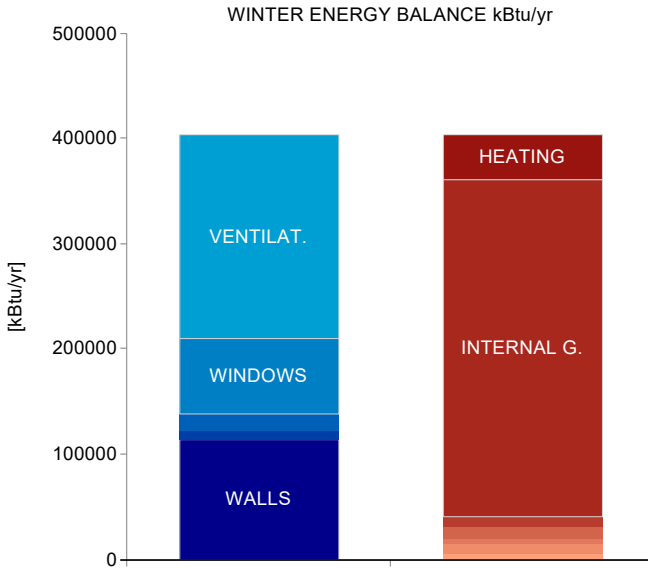
Relevant boundary conditions for heating load calculation: Heating load 1

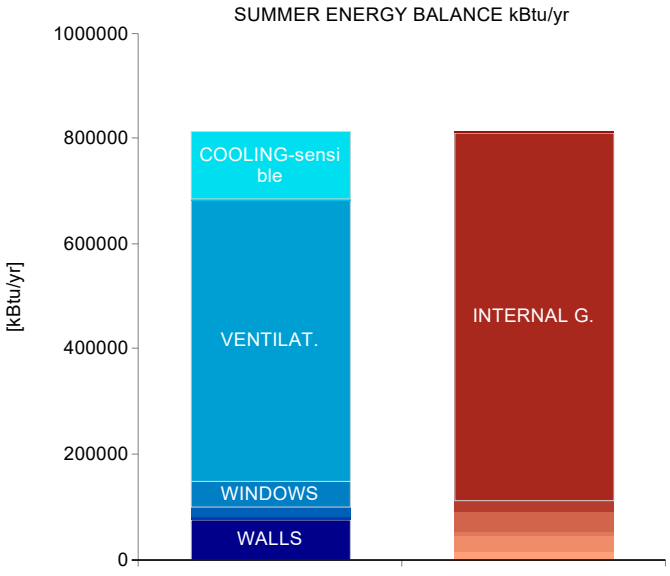
ANNUAL HEAT DEMAND

Transmission losses :	**209,095**	kBtu/yr
Ventilation losses:	**194,512**	kBtu/yr
Total heat losses:	**403,607**	kBtu/yr
Solar heat gains:	**50,520**	kBtu/yr
Internal heat gains:	**405,408**	kBtu/yr
Total heat gains:	**455,928**	kBtu/yr
Utilization factor:	**79**	%
Useful heat gains:	**359,957**	kBtu/yr
Annual heat demand:	**43,650**	kBtu/yr
Specific annual heat demand:	**1,159.3**	Btu/ft²yr

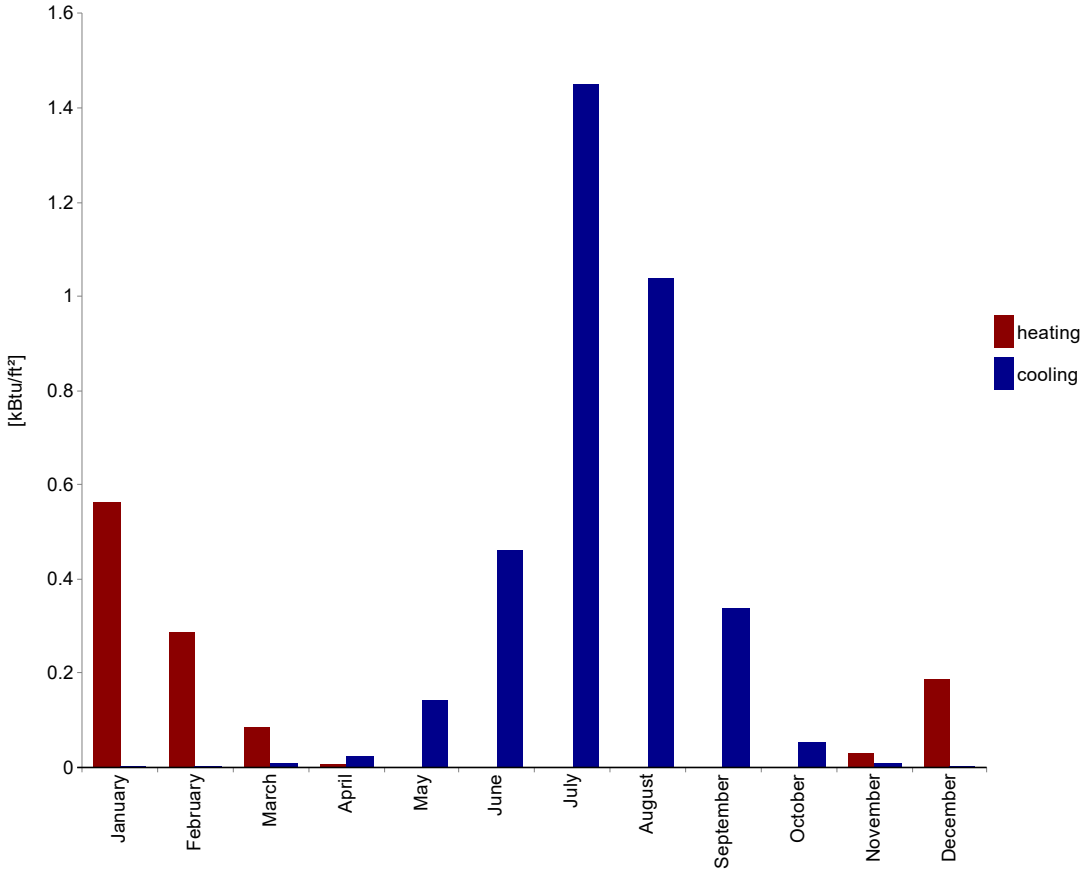
ANNUAL COOLING DEMAND

Solar heat gains:	**112,384**	kBtu/yr
Internal heat gains:	**697,991**	kBtu/yr
Total heat gains:	**810,374**	kBtu/yr
Transmission losses :	**358,648**	kBtu/yr
Ventilation losses:	**1,300,850**	kBtu/yr
Total heat losses:	**1,659,498**	kBtu/yr
Utilization factor:	**41**	%
Useful heat losses:	**680,569**	kBtu/yr
Cooling demand - sensible:	**129,806**	kBtu/yr
Cooling demand - latent:	**3,369**	kBtu/yr
Annual cooling demand:	**133,174**	kBtu/yr
Specific annual cooling demand:	**3.5**	kBtu/ft²yr





SPECIFIC HEAT/COOLING DEMAND MONTHLY



Month	Heating [kBtu/ft²]	Cooling [kBtu/ft²]
January	0.6	0
February	0.3	0
March	0.1	0
April	0	0
May	0	0.1
June	0	0.5
July	0	1.5
August	0	1
September	0	0.3
October	0	0.1
November	0	0
December	0.2	0

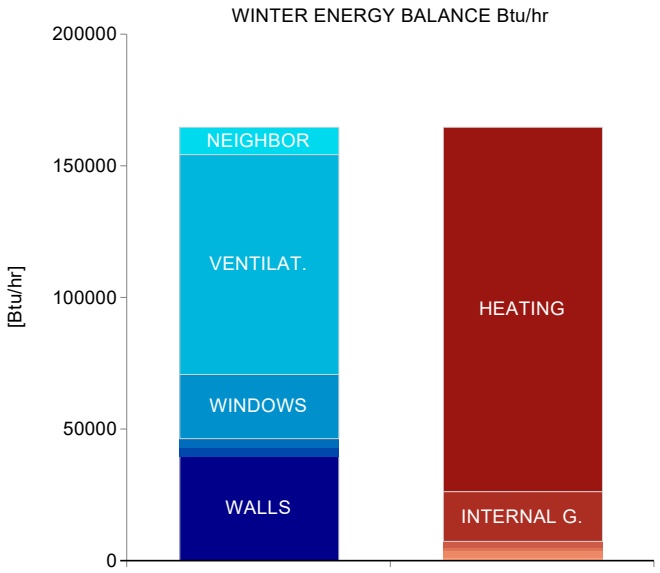
HEATING LOAD

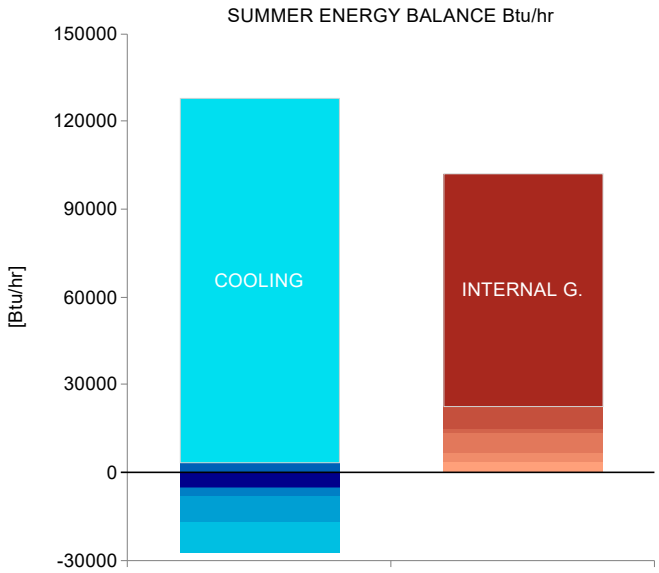
	First climate	Second climate
Transmission heat losses:	**80,906.8** Btu/hr	**61,625.3** Btu/hr
Ventilation heat losses:	**83,488.2** Btu/hr	**59,355** Btu/hr
Total heat loss:	**164,395** Btu/hr	**120,980.2** Btu/hr
Solar heat gain:	**7,008.9** Btu/hr	**3,957.8** Btu/hr
Internal heat gain:	**19,099** Btu/hr	**19,099** Btu/hr
Total heat gains heating:	**26,107.9** Btu/hr	**23,056.8** Btu/hr
Heating load:	**138,287.2** Btu/hr	**97,923.4** Btu/hr

Relevant heating load:	**138,287.2** Btu/hr
Specific heating load:	**3.7** Btu/hr ft²

COOLING LOAD

Solar heat gain:	**22,431.7** Btu/hr
Internal heat gain:	**79,687.1** Btu/hr
Total heat gains cooling:	**102,118.8** Btu/hr
Transmission heat losses:	**-14,017.9** Btu/hr
Ventilation heat losses:	**-8,581.7** Btu/hr
Total heat loss:	**-22,599.7** Btu/hr
Cooling load - sensible:	**124,718.5** Btu/hr
Cooling load - latent:	**0** Btu/hr
Relevant cooling load:	**124,718.5** Btu/hr
Specific maximum cooling load:	**3.3** Btu/hr ft²





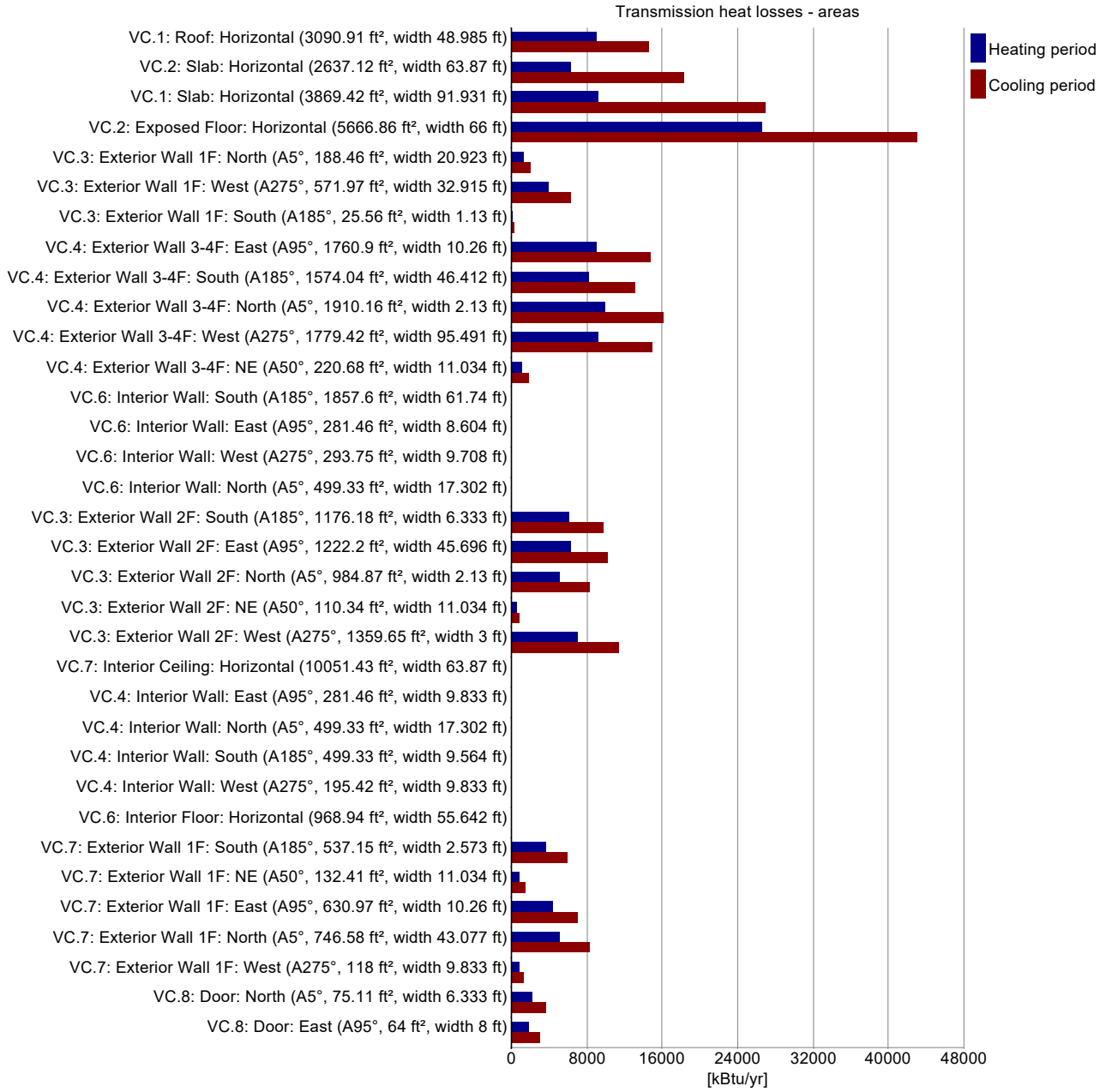
AREAS

Transmission heat losses - areas

Name	Area [ft²]	Average U-value [Btu/hr ft² °F]	Absorption coefficient	Emission coefficient	Reduction factor shading [%]	Transmission losses heating [kBtu/yr]	Transmission losses cooling [kBtu/yr]
VC.1: Roof: Horizontal (3090.91 ft², width 48.985 ft)	3090.9	0.02	0.4	0.9	100	9016.2	14597.3
VC.2: Slab: Horizontal (2637.12 ft², width 63.87 ft)	2637.1	0.063	0	0	0	6283.8	18329
VC.1: Slab: Horizontal (3869.42 ft², width 91.931 ft)	3869.4	0.063	0	0	0	9220.2	26893.9
VC.2: Exposed Floor: Horizontal (5666.86 ft², width 66 ft)	5666.9	0.032	0.4	0.9	100	26611.9	43084.7
VC.3: Exterior Wall 1F: North (A5°, 188.46 ft², width 20.923 ft)	188.5	0.046	0.4	0.9	100	1296	2098.2
VC.3: Exterior Wall 1F: West (A275°, 571.97 ft², width 32.915 ft)	572	0.046	0.4	0.9	100	3933.3	6368
VC.3: Exterior Wall 1F: South (A185°, 25.56 ft², width 1.13 ft)	25.6	0.046	0.4	0.9	100	175.8	284.6
VC.4: Exterior Wall 3-4F: East (A95°, 1760.9 ft², width 10.26 ft)	1760.9	0.035	0.4	0.9	100	9137.8	14794.1
VC.4: Exterior Wall 3-4F: South (A185°, 1574.04 ft², width 46.412 ft)	1574	0.035	0.4	0.9	100	8168.1	13224.2
VC.4: Exterior Wall 3-4F: North (A5°, 1910.16 ft², width 2.13 ft)	1910.2	0.035	0.4	0.9	100	9912.3	16048.1
VC.4: Exterior Wall 3-4F: West (A275°, 1779.42 ft², width 95.491 ft)	1779.4	0.035	0.4	0.9	100	9233.9	14949.7
VC.4: Exterior Wall 3-4F: NE (A50°, 220.68 ft², width 11.034 ft)	220.7	0.035	0.4	0.9	100	1145.1	1854
VC.6: Interior Wall: South (A185°, 1857.6 ft², width 61.74 ft)	1857.6	0.319	0	0	0	0	0
VC.6: Interior Wall: East (A95°, 281.46 ft², width 8.604 ft)	281.5	0.319	0	0	0	0	0
VC.6: Interior Wall: West (A275°, 293.75 ft², width 9.708 ft)	293.7	0.319	0	0	0	0	0
VC.6: Interior Wall: North (A5°, 499.33 ft², width 17.302 ft)	499.3	0.319	0	0	0	0	0
VC.3: Exterior Wall 2F: South (A185°, 1176.18 ft², width 6.333 ft)	1176.2	0.035	0.4	0.9	100	6103.5	9881.6
VC.3: Exterior Wall 2F: East (A95°, 1222.2 ft², width 45.696 ft)	1222.2	0.035	0.4	0.9	100	6342.3	10268.3
VC.3: Exterior Wall 2F: North (A5°, 984.87 ft², width 2.13 ft)	984.9	0.035	0.4	0.9	100	5110.8	8274.3
VC.3: Exterior Wall 2F: NE (A50°, 110.34 ft², width 11.034 ft)	110.3	0.035	0.4	0.9	100	572.6	927
VC.3: Exterior Wall 2F: West (A275°, 1359.65 ft², width 3 ft)	1359.6	0.035	0.4	0.9	100	7055.6	11423
VC.7: Interior Ceiling: Horizontal (10051.43 ft², width 63.87 ft)	10051.4	0.049	0	0	0	0	0
VC.4: Interior Wall: East (A95°, 281.46 ft², width 9.833 ft)	281.5	0.319	0	0	0	0	0
VC.4: Interior Wall: North (A5°, 499.33 ft², width 17.302 ft)	499.3	0.319	0	0	0	0	0
VC.4: Interior Wall: South (A185°, 499.33 ft², width 9.564 ft)	499.3	0.319	0	0	0	0	0
VC.4: Interior Wall: West (A275°, 195.42 ft², width 9.833 ft)	195.4	0.319	0	0	0	0	0
VC.6: Interior Floor: Horizontal (968.94 ft², width 55.642 ft)	968.9	0.048	0	0	0	0	0
VC.7: Exterior Wall 1F: South (A185°, 537.15 ft², width 2.573 ft)	537.1	0.046	0.4	0.9	100	3693.8	5980.3
VC.7: Exterior Wall 1F: NE (A50°, 132.41 ft², width 11.034 ft)	132.4	0.046	0.4	0.9	100	910.5	1474.1
VC.7: Exterior Wall 1F: East (A95°, 630.97 ft², width 10.26 ft)	631	0.046	0.4	0.9	100	4339	7024.8
VC.7: Exterior Wall 1F: North (A5°, 746.58 ft², width 43.077 ft)	746.6	0.046	0.4	0.9	100	5134.1	8312.1
VC.7: Exterior Wall 1F: West (A275°, 118 ft², width 9.833 ft)	118	0.046	0.4	0.9	100	811.5	1313.7
VC.8: Door: North (A5°, 75.11 ft², width 6.333 ft)	75.1	0.201	0.4	0.9	100	2241.8	3629.4
VC.8: Door: East (A95°, 64 ft², width 8 ft)	64	0.201	0.4	0.9	100	1910.1	3092.5

Degree hours [kFh/a]

	Heating	Cooling
Ambient heating	82.3	133.3
Ground heating	21.1	61.7



THERMAL BRIDGES

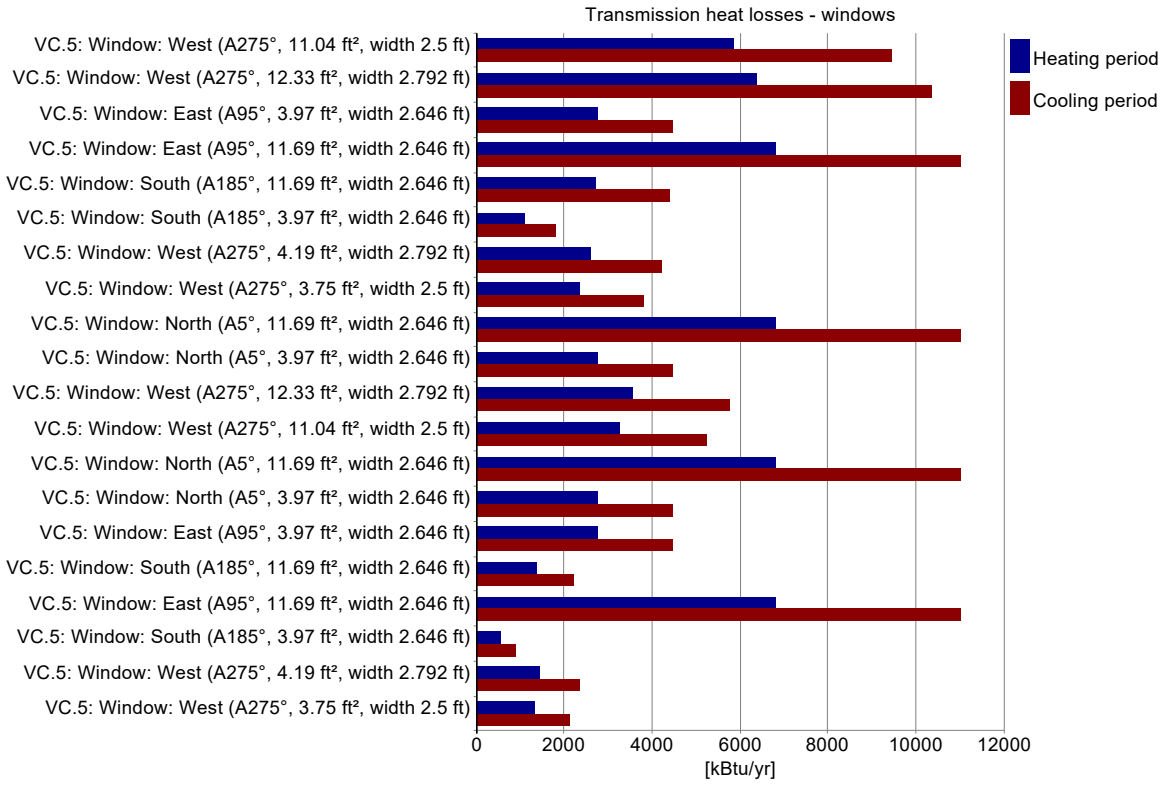
Transmission heat losses - thermal bridges

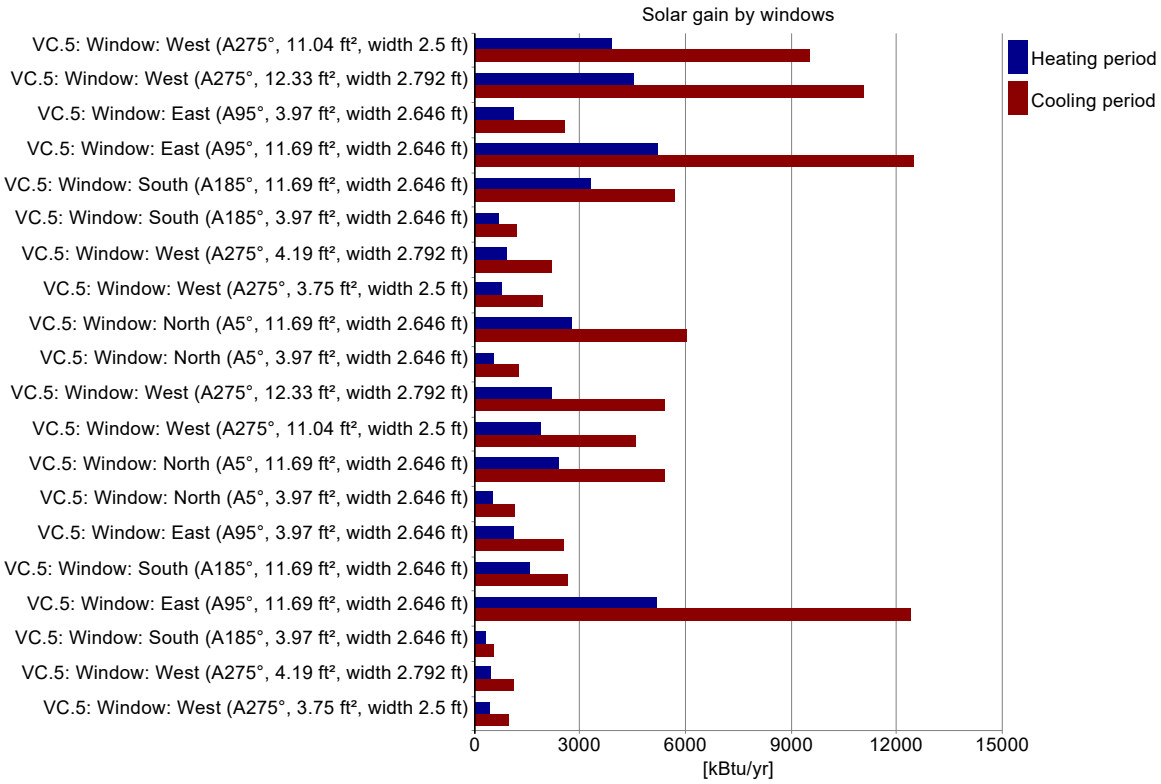
Name	Length [ft]	Psi-value [Btu/hr ft °F]	Transmission losses [kBtu/yr]	Transmission losses cooling [kBtu/yr]

WINDOWS

Transmission heat losses - windows

Name	Quan-tity	Incli-nation [°]	U-value total [Btu/hr ft² °F]	SHGC (perpen-dicular)	Reduction factor shading [%]	Reduction factor shading summer [%]	Solar gain heating [kBtu/yr]	Solar gain cooling [kBtu/yr]	Transmission losses heating [kBtu/yr]	Transmission losses cooling [kBtu/yr]
VC.5: Window: West (A275°, 11.04 ft², width 2.5 ft)	18	90	0.198	0.5	79.4	82.3	3,890.2	9,503.4	5,844.7	9,462.6
VC.5: Window: West (A275°, 12.33 ft², width 2.792 ft)	18	90	0.194	0.5	79.5	82.1	4,559.7	11,097.9	6,389.7	10,344.9
VC.5: Window: East (A95°, 3.97 ft², width 2.646 ft)	20	90	0.235	0.5	80.1	82.1	1,122.4	2,551.6	2,762	4,471.7
VC.5: Window: East (A95°, 11.69 ft², width 2.646 ft)	20	90	0.196	0.5	80.4	85.7	5,232.5	12,514.6	6,796.9	11,004.1
VC.5: Window: South (A185°, 11.69 ft², width 2.646 ft)	8	90	0.196	0.5	69.9	68.8	3,306.4	5,671.8	2,718.7	4,401.7
VC.5: Window: South (A185°, 3.97 ft², width 2.646 ft)	8	90	0.235	0.5	71	65.9	711.6	1,177.2	1,104.8	1,788.7
VC.5: Window: West (A275°, 4.19 ft², width 2.792 ft)	18	90	0.234	0.5	77.8	78.7	941	2,222.2	2,608.5	4,223.2
VC.5: Window: West (A275°, 3.75 ft², width 2.5 ft)	18	90	0.236	0.5	78.3	79.3	808.5	1,915.3	2,363.1	3,825.8
VC.5: Window: North (A5°, 11.69 ft², width 2.646 ft)	20	90	0.196	0.5	78.2	75.5	2,741.1	6,057.5	6,796.9	11,004.2
VC.5: Window: North (A5°, 3.97 ft², width 2.646 ft)	20	90	0.235	0.5	79.2	77.8	553.2	1,254.7	2,762	4,471.7
VC.5: Window: West (A275°, 12.33 ft², width 2.792 ft)	10	90	0.194	0.5	69.5	72	2,200.4	5,387.1	3,549.8	5,747.2
VC.5: Window: West (A275°, 11.04 ft², width 2.5 ft)	10	90	0.198	0.5	69.3	71.9	1,874.6	4,603.2	3,247	5,257
VC.5: Window: North (A5°, 11.69 ft², width 2.646 ft)	20	90	0.196	0.5	69.7	67.8	2,410.9	5,395.5	6,796.9	11,004.2
VC.5: Window: North (A5°, 3.97 ft², width 2.646 ft)	20	90	0.235	0.5	73.5	72.6	507.7	1,163.5	2,762	4,471.7
VC.5: Window: East (A95°, 3.97 ft², width 2.646 ft)	20	90	0.235	0.5	79.3	81.2	1,112.7	2,526.2	2,762	4,471.7
VC.5: Window: South (A185°, 11.69 ft², width 2.646 ft)	4	90	0.196	0.5	65.9	64.9	1,557.5	2,673	1,359.4	2,200.8
VC.5: Window: East (A95°, 11.69 ft², width 2.646 ft)	20	90	0.196	0.5	79.6	84.9	5,179.7	12,390.2	6,796.9	11,004.1
VC.5: Window: South (A185°, 3.97 ft², width 2.646 ft)	4	90	0.235	0.5	69.4	64.7	347.4	575.8	552.4	894.3
VC.5: Window: West (A275°, 4.19 ft², width 2.792 ft)	10	90	0.234	0.5	69.7	70.8	465.1	1,105.2	1,449.2	2,346.2
VC.5: Window: West (A275°, 3.75 ft², width 2.5 ft)	10	90	0.236	0.5	70.5	71.6	403	959.1	1,312.8	2,125.4





Summary building envelope

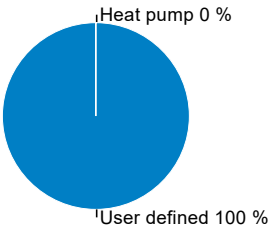
	Total area / length	Average U-value / Psi value	Transmission losses
Exterior wall ambient:	**20,855.5** ft²	**0.037** Btu/hr ft² °F	**113,839.7** kBtu/yr
Exterior wall ground:	**0** ft²	**0** Btu/hr ft² °F	**0** kBtu/yr
Basement:	**6,506.5** ft²	**0.063** Btu/hr ft² °F	**15,504.1** kBtu/yr
Roof:	**3,090.9** ft²	**0.02** Btu/hr ft² °F	**9,016.2** kBtu/yr
Windows:	**2,316.9** ft²	**0.206** Btu/hr ft² °F	**70,735.5** kBtu/yr
Doors:	**0** ft²	**0** Btu/hr ft² °F	**0** kBtu/yr
Thermal bridge ambient:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr
Thermal bridge perimeter:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr
Thermal bridge floor slab:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr

Shading

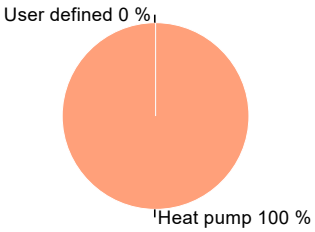
	Heating	Cooling
Reduction factor North:	**74.4** %	**72.3** %
Reduction factor East:	**79.9** %	**84.7** %
Reduction factor South:	**68.9** %	**67.2** %
Reduction factor West:	**75.7** %	**78.1** %
Reduction factor Horizontal:	**100** %	**100** %

System	DHW			Heating			Total		
	Covered DHW demand [%]	Estimated solar fraction [%]	Final energy demand [kBtu/yr]	Covered heating demand [%]	Estimated solar fraction [%]	Final energy demand [kBtu/yr]	Performance ratio	CO2 equivalent emissions [lb/yr]	Source energy demand [kBtu/yr]
Heat pump, Mitsubishi VRF (PURY)	0	0	0	100	0	12,261.4	0	5,387.7	34,332
User defined, Lochinvar Armor AWN601PM (96% Thermal Eff. Rated by .03 per PHIUS	100	0	391,444.1	0	0	0	1.1	63,239.7	430,588.5
Σ	100	0	391,444.1	100	0	12,261.4		68,627.3	464,920.5

DHW - final energy



Heating - final energy



COOLING UNITS

	sensible	latent
Air cooling:	**0** kBtu/ft²yr	**0** kBtu/ft²yr
Recirculation cooling:	**3.4** kBtu/ft²yr	**2.4** kBtu/ft²yr
Additional dehumidification:		**0** kBtu/ft²yr
Panel cooling:	**0** kBtu/ft²yr	
Sum:	**3.4** kBtu/ft²yr	**2.4** kBtu/ft²yr

VENTILATION

Energy transportable by supply air

Heating energy

transportable: **2.91** W/ft²

load: **1.08** W/ft²

Cooling energy

transportable: **1.76** W/ft²

load: **0.97** W/ft²

Infiltration pressure test ACH50: **0.49** 1/hr

Total extract air demand: **5,200** cfm

Supply air per person: **12** cfm

Occupancy: **225**

Average air flow rate: **5,200** cfm

Average air change rate: **0.89** 1/hr

Effective ACH ambient: **0.21** 1/hr

Effective ACH ground: **0** 1/hr

Energetically effective air exchange: **0.21** 1/hr

Infiltration air change rate: **0.03** 1/hr

Infiltration air change rate (heating load): **0.09** 1/hr

Type of ventilation system: **Balanced PH ventilation**

Wind screening coefficient (e): **0.07**

Wind exposure factor: **15**

Wind shield factor: **0.05**

Ventilation heat losses: **184,761.43** kBtu/yr

Devices

Name	Sensible recovery efficiency [-]	Electric efficiency [W/cfm]	Heat recovery efficiency SHX [-]	Effective recovery efficiency [-]
Pending MECH drawings	0.8	0.05	0	0.8
Altogether	0.8	0.05	0	0.8

Ducts

Name	Length (total) [ft]	Clear cross-section [ft²]	U-value [Btu/hr ft² °F]	Assigned ventilation units
ERV-1	10	2.7778	7.82	Pending MECH drawings
ERV-1	10	2.7778	7.82	Pending MECH drawings
ERV-2	10	2.7778	7.82	Pending MECH drawings
ERV-2	10	2.7778	7.82	Pending MECH drawings
Σ	40			

*length * quantity ** thermal conductivity / thickness

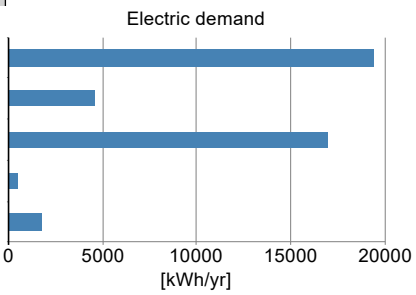
SUMMER VENTILATION

ACH night ventilation: **0** 1/hr

ACH natural summer: **0** 1/hr

ELECTRICITY DEMAND - AUXILIARY ELECTRICITY

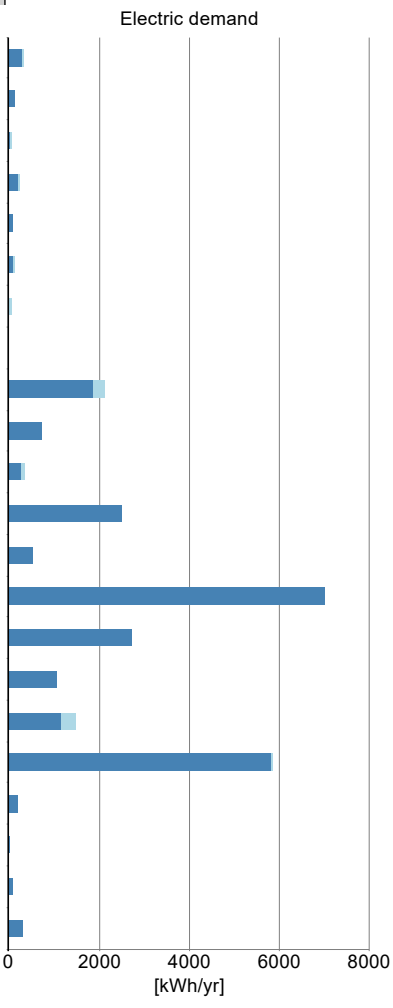
Type	Quantity	Indoor	Norm demand	Electric demand [kWh/yr]	Source energy [kBtu/yr]
Ventilation winter	1	no	0.8 W/cfm	19454.1	185845.8
Ventilation Defrost	1	no	24,375 W	4546.7	43435
Ventilation summer	1	no	0.8 W/cfm	16987.5	162282.8
DHW circulating pump	1	no	56.4 W	452.4	4322
DHW storage load pump	1	no	261.1 W	1767.2	16882.6
Σ				43208	412768.1



ELECTRICITY DEMAND NON-RESIDENTIAL BUILDING

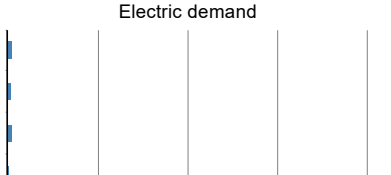
Equipment

Type	Quantity	Indoor	Utilization pattern	Power rating norm demand	Electric demand [kWh/yr]	Source energy [kBtu/yr]
PC	4	yes	Pattern 2: Classrom	80 (+30) W	302.4 (+37.8)	3249.9
Monitor	4	yes	Pattern 2: Classrom	31 (+2) W	117.2 (+2.5)	1143.5
Printer	1	yes	Pattern 2: Classrom	300 (+17) W	42 (+21.4)	605.9
PC	2	yes	Pattern 7: Workgroup Office	80 (+30) W	215.6 (+34.7)	2390.7
Monitor	2	yes	Pattern 7: Workgroup Office	31 (+2) W	83.5 (+2.3)	820.2
Printer	1	yes	Pattern 7: Workgroup Office	300 (+17) W	82.5 (+42.1)	1190.1
PC	1	yes	Pattern 6: Workshop	80 (+30) W	0 (+67.5)	644.8
Monitor	1	yes	Pattern 6: Workshop	31 (+2) W	0 (+4.5)	43
PC	25	yes	Pattern 2: Classrom	80 (+30) W	1,890 (+236.3)	20312.2
Monitor	25	yes	Pattern 2: Classrom	31 (+2) W	732.4 (+15.8)	7146.9
Printer	2	yes	Pattern 2: Classrom	1,000 (+30) W	280 (+75.6)	3397.1
User defined	1	yes		2,500 (+0) W	2,500 (+0)	23882.6
Telephone system	1	yes		60 (+0) W	525.6 (+0)	5021.1
PC	30	yes	Pattern 8: Hospital	80 (+30) W	7,008 (+0)	66947.8
Monitor	30	yes	Pattern 8: Hospital	31 (+2) W	2,715.6 (+0)	25942.3
Telephone system	2	yes		60 (+0) W	1,051.2 (+0)	10042.2
Printer	2	yes	Pattern 8: Hospital	1,000 (+30) W	1,168 (+315.4)	14170.6
Server	1	yes	Pattern 8: Hospital	1,000 (+2) W	5,840 (+5.8)	55845.6
Cooktop	1	yes	Pattern 1: Meeting, Conference	0.3 kWh/meal	187.5	1791.2
Dishwasher	1	yes	Pattern 1: Meeting, Conference	0.1 kWh/cover	41.3	394.1
Refrigerator	1	yes		0.3 kWh/d	102.2	976.3
Refrigerator	3	yes		0.3 kWh/d	306.6	2929
Σ	141				25,191.6 (+861.6)	248886.9



Lighting

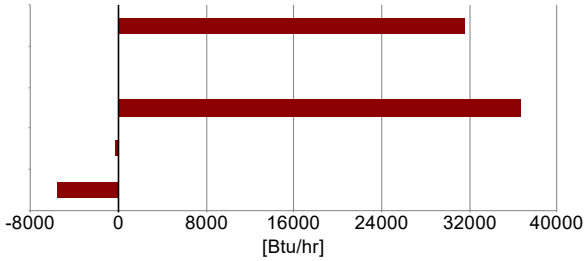
Name	Utilization pattern	Installed lighting power [W/ft²]	Daylight utilization	Lighting full load hours [hrs/yr]	Electric demand [kWh/yr]	Source energy [kBtu/yr]
Lighting 1: 101 Community Room	Pattern 1: Meeting, Conference	0.6	Good	1543.7	418.5	3998.3
Lighting 2: 102 Student Resources	Pattern 2: Classrom	0.6	Good	988.6	290.4	2773.8
Lighting 3: 103 Lobby	Pattern 3: Traffic/Circulation Area	0.6	None	770	313.1	2991.5
Lighting 4: 104 Stair	Pattern 3: Traffic/Circulation	0.6	None	770	69.6	664.8



INTERNAL HEAT GAINS

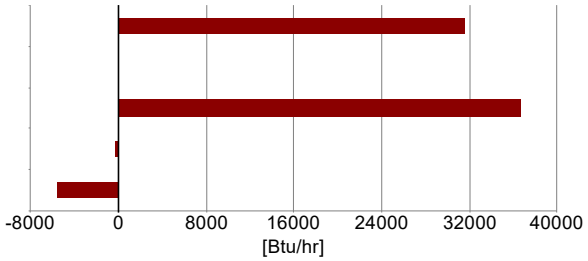
Heating season

Electricity total:	**31,571.5**	Btu/hr
Auxiliary electricity:	**0**	Btu/hr
People:	**36,793.5**	Btu/hr
Cold water:	**-292.7**	Btu/hr
Evaporation:	**-5,527.7**	Btu/hr
Σ:	**79,687.1**	Btu/hr
Specific internal heat gains:	**2.1**	Btu/hr ft²



Cooling season

Electricity total:	**31,571.5**	Btu/hr
Auxiliary electricity:	**0**	Btu/hr
People:	**36,793.5**	Btu/hr
Cold and hot water:	**-292.7**	Btu/hr
Evaporation:	**-5,527.7**	Btu/hr
Σ:	**79,687.1**	Btu/hr
Specific internal heat gains:	**2.1**	Btu/hr ft²



DHW AND DISTRIBUTION

DHW consumption per person per day:	**3.2**	gal/Person/day
Average cold water temperature supply:	**52.8**	°F
Useful heat DHW:	**190,776.1**	kBtu/yr
Specific useful heat DHW:	**5,066.8**	Btu/ft²yr
Total heat losses of the DHW system:	**155,634.6**	kBtu/yr
Specific losses of the DHW system:	**4,133.5**	Btu/ft²yr
Performance ratio DHW distribution system and storage:	**1.8**	
Utilization ratio DHW distribution system and storage:	**0.6**	
Total heat demand of DHW system:	**346,410.7**	kBtu/yr
Total specific heat demand of DHW system:	**9,200.3**	Btu/ft²yr
Total heat losses of the hydronic heating distribution:	**0**	kBtu/yr
Specific losses of the hydronic heating distribution:	**0**	Btu/ft²yr
Performance ratio of heat distribution:	**100**	%

Region	Length [ft]	Annual heat loss [kBtu/yr]
Hydronic heating distribution pipes		
Σ	0	0
DHW circulation pipes		
In conditioned space	50	1467.3
Σ	50	1467.3
Individual pipes		
In conditioned space	300	154167.3
Σ	300	154167.3
Water storage		
Device 4 (Water storage: DHW): Lochinvar RJA120 Lock-Temp Stainless Steel 119-gallon		0
Σ		0

Property/Site

Building name: Rindge Commons Building A Residential

Property information

Owner's name:	Just-A-Start Corporation
Property address:	402 Rindge Ave
City:	Cambridge
Zip:	02140

Site information

Climate Location **MA - BOSTON LOGAN INT ARPT (AMeDAS standard year)**

Building

Building Information

Area of Conditioned Space	**26,524** ft²
Volume of conditioned space	**236,651** ft³
Number of bedrooms	**38**
Foundation Type	**Slab on grade**
Winter setpoint temperature	**68** °F
Summer setpoint temperature	**77** °F

Slab floor

Name	Area [ft²]	Assembly
Slab	1,437.5	Concrete Slab 3.5" EPS (R-15)

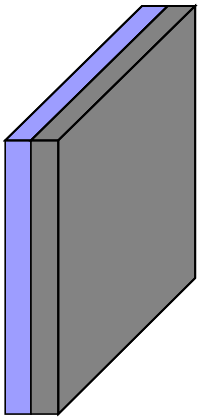
Assembly (Id.15): Concrete Slab 3.5" EPS (R-15)

Homogenous layers

Thermal resistance: 15.004 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.063 Btu/hr ft² °F

Thickness: 7.64 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Expanded Polystyrene Insulation	0.92	0.35	0.0208	3.64	
2	Concrete	131.35	0.19	0.7933	4	

Slab on grade

Floor slab area	**1,437.5** ft²
U-Value of basement slab	**0.1** Btu/hr ft² °F
Floor slab perimeter (P)	**220** ft
Total R-value of perimeter insulation	**14** hr ft² °F/Btu

Above-grade walls & Rim/band joists

Name	Orientation	Area [ft²]	Short wave radiation absorption	Assembly
Exterior Wall 2-6F	S (20 %), E (34 %), W (32 %), N (14 %)	9,936.9	0.4	Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)
Roof	Horizontal (100 %)	10,520	0.4	Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Opaque Door	S (43 %), E (43 %), W (14 %)	172.4	0.4	Door (R-4)
Exterior Wall 1F	S (51 %), E (17 %), W (20 %), N (12 %)	1,720.1	0.4	Steel Frame, 5.5" Fiberglass (R-9.17), 2.5" Mineral Wool (R-10)
Total		**22,349.5**		

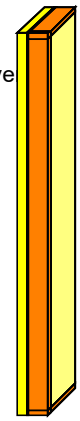
Assembly (Id.9): Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)

Inhomogenous layers

Thermal resistance: 27.581 / 29.559 hr ft² °F/Btu (EN ISO 6946 / homogenous laye

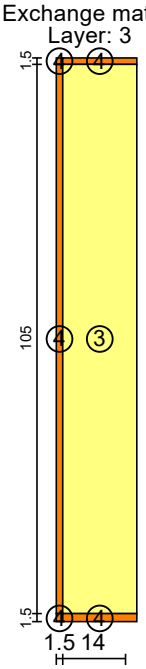
Heat transfer coefficient (U-value): 0.035 Btu/hr ft² °F

Thickness: 8.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	dena Mineral Wool (heat cond.: 0.035 W/mK)	3.75	0.2	0.0208	2.5	
2	Plywood (USA)	29.34	0.45	0.0485	0.5	
3	Fibre Glass	1.87	0.2	0.0245	5.5	
Exchange materials						
4	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.9): Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)



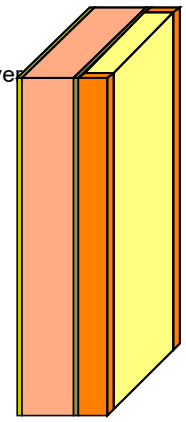
Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)

Inhomogenous layers

Thermal resistance: 50.006 / 52.321 hr ft² °F/Btu (EN ISO 6946 / homogenous layer

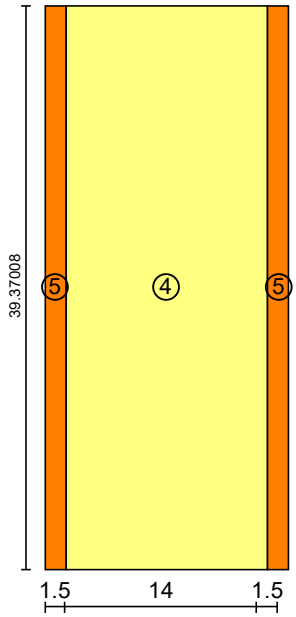
Heat transfer coefficient (U-value): 0.02 Btu/hr ft² °F

Thickness: 10.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Fiberboard	18.79	0.33	0.0285	0.5	
2	Polyisocyanurate Insulation	1.65	0.35	0.0139	6	
3	Plywood (USA)	29.34	0.45	0.0485	0.5	
4	Fibre Glass	1.87	0.2	0.0208	3.5	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Layer: 4



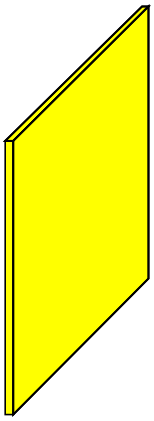
Assembly (Id.8): Door (R-4)

Homogenous layers

Thermal resistance: 4 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.201 Btu/hr ft² °F

Thickness: 1 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Cellulose Fiber (heat cond.: 0,04 W/mK)	4.37	0.33	0.0208	1	

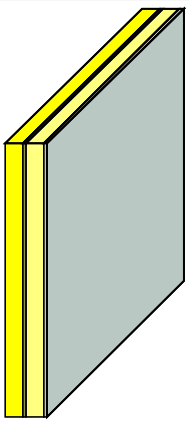
Assembly (Id.7): Steel Frame, 5.5" Fiberglass (R-9.17), 2.5" Mineral Wool (R-10)

Homogenous layers

Thermal resistance: 20.585 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.046 Btu/hr ft² °F

Thickness: 6.039 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	dena Mineral Wool (heat cond.: 0.035 W/mK)	3.75	0.2	0.0208	2.5	
2	Plywood (USA)	29.34	0.45	0.0485	0.5	
3	Fibre Glass (Steal Frame)	1.87	0.2	0.0219	2.414	
4	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	

Adiabatic walls

Name	Area [ft²]	Assembly
Interior Wall	4,407.7	Adiabatic Wall
Interior Floor	10,051.4	Adiabatic Floor (3.5" Sound Batt)
Interior Ceiling	968.9	Adiabatic Floor (3.5" Sound Batt)
Total	**15,428.1**	

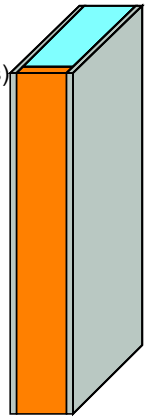
Assembly (Id.22): Adiabatic Wall

Inhomogenous layers

Thermal resistance: 2.137 / 2.012 hr ft² °F/Btu (EN ISO 6946 / homogenous layers)

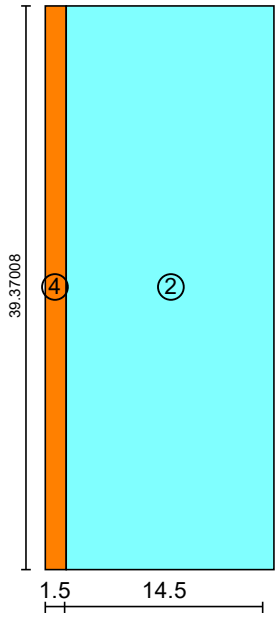
Heat transfer coefficient (U-value): 0.322 Btu/hr ft² °F

Thickness: 7.156 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
2	Air Layer 150 mm	0.08	0.24	0.5431	5.906	
3	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
Exchange materials						
4	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.22): Adiabatic Wall
Layer: 2



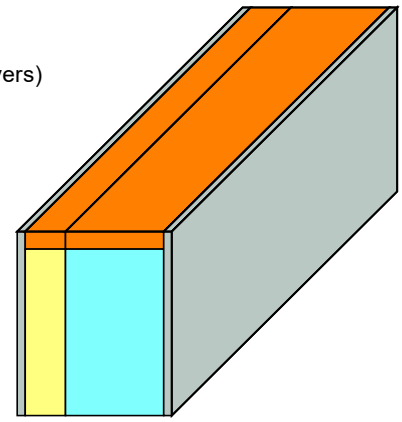
Assembly (Id.23): Adiabatic Floor (3.5" Sound Batt)

Inhomogenous layers

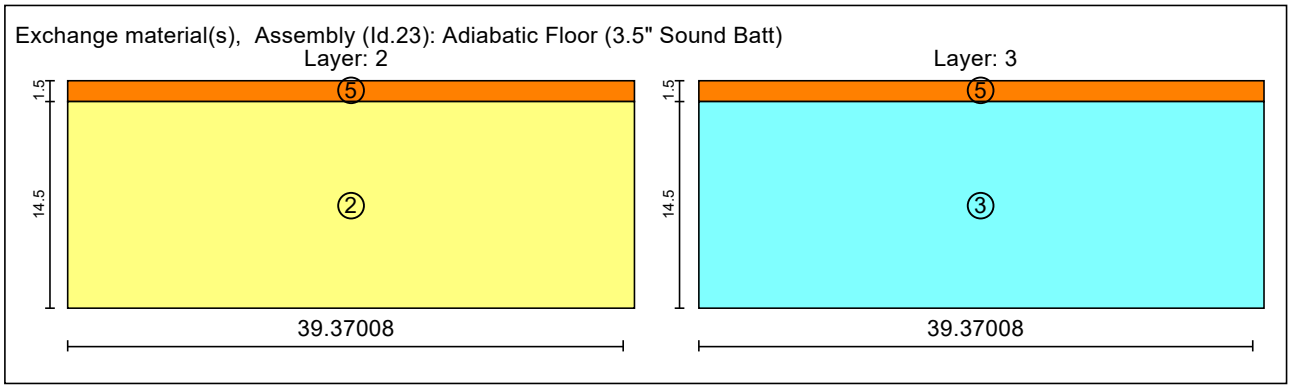
Thermal resistance: 19.442 / 19.817 hr ft² °F/Btu (EN ISO 6946 / homogenous layers)

Heat transfer coefficient (U-value): 0.048 Btu/hr ft² °F

Thickness: 13.25 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
2	Fibre Glass	1.87	0.2	0.0245	3.5	
3	Air Layer 30 mm	0.08	0.24	0.104	8.5	
4	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	



Windows and Glass Doors

Name	Orientation	Area [ft²]	Window type
Window	S (9 %), E (38 %), W (46 %), N (6 %)	2,097.9	U -.18 (Operable)
Glazed Door	N (100 %)	50.7	U - .33
Total		**2,148.6**	

Window type (Id 1): U -.18 (Operable)

Basic data

Uw -mounted [Btu/hr ft² °F]	0.1813
Frame factor	0.6884
Glass U-value [Btu/hr ft² °F]	0.132
SHGC/Solar energy transmittance (perpendicular)	0.46

Frame data

Setting	Left	Right	Top	Bottom
Frame width [in]	4.5	4.5	4.5	4.5
Frame U-value [Btu/hr ft² °F]	.15	.15	.15	.15
Glazing-to-frame psi-value [Btu/hr ft °F]	.023	.023	.023	.023
Frame-to-Wall psi-value [Btu/hr ft °F]	.029	.029	.029	.029

Solar radiation angle dependent data

Angle [°]	Total solar trans.
0	

Window type (Id 3): U - .33

Basic data

Uw -mounted [Btu/hr ft² °F]	0.3333
Frame factor	0.8198
Glass U-value [Btu/hr ft² °F]	0.27
SHGC/Solar energy transmittance (perpendicular)	0.59

Frame data

Setting	Left	Right	Top	Bottom
Frame width [in]	2.5	2.5	2.5	2.5
Frame U-value [Btu/hr ft² °F]	.37	.37	.37	.37
Glazing-to-frame psi-value [Btu/hr ft °F]	.023	.023	.023	.023
Frame-to-Wall psi-value [Btu/hr ft °F]	.029	.029	.029	.029

Solar radiation angle dependent data

Angle [°]	Total solar trans.
0	

Ceilings

Name	Area [ft²]	Short wave radiation absorption	Assembly
Roof	10,520	0.4	Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)

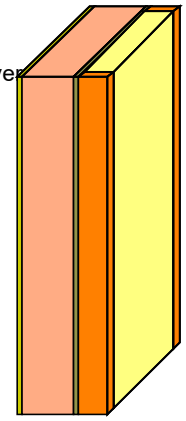
Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)

Inhomogenous layers

Thermal resistance: 50.006 / 52.321 hr ft² °F/Btu (EN ISO 6946 / homogenous layer)

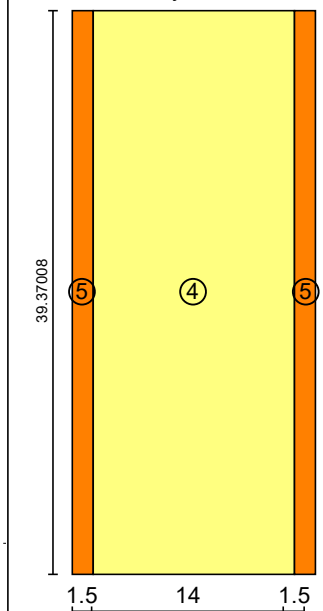
Heat transfer coefficient (U-value): 0.02 Btu/hr ft² °F

Thickness: 10.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Fiberboard	18.79	0.33	0.0285	0.5	
2	Polyisocyanurate Insulation	1.65	0.35	0.0139	6	
3	Plywood (USA)	29.34	0.45	0.0485	0.5	
4	Fibre Glass	1.87	0.2	0.0208	3.5	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Layer: 4



Space heating

Type	Performance ratio of heat generator [-]	Fuel type
Heat pump	0.28	Electricity

Space cooling

Type	Distribution	Capacity [kBtu/hr]	COP
Heat pump	| Recirculation air	288	5.57
Total		**288**	

Water heating

Type	Performance ratio of heat generator [-]	Fuel type
User defined	1.13	Natural Gas

Water storage

Nr	Capacity [gal]
4	119
Total	**119**

Infiltration/Ventilation

ACH @ 50 Pascal **0.6** 1/hr

CFM @ 50 Pascal **1,555** cfm

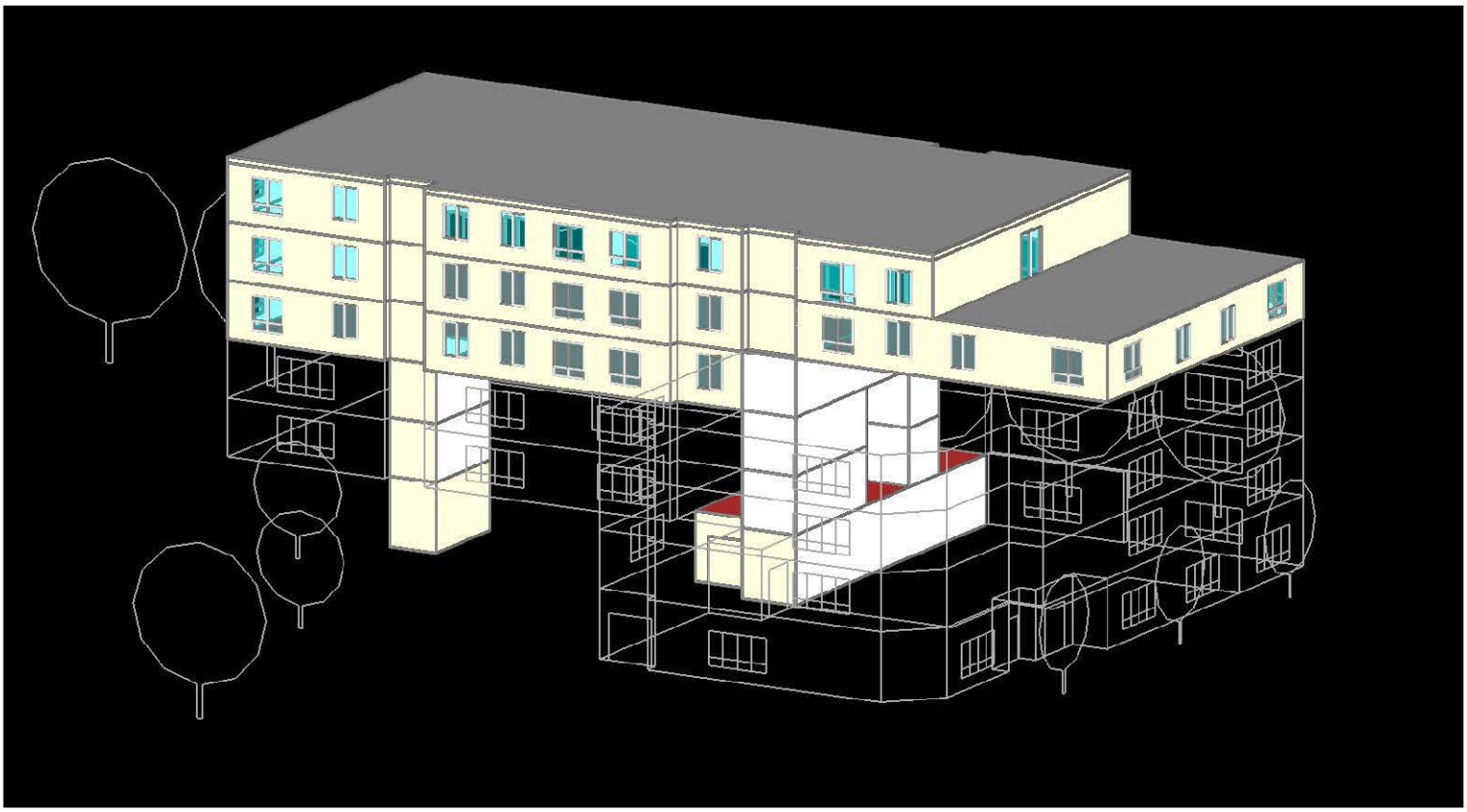
Nr	Sensible recovery efficiency [-]	Rate [cfm]	Electric efficiency [W/cfm]	Fan [W]	Defrost	Temperature below which defrost must be used [°F]	Subsoil heat exchanger efficiency [-]
1	0.47	959.38	0.03	767.51	yes	13.54	0
Total	**0.46**	**959.38**		**767.51**			

Lights and appliances

Type	Energy use [kWh/yr]	In conditioned space
Kitchen refrigerator	10,152	yes
Kitchen dishwasher	2,309.54	yes
Kitchen cooking	6,200	yes
Laundry - washer	1,078.54	yes
Laundry - dryer	8,630.65	yes
Energy consumed by evaporation	0 (360.5)	yes
User defined lighting	31,069	yes
User defined lighting	2,524	no
User defined MELs	26,668	yes
Ventilation winter	6,098.1	no
Ventilation Defrost	1,454.32	no
Ventilation summer	5,324.94	no
DHW circulating pump	373.9	yes
DHW storage load pump	485.9	yes
Total	**102,368.9**	

NEW ECOLOGY Community-Based Sustainable Development	Project Name:		**Rindge Commons Building A (Residential)**	
	Climate		Boston Logan International Airport	
	Case		Reference Building (VRF Option)	PHIUS+ Core
Change from the Reference Building **Meets PHIUS Target** **Misses PHIUS Target**	Notes		Baseline envelope provided in drawings, VRF Heating & Cooling, Central Gas-Fired DHW	Upgraded envelope from reference building with added Solar PV to meet PHIUS+ Core requirements. VRF Heating and Cooling, Central Gas-Fired DHW
WUFI PASSIVE RESULTS	**Units**	**Target**		
Heating Demand	kBtu/ft2.yr	3.80	**7.07**	**2.61**
Cooling Demand	kBtu/ft2.yr	6.00	**2.70**	**3.37**
Heating Load	Btu/hr.ft2	3.70	**7.20**	**3.40**
Cooling Load	Btu/hr.ft2	3.10	**3.20**	**2.98**
SITE ENERGY RESULTS	**Units**	**Target**		
Source Energy	kWh/person.yr	5,500	**6,427**	**5,288**
Site Energy Use Index	kBtu/ft2.yr	-	**21**	**18**
Site Energy Consumption	kWh/yr	-	**166,980**	**142,104**
Geometry	**Units**			
Interior Conditioned Floor Area (iCFA)	ft2		26,524	26,524
Net Volume	ft3		236,651	236,651
Envelope Area	ft2		25,936	25,936
Average Window-to-Wall Ratio	%		16%	16%
Exterior Envelope	**Units**			
Roof	R		50	50
Exterior Wall (1F)	R (effective)		21	21
Exterior Wall (4-6F)	R (effective)		28	28
Slab	R		15	15
Window	U		0.27	0.18
	SHGC		0.3	0.3
Glazed Door	U		0.33	0.33
	SHGC		0.4	0.4
Opaque Door	R		4	4
Airtightness	**Units**			
Air changes per hour at 50 Pa	ACH50		**3.00**	**0.63**
Lighting Assumptions	**Units**			
Lighting	kWh/yr		31,069	31,069
Plug Loads	**Units**			
Miscellaneous Electric Loads	kWh/yr		26,668	26,668
Occupancy	**Units**			
Bedrooms	#		38	38
Average Occupancy	# Bedrooms + 1		62	62
Appliances	**Units**			
Refrigerator	kWh/year/unit		423	423
Dishwasher	kWh/year/unit		260	260
Clothes Washer	kWh/year/unit		116	116
Clothes Dryer	Energy Factor		3.4	3.4
Electric Cooktop	kWh/use		0.2	0.2
Ventilation	**Units**			
Dryer Exhaust	cfm		125	125
ERV Ventilation	cfm		1,630	1,630
ERV Power	W/cfm		1.0	0.8
ERV Recovery Effiency	%		80%	80%
Mechanical Systems	**Units**			

Heat Pumps	Heating COP	3.56	3.56
	Cooling COP	5.6	5.6
Domestic Hot Water	**Units**		
Water Heater Thermal Efficiency	%	88%	88%
DHW Pump	kW	0.20	0.20
Recirculation Pump	kW	0.05	0.05
Renewable Generation	**Units**		
Solar PV	kWh/yr	0	15,000



BUILDING INFORMATION

Category:	**Residential**
Status:	**In planning**
Building type:	**New construction**
Year of construction:	
Units:	**24**
Number of occupants:	**62 (Design)**
Occupant density:	**427.8** ft²/Person

Boundary conditions

Climate: **MA - BOSTON LOGAN INT ARPT (AMeDAS standard year)**

Internal heat gains:	**1.1** Btu/hr ft²
Interior temperature:	**68** °F
Overheat temperature:	**77** °F

Building geometry

Enclosed volume:	**292,459.4** ft³
Net-volume:	**236,651** ft³
Total area envelope:	**25,935.6** ft²
Area/Volume Ratio:	**0.1** 1/ft
Floor area:	**26,524** ft²
Envelope area/iCFA:	**0.978**

PASSIVEHOUSE REQUIREMENTS

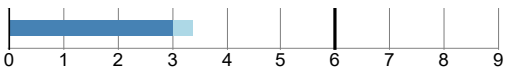
Certificate criteria: PHIUS+ 2018

Heating demand

specific:	**2.61** kBtu/ft²yr
target:	**3.8** kBtu/ft²yr
total:	69,348.92 kBtu/yr

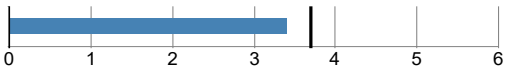
Cooling demand

sensible:	**3** kBtu/ft²yr
latent:	**0.38** kBtu/ft²yr
specific:	**3.37** kBtu/ft²yr
target:	**6** kBtu/ft²yr
total:	89,413.82 kBtu/yr



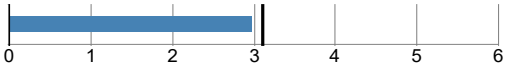
Heating load

specific:	**3.4** Btu/hr ft²
target:	**3.7** Btu/hr ft²
total:	90,079.64 Btu/hr



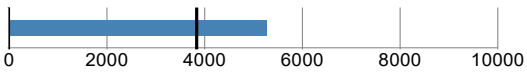
Cooling load

specific:	**2.98** Btu/hr ft²
target:	**3.1** Btu/hr ft²
total:	78,952.14 Btu/hr



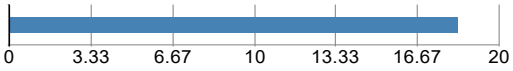
Source energy

total:	**327,885.39**	kWh/yr
specific:	**5,288**	kWh/Person yr
target:	**3,840**	kWh/Person yr
total:	**1,118,680.97**	kBtu/yr
specific:	42.18	kBtu/ft²yr



Site energy

total:	484,680.29	kBtu/yr
specific:	18.28	kBtu/ft²yr
total:	142,059.79	kWh/yr
specific:	5.36	kWh/ft²

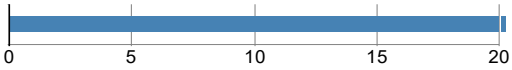


Air tightness

ACH50:	**0.63**	1/hr
CFM50 per envelope area:	**0.06**	cfm/ft²
target:	**0.63**	1/hr
target CFM50:	**0.06**	cfm/ft²

PASSIVEHOUSE RECOMMENDATIONS

Sensible recovery efficiency:	**78.4**	%
Frequency of overheating: Cooling system is required	**33.5**	%



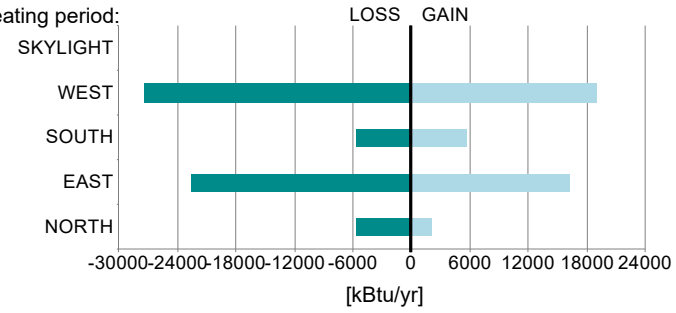
Frequency of overheating only applies if there is not a [properly sized] cooling system installed.

BUILDING ELEMENTS

Windows

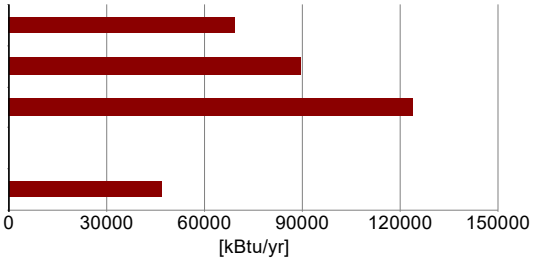
Average SHGC:	**0.46**	
Average solar reduction factor heating:	**0.38**	
Average solar reduction factor cooling:	**0.4**	
Average U-value:	**0.203**	Btu/hr ft² °F
Total glazing area:	**1,237.1**	ft²
Total window area:	**2,148.6**	ft²

Heat gain/loss heating period:



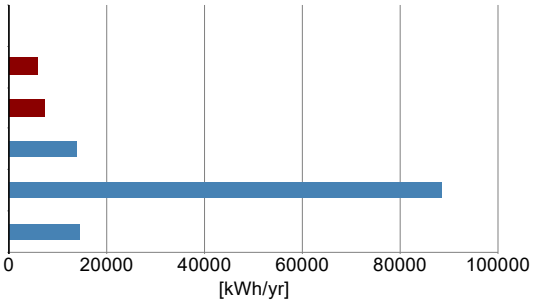
HVAC

Total heating demand:	**69,349**	kBtu/yr
Total cooling demand:	**89,414**	kBtu/yr
Total DHW energy demand:	**124,114**	kBtu/yr
Solar DHW contribution:	**0**	kBtu/yr
Auxiliary electricity:	**46,869**	kBtu/yr



Electricity

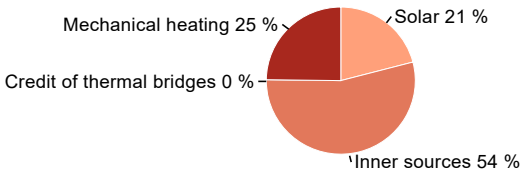
Direct heating / DHW:	**0**	kWh/yr
Heatpump heating:	**5,710**	kWh/yr
Cooling:	**7,274**	kWh/yr
HVAC auxiliary energy:	**13,737**	kWh/yr
Appliances:	**88,632**	kWh/yr
Renewable generation, coincident production and use:	**14,400**	kWh/yr
Total electricity demand:	**100,953**	kWh/yr



HEAT FLOW - HEATING PERIOD

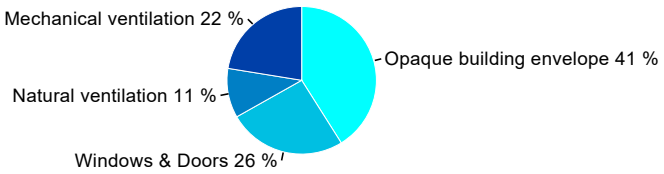
Heat gains

Solar:	**53,001**	kBtu/yr
Inner sources:	**137,295**	kBtu/yr
Credit of thermal bridges:	**0**	kBtu/yr
Mechanical heating:	**69,349**	kBtu/yr



Heat losses

Opaque building envelope:	**106,757**	kBtu/yr
Windows & Doors:	**66,587**	kBtu/yr
Natural ventilation:	**28,115**	kBtu/yr
Mechanical ventilation:	**58,186**	kBtu/yr

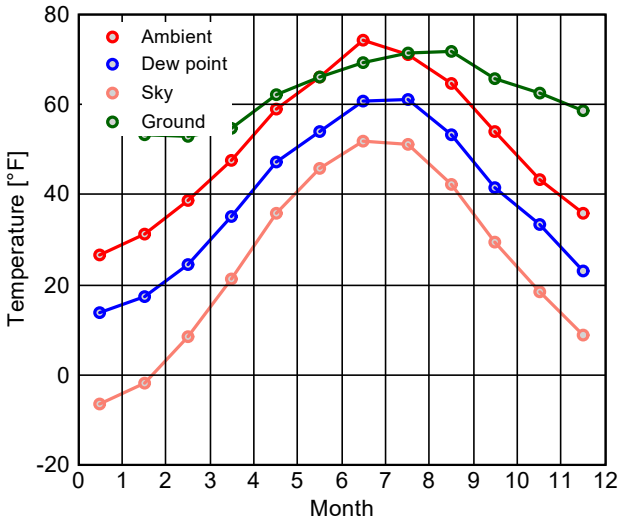


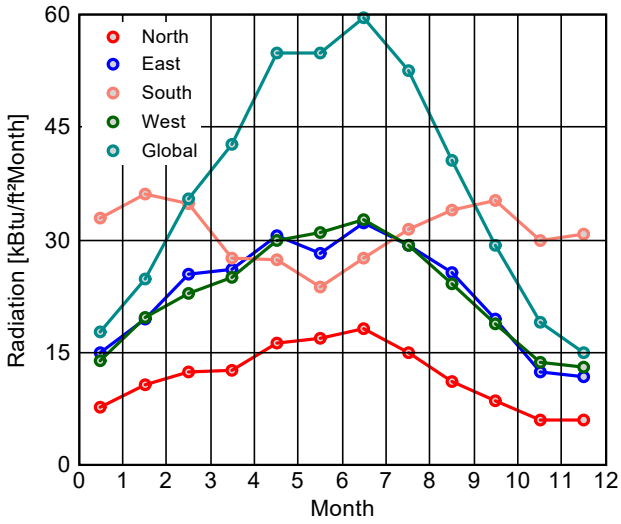
CLIMATE

Latitude:	**42.4**	°
Longitude:	**-71**	°
Elevation of weather station:	**19.7**	ft
Elevation of building site:	**2**	ft
Heat capacity air:	**0.018**	Btu/ft³F
Daily temperature swing summer:	**14.8**	°F
Average wind speed:	**13.1**	ft/s

Ground

Average ground surface temperature:	**52.8**	°F
Amplitude ground surface temperature:	**55.8**	°F
Ground thermal conductivity:	**1.2**	Btu/hr ft °F
Ground heat capacity:	**29.8**	Btu/ft³F
Depth below grade of groundwater:	**9.8**	ft
Flow rate groundwater:	**0.2**	ft/d





Calculation parameters

Length of heating period	**212**	days/yr
Heating degree hours	**140.8**	kFh/a
Phase shift months	**1.3**	mths
Time constant heating demand	**165.7**	hr
Time constant cooling demand	**0**	hr
Time constant cooling demand with night ventilation	**0**	hr

Climate for	Heating load 1	Heating load 2	Cooling
Temperature [°F]	16.9	31.6	83.5
Solar radiation North [Btu/hr ft²]	12	7.9	27.6
Solar radiation East [Btu/hr ft²]	22.8	13.3	61.5
Solar radiation South [Btu/hr ft²]	49.5	27.3	41.8
Solar radiation West [Btu/hr ft²]	22.2	11.4	53.3
Solar radiation Global [Btu/hr ft²]	26.9	16.5	101.4

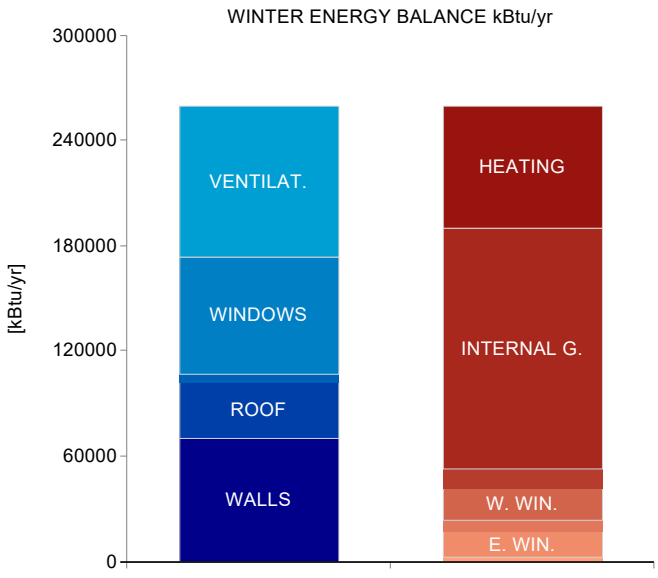
Relevant boundary conditions for heating load calculation: Heating load 1

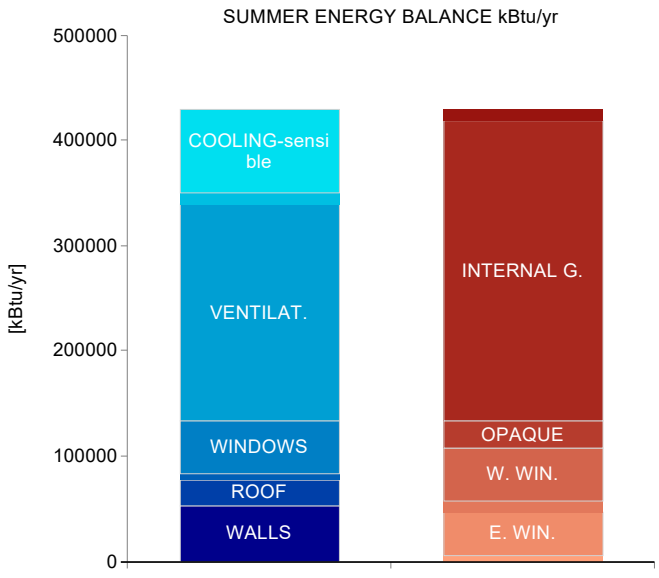
ANNUAL HEAT DEMAND

Transmission losses :	**173,344**	kBtu/yr
Ventilation losses:	**86,301**	kBtu/yr
Total heat losses:	**259,645**	kBtu/yr
Solar heat gains:	**58,556**	kBtu/yr
Internal heat gains:	**151,684**	kBtu/yr
Total heat gains:	**210,240**	kBtu/yr
Utilization factor:	**90.5**	%
Useful heat gains:	**190,296**	kBtu/yr
Annual heat demand:	**69,349**	kBtu/yr
Specific annual heat demand:	**2,614.8**	Btu/ft²yr

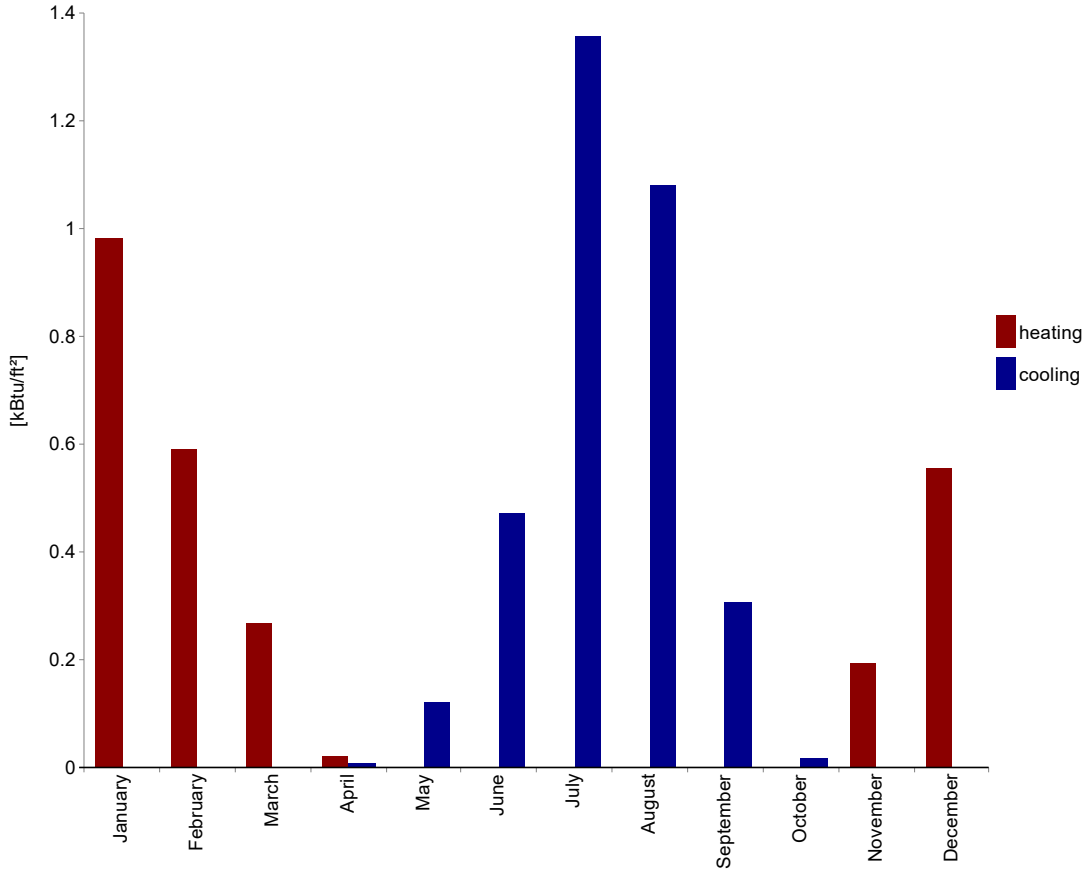
ANNUAL COOLING DEMAND

Solar heat gains:	**133,160**	kBtu/yr
Internal heat gains:	**285,905**	kBtu/yr
Total heat gains:	**419,064**	kBtu/yr
Transmission losses :	**284,374**	kBtu/yr
Ventilation losses:	**442,275**	kBtu/yr
Total heat losses:	**726,648**	kBtu/yr
Utilization factor:	**46.7**	%
Useful heat losses:	**339,616**	kBtu/yr
Cooling demand - sensible:	**79,449**	kBtu/yr
Cooling demand - latent:	**9,965**	kBtu/yr
Annual cooling demand:	**89,414**	kBtu/yr
Specific annual cooling demand:	**3.4**	kBtu/ft²yr





SPECIFIC HEAT/COOLING DEMAND MONTHLY



Month	Heating [kBtu/ft²]	Cooling [kBtu/ft²]
January	1	0
February	0.6	0
March	0.3	0
April	0	0
May	0	0.1
June	0	0.5
July	0	1.4
August	0	1.1
September	0	0.3
October	0	0
November	0.2	0
December	0.6	0

HEATING LOAD

	First climate	Second climate
Transmission heat losses:	**68,338.3** Btu/hr	**52,005.3** Btu/hr
Ventilation heat losses:	**43,051.9** Btu/hr	**30,607.2** Btu/hr
Total heat loss:	**111,390.1** Btu/hr	**82,612.5** Btu/hr
Solar heat gain:	**7,857.6** Btu/hr	**4,329.9** Btu/hr
Internal heat gain:	**13,452.9** Btu/hr	**13,452.9** Btu/hr
Total heat gains heating:	**21,310.5** Btu/hr	**17,782.8** Btu/hr
Heating load:	**90,079.6** Btu/hr	**64,829.7** Btu/hr

Relevant heating load: **90,079.6** Btu/hr

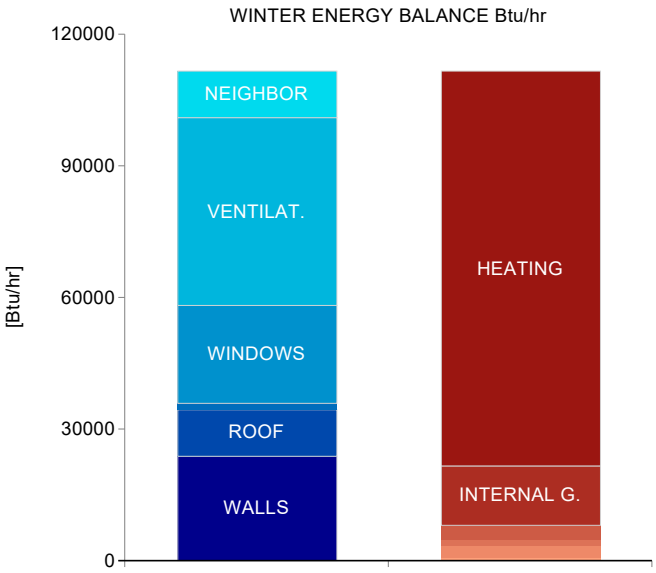
Specific heating load: **3.4** Btu/hr ft²

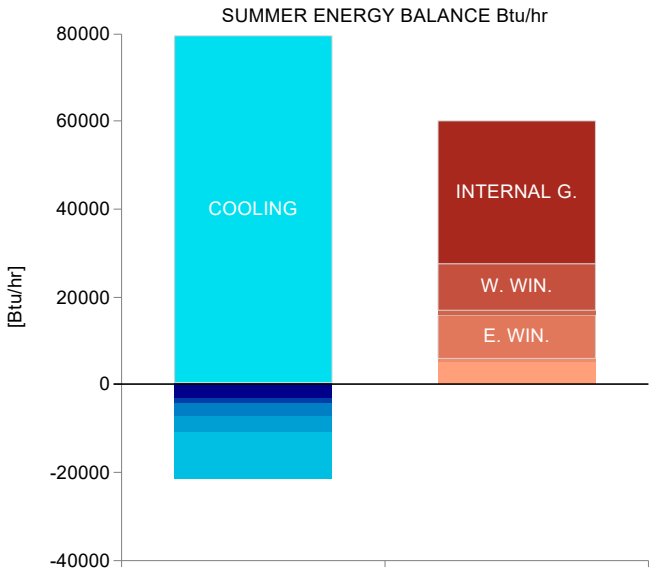
COOLING LOAD

Solar heat gain:	**27,453.1** Btu/hr
Internal heat gain:	**32,640.7** Btu/hr
Total heat gains cooling:	**60,093.8** Btu/hr
Transmission heat losses:	**-15,155.3** Btu/hr
Ventilation heat losses:	**-3,703** Btu/hr
Total heat loss:	**-18,858.4** Btu/hr
Cooling load - sensible:	**78,952.1** Btu/hr
Cooling load - latent:	**0** Btu/hr

Relevant cooling load: **78,952.1** Btu/hr

Specific maximum cooling load: **3** Btu/hr ft²





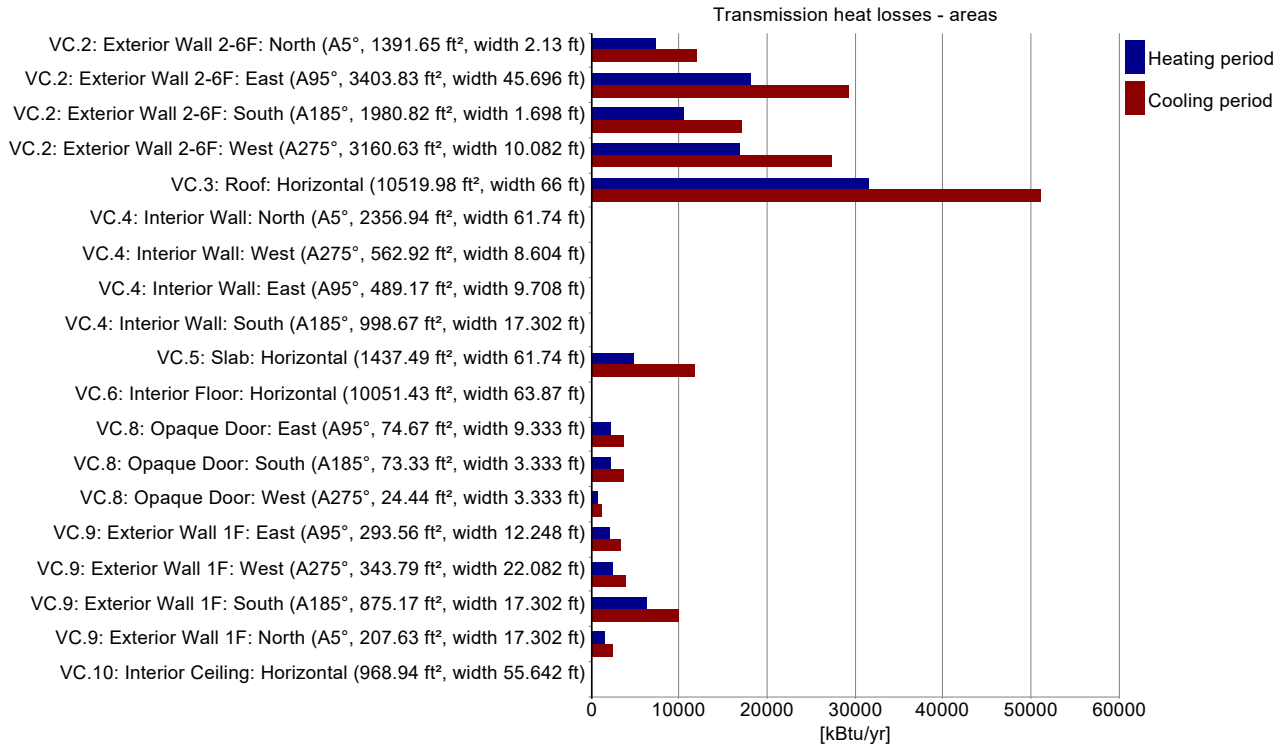
AREAS

Transmission heat losses - areas

Name	Area [ft²]	Average U-value [Btu/hr ft² °F]	Absorption coefficient	Emission coefficient	Reduction factor shading [%]	Transmission losses heating [kBtu/yr]	Transmission losses cooling [kBtu/yr]
VC.2: Exterior Wall 2-6F: North (A5°, 1391.65 ft², width 2.13 ft)	1391.6	0.035	0.4	0.9	100	7425.5	12005
VC.2: Exterior Wall 2-6F: East (A95°, 3403.83 ft², width 45.696 ft)	3403.8	0.035	0.4	0.9	100	18161.9	29363
VC.2: Exterior Wall 2-6F: South (A185°, 1980.82 ft², width 1.698 ft)	1980.8	0.035	0.4	0.9	100	10569.1	17087.4
VC.2: Exterior Wall 2-6F: West (A275°, 3160.63 ft², width 10.082 ft)	3160.6	0.035	0.4	0.9	100	16864.3	27265
VC.3: Roof: Horizontal (10519.98 ft², width 66 ft)	10520	0.02	0.4	0.9	100	31553.1	51012.9
VC.4: Interior Wall: North (A5°, 2356.94 ft², width 61.74 ft)	2356.9	0.319	0	0	0	0	0
VC.4: Interior Wall: West (A275°, 562.92 ft², width 8.604 ft)	562.9	0.319	0	0	0	0	0
VC.4: Interior Wall: East (A95°, 489.17 ft², width 9.708 ft)	489.2	0.319	0	0	0	0	0
VC.4: Interior Wall: South (A185°, 998.67 ft², width 17.302 ft)	998.7	0.319	0	0	0	0	0
VC.5: Slab: Horizontal (1437.49 ft², width 61.74 ft)	1437.5	0.063	0	0	0	4728.4	11767.9
VC.6: Interior Floor: Horizontal (10051.43 ft², width 63.87 ft)	10051.4	0.048	0	0	0	0	0
VC.8: Opaque Door: East (A95°, 74.67 ft², width 9.333 ft)	74.7	0.201	0.4	0.9	100	2291.4	3704.6
VC.8: Opaque Door: South (A185°, 73.33 ft², width 3.333 ft)	73.3	0.201	0.4	0.9	100	2250.5	3638.4
VC.8: Opaque Door: West (A275°, 24.44 ft², width 3.333 ft)	24.4	0.201	0.4	0.9	100	750.2	1212.8
VC.9: Exterior Wall 1F: East (A95°, 293.56 ft², width 12.248 ft)	293.6	0.046	0.4	0.9	100	2075.7	3355.9
VC.9: Exterior Wall 1F: West (A275°, 343.79 ft², width 22.082 ft)	343.8	0.046	0.4	0.9	100	2430.8	3930
VC.9: Exterior Wall 1F: South (A185°, 875.17 ft², width 17.302 ft)	875.2	0.046	0.4	0.9	100	6188.2	10004.6
VC.9: Exterior Wall 1F: North (A5°, 207.63 ft², width 17.302 ft)	207.6	0.046	0.4	0.9	100	1468.1	2373.5
VC.10: Interior Ceiling: Horizontal (968.94 ft², width 55.642 ft)	968.9	0.049	0	0	0	0	0

Degree hours [kFh/a]

	Heating	Cooling
Ambient heating	84.7	136.9
Ground heating	29.2	72.6



THERMAL BRIDGES

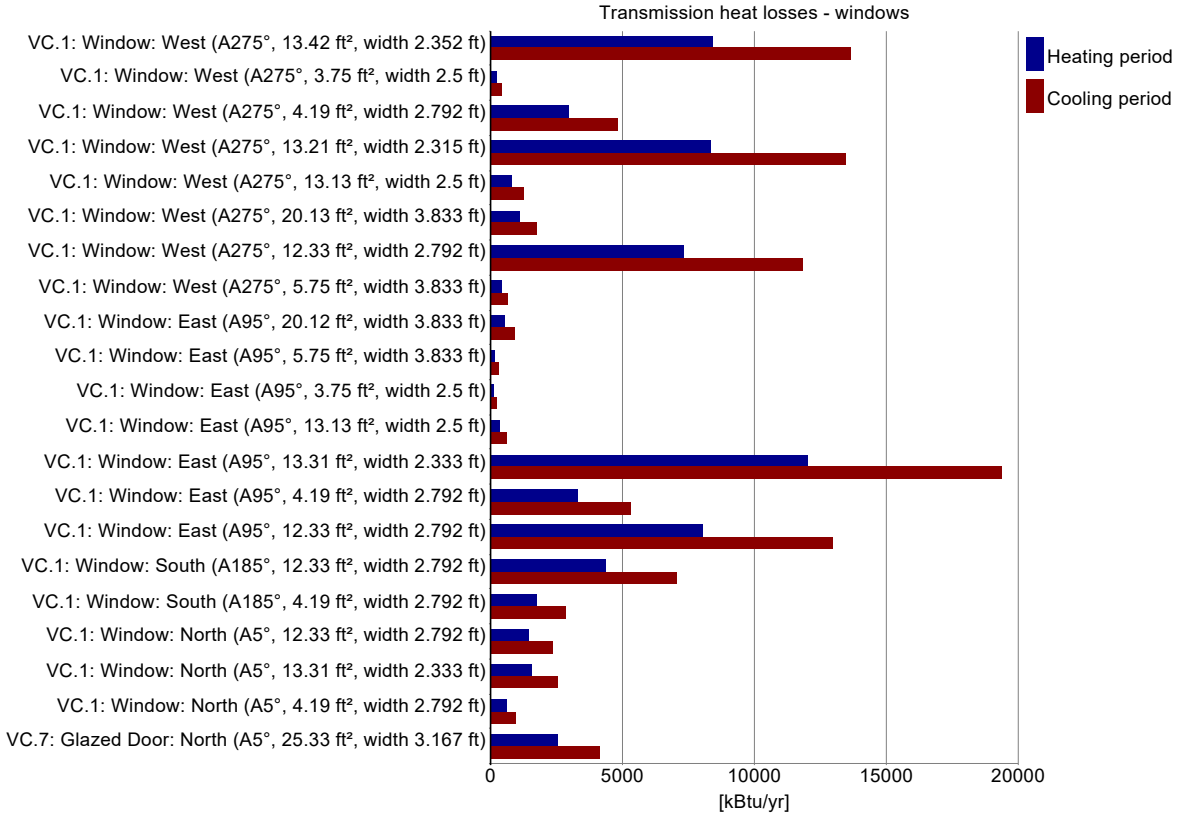
Transmission heat losses - thermal bridges

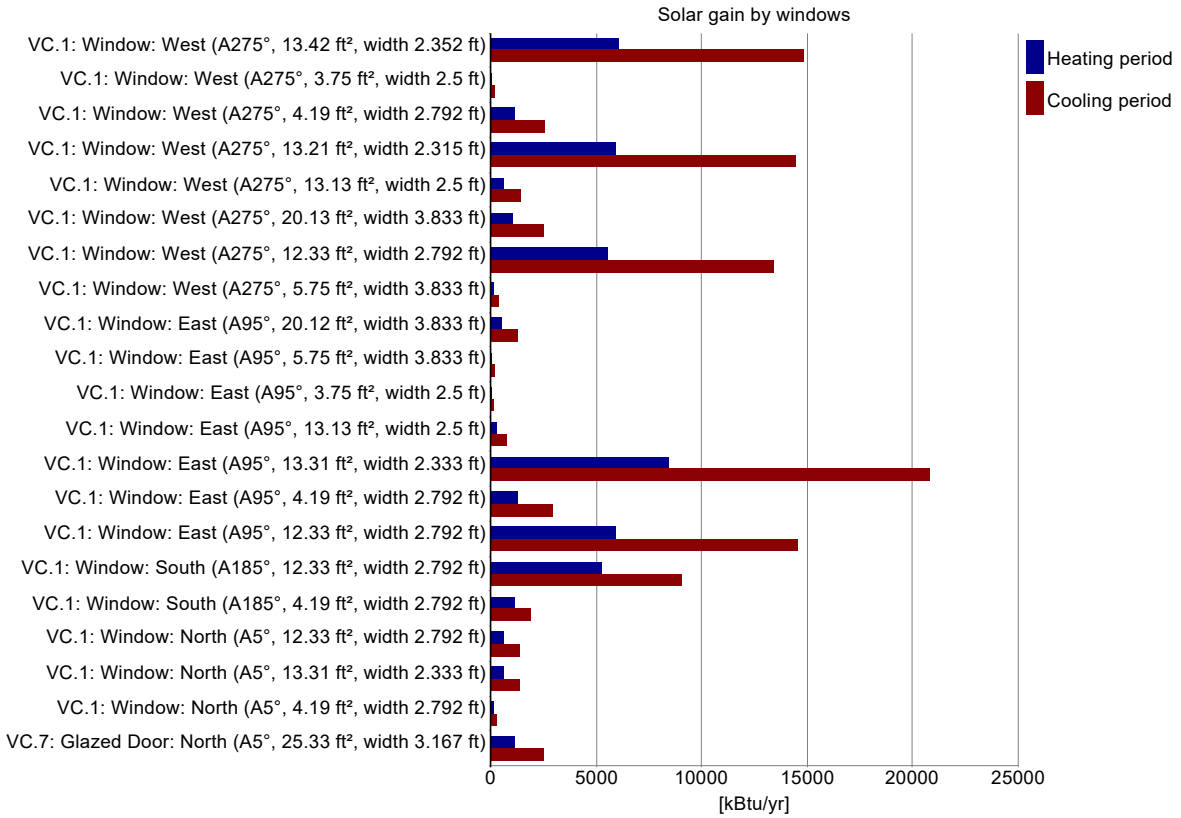
Name	Length [ft]	Psi-value [Btu/hr ft °F]	Transmission losses [kBtu/yr]	Transmission losses cooling [kBtu/yr]

WINDOWS

Transmission heat losses - windows

Name	Quan-tity	Incli-nation [°]	U-value total [Btu/hr ft² °F]	SHGC (perpen-dicular)	Reduction factor shading [%]	Reduction factor shading summer [%]	Solar gain heating [kBtu/yr]	Solar gain cooling [kBtu/yr]	Transmission losses heating [kBtu/yr]	Transmission losses cooling [kBtu/yr]
VC.1: Window: West (A275°, 13.42 ft², width 2.352 ft)	21	90	0.197	0.5	86	89.2	6,081.6	14,852.4	8,443	13,650
VC.1: Window: West (A275°, 3.75 ft², width 2.5 ft)	2	90	0.236	0.5	82.9	83.8	95.5	225.4	270	436.5
VC.1: Window: West (A275°, 4.19 ft², width 2.792 ft)	20	90	0.234	0.5	82.7	83.5	1,113.4	2,622.3	2,980.2	4,818.1
VC.1: Window: West (A275°, 13.21 ft², width 2.315 ft)	21	90	0.197	0.5	85.9	89.1	5,926.7	14,485.8	8,340.7	13,484.7
VC.1: Window: West (A275°, 13.13 ft², width 2.5 ft)	2	90	0.195	0.5	86.4	89.3	580.6	1,410	781.4	1,263.3
VC.1: Window: West (A275°, 20.13 ft², width 3.833 ft)	2	90	0.181	0.5	88.6	90.6	1,063.7	2,546.8	1,110.7	1,795.7
VC.1: Window: West (A275°, 12.33 ft², width 2.792 ft)	20	90	0.194	0.5	86.7	89.1	5,572.2	13,440.2	7,300	11,802.2
VC.1: Window: West (A275°, 5.75 ft², width 3.833 ft)	2	90	0.227	0.5	82.2	82.7	167.9	393.7	398.2	643.7
VC.1: Window: East (A95°, 20.12 ft², width 3.833 ft)	1	90	0.181	0.5	85	89.9	559.5	1,320.6	555.4	897.9
VC.1: Window: East (A95°, 5.75 ft², width 3.833 ft)	1	90	0.227	0.5	80.9	82.1	93.3	209.6	199.1	321.9
VC.1: Window: East (A95°, 3.75 ft², width 2.5 ft)	1	90	0.236	0.5	82.2	83.4	53.7	120.8	135	218.2
VC.1: Window: East (A95°, 13.13 ft², width 2.5 ft)	1	90	0.195	0.5	84.4	89	316.2	744.5	390.7	631.6
VC.1: Window: East (A95°, 13.31 ft², width 2.333 ft)	30	90	0.197	0.5	78.9	86	8,441.7	20,794.5	11,988.3	19,381.9
VC.1: Window: East (A95°, 4.19 ft², width 2.792 ft)	22	90	0.234	0.5	79.2	81.9	1,301.9	2,989.1	3,278.2	5,299.9
VC.1: Window: East (A95°, 12.33 ft², width 2.792 ft)	22	90	0.194	0.5	78.8	85.5	5,935.6	14,535.1	8,030	12,982.4
VC.1: Window: South (A185°, 12.33 ft², width 2.792 ft)	12	90	0.194	0.5	69.2	68.3	5,288.5	9,066	4,380	7,081.3
VC.1: Window: South (A185°, 4.19 ft², width 2.792 ft)	12	90	0.234	0.5	71.1	66.2	1,152.7	1,906.4	1,788.1	2,890.9
VC.1: Window: North (A5°, 12.33 ft², width 2.792 ft)	4	90	0.194	0.5	81.4	78.6	614	1,357.3	1,460	2,360.4
VC.1: Window: North (A5°, 13.31 ft², width 2.333 ft)	4	90	0.197	0.5	79.8	76.5	637.5	1,394.8	1,598.4	2,584.3
VC.1: Window: North (A5°, 4.19 ft², width 2.792 ft)	4	90	0.234	0.5	80.2	78.7	120.6	273.5	596	963.6
VC.7: Glazed Door: North (A5°, 25.33 ft², width 3.167 ft)	2	90	0.332	0.6	83.3	80.3	1,123.2	2,480.6	2,563.3	4,144.1





Summary building envelope

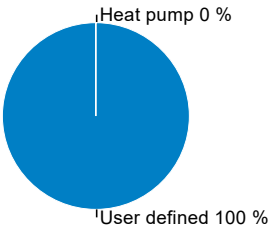
	Total area / length	Average U-value / Psi value	Transmission losses
Exterior wall ambient:	**11,829.5** ft²	**0.039** Btu/hr ft² °F	**70,475.6** kBtu/yr
Exterior wall ground:	**0** ft²	**0** Btu/hr ft² °F	**0** kBtu/yr
Basement:	**1,437.5** ft²	**0.063** Btu/hr ft² °F	**4,728.4** kBtu/yr
Roof:	**10,520** ft²	**0.02** Btu/hr ft² °F	**31,553.1** kBtu/yr
Windows:	**2,148.6** ft²	**0.203** Btu/hr ft² °F	**66,586.6** kBtu/yr
Doors:	**0** ft²	**0** Btu/hr ft² °F	**0** kBtu/yr
Thermal bridge ambient:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr
Thermal bridge perimeter:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr
Thermal bridge floor slab:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr

Shading

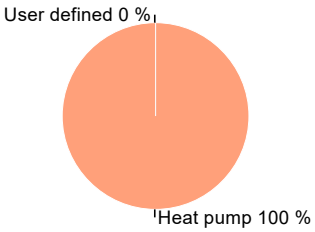
	Heating	Cooling
Reduction factor North:	**81.7** %	**78.8** %
Reduction factor East:	**79.2** %	**85.6** %
Reduction factor South:	**69.5** %	**68** %
Reduction factor West:	**86.1** %	**88.8** %
Reduction factor Horizontal:	**100** %	**100** %

System	DHW			Heating			Total		
	Covered DHW demand [%]	Estimated solar fraction [%]	Final energy demand [kBtu/yr]	Covered heating demand [%]	Estimated solar fraction [%]	Final energy demand [kBtu/yr]	Performance ratio	CO2 equivalent emissions [lb/yr]	Source energy demand [kBtu/yr]
Heat pump, Mitsubishi VRF (PURY)	0	0	0	100	0	19,480.1	0	8,559.5	54,544.3
User defined, Lochinvar Armor AWN601PM (96% Thermal Eff. Rated by .03 per PHIUS	100	0	140,249.3	0	0	0	1.1	31,952.6	154,274.3
Σ	100	0	140,249.3	100	0	19,480.1		40,512.2	208,818.6

DHW - final energy



Heating - final energy



COOLING UNITS

	sensible	latent
Air cooling:	**0** kBtu/ft²yr	**0** kBtu/ft²yr
Recirculation cooling:	**3** kBtu/ft²yr	**2.2** kBtu/ft²yr
Additional dehumidification:		**0** kBtu/ft²yr
Panel cooling:	**0** kBtu/ft²yr	
Sum:	**3** kBtu/ft²yr	**2.2** kBtu/ft²yr

VENTILATION

Energy transportable by supply air

Heating energy

transportable: **1.34** W/ft²
load: **1** W/ft²

Cooling energy

transportable: **0.8** W/ft²
load: **0.87** W/ft²

Infiltration pressure test ACH50: **0.63** 1/hr
Total extract air demand: **1,630** cfm
Supply air per person: **18** cfm
Occupancy: **62**

Average air flow rate: **1,663.28** cfm
Average air change rate: **0.42** 1/hr
Effective ACH ambient: **0.14** 1/hr
Effective ACH ground: **0** 1/hr
Energetically effective air exchange: **0.14** 1/hr
Infiltration air change rate: **0.04** 1/hr
Infiltration air change rate (heating load): **0.11** 1/hr

Type of ventilation system: **Balanced PH ventilation**
Wind screening coefficient (e): **0.07**
Wind exposure factor: **15**
Wind shield factor: **0.05**

Ventilation heat losses: **79,724.9** kBtu/yr

Devices

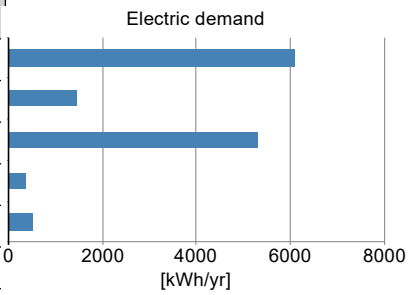
Name	Sensible recovery efficiency [-]	Electric efficiency [W/cfm]	Heat recovery efficiency SHX [-]	Effective recovery efficiency [-]
Pending MECH drawings	0.8	0.05	0	0.8
Altogether	0.8	0.04	0	0.8

SUMMER VENTILATION

ACH night ventilation: **0** 1/hr
ACH natural summer: **0** 1/hr
Mechanical ventilation summer: **0.4** 1/hr
Mechanical ventilation summer with HR: **no**
Preferred minimum indoor temperature for night ventilation: **68** °F
Overheating temperature: **77** °F

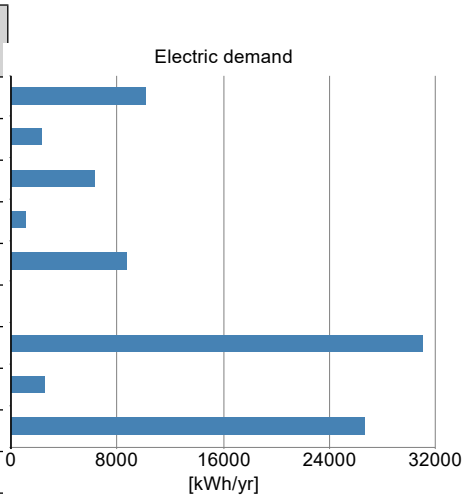
ELECTRICITY DEMAND - AUXILIARY ELECTRICITY

Type	Quantity	Indoor	Norm demand	Electric demand [kWh/yr]	Source energy [kBtu/yr]
Ventilation winter	1	no	0.8 W/cfm	6098.1	58255.5
Ventilation Defrost	1	no	7,796.6 W	1454.3	13893.2
Ventilation summer	1	no	0.8 W/cfm	5324.9	50869.4
DHW circulating pump	1	yes	48.2 W	373.9	3571.9
DHW storage load pump	1	yes	200.4 W	485.9	4641.8
Σ				13737.2	131231.9



ELECTRICITY DEMAND RESIDENTIAL BUILDING

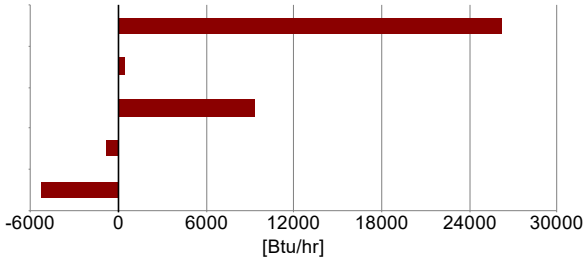
Type	Quantity	Indoor	Norm demand	Electric demand [kWh/yr]	Non-electric demand [kWh/yr]	Source energy [kBtu/yr]
Kitchen refrigerator	1	yes	1.2	10152	0	96982.6
Kitchen dishwasher	1	yes	1.2	2309.5	0	22063.2
Kitchen cooking	1	yes	0.2	6200	0	59228.9
Laundry - washer	1	yes	0.3	1078.5	0	10303.4
Laundry - dryer	1	yes	3.4	8630.6	0	82449
Energy consumed by evaporation	1	yes	3.1	0	360.5	1607.9
User defined lighting	1	yes	31,069	31069	0	296803.8
User defined lighting	1	no	2,524	2524	0	24111.9
User defined MELs	1	yes	26,668	26668	0	254760.8
Σ	9			88631.7	360.5	848311.6



INTERNAL HEAT GAINS

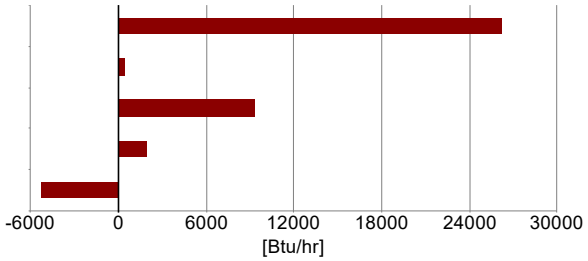
Heating season

Electricity total:	**26,236.1**	Btu/hr
Auxiliary electricity:	**432.3**	Btu/hr
People:	**9,308.3**	Btu/hr
Cold water:	**-860.7**	Btu/hr
Evaporation:	**-5,288.8**	Btu/hr
Σ:	**29,815.1**	Btu/hr
Specific internal heat gains:	**1.1**	Btu/hr ft²



Cooling season

Electricity total:	**26,236.1**	Btu/hr
Auxiliary electricity:	**432.3**	Btu/hr
People:	**9,308.3**	Btu/hr
Cold and hot water:	**1,964.9**	Btu/hr
Evaporation:	**-5,288.8**	Btu/hr
Σ:	**29,815.1**	Btu/hr
Specific internal heat gains:	**1.1**	Btu/hr ft²



DHW AND DISTRIBUTION

DHW consumption per person per day:	**6.6**	gal/Person/day
Average cold water temperature supply:	**52.8**	°F
Useful heat DHW:	**108,339.3**	kBtu/yr
Specific useful heat DHW:	**4,085**	Btu/ft²yr
Total heat losses of the DHW system:	**15,775.1**	kBtu/yr
Specific losses of the DHW system:	**594.8**	Btu/ft²yr
Performance ratio DHW distribution system and storage:	**1.1**	
Utilization ratio DHW distribution system and storage:	**0.9**	
Total heat demand of DHW system:	**124,114.4**	kBtu/yr
Total specific heat demand of DHW system:	**4,679.8**	Btu/ft²yr
Total heat losses of the hydronic heating distribution:	**0**	kBtu/yr
Specific losses of the hydronic heating distribution:	**0**	Btu/ft²yr
Performance ratio of heat distribution:	**100**	%

Region	Length [ft]	Annual heat loss [kBtu/yr]
Hydronic heating distribution pipes		
Σ	0	0
DHW circulation pipes		
In conditioned space	200	6925.4
Σ	200	6925.4
Individual pipes		
In conditioned space	750	6960.3
Σ	750	6960.3
Water storage		
Device 4 (Water storage: DHW): Lochinvar RJA120 Lock-Temp Stainless Steel 119-gallon		1889.4
Σ		1889.4

Property/Site

Building name: Rindge Commons Building B

Property information

Owner's name:	Just-A-Start Corporation
Property address:	402 Rindge Ave
City:	Cambridge
Zip:	02140

Site information

Climate Location **MA - BOSTON LOGAN INT ARPT (AMeDAS standard year)**

Building

Building Information

Area of Conditioned Space	**87,754** ft²
Volume of conditioned space	**799,891** ft³
Number of bedrooms	**160**
Foundation Type	**Slab on grade**
Winter setpoint temperature	**68** °F
Summer setpoint temperature	**77** °F

Slab floor

Name	Area [ft²]	Assembly
Slab	961.8	Concrete Slab 3.5" XPS (R-15)

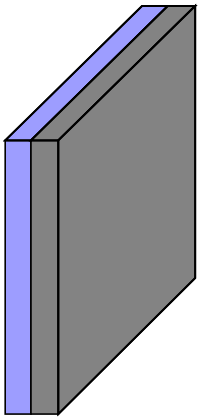
Assembly (Id.15): Concrete Slab 3.5" XPS (R-15)

Homogenous layers

Thermal resistance: 15.004 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.063 Btu/hr ft² °F

Thickness: 7.64 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Expanded Polystyrene Insulation	0.92	0.35	0.0208	3.64	
2	Concrete	131.35	0.19	0.7933	4	

Slab on grade

Floor slab area	**961.8** ft²
U-Value of basement slab	**0.1** Btu/hr ft² °F
Floor slab perimeter (P)	**180.5** ft
Total R-value of perimeter insulation	**14** hr ft² °F/Btu

Above-grade walls & Rim/band joists

Name	Orientation	Area [ft²]	Short wave radiation absorption	Assembly
Roof	Horizontal (100 %)	15,906.4	0.4	Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Exterior Wall 2-6F	SE (8 %), SW (31 %), E (10 %), W (14 %), NE (25	32,543.1	0.4	Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)
Exposed Floor	Horizontal (100 %)	14,944.6	0.4	Exposed Floor (R-30)
Exterior Wall 1F	SE (11 %), SW (33 %), E (13 %), NE (22 %), NW	2,073.4	0.4	Steel Frame, 5.5" Fiberglass (R-9.17), 2.5" Mineral Wool (R-10)
Total		**65,467.5**		

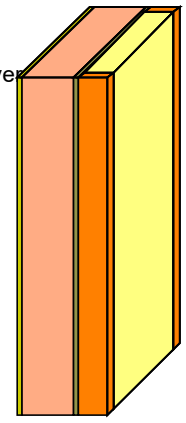
Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)

Inhomogenous layers

Thermal resistance: 50.006 / 52.321 hr ft² °F/Btu (EN ISO 6946 / homogenous layer

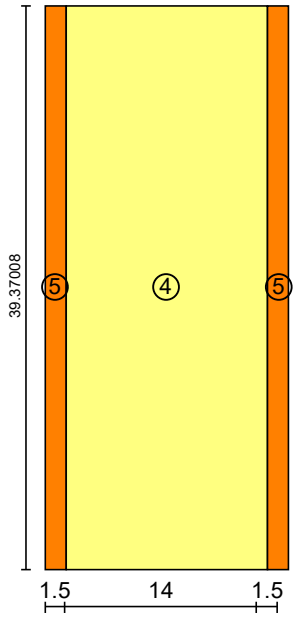
Heat transfer coefficient (U-value): 0.02 Btu/hr ft² °F

Thickness: 10.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Fiberboard	18.79	0.33	0.0285	0.5	
2	Polyisocyanurate Insulation	1.65	0.35	0.0139	6	
3	Plywood (USA)	29.34	0.45	0.0485	0.5	
4	Fibre Glass	1.87	0.2	0.0208	3.5	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Layer: 4



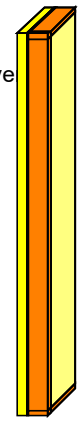
Assembly (Id.9): Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)

Inhomogenous layers

Thermal resistance: 27.581 / 29.559 hr ft² °F/Btu (EN ISO 6946 / homogenous laye

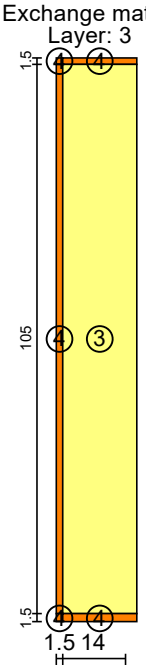
Heat transfer coefficient (U-value): 0.035 Btu/hr ft² °F

Thickness: 8.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	dena Mineral Wool (heat cond.: 0.035 W/mK)	3.75	0.2	0.0208	2.5	
2	Plywood (USA)	29.34	0.45	0.0485	0.5	
3	Fibre Glass	1.87	0.2	0.0245	5.5	
Exchange materials						
4	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.9): Wood Frame, 5.5" Fiberglass (R-16), 2.5" Mineral Wool (R-10)



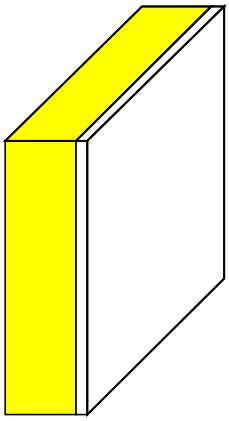
Assembly (Id.6): Exposed Floor (R-30)

Homogenous layers

Thermal resistance: 30.365 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.032 Btu/hr ft² °F

Thickness: 11.75 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Cellulose Fiber (heat cond.: 0,04 W/mK)	4.37	0.33	0.0278	10	
2	Gypcrete			0.4	1.75	

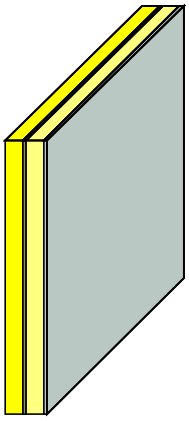
Assembly (Id.7): Steel Frame, 5.5" Fiberglass (R-9.17), 2.5" Mineral Wool (R-10)

Homogenous layers

Thermal resistance: 20.585 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.046 Btu/hr ft² °F

Thickness: 6.039 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	dena Mineral Wool (heat cond.: 0.035 W/mK)	3.75	0.2	0.0208	2.5	
2	Plywood (USA)	29.34	0.45	0.0485	0.5	
3	Fibre Glass (Steal Frame)	1.87	0.2	0.0219	2.414	
4	Gypsum Board (USA)	53.06	0.21	0.0942	0.625	

Windows and Glass Doors

Name	Orientation	Area [ft²]	Window type
Window	SE (13 %), SW (36 %), E (6 %), W (10 %), NE (29 %), N (5 %)	4,104	U -.18 (Fixed)
Window	SW (39 %), E (15 %), W (9 %), NE (27 %), N (10 %)	4,009.5	U -.18 (Fixed)
Window	NE (100 %)	171	U -.18 (Fixed)
Door Glazing	SE (31 %), NE (69 %)	37.1	U - .33
Total		**8,321.6**	

Window type (Id 7): U -.18 (Fixed)

Basic data

Uw -mounted [Btu/hr ft² °F]	0.1805
Frame factor	0.8198
Glass U-value [Btu/hr ft² °F]	0.132
SHGC/Solar energy transmittance (perpendicular)	0.37

Frame data

Setting	Left	Right	Top	Bottom
Frame width [in]	2.5	2.5	2.5	2.5
Frame U-value [Btu/hr ft² °F]	.15	.15	.15	.15
Glazing-to-frame psi-value [Btu/hr ft °F]	.023	.023	.023	.023
Frame-to-Wall psi-value [Btu/hr ft °F]	.029	.029	.029	.029

Solar radiation angle dependent data

Angle [°]	Total solar trans.
0	

Window type (Id 3): U - .33

Basic data

Uw -mounted [Btu/hr ft² °F]	0.3333
Frame factor	0.8198
Glass U-value [Btu/hr ft² °F]	0.27
SHGC/Solar energy transmittance (perpendicular)	0.59

Frame data

Setting	Left	Right	Top	Bottom
Frame width [in]	2.5	2.5	2.5	2.5
Frame U-value [Btu/hr ft² °F]	.37	.37	.37	.37
Glazing-to-frame psi-value [Btu/hr ft °F]	.023	.023	.023	.023
Frame-to-Wall psi-value [Btu/hr ft °F]	.029	.029	.029	.029

Solar radiation angle dependent data

Angle [°]	Total solar trans.
0	

Doors

Name	Orientation	Area [ft²]	Short wave radiation absorption	Assembly
Opaque Door	SW (33 %), NE (33 %), NW (33 %)	59.5	0.4	Door (R-4)
Glazed Door	SE (35 %), NE (65 %)	38	0.4	Door (R-4)
Total		**97.5**		

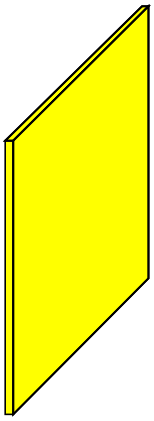
Assembly (Id.8): Door (R-4)

Homogenous layers

Thermal resistance: 4 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.201 Btu/hr ft² °F

Thickness: 1 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Cellulose Fiber (heat cond.: 0,04 W/mK)	4.37	0.33	0.0208	1	

Ceilings

Name	Area [ft²]	Short wave radiation absorption	Assembly
Roof	15,906.4	0.4	Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Exposed Floor	14,944.6	0.4	Exposed Floor (R-30)
Total	**30,851**		

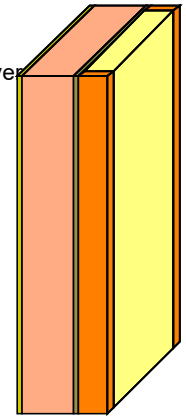
Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)

Inhomogenous layers

Thermal resistance: 50.006 / 52.321 hr ft² °F/Btu (EN ISO 6946 / homogenous layer

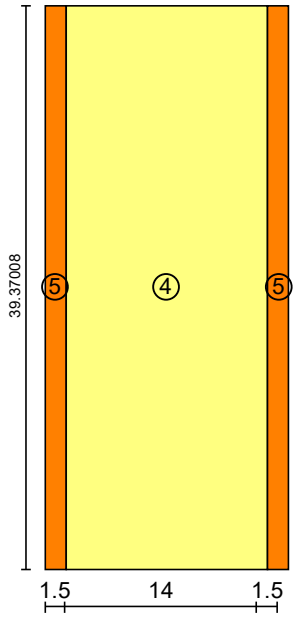
Heat transfer coefficient (U-value): 0.02 Btu/hr ft² °F

Thickness: 10.5 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Fiberboard	18.79	0.33	0.0285	0.5	
2	Polyisocyanurate Insulation	1.65	0.35	0.0139	6	
3	Plywood (USA)	29.34	0.45	0.0485	0.5	
4	Fibre Glass	1.87	0.2	0.0208	3.5	
Exchange materials						
5	Softwood	24.97	0.33	0.052	---	

Exchange material(s), Assembly (Id.11): Roof 6" Polyiso (R-36) 3.5" Fiberglass (R-11)
Layer: 4



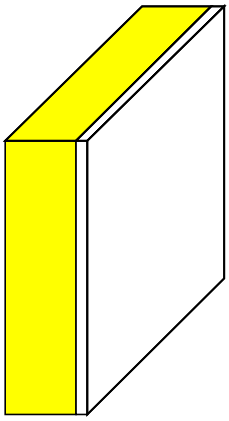
Assembly (Id.6): Exposed Floor (R-30)

Homogenous layers

Thermal resistance: 30.365 hr ft² °F/Btu (without Rsi, Rse)

Heat transfer coefficient (U-value): 0.032 Btu/hr ft² °F

Thickness: 11.75 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]	Color
1	Cellulose Fiber (heat cond.: 0,04 W/mK)	4.37	0.33	0.0278	10	
2	Gypcrete			0.4	1.75	

Space heating

Type	Performance ratio of heat generator [-]	Fuel type
Heat pump	0.28	Electricity

Space cooling

Type	Distribution	Capacity [kBtu/hr]	COP
Heat pump	| Recirculation air	500	5.57
Total		**500**	

Water heating

Type	Performance ratio of heat generator [-]	Fuel type
User defined	1.13	Natural Gas

Water storage

Nr	Capacity [gal]
4	119
Total	**119**

Infiltration/Ventilation

ACH @ 50 Pascal **0.3** 1/hr

CFM @ 50 Pascal **4,487.7** cfm

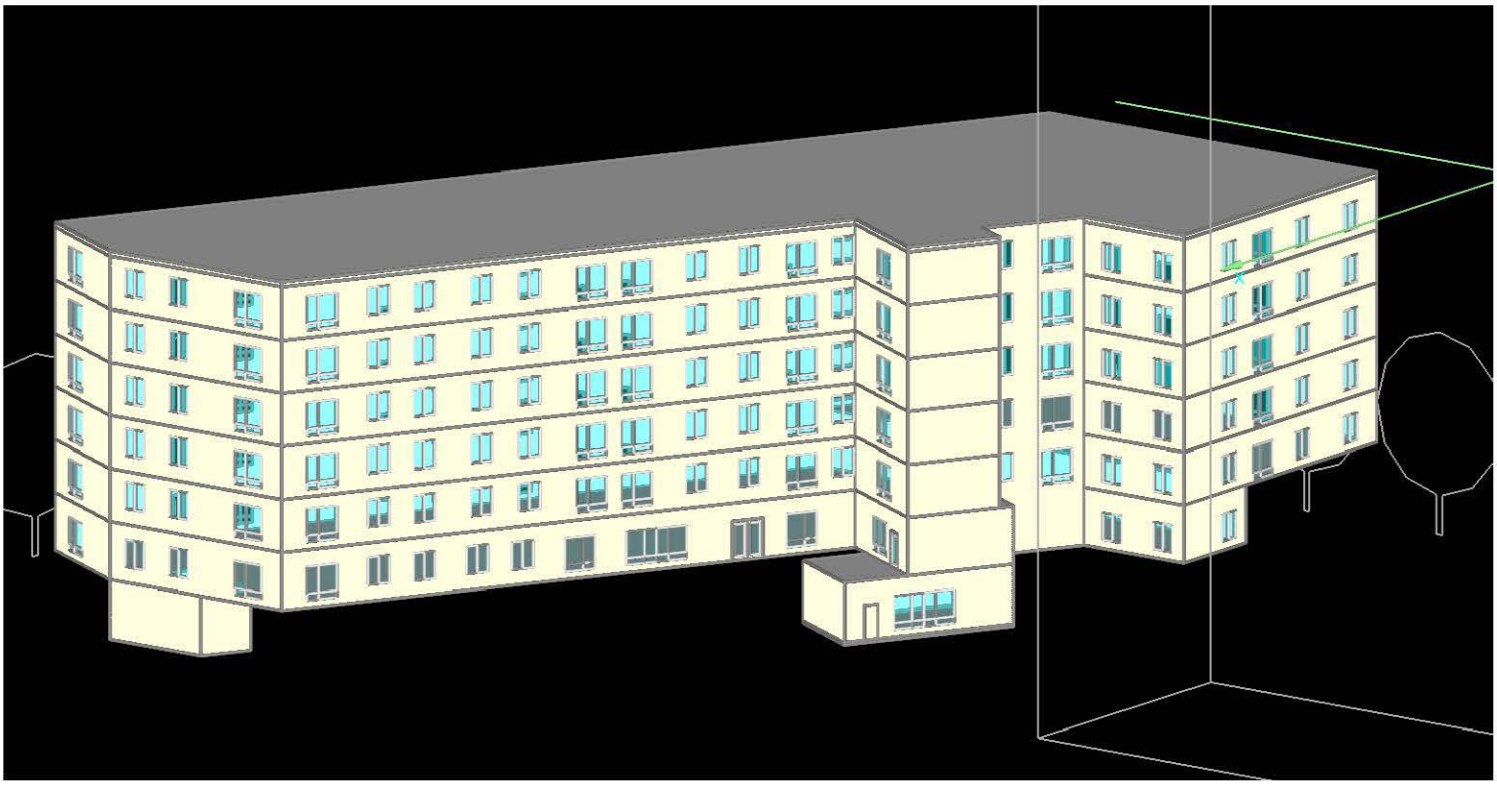
Nr	Sensible recovery efficiency [-]	Rate [cfm]	Electric efficiency [W/cfm]	Fan [W]	Defrost	Temperature below which defrost must be used [°F]	Subsoil heat exchanger efficiency [-]
1	0.47	1,628.59	0.03	1,302.88	yes	13.54	0
Total	**0.46**	**1,628.59**		**1,302.88**			

Lights and appliances

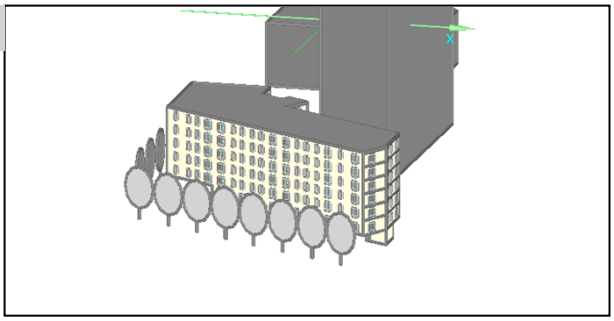
Type	Energy use [kWh/yr]	In conditioned space
Kitchen refrigerator	32,571	yes
Kitchen dishwasher	8,300.11	yes
Kitchen cooking	23,700	yes
Laundry - washer	3,795.23	yes
Laundry - dryer	30,369.95	yes
Energy consumed by evaporation	0 (1,447.2)	yes
User defined lighting	85,426	yes
User defined MELs	84,695	yes
Ventilation winter	20,703.62	no
Ventilation Defrost	4,949.99	no
Ventilation summer	18,078.65	no
DHW circulating pump	844.19	yes
DHW storage load pump	5,069.98	yes
Total	**318,503.72**	

NEW ECOLOGY Community-Based Sustainable Development	Project Name:		**Rindge Commons Building B (Residential)**	
	Climate		Boston Logan International Airport	
	Case		Reference Building (VRF Option)	PHIUS+ Core
Change from the Reference Building **Meets PHIUS Target** **Misses PHIUS Target**	Notes		Baseline envelope provided in drawings, VRF Heating & Cooling, Central Gas-Fired DHW	Upgraded envelope from reference building with added Solar PV to meet PHIUS+ Core requirements. VRF Heating and Cooling, Central Gas-Fired DHW
WUFI PASSIVE RESULTS	**Units**	**Target**		
Heating Demand	kBtu/ft2.yr	4.00	**7.07**	**1.99**
Cooling Demand	kBtu/ft2.yr	7.20	**2.43**	**3.17**
Heating Load	Btu/hr.ft2	3.80	**6.82**	**2.46**
Cooling Load	Btu/hr.ft2	2.50	**2.67**	**2.41**
SITE ENERGY RESULTS	**Units**	**Target**		
Source Energy	kWh/person.yr	5,500	**5,378**	**4,905**
Site Energy Use Index	kBtu/ft2.yr	-	**21**	**20**
Site Energy Consumption	kWh/yr	-	**545,505**	**507,698**
Geometry	**Units**			
Interior Conditioned Floor Area (iCFA)	ft2		87,754	87,754
Net Volume	ft3		799,891	799,891
Envelope Area	ft2		74,848	74,848
Average Window-to-Wall Ratio	%		19%	19%
Exterior Envelope	**Units**			
Roof	R		50	50
Exterior Wall (1F)	R (effective)		21	21
Exterior Wall (2-6F)	R (effective)		28	28
Slab	R		15.0	15.0
Window	U		0.27	0.18
	SHGC		0.3	0.3
Glazed Door	U		0.33	0.33
	SHGC		0.4	0.4
Opaque Door	R		4	4
Airtightness	**Units**			
Air changes per hour at 50 Pa	ACH50		**3.00**	**0.34**
Lighting Assumptions	**Units**			
Lighting	kWh/yr		85,426	85,426
Plug Loads	**Units**			
Miscellaneous Electric Loads	kWh/yr		84,695	84,695
Occupancy	**Units**			
Bedrooms	#		160	160
Average Occupancy	# Bedrooms + 1		237	237
Appliances	**Units**			
Refrigerator	kWh/year/unit		423	423
Dishwasher	kWh/year/unit		260	260
Clothes Washer	kWh/year/unit		116	116
Clothes Dryer	Energy Factor		3.4	3.4
Electric Cooktop	kWh/use		0.2	0.2
Ventilation	**Units**			
Dryer Exhaust	cfm		125	125
ERV Ventilation	cfm		5,500	5,500
ERV Power	W/cfm		1.0	0.8
ERV Recovery Effiency	%		80%	80%
Mechanical Systems	**Units**			

Heat Pumps	Heating COP	3.56	3.56
	Cooling COP	5.6	5.6
Domestic Hot Water	**Units**		
Water Heater Thermal Efficiency	%	88%	88%
DHW Pump	kW	0.58	0.58
Recirculation Pump	kW	0.10	0.10
Renewable Generation	**Units**		
Solar PV	kWh/yr	0	0



BUILDING INFORMATION



Category:	**Residential**
Status:	**In planning**
Building type:	**New construction**
Year of construction:	
Units:	**77**
Number of occupants:	**237 (Design)**
Occupant density:	**370.3** ft²/Person

Boundary conditions

Climate: **MA - BOSTON LOGAN INT ARPT (AMeDAS standard year)**

Internal heat gains:	**1.1** Btu/hr ft²
Interior temperature:	**68** °F
Overheat temperature:	**77** °F

Building geometry

Enclosed volume:	**1,000,267.3** ft³
Net-volume:	**799,891** ft³
Total area envelope:	**74,848.4** ft²
Area/Volume Ratio:	**0.1** 1/ft
Floor area:	**87,754** ft²
Envelope area/iCFA:	**0.853**

PASSIVEHOUSE REQUIREMENTS

Certificate criteria: PHIUS+ 2018

Heating demand

specific:	**1.99** kBtu/ft²yr
target:	**4** kBtu/ft²yr
total:	174,276.52 kBtu/yr

Cooling demand

sensible:	**2.79** kBtu/ft²yr
latent:	**0.38** kBtu/ft²yr
specific:	**3.17** kBtu/ft²yr
target:	**7.2** kBtu/ft²yr
total:	277,792.38 kBtu/yr

Heating load

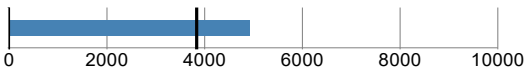
specific:	**2.46** Btu/hr ft²
target:	**3.8** Btu/hr ft²
total:	215,538.97 Btu/hr

Cooling load

specific:	**2.41** Btu/hr ft²
target:	**2.5** Btu/hr ft²
total:	211,086.33 Btu/hr

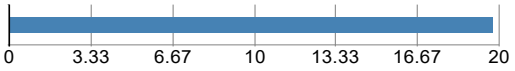
Source energy

total:	**1,162,387.25**	kWh/yr
specific:	**4,905**	kWh/Person yr
target:	**3,840**	kWh/Person yr
total:	**3,965,838.47**	kBtu/yr
specific:	45.2	kBtu/ft²yr



Site energy

total:	1,732,105.63	kBtu/yr
specific:	19.74	kBtu/ft²yr
total:	507,680.16	kWh/yr
specific:	5.79	kWh/ft²

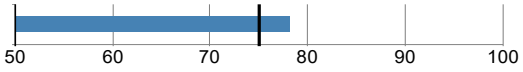


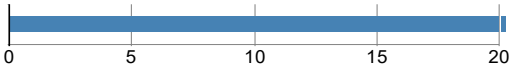
Air tightness

ACH50:	**0.34**	1/hr
CFM50 per envelope area:	**0.06**	cfm/ft²
target:	**0.34**	1/hr
target CFM50:	**0.06**	cfm/ft²

PASSIVEHOUSE RECOMMENDATIONS

Sensible recovery efficiency:	**78.2**	%
Frequency of overheating: Cooling system is required	**33.4**	%





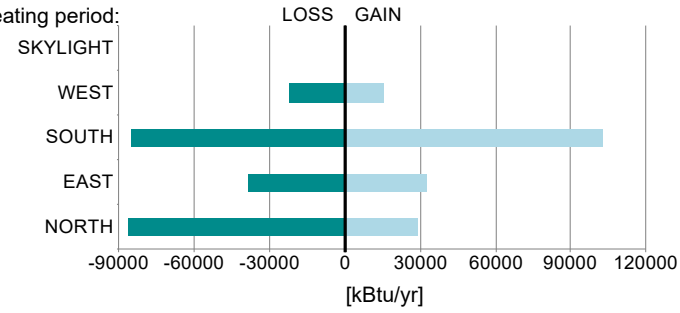
Frequency of overheating only applies if there is not a [properly sized] cooling system installed.

BUILDING ELEMENTS

Windows

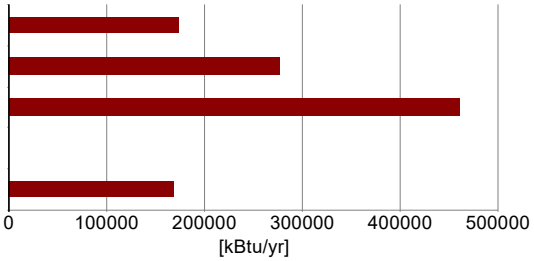
Average SHGC:	**0.37**	
Average solar reduction factor heating:	**0.45**	
Average solar reduction factor cooling:	**0.48**	
Average U-value:	**0.198**	Btu/hr ft² °F
Total glazing area:	**6,301.1**	ft²
Total window area:	**8,321.6**	ft²

Heat gain/loss heating period:



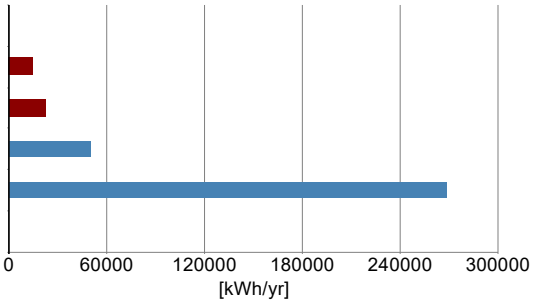
HVAC

Total heating demand:	**174,277**	kBtu/yr
Total cooling demand:	**277,792**	kBtu/yr
Total DHW energy demand:	**460,207**	kBtu/yr
Solar DHW contribution:	**0**	kBtu/yr
Auxiliary electricity:	**169,384**	kBtu/yr



Electricity

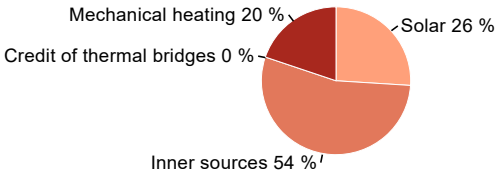
Direct heating / DHW:	**0**	kWh/yr
Heatpump heating:	**14,348**	kWh/yr
Cooling:	**22,406**	kWh/yr
HVAC auxiliary energy:	**49,646**	kWh/yr
Appliances:	**268,857**	kWh/yr
Renewable generation, coincident production and use:	**0**	kWh/yr
Total electricity demand:	**355,258**	kWh/yr



HEAT FLOW - HEATING PERIOD

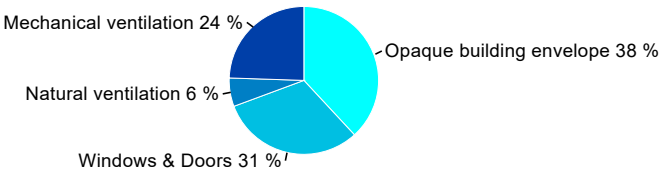
Heat gains

Solar:	**203,411**	kBtu/yr
Inner sources:	**423,853**	kBtu/yr
Credit of thermal bridges:	**0**	kBtu/yr
Mechanical heating:	**174,277**	kBtu/yr



Heat losses

Opaque building envelope:	**305,962**	kBtu/yr
Windows & Doors:	**249,501**	kBtu/yr
Natural ventilation:	**49,931**	kBtu/yr
Mechanical ventilation:	**196,145**	kBtu/yr

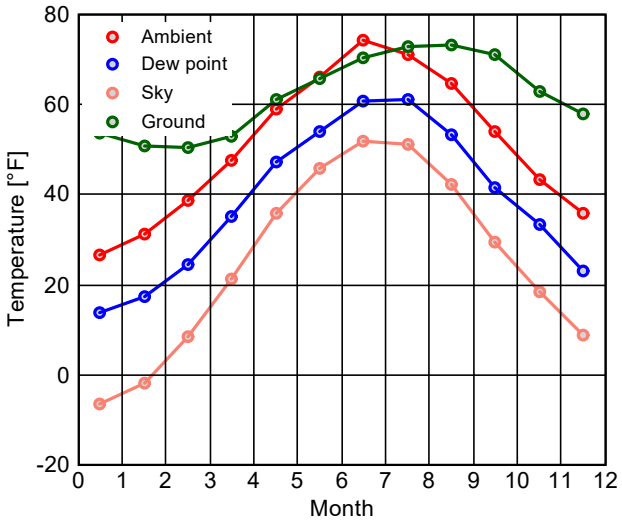


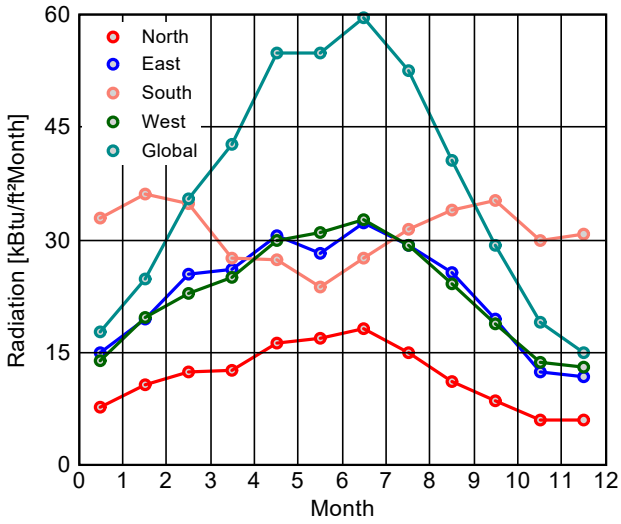
CLIMATE

Latitude:	**42.4**	°
Longitude:	**-71**	°
Elevation of weather station:	**19.7**	ft
Elevation of building site:	**2**	ft
Heat capacity air:	**0.018**	Btu/ft³F
Daily temperature swing summer:	**14.8**	°F
Average wind speed:	**13.1**	ft/s

Ground

Average ground surface temperature:	**52.8**	°F
Amplitude ground surface temperature:	**55.8**	°F
Ground thermal conductivity:	**1.2**	Btu/hr ft °F
Ground heat capacity:	**29.8**	Btu/ft³F
Depth below grade of groundwater:	**9.8**	ft
Flow rate groundwater:	**0.2**	ft/d





Calculation parameters

Length of heating period	**212**	days/yr
Heating degree hours	**140.8**	kFh/a
Phase shift months	**1.3**	mths
Time constant heating demand	**179**	hr
Time constant cooling demand	**0**	hr
Time constant cooling demand with night ventilation	**0**	hr

Climate for	Heating load 1	Heating load 2	Cooling
Temperature [°F]	16.9	31.6	83.5
Solar radiation North [Btu/hr ft²]	12	7.9	27.6
Solar radiation East [Btu/hr ft²]	22.8	13.3	61.5
Solar radiation South [Btu/hr ft²]	49.5	27.3	41.8
Solar radiation West [Btu/hr ft²]	22.2	11.4	53.3
Solar radiation Global [Btu/hr ft²]	26.9	16.5	101.4

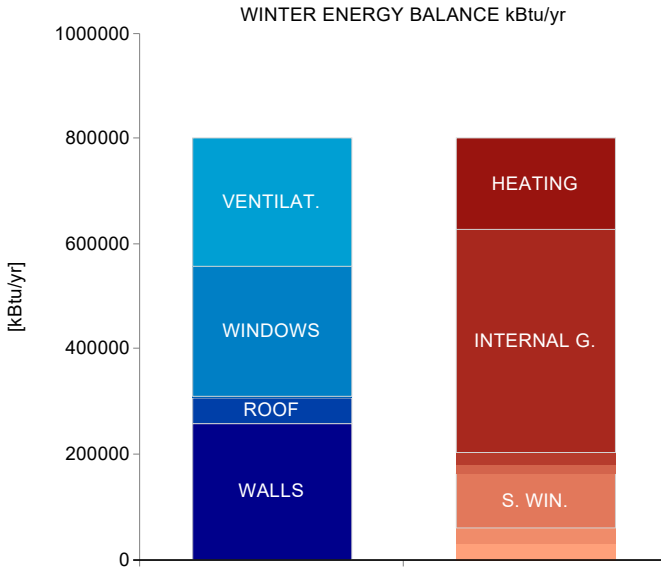
Relevant boundary conditions for heating load calculation: Heating load 1

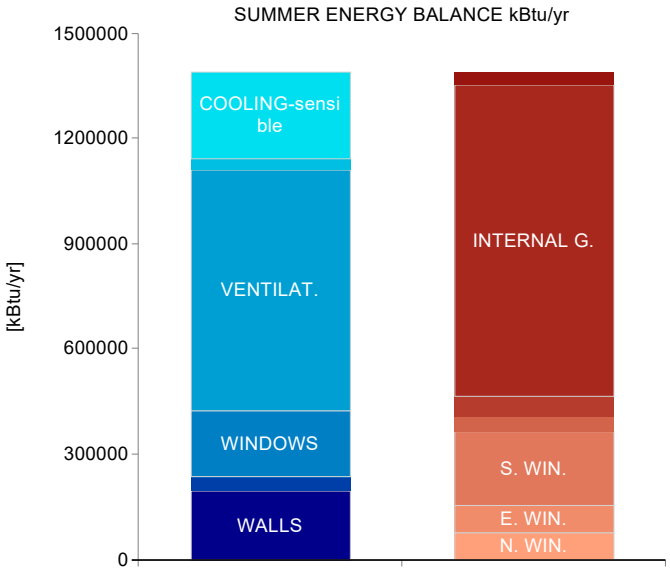
ANNUAL HEAT DEMAND

Transmission losses :	**555,464**	kBtu/yr
Ventilation losses:	**246,076**	kBtu/yr
Total heat losses:	**801,540**	kBtu/yr
Solar heat gains:	**228,953**	kBtu/yr
Internal heat gains:	**477,077**	kBtu/yr
Total heat gains:	**706,031**	kBtu/yr
Utilization factor:	**88.8**	%
Useful heat gains:	**627,264**	kBtu/yr
Annual heat demand:	**174,277**	kBtu/yr
Specific annual heat demand:	**1,986.2**	Btu/ft²yr

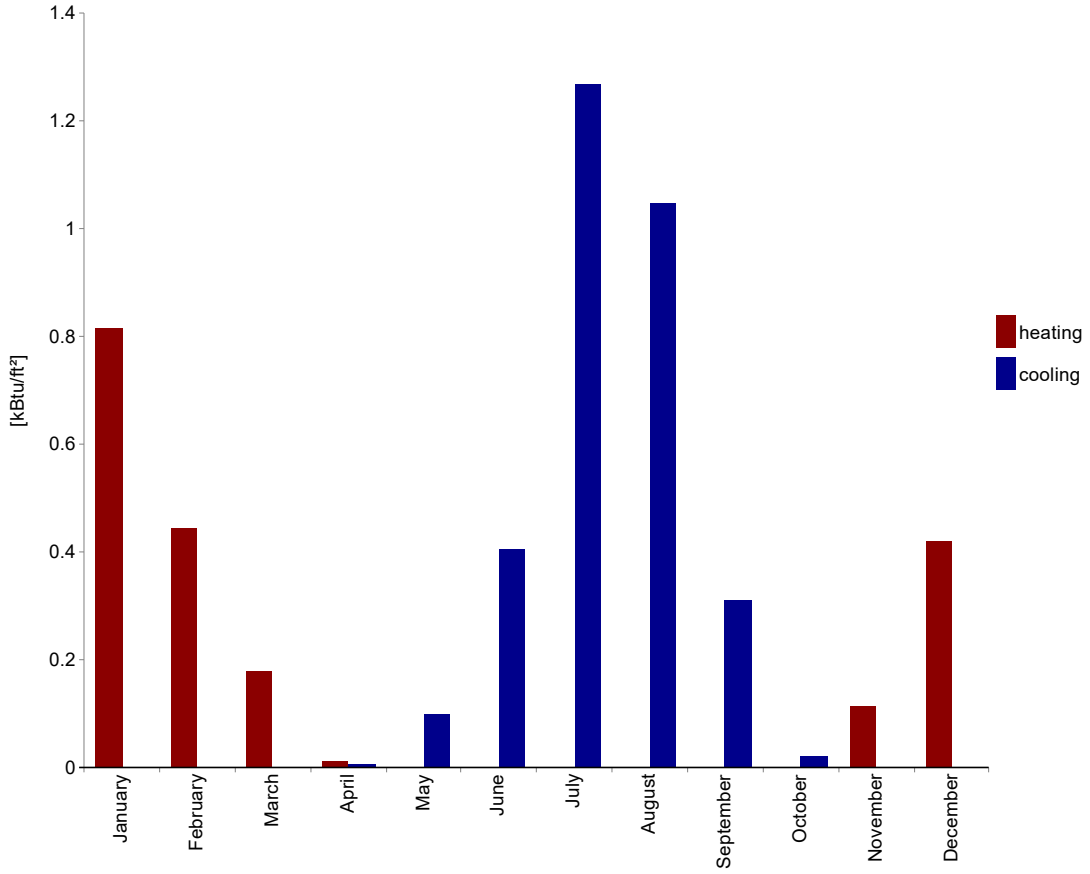
ANNUAL COOLING DEMAND

Solar heat gains:	**463,717**	kBtu/yr
Internal heat gains:	**889,768**	kBtu/yr
Total heat gains:	**1,353,485**	kBtu/yr
Transmission losses :	**890,618**	kBtu/yr
Ventilation losses:	**1,438,780**	kBtu/yr
Total heat losses:	**2,329,398**	kBtu/yr
Utilization factor:	**47.6**	%
Useful heat losses:	**1,109,103**	kBtu/yr
Cooling demand - sensible:	**244,383**	kBtu/yr
Cooling demand - latent:	**33,410**	kBtu/yr
Annual cooling demand:	**277,792**	kBtu/yr
Specific annual cooling demand:	**3.2**	kBtu/ft²yr





SPECIFIC HEAT/COOLING DEMAND MONTHLY



Month	Heating [kBtu/ft²]	Cooling [kBtu/ft²]
January	0.8	0
February	0.4	0
March	0.2	0
April	0	0
May	0	0.1
June	0	0.4
July	0	1.3
August	0	1
September	0	0.3
October	0	0
November	0.1	0
December	0.4	0

HEATING LOAD

	First climate	Second climate
Transmission heat losses:	**189,504.8** Btu/hr	**135,028.9** Btu/hr
Ventilation heat losses:	**109,591.4** Btu/hr	**77,912.7** Btu/hr
Total heat loss:	**299,096.2** Btu/hr	**212,941.6** Btu/hr
Solar heat gain:	**39,048.6** Btu/hr	**21,863.7** Btu/hr
Internal heat gain:	**44,508.6** Btu/hr	**44,508.6** Btu/hr
Total heat gains heating:	**83,557.2** Btu/hr	**66,372.3** Btu/hr
Heating load:	**215,539** Btu/hr	**146,569.3** Btu/hr

Relevant heating load: **215,539** Btu/hr

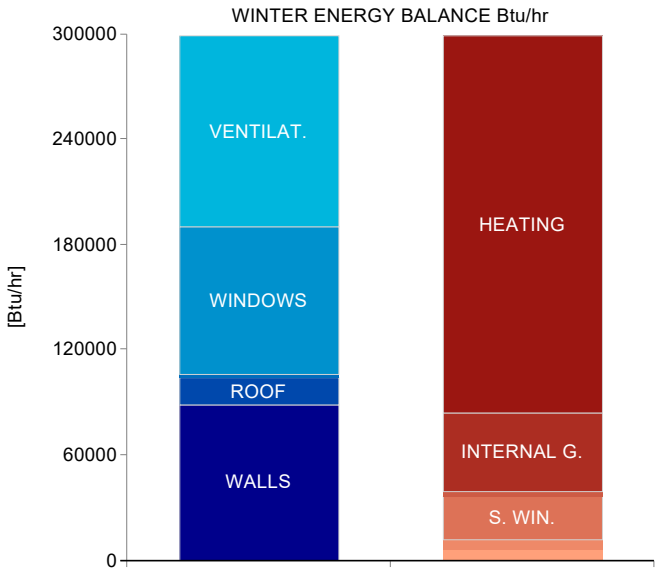
Specific heating load: **2.5** Btu/hr ft²

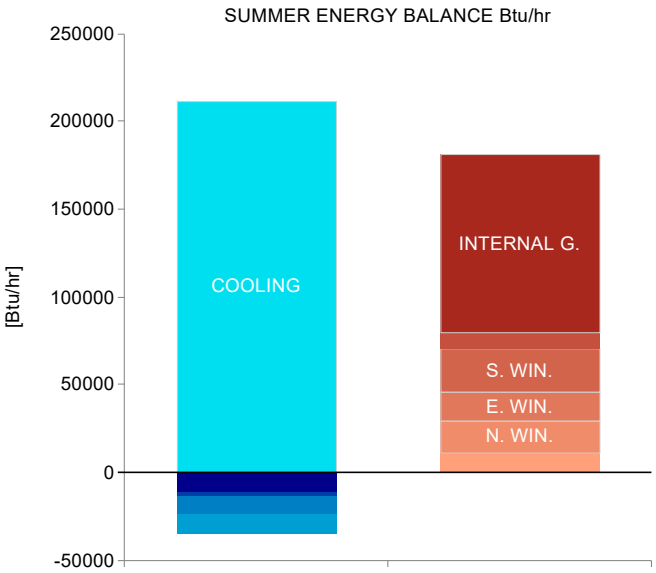
COOLING LOAD

Solar heat gain:	**79,344.4** Btu/hr
Internal heat gain:	**101,581.7** Btu/hr
Total heat gains cooling:	**180,926** Btu/hr
Transmission heat losses:	**-19,402.1** Btu/hr
Ventilation heat losses:	**-10,758.2** Btu/hr
Total heat loss:	**-30,160.3** Btu/hr
Cooling load - sensible:	**211,086.3** Btu/hr
Cooling load - latent:	**0** Btu/hr

Relevant cooling load: **211,086.3** Btu/hr

Specific maximum cooling load: **2.4** Btu/hr ft²





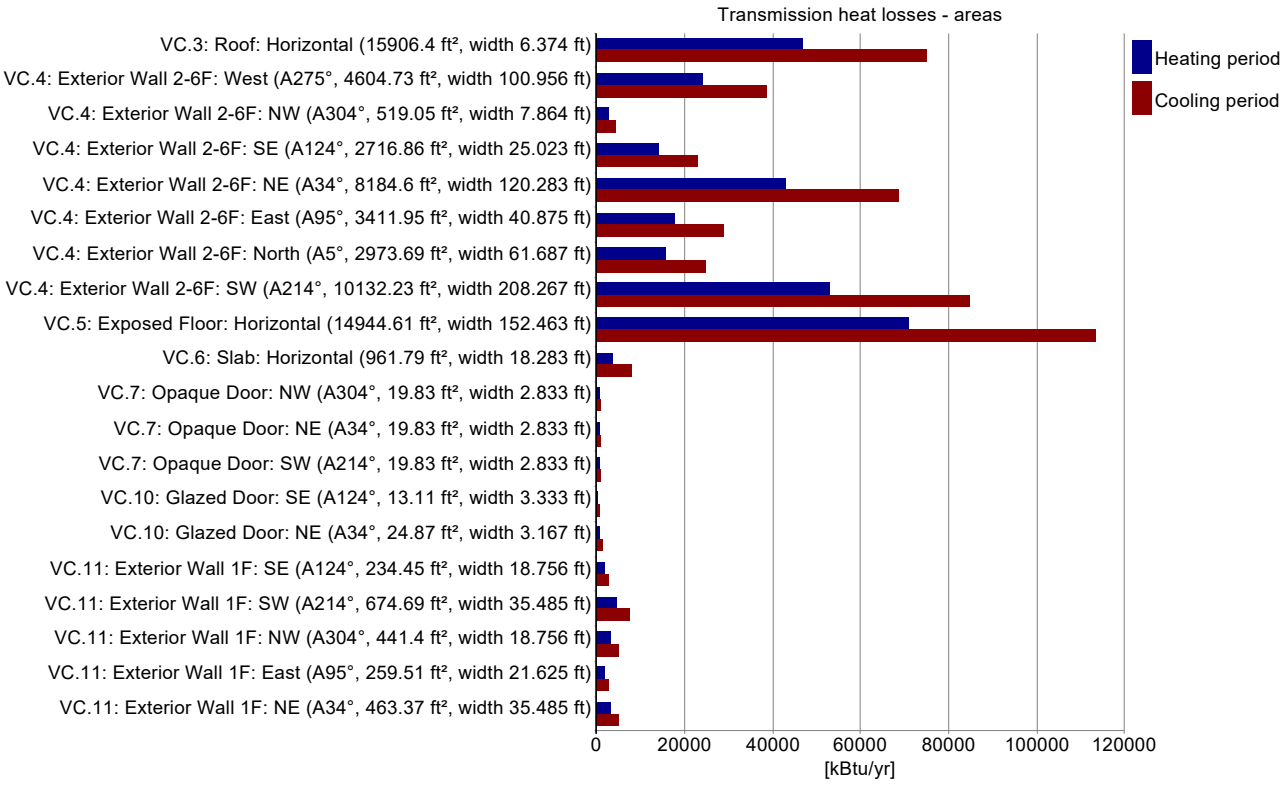
AREAS

Transmission heat losses - areas

Name	Area [ft²]	Average U-value [Btu/hr ft² °F]	Absorption coefficient	Emission coefficient	Reduction factor shading [%]	Transmission losses heating [kBtu/yr]	Transmission losses cooling [kBtu/yr]
VC.3: Roof: Horizontal (15906.4 ft², width 6.374 ft)	15906.4	0.02	0.4	0.9	100	46824.1	74881
VC.4: Exterior Wall 2-6F: West (A275°, 4604.73 ft², width 100.956 ft)	4604.7	0.035	0.4	0.9	100	24114	38563
VC.4: Exterior Wall 2-6F: NW (A304°, 519.05 ft², width 7.864 ft)	519.1	0.035	0.4	0.9	100	2718.2	4346.9
VC.4: Exterior Wall 2-6F: SE (A124°, 2716.86 ft², width 25.023 ft)	2716.9	0.035	0.4	0.9	100	14227.6	22752.8
VC.4: Exterior Wall 2-6F: NE (A34°, 8184.6 ft², width 120.283 ft)	8184.6	0.035	0.4	0.9	100	42861	68543.2
VC.4: Exterior Wall 2-6F: East (A95°, 3411.95 ft², width 40.875 ft)	3411.9	0.035	0.4	0.9	100	17867.6	28573.9
VC.4: Exterior Wall 2-6F: North (A5°, 2973.69 ft², width 61.687 ft)	2973.7	0.035	0.4	0.9	100	15572.6	24903.6
VC.4: Exterior Wall 2-6F: SW (A214°, 10132.23 ft², width 208.267 ft)	10132.2	0.035	0.4	0.9	100	53060.3	84853.9
VC.5: Exposed Floor: Horizontal (14944.61 ft², width 152.463 ft)	14944.6	0.032	0.4	0.9	100	70823.3	113260.3
VC.6: Slab: Horizontal (961.79 ft², width 18.283 ft)	961.8	0.063	0	0	0	3504.7	7926.9
VC.7: Opaque Door: NW (A304°, 19.83 ft², width 2.833 ft)	19.8	0.201	0.4	0.9	100	597.4	955.3
VC.7: Opaque Door: NE (A34°, 19.83 ft², width 2.833 ft)	19.8	0.201	0.4	0.9	100	597.4	955.3
VC.7: Opaque Door: SW (A214°, 19.83 ft², width 2.833 ft)	19.8	0.201	0.4	0.9	100	597.4	955.3
VC.10: Glazed Door: SE (A124°, 13.11 ft², width 3.333 ft)	13.1	0.201	0.4	0.9	100	394.9	631.5
VC.10: Glazed Door: NE (A34°, 24.87 ft², width 3.167 ft)	24.9	0.201	0.4	0.9	100	749.2	1198.1
VC.11: Exterior Wall 1F: SE (A124°, 234.45 ft², width 18.756 ft)	234.4	0.046	0.4	0.9	100	1627	2601.9
VC.11: Exterior Wall 1F: SW (A214°, 674.69 ft², width 35.485 ft)	674.7	0.046	0.4	0.9	100	4682.1	7487.6
VC.11: Exterior Wall 1F: NW (A304°, 441.4 ft², width 18.756 ft)	441.4	0.046	0.4	0.9	100	3063.2	4898.6
VC.11: Exterior Wall 1F: East (A95°, 259.51 ft², width 21.625 ft)	259.5	0.046	0.4	0.9	100	1800.9	2880
VC.11: Exterior Wall 1F: NE (A34°, 463.37 ft², width 35.485 ft)	463.4	0.046	0.4	0.9	100	3215.7	5142.5

Degree hours [kFh/a]

	Heating	Cooling
Ambient heating	83.1	132.9
Ground heating	32.3	73.1



THERMAL BRIDGES

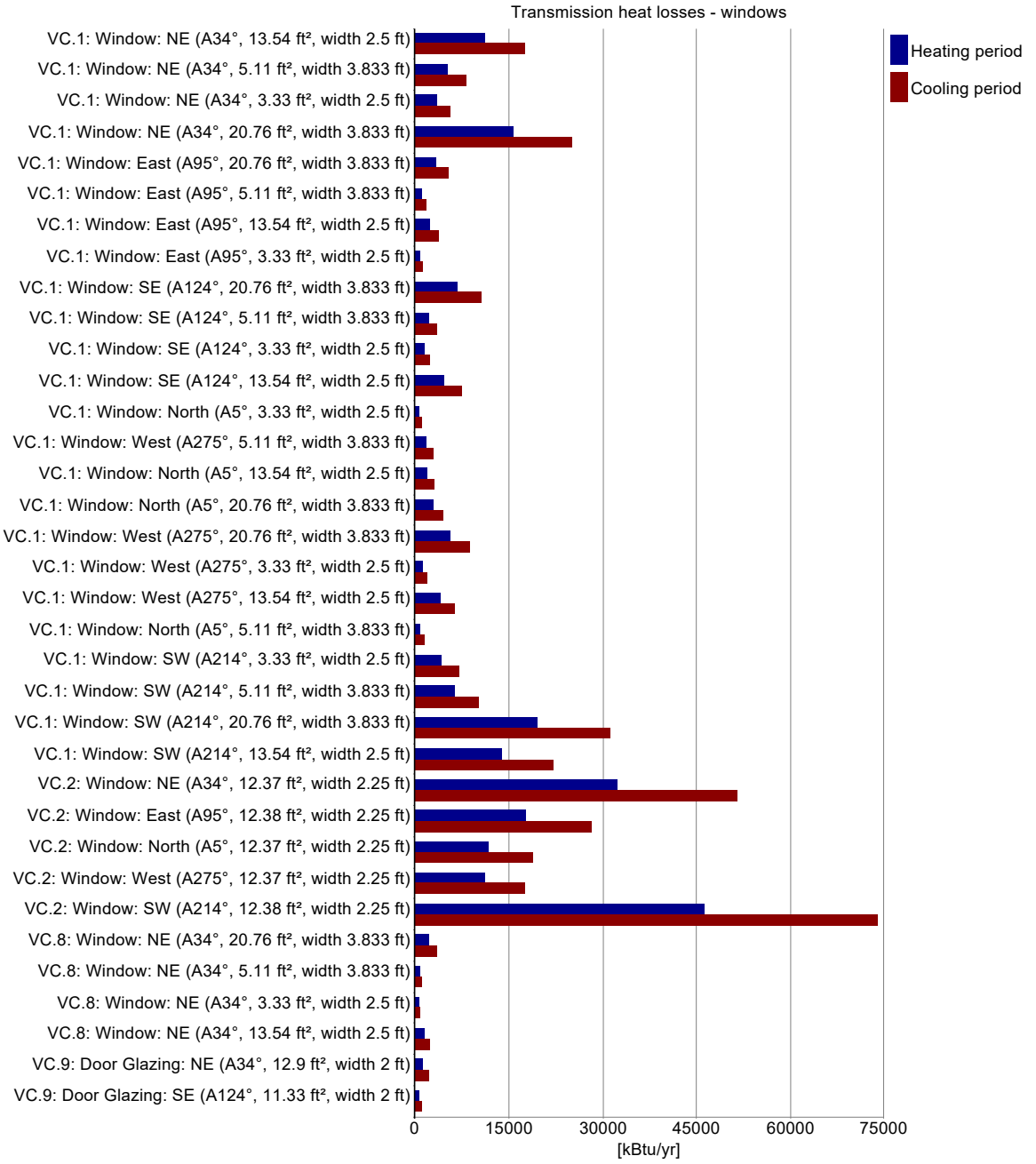
Transmission heat losses - thermal bridges

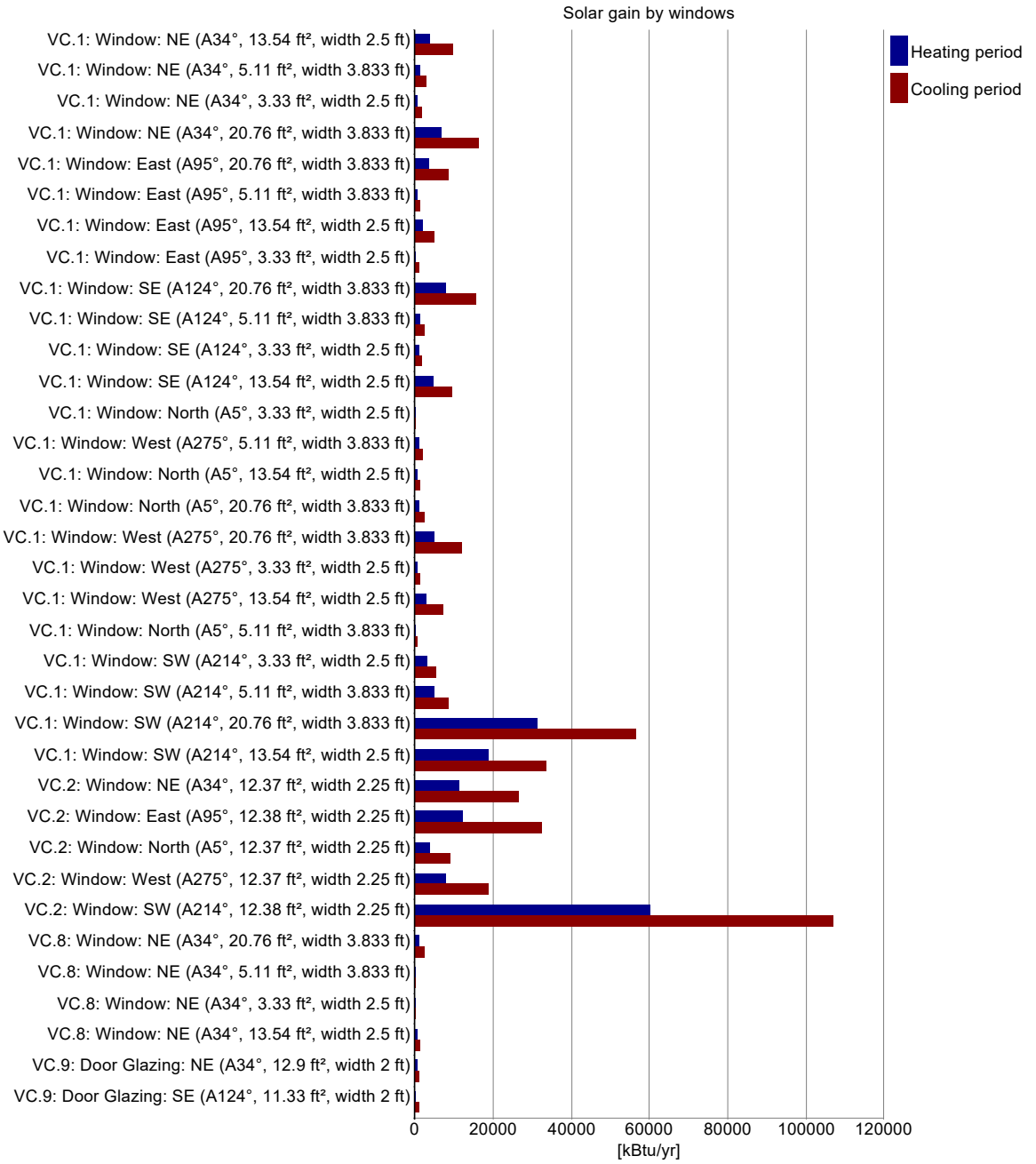
Name	Length [ft]	Psi-value [Btu/hr ft °F]	Transmission losses [kBtu/yr]	Transmission losses cooling [kBtu/yr]

WINDOWS

Transmission heat losses - windows

Name	Quan-tity	Incli-nation [°]	U-value total [Btu/hr ft² °F]	SHGC (perpen-dicular)	Reduction factor shading [%]	Reduction factor shading summer [%]	Solar gain heating [kBtu/yr]	Solar gain cooling [kBtu/yr]	Transmission losses heating [kBtu/yr]	Transmission losses cooling [kBtu/yr]
VC.1: Window: NE (A34°, 13.54 ft², width 2.5 ft)	28	90	0.194	0.4	65.3	67.4	3,916.5	9,555.1	11,007.7	17,603.4
VC.1: Window: NE (A34°, 5.11 ft², width 3.833 ft)	28	90	0.237	0.4	64	65.8	1,166.6	2,816.2	5,063.8	8,098
VC.1: Window: NE (A34°, 3.33 ft², width 2.5 ft)	28	90	0.248	0.4	63.4	64.7	711.8	1,701.2	3,458.6	5,531
VC.1: Window: NE (A34°, 20.76 ft², width 3.833 ft)	28	90	0.18	0.4	68.7	72	6,638.1	16,478.6	15,622.2	24,983
VC.1: Window: East (A95°, 20.76 ft², width 3.833 ft)	6	90	0.18	0.4	88.3	89.9	3,607.9	8,670	3,347.6	5,353.5
VC.1: Window: East (A95°, 5.11 ft², width 3.833 ft)	6	90	0.237	0.4	76.8	77	586.5	1,385.1	1,085.1	1,735.3
VC.1: Window: East (A95°, 13.54 ft², width 2.5 ft)	6	90	0.194	0.4	85.6	88.3	2,102.8	5,121.1	2,358.8	3,772.2
VC.1: Window: East (A95°, 3.33 ft², width 2.5 ft)	6	90	0.248	0.4	76.4	77.2	352.8	839.6	741.1	1,185.2
VC.1: Window: SE (A124°, 20.76 ft², width 3.833 ft)	12	90	0.18	0.4	78.2	84	8,084.5	15,521.3	6,695.2	10,707
VC.1: Window: SE (A124°, 5.11 ft², width 3.833 ft)	12	90	0.237	0.4	69.4	70.8	1,384.5	2,508.8	2,170.2	3,470.6
VC.1: Window: SE (A124°, 3.33 ft², width 2.5 ft)	12	90	0.248	0.4	69.2	70.7	841.2	1,526.1	1,482.3	2,370.4
VC.1: Window: SE (A124°, 13.54 ft², width 2.5 ft)	12	90	0.194	0.4	76	81.8	4,788.1	9,199.3	4,717.6	7,544.3
VC.1: Window: North (A5°, 3.33 ft², width 2.5 ft)	5	90	0.248	0.4	57.3	55.5	110.3	275	617.6	987.7
VC.1: Window: West (A275°, 5.11 ft², width 3.833 ft)	10	90	0.237	0.4	73	73.9	806.1	1,905.6	1,808.5	2,892.2
VC.1: Window: North (A5°, 13.54 ft², width 2.5 ft)	5	90	0.194	0.4	56.1	53.4	604.2	1,468	1,965.7	3,143.5
VC.1: Window: North (A5°, 20.76 ft², width 3.833 ft)	5	90	0.18	0.4	58	55.9	1,006	2,489.8	2,789.7	4,461.2
VC.1: Window: West (A275°, 20.76 ft², width 3.833 ft)	10	90	0.18	0.4	84.8	87.2	4,986.7	12,066.6	5,579.4	8,922.5
VC.1: Window: West (A275°, 3.33 ft², width 2.5 ft)	10	90	0.248	0.4	72.7	74.3	482.8	1,156.9	1,235.2	1,975.4
VC.1: Window: West (A275°, 13.54 ft², width 2.5 ft)	10	90	0.194	0.4	82.2	85.7	2,898.5	7,133.7	3,931.3	6,286.9
VC.1: Window: North (A5°, 5.11 ft², width 3.833 ft)	5	90	0.237	0.4	57	55.5	178.8	448.5	904.3	1,446.1
VC.1: Window: SW (A214°, 3.33 ft², width 2.5 ft)	35	90	0.248	0.4	70	64.3	3,087.6	5,281.7	4,323.3	6,913.8
VC.1: Window: SW (A214°, 5.11 ft², width 3.833 ft)	35	90	0.237	0.4	70.2	64.4	5,084	8,687.4	6,329.8	10,122.5
VC.1: Window: SW (A214°, 20.76 ft², width 3.833 ft)	35	90	0.18	0.4	83.8	82.6	31,404.7	56,526.2	19,527.8	31,228.7
VC.1: Window: SW (A214°, 13.54 ft², width 2.5 ft)	35	90	0.194	0.4	81.3	79.5	18,703	33,448.9	13,759.6	22,004.3
VC.2: Window: NE (A34°, 12.37 ft², width 2.25 ft)	88	90	0.198	0.4	64.5	65.4	11,186.2	26,554.4	32,324.3	51,692.9
VC.2: Window: East (A95°, 12.38 ft², width 2.25 ft)	48	90	0.198	0.4	75.8	82.5	12,445.5	32,252.8	17,631.4	28,196.1
VC.2: Window: North (A5°, 12.37 ft², width 2.25 ft)	32	90	0.198	0.4	59.2	55.6	3,720.7	8,876.2	11,754.3	18,797.4
VC.2: Window: West (A275°, 12.37 ft², width 2.25 ft)	30	90	0.198	0.4	81.6	84.8	7,757.1	19,011.8	11,019.6	17,622.6
VC.2: Window: SW (A214°, 12.38 ft², width 2.25 ft)	126	90	0.198	0.4	80.8	78.8	60,107	107,155.4	46,282.5	74,014.8
VC.8: Window: NE (A34°, 20.76 ft², width 3.833 ft)	4	90	0.18	0.4	68.3	72	933.2	2,338.7	2,231.7	3,569
VC.8: Window: NE (A34°, 5.11 ft², width 3.833 ft)	4	90	0.237	0.4	63.4	65.5	164.1	398.5	723.4	1,156.9
VC.8: Window: NE (A34°, 3.33 ft², width 2.5 ft)	4	90	0.248	0.4	63	64.8	100	241.4	494.1	790.1
VC.8: Window: NE (A34°, 13.54 ft², width 2.5 ft)	4	90	0.194	0.4	65	68	546	1,356.8	1,572.5	2,514.8
VC.9: Door Glazing: NE (A34°, 12.9 ft², width 2 ft)	2	90	0.361	0.6	70.4	74.6	425.5	1,074	1,392.8	2,227.4
VC.9: Door Glazing: SE (A124°, 11.33 ft², width 2 ft)	1	90	0.364	0.6	65.5	80.2	376.6	854.4	616.3	985.6


Transmission heat losses - windows
VC.1: Window: NE (A34°, 13.54 ft², width 2.5 ft)
VC.1: Window: NE (A34°, 5.11 ft², width 3.833 ft)
VC.1: Window: NE (A34°, 3.33 ft², width 2.5 ft)
VC.1: Window: NE (A34°, 20.76 ft², width 3.833 ft)
VC.1: Window: East (A95°, 20.76 ft², width 3.833 ft)
VC.1: Window: East (A95°, 5.11 ft², width 3.833 ft)
VC.1: Window: East (A95°, 13.54 ft², width 2.5 ft)
VC.1: Window: East (A95°, 3.33 ft², width 2.5 ft)
VC.1: Window: SE (A124°, 20.76 ft², width 3.833 ft)
VC.1: Window: SE (A124°, 5.11 ft², width 3.833 ft)
VC.1: Window: SE (A124°, 3.33 ft², width 2.5 ft)
VC.1: Window: SE (A124°, 13.54 ft², width 2.5 ft)
VC.1: Window: North (A5°, 3.33 ft², width 2.5 ft)
VC.1: Window: West (A275°, 5.11 ft², width 3.833 ft)
VC.1: Window: North (A5°, 13.54 ft², width 2.5 ft)
VC.1: Window: North (A5°, 20.76 ft², width 3.833 ft)
VC.1: Window: West (A275°, 20.76 ft², width 3.833 ft)
VC.1: Window: West (A275°, 3.33 ft², width 2.5 ft)
VC.1: Window: West (A275°, 13.54 ft², width 2.5 ft)
VC.1: Window: North (A5°, 5.11 ft², width 3.833 ft)
VC.1: Window: SW (A214°, 3.33 ft², width 2.5 ft)
VC.1: Window: SW (A214°, 5.11 ft², width 3.833 ft)
VC.1: Window: SW (A214°, 20.76 ft², width 3.833 ft)
VC.1: Window: SW (A214°, 13.54 ft², width 2.5 ft)
VC.2: Window: NE (A34°, 12.37 ft², width 2.25 ft)
VC.2: Window: East (A95°, 12.38 ft², width 2.25 ft)
VC.2: Window: North (A5°, 12.37 ft², width 2.25 ft)
VC.2: Window: West (A275°, 12.37 ft², width 2.25 ft)
VC.2: Window: SW (A214°, 12.38 ft², width 2.25 ft)
VC.8: Window: NE (A34°, 20.76 ft², width 3.833 ft)
VC.8: Window: NE (A34°, 5.11 ft², width 3.833 ft)
VC.8: Window: NE (A34°, 3.33 ft², width 2.5 ft)
VC.8: Window: NE (A34°, 13.54 ft², width 2.5 ft)
VC.9: Door Glazing: NE (A34°, 12.9 ft², width 2 ft)
VC.9: Door Glazing: SE (A124°, 11.33 ft², width 2 ft)
Heating period
Cooling period
0
15000
30000
45000
60000
75000
[kBtu/yr]


Solar gain by windows
VC.1: Window: NE (A34°, 13.54 ft², width 2.5 ft)
VC.1: Window: NE (A34°, 5.11 ft², width 3.833 ft)
VC.1: Window: NE (A34°, 3.33 ft², width 2.5 ft)
VC.1: Window: NE (A34°, 20.76 ft², width 3.833 ft)
VC.1: Window: East (A95°, 20.76 ft², width 3.833 ft)
VC.1: Window: East (A95°, 5.11 ft², width 3.833 ft)
VC.1: Window: East (A95°, 13.54 ft², width 2.5 ft)
VC.1: Window: East (A95°, 3.33 ft², width 2.5 ft)
VC.1: Window: SE (A124°, 20.76 ft², width 3.833 ft)
VC.1: Window: SE (A124°, 5.11 ft², width 3.833 ft)
VC.1: Window: SE (A124°, 3.33 ft², width 2.5 ft)
VC.1: Window: SE (A124°, 13.54 ft², width 2.5 ft)
VC.1: Window: North (A5°, 3.33 ft², width 2.5 ft)
VC.1: Window: West (A275°, 5.11 ft², width 3.833 ft)
VC.1: Window: North (A5°, 13.54 ft², width 2.5 ft)
VC.1: Window: North (A5°, 20.76 ft², width 3.833 ft)
VC.1: Window: West (A275°, 20.76 ft², width 3.833 ft)
VC.1: Window: West (A275°, 3.33 ft², width 2.5 ft)
VC.1: Window: West (A275°, 13.54 ft², width 2.5 ft)
VC.1: Window: North (A5°, 5.11 ft², width 3.833 ft)
VC.1: Window: SW (A214°, 3.33 ft², width 2.5 ft)
VC.1: Window: SW (A214°, 5.11 ft², width 3.833 ft)
VC.1: Window: SW (A214°, 20.76 ft², width 3.833 ft)
VC.1: Window: SW (A214°, 13.54 ft², width 2.5 ft)
VC.2: Window: NE (A34°, 12.37 ft², width 2.25 ft)
VC.2: Window: East (A95°, 12.38 ft², width 2.25 ft)
VC.2: Window: North (A5°, 12.37 ft², width 2.25 ft)
VC.2: Window: West (A275°, 12.37 ft², width 2.25 ft)
VC.2: Window: SW (A214°, 12.38 ft², width 2.25 ft)
VC.8: Window: NE (A34°, 20.76 ft², width 3.833 ft)
VC.8: Window: NE (A34°, 5.11 ft², width 3.833 ft)
VC.8: Window: NE (A34°, 3.33 ft², width 2.5 ft)
VC.8: Window: NE (A34°, 13.54 ft², width 2.5 ft)
VC.9: Door Glazing: NE (A34°, 12.9 ft², width 2 ft)
VC.9: Door Glazing: SE (A124°, 11.33 ft², width 2 ft)
Heating period
Cooling period
0
20000
40000
60000
80000
100000
120000
[kBtu/yr]

Summary building envelope

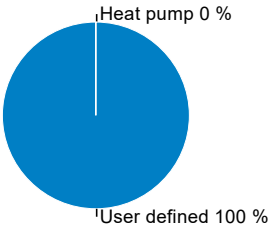
	Total area / length	Average U-value / Psi value	Transmission losses
Exterior wall ambient:	**49,561.1** ft²	**0.034** Btu/hr ft² °F	**255,633.5** kBtu/yr
Exterior wall ground:	**0** ft²	**0** Btu/hr ft² °F	**0** kBtu/yr
Basement:	**961.8** ft²	**0.063** Btu/hr ft² °F	**3,504.7** kBtu/yr
Roof:	**15,906.4** ft²	**0.02** Btu/hr ft² °F	**46,824.1** kBtu/yr
Windows:	**8,321.6** ft²	**0.198** Btu/hr ft² °F	**246,565.2** kBtu/yr
Doors:	**97.5** ft²	**0.201** Btu/hr ft² °F	**2,936.2** kBtu/yr
Thermal bridge ambient:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr
Thermal bridge perimeter:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr
Thermal bridge floor slab:	**0** ft	**0** Btu/hr ft °F	**0** kBtu/yr

Shading

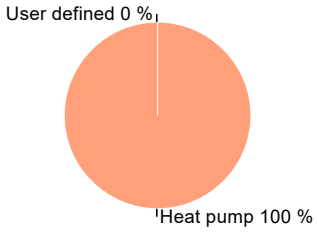
	Heating	Cooling
Reduction factor North:	**64.6** %	**65.7** %
Reduction factor East:	**77.5** %	**82.9** %
Reduction factor South:	**80.9** %	**78.8** %
Reduction factor West:	**81.9** %	**84.8** %
Reduction factor Horizontal:	**100** %	**100** %

System	DHW			Heating			Total		
	Covered DHW demand [%]	Estimated solar fraction [%]	Final energy demand [kBtu/yr]	Covered heating demand [%]	Estimated solar fraction [%]	Final energy demand [kBtu/yr]	Performance ratio	CO2 equivalent emissions [lb/yr]	Source energy demand [kBtu/yr]
Heat pump, Mitsubishi VRF (PURY)	0	0	0	100	0	48,954.3	0	21,510.5	137,072
User defined, Lochinvar Armor AWN601PM (96% Thermal Eff. Derated by .02 per PHIUS	100	0	520,033.7	0	0	0	1.1	119,543.6	572,037.1
Σ	100	0	520,033.7	100	0	48,954.3		141,054.1	709,109.1

DHW - final energy



Heating - final energy



COOLING UNITS

	sensible	latent
Air cooling:	**0** kBtu/ft²yr	**0** kBtu/ft²yr
Recirculation cooling:	**2.8** kBtu/ft²yr	**2.1** kBtu/ft²yr
Additional dehumidification:		**0** kBtu/ft²yr
Panel cooling:	**0** kBtu/ft²yr	
Sum:	**2.8** kBtu/ft²yr	**2.1** kBtu/ft²yr

VENTILATION

Energy transportable by supply air

Heating energy

transportable: **1.38** W/ft²
load: **0.72** W/ft²

Cooling energy

transportable: **0.82** W/ft²
load: **0.7** W/ft²

Infiltration pressure test ACH50: **0.34** 1/hr
Total extract air demand: **5,534** cfm
Supply air per person: **18** cfm
Occupancy: **237**

Average air flow rate: **5,661.23** cfm
Average air change rate: **0.42** 1/hr
Effective ACH ambient: **0.12** 1/hr
Effective ACH ground: **0** 1/hr
Energetically effective air exchange: **0.12** 1/hr
Infiltration air change rate: **0.02** 1/hr
Infiltration air change rate (heating load): **0.06** 1/hr

Type of ventilation system: **Balanced PH ventilation**
Wind screening coefficient (e): **0.07**
Wind exposure factor: **15**
Wind shield factor: **0.05**

Ventilation heat losses: **231,620.5** kBtu/yr

Devices

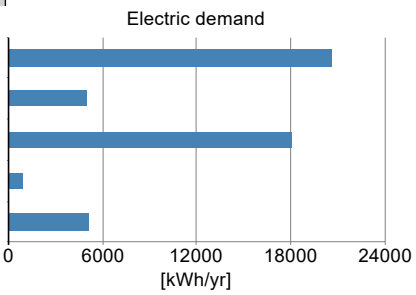
Name	Sensible recovery efficiency [-]	Electric efficiency [W/cfm]	Heat recovery efficiency SHX [-]	Effective recovery efficiency [-]
Pending MECH drawings	0.8	0.05	0	0.8
Altogether	0.8	0.04	0	0.8

SUMMER VENTILATION

ACH night ventilation: **0** 1/hr
ACH natural summer: **0** 1/hr
Mechanical ventilation summer: **0.4** 1/hr
Mechanical ventilation summer with HR: **no**
Preferred minimum indoor temperature for night ventilation: **68** °F
Overheating temperature: **77** °F

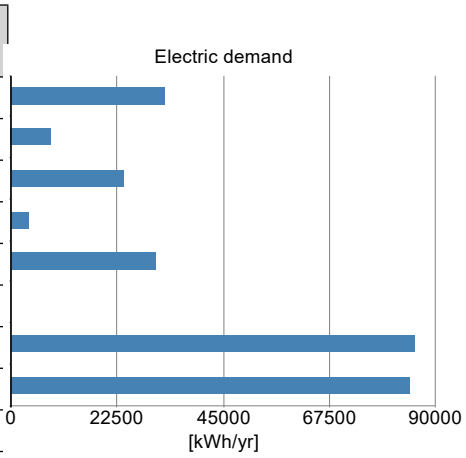
ELECTRICITY DEMAND - AUXILIARY ELECTRICITY

Type	Quantity	Indoor	Norm demand	Electric demand [kWh/yr]	Source energy [kBtu/yr]
Ventilation winter	1	no	0.8 W/cfm	20703.6	197782.8
Ventilation Defrost	1	no	26,537 W	4950	47287.5
Ventilation summer	1	no	0.8 W/cfm	18078.7	172706.3
DHW circulating pump	1	yes	99.5 W	844.2	8064.6
DHW storage load pump	1	yes	578.8 W	5070	48433.8
Σ				49646.4	474275



ELECTRICITY DEMAND RESIDENTIAL BUILDING

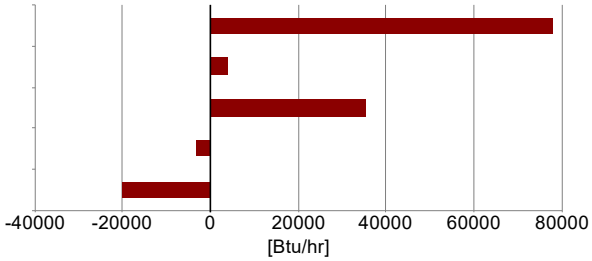
Type	Quantity	Indoor	Norm demand	Electric demand [kWh/yr]	Non-electric demand [kWh/yr]	Source energy [kBtu/yr]
Kitchen refrigerator	1	yes	1.2	32571	0	311152.5
Kitchen dishwasher	1	yes	1.2	8300.1	0	79291.4
Kitchen cooking	1	yes	0.2	23700	0	226407.4
Laundry - washer	1	yes	0.3	3795.2	0	36256.1
Laundry - dryer	1	yes	3.4	30369.9	0	290125.7
Energy consumed by evaporation	1	yes	3.1	0	1447.2	6153.7
User defined lighting	1	yes	85,426	85426	0	816079.2
User defined MELs	1	yes	84,695	84695	0	809095.9
Σ	8			268857.3	1447.2	2574561.8



INTERNAL HEAT GAINS

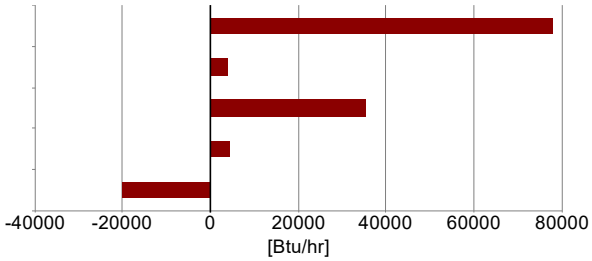
Heating season

Electricity total:	**77,842.8**	Btu/hr
Auxiliary electricity:	**3,874.8**	Btu/hr
People:	**35,581.8**	Btu/hr
Cold water:	**-3,290.1**	Btu/hr
Evaporation:	**-20,216.9**	Btu/hr
Σ:	**93,774.4**	Btu/hr
Specific internal heat gains:	**1.1**	Btu/hr ft²



Cooling season

Electricity total:	**77,842.8**	Btu/hr
Auxiliary electricity:	**3,874.8**	Btu/hr
People:	**35,581.8**	Btu/hr
Cold and hot water:	**4,517.1**	Btu/hr
Evaporation:	**-20,216.9**	Btu/hr
Σ:	**93,774.4**	Btu/hr
Specific internal heat gains:	**1.1**	Btu/hr ft²



DHW AND DISTRIBUTION

DHW consumption per person per day:	**6.6**	gal/Person/day
Average cold water temperature supply:	**52.8**	°F
Useful heat DHW:	**414,135.9**	kBtu/yr
Specific useful heat DHW:	**4,719.7**	Btu/ft²yr
Total heat losses of the DHW system:	**46,070.9**	kBtu/yr
Specific losses of the DHW system:	**525.1**	Btu/ft²yr
Performance ratio DHW distribution system and storage:	**1.1**	
Utilization ratio DHW distribution system and storage:	**0.9**	
Total heat demand of DHW system:	**460,206.8**	kBtu/yr
Total specific heat demand of DHW system:	**5,244.8**	Btu/ft²yr
Total heat losses of the hydronic heating distribution:	**0**	kBtu/yr
Specific losses of the hydronic heating distribution:	**0**	Btu/ft²yr
Performance ratio of heat distribution:	**100**	%

Region	Length [ft]	Annual heat loss [kBtu/yr]
Hydronic heating distribution pipes		
Σ	0	0
DHW circulation pipes		
In conditioned space	350	12810.2
Σ	350	12810.2
Individual pipes		
In conditioned space	2675	31263.6
Σ	2675	31263.6
Water storage		
Device 4 (Water storage: DHW): Lochinvar RJA120 Lock-Temp Stainless Steel 119-gallon		1997.1
Σ		1997.1

Green Building Project Checklist

Green Building Project Location: 402 Rindge Avenue, Cambridge MA 02140

Applicant

Name: Just-A-Start Corporation

Address: 1035 Cambridge Street, #12, Cambridge, MA 02141

Contact Information

Email Address: robertmacarthur@justastart.org

Telephone #: 617-918-7521

Project Information (select all that apply):

- [x] New Construction – GFA: 161,043 sf
- [ ] Addition – GFA of Addition: _____
- [ ] Rehabilitation of Existing Building – GFA of Rehabilitated Area: _____
  - [ ] Existing Use(s) of Rehabilitated Area: _____
  - [ ] Proposed Use(s) of Rehabilitated Area: _____
- [x] Requires Planning Board Special Permit approval *Done through a 40B Comprehensive permit
- [x] Subject to Section 19.50 Building and Site Plan Requirements
- [ ] Site was previously subject to Green Building Requirements

Green Building Rating Program/System:

- [ ] Leadership in Energy and Environmental Design (LEED) – Version: _____
  - [ ] Building Design + Construction (BD+C) – Subcategory: _____
  - [ ] Residential BD+C – Subcategory: _____
  - [ ] Interior Design + Construction (ID+C) – Subcategory: _____
  - [ ] Other: _____
- [x] Passive House – Version: Core 2018
  - [x] PHIUS+
  - [ ] Passivhaus Institut (PHI)
  - [ ] Other: _____
- [ ] Enterprise Green Communities – Version: _____

Project Phase

☐ **SPECIAL PERMIT**

Before applying for a building permit, submit this documentation to CDD for review and approval.

Required Submissions

All rating programs:

- ☐ Rating system checklist
- ☐ Rating system narrative
- ☐ Net zero narrative (see example template for guidance)
- ☐ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Special Permit)

Project Phase

☐ **BUILDING PERMIT**

Before applying for a building permit, submit this documentation to CDD for review and approval.

Required Submissions

All rating programs:

- ☐ Rating system checklist – updated from any prior version
- ☐ Rating system narrative – updated from any prior version with additional supporting information from construction documents
- ☐ Net zero narrative – updated from any prior version (see example template for guidance)
- ☐ Energy Simulation Tool results demonstrating compliance with selected rating system. *[Note: For Passive House rating program, must use WUFI Passive, Passive House Planning Package (PHPP), or comparable software tool authorized by Passive House.]*
- ☐ Credentials of Green Commissioning Authority (or copy of contract between developer and Commissioning Authority if an independent consultant or subcontractor), including documentation of Green Commissioning process experience on at least two building projects with a scope of work similar to the proposed project extending from early design phase through at least ten (10) months of occupancy
- ☐ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Building Permit)

Passive House rating program only:

- ☐ Letter of intent from Passive House rater/verifier hired for on-site verification, with credentials of rater/verifier
- ☐ Credentials of Certified Passive House Consultant who has provided design, planning, or consulting services (if different from the Green Building Professional for the project)
- ☐ Construction drawings and specifications

Project Phase

☐ **CERTIFICATE OF OCCUPANCY**

Before applying for a certificate of occupancy, submit this documentation to CDD for review and approval.

Required Submissions

All rating programs:

- ☐ Rating system checklist – updated from any prior version
- ☐ Rating system narrative – updated from any prior version with additional supporting information from as-built conditions
- ☐ Net zero narrative – updated from any prior version (see example template for guidance)
- ☐ Energy Simulation Tool results demonstrating compliance with selected rating system, updated to as-built conditions. *[Note: For Passive House rating program, must use WUFI Passive, Passive House Planning Package (PHPP), or comparable software tool authorized by Passive House.]*
- ☐ Affidavit with schedule of commissioning requirements signed by Green Commissioning Authority, with attached credentials – use City form provided (Certificate of Occupancy)
- ☐ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Certificate of Occupancy)

Passive House rating program only:

- ☐ Pressure Test Verification
- ☐ Ventilation Commissioning
- ☐ Quality Assurance Workbook
- ☐ Final testing and verification report from rater/verifier

Affidavit Form for Green Building Professional
Special Permit

Green Building
Project Location: 402 Rindge Ave, Cambridge, MA

Green Building Professional

Name: Maciej Konieczny

☐ Architect

☐ Engineer

Mass. License Number: CPHC#: 2642

Company: New Ecology, Inc.

Address: 15 Court Square, Suite 420, Boston, MA

Contact Information

Email Address: konieczny@newecology.org

Telephone Number: 617-557-1700 x7024

I, Maciej Konieczny, as the Green Building Professional for this Green Building Project, have reviewed all relevant documents for this project and confirm to the best of my knowledge that those documents indicate that the project is being designed to achieve the requirements of Section 22.24 under Article 22.20 of the Cambridge Zoning Ordinance.

(Signature) *(Date)* June 25, 2020

Attach either:

☒ Credential from the applicable Green Building Rating Program indicating advanced knowledge and experience in environmentally sustainable development in general as well as the applicable Green Building Rating System for this Green Building Project.

☐ If the Green Building Rating Program does not offer such a credential, evidence of experience as a project architect or engineer, or as a consultant providing third-party review, on at least three (3) projects that have been certified using the applicable Green Building Rating Program.

CITY OF CAMBRIDGE
TRAFFIC, PARKING, + TRANSPORTATION

MEMORANDUM

To: Cambridge Board of Zoning Appeal (BZA)

From: Joseph E. Barr, Director

Copy: Cambridge Planning Board

Date: June 24, 2020

Subject: Comprehensive Permit Application for Rindge Commons (402 Rindge Avenue)

The Cambridge Traffic, Parking, and Transportation Department (TP+T) has been working with Just-A-Start Corporation on the proposed Rindge Commons project, a project to construct two new buildings at 402 Rindge Avenue in two phases, with a combined total of 101 affordable housing units and approximately 42,000 square feet of office space for education and training programs.

The site has an existing 22-story tower building with 273 affordable units; therefore, the Rindge Commons project will result in a future build condition of 374 total affordable housing units at the site. The existing site has 273 surface parking spaces which will be reduced to 220 spaces for a future 0.59 parking spaces per unit ratio. During the day, vacant residential parking spaces are expected to be available for the site's office users.

The project will add 134 long-term bicycle parking spaces and 22 short-term bicycle parking spaces. The project will also install a new Bluebikes bikeshare station on the site.

TP&T offers the Board of Zoning Appeal (BZA) the following comments on this project.

Just-A-Start submitted a Transportation Impact Study (TIS) for the project which was completed by Vanasse & Associates, Inc. dated December 2019. TP+T believes that the TIS was a prepared in a complete and reliable manner.

The TIS was submitted with the Comprehensive Permit Application and indicated that the project will generate a total of:

- 928 daily vehicle trips, (85 AM Peak/72 PM Peak hour net new vehicle trips)
- 550 daily transit trips, (48 AM Peak/44 PM Peak hour transit trips)
- 218 daily pedestrian trips, (17 AM Peak 17 PM Peak hour transit trips)
- 20 daily bicycle trips, (1 AM Peak /1 PM Peak hour bicycle trips)

The TIS evaluated the area's transportation conditions, the site driveways, and intersection of Rindge Avenue at Alewife Brook Parkway. The TIS included the Project's trip generation and cumulative traffic impacts with the existing site conditions and other

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development projects in the area. The TIS reviewed all modes of transportation (vehicle, transit, walking, and bicycling) and the project's service and loading operations.

The TIS indicated that the Planning Board Special Permit transportation criteria were exceeded in 5 instances.

- The criteria for Traffic on Residential Streets was exceeded for Rindge Avenue, between Alewife Brook Parkway to Clifton Street, because an estimated 53 new vehicles are anticipated to use Rindge Avenue in the AM Peak hour which exceeds the criteria of 40 new vehicles.
- The Pedestrian Level of Service (PLOS) criteria was exceeded for the AM and PM Peak hour at the Alewife Brook Parkway at Rindge Avenue intersection because of an existing level-of-service E for pedestrians crossing Alewife Brook Parkway and Rindge Avenue. The project will not change this condition. This intersection is owned by the state Department of Conservation and Recreation (DCR). TP+T believes that the wait time for pedestrians to cross this intersection is reasonably balanced with the need to process vehicles through the intersection during the peak periods.

The TIS includes maps and tables showing the differences in vehicle and pedestrian delays at the Alewife Brook Parkway at Rindge Avenue intersection between the Existing and Build condition (i.e., delay due to project trips) and between Existing and a 5-Year Future condition (i.e., delay due to project trips, cumulative impacts with other development project trips, and a background growth rate of 0.5% per year for five years).

In addition to vehicle and pedestrian analysis, the TIS included a transit analysis of the MBTA buses in the area and the MBTA Red Line subway at Alewife station. The TIS indicated that there is sufficient bus and subway capacity to accommodate the project.

Automobile Parking

In order to accommodate the two new buildings, approximately 53 surface parking spaces will be permanently removed due to construction. However, a parking study in the TIS found that not all of the existing parking spaces are used and that the proposed future parking supply should be able to accommodate the sites parking demand. Furthermore, because the residential parking demand peaks at night and office-use parking demand will peak during the daytime, parking spaces can be shared.

Overall, TP+T believes that the project's proposed parking plan is reasonable and sufficient. The 0.59 parking space per unit ratio will provide the parking spaces needed for the residents that need to own a car but by limiting the parking spaces it will also discourage automobile ownership and use. Typically, affordable housing projects located near a transit station have a parking demand of approximately 0.5 spaces per unit or less, but TP+T believes that a 0.59 parking ratio is reasonable because Just-A-Start must both balance the needs of existing residents that already own a car, and discourage existing and future residents from owning a car or a second car to support sustainable travel modes.

TP+T recommends that the BZA support the proposed parking plan in the Comprehensive Permit, including sharing of parking spaces between residential and non-residential uses at the site. TP+T also recommends that Just-A-Start be permitted to reduce the number of parking spaces over time as feasible, in order to replace any

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future un-used parking spaces or parking areas with trees and green space, especially as transportation patterns change in the future (i.e., increase in biking, ride-hailing services, etc.). Parking at the site should be permitted to be as flexible as possible instead of locking the project into a specific number of parking spaces now. In other words, TP+T supports approving 220 spaces on the site, and also recommend that future reductions be permitted without needing zoning relief.

Bicycle Parking

The project is adding long-term and short-term bicycle parking spaces to meet the zoning requirements for the two new buildings. Furthermore, to encourage the use of bicycling, the project is proposing to install a Bluebikes station on the site, which TP+T believes will be a great amenity for those living and working there.

The project will not be adding new long-term bicycle parking spaces to the existing tower building however, the existing residents will be permitted to park their bike in the new bicycle parking spaces created for the new buildings as available. There are some existing bicycle parking spaces for the existing tower. TP+T suggests that residents be surveyed occasionally, and bicycle parking monitored to determine whether the spaces are sufficient for the residents and that the project consider adding more bicycle parking in the future as needed. Survey and monitoring reports can be submitted to TP+T but are not required to be.

Site Plan

The project will close one existing curb cut on Rindge Avenue which TP+T believes is positive because it will remove a conflict point on Rindge Avenue. The project will also make needed landscaping improvements to the site which will improve the pedestrian conditions, reduce the heat island effect, and help with sustainability goals.

The project should update or reconstruct adjacent sidewalks and pedestrian ramps and make sure they are brought into compliance with City and ADA standards in coordination with TP+T and DPW. TP+T will work with the Applicant and DPW on the details of the building permit plan during the building permit process.

An important future goal for the area is the creation of a multi-use path along the Fitchburg railroad right-of-way adjacent to the site and another idea is a possible bridge over the railroad tracks to connect to the Fresh Pond mall. TP+T is pleased that Just-A-Start has been engaged in these important ideas which would provide tremendous access benefits for the site. Just-A-Start is currently working with the Cambridge Redevelopment Authority on an Affordable Housing Open Space Connectivity Plan for Rindge Avenue that will help with visioning these projects. TP+T thanks Just-A-Start for their work and commitment toward advancing these ideas.

Loading and Service Delivery

All loading and service deliveries will occur on the project's property and TP+T believes there will be no issues with accommodating the loading and service needs for this site. Resident move-in operations will be scheduled with building management and occur on-site as is the current practice.

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Transportation Demand Management (TDM)

Overall, TP+T supports this Comprehensive Permit Application for the Rindge Common's 101 new affordable housing units and approximately 42,000 square feet of office space for education and training programs. Just-A-Start has established several important goals for the project and has committed to a program of Transportation Demand Management Measures aimed at reducing the project's transportation impacts as listed below.

Goals

- Reduce congestion on Rindge Avenue, at the Rindge / Alewife Intersection, and throughout the City and Region.
- Reduce their carbon footprint and combat climate change.
- Pedestrians make for friendlier and safer streets.
- Encourage buying locally.
- Improvements to health and happiness though walking and biking.

Specific Transportation Demand Management Measures

- Install a new Bluebikes bikesharing station on the site.
- Organize orientation sessions with residents to teach biking rules, safe biking measures, basic maintenance and repairs and help identify bike routes to various locations.
- Provide a wide and well-lit pedestrian connection from the Rindge Commons property to the Alewife and Rindge intersection.
- Install a Transit display screen in the lobby of the existing tower and new developments to make transit use more transparent and simpler to access with real-time information.
- Subsidize 100% of the cost of a MBTA transit pass for its employees or $240 annual reimbursement for bike maintenance for employees who choose to commute by bike.
- Provide MBTA transit passes (up to 2 cards per household) to new residents upon move-in loaded with 2 months of full ridership access.
- Set aside parking spaces to serve car sharing service.
- Develop a carpool/vanpool board for residents and students at the site and coordinate with the Alewife Transportation Management Association to identify resources available to residents, students and employees.
- Provide electric car charging stations on-site.
- Participate in a study to look at connectivity for pedestrians and bikes and the potential of adding paths that would serve the residents of Rindge Commons, the adjacent towers, Jefferson Park and neighborhood at large. This study will include the concept of adding a path along the railroad right-of-way with possible connections west to Cambridgepark Drive passing under the Alewife Brook Parkway bridge and east to Sherman Street and even the possibility of a pedestrian bridge providing access to the Fresh Pond Mall and Denehy Park.

Finally, TP+T wants to thank Just-A-Start for working with us on this project and we look forward to continuing to work on this important project as it moves forward.

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June 22, 2020

Constantine Alexander, Chair
Board of Zoning Appeal
City of Cambridge
831 Massachusetts Avenue
Cambridge, MA 02139

Re: Comprehensive Permit Application for Rindge Commons

Dear Chairman Alexander:

I am writing to offer my unequivocal support for Just-A-Start's proposed Rindge Commons project. Just-A-Start is a wonderful neighbor and a first-class operator of service-enriched affordable housing which benefits not only its residents but the entire community. We are so happy that the project will not only offer expanded affordable housing opportunities but will provide critical programming and services for the underserved in Alewife/North Cambridge.

As you know, the proposed project will bring 101 new affordable apartments to a transit-oriented site and will include much needed larger family-sized units which are in great demand, and in very short supply in the existing Towers. The commercial uses of the project will inure to the benefit of the community and include a critical job training and education center and early childhood education, in addition to safe high-quality housing. Finally, the project as proposed will energize and aesthetically improve what has been a desolate corner.

We have met with Just-A-Start several times to discuss the project and their team has been quite receptive to our opinions and concerns. We are thrilled to support more public purpose development on this critical site and are excited about the synergies and benefits this project will bring to the residents of our towers.

JAS is the type of organization that is critical to the neighborhood and the City as a whole, and we are in complete support of this important project.

Sincerely,

Richard J. Henken
President, Schochet Associates, Inc, General Partner, Rindge Associates Limited Partnership

RINDGE COMMONS

Location

402 Rindge Avenue
Cambridge, MA 02140

Developer

Just-A-Start Corporation
1035 Cambridge Street, #12
Cambridge, MA 02141

Rindge Commons Summary

Just-A-Start (JAS) is working to create a mixed-use development that will include 101 new affordable apartments, an integrated workforce training center, and other community oriented commercial uses in North Cambridge adjacent to the Alewife MBTA Station.

The project will be located on land controlled by JAS adjacent to JAS's 402 Rindge Avenue tower, a 273-unit, 22-story affordable housing development. The new affordable apartments will complement the existing development, providing a range of income levels and apartment sizes throughout the combined development.

In addition to the housing, the project includes 42,500 square feet of space to house JAS's Education & Training programs and other community oriented service provider(s) to serve new and existing residents, as well as the broader Alewife community. JAS and the City of Cambridge have begun discussions to locate several classrooms dedicated to the City's universal Pre-K education initiative. The JAS space will accommodate the breadth of its educational programs, including the Biomedical and Information Technology Careers Programs and JAS's YouthBuild program, and will allow JAS to expand its training programs.

Site Information

The site is located in the Alewife district of North Cambridge and is less than ¼ mile from the Alewife MBTA Station. Red Line subway service connects through Somerville, Cambridge, Boston, and south to both Ashmont and Braintree.

The Alewife Station also includes service on the MBTA 62, 67, 76, 79, 84, 350 and 351 buses, with the 83 bus line within a five minute walk from the site.

The site is located at the entry point of Route 2, providing easy access to western Boston suburbs and employment opportunities on the Route 128 corridor.

Nearby retail amenities include Whole Foods, Trader Joe's, CVS, T.J. Maxx, HomeGoods, Eastern Bank, and other retailers. Comeau Field and the Francis McCrehan Swimming Pool are 0.2 miles (a four minute walk) from the site. Additionally, the site is within walking distance to Danehy Park with additional open space.

Affordable Housing

Cambridge has a clear need for more affordable housing. An analysis of the waiting lists of qualified applicants for existing affordable developments shows high and unmet demand in the city.

- In November 2019, JAS had over 1,200 households on its existing property waitlists.
- As of March 2020, there are 3,742 applicants in the City's Rental Applicant Pool of households seeking affordable apartments marketed by CDD.
- The Cambridge Housing Authority's waitlist in March 2019 was over 19,000 households.

JAS is proposing new income restricted housing to help combat this affordability crisis. The proposed development will add 101 permanently affordable apartments to the City of Cambridge's inventory. Initially, all of the 101 new apartments at Rindge Commons will be Low Income Housing Tax Credit (LIHTC) eligible units for households earning below 80% of the Area Median Income (AMI) with the majority earning below 60% AMI. LIHTC eligibility guidelines are determined by Sec. 42 of the Internal Revenue Code, as well as the 2020-2021 DHCD Qualified Allocation Plan. Permanent affordability will be maintained at or below 80% AMI. Recent market data shows that almost 10,000 households in the immediate area would qualify for these new apartments.

Design Strategy

The mix of apartments will be spread between 1, 2, and 3-bedroom floorplans, with approximately 20% of the apartments being 3 bedroom. Since the existing building only has studio, 1, and 2- bedroom apartments, the new project will provide a much needed increase in apartments for larger families.

The proposed site design integrates the new buildings with the existing tower by improving pedestrian flow, simplifying parking and driveway layouts, and coordinating compatible building materials and palettes. All elements work towards creating a common theme for the expanded development.

Climate and resiliency are key drivers in JAS's plan for the property, and the proposed buildings will comply with Cambridge's Article 22 requirements for energy efficiency through Passive House certification.

	Commercial sf	1BR	2BR	3BR
Phase 1	42,500	10	14	0
Phase 2	0	16	39	22
TOTAL	42,500	26	53	22

Traffic and Parking Strategy

Rindge Commons will have at least 220 on-site parking spaces serving the property, including 12 accessible parking spaces. These spaces will include a mix of covered and open parking. The addition of covered parking spaces is a new benefit for the existing residents in the tower. Pickup and loading zones will be available for ride share, carpool/vanpool drop off and pickup, and deliveries.

To retain sufficient parking on the site for new and existing uses, ground level parking will be included in both phases of construction, with commercial and residential construction above. The project will take advantage of its proximity to public transportation and reduce parking from the current 273 spaces while still retaining an above-average parking per unit ratio for the City of Cambridge.

A traffic study for the project was completed by Vanasse Associates in December 2019 and included a review of the proposed development under Article 19 of the Cambridge Zoning Ordinance. The analysis concluded that "the Project is not expected to have a substantial adverse impact on City traffic such that issuance of a Project Review Special Permit is appropriate with respect to potential traffic impacts." The

report did recommend the implementation of a Transportation Demand Management Program to mitigate any impacts of the project on city traffic.

In addition to car parking, Rindge Commons will add 134 long-term and 22 short-term bike parking spaces to the existing 26 covered spaces on site for the Tower.

The project is implementing several measures to minimize Single-Occupancy-Vehicle use at Rindge Commons. These measures include:

- BlueBike Bikeshare: The site plan includes a location for a new BlueBike station adjacent to the existing 402 Rindge Project, with some discounted memberships.
- Improved Pedestrian Environment: JAS will provide a wide and well-lit pedestrian connection from the Rindge Commons property to the Alewife and Rindge intersection.
- Car Sharing Service: The project will set aside parking spaces to serve a car sharing service.
- Car/Vanpool: JAS and the property management team will develop a carpool board for residents and students at the site. Also, the project will coordinate with the Alewife Transportation Management association to identify resources available to residents, students, and employees.
- Transit Promotion: JAS will install a Transitscreen® system in the lobby of the existing tower and new developments to make transit information more transparent and simpler to access.
- Employer Transit Incentive: Just-A-Start Corporation will occupy 17,000 square feet of the project and will subsidize 100% of the cost of an MBTA transit pass for its employees or a $240 annual reimbursement for bicycle maintenance for employees who choose to commute by bike.
- Resident Biking Education: Just-A-Start will organize orientation sessions with residents to teach biking rules, safe biking measures, basic maintenance and repairs and help identify bike routes to various locations.
- Resident Education (Transit): JAS will provide transit orientations for new residents to familiarize them with transit and walking options for work, schools, medical clinics and other amenities. Charlie Cards will be handed out to residents at that time.

Green Building and Resiliency

The property will comply with Cambridge's Article 22 for energy building efficiency. JAS is currently designing the project to comply with Passive House standards through both phases of development.

Resiliency: Phase I of the development is in the 2070 flood zone per the City of Cambridge's projections. The finish elevation of Building A is engineered to be above the anticipated flood level. Where possible mechanical and electrical system rooms will be located on upper floors to avoid potential for disruption in case of catastrophic flooding. The first floor will also be designed and allow for limited impact and quick recovery from a flood event. Residential living and community spaces will be located on upper floors, ensuring that residents will not risk harm or personal property damage from any flooding.

The current site layout, which dates back to the 1970's, lacks any elements of storm water retention or contaminant remediation. JAS will install infrastructure at Rindge Commons that will address more than the requirements of just the two new buildings, significantly improving the site's existing conditions.

Current site characteristics create a large heat island with virtually the entire site covered by a dark asphalt parking lot. To mitigate these conditions, the development will implement several strategies to enhance the site. White roofing materials and sections of green roofs will significantly lessen the heat retention of the new buildings. The addition of the new buildings will provide much needed shade to the site, especially around the expanded play area. In addition to building-generated shade, multiple new trees will be planted at various locations along the pedestrian paths and parking lot. Since the Rindge Commons is an affordable housing development, the project is exempt from tree removal regulations. However, JAS is committed to maintaining as much natural tree canopy as possible. Unfortunately, 27 trees will be removed during the development. 21 of those trees are significant. JAS believes that shading and tree canopy are key factors in reducing urban heat effects and creating a more livable environment for residents. Therefore, the project will be planting 38 new trees throughout the site with the majority of these being large tree species with expected canopy spreads between 25-30 feet in diameter.

Community Outreach

Just-A-Start began community outreach for the project in January 2019, and implemented an extensive community outreach process throughout the year.

Online Outreach: JAS set up a project website (https://rindgecommons.org/) to share details about the development and collect community questions and feedback. JAS responded directly to all inquiries it received.

Community Meetings: JAS hosted the following seven public meetings prior to submitting this application. All meetings were posted on JAS's website, at the 402 Rindge Site, and on the Rindge Commons website, and were advertised with flyers at local businesses and other high-visibility locations.

- 4/29: Project Introduction- 402 Rindge Ave
- 6/21: Public Meeting #2- MassHire, 186 Alewife Brook Pkwy
- 7/10: Presentation to North Cambridge Stabilization Group
- 7/25: Public Meeting #3- Jefferson Park Community Room, 1 Jackson Place
- 8/15: Public Meeting #4- 402 Rindge Ave
- 9/26: Community Open House- Cambridge Armory, 450 Concord Ave
- 10/16: Community Open House- 402 Rindge Ave

Stakeholder Meetings: JAS also met with abutters and key neighborhood and citywide resident groups.

Phasing and Schedule

The project will be broken up into two phases. Phase I will include the integrated job training center and 24 affordable apartments, while Phase II will consist of 77 units of affordable rental housing.

Permitting and entitlement is proceeding for the entire site under a single comprehensive permit.

JAS plans to start construction on Phase I in early 2021, with Phase II to follow in 2024. The project's current development schedule is below:

- April 2020: 40B Application Submitted
- Spring/Summer 2020: 40B Comprehensieve Permit approval
- March 2021: Phase 1 Construction Start
- September 2023: Phase 1 Construction Completion
- January 2024: Phase 2 Construction Start
- September 2025: Phase 2 Construction Completion

Requested Relief

Just-A-Start and Icon Architecture completed an analysis of City of Cambridge Zoning Ordinance, specifically reviewing guidelines related to floor area ratio, parking, and other urban design criteria. The Rindge Commons site is situated in a Residential C-2 District and also lies within the Parkway Overlay District. JAS is seeking zoning relief from the Board of Zoning Appeal through the Comprehensive Permit application for the following issues, for ease of reference broken down by JAS's 2 districts:

RESIDENTIAL C-2

DIMENSIONAL

- Front Setback: The project is seeking relief under Sections 5.11 & 5.31 for the front setbacks. The Rindge Commons site is a corner lot and thus has two front yards. The Rindge Avenue setback is 32' as measured from the center of Rindge Avenue and 10'-7" from the lot line, while the requirement is a distance of 57.19'. While the front setback is closer than required, the improvements JAS will make to the front entry will create a wider and more pedestrian-friendly sidewalk than currently exists.

- Side Setbacks: With two front yards, the remaining edges of the site fall under the side yard category. The C-2 district requires that the project maintains 64.53' from Building B to JAS's property lines. JAS is able to achieve 53'-1" to the property line along the MBTA railroad tracks and 47'-3" to the property line along the Fresh Pond Apartments parking lot. As the primary use of both properties is parking along the shared property line, JAS believes 47' is ample distance and therefore requests relief under Sections 5.11 & 5.31 for the side setbacks.

DENSITY

- Floor Area: Zoning Ordinance Sections 5.11, 5.31 & 11.203.5(a) provides Floor Area Ratio (FAR) and Unit Count requirements for the C-2 district with allowances for affordable housing. In the C-2 district, the FAR requirement is stated as a Maximum FAR of 1.75 for residential uses. Section 11.203.5 allows for an increase of FAR for affordable housing of 30%. To calculate the proposed FAR, the site is 155,591 square feet, and the proposed development is 425,211 square feet, or 2.73 FAR, and over the requirement of 2.229 when factoring in the mixed-use nature of Building A.

- Minimum Lot Size: In Section 5.11 & 5.31 the required Minimum Lot Area per Dwelling Unit is 600 SF. The proposed Lot Area per Dwelling Unit is calculated by using the site area increased by the multiplier of 30% for affordable housing in Article 11.203.5(b), resulting in an allowed lot area per dwelling unit of 461.54 SF. The proposed density is slightly higher than prescribed for the zoning

district equaling 416.02 SF. However, overall the design is contextual with other recent developments in terms of massing and height and preferred urban design guidelines.

PARKING

- Car Parking: The 402 Rindge Avenue site is currently a tall, relatively slender building surrounded by a sea of parking. It was designed and constructed during a period of car-centric culture prior to the MBTA Red Line being extended to Alewife. The parking reaches up to the property lines along Alewife Brook Parkway, as well as the southern and eastern boundaries. The project is seeking relief under Sections 6.31, 6.35.1(3), 6.36.1(g), 6.36.3(d)(5), and 3.36.4(d) to propose 220 parking spaces. This creates a parking ratio of 0.59 to residential units. JAS is also requesting a shared day/night use parking arrangement between the residential and commercial uses whereby the entirety of the commercial use is accounted for in the residential parking count.

  Car ownership information from current applicants to JAS affordable housing indicates car ownership rates that are considerably lower the 0.59 ratio JAS is requesting. Fewer than 50% of current applicants at Rindge request parking, while the remainder of JAS's Cambridge portfolio sees parking requirements from applicants below 25%. Further, JAS will implement transportation demand management strategies to encourage residents to utilize options other than single occupant vehicles.

- Parking Lot Dimensions and Layout: The site currently has several existing non-conformities in relation to the parking design. The requirements under section 6.44.1(c) do not allow parking in the front yard. The existing parking lot reaches the property line along both Rindge Avenue and Alewife Brook Parkway. Section 6.48.1(g) requires planting buffers equal to the size of one parking space for parking rows greater than 25 spaces. While the project will have planting buffers, some of the existing buffers do not reach the proper width. Lastly, the current design has a large number of compact sized spaces. The loss of certain parking areas will result in a percentage of compact spaces higher than what is allowed under Section 6.34. JAS is seeking relief for an existing non-conformity under Section 6.34.

- Bicycle Parking: The project is seeking relief for bicycle parking under section 6.107.2 & 3. Due to the era in which the Tower was originally built, the site currently has limited bicycle parking, with 26 covered spaces available for the 273 units. The new construction will create covered, secure, and well-lit long-term bicycle parking spaces in excess of the amount required by zoning for the new construction. These spaces will be available for all residents at Rindge Commons. The site plan also includes a location for a BlueBikes station with 24 docks to mitigate for the capacity shortcoming of the Tower.

OPEN SPACE & GREEN BUILDING

Open Space: 402 Rindge was originally developed with a car-centric approach. As such, the site has limited open space in its current design. We are seeking relief under sections 5.31 & 5.22.1 for minimum amount of open space in a C-2. The site currently has 14,896 square feet equating to 9.5% of private open space. The new plan increases the square footage of open space to 18,653 sf, which equates to 13.3%. However, this remains just short of the 15% requirement.

Green Building: The project as designed will be compliant with article 22 through Passive House certification upon completion of both Phase 1 and Phase 2. Unfortunately, Building A will not comply with the Passive House requirements upon its completion and occupancy due to its reliance on solar capacity planned for Building B. In order to satisfy lender requirements associated with Building A, we request relief for Building A for compliance with section 22.23.1(b) whereby Building A will be deemed to comply with Article 22 irrespective of whether Building B is constructed.

PARKWAY OVERLAY

DIMENSIONAL

- Height: The Parkway Overlay districts creates some relief points atypical of traditional C-2 requirements. Specifically, height under Section 20.64.2 requires that buildings step back by 10 feet and at a 60 degree angle above 55 feet while the C-2 zone allows for heights up to 85 feet. JAS is requesting heights that are below the C-2 threshold for the 2 new buildings but not compliant with the parkway step back.

- Front Setback: The project is seeking relief under Section 20.64.1(1) for the front setbacks. The Rindge Commons site is a corner lot and thus has two front yards. The Parkway Overlay requires a 25-foot front setback from the street. The closest point for the project is 23'-11" from the street; however, that occurs at a point where the setback from the property line is less than 5'. JAS's property is separated from Alewife Brook Parkway with a swath of land owned by the Department of Conservation and Recreation. Further, the site plan brings the buildings closer to the street in order to activate the frontage and encourage pedestrian usage. The project is also seeking relief under Section 20.67(1) because it is likely that the transformer needed for the development will fall within the front yard. While technically very close to the property line, this screened area is situated over 45' away from the street and is 8' lower in elevation. Therefore, JAS feels that the impact of this non-compliance is negligible.

- Building Facade: The Parkway Overlay District requires under section 20.64.3(3) that ground floor include a minimum of 30% transparency. The project's current transparency threshold for finished floor area is 22%. The project will also seek relief under Section 20.64.3(3) for a primary entrance on Rindge Avenue, whereas the Parkway Overlay District requires the front entry to face the Parkway. The overall plan for landscaping and urban design creates a welcoming and integrated connection to the pedestrian path linking Rindge Avenue to the Alewife MBTA Station and is a substantial improvement over the current conditions. In addition, the DCR land and elevation change between Alewife Brook Parkway and the property, discussed above, are such that it would it would not serve the purpose of the ordinance to have the buildings' front entries face the Parkway.

PARKING

- Parking Lot Dimensions and Layout: The site currently has several existing non-conformities in relation to the parking design. The Parkway Overlay district requirements under section 20.66.2 do not allow parking in the front yard. The existing parking lot reaches the property line along Alewife Brook Parkway. Section 20.66.3 deals with landscaping requirements of surface level parking. Due to the existing conditions of the parking lot, the project will require relief for all

components of this section. While the project plan includes planting buffers and trees, the project will fall short of the thresholds called for under this section. Section 20.64.1(2) requires that front yards consist entirely of Green Area Open Space save allowed driveways no wider than 24'. Since the current condition of the front yard is surface level parking, the project will need relief for this requirement. Again, the impact of this relief is mitigated by the fact that the front yard parking is at a lower elevation than Alewife Brook Parkway, and separated from the parkway by the DCR land.

OPEN SPACE

402 Rindge was originally developed with a car-centric approach. As such, the site has limited open space in its current design. The project is seeking relief under 20.66.3(1)-(4) and 20.66.4(1) related to open space in parking areas for the Parkway Overlay district. The Parkway Overlay district has specific planting requirements in parking lots that the project will also fall short of due to the existing non-conforming nature of the parking lot. In addition, the project will require a variance under section 20.64.1(3) since the site will not reach this section's requirements.

OTHER RELIEF

PUBLIC WORKS

- Curb Cut Modification: The project is requesting permission to remove one curb cut on Rindge Avenue and modify another existing curb cut also serving Rindge Avenue. The site currently has two driveways onto Rindge Avenue, which can cause confusion for drivers. One serves the Tower, and the second serves the adjacent condominiums along with excess Tower parking. The project will abandon the current driveway for the Tower and adapt the driveway furthest from Alewife Brook Parkway resulting in a single driveway for all uses. With the modified curb cut, the project will also need relief under section 20.66.1, due to the fact that the remaining curb cut will be wider than 40' in order to allow for a safe turning radius for school buses entering Rindge Avenue and a safe drop-off area for ride share services.

- Storm Water: Rindge Commons will also require relief from the City of Cambridge Wastewater and Storm Water Drainage Systems and phosphorous reduction goals. The site currently has extremely limited mechanisms for storm water retention and zero capacity for phosphorous mitigation. The proposed drainage system will generally consist of drywells, detention tanks, area drains, manholes, and underground piping. The project's engineers have designed the storm water management system for capacity well beyond the City of Cambridge rate reduction (25-2) requirements for the two new buildings and the new system greatly improves the site's current capacity; however, it falls short of meeting the requirement for the entire site by 2.2 cubic feet per second. Site constraints related to high ground water, poorly drained soils, and existing site development make meeting this requirement infeasible. The project will improve the site's current phosphorous removal thresholds but will fall short of the City's 65 percent removal goal. The project will implement both an "isolator row" and Stormceptor water quality structure as components of its development plans. These efforts will achieve 50 percent of the City's goal, because site constraints regarding available space for additional phosphorous reduction measures and overall cost limit JAS's ability to meet this goal.

USE

The design for a mixed-use building at the corner of Rindge Avenue and Alewife Brook Parkway requires a variance for the inclusion of general office as an approved use under Section 4.34(d). The creation of space at that corner to provide workforce training and other mission-driven, service-oriented office uses builds a common hub for the Alewife neighborhood, one that can bring together and serve the population down the Rindge corridor and the expanded commercial and residential uses along Cambridgepark Drive. The use is both complementary to the affordable housing on site as well as incidental in size related to the amount of housing.

About Just-A-Start:

Just-A-Start (JAS) is a 52-year-old community development corporation (501(c)(3)) dedicated to building the housing security and economic stability of low- to moderate-income people in Cambridge and nearby communities. Through innovative, comprehensive and integrated programs, JAS creates and preserves affordable housing, provides housing resources and services, offers education and workforce training for youth and adults, and builds community engagement.

JAS's vision is a better future for all of its constituents: a secure home, a sustaining career, and a connection to the community.

As part of its core mission, JAS develops and owns affordable apartments that allow low- to moderate income residents to live in Cambridge at rents that are within their means. JAS's portfolio of rental properties includes over 600 apartments across 41 properties, ranging in size from studios to 5-bedrooms. JAS also currently has approximately 230 units of new affordable and workforce housing units in its development pipeline.

Key Staff

Carl Nagy-Koechlin has served as Just-A-Start's Executive Director since July of 2019. Carl has over 30 years of community development and affordable housing experience. He most recently served as the executive director at Housing Solutions for Southeastern Mass. and at Fenway Community Development Corp. Under his leadership, these organizations created 400 apartments and homes in 15 affordable housing development projects; implemented and strengthened housing stabilization and homelessness prevention programs; and developed job training and placement programs that ensured strong career ladders and sustaining jobs for community residents. Carl holds a Bachelor degree in Economics from the University of Massachusetts, Amherst, and a Master of City Planning from the Massachusetts Institute of Technology.

Noah Sawyer is the Director of Real Estate, managing their development team and its work in Cambridge and surrounding municipalities. Previously, Noah served as a senior project manager for The Community Builders, Inc. in its Boston office, where he led development teams for affordable and mixed-income real estate projects in New England. During his tenure, Noah oversaw the closing and construction of over 350 new apartments and led the master planning efforts, adding over 700 units to TCB's development pipeline. Noah also served as a project manager in The Community Builders' preservation group, managing the restructuring and renovation of over 1,000 units of distressed and at-risk affordable housing. He also served as a research associate at the Urban Institute in Washington, D.C., conducting research on housing finance and community development for federal, state and local government. Noah

holds a Master's in Public Policy and Urban Planning from Harvard University, as well as a Bachelor's in Mathematics from Vassar College.

Craig Nicholson brings over 15 years of experience to the Just-A-Start team, where he is the Director of Real Estate Acquisitions. Since joining Just-A-Start, Craig has worked to close three LIHTC transactions ranging from 32 units to 273 units. Previously, Craig served as President and Founder of Nicholson Development, Inc. where he managed all aspects of the company and projects that ranged from tenant improvements to master planned developments throughout the eastern United States. Prior to launching his own company, Craig spent six years at The Nicholson Company as a Principal responsible for the finance, operations, legal, property and project management departments. Craig holds degrees in Business Administration, Psychology and Sociology from the University of California, Los Angeles.

Robert MacArthur is a Senior Project Manager in the Real Estate department. Before arriving at Just-A-Start, Robert was the Director of Real Estate Development at Windale Developers, Inc., a mission based minority-owned development company in Roxbury, MA. While there, Robert was responsible for leading the firm in developing over 100 homes in Roxbury and Dorchester. Robert also has over ten years of community development experience working with two Boston based nonprofit organizations where he gained experience with the Low Income Tax Credit Program on three development projects. Robert has a BA in Anthropology from Columbia University.

Carol Burt provides financial and accounting services to for-profit and non-profit organizations with a focus on affordable housing development since 2001. She has experience preparing financial and investment return analyses, financing applications and proposals for projects using new markets tax credits, historic tax credits and low income housing tax credits. She is also experienced in financial statement preparation, accounting and financial systems implementation and staff accounting resource and support. From 1988 through 2000, Ms. Burt was a Manager of Equity Finance at The Community Builders, Inc. in Boston, Massachusetts, where she was responsible for structuring equity and debt financing for low and mixed income housing developments for community based non-profit housing developers. Ms. Burt worked as a Certified Public Accountant for Arthur Andersen & Co. and holds a Bachelor of Science degree in Finance and Accounting with highest honor from Northeastern University.

Commonwealth of Massachusetts
DEPARTMENT OF HOUSING & COMMUNITY DEVELOPMENT
Charles D. Baker, Governor ◆ Karyn E. Polito, Lt. Governor ◆ Janelle Chan, Undersecretary

February 3, 2020

Mr. Craig Nicholson
Director of Real Estate Acquisitions
Just-A-Start Corporation
Housing Department
1035 Cambridge Street #11
Cambridge, MA 02141

Re: Rindge Commons – Cambridge – Site Approval Letter

Dear Mr. Nicholson:

I am pleased to inform you that your application for site eligibility determination for the proposed "Rindge Commons" project in Cambridge has been approved under the Low Income Housing Tax Credit (LIHTC) program. This approval is based on the proposed plan for one hundred and one (101) affordable rental units. All units will be affordable to households earning at or below 60% of Area Median Income. All of the units described in the application are generally consistent with the standards for affordable housing to be included in the community's Chapter 40B affordable housing stock. This approval does not constitute a guarantee that LIHTC funds will be allocated to Rindge Commons. It does create a presumption of fundability under 760 CMR 56.04 and permits the Just-A-Start Corporation to apply to the Cambridge Zoning Board of Appeals to seek a comprehensive permit. The sponsor should note that a One Stop submission for funding for this project must conform to all Department of Housing and Community Development (DHCD) program limits and requirement in effect at the time of submission.

As part of the review process the Department of Housing and Community Development (DHCD) has made the following findings:

1. The proposed project appears generally eligible under the requirements of the LIHTC program.
2. DHCD has performed an on-site inspection of the proposed project, Rindge Commons.
3. The proposed housing design is generally appropriate for the site.
4. The proposed project appears financially feasible in the context of the Cambridge housing market.
5. The initial pro forma for the project appears financially feasible on the basis of estimated development and operating costs.
6. Just-A-Start meets the general eligibility standards of the LIHTC program.
7. The 30-day comment period ended January 3, 2020. DHCD did not receive any written comments from the City of Cambridge.

The proposed project, Rindge Commons, will have to comply with all state and local codes not specifically exempted by a comprehensive permit. In applying for a comprehensive permit, the project sponsor should identify all aspects of the proposal that will not comply with local requirements.

If a comprehensive permit is granted, construction of this project may not commence without DHCD's issuance of Final Approval pursuant to 760 CMR 56.04 (7) and an award of LIHTC funds. This site eligibility determination letter is not transferable to any other project sponsor or housing program without the express written consent of DHCD.

This letter shall expire two years from this date, or on February 3, 2022, unless a comprehensive permit has been issued.

We congratulate you on your efforts to work with the City of Cambridge to increase its supply of affordable housing. If you have any questions as you proceed with the project, please feel free to call Bill Cole at (617) 573-1303.

Sincerely,

Catherine Racer
Associate Director

cc: Louis A. DePasquale, Cambridge City Manager

City of Cambridge

MASSACHUSETTS

BOARD OF ZONING APPEAL

831 Mass Avenue, Cambridge, MA.
(617) 349-6100

TO: Board of Zoning Appeal
(Specify Local Board or Agency)

NOTICE OF FILING OF A COMPREHENSIVE PERMIT APPLICATION

REGARDING: 402 Rindge Avenue
(Address of Property)

Please be informed that an application for a Comprehensive Permit for the development of low or moderate income housing at the above referenced property has been filed with the Cambridge Board of Zoning Appeals, and is scheduled for a hearing at _____p.m., on Thursday, _____, at the Senior Center, 806 Mass Avenue, Cambridge, MA. 1st Floor Ballroom.

A copy of the Comprehensive Permit application is attached. The relief requested In the application includes: Relief from dimensional requirements concerning FAR (§§5.11, 5.31,11.203.5(a)), Minimum lot area (§§ 5.11, 5.31, 11.203.5(b)), front setback (§§ 5.11, 5.31, 20.64.1(1)), side setback (§§ 5.11, 5.31), height (§§ 5.11, 5.31, 20.64.2), building facade (§§ 20.64.3(1), 20.64.3(3)), mechanical equipment (§ 20.67(1)) open space (§§ 5.22.1, 5.31, 20.66.4(1), front yard driveway (§§ 20.64.1(2)-(3), parking (§§ 6.31, 6.35.1(3), 6.36.1(g), 6.36.3(d)(5), 6.36.4(d)), bike parking (§§ 6.107.2, 6.107.3), parking design (§§ 6.44.1(c), 6.34, 6.48.1(g), 20.66.2, 20.66.3(1)-(4)), curb cut modification (§ 20.66.1), Office Use (§ 4.34(d)), Green Building (§ 22.23.1(b), stormwater retention & phosphorous mitigation

In acting on Comprehensive Permit applications, the Board of Zoning Appeals has the power to grant any permits or approvals, which would otherwise be required from other local agencies. The Board requests that _____ and other applicable agencies and boards appear at this hearing to make recommendations relative to this application, and/or that written recommendations be submitted to the Board prior to that hearing date.
Please contact the Zoning Specialist at (617) 349__6100, to receive further information on this Comprehensive Permit proceeding.

COMPREHENSIVE PERMIT APPLICATION

PETITIONER: Just-A-Start Corporation

PETITIONER'S ADDRESS: 1035 Cambridge Street #12, Cambridge, MA 02141

PETITIONER'S TELEPHONE: 617-918-7540

NAME, ADDRESS, AND PHONE NUMBER OF CONTACT PERSON
(If different from Petitioner): Craig Nicholson

LOCATION OF SITE: 402 Rindge Avenue

DESCRIPTION OF PROJECT: Rindge Commons is the creation of 101 units of affordable housing on the site of the Rindge Tower Apartments which has 273 affordable apartments. The project consists of 2 buildings which will be built in phases. Phase I will include 24 units of housing and 42,500 sf of commercial space. Phase II will include 77 units of housing.

SPECIFY LOCAL REGULATIONS OR REQUIRMENTS FROM WHICH RELIEF IS REQUESTED:

Relief Requested:	Applicable Local Board or Authority:
	See Attachment A

1. Please specify whether Petitioner is:

   ( ) A public agency
   (X) A non-profit organization
   ( ) A limited divided organization

2. Is the proposed project new construction? Yes If not, please explain. _____

3. **Does the Petitioner own and control the site?** Yes **If not, please describe the anticipated circumstances and time frames under which the Petitioner will acquire ownership and control of the site. If there are additional owners, please identify each owner, including name, address and the ownership interest for each owner identified. Please ATTACH a copy of the deed, purchase and sale agreement or option agreement.**

Please see the attached option agreement. The owner of the property, Rindge Tower Apartments LLC, is a controlled entity of Just-A-Start.

4. **What are the sources of the public subsidy for the proposed project? Please ATTACH project eligibility letter, site approval letter, or other evidence of subsidy for this project.**

Phase I public subsidy includes 4% Low Income Housing Tax Credits, anticipated funds from the Cambridge Affordable Housing Trust and New Market Tax Credits. Phase II public subsidy will include 4% & 9% LIHTC, MA Housing Tax Credits, DHCD Sources (AHT, CBH, HOME, HSF) and anticipated funds from the City's Affordable Housing Trust.

5. **Total number of dwelling units proposed:** 374
Total number of affordable rental units: 374
Total number of affordable home ownership units: 0

6. **Please describe the eligibility standards for low and moderate income occupants and the duration of the affordability restrictions for the project. If you refer to program regulations or guidelines, please attach copies.**

All units will initially be subject to the LIHTC eligibility guidelines wtih 10% of the units reserved for households below 30% AMI, the remaining units will be for households below 80% AMI with the majority being below 60% AMI. All units will also be subject to a mortgage covenant from the City and will be permanently affordable at or below 80% AMI.

7. **How will this project meet local needs for low income and moderate income housing?**

The addition of 101 permanently affordable apartments will have a significant impact on the housing crisis in Cambridge. While this will not address all of the City's needs, it will expand the affordable housing opportunities within the thriving community that already exists at 402 Rindge Ave. The site's access to public transportation, shopping and recreation areas make this an ideal location for additional housing.

8. Please provide a complete description of the proposed project, and include with this Comprehensive Permit Application, each of the following items:

a. Site Development Plans – site development plans showing locations and outlines of proposed buildings; the proposed locations, general dimensions for streets, drives, parking areas, walks and paved areas; and proposed landscaping improvements and open areas within the site; (1 copy)

b. Report on Existing Site Conditions – a summary of conditions in the surrounding areas, showing the location and nature of existing buildings, existing street elevations, traffic patterns and character of open areas, if any, in the neighborhood;

c. Drawings – scaled, architectural drawings, including typical floor plans, typical elevations and sections, and identifying construction type and exterior finish. All projects of five or more units must have site development plans signed by a registered architect;

d. Building Tabulations – a tabulation of proposed buildings by type, size (number of bedrooms, floor area) and ground coverage, and a summary showing the percentage of the tract to be occupied by buildings, by parking and other paved vehicular areas, and by open areas; (1 copy)

e. Subdivision Plan – where a subdivision of land is involved, a preliminary subdivision plan; (1 copy)

f. Utilities Plan – a preliminary utilities plan showing the proposed location and types of sewage, drainage, and water facilities, including hydrants;

g. Dimensional Form – provided with application; (1 copy)

h. Photographs – photographs of site and existing buildings;

i. Assessor's Plat – available at City of Cambridge, Engineering Department, 147 Hampshire Street, Cambridge, MA.;

j. Ownership Certificate – 1 original notarized copy, provided with application.

I certify that the information contained herein is true and accurate to the best of my knowledge and belief.

Petitioner's Signature

Craig Nicholson

Print Petitioner's Name

April 22, 2020

Date

City of Cambridge

MASSACHUSETTS

BOARD OF ZONING APPEAL

831 Mass Avenue, Cambridge, MA.
(617) 349-6100

COMPREHENSIVE PERMIT APPLICATION PROCESS

ADDRESS OF PROPERTY: 402 Rindge Avenue, Cambridge

A copy of the proposed plan with description of the project be submitted to the following City Agencies. Please provide evidence of submission to these agencies. Upon completion, this sheet must be submitted to the Board Zoning Appeals case file.

Signature and Date	City Department/Address
_____	Community Development Department, *344 Broadway*
_____	Conservation Commission, *147 Hampshire Street*
_____	Fire Department, *491 Broadway*
_____	Historical Department, *831 Massachusetts Avenue*
_____	Law Department, *795 Massachusetts Avenue*
_____	Public Works Department, *147 Hampshire Street*
_____	Traffic and Parking Department, *344 Broadway*

City of Cambridge

MASSACHUSETTS

BOARD OF ZONING APPEAL

831 Mass Avenue, Cambridge, MA.
(617) 349-6100

TO:

FROM:

RE:

PETITIONER:

The Petitioner has applied to the Cambridge Zoning Board of Appeals for a comprehensive Permit to create affordable/low income housing at the above referenced property.

Pursuant to Chapter 774 of the Massachusetts General Laws, the Zoning Board of Appeals by the Comprehensive permit process is empowered to grant all necessary permits and licenses that are normally granted by other City agencies or Boards.

If any city agency or board is interested in this case or normally they would grant relief for this development, they should forward all correspondence to the Board of Zoning Appeal before the scheduled hearing dated, as there will be no other hearings will be scheduled for this case.

If you have any questions, please call Ranjit, or Maria at (617) 349-6100.

DIMENSIONAL FORM

LOCATION: 402 Rindge Avenue, Cambridge **ZONE:** C-2, Parkway Overlay

APPLICANT: Just-A-Start Corp. **REQUESTED USE/OCCUPANCY:** Multi-family & Business

PHONE: 617-494-0444 **PRESENT USE/OCCUPANCY:** Multi-family

		EXISTING CONDITIONS	REQUESTED CONDITIONS	ORDINANCE REQUIREMENTS[1]
TOTAL GROSS FLOOR AREA:		264,168 sf	425,211 sf	346,778 sf
LOT SIZE:		155,591 sf	155,591 sf	155,591 sf
RATIO OF TOTAL FLOOR AREA TO LOT AREA:[2]		1.697	2.73	2.229
MINIMUM LOT AREA FOR EACH DWELLING UNIT:		569.93	416.02	461.54
SIZE OF LOT:	WIDTH	257'-2"	--	--
	LENGTH	638'-4"	--	--
(setbacks in feet):	FRONT - Rindge	233'-2"	A: 32', B: 467'-6"	10' Min A: (68.33+113.33)/4= 45.42', B:(78.5'+192.5')/4=67.75'
	FRONT - Alewife	153'-3"	A: 5'-9", B: 4'-8"	Primary facade 25' A: (68.33=164.17)/4=58.13' B: (78.5+78.83)/4=39.33'
	LEFT SIDE	225'-7"	A: 404'-10" B: 53'-1"	A: (68.33+113.33)/5 = 36.33' B: (78.5+206)/5 = 56.9'
	RIGHT SIDE	86'-6"	A: 76'-11" B: 47'-3"	A: (68.33+164.17)/5 = 46.50' B: (78.5+90.58)/5 = 33.82'
SIZE OF BLDG.:	HEIGHT	193'	A: 68'-4", B: 78'-7"	Parkway: 55' then step back to 85' C-2: 85'
	LENGTH	199'-6""	A: 164'-2",B: 244'-2"	
	WIDTH	58'-0"	A: 113'-4", B: 85'	
RATIO OF USABLE OPEN SPACE TO LOT AREA:[3]		10%	13%	15%
NO. OF DWELLING UNITS:		273	374	337
NO. OF PARKING SPACES:		273	220	446 or 392 w/ Shared Use
NO. OF LOADING AREAS:		1	3	
NO. BIKE PARKING SPACES:		26	134 LT (A: 38, B: 96, TOWER: 0) 48 ST (A: 12, B: 10, TOWER: 26)	403 LT, 48 ST
OTHER OCCUPANCIES ON SAME LOT:		N/A	Business & Multifamily	Zoned for Multifamily
DISTANCE TO NEAREST BLDG.:		N/A	A: 53'-9", B: 47'-10"	A: 43.5', B: 44.5'
SIZE OF BLDGS. ADJACENT ON SAME LOT:		See Above	See Above	
TYPE OF CONSTRUCTION:[4]		Concrete & Brick	Brick, Wood & Concrete	

SUBMIT: PLOT PLAN:_____ PARKING PLAN:_____ BUILDING PLAN:_____

1. SEE CAMBRIDGE ZONING ORDINANCE ARTICLE 5.000, SECTION 5.30 (DISTRICT OF DIMENSIONAL REGULATIONS).
2. TOTAL GROSS FLOOR AREA (INCLUDING BASEMENT 7'-3" IN HEIGHT AND ATTIC AREAS GREATER THAN 5') DIVIDED BY LOT AREA.
3. OPEN SPACE SHALL NOT INCLUDE PARKING AREAS, WALKWAYS OR DRIVEWAYS AND SHALL HAVE A MINIMUM DIMENSION OF 15'.
4. E.G., WOOD FRAME, CONCRETE, BRICK, STEEL, ETC.

** The Tower is the existing structure, the 2 new structures are referred to as Building A & Building B*

OWNERSHIP INFORMATION FOR BOARD OF ZONING APPEAL RECORD

(To be completed by **OWNER**, signed before a notary, and returned to Secretary of Board of Appeal).

I/We Rindge Tower Apartments LLC
(OWNER)

Address: 135 Cambridge Street, #12, Cambridge, MA 02141

State that I/We own the property located at 402 Rindge Avenue which is

the subject of this zoning application.

The record title of this property is in the name of
Rindge Tower Apartments LLC

*Pursuant to a deed of duly recorded in the date 12/22/2015, Middlesex South County Registry of Deeds at Book 66573, Page 239; or Middlesex Registry District of Land Court, Certificate No. _____ Book _____ Page _____.

SIGNATURE BY LAND OWNER OR AUTHORIZED TRUSTEE, OFFICER OR AGENT

Commonwealth of Massachusetts, County of _____

The above-name _____ personally appeared before me, this _____of _____, 199_, and made oath that the above statement is true.

_____Notary

My commission expires _____(Notary Seal).

* If ownership is not shown in recorded deed, e.g. if by court order, recent deed, or inheritance, please include documentation.

Rindge Commons

Comprehensive Permit - Attachment A

Relief Requested:		Sections:	Applicable Board or Authority:
1	FAR / Total Gross Floor Area	§§ 5.11, 5.31, 11.203.5(a)	Board of Zoning Appeal
2	Minimum Lot Area / Max # of Dwelling Units	§§ 5.11, 5.31, 11.203.5(b)	Board of Zoning Appeal
3	Front Setback	§§ 5.11, 5.31, 20.64.1(1)	Board of Zoning Appeal
4	Side Setback	§§ 5.11, 5.31	Board of Zoning Appeal
5	Height	§§ 5.11, 5.31, 20.64.2	Board of Zoning Appeal
6	Building Façade	§§ 20.64.3(1), 20.64.3(3)	Board of Zoning Appeal
7	Mechanical Equipment	§ 20.67(1)	Board of Zoning Appeal
8	Open Space	§§ 5.22.1, 5.31, 20.66.4(1)	Board of Zoning Appeal
9	Front Yard Driveway	§ 20.64.1(2), 20.64.1(3)	Board of Zoning Appeal
10	Parking	§§ 6.31, 6.35.1(3), 6.36.1(g), 6.36.3(d)(5), 6.36.4(d)	Traffic and Parking Department
11	Parking Design	§§ 6.44.1(c), 6.34, 6.48.1(g), 20.66.2, 20.66.3(1)-(4)	Traffic and Parking Department
12	Bicycle Parking	§§ 6.107.2	Community Development Department
13	Use	§ 4.34(d)	Planning Board
14	Curb cut modification	§ 20.66.1	Department of Public Works / BZA
15	Green Building	§§ 22.000, 22.23.1(b)	Board of Zoning Appeal
16	Storm Water Retention	DPW Regulations	Department of Public Works
17	Phosphorous Mitigation	DPW Regulations	Department of Public Works

Just-A-Start Corporation
1035 Cambridge Street, #12 | Cambridge, MA 02141 | T: 617-494-0444 | www.justastart.org

COMPREHENSIVE PERMIT APPLICATION

ELIGIBILITY STANDARDS, LONG-TERM AFFORDABILITY, AND FUNDING

Rindge Commons

402 Rindge Ave
Cambridge, MA 02140

Long Term Affordability

The proposed development will add 101 Long-term affordable apartments to the City of Cambridge.

All of the 101 new units at Rindge Commons will be Low Income Housing Tax Credit (LIHTC) eligible units for residents. LIHTC eligibility guidelines are determined by Sec. 42 of the Internal Revenue Code, as well as the 2018 DHCD Draft Qualified Allocation Plan.

Funding

The majority of the project will be financed through 4% Low Income Housing Tax Credits (LIHTCs) and tax-exempt bonds, as allocated from DHCD and MassHousing. Other state sources include Community Based Housing Funds (CBH) and other subordinate debt from the Commonwealth of Massachusetts DHCD. The City of Cambridge Affordable Housing Trust (CAHT) has also committed funds to the project.

Restrictions

The Cambridge Affordable Housing Trust will include a mortgage that encumbers the property. The property will enter into an Affordable Housing Covenant whereby all units to be constructed will be available solely to households whose income does not exceed an AMI approved by the Trust.

The Property will be further encumbered by affordability restrictions from MA DHCD and MassHousing that will commit the project to renting units to low income families at affordable rents.

Just-A-Start Corporation
1035 Cambridge Street, #12 | Cambridge, MA 02141 | T: 617-494-0444 | www.justastart.org

COMPREHENSIVE PERMIT APPLICATION

REPORT OF EXISTING SITE CONDITIONS

Rindge Commons
402 Rindge Ave
Cambridge, MA 02140

Proximity to Services

The site is located in the Alewife district of North Cambridge and is less than ¼ mile from the Alewife T station which provides the Red Line train through Somerville, Cambridge, Boston, and south to both Ashmont and Braintree.

Retail amenities such as Whole Foods, Trader Joe's, CVS, Marshalls, Bank of America and numerous other retail and food establishments are also within easy walking distance.

Comeau field and the Francics McCrehan Swimming Pool are 0.2 miles-- a four minute walk -- from the site. Additionally, the site is walking distance to Danehy Park with additional open space.

Accessibility

Parking
Rindge Commons will have 240 on-site parking spaces serving the property, including 12 accessible parking spaces. These spaces will include a mix of covered and open parking. Pickup and loading zones will be available for ride share, Carpool/vanpool drop off and pickup, and deliveries.

Transit

Alewife Station is 0.2 miles from the project site, with accessible sidewalks and crossings between the Rindge property and the Station. Available at Alewife are the MBTA Red Line serving Cambridge, Somerville, Boston and Quincy, and the MBTA 62, 67 ,76 ,79 ,84, 350 and 351 buses serving over a dozen other metro-area communities.

Major Thoroughfares

The project is a one minute drive from route 2.

Neighborhood Context

The project is located on an existing developed site, and makes efficient use of previously under-utilized space. The site is located in a fully developed dense urban neighborhood that is within easy walking distance to a variety of amenities.

Adjacent to the property are The Alewife MBTA station to the Northwest, with parking, MBTA Bus and Subway Service. To the west are a mix of mid-rise residential and commercial buildings. To the north of the site is Jerry's Pond and Comeau Field. To the east are two other high rise apartment buildings.

The broader neighborhood contains a mix of high-rise residential, mid-rise residential and commercial, and low rise multifamily and single-family homes.

54 (4) 4pgs

2015 00217675
Bk: 66573 Pg: 239 Doc: DEED
Page: 1 of 4 12/22/2015 02:40 PM

QUITCLAIM DEED

JUST-A-START CORPORATION, a Massachusetts nonprofit corporation, as successor by merger to 402 Rindge Corporation*, having an address of 1035 Cambridge Street, #12, Cambridge, Massachusetts 02141 ("Grantor")

For consideration paid of $22,934,625

GRANTS TO RINDGE TOWERS APARTMENTS LLC, a Massachusetts limited liability company having an address of c/o Just-A-Start Corporation, 1035 Cambridge Street, #12, Cambridge, Massachusetts 02141.

402 Rindge Avenue, Cambridge, Massachusetts

WITH QUITCLAIM CONVENANTS, all of its right, title and interest in certain parcels of land with 273-affordable rental units located at 402 Rindge Avenue in Cambridge, Middlesex South County, Massachusetts, known as Rindge Tower Apartments ("Property"). The Property was conveyed to Grantor by that certain deed dated January 6, 1997 and recorded with Middlesex South Registry of Deeds in Book 27020, Page 576, and being more particularly described in Exhibit A attached hereto.

The corporate merger of 402 Rindge Corporation into Just-A-Start Corporation is not intended to merge out the Parking Easement Deed dated May 18, 1999, by and between 402 Rindge Corporation and Just-A-Start Corporation, recorded at Book 30228, Page 20, as amended and modified by Amendment and Modification to Parking Easement Deed dated February 8, 2000, recorded at Book 31176, Page 258 and the Parking Easement Deed dated March 1, 2005, by and between 402 Rindge Corporation and Just-A-Start Corporation, recorded at Book 45145, Page 317 and it is specifically intended that said Parking Easement Deeds are to survive.

This conveyance is made subject to (i) the Notice of Activity and Use Limitation dated January 21, 1999 and recorded at Book 29690, Page 16, and (ii) any encumbrances, liens, reservations, and restrictions of record.

This conveyance does not represent the sale of all or substantially all of the assets of the Grantor within the Commonwealth of Massachusetts.

* See Certificate of merger recorded in Book 60555, Page 163.

MASSACHUSETTS EXCISE TAX
Southern Middlesex District ROD # 001
Date: 12/22/2015 02:40 PM
Ctrl# 235952 23624 Doc# 00217675
Fee: $104,583.60 Cons: $22,934,625.00

KH 364731.4

Klein Hornig LLP
101 Arch Street, Suite 1101
Boston, Massachusetts 02110
Attn: Wataru Matsuyasu, Esq.

Witness my hand and seal on this 14 day of December, 2015.

JUST-A-START CORPORATION

By: _____

Name: Deborah Ruhe

Title: Executive Director

COMMONWEALTH OF MASSACHUSETTS

Suffolk County, ss.

On this 11th day of December, 2015, before me, the undersigned notary public, personally appeared Deborah Ruhe, the Executive Director of Just-A-Start Corporation, proved to me by satisfactory evidence of identification, being my own personal knowledge of the identity of the signatory, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he/she signed it voluntarily for its stated purpose.

_____

Notary Public: _____

My Commission Expires: _____

EXHIBIT A

A certain parcel of land, with all improvements thereon, and appurtenances thereto, situated on the southerly side of Rindge Avenue in Cambridge, Middlesex County, Massachusetts, being Lot A on a Plan by Joseph Selwyn, Civil Engineer, dated December 6, 1967, recorded with Middlesex South District Registry of Deeds, in Book 11446, Page 398, being bounded and described as follows:

Beginning at a point at the northwesterly corner of the premises on the south side of Rindge Avenue at its intersection with Alewife Brook Parkway.

Thence running easterly by Rindge Avenue on a curve having a radius of 279.90 feet fifty eight and 59/100 (58.59);

Thence continuing due East on Rindge Avenue one hundred forty four and 00/100 feet (144.00) to land of Alphonse A. Chaisson;

Thence turning and running due South by land of said Alphonse A. Chaisson, one hundred and 00/100 feet (100.00);

Thence turning and running due East by land of said Alphonse A. Chaisson, fifty five and 72/100 (55.72) to Lot B as shown on said plan;

Thence turning and running S 00° 22' 01: E by said Lot B six hundred two and 72/100 feet (602.72) to land of the Boston and Maine Railroad;

Thence turning and running northwesterly by said line of the Boston and Maine Railroad by a curve having a radius of 975.25 feet to the Alewife Brook Parkway a distance of two hundred and seventy four and 41/100 feet (274.41).

Thence turning and running N 01° 32' 10" W in a straight line by said Alewife Brook Parkway four hundred eighteen and 09/100 (418.09) feet.

Thence continuing in a northerly direction by said Alewife Brook Parkway by a curve having a radius of 8,631.77 feet one hundred sixty eight and 10/100 feet (168.10) to Rindge Avenue and the point of beginning.

The parcel contains 151,075 s.f. or 3.468 Acres.

The property is subject to a Notice of Activity and Use Limitation dated January 21, 1999 and recorded with the Middlesex Southern District Registry of Deeds in Book 29690, Page 16.

PERSPECTIVE VIEW:

PROJECT TEAM:

OWNER/DEVELOPER:
JUST-A-START CORPORATION
1035 CAMBRIDGE ST #12
CAMBRIDGE, MA 02141

ARCHITECT:
ICON ARCHITECTURE
101 SUMMER ST FL 5
BOSTON, MA 02110

LANDSCAPE ARCHITECT:
COPLEY WOLF DESIGN GROUP
10 POST OFFICE SQUARE, SUITE 1315
BOSTON, MA 02109

CIVIL ENGINEER:
NITSCH ENGINEERING, INC
2 CENTER PLZ #430
BOSTON, MA 02108

STRUCTURAL ENGINEER:
LIM CONSULTANTS, INC
6 PLEASANT ST
MALDEN, MA 02148

MECHANICAL, PLUMBING, ELECTRICAL & FIRE PROTECTION ENGINEER:
PETERSEN ENGINEERING INC
127 PARROTT AVE
PORTSMOUTH, NH 03801

GEOTECHNICAL ENGINEER:
MCPHAIL ASSOCIATES LLC
2269 MASSACHUSETTS AVE
CAMBRIDGE, MA 02140

ENERGY CONSULTANT:
NEW ECOLOGY, INC
15 COURT SQUARE, SUITE 420
BOSTON, MA 02108

3/25/2020 4:12:08 PM

Site & Building

	Non-Resid'l			Residential	Shared			Building GSF
	J-A-S E&T	community rm	Health Provider	Units and Comm *includes Mech	Circulation	BIKE PARKING	Footprint	excl. Parking
Building A								
First Floor	2,264	0	3,083	1,559	1,334	916		9,156
Second Floor	11,740	757	0	668	623	0		13,788
Third Floor	0	0	12,920	289	576	0		13,785
Fourth Floor	0	0	6,281	6,694	571	0		13,546
Fifth Floor	0	0	0	10,406	213	0		10,619
Sixth Floor	0	0	0	7,861	213	0		8,074
Building A Total	14,004	757	22,284	27,477	3,530	916		[illegible]
	37,045			**31,007**		**916**		**68,968**
Building B								
First Floor	0	0	0	1,698	0	842		2,540
Second Floor	0	0	0	10,351	0	1,715		12,066
Third Floor	0	0	0	15,344	0	0		15,344
Fourth Floor	0	0	0	15,344	0	0		15,344
Fifth Floor	0	0	0	15,344	0	0		15,344
Sixth Floor	0	0	0	15,344	0	0		15,344
Seventh Floor	0	0	0	14,093	0	0		14,093
Building B Total				87,518	0	2,557		[illegible]
					90,075			**90,075**
Existing 402								
[E] Building Total								**264,168**
OVERALL PROJECT TOTAL								**423,211**

Parking

	AUTO					BICYCLE		
	Surface	[Accessible]	Covered	[Accessible]	TOTAL	Long-Term	Short-Term	Total
Existing 273	273	10			**273**	26		26
Proposed					**240**	134	22	**156**
Required					**374**	**160**	**22**	**182**
Ratio Parking:Unit					0.64			

Unit Mix

	STUDIO	1-BR	1-BR-BF	2BR	2-BR-BF	3BR	3-BR-BF	TOTAL
EXISTING	21	84		168		0		273
BUILDING A		10		14		0		24
BUILDING B		16		39		22		77
	21	**110**		**221**	**0**	**22**	**0**	**374**
Percentage [Site TOTAL]	6%	29%		59%		6%	0%	100%
Percentage [New Const TOTAL]	0%	26%		52%		22%		100%

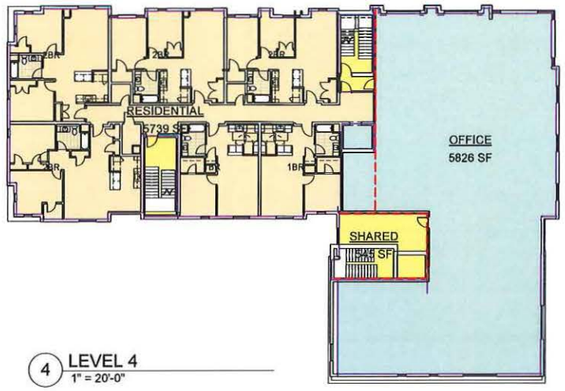
RINDGE COMMONS BUILDING A - PHASE 1

402 RINDGE AVE
CAMBRIDGE, MA
JUST - A - START

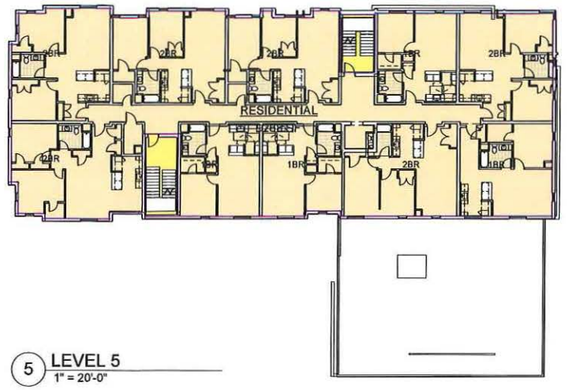
ISSUE DATE: **APRIL 20, 2020**
PROGRESS SET

Rentable Area Legend

- OFFICE
- RESIDENTIAL
- SHARED



4 LEVEL 4
1" = 20'-0"



5 LEVEL 5
1" = 20'-0"

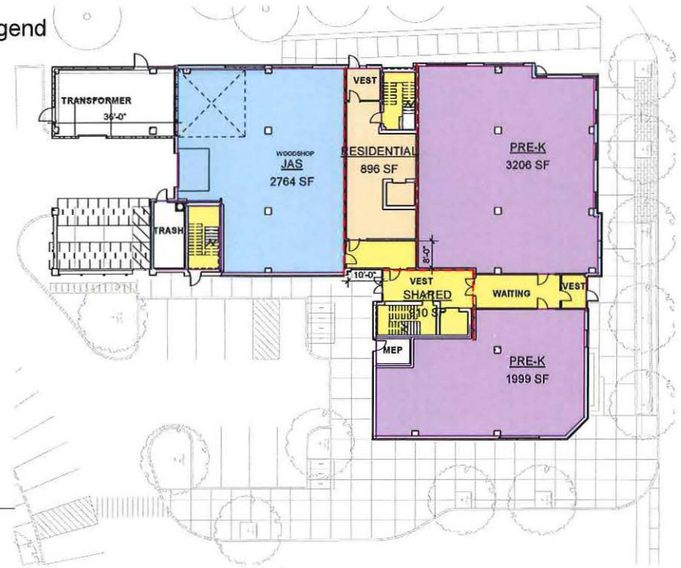
6 LEVEL 6
1" = 20'-0"

UNIT MIX

BEDS	1	2	3	T
4TH	2	4	0	6
5TH	4	6	0	10
6TH	4	4	0	8
TOTAL	10	14	0	24

Rentable Area Legend

- JAS
- PRE-K
- RESIDENTIAL
- SHARED



1 LEVEL 1
1" = 20'-0"

2 LEVEL 2
1" = 20'-0"

3 LEVEL 3
1" = 20'-0"

6/12/2020 3:23:07 PM

RINDGE COMMONS - BUILDING A PHASE 1

@ 402 RINDGE AVE
CAMBRIDGE, MA

JUST-A-START

ARCHITECT

E-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

PRE-K: 10,980 SF
JAS: 19,928 SF
OFFICE: 5,576 SF
RES LOBBY: 694 SF

MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

AREA PLANS

G-004

CHICAGO TITLE INSURANCE COMPANY
FILE NUMBER 50262
EFFECTIVE DATE APRIL 16, 2018

EXHIBIT A

A certain parcel of land, with all improvements thereon, and appurtenances thereto, situated on the southerly side of Rindge Avenue in Cambridge, Middlesex County, Massachusetts, being Lot A on a Plan by Joseph Selwyn, Civil Engineer, dated December 6, 1967, recorded with Middlesex South District Registry of Deeds, in Book 11446, Page 398, being bounded and described as follows:

Beginning at a point at the northwesterly corner of the premises on the south side of Rindge Avenue at its intersection with Alewife Brook Parkway.

Thence running easterly by Rindge Avenue on a curve having a radius of 279.90 feet fifty eight and 59/100 (58.59);

Thence continuing due East on Rindge Avenue one hundred forty four and 00/100 feet (144.00) to land of Alphonse A. Choisson;

Thence turning and running due South by land of said Alphonse A. Chaisson, one hundred and 00/100 feet (100.00);

Thence turning and running due East by land of said Alphonse A. Chaisson, fifty five and 72/100 (55.72) to Lot B as shown on said plan;

Thence turning and running S 00° 22' 01" E by said Lot B six hundred two and 72/100 feet (602.72) to land of the Boston and Maine Railroad;

Thence turning and running northwesterly by said line of the Boston and Maine Railroad by a curve having a radius of 975.25 feet to the Alewife Brook Parkway a distance of two hundred and seventy four and 41/100 feet (274.41).

Thence turning and running N 01° 32' 10" W in a straight line by said Alewife Brook Parkway four hundred eighteen and 09/100 (418.09) feet.

Thence continuing in a northerly direction by said Alewife Brook Parkway by a curve having a radius of 8,631.77 feet one hundred sixty eight and 10/100 feet (168.10) to Rindge Avenue and the point of beginning.

The parcel contains 151,075 s. f. or 3.468 Acres, subject to a City of Cambridge Drain Easement as shown of the above-referenced plan.

Zoning Restrictions for Cambridge C-2 Zone: Residence-2

Existing dimensions are rough estimates using engineer scale and basic math.

	Required Dimension
Maximum Height:	85'
Max. Floor to Area Ratio:	1.75
Min. Setback Front	H+L(o)/4
Min. Setback Side	H+L/5
Min. Setback rear	H+L(c)/4
Min. open space ratio	15%
Min. Lot Area	5000 sq. feet

287 TOTAL PARKING SPACES
10 OF WHICH ARE HANDICAP PARKING SPACES
13 INCLUDED IN EASEMENT

The property shown lies within ZONE X
(area outside 0.2% annual chance floodplain)
and ZONE X SHADED (areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.)
as shown on FLOOD INSURANCE RATE MAP
for THE CITY OF CAMBRIDGE
COMMUNITY 25017
PANEL NUMBER 419E
WITH EFFECTIVE DATE OF JUNE 4, 2010

TABLE A ITEMS

1. Surveyor was not provided a zoning report by the client.
2. There was no delineation of Wetlands by a specialist.

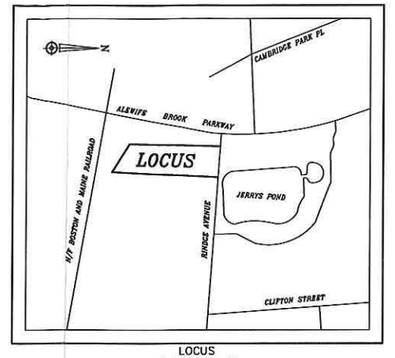
LEGEND

⊕	DRAIN MANHOLE	—•—	DRAIN
⊕	CABLE TV MANHOLE	—E—	ELECTRIC
⊕	ELECTRIC MANHOLE	—G—	GAS
⊕	SEWER MANHOLE	—OHW—	OVERHEAD WIRES
⊕	TELEPHONE MANHOLE	—S—	SEWER
■	CATCH BASIN	—ST—	STEAM
GG	GAS GATE	—W—	WATER
WG	WATER GATE		
○	LIGHT POLE		
◇	WOOD UTILITY POLE		
⋈	HYDRANT		
FA	FIRE ALARM		
DW	DETECTIVE WARNING PANEL		
○	BOLLARD		
ELS	ELECTRIC CAR STATION		
D	DECIDUOUS TREE		
MW	MONITORING WELL		
	TREE		

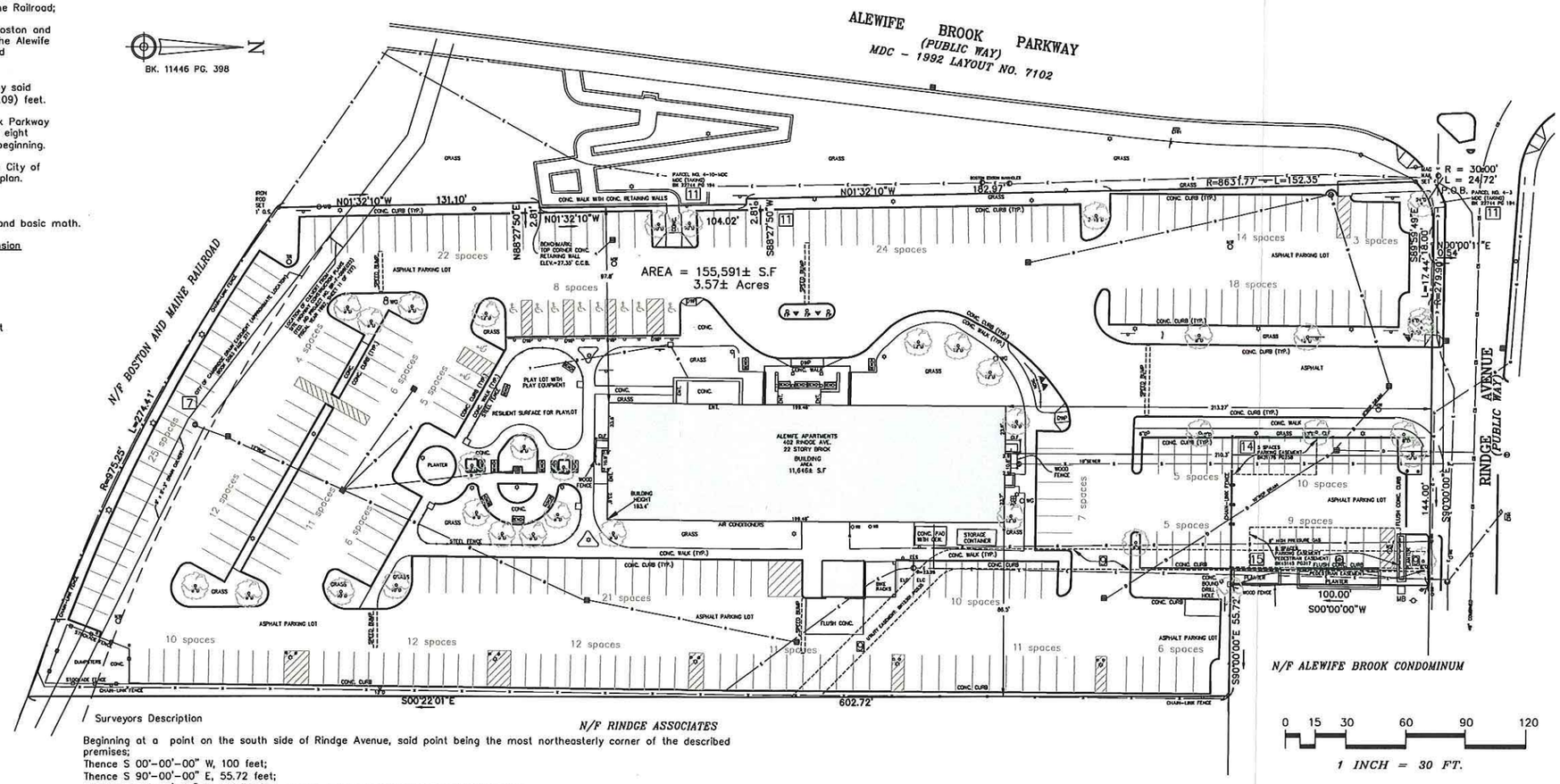
Underground utilities shown are from field observations and record information and are not warranted to be exact nor is it warranted that all underground pipes

SCHEDULE B

7. Taking of Sewer Easement by the City of Cambridge dated January 25, 1927 and recorded in Book 5063, Page 371. PLOTTED
9. Utility Easements as set forth in Grant to Cambridge Electric Light Company dated November 19, 1971 and recorded in Book 12301, Page 535. (NOT PLOTTED TEMPORARY EASEMENT)
11. Taking for the Construction (Layout No. 7102) by the Department of Highways of the Commonwealth of Massachusetts, acting on behalf of the Metropolitan District Commission of said Commonwealth, to alter portions of highways previously laid out dated December 16, 1992 and recorded in Book 22744, Page 194. (Affects Alewife Brook Parkway only.) PLOTTED
13. Notice of Activity and Use Limitation by 402 Rindge Corporation dated January 21, 1999 and recorded in Book 29690, Page 16. NOT PLOTTED BLANKET
14. Parking Easement Agreement by and between 402 Rindge Corporation and Just-A-Start Corp. as set forth in document entitled Parking Easement Deed dated May 18, 1999 and recorded in Book 30228, Page 20, as amended and modified by Amendment and Modification to Parking Easement Deed dated February 8, 2000 and recorded in Book 31176, Page 258. PLOTTED
15. Parking Easement Agreement by and between 402 Rindge Corporation and Just-A-Start Corp. dated March 1, 2005 as set forth in document entitled Parking Easement Deed and recorded in Book 45145, Page 317. PLOTTED



LOCUS
(NOT TO SCALE)



Surveyors Description

Beginning at a point on the south side of Rindge Avenue, said point being the most northeasterly corner of the described premises;
Thence S 00°-00'-00" W, 100 feet;
Thence S 90°-00'-00" E, 55.72 feet;
Thence S 00°-22'-01" E, 602.72 feet by land now or formerly of Rindge Associates;
Thence along a curve having a radius of 975.25 feet and an arc length of 274.41 feet by land now or formerly of Boston and Maine Railroad;
Thence N 01°-32'-10" W, 131.10 feet;
Thence N 88°-27'-50" E, 2.81 feet;
Thence N 01°-32'-10" W, 104.02 feet;
Thence S 88°-27'-50" W, 2.81 feet;
Thence N 01°-32'-10" W, 182.97 feet;
Thence along a curve to the right with a radius of 8631.77 feet and an arc length of 152.35 feet. The previous six courses are by Alewife Brook Parkway;
Thence along a curve with a radius of 30.00 feet and an arc length of 24.72 feet;
Thence S 89°-59'-49" E, 18.00 feet;
Thence N 00°-00'-11" E, 0.54 feet;
Thence along a curve with a radius of 279.90 feet and an arc length of 17.44 feet;
Thence S 90°-00'-00" E, 144.00 feet to the point of beginning. The previous five courses are by Rindge Avenue.

To U.S. Department of Housing and Urban Development, the Massachusetts Housing Finance Agency, Chicago Title Insurance Company, Rindge Towers Apartments LLC, Stratford Rindge Tower Investors Limited Partnership, a Massachusetts limited partnership, Stratford SLP, Inc., a Delaware corporation:

This is to certify that this map or plat and the survey on which it is based were made in accordance with the 2016 Minimum Standard Detail Requirements for ALTA/NSPS Land Title Surveys, jointly established and adopted by ALTA and NSPS, and includes Item 1, 2, 3, 4, 6a, 6b, 7a, 8, 9, 11, 12, 13, 16, 17, 18, 20 of Table A thereof. The field work was completed on December 1, 2014 and last revised April 20, 2018.

Registered Professional Land Surveyor

REVISION - DATE
4/20/2015
12/05/2015

JOB NO. 2527

ALTA/NSPS
LAND TITLE SURVEY
402 Rindge Avenue
Cambridge, Massachusetts

Scale: 1"=30' | Drawn By: RPH/APM | Job: 2527
Date: 12/1/14 | Checked By: SDC | Dwg: 2527MPM

R.E. Cameron & Associates, Inc.
Land Surveyors Civil Engineers
681 Washington Street, Norwood Massachusetts 02062
Tel.(781) 769-1777 Fax (781) 769-8644

The property shown lies within ZONE X
(area outside 0.2% annual chance floodplain)
and ZONE X SHADED (areas of 0.2% annual chance flood;
areas of 1% annual chance flood with average depths
of less than 1 foot or with drainage areas
less than 1 square mile; and areas protected by levees
from 1% annual chance flood.)
as shown on FLOOD INSURANCE RATE MAP
for THE CITY OF CAMBRIDGE
COMMUNITY 25017
PANEL NUMBER 419E
WITH EFFECTIVE DATE OF JUNE 4, 2010

BK. 11446 PG. 398

LEGEND

- DRAIN MANHOLE
- CABLE TV MANHOLE
- ELECTRIC MANHOLE
- SEWER MANHOLE
- TELEPHONE MANHOLE
- CATCH BASIN
- MH MANHOLE
- AD AREA DRAIN
- GG GAS GATE
- WG WATER GATE
- LIGHT POLE
- WOOD UTILITY POLE
- HYDRANT
- ASP AUTO SPRINKLER
- FA FIRE ALARM
- DWP DETECTIVE WARNING PANEL
- BOLLARD
- ELS ELECTRIC CAR STATION
- TR TRASH
- MW MONITORING WELL
- RD ROOF DRAIN
- DECIDUOUS TREE
- R RIM
- I INVERT
- TOW TOP OF WATER
- D DRAIN
- E ELECTRIC
- G GAS
- OHW OVERHEAD WIRES
- S SEWER
- W WATER
- FEMA LINE

Match Line

ALEWIFE BROOK PARKWAY
(PUBLIC WAY)
MDC – 1992 LAYOUT NO. 7102

N/F BOSTON AND MAINE RAILROAD

PARCEL NO. 4-10-MDC
MDC (TAKING)
BK 22744 PG 194

CONC. WALK WITH CONC. RETAINING WALLS

IRON ROD SET 1' O.S.

N01°32'10"W 131.10'

N88°27'50"E 2.81'

N01°32'10"W 104.02'

S88°27'50"W 2.81'

N01°32'10"W 182.97'

BENCHMARK:
TOP CORNER CONC. RETAINING WALL
ELEV.=27.35' C.C.B.

AREA = 155,591± S.F
3.57± Acres

ASPHALT PARKING LOT

22 spaces

24 spaces

8 spaces

97.8'

R=22.62
TOW=19.5

PLAY LOT WITH PLAY EQUIPMENT

RESILIENT SURFACE FOR PLAYLOT

AD PAVERS

ALEWFE APARTMENTS
402 RINDGE AVE.
22 STORY BRICK
BUILDING
AREA
11,646± S.F

199.5'

OVERHANG

BUILDING HEIGHT 193'

AIR CONDITIONERS

CONC. PAD WITH GEN.

STORAGE CONTAINER

BIKE RACKS

FLUSH CONC.

R=23.80

86.5'

10 spaces

11 spaces

12 spaces

21 spaces

7 spaces

R=975.25' L=274.41'

DRAIN CULVERT LOCATION AND GRADES ARE FROM BSC ENGINEERING'S DRAIN CULVET INVESTIGATION

APPROXIMATE LOCATION DRAIN CULVERT

TOP OF CULVERT 17.6'

TOP OF CULVERT 17.7'

TOP OF CULVERT 17.5'

DUMPSTERS

STOCKADE FENCE

CHAIN-LINK FENCE

WOOD FENCE

STEEL FENCE

CONC. CURB (TYP.)

CONC. WALK (TYP.)

CONC. CURB

SPEED BUMP

AREA OF NATIONAL FLOOD HAZARD ZONE X

0.2 PCT ANNUAL CHANCE FLOOD HAZARD ZONE X

UTILITY EASEMENT: BK13291 PG53

BROKEN SLT SACK R=22.44 TOW=18.0

S00°22'01"E 602.72'

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

N/F RINDGE ASSOCIATES

N/F RINDGE ASSOCIATES

REVISION – DATE

P1

JOB NO. 2527

EXISTING CONDITIONS
402 Rindge Avenue
Cambridge, Massachusetts

Scale: 1"=20' | Drawn By: RPH/MPM | Job: 2527 | Dwg: 2527MPMEX
Date: 4/1/19 | Checked By: SDC

R.E. Cameron & Associates, Inc.
Land Surveyors
Civil Engineers
681 Washington Street, Norwood Massachusetts 02062
Tel.(781) 769-1777 Fax (781) 769-8644

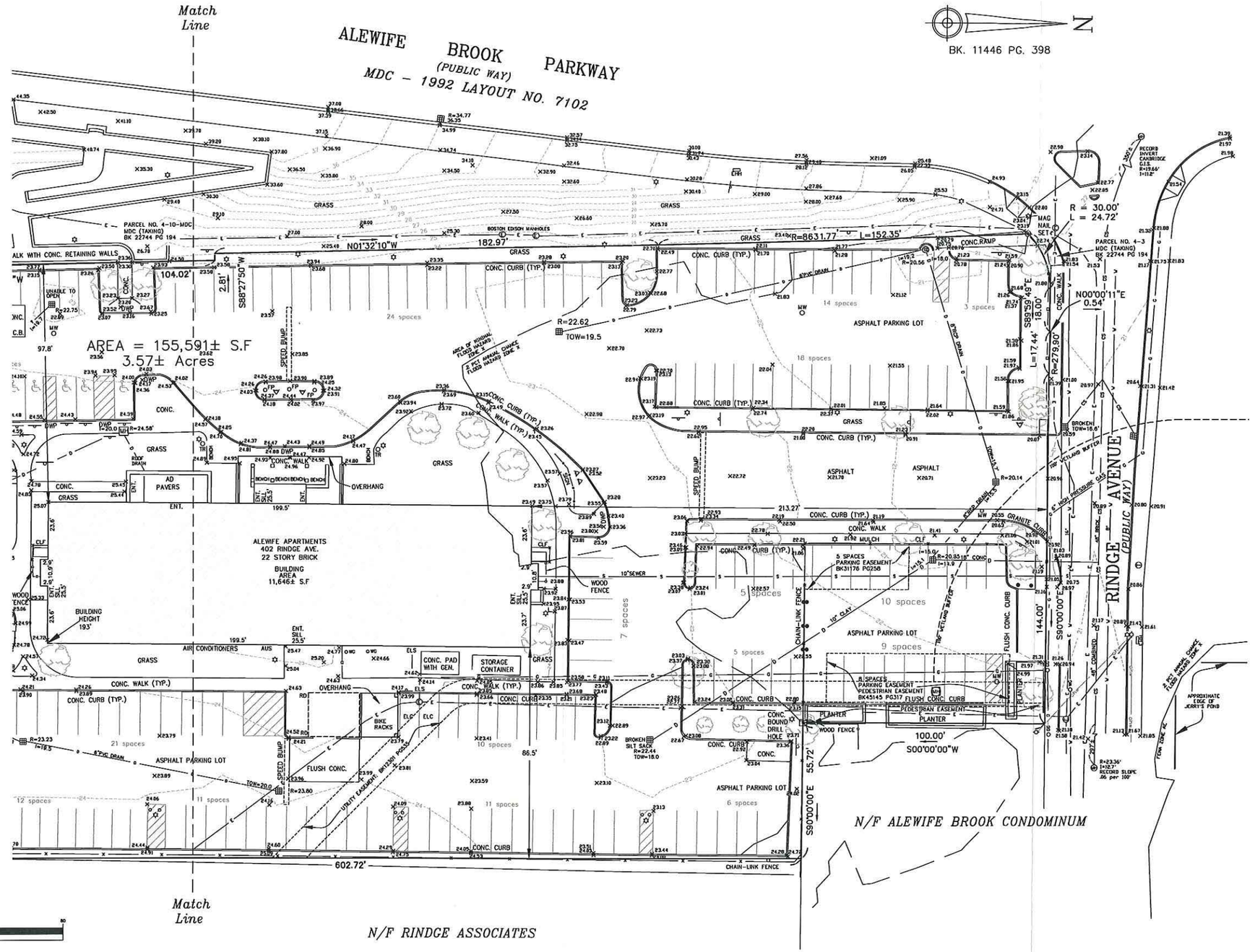
2527

The property shown lies within ZONE X
(area outside 0.2% annual chance floodplain)
and ZONE X SHADED (areas of 0.2% annual chance flood;
areas of 1% annual chance flood with average depths
of less than 1 foot or with drainage areas
less than 1 square mile; and areas protected by levees
from 1% annual chance flood.)
as shown on FLOOD INSURANCE RATE MAP
for THE CITY OF CAMBRIDGE
COMMUNITY 25017
PANEL NUMBER 419E
WITH EFFECTIVE DATE OF JUNE 4, 2010

LEGEND

- DRAIN MANHOLE
- CABLE TV MANHOLE
- ELECTRIC MANHOLE
- SEWER MANHOLE
- TELEPHONE MANHOLE
- CATCH BASIN
- MANHOLE
- AREA DRAIN
- GAS GATE
- WATER GATE
- LIGHT POLE
- WOOD UTILITY POLE
- HYDRANT
- AUTO SPRINKLER
- FIRE ALARM
- DETECTIVE WARNING PANEL
- BOLLARD
- ELECTRIC CAR STATION
- TRASH
- MONITORING WELL
- ROOF DRAIN
- DECIDUOUS TREE

- RIM
- INVERT
- TOP OF WATER
- DRAIN
- ELECTRIC
- GAS
- OVERHEAD WIRES
- SEWER
- WATER
- FEMA LINE



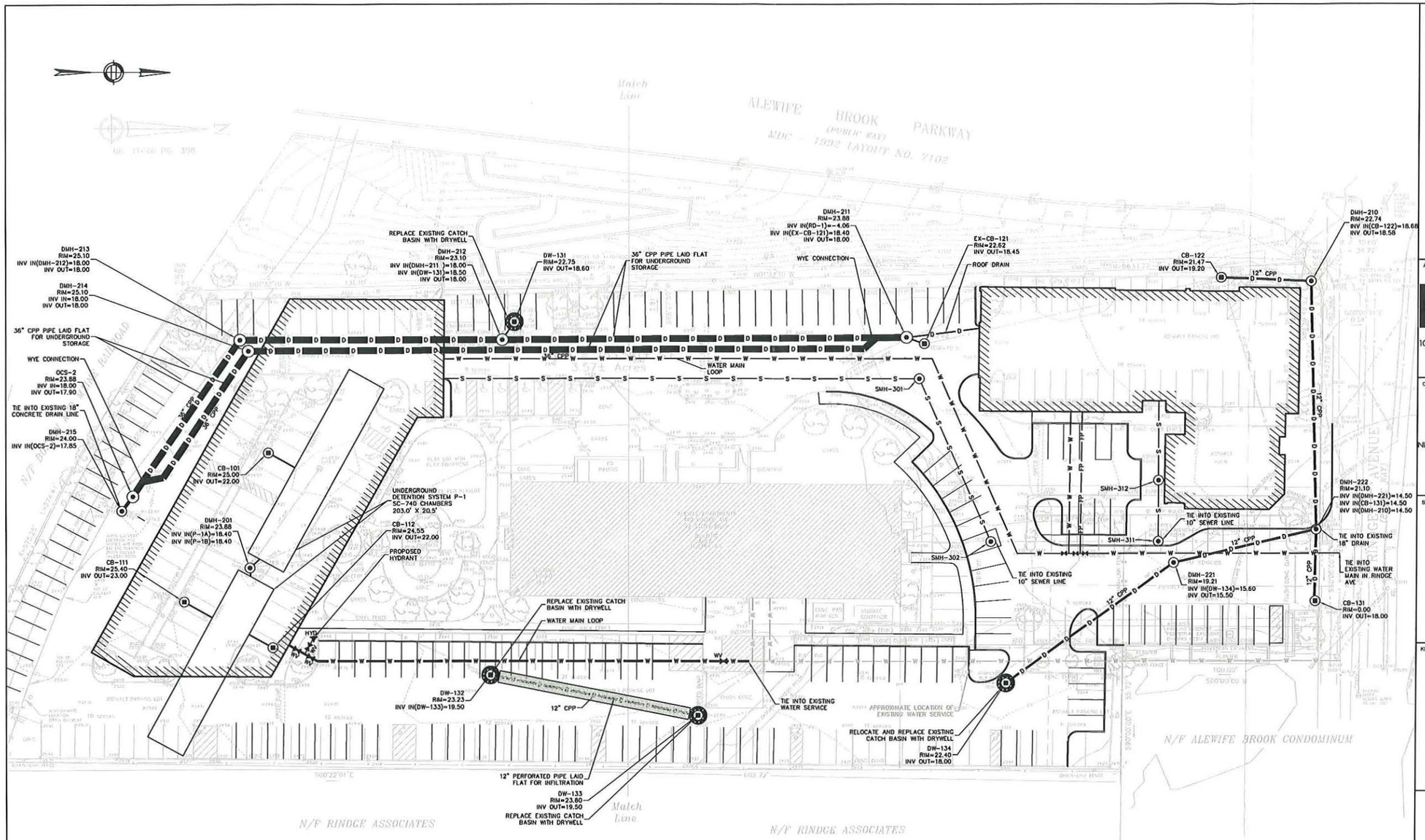
GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

REVISION – DATE | P2 | JOB NO. 2527

EXISTING CONDITIONS
402 Rindge Avenue
Cambridge, Massachusetts

Scale: 1"=20' | Drawn By: RPM/APM | Job: 2527
Date: 4/1/19 | Checked By: SDC | Dwg: 2527MPMEX

R.E. Cameron & Associates, Inc.
Land Surveyors Civil Engineers
681 Washington Street, Norwood Massachusetts 02062
Tel.(781) 769-1777 Fax (781) 769-8644



GENERAL NOTES:

1. TOPOGRAPHIC DATA, PROPERTY LINE INFORMATION, AND EXISTING SITE FEATURES WERE OBTAINED FROM A PLAN ENTITLED "xxxx", PREPARED BY xxx., DATED xxx.
2. FLOODPLAIN INFORMATION WAS OBTAINED FROM THE FLOOD INSURANCE RATE MAP (FIRM) NO. 25017C0419E. THE SITE IS IN ZONE X.
3. THE CONTRACTOR SHALL COMPLY WITH MASSACHUSETTS GENERAL LAWS CHAPTER 82, SECTION 40, AS AMENDED, WHICH STATES THAT NO ONE MAY EXCAVATE IN THE COMMONWEALTH OF MASSACHUSETTS EXCEPT IN AN EMERGENCY WITHOUT 72 HOURS NOTICE, EXCLUSIVE OF SATURDAYS, SUNDAYS, AND LEGAL HOLIDAYS, TO NATURAL GAS PIPELINE COMPANIES, AND MUNICIPAL UTILITY DEPARTMENTS THAT SUPPLY GAS, ELECTRICITY, TELEPHONE, OR CABLE TELEVISION SERVICE IN OR TO THE CITY OR TOWN WHERE THE EXCAVATION IS TO BE MADE. THE CONTRACTOR SHALL CALL "DIG SAFE" AT 1-888-DIG-SAFE.
4. THE CONTRACTOR SHALL COMPLY WITH MASSACHUSETTS GENERAL LAWS CHAPTER 82A, ALSO REFERRED TO AS JACKIE'S LAW, AS DETAILED IN SECTION 520 CMR 14.00 OF THE CODE OF MASSACHUSETTS REGULATIONS.
5. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS, RULES, REGULATIONS AND SAFETY CODES IN THE CONSTRUCTION OF ALL IMPROVEMENTS.
6. THE LOCATIONS AND ELEVATIONS OF ALL EXISTING UTILITIES ARE APPROXIMATE AND ALL UTILITIES MAY NOT BE SHOWN. PRESENCE AND LOCATIONS OF ALL UTILITIES WITHIN THE LIMIT OF WORK MUST BE DETERMINED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF CONSTRUCTION ACTIVITY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING AND CONTACTING THE CONTROLLING AUTHORITIES AND/OR UTILITY COMPANIES RELATIVE TO THE LOCATIONS AND ELEVATIONS OF THEIR LINES. THE CONTRACTOR SHALL KEEP A RECORD OF ANY DISCREPANCIES OR CHANGES IN THE LOCATIONS OF ANY UTILITIES SHOWN OR ENCOUNTERED DURING CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED TO THE OWNER AND NITSCH ENGINEERING. ANY DAMAGE RESULTING FROM THE FAILURE OF THE CONTRACTOR TO MAKE THESE DETERMINATIONS AND CONTACTS SHALL BE BORNE BY THE CONTRACTOR.
7. THE CONTRACTOR SHALL, THROUGHOUT CONSTRUCTION, TAKE ADEQUATE PRECAUTIONS TO PROTECT ALL WALKS, GRADING, SIDEWALKS AND SITE DETAILS OUTSIDE OF THE LIMIT OF WORK AS DEFINED ON THE DRAWINGS AND SHALL REPAIR AND REPLACE OR OTHERWISE MAKE GOOD AS DIRECTED BY THE ENGINEER OR OWNER'S DESIGNATED REPRESENTATIVE ANY SUCH OR OTHER DAMAGE SO CAUSED.
8. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR JOB SITE SAFETY AND ALL CONSTRUCTION MEANS AND METHODS.
9. PRIOR TO BEGINNING CONSTRUCTION, THE CONTRACTOR SHALL BECOME FAMILIAR WITH THE SITE AND CONSTRUCTION DOCUMENTS TO DEVELOP A THOROUGH UNDERSTANDING OF THE PROJECT, INCLUDING ANY SPECIAL CONDITIONS AND CONSTRAINTS.
10. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BECOME FAMILIAR WITH THE PROJECT SITE AND TO VERIFY ALL CONDITIONS IN THE FIELD AND REPORT DISCREPANCIES BETWEEN PLANS AND ACTUAL CONDITIONS TO THE OWNER OR OWNER'S REPRESENTATION IMMEDIATELY.
11. THE CONTRACTOR SHALL CONDUCT ALL NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN ALL NECESSARY CONSTRUCTION PERMITS.
12. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE ESTABLISHMENT AND USE OF ALL VERTICAL AND HORIZONTAL CONSTRUCTION CONTROLS.
13. ELEVATIONS REFER TO XXXX.
14. THE CONTRACTOR SHALL COMPLY WITH THE ORDER OF CONDITIONS DATED XXXX XX, XXXX AND ISSUED BY THE XXXX CONSERVATION COMMISSION (DEP #XXX-XXX).
15. FOR SOIL INFORMATION REFER TO GEOTECHNICAL REPORT.

UTILITY NOTES:

1. ALL UTILITY CONNECTIONS ARE SUBJECT TO THE APPROVAL OF, AND GRANTING OF PERMITS BY, THE LOCAL MUNICIPALITY. IT SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN ALL PERMITS AND APPROVALS RELATED TO UTILITY WORK PRIOR TO COMMENCEMENT OF CONSTRUCTION.
2. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR OBTAINING ALL PERMISSIONS FOR, AND FOR CONDUCTING ALL PREPARATIONS RELATED TO, WORK AFFECTING ANY UTILITIES WITHIN THE JURISDICTION OF ANY NON-MUNICIPAL UTILITY COMPANY, INCLUDING BUT NOT LIMITED TO ELECTRIC, TELEPHONE, AND/OR GAS. THE CONTRACTOR SHALL NOTIFY ALL APPROPRIATE AGENCIES, DEPARTMENTS, AND UTILITY COMPANIES, IN WRITING, AT LEAST 7 DAYS (OR PER UTILITY COMPANY REQUIREMENT) AND NOT MORE THAN 30 DAYS PRIOR TO ANY CONSTRUCTION.
3. THE CONTRACTOR SHALL MAINTAIN UTILITIES SERVICING BUILDINGS AND FACILITIES WITHIN OR OUTSIDE THE PROJECT LIMIT UNLESS THE INTERRUPTION OF SERVICE IS COORDINATED WITH THE OWNER.
4. ALL WATER, SEWER, AND DRAIN WORK SHALL BE PERFORMED ACCORDING TO THE REQUIREMENTS AND STANDARD SPECIFICATIONS OF THE LOCAL MUNICIPALITY.
5. GAS, TELECOMMUNICATIONS AND ELECTRIC SERVICES ARE TO BE DESIGNED BY EACH UTILITY COMPANY IN COORDINATION WITH THE MECHANICAL, ELECTRIC, AND PLUMBING CONSULTANTS.
6. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES OF NEW UTILITIES WITH GAS, TELECOMMUNICATION AND ELECTRICAL SERVICES.
7. INSTALL WATER LINES WITH A MINIMUM OF FIVE FEET OF COVER AND A MAXIMUM OF SEVEN FEET COVER FROM THE FINAL DESIGN GRADES.
8. MAINTAIN 10 FEET HORIZONTAL SEPARATION AND 18 INCHES VERTICAL SEPARATION (WATER OVER SEWER) BETWEEN SEWER AND WATER LINES. WHEREVER THERE IS LESS THAN 10 FEET OF HORIZONTAL SEPARATION AND 18 INCHES OF VERTICAL SEPARATION BETWEEN A PROPOSED OR EXISTING SEWER LINE TO REMAIN AND A PROPOSED OR EXISTING WATER LINE TO REMAIN BOTH WATER MAIN AND SEWER MAIN SHALL BE CONSTRUCTED OF MECHANICAL JOINT CEMENT LINED DUCTILE IRON PIPE FOR A DISTANCE OF 10-FEET ON EITHER SIDE OF THE CROSSING. ONE (1) FULL LENGTH OF WATER PIPE SHALL BE CENTERED OVER THE SEWER AT THE CROSSING.
9. THE CONTRACTOR SHALL MAINTAIN ALL EXISTING UTILITIES EXCEPT THOSE NOTED TO BE ABANDONED AND/OR REMOVED & DISPOSED.
10. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR TRENCHING, BACKFILLING, AND SURFACE RESTORATION FOR GAS UTILITY SYSTEMS.
11. ALL ONSITE UTILITIES SHALL BE INSTALLED UNDERGROUND UNLESS OTHERWISE NOTED.
12. ALL EXISTING AND PROPOSED MANHOLE FRAMES, COVERS, VALVES, CLEANOUTS, CASTINGS, ETC. SHALL BE RAISED TO FINISHED GRADE PRIOR TO FINAL GRADING AND PAVING CONSTRUCTION.
13. ALL GRATES IN WALKWAYS SHALL BE ADA COMPLIANT.

COST ESTIMATING NOTES:

1. ALL WATER LINES ARE DUCTILE IRON UNLESS OTHERWISE NOTED. ASSUME ALL WATER LINES INSTALLED WITH 5' OF COVER.
2. ASSUME ALL ROADWAY DRAINAGE LINES ARE 12" RCP UNLESS OTHERWISE NOTED. ASSUME ALL DRAIN LINES INSTALLED WITH 6' OF COVER.
3. ASSUME ALL ROOF DRAINAGE LINES ARE 6" CORRUGATED PLASTIC PIPE UNLESS OTHERWISE NOTED. ASSUME ALL DRAIN LINES INSTALLED WITH 4' OF COVER.
4. ASSUME THAT ALL SEWER LINES ARE 8" PVC. ASSUME ALL SEWER LINES INSTALLED WITH 6' OF COVER.
5. ASSUME ALL STRUCTURES ARE 4' INSIDE DIAMETER, EXCEPT FOR DOUBLE CB'S AND STRUCTURES THAT ARE DIRECTLY CONNECTED TO THE UNDER GROUND DETENTION SYSTEM. ASSUME THOSE STRUCTURES ARE 6' INSIDE DIAMETER.
6. SEE MEP PLANS FOR SIZING ELECTRIC, CABLE, TELEPHONE AND LIGHTING.

SCALE:
1" = 20'
20 10 0 20 40

10/2/2019 11:41:44 AM

RINDGE COMMONS

402 RINDGE AVE
CAMBRIDGE, MA

JUST - A - START

ARCHITECT
E-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT
Nitsch Engineering
www.nitschengg.com
2 Center Plaza, Suite 430
Boston, MA 02108
T: (617) 338-0063
F: (617) 338-6472

STAMP

KEY PLAN

DRAFT

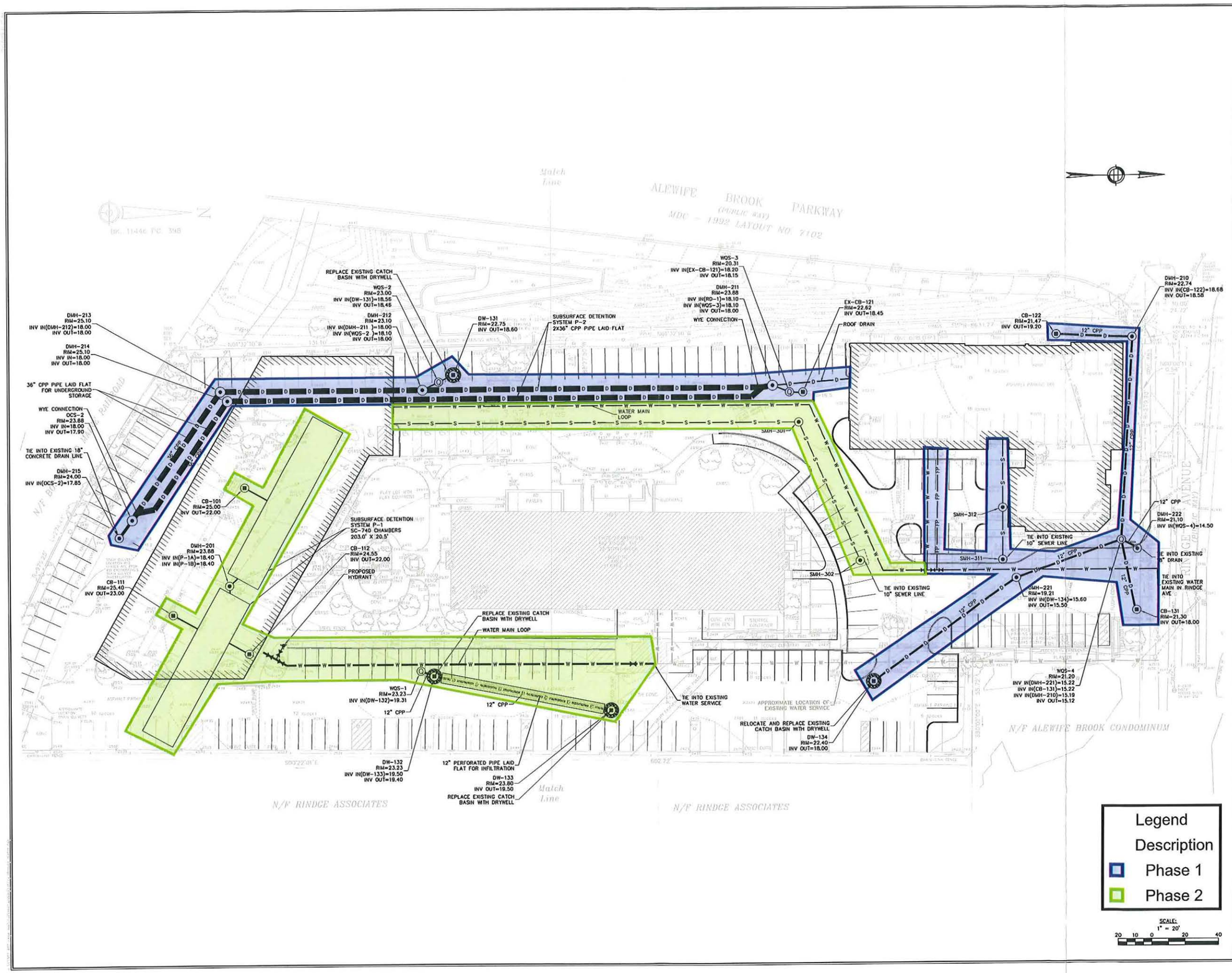
MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: AMM
CHECKED BY: AG

SHEET TITLE

SITE UTILITY PLAN

C-300



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

- Civil Engineering
- Land Surveying
- Transportation Engineering
- Structural Engineering
- Green Infrastructure
- Planning
- GIS

UTILITY PHASING PLAN

402 RINDGE AVENUE
CAMBRIDGE, MA

PREPARED FOR:
JUST-A-START CORPORATION
1035 CAMBRIDGE STREET #12, CAMBRIDGE, MA

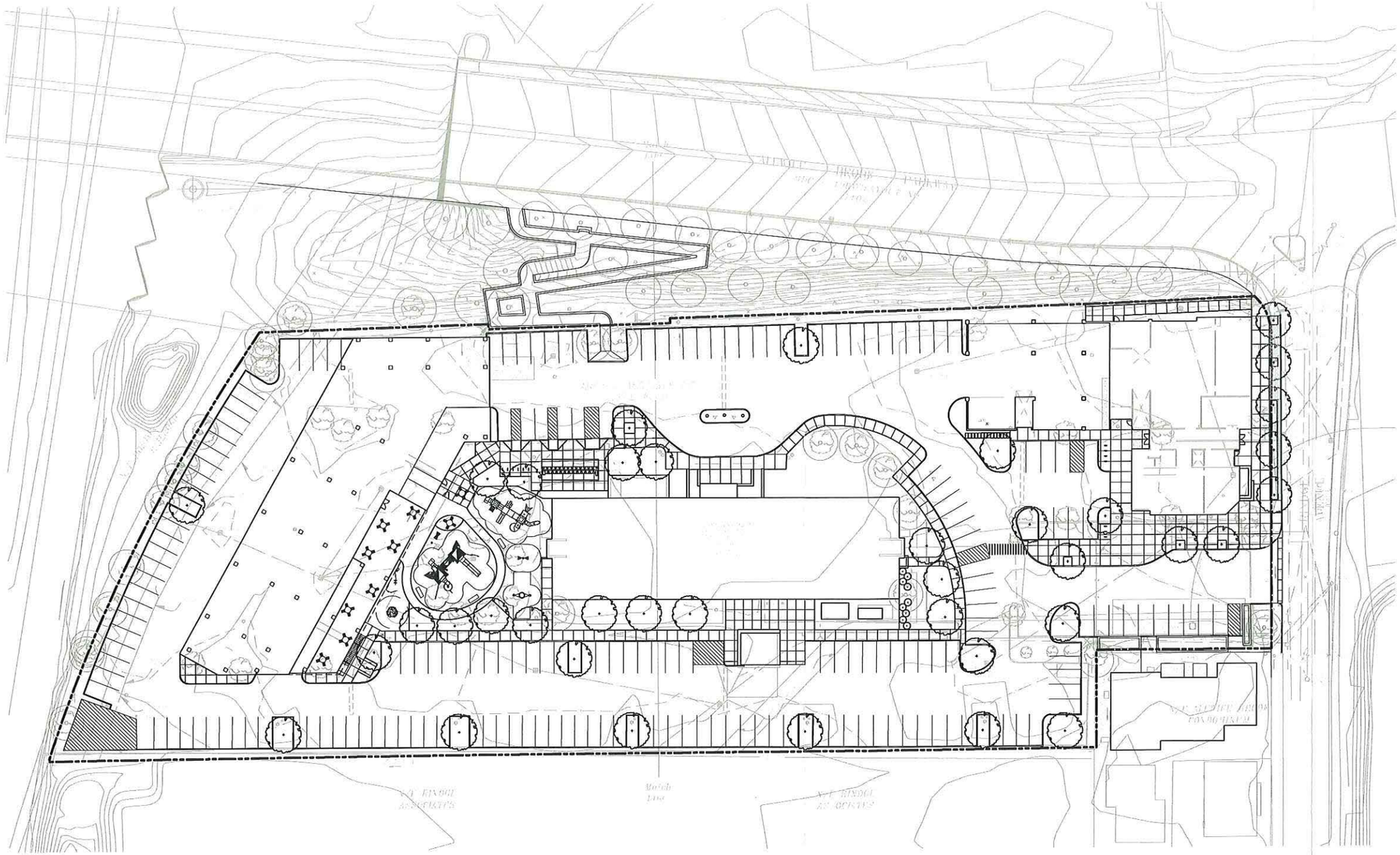
REV.	COMMENTS	DATE
	REVISIONS	

NITSCH PROJECT #	13307
FILE:	
SCALE:	1"=20'
DATE:	12-06-20;9
PROJECT MANAGER:	AG
SURVEYOR:	
DRAFTED BY:	AM
CHECKED BY:	AG

SHEET: 1

SK-1

OF 1 REV.



Site Plan
Scale: 1" = 30'

0 15 30 60 FEET

EXISTING

PROPOSED

ADDED SAFE PEDESTRIAN CONNECTIONS THROUGH SITE TO ALEWIFE
- REDUCE CROSSWALKS NEEDED
- NEW SITE LIGHTING

DESIGNATED CAR-SHARING SERVICE TO REDUCE PARKING NEEDS

DUAL USE PARKING FOR COMMERCIAL & RESIDENTIAL TO REDUCE PARKING NEEDS

REDUCE OVERALL PARKING RATIO TO .64 PER DWELLING UNIT

INCREASE AVAILABLE BIKE PARKING:
+38 LONG TERM SPACES
+12 SHORT TERM SPACES
(+134 OVERALL, +22 OVERALL)

PROVIDE NEW BLUE BIKE STATION (24 DOCKS) TO SUPPPLEMENT EXISTING 26 LONG TERM SPACES

INCREASE AVAILABLE BIKE PARKING:
+96 LONG TERM SPACES
+10 SHORT TERM SPACES
(+134 OVERALL, +22 OVERALL)

SAFE DROPOFF FOR CAR/VAN-POOL

E-ICON ARCHITECTURE

SITE TDM STRATEGIES

RINDGE COMMONS

02/04/20

EXISTING

PROPOSED

ADDED TREE CANOPY

LOW-INTENSIVE GREEN ROOF

LIGHT PAVING TO REPLACE AREA OF ASPHALT PARKING SURFACE

NEW PODIUM CONSTRUCTION INFILL TO REDUCE AREA OF ASPHALT PARKING SURFACE

ADDED TREE CANOPY

ADDED TREES THROUGHOUT PARKING SURFACE

REDUCE PARKING AISLE WIDTH, REDUCE AREA OF PARKING SURFACE

PERVIOUS SITE MATERIAL & PLANTING

NEW PODIUM CONSTRUCTION INFILL TO REDUCE AREA OF ASPHALT PARKING SURFACE

LOW-INTENSIVE GREEN ROOF

E-ICON ARCHITECTURE

SITE COOLING STRATEGIES

RINDGE COMMONS

02/04/20

BIRDSEYE VIEW OF INTERSECTION (OVERALL)

DESIGN RESPONSES:

- DEFINE MATERIALITY
- ADD RESIDENTIAL DOOR ON PARKWAY SIDE
- GREEN ROOF & COOL ROOF STRATEGIES

FIBER CEMENT WOOD-LOOK PANEL

01

FIBER CEMENT LAP SIDING

02

FIBER CEMENT LARGE FORMAT PANEL

03

COMPOSITE METAL PANEL

04

GREENSCREEN

05

E-ICON ARCHITECTURE

OVERALL SITE VIEW

RINDGE COMMONS

4/20/2020

RINDGE ELEVATION

PARKWAY ELEVATION

EAST ELEVATION

DESIGN RESPONSES:

- ARTICULATION OF ELEVATIONS BETWEEN PARKWAY & RINDGE AVE FACING FACADE
- ARTICULATE PEDESTRIAN ZONE AT STREET ("SPECIAL MATERIAL")
- CHAMFER CORNER LEADING INTO SITE FOR BENEFIT OF PEDESTRIAN MOVEMENT
- INCREASE GLAZING

DESIGN RESPONSES:

- ARTICULATION OF ELEVATIONS BETWEEN PARKWAY & RINDGE AVE FACING FACADE
- ADD RESIDENTIAL DOOR ON PARKWAY FACADE
- FURTHER STUDY OF WINDOW TO WALL RATIO
- LARGER EXPANSES OF GLAZING AT UNIT BAYS

DESIGN RESPONSES:

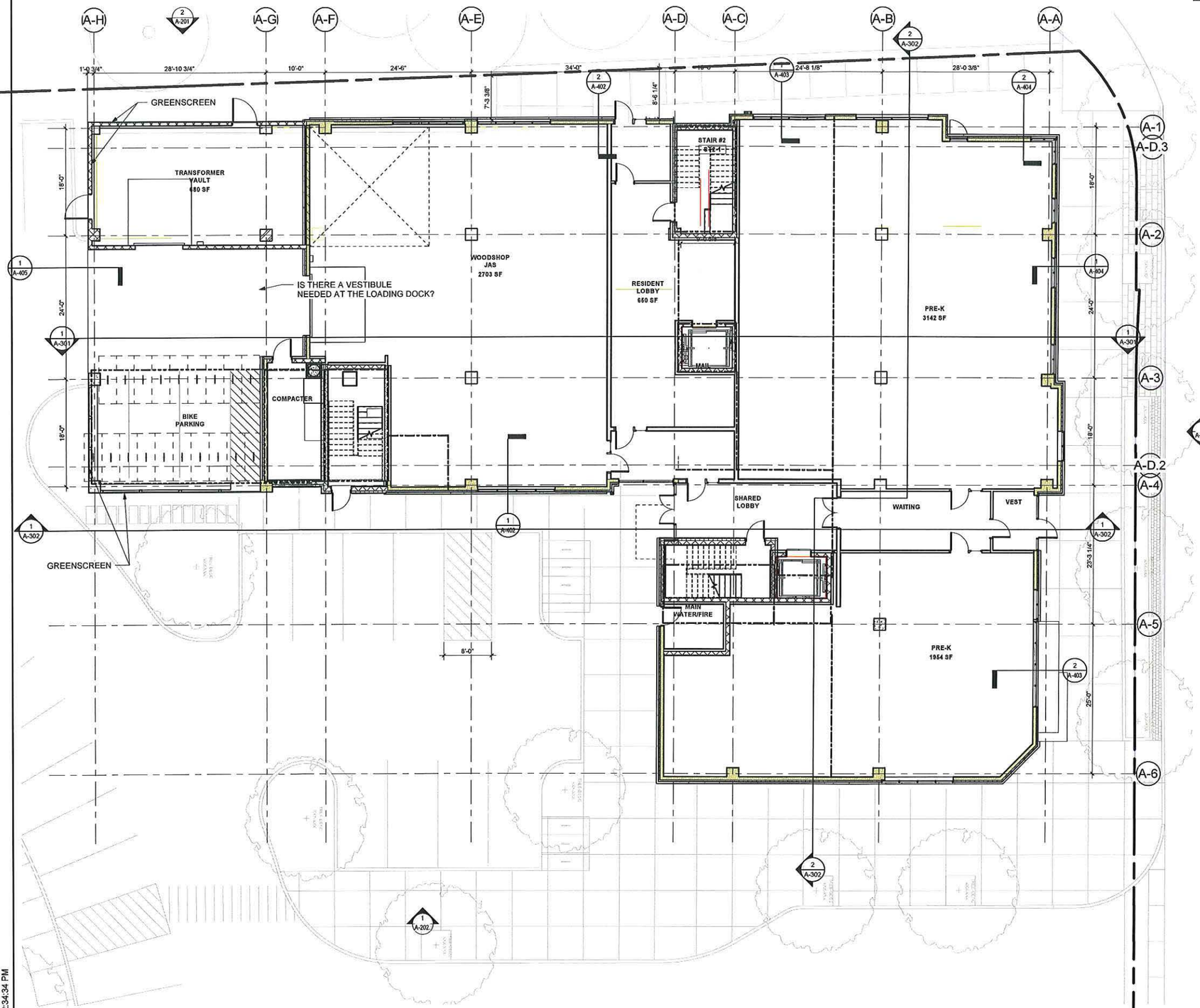
- GROUND THE BUILDING WITH THICKER COLUMNS/PIERS
- DEPTH OF SCREENING AT OPEN PARKING (GREENSCREEN OR SIM)
- PEDESTRIAN VIEWS INTO WOODSHOP

E-ICON ARCHITECTURE

PHASE 1 - BUILDING A

RINDGE COMMONS

4/20/2020



GENERAL PLAN NOTES

1. ALL CMU WALLS ARE DIMENSIONED FACE TO FACE.
2. ALL STUD WALLS ARE DIMENSIONED CENTER-LINE TO CENTERLINE OF STUD.
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9. INTERIOR DIMENSIONS TO THE EXTERIOR WALL ARE TO THE OUTSIDE FACE OF STUD /OUTSIDE FACE OF FOUNDATION.
10. REFER TO A-900's FOR FINISH FLOOR AND REFLECTED CEILING PLANS

FE — SURFACE MOUNTED FIRE EXTINGUISHER

FEC — SEMI-RECESSED FIRE EXTINGUISHER

FD — FLOOR DRAIN

PAINTED PARKING STRIPES

1 HR

2 HR

3 HR

4 HR

SMOKE

PATH OF EGRESS

NORTH 0 4' 8' 16'

6/12/2020 2:34:34 PM

RINDGE COMMONS - BUILDING A PHASE 1

@ 402 RINDGE AVE
CAMBRIDGE, MA

JUST-A-START

ARCHITECT

E-ICON ARCHITECTURE

101 SUMMER ST BOSTON MA 02110

STAMP

KEY PLAN

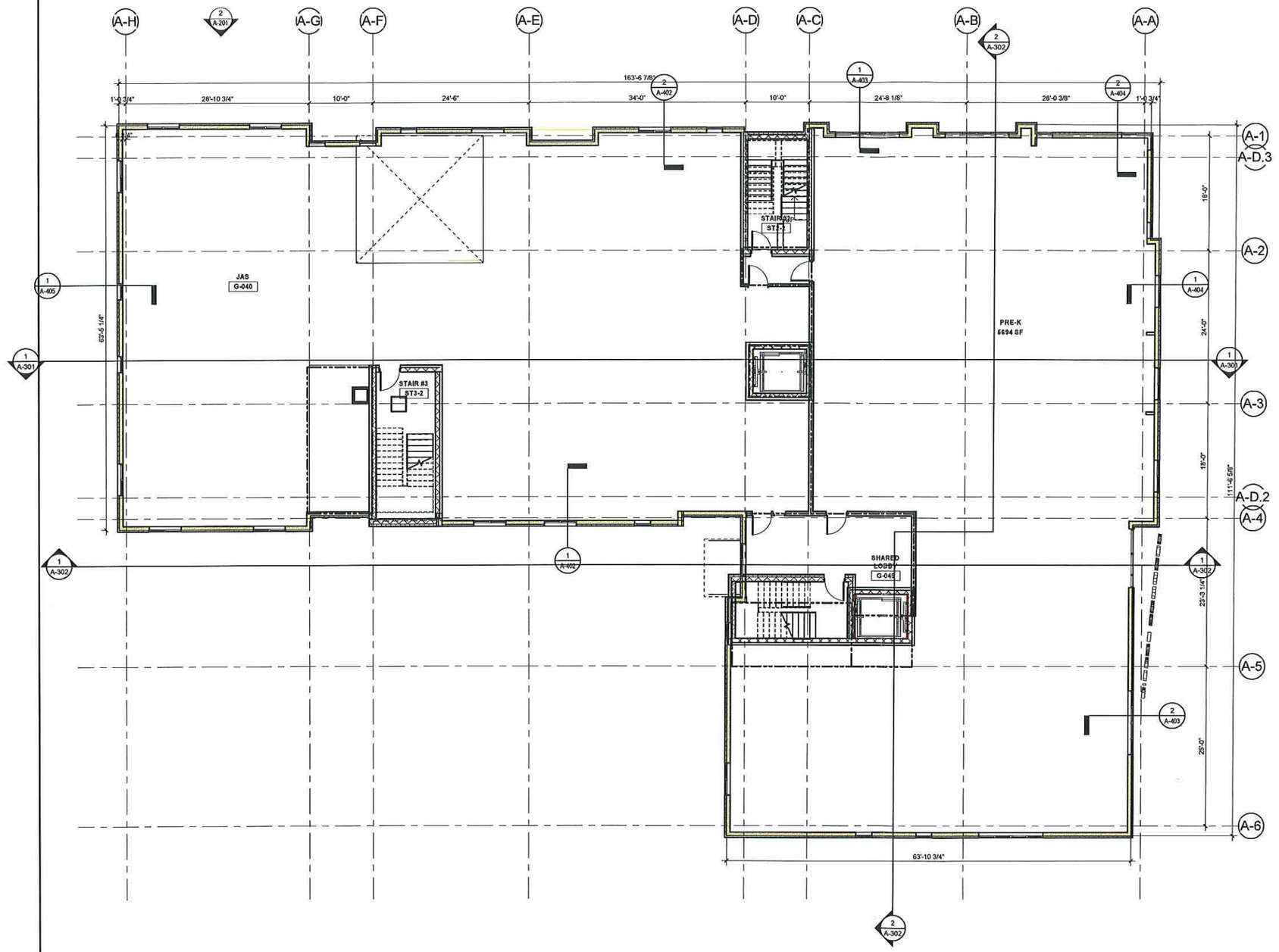
MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

FIRST FLOOR PLAN

A-103



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FD — FLOOR DRAIN

PAINTED PARKING STRIPES

1 HR

2 HR

3 HR

4 HR

SMOKE

PATH OF EGRESS

NORTH 0 4' 8' 16'

RINDGE COMMONS - BUILDING A PHASE 1

@ 402 RINDGE AVE
CAMBRIDGE, MA

JUST-A-START

ARCHITECT

E-ICON ARCHITECTURE

101 SUMMER ST BOSTON MA 02110

STAMP

KEY PLAN

MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

SECOND FLOOR PLAN

A-104

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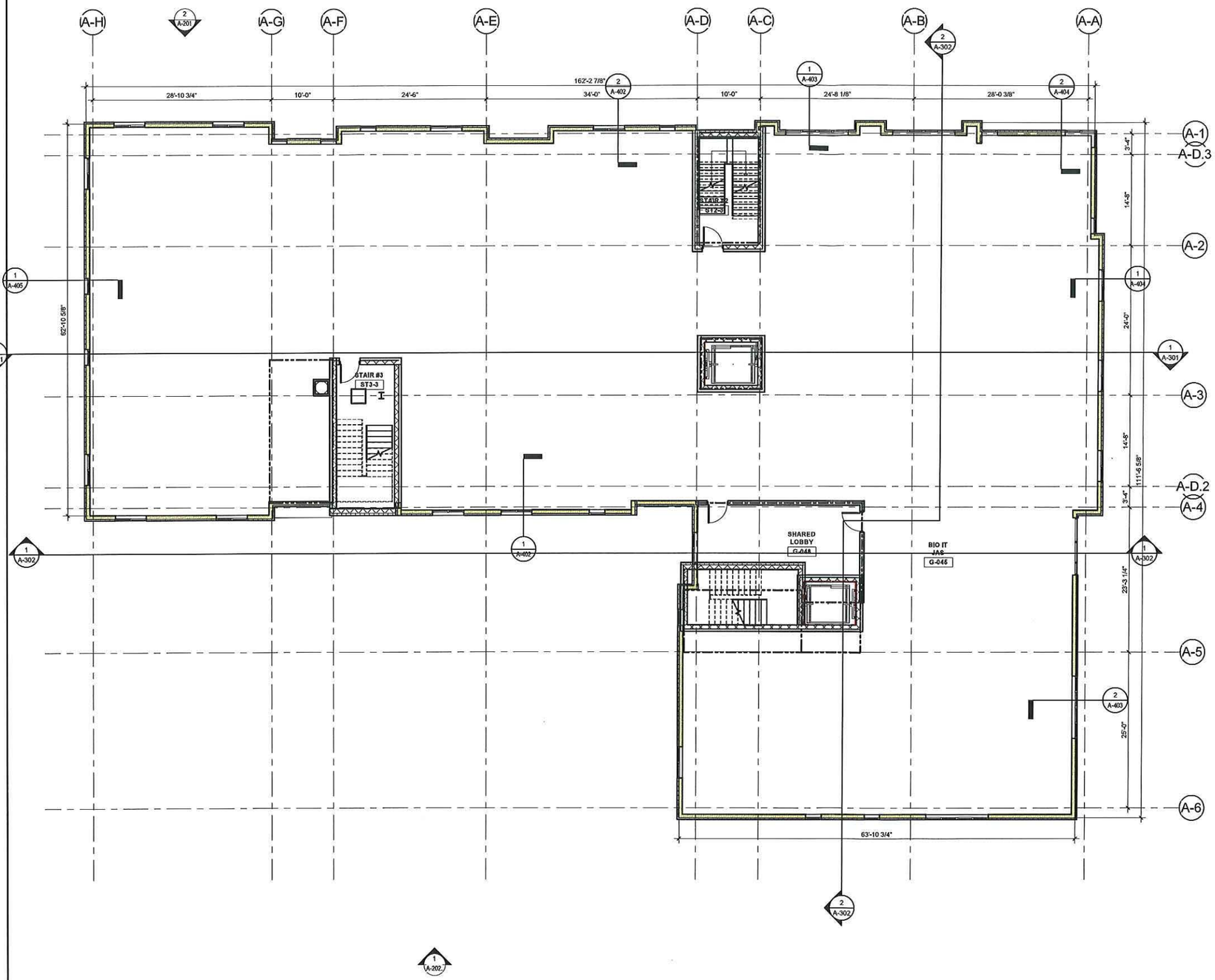

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PAINTED PARKING STRIPES

1 HR

2 HR

3 HR

4 HR

SMOKE

PATH OF EGRESS

NORTH

0 4' 8' 16'

6/12/2020 2:34:38 PM

RINDGE COMMONS - BUILDING A PHASE 1

@ 402 RINDGE AVE
CAMBRIDGE, MA

JUST-A-START

ARCHITECT

E-ICON ARCHITECTURE

101 SUMMER ST BOSTON MA 02110

STAMP

KEY PLAN

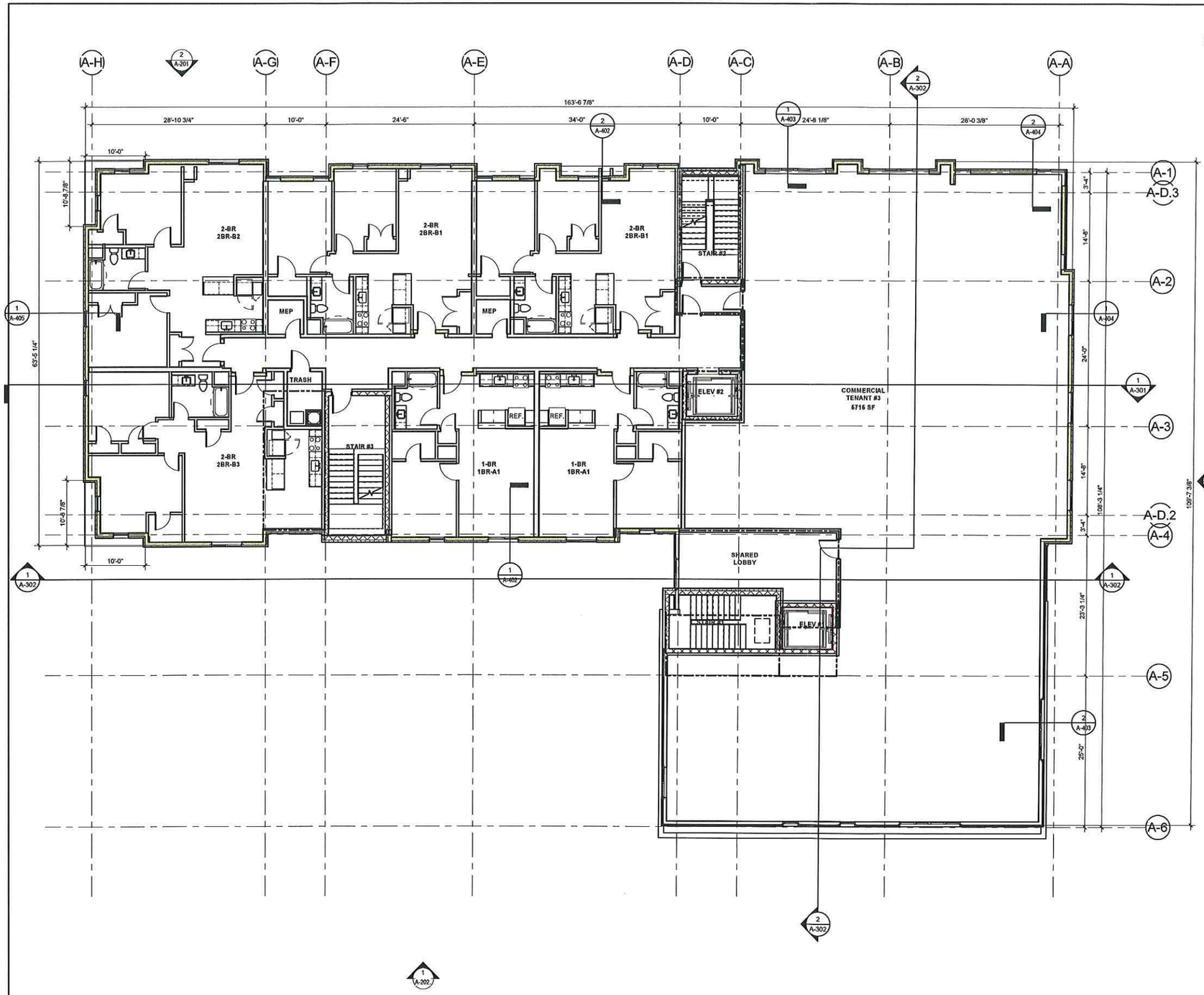
MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

THIRD FLOOR PLAN

A-105



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FEC — SEMI-RECESSED FIRE EXTINGUISHER

FD — FLOOR DRAIN

PAINTED PARKING STRIPES

1 HR

2 HR

3 HR

4 HR

SMOKE

PATH OF EGRESS

UNIT MIX

BEDS	1	2	3	T
4TH	2	4	0	6
5TH	4	6	0	10
6TH	4	4	0	8
TOTAL	10	14	0	24

NORTH

0 4' 8' 16'

RINDGE COMMONS - BUILDING A PHASE 1

@ 402 RINDGE AVE
CAMBRIDGE, MA

JUST-A-START

ARCHITECT

E-ICON ARCHITECTURE

101 SUMMER ST BOSTON MA 02110

STAMP

KEY PLAN

MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

FOURTH FLOOR PLAN

A-106

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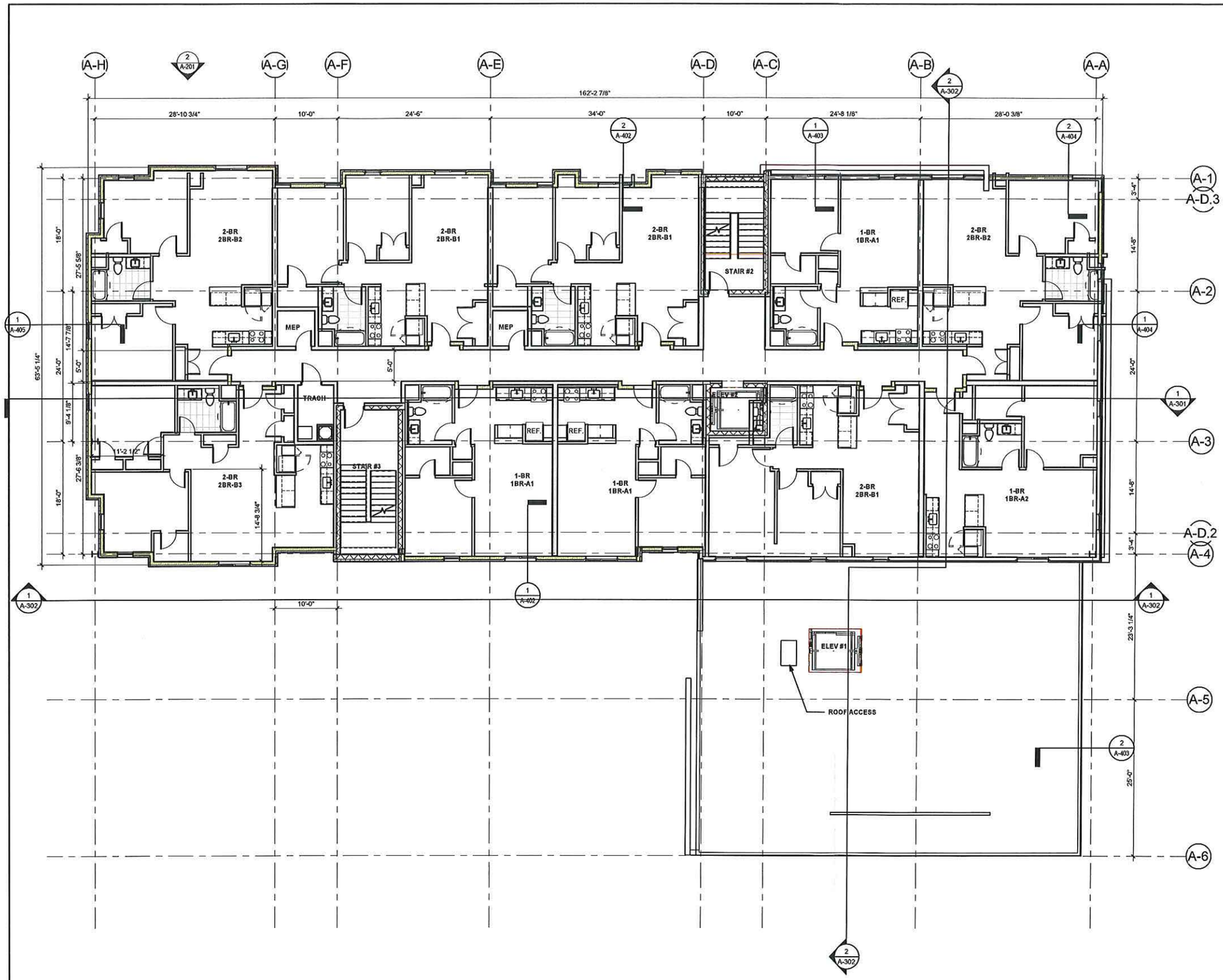

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FEC — SEMI-RECESSED FIRE EXTINGUISHER

FD — FLOOR DRAIN

PAINTED PARKING STRIPES

1 HR

2 HR

3 HR

4 HR

SMOKE

PATH OF EGRESS

UNIT MIX

BEDS	1	2	3	T
4TH	2	4	0	6
5TH	4	6	0	10
6TH	4	4	0	8
TOTAL	10	14	0	24

NORTH 0 4' 8' 16'

RINDGE COMMONS - BUILDING A PHASE 1

@ 402 RINDGE AVE
CAMBRIDGE, MA

JUST-A-START

ARCHITECT

E-ICON ARCHITECTURE

101 SUMMER ST BOSTON MA 02110

STAMP

KEY PLAN

MARK	DATE	DESCRIPTION

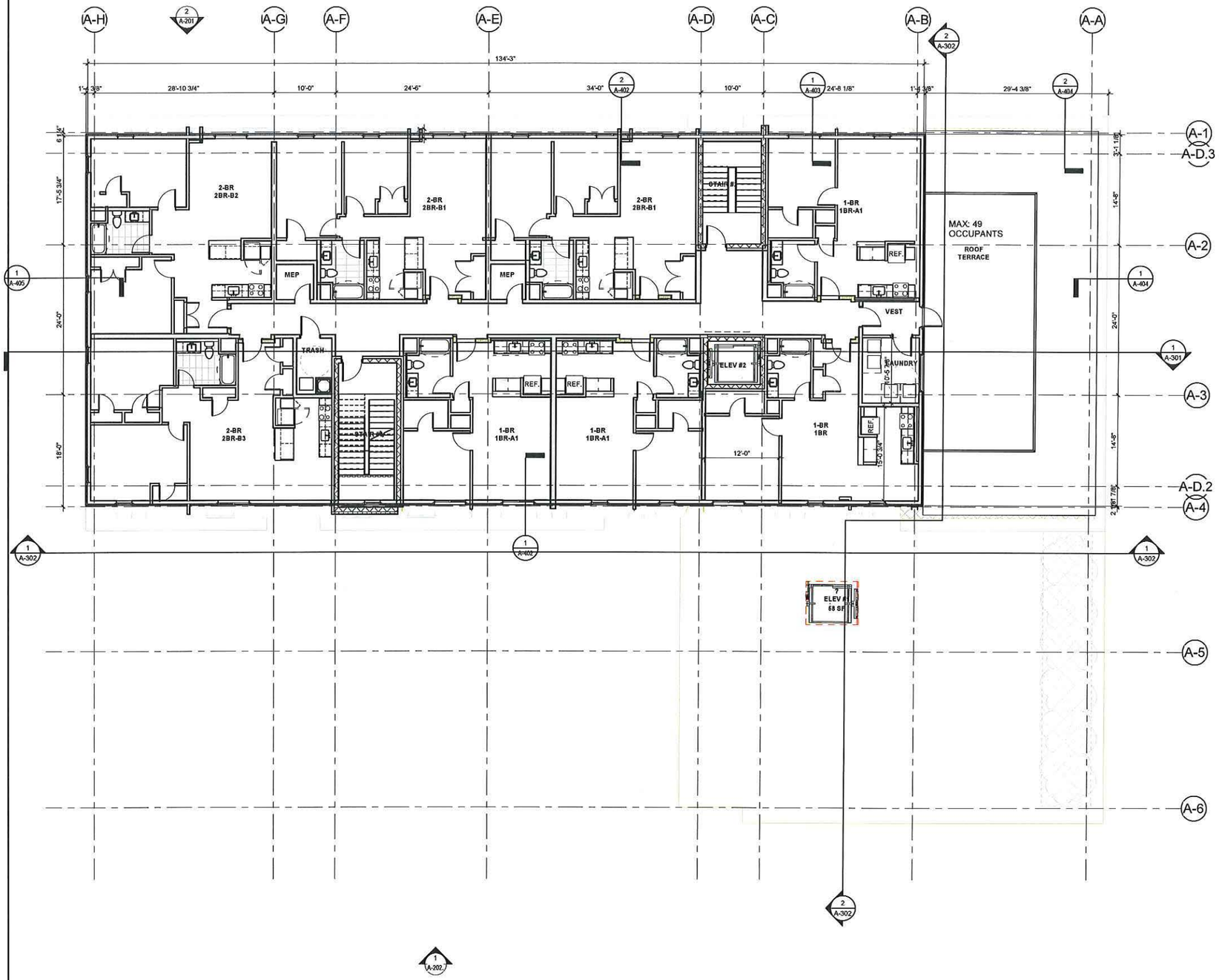
PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

FIFTH FLOOR PLAN

A-107

6/12/2020 3:23:01 PM



GENERAL PLAN NOTES

1. ALL CMU WALLS ARE DIMENSIONED FACE TO FACE.
2. ALL STUD WALLS ARE DIMENSIONED CENTER-LINE TO CENTERLINE OF STUD.
3. ALL EXTERIOR WALLS ARE DIMENSIONED TO EXTERIOR FACE OF MASONRY OR EXTERIOR FACE OF STUD.
4. ALL OPENINGS WITHIN A MASONRY WALL ARE DIMENSIONED TO THE MASONRY OPENING.
5. ALL OPENINGS WITHIN A STUD WALL ARE DIMENSIONED TO CENTER-LINE OF OPENING.
6. COORDINATE ALL FOOTINGS, PIERS, SLABS, AND DETAILS WITH STRUCTURAL DRAWINGS AND SPECIFICATIONS.
7. UNLESS OTHERWISE NOTED, INTERIOR DIMENSIONS ARE TO CENTERLINE OF STUD.
8. INTERIOR DIMENSIONS TO DEMISING PARTITIONS ARE TO CENTERLINE OF OVERALL PARTITION.
9. INTERIOR DIMENSIONS TO THE EXTERIOR WALL ARE TO THE OUTSIDE FACE OF STUD /OUTSIDE FACE OF FOUNDATION.
10. REFER TO A-900's FOR FINISH FLOOR AND REFLECTED CEILING PLANS

FE — SURFACE MOUNTED FIRE EXTINGUISHER

FEC — SEMI-RECESSED FIRE EXTINGUISHER

FD — FLOOR DRAIN

PAINTED PARKING STRIPES

1 HR

2 HR

3 HR

4 HR

SMOKE

PATH OF EGRESS

UNIT MIX

BEDS	1	2	3	T
4TH	2	4	0	6
5TH	4	6	0	10
6TH	4	4	0	8
TOTAL	10	14	0	24

NORTH 0 4' 8' 16'

RINDGE COMMONS - BUILDING A PHASE 1

@ 402 RINDGE AVE
CAMBRIDGE, MA

JUST-A-START

ARCHITECT

E-ICON ARCHITECTURE

101 SUMMER ST BOSTON MA 02110

STAMP

KEY PLAN

MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

SIXTH FLOOR PLAN

A-108

6/12/2020 3:23:03 PM

ROOF NOTES

- SLOPE CANNOT EXCEED 1" RISE MAX ACROSS CONDENSING UNITS
- ALL ROOF VENTS MUST BE SEPERATED BY AT LEAST 12" O.C.

RD ROOF DRAIN AND SECODARY OVERFLOW DRAIN
FV FIREPLACE VENT
PV PLUMBING VENT
MV MECHANICAL VENT
RV RADON VENT
ROOF WALKWAY PADS
AIR COOLED CONDENSING UNITS

ROOF 3
ROOF TERRACE BELOW ROOF 2
ROOF 1
MECHANICAL SCREENS
WHITE TPO ROOF (TYP)
AREA OF LOW INTENSIVE GREEN ROOF

NORTH 0 4' 8' 16'

6/12/2020 2:34:47 PM

RINDGE COMMONS - BUILDING A PHASE 1

@ 402 RINDGE AVE
CAMBRIDGE, MA

JUST-A-START

ARCHITECT
E-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

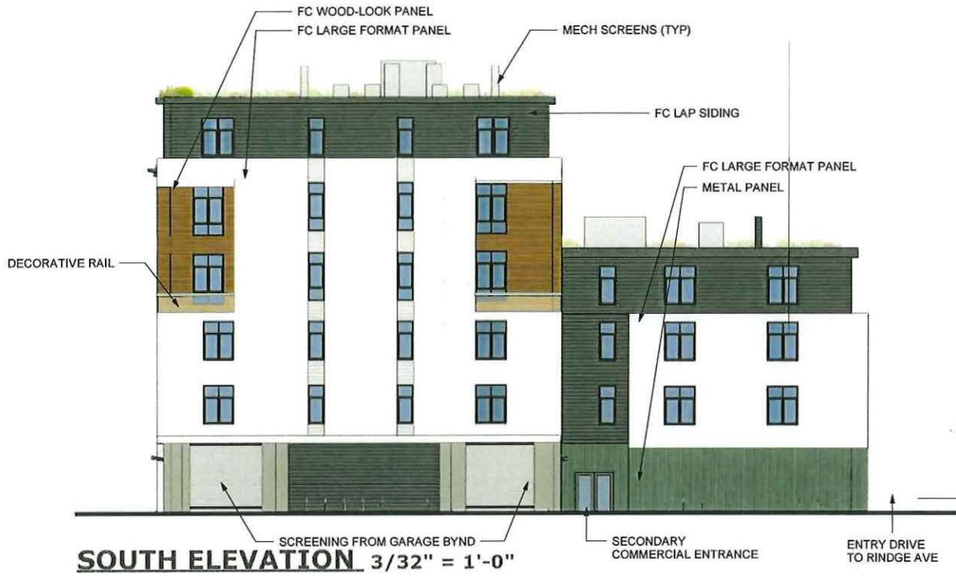
MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

ROOF PLAN

A-120



SOUTH ELEVATION 3/32" = 1'-0"

EAST ELEVATION 3/32" = 1'-0"

NORTH ELEVATION 3/32" = 1'-0"

WEST ELEVATION 3/32" = 32'-0"

4/20/2020 5:27:05 PM

RINDGE COMMONS

402 RINDGE AVE
CAMBRIDGE, MA

JUST - A - START

ARCHITECT

E-ICON ARCHITECTURE

101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

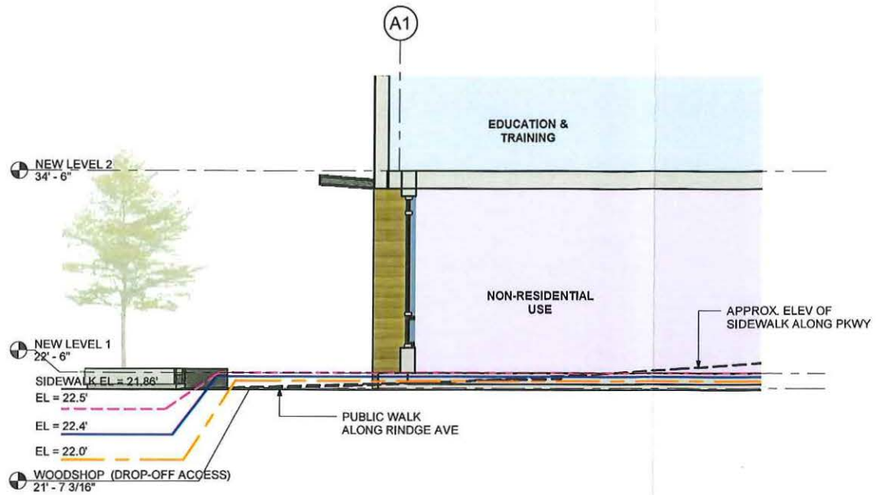
SHEET TITLE

BUILDING A ELEVATIONS

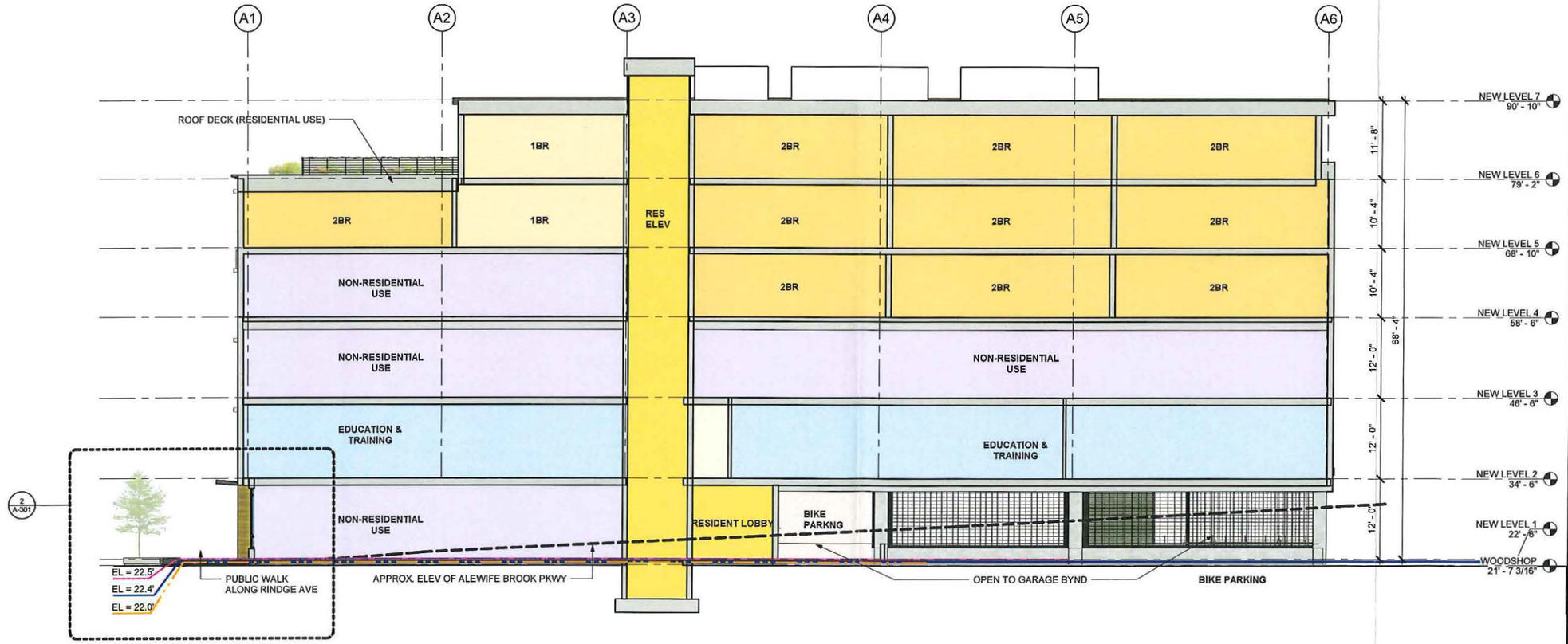
A-201

2070 100 YR SLR/SS = 22.5'
FEMA 500 YR = 22.4'
2070 10 YR SLR/SS = 22.0'
2070 100 YR PRECIP = 20.0' (PARCEL NOT IMPACTED)
2030 100 YR PRECIP = 19.2' (PARCEL NOT IMPACTED)

AVG GROUND ELEV @ SIDEWALK = 21.86'
GROUND FLOOR ELEV = 22.5'
RESIDENTIAL ELEV = 58.5'



2 ENLARGED DETAIL
1/4" = 1'-0"



1 Section 1
1/8" = 1'-0"

4/20/2020 5:24:32 PM

RINDGE COMMONS

402 RINDGE AVE
CAMBRIDGE, MA
JUST - A - START

ARCHITECT
E-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

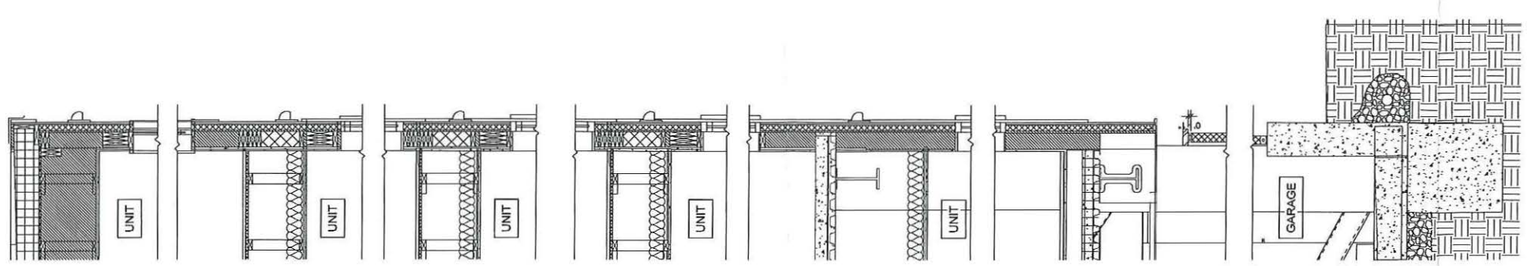
MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

BUILDING SECTION

A-301



1 TYPICAL WALL SECTION
1/2" = 1'-0"

2/17/2020 4:33:15 PM

RINDGE COMMONS -PHASE 1

402 RINDGE AVE
CAMBRIDGE, MA

JUST - A - START

ARCHITECT
E-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

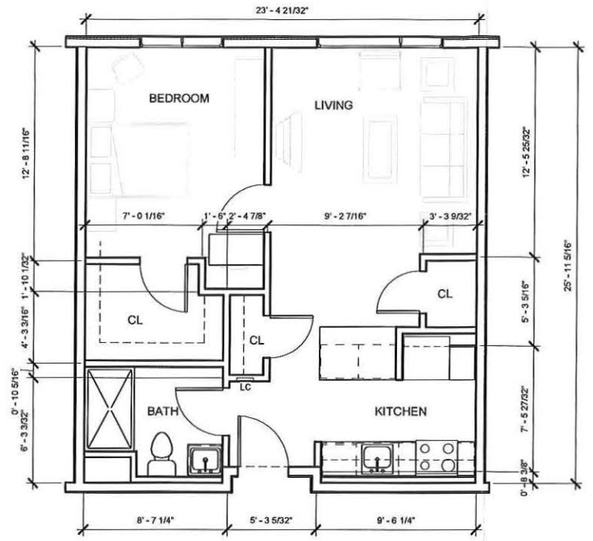
MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

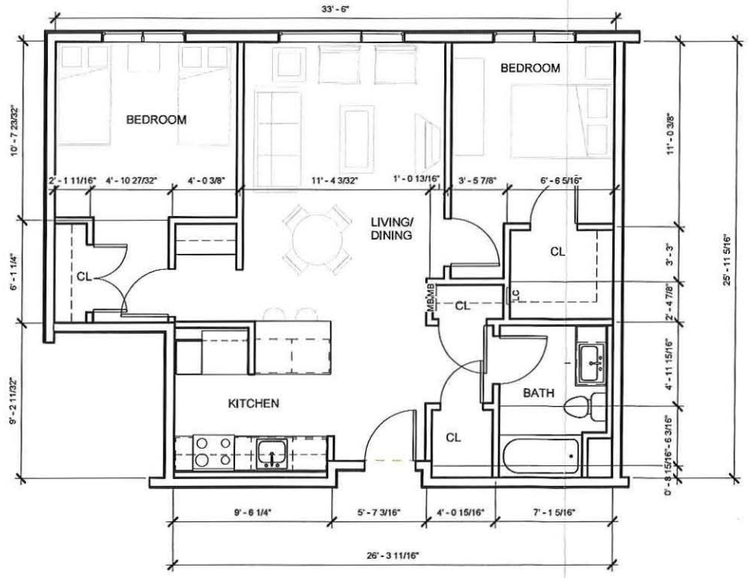
SHEET TITLE

WALL SECTION

A-401



1A 1BR - TYP
1/4" = 1'-0"



2A 2BR - TYP
1/4" = 1'-0"

11/4/2019 3:02:36 PM

RINDGE COMMONS -PHASE 1

402 RINDGE AVE
CAMBRIDGE, MA

JUST - A - START

ARCHITECT
E-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

ENLARGED UNIT PLANS

A-501

PERSPECTIVE VIEW:

PROJECT TEAM:

OWNER/DEVELOPER:
JUST-A-START CORPORATION
1035 CAMBRIDGE ST #12
CAMBRIDGE, MA 02141

ARCHITECT:
ICON ARCHITECTURE
101 SUMMER ST FL 5
BOSTON, MA 02110

LANDSCAPE ARCHITECT:
COPLEY WOLF DESIGN GROUP
10 POST OFFICE SQUARE, SUITE 1315
BOSTON, MA 02109

CIVIL ENGINEER:
NITSCH ENGINEERING, INC
2 CENTER PLZ #430
BOSTON, MA 02108

STRUCTURAL ENGINEER:
LIM CONSULTANTS, INC
6 PLEASANT ST
MALDEN, MA 02148

MECHANICAL, PLUMBING, ELECTRICAL & FIRE PROTECTION ENGINEER:
PETERSEN ENGINEERING INC
127 PARROTT AVE
PORTSMOUTH, NH 03801

GEOTECHNICAL ENGINEER:
MCPHAIL ASSOCIATES LLC
2269 MASSACHUSETTS AVE
CAMBRIDGE, MA 02140

ENERGY CONSULTANT:
NEW ECOLOGY, INC
15 COURT SQUARE, SUITE 420
BOSTON, MA 02108

4/20/2020 7:24:27 PM

Site & Building

	Non-Resid'l			Residential	Shared			Building GSF
	J-A-S E&T	community rm	Health Provider	Units and Comm *includes Mech	Circulation	BIKE PARKING	Footprint	excl. Parking
Building A								
First Floor	2,264	0	3,083	1,559	1,334	916		9,156
Second Floor	11,740	757	0	668	623	0		13,788
Third Floor	0	0	12,920	289	576	0		13,785
Fourth Floor	0	0	6,281	6,694	571	0		13,546
Fifth Floor	0	0	0	10,406	213	0		10,619
Sixth Floor	0	0	0	7,861	213	0		8,074
Building A Total	14,004	757	22,284	27,477	3,530	916		
	37,045			**31,007**		**916**		**68,968**
Building B								
First Floor	0	0	0	1,698	0	842		2,540
Second Floor	0	0	0	10,351	0	1,715		12,066
Third Floor	0	0	0	15,344	0	0		15,344
Fourth Floor	0	0	0	15,344	0	0		15,344
Fifth Floor	0	0	0	15,344	0	0		15,344
Sixth Floor	0	0	0	15,344	0	0		15,344
Seventh Floor	0	0	0	14,093	0	0		14,093
Building B Total				87,518	0	2,557		
					90,075			**90,075**
Existing 402								
[E] Building Total								**264,168**
OVERALL PROJECT TOTAL								**423,211**

Parking

	AUTO					BICYCLE		
	Surface	[Accessible]	Covered	[Accessible]	TOTAL	Long-Term	Short-Term	Total
Existing 273	273	10			**273**	26		26
Proposed					**240**	134	22	**156**
Required					**374**	**160**	**22**	**182**
Ratio Parking:Unit					0.64			

Unit Mix

	STUDIO	1-BR	1-BR-BF	2BR	2-BR-BF	3BR	3-BR-BF	TOTAL
EXISTING	21	84		168		0		**273**
BUILDING A		10		14		0		**24**
BUILDING B		16		39		22		**77**
	21	**110**		**221**	**0**	**22**	**0**	**374**
Percentage [Site TOTAL]	6%	29%		59%		6%	0%	100%
Percentage [New Const TOTAL]	0%	26%		52%		22%		100%

RINDGE COMMONS BUILDING B - PHASE 2

402 RINDGE AVE
CAMBRIDGE, MA
JUST - A - START

ISSUE DATE: **APRIL 20, 2020**
PROGRESS SET

Site & Building

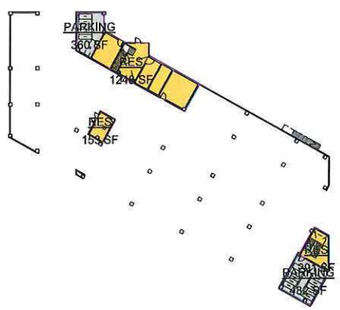
	Non-Resid'l			Residential	Shared			Building GSF
	J-A-S E&T	community rm	Health Provider	Units and Comm *includes Mech	Circulation	BIKE PARKING	Footprint	excl. Parking
Building A								
First Floor	2,264	0	3,083	1,559	1,334	916		9,156
Second Floor	11,740	757	0	668	623	0		13,788
Third Floor	0	0	12,920	289	576	0		13,785
Fourth Floor	0	0	6,281	6,694	571	0		13,546
Fifth Floor	0	0	0	10,406	213	0		10,619
Sixth Floor	0	0	0	7,861	213	0		8,074
Building A Total	14,004	757	22,284	27,477	3,530	916		
	37,045			**31,007**		**916**		**68,968**
Building B								
First Floor	0	0	0	1,698	0	842		2,540
Second Floor	0	0	0	10,351	0	1,715		12,066
Third Floor	0	0	0	15,344	0	0		15,344
Fourth Floor	0	0	0	15,344	0	0		15,344
Fifth Floor	0	0	0	15,344	0	0		15,344
Sixth Floor	0	0	0	15,344	0	0		15,344
Seventh Floor	0	0	0	14,093	0	0		14,093
Building B Total				87,518	0	2,557		
					90,075			**90,075**
Existing 402								
[E] Building Total								**264,168**
OVERALL PROJECT TOTAL								**423,211**

Parking

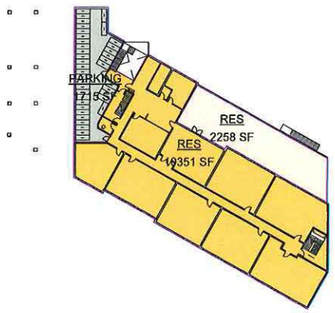
	AUTO					BICYCLE		
	Surface	[Accessible]	Covered	[Accessible]	TOTAL	Long-Term	Short-Term	Total
Existing 273	273	10			**273**	26		26
Proposed					**240**	134	22	**156**
Required					**374**	**160**	**22**	**182**
Ratio Parking:Unit					0.64			

Unit Mix

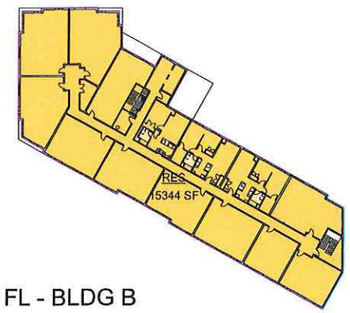
	STUDIO	1-BR	1-BR-BF	2BR	2-BR-BF	3BR	3-BR-BF	TOTAL
EXISTING	21	84		168		0		**273**
BUILDING A		10		14		0		**24**
BUILDING B		16		39		22		**77**
	21	**110**		**221**	**0**	**22**	**0**	**374**
Percentage [Site TOTAL]	6%	29%		59%		6%	0%	**100%**
Percentage [New Const TOTAL]	0%	26%		52%		22%		**100%**



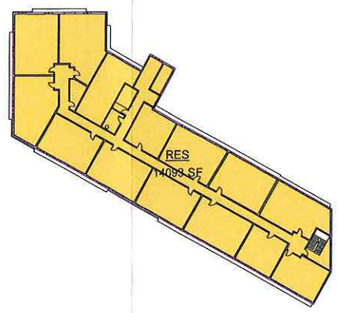
1 1ST FL - BLDG B
1" = 40'-0"



2 2ND FL - BLDG B
1" = 40'-0"



3-6 3RD FL - BLDG B
4TH - 6TH FL (SIM)
1" = 40'-0"



7 7TH FL - BLDG B
1" = 40'-0"

2/18/2020 11:21:58 AM

RINDGE COMMONS -PHASE 2

402 RINDGE AVE
CAMBRIDGE, MA

JUST - A - START

ARCHITECT
E-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

AREA PLANS

G-001B

CHICAGO TITLE INSURANCE COMPANY
FILE NUMBER 50262
EFFECTIVE DATE APRIL 16, 2018

EXHIBIT A

A certain parcel of land, with all improvements thereon, and appurtenances thereto, situated on the southerly side of Rindge Avenue in Cambridge, Middlesex County, Massachusetts, being Lot A on a Plan by Joseph Selwyn, Civil Engineer, dated December 6, 1967, recorded with Middlesex South District Registry of Deeds, in Book 11446, Page 398, being bounded and described as follows:

Beginning at a point at the northwesterly corner of the premises on the south side of Rindge Avenue at its intersection with Alewife Brook Parkway.

Thence running easterly by Rindge Avenue on a curve having a radius of 279.90 feet fifty eight and 59/100 (58.59);

Thence continuing due East on Rindge Avenue one hundred forty four and 00/100 feet (144.00) to land of Alphonse A. Chaisson;

Thence turning and running due South by land of said Alphonse A. Chaisson, one hundred and 00/100 feet (100.00);

Thence turning and running due East by land of said Alphonse A. Chaisson, fifty five and 72/100 (55.72) to Lot B as shown on said plan;

Thence turning and running S 00° 22' 01" E by said Lot B six hundred two and 72/100 feet (602.72) to land of the Boston and Maine Railroad;

Thence turning and running northwesterly by said line of the Boston and Maine Railroad by a curve having a radius of 975.25 feet to the Alewife Brook Parkway a distance of two hundred and seventy four and 41/100 feet (274.41).

Thence turning and running N 01° 32' 10" W in a straight line by said Alewife Brook Parkway four hundred eighteen and 09/100 (418.09) feet.

Thence continuing in a northerly direction by said Alewife Brook Parkway by a curve having a radius of 8,631.77 feet one hundred sixty eight and 10/100 feet (168.10) to Rindge Avenue and the point of beginning.

The parcel contains 151,075 s. f. or 3.468 Acres, subject to a City of Cambridge Drain Easement as shown of the above-referenced plan.

Zoning Restrictions for Cambridge C-2 Zone: Residence-2

Existing dimensions are rough estimates using engineer scale and basic math.

	Required Dimension
Maximum Height:	85'
Max. Floor to Area Ratio:	1.75
Min. Setback Front	H+L(a)/4
Min. Setback Side	H+L/5
Min. Setback rear	H+L(c)/4
Min. open space ratio	15%
Min. Lot Area	5000 sq. feet

287 TOTAL PARKING SPACES
10 OF WHICH ARE HANDICAP PARKING SPACES
13 INCLUDED IN EASEMENT

The property shown lies within ZONE X
(area outside 0.2% annual chance floodplain)
and ZONE X SHADED (areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.)
as shown on FLOOD INSURANCE RATE MAP
for THE CITY OF CAMBRIDGE
COMMUNITY 25017
PANEL NUMBER 419E
WITH EFFECTIVE DATE OF JUNE 4, 2010

TABLE A ITEMS

1. Surveyor was not provided a zoning report by the client.
2. There was no delineation of Wetlands by a specialist.

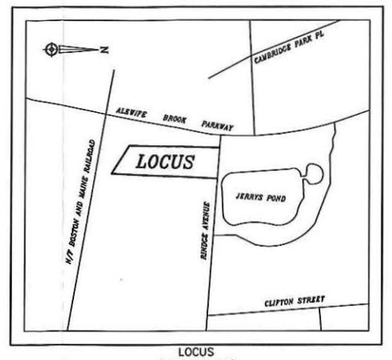
LEGEND

●	DRAIN MANHOLE	—D—	DRAIN
●	CABLE TV MANHOLE	—E—	ELECTRIC
●	ELECTRIC MANHOLE	—G—	GAS
●	SEWER MANHOLE	—OHW—	OVERHEAD WIRES
■	TELEPHONE MANHOLE	—S—	SEWER
■	CATCH BASIN	—ST—	STEAM
GG	GAS GATE	—W—	WATER
WG	WATER GATE		
☼	LIGHT POLE		
○	WOOD UTILITY POLE		
	HYDRANT		
FA	FIRE ALARM		
DW	DETECTIVE WARNING PANEL		
○	BOLLARD		
ELS	ELECTRIC CAR STATION		
D	DECIDUOUS TREE		
MW	MONITORING WELL		
	TREE		

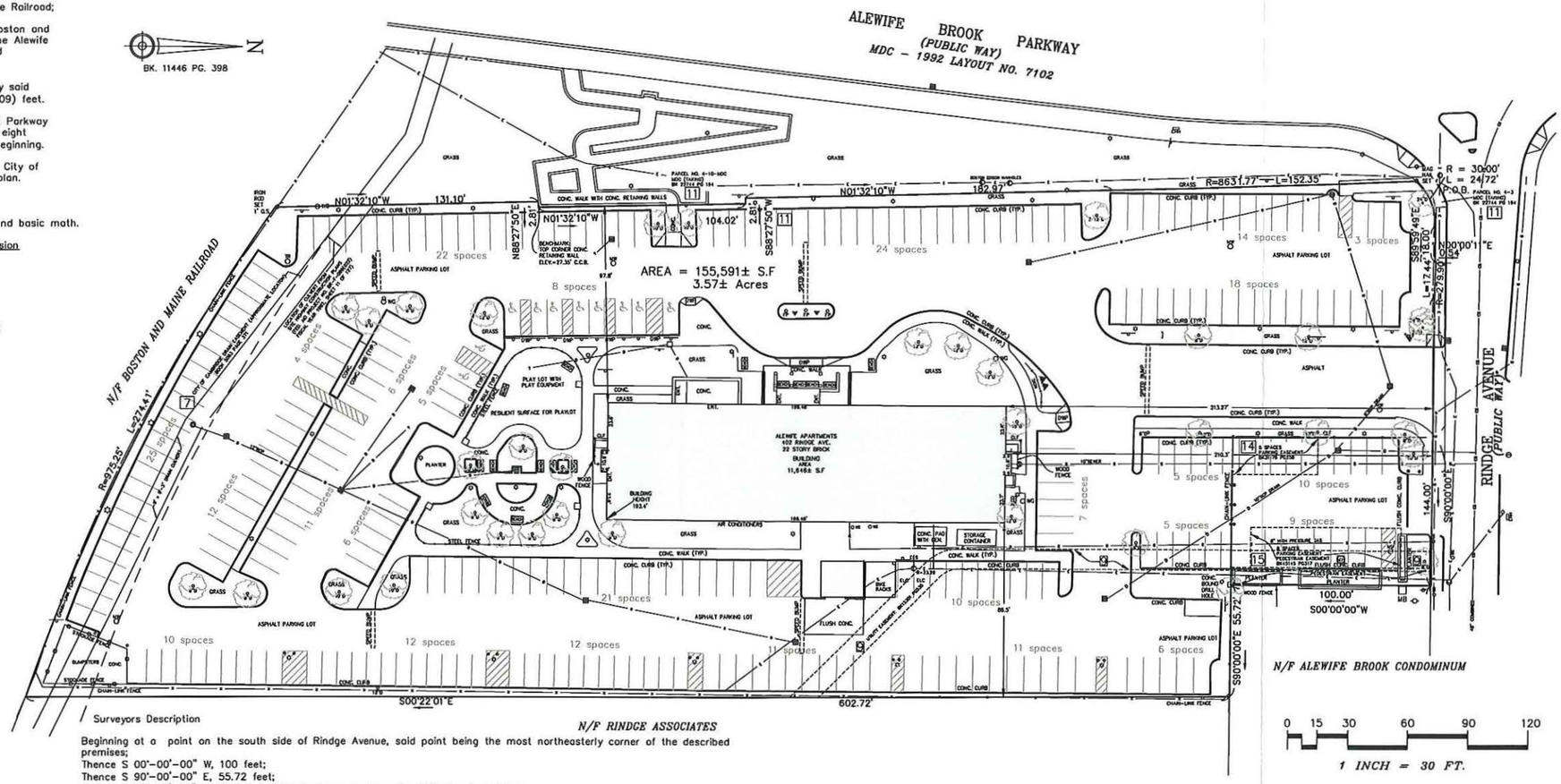
Underground utilities shown are from field observations and record information and are not warranted to be exact nor is it warranted that all underground pipes

SCHEDULE B

7. Taking of Sewer Easement by the City of Cambridge dated January 25, 1927 and recorded in Book 5063, Page 371. PLOTTED
9. Utility Easements as set forth in Grant to Cambridge Electric Light Company dated November 19, 1971 and recorded in Book 12301, Page 535. (NOT PLOTTED TEMPORARY EASEMENT)
11. Taking for the Construction (Layout No. 7102) by the Department of Highways of the Commonwealth of Massachusetts, acting on behalf of the Metropolitan District Commission of said Commonwealth, to alter portions of highways previously laid out dated December 16, 1992 and recorded in Book 22744, Page 194. (Affects Alewife Brook Parkway only.) PLOTTED
13. Notice of Activity and Use Limitation by 402 Rindge Corporation dated January 21, 1999 and recorded in Book 29690, Page 16. NOT PLOTTED BLANKET
14. Parking Easement Agreement by and between 402 Rindge Corporation and Just-A-Start Corp. as set forth in document entitled Parking Easement Deed dated May 18, 1999 and recorded in Book 30228, Page 20, as amended and modified by Amendment and Modification to Parking Easement Deed dated February 8, 2000 and recorded in Book 31176, Page 258. PLOTTED
15. Parking Easement Agreement by and between 402 Rindge Corporation and Just-A-Start Corp. dated March 1, 2005 as set forth in document entitled Parking Easement Deed and recorded in Book 45145, Page 317. PLOTTED



LOCUS
(NOT TO SCALE)



Surveyors Description

N/F RINDGE ASSOCIATES

Beginning at a point on the south side of Rindge Avenue, said point being the most northeasterly corner of the described premises;
Thence S 00°-00'-00" W, 100 feet;
Thence S 90°-00'-00" E, 55.72 feet;
Thence S 00°-22'-01" E, 602.72 feet by land now or formerly of Rindge Associates;
Thence along a curve having a radius of 975.25 feet and an arc length of 274.41 feet by land now or formerly of Boston and Maine Railroad;
Thence N 01°-32'-10" W, 131.10 feet;
Thence N 88°-27'-50" E, 2.81 feet;
Thence N 01°-32'-10" W, 104.02 feet;
Thence S 88°-27'-50" W, 2.81 feet;
Thence N 01°-32'-10" W, 182.97 feet;
Thence along a curve to the right with a radius of 8631.77 feet and an arc length of 152.35 feet. The previous six courses are by Alewife Brook Parkway;
Thence along a curve with a radius of 30.00 feet and an arc length of 24.72 feet;
Thence S 89°-59'-49" E, 18.00 feet;
Thence N 00°-00'-11" E, 0.54 feet;
Thence along a curve with a radius of 279.90 feet and an arc length of 17.44 feet;
Thence S 90°-00'-00" E, 144.00 feet to the point of beginning. The previous five courses are by Rindge Avenue.

To U.S. Department of Housing and Urban Development, the Massachusetts Housing Finance Agency, Chicago Title Insurance Company, Rindge Towers Apartments LLC, Stratford Rindge Tower Investors Limited Partnership, a Massachusetts limited partnership, Stratford SLP, Inc., a Delaware corporation:

This is to certify that this map or plat and the survey on which it is based were made in accordance with the 2016 Minimum Standard Detail Requirements for ALTA/NSPS Land Title Surveys, jointly established and adopted by ALTA and NSPS, and includes Item 1, 2, 3, 4, 6a, 6b, 7a, 8, 9, 11, 12, 13, 16, 17, 18, 20 of Table A thereof. The field work was completed on December 1, 2014 and last revised April 20, 2018.

Registered Professional Land Surveyor

REVISION - DATE
4/20/2018
12/20/2013

JOB NO. 2527

ALTA/NSPS
LAND TITLE SURVEY
402 Rindge Avenue
Cambridge, Massachusetts

Scale: 1"=30' | Drawn By: RPM/APM | Job: 2527
Date: 12/1/14 | Checked By: SDC | Dwg: 2527ALPM

R.E. Cameron & Associates, Inc.
Land Surveyors Civil Engineers
681 Washington Street, Norwood Massachusetts 02062
Tel.(781) 769-1777 Fax (781) 769-8644

2527

The property shown lies within ZONE X
(area outside 0.2% annual chance floodplain)
and ZONE X SHADED (areas of 0.2% annual chance flood;
areas of 1% annual chance flood with average depths
of less than 1 foot or with drainage areas
less than 1 square mile; and areas protected by levees
from 1% annual chance flood.)
as shown on FLOOD INSURANCE RATE MAP
for THE CITY OF CAMBRIDGE
COMMUNITY 25017
PANEL NUMBER 419E
WITH EFFECTIVE DATE OF JUNE 4, 2010

BK. 11446 PG. 398

LEGEND

- DRAIN MANHOLE
- CABLE TV MANHOLE
- ELECTRIC MANHOLE
- SEWER MANHOLE
- TELEPHONE MANHOLE
- CATCH BASIN
- MH — MANHOLE
- AD — AREA DRAIN
- OGG — GAS GATE
- OWG — WATER GATE
- LIGHT POLE
- WOOD UTILITY POLE
- HYDRANT
- ASP — AUTO SPRINKLER
- FIRE ALARM
- DWP — DETECTIVE WARNING PANEL
- BOLLARD
- ELS — ELECTRIC CAR STATION
- TR — TRASH
- MW — MONITORING WELL
- RD — ROOF DRAIN
- DECIDUOUS TREE
- R — RIM
- I — INVERT
- TOW — TOP OF WATER
- —D— DRAIN
- —E— ELECTRIC
- —G— GAS
- —OHW— OVERHEAD WIRES
- —S— SEWER
- —W— WATER
- — — FEMA LINE

Match Line

ALEWIFE BROOK PARKWAY
(PUBLIC WAY)
MDC – 1992 LAYOUT NO. 7102

N/F BOSTON AND MAINE RAILROAD

AREA = 155,591± S.F
3.57± Acres

PARCEL NO. 4-10-MDC
MDC (TAKING)
BK 22744 PG 194

BENCHMARK:
TOP CORNER CONC. RETAINING WALL
ELEV.=27.35' C.C.B.

ALEWIFE APARTMENTS
402 RINDGE AVE.
22 STORY BRICK
BUILDING
AREA
11,646± S.F

N/F RINDGE ASSOCIATES

N/F RINDGE ASSOCIATES

GRAPHIC SCALE
(IN FEET)
1 inch = 20 ft.

REVISION – DATE

P1

JOB NO. 2527

EXISTING CONDITIONS
402 Rindge Avenue
Cambridge, Massachusetts

Scale: 1"=20' | Drawn: BY: RPH/APM | Job: 2527 | Dwg: 2527MPMEX
Date: 4/1/19 | Checked BY: SDC

R.E. Cameron & Associates, Inc.
Land Surveyors
Civil Engineers
681 Washington Street, Norwood Massachusetts 02062
Tel.(781) 769-1777 Fax (781) 769-8644

2527

The property shown lies within ZONE X
(area outside 0.2% annual chance floodplain)
and ZONE X SHADED (areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.)
as shown on FLOOD INSURANCE RATE MAP
for THE CITY OF CAMBRIDGE
COMMUNITY 25017
PANEL NUMBER 419E
WITH EFFECTIVE DATE OF JUNE 4, 2010

LEGEND

- DRAIN MANHOLE
- CABLE TV MANHOLE
- ELECTRIC MANHOLE
- SEWER MANHOLE
- TELEPHONE MANHOLE
- CATCH BASIN
- MANHOLE
- AD AREA DRAIN
- OGG GAS GATE
- OWG WATER GATE
- LIGHT POLE
- WOOD UTILITY POLE
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- ASP AUTO SPRINKLER
- FIRE ALARM
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- BOLLARD
- ELS ELECTRIC CAR STATION
- TR TRASH
- MW MONITORING WELL
- RD ROOF DRAIN
- DECIDUOUS TREE
- R RIM
- I INVERT
- TOW TOP OF WATER
- —D— DRAIN
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- —G— GAS
- —OHW— OVERHEAD WIRES
- —S— SEWER
- —W— WATER
- FEMA LINE

Match Line

ALEWIFE BROOK PARKWAY
(PUBLIC WAY)
MDC – 1992 LAYOUT NO. 7102

N

BK. 11446 PG. 398

PARCEL NO. 4-10-MDC
MDC (TAKING)
BK 22744 PG 194

BOSTON EDISON MANHOLES

N01°32'10"W 182.97'

S88°27'50"W 104.02'

2.81'

R=8631.77' L=152.35'

R = 30.00'
L = 24.72'

MAG NAIL SET

PARCEL NO. 4-3
MDC (TAKING)
BK 22744 PG 194

S89°59'49"E 18.00'

L=17.44'

R=279.90'

N00°00'11"E 0.54'

R=22.62
TOW=19.5

AREA = 155,591± S.F
3.57± Acres

ALEWIFE APARTMENTS
402 RINDGE AVE.
22 STORY BRICK
BUILDING
AREA
11,646± S.F

BUILDING HEIGHT 193'

ASPHALT PARKING LOT

24 spaces
14 spaces
3 spaces
18 spaces
21 spaces
12 spaces
11 spaces
10 spaces
7 spaces
5 spaces
9 spaces
6 spaces

5 SPACES PARKING EASEMENT BK31176 PG258

8 SPACES PARKING EASEMENT PEDESTRIAN EASEMENT BK45145 PG317

PEDESTRIAN EASEMENT

UNITY EASEMENT BK12281 PG252

213.27'

144.00'

100.00'
S00°00'00"W

S90°00'00"E 55.72'

602.72'

RINDGE AVENUE (PUBLIC WAY)

N/F ALEWIFE BROOK CONDOMINUM

N/F RINDGE ASSOCIATES

GRAPHIC SCALE
(IN FEET)
1 inch = 20 ft.

REVISION – DATE

P2

JOB NO. 2527

EXISTING CONDITIONS
402 Rindge Avenue
Cambridge, Massachusetts

Scale: 1"=20' | Drawn By: RPH/MPM | Job: 2527
Date: 4/1/19 | Checked By: SDC | Dwg: 2527MPMEX

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Land Surveyors
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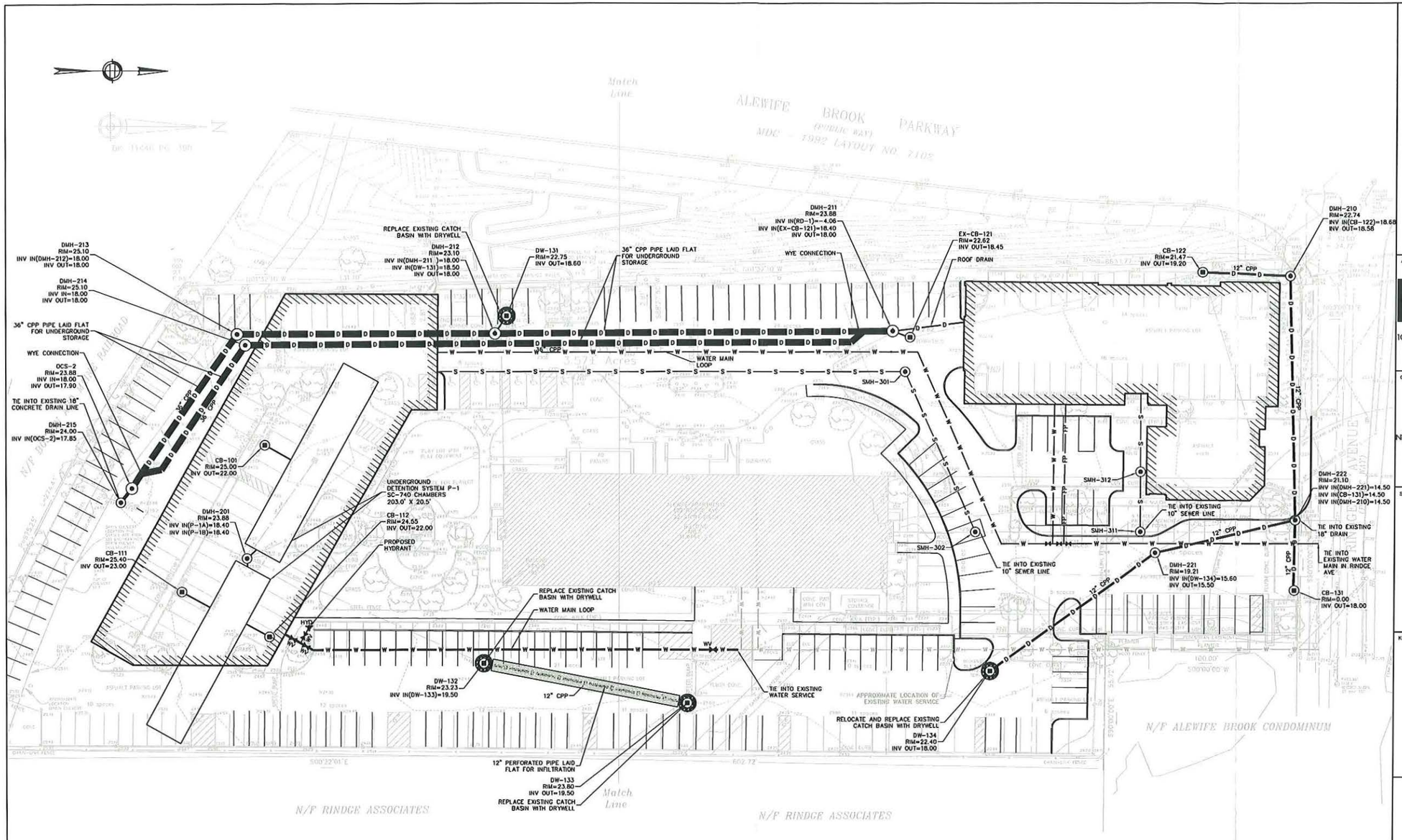
681 Washington Street, Norwood Massachusetts 02062
Tel.(781) 769-1777 Fax (781) 769-8644

2527



GENERAL NOTES:

1. TOPOGRAPHIC DATA, PROPERTY LINE INFORMATION, AND EXISTING SITE FEATURES WERE OBTAINED FROM A PLAN ENTITLED "xxxx", PREPARED BY xxx., DATED xxx.
2. FLOODPLAIN INFORMATION WAS OBTAINED FROM THE FLOOD INSURANCE RATE MAP (FIRM) NO. 25017C0419E. THE SITE IS IN ZONE X.
3. THE CONTRACTOR SHALL COMPLY WITH MASSACHUSETTS GENERAL LAWS CHAPTER 82, SECTION 40, AS AMENDED, WHICH STATES THAT NO ONE MAY EXCAVATE IN THE COMMONWEALTH OF MASSACHUSETTS EXCEPT IN AN EMERGENCY WITHOUT 72 HOURS NOTICE, EXCLUSIVE OF SATURDAYS, SUNDAYS, AND LEGAL HOLIDAYS, TO NATURAL GAS PIPELINE COMPANIES, AND MUNICIPAL UTILITY DEPARTMENTS THAT SUPPLY GAS, ELECTRICITY, TELEPHONE, OR CABLE TELEVISION SERVICE IN OR TO THE CITY OR TOWN WHERE THE EXCAVATION IS TO BE MADE. THE CONTRACTOR SHALL CALL "DIG SAFE" AT 1-888-DIG-SAFE.
4. THE CONTRACTOR SHALL COMPLY WITH MASSACHUSETTS GENERAL LAWS CHAPTER 82A, ALSO REFERRED TO AS JACKIE'S LAW, AS DETAILED IN SECTION 520 CMR 14.00 OF THE CODE OF MASSACHUSETTS REGULATIONS.
5. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS, RULES, REGULATIONS AND SAFETY CODES IN THE CONSTRUCTION OF ALL IMPROVEMENTS.
6. THE LOCATIONS AND ELEVATIONS OF ALL EXISTING UTILITIES ARE APPROXIMATE AND ALL UTILITIES MAY NOT BE SHOWN. PRESENCE AND LOCATIONS OF ALL UTILITIES WITHIN THE LIMIT OF WORK MUST BE DETERMINED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF CONSTRUCTION ACTIVITY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING AND CONTACTING THE CONTROLLING AUTHORITIES AND/OR UTILITY COMPANIES RELATIVE TO THE LOCATIONS AND ELEVATIONS OF THEIR LINES. THE CONTRACTOR SHALL KEEP A RECORD OF ANY DISCREPANCIES OR CHANGES IN THE LOCATIONS OF ANY UTILITIES SHOWN OR ENCOUNTERED DURING CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED TO THE OWNER AND NITSCH ENGINEERING. ANY DAMAGE RESULTING FROM THE FAILURE OF THE CONTRACTOR TO MAKE THESE DETERMINATIONS AND CONTACTS SHALL BE BORNE BY THE CONTRACTOR.
7. THE CONTRACTOR SHALL, THROUGHOUT CONSTRUCTION, TAKE ADEQUATE PRECAUTIONS TO PROTECT ALL WALKS, GRADING, SIDEWALKS AND SITE DETAILS OUTSIDE OF THE LIMIT OF WORK AS DEFINED ON THE DRAWINGS AND SHALL REPAIR AND REPLACE OR OTHERWISE MAKE GOOD AS DIRECTED BY THE ENGINEER OR OWNER'S DESIGNATED REPRESENTATIVE ANY SUCH OR OTHER DAMAGE SO CAUSED.
8. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR JOB SITE SAFETY AND ALL CONSTRUCTION MEANS AND METHODS.
9. PRIOR TO BEGINNING CONSTRUCTION, THE CONTRACTOR SHALL BECOME FAMILIAR WITH THE SITE AND CONSTRUCTION DOCUMENTS TO DEVELOP A THOROUGH UNDERSTANDING OF THE PROJECT, INCLUDING ANY SPECIAL CONDITIONS AND CONSTRAINTS.
10. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BECOME FAMILIAR WITH THE PROJECT SITE AND TO VERIFY ALL CONDITIONS IN THE FIELD AND REPORT DISCREPANCIES BETWEEN PLANS AND ACTUAL CONDITIONS TO THE OWNER OR OWNER'S REPRESENTATION IMMEDIATELY.
11. THE CONTRACTOR SHALL CONDUCT ALL NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN ALL NECESSARY CONSTRUCTION PERMITS.
12. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE ESTABLISHMENT AND USE OF ALL VERTICAL AND HORIZONTAL CONSTRUCTION CONTROLS.
13. ELEVATIONS REFER TO XXXX.
14. THE CONTRACTOR SHALL COMPLY WITH THE ORDER OF CONDITIONS DATED XXXX XX, XXXX AND ISSUED BY THE XXXX CONSERVATION COMMISSION (DEP #XXX-XXX).
15. FOR SOIL INFORMATION REFER TO GEOTECHNICAL REPORT.

UTILITY NOTES:

1. ALL UTILITY CONNECTIONS ARE SUBJECT TO THE APPROVAL OF, AND GRANTING OF PERMITS BY, THE LOCAL MUNICIPALITY. IT SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN ALL PERMITS AND APPROVALS RELATED TO UTILITY WORK PRIOR TO COMMENCEMENT OF CONSTRUCTION.
2. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR OBTAINING ALL PERMISSIONS FOR, AND FOR CONDUCTING ALL PREPARATIONS RELATED TO, WORK AFFECTING ANY UTILITIES WITHIN THE JURISDICTION OF ANY NON-MUNICIPAL UTILITY COMPANY, INCLUDING BUT NOT LIMITED TO ELECTRIC, TELEPHONE, AND/OR GAS. THE CONTRACTOR SHALL NOTIFY ALL APPROPRIATE AGENCIES, DEPARTMENTS, AND UTILITY COMPANIES, IN WRITING, AT LEAST 7 DAYS (OR PER UTILITY COMPANY REQUIREMENT) AND NOT MORE THAN 30 DAYS PRIOR TO ANY CONSTRUCTION.
3. THE CONTRACTOR SHALL MAINTAIN UTILITIES SERVICING BUILDINGS AND FACILITIES WITHIN OR OUTSIDE THE PROJECT LIMIT UNLESS THE INTERRUPTION OF SERVICE IS COORDINATED WITH THE OWNER.
4. ALL WATER, SEWER, AND DRAIN WORK SHALL BE PERFORMED ACCORDING TO THE REQUIREMENTS AND STANDARD SPECIFICATIONS OF THE LOCAL MUNICIPALITY.
5. GAS, TELECOMMUNICATIONS AND ELECTRIC SERVICES ARE TO BE DESIGNED BY EACH UTILITY COMPANY IN COORDINATION WITH THE MECHANICAL, ELECTRIC, AND PLUMBING CONSULTANTS.
6. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES OF NEW UTILITIES WITH GAS, TELECOMMUNICATION AND ELECTRICAL SERVICES.
7. INSTALL WATER LINES WITH A MINIMUM OF FIVE FEET OF COVER AND A MAXIMUM OF SEVEN FEET COVER FROM THE FINAL DESIGN GRADES.
8. MAINTAIN 10 FEET HORIZONTAL SEPARATION AND 18 INCHES VERTICAL SEPARATION (WATER OVER SEWER) BETWEEN SEWER AND WATER LINES. WHEREVER THERE IS LESS THAN 10 FEET OF HORIZONTAL SEPARATION AND 18 INCHES OF VERTICAL SEPARATION BETWEEN A PROPOSED OR EXISTING SEWER LINE TO REMAIN AND A PROPOSED OR EXISTING WATER LINE TO REMAIN BOTH WATER MAIN AND SEWER MAIN SHALL BE CONSTRUCTED OF MECHANICAL JOINT CEMENT LINED DUCTILE IRON PIPE FOR A DISTANCE OF 10-FEET ON EITHER SIDE OF THE CROSSING. ONE (1) FULL LENGTH OF WATER PIPE SHALL BE CENTERED OVER THE SEWER AT THE CROSSING
9. THE CONTRACTOR SHALL MAINTAIN ALL EXISTING UTILITIES EXCEPT THOSE NOTED TO BE ABANDONED AND/OR REMOVED & DISPOSED.
10. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR TRENCHING, BACKFILLING, AND SURFACE RESTORATION FOR GAS UTILITY SYSTEMS.
11. ALL ONSITE UTILITIES SHALL BE INSTALLED UNDERGROUND UNLESS OTHERWISE NOTED.
12. ALL EXISTING AND PROPOSED MANHOLE FRAMES, COVERS, VALVES, CLEANOUTS, CASTINGS, ETC. SHALL BE RAISED TO FINISHED GRADE PRIOR TO FINAL GRADING AND PAVING CONSTRUCTION.
13. ALL GRATES IN WALKWAYS SHALL BE ADA COMPLIANT.

COST ESTIMATING NOTES:

1. ALL WATER LINES ARE DUCTILE IRON UNLESS OTHERWISE NOTED. ASSUME ALL WATER LINES INSTALLED WITH 5' OF COVER.
2. ASSUME ALL ROADWAY DRAINAGE LINES ARE 12" RCP UNLESS OTHERWISE NOTED. ASSUME ALL DRAIN LINES INSTALLED WITH 6' OF COVER.
3. ASSUME ALL ROOF DRAINAGE LINES ARE 8" CORRUGATED PLASTIC PIPE UNLESS OTHERWISE NOTED. ASSUME ALL DRAIN LINES INSTALLED WITH 4' OF COVER.
4. ASSUME THAT ALL SEWER LINES ARE 8" PVC. ASSUME ALL SEWER LINES INSTALLED WITH 6' OF COVER.
5. ASSUME ALL STRUCTURES ARE 4' INSIDE DIAMETER, EXCEPT FOR DOUBLE CB'S AND STRUCTURES THAT ARE DIRECTLY CONNECTED TO THE UNDER GROUND DETENTION SYSTEM. ASSUME THOSE STRUCTURES ARE 6' INSIDE DIAMETER.
6. SEE MEP PLANS FOR SIZING ELECTRIC, CABLE, TELEPHONE AND LIGHTING.

SCALE:
1" = 20'
20 10 0 20 40

10/2/2019 11:41:04 AM

RINDGE COMMONS

402 RINDGE AVE
CAMBRIDGE, MA

JUST - A - START

ARCHITECT
E-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT
Nitsch Engineering
www.nitschengg.com
2 Center Plaza, Suite 430
Boston, MA 02108
T: (617) 338-0063
F: (617) 338-6472

STAMP

KEY PLAN

DRAFT

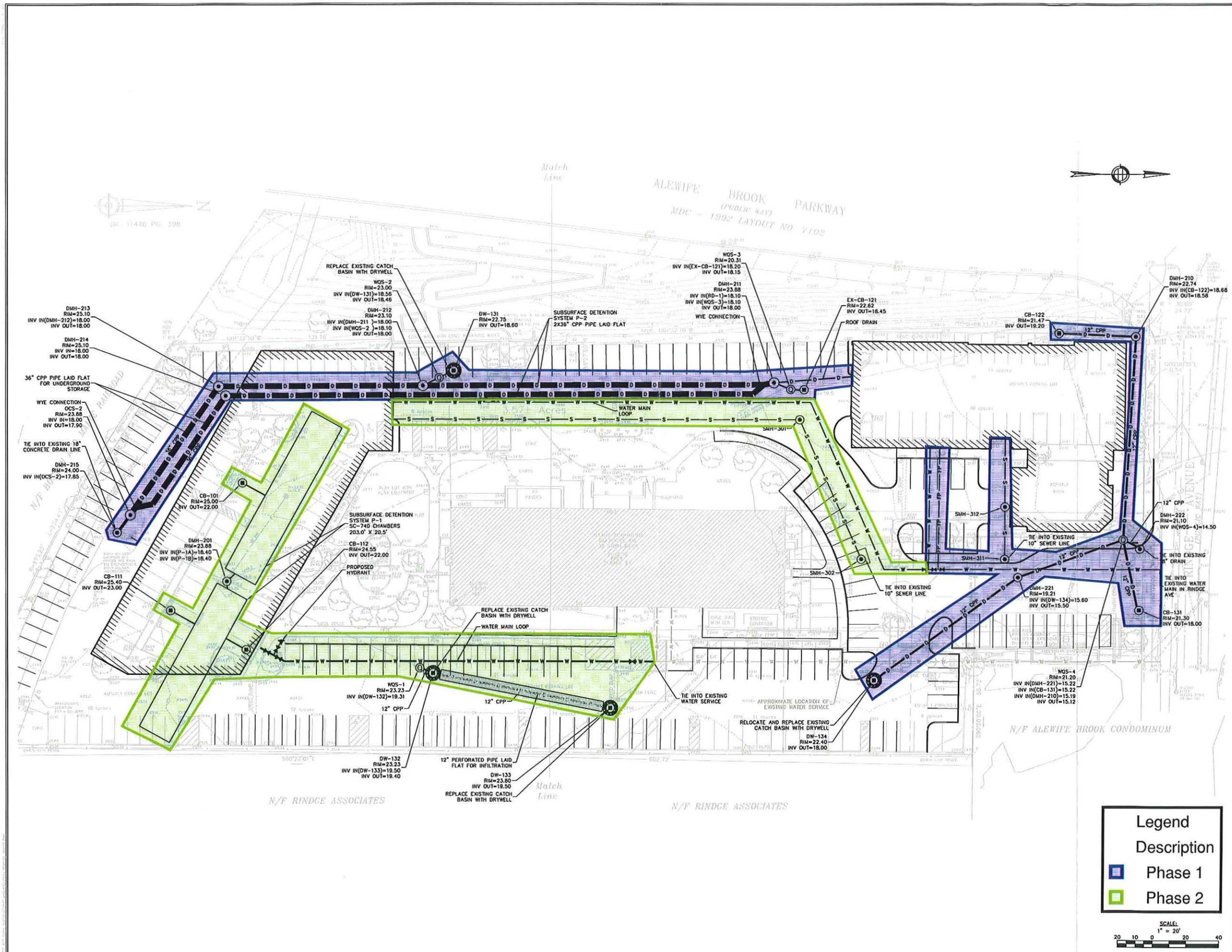
MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: AMM
CHECKED BY: AG

SHEET TITLE

SITE UTILITY PLAN

C-300



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

- Civil Engineering
- Land Surveying
- Transportation Engineering
- Structural Engineering
- Green Infrastructure
- Planning
- GIS

UTILITY PHASING PLAN

402 RINDGE AVENUE
CAMBRIDGE, MA

PREPARED FOR:
JUST-A-START CORPORATION
1035 CAMBRIDGE STREET #12, CAMBRIDGE, MA

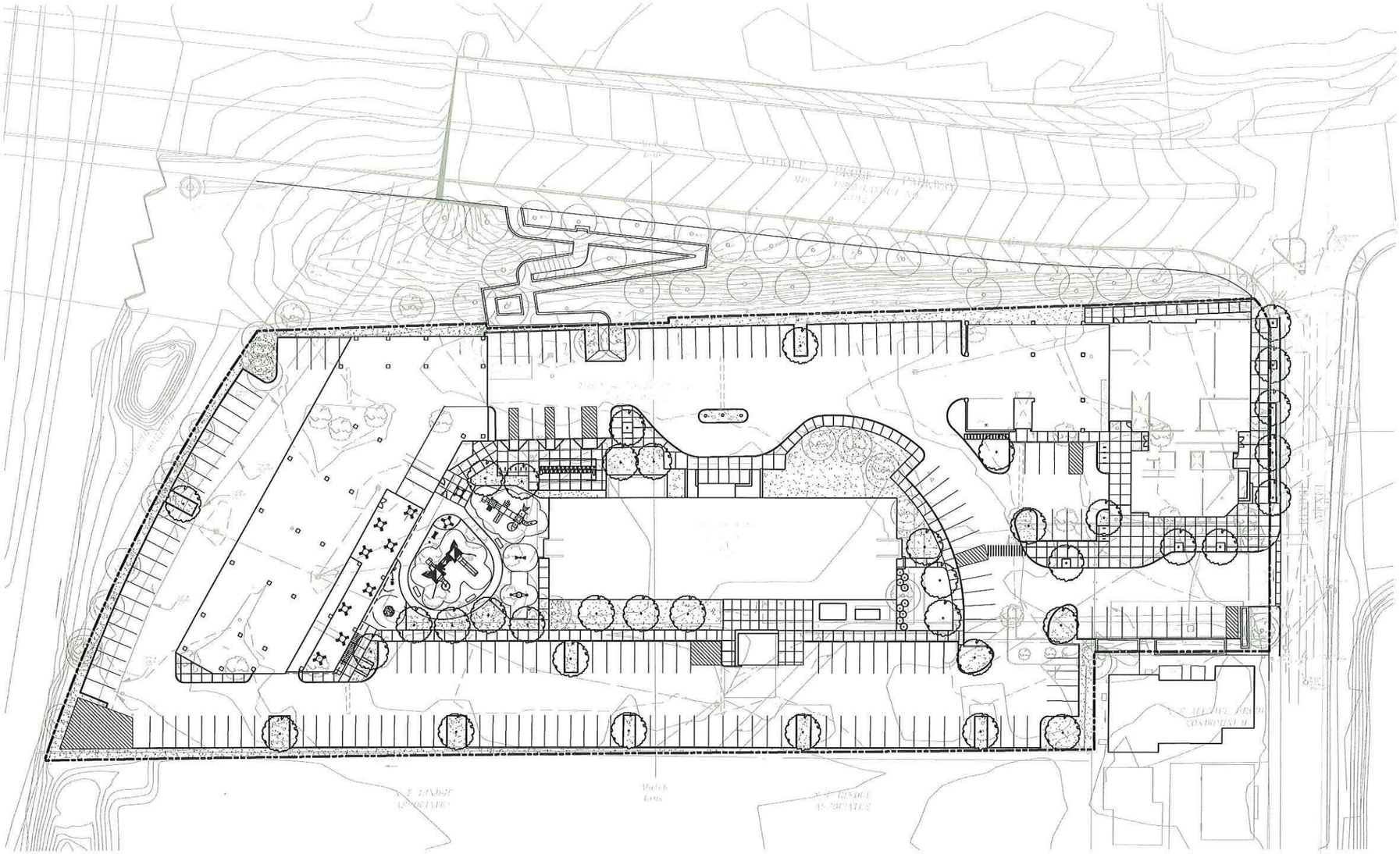
REV.	COMMENTS REVISIONS	DATE

NITSCH PROJECT #	13307
FILE:	
SCALE:	1"=20'
DATE:	12-06-2019
PROJECT MANAGER:	AG
SURVEYOR:	
DRAFTED BY:	AM
CHECKED BY:	AG

SHEET: 1

SK-1

OF 1 REV.



Site Plan
Scale: 1" = 30'

0 15 30 60 FEET

EXISTING

PROPOSED

ADDED SAFE PEDESTRIAN CONNECTIONS THROUGH SITE TO ALEWIFE
- REDUCE CROSSWALKS NEEDED
- NEW SITE LIGHTING

DESIGNATED CAR-SHARING SERVICE TO REDUCE PARKING NEEDS

DUAL USE PARKING FOR COMMERCIAL & RESIDENTIAL TO REDUCE PARKING NEEDS

REDUCE OVERALL PARKING RATIO TO .64 PER DWELLING UNIT

INCREASE AVAILABLE BIKE PARKING:
+38 LONG TERM SPACES
+12 SHORT TERM SPACES
(+134 OVERALL, +22 OVERALL)

PROVIDE NEW BLUE BIKE STATION (24 DOCKS) TO SUPPPLEMENT EXISTING 26 LONG TERM SPACES

INCREASE AVAILABLE BIKE PARKING:
+96 LONG TERM SPACES
+10 SHORT TERM SPACES
(+134 OVERALL, +22 OVERALL)

SAFE DROPOFF FOR CAR/VAN-POOL

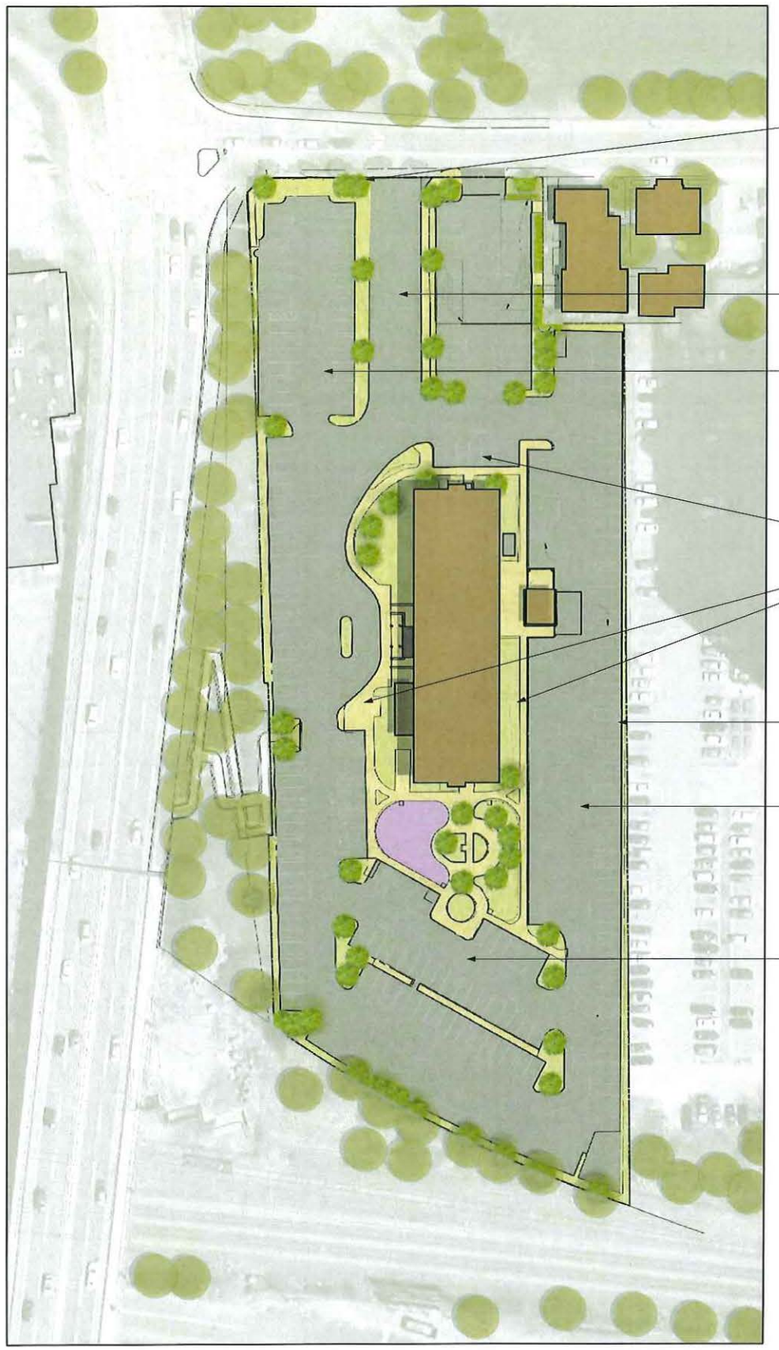
E-ICON ARCHITECTURE

SITE TDM STRATEGIES

RINDGE COMMONS

02/04/20

EXISTING



PROPOSED

ADDED TREE CANOPY

LOW-INTENSIVE GREEN ROOF

LIGHT PAVING TO REPLACE AREA OF ASPHALT PARKING SURFACE

NEW PODIUM CONSTRUCTION INFILL TO REDUCE AREA OF ASPHALT PARKING SURFACE

ADDED TREE CANOPY

ADDED TREES THROUGHOUT PARKING SURFACE

REDUCE PARKING AISLE WIDTH, REDUCE AREA OF PARKING SURFACE

PERVIOUS SITE MATERIAL & PLANTING

NEW PODIUM CONSTRUCTION INFILL TO REDUCE AREA OF ASPHALT PARKING SURFACE

LOW-INTENSIVE GREEN ROOF

E-ICON ARCHITECTURE

SITE COOLING STRATEGIES

RINDGE COMMONS

02/04/20

BIRDSEYE VIEW OF INTERSECTION (OVERALL)

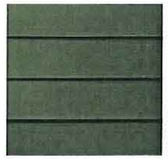
DESIGN RESPONSES:

- DEFINE MATERIALITY
- ADD RESIDENTIAL DOOR ON PARKWAY SIDE
- GREEN ROOF & COOL ROOF STRATEGIES

FIBER CEMENT WOOD-LOOK PANEL

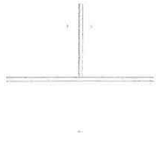
01

FIBER CEMENT LAP SIDING



02

FIBER CEMENT LARGE FORMAT PANEL



03

COMPOSITE METAL PANEL

04

GREENSCREEN

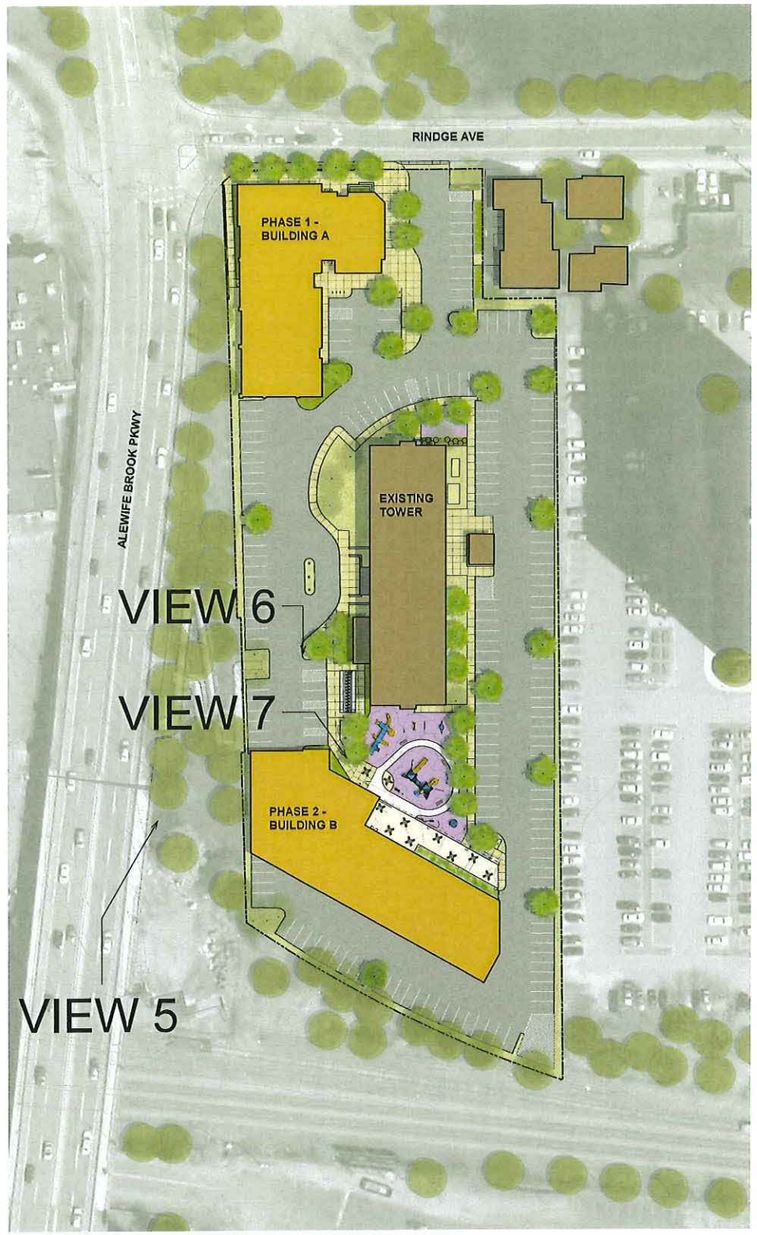
05

E-ICON ARCHITECTURE

OVERALL SITE VIEW

RINDGE COMMONS

4/20/2020



PARKWAY ELEVATION BUILDING B

DESIGN RESPONSES:

- GRANDER CIVIC SCALE AT REAR ELEVATION
- ARTICULATION OF ELEVATIONS BETWEEN PARKWAY & REAR FACING FACADE
- GREENSCREEN WITH PLANTINGS AT OPEN PARKING FACING PARKWAY

PATH TO BUILDING B ENTRY

DESIGN RESPONSES:

- ORIENT ENTRY DIRECTLY TO APPROACH
- GROUND BASE OF BUILDING
- GREENSCREEN WITH PLANTINGS AT PARKING SCREENING
- MATERIALS RESPOND TO INTERIOR PROGRAM ZONES

TOT LOT

DESIGN RESPONSES:

- INTEGRATE PLAY PANELS AT PARKING SCREENING
- CONSIDER ART AT WALLS OF BIKE PARKING

E-ICON ARCHITECTURE

PHASE 2 - BUILDING B

RINDGE COMMONS

4/20/2020

RINDGE COMMONS

402 RINDGE AVE
CAMBRIDGE, MA
JUST - A - START

ARCHITECT

E-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

BUILDING B GROUND FLOOR PLAN

A-101B

3/27/2020 2:46:20 PM

3/27/2020 2:46:28 PM

RINDGE COMMONS

402 RINDGE AVE
CAMBRIDGE, MA
JUST - A - START

ARCHITECT
E-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

MARK	DATE	DESCRIPTION
1	Date 2	Addendum

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

BUILDING B SECOND FLOOR PLAN

A-102B

3/25/2020 3:52:22 PM

RINDGE COMMONS

402 RINDGE AVE
CAMBRIDGE, MA
JUST - A - START

ARCHITECT
ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

BUILDING B TYP FLOOR PLAN

A-103B

3/25/2020 3:52:25 PM

RINDGE COMMONS

402 RINDGE AVE
CAMBRIDGE, MA
JUST - A - START

ARCHITECT
ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

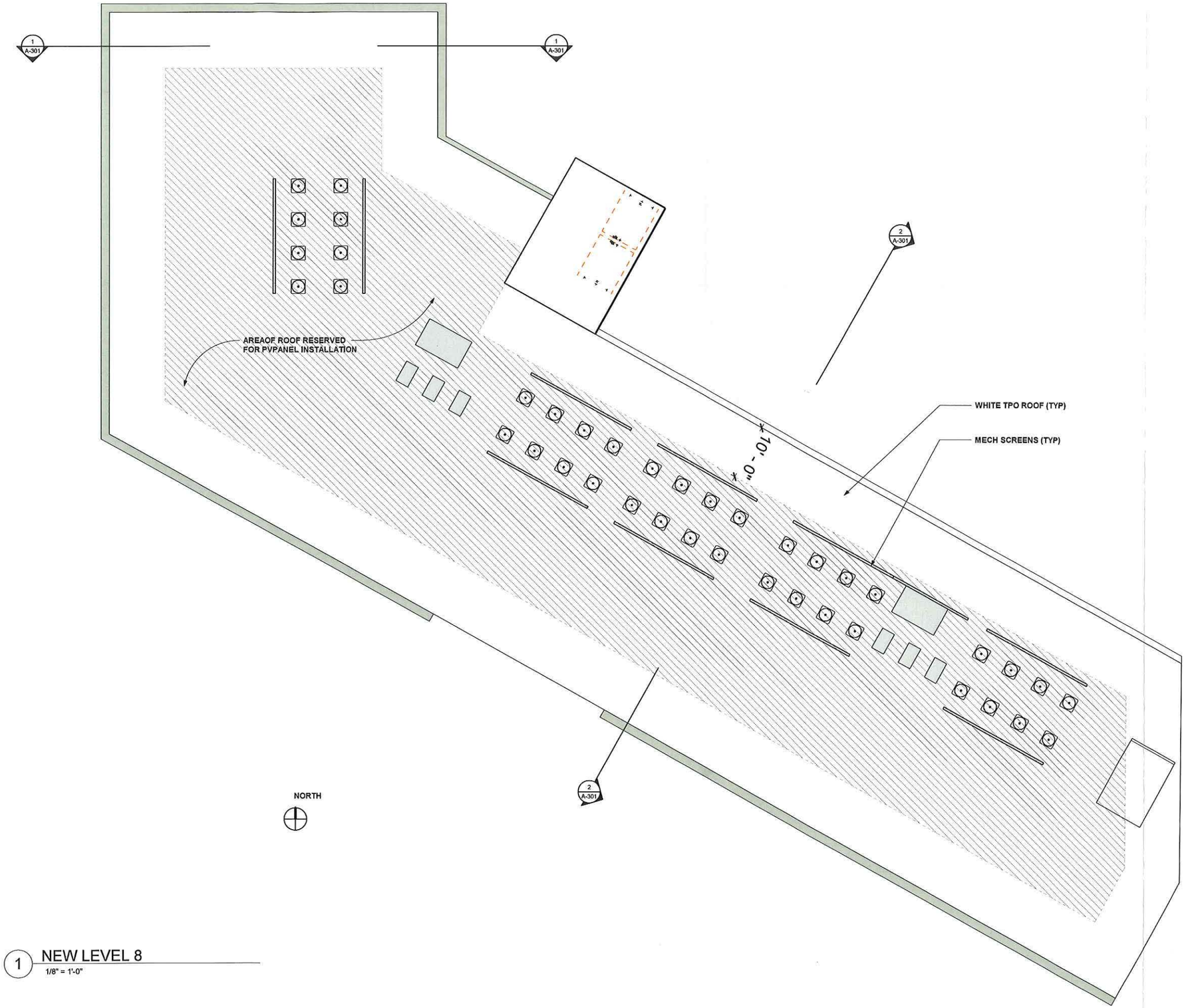
MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

7TH FLOOR PLAN

A-104B



1 NEW LEVEL 8
1/8" = 1'-0"

4/20/2020 7:22:10 PM

RINDGE COMMONS

402 RINDGE AVE
CAMBRIDGE, MA
JUST - A - START

ARCHITECT
E-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

ROOF PLAN

A-105B

WEST ELEVATION 3/32" = 1'-0"

SOUTH ELEVATION 3/32"= 1'-0"

4/20/2020 5:37:38 PM

RINDGE COMMONS

402 RINDGE AVE
CAMBRIDGE, MA
JUST - A - START

ARCHITECT
E-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

BUILDING B
ELEVATIONS

A-201B

NORTH ELEVATION 1"=32'-0"

EAST ELEVATION 3/32" = 1'-0"

4/20/2020 5:37:39 PM

RINDGE COMMONS

402 RINDGE AVE
CAMBRIDGE, MA
JUST - A - START

ARCHITECT
I-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

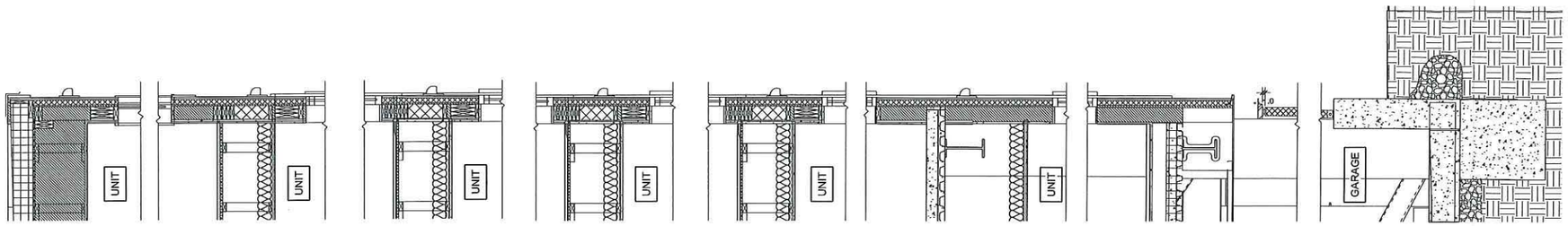
MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

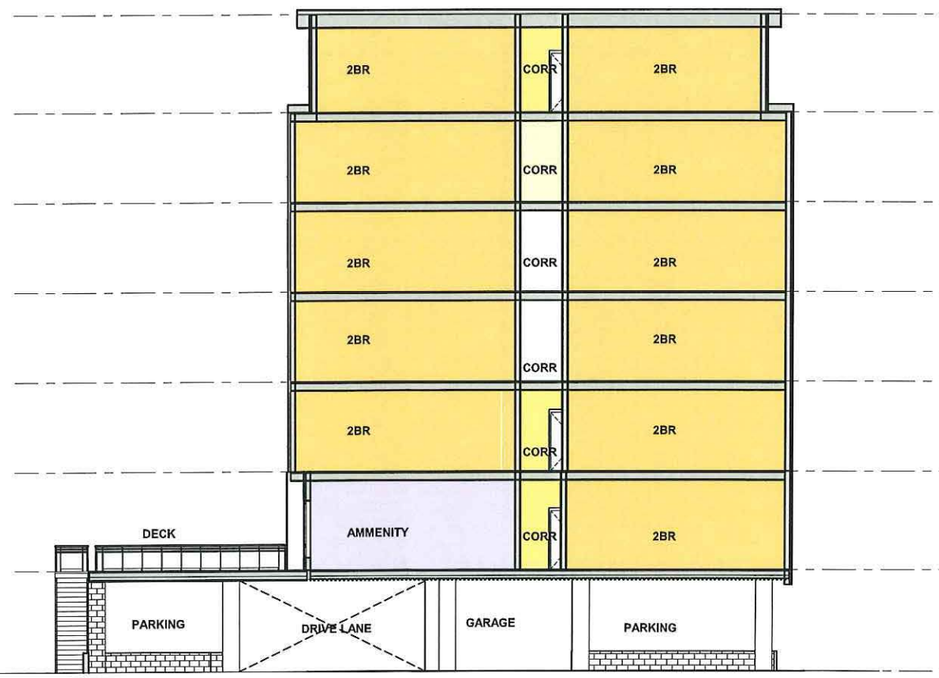
SHEET TITLE

BUILDING B
ELEVATIONS

A-202B



1 TYPICAL WALL SECTION
1/2" = 1'-0"



2 BUILDING CROSS SECTION
1/8" = 1'-0"

1 BUILDING CROSS SECTION
1/8" = 1'-0"

2/17/2020 6:13:24 PM

RINDGE COMMONS - PHASE 2

402 RINDGE AVE
CAMBRIDGE, MA

JUST - A - START

ARCHITECT
E-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

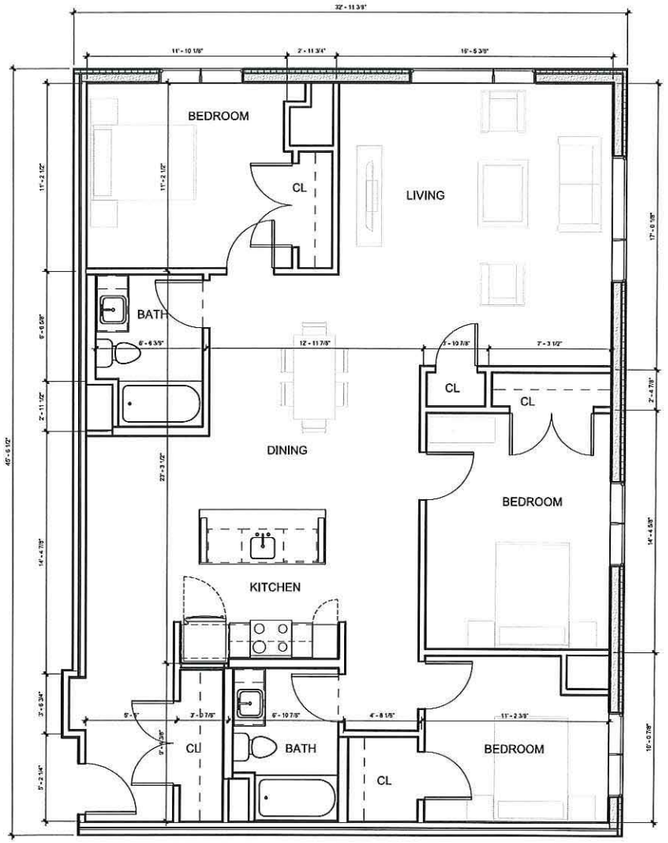
MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

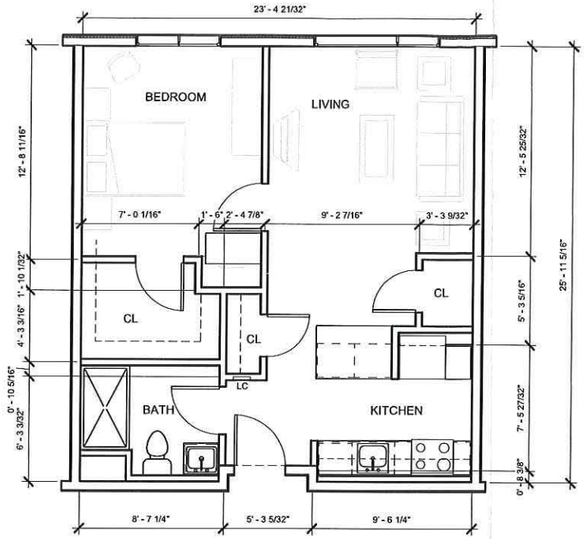
SHEET TITLE

BUILDING SECTION

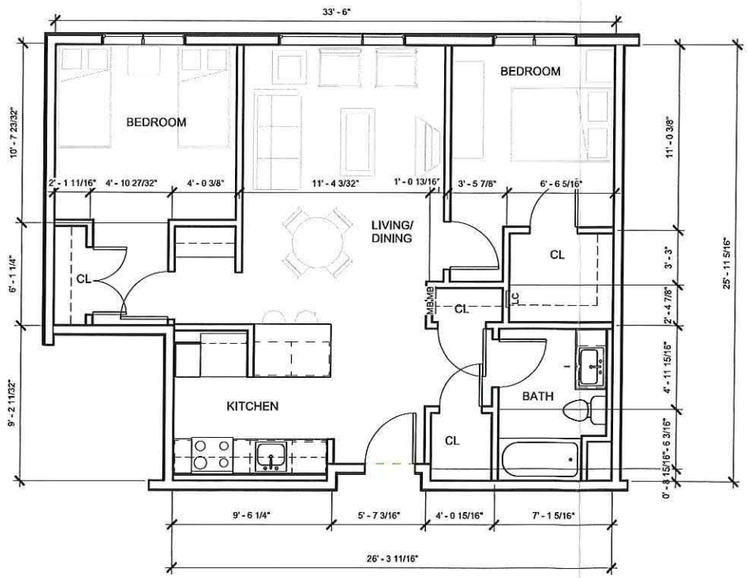
A-301



3A 3BR - TYP
1/4" = 1'-0"



1A 1BR - TYP
1/4" = 1'-0"



2A 2BR - TYP
1/4" = 1'-0"

2/17/2020 6:13:26 PM

RINGE COMMONS - PHASE 2

402 RINDGE AVE
CAMBRIDGE, MA

JUST - A - START

ARCHITECT
E-ICON ARCHITECTURE
101 SUMMER ST BOSTON MA 02110

CONSULTANT

STAMP

KEY PLAN

MARK	DATE	DESCRIPTION

PROJECT NUMBER: 217003
DRAWN BY: Author
CHECKED BY: Checker

SHEET TITLE

ENLARGED UNIT PLANS

A-501