Project Documentation #6369

Zertifiziertes Passivhaus
Passivhaus Institut
| classic | plus | premium |

Abstract

© Handel Architects

Sendero Verde, Building B-South
Multi-family Residential Building in New York City, USA

Data of building | Gebäudedaten

Year of construction	2022	**Space heating**	**4.1 kBTU/(ft²yr)**
R-value external wall	41.3 hr-ft²-°F/BTU		
R-value basement	N/A hr-ft²-°F/BTU	Primary Energy Renewable (PER)	34.7 kBTU/(ft²yr)
R-value roof	41.3 hr-ft²-°F/BTU	Generation of renewable Energy	357,207 kBTU/yr
U-value window	Varies BTU/hr-ft²-°F	Non-renewable Primary Energy (PE)	46.13 kBTU/(ft²yr)
Heat recovery	Varies by location 75% - 86%	Pressurization test n_{50}	0,4 h^{-1}
Special features	Rainwater harvesting, PV panels (not considered in PHPP), electric cooking appliances		

Brief Description

Sendero Verde Building B-South

This 85-unit multi-family residential building is one of two Passive House buildings completed in Phase 1 of the Sendero Verde Residential development. The development will ultimately provide 709, 100% affordable housing units, all certified Passive House, in the East Harlem neighborhood of New York City. This development is the result of an RFP titled SustainNYC, supported by The NYC City Council and the NYC Department of Housing, Preservation, and Development (HPD). Passive House certification was a requirement for this RFP.

Building B-South is comprised of a mix of income levels from 90% Area-Median Income (AMI) to units reserved for those formerly experiencing homelessness. The Passive House design offers tenants improved comfort from a typical apartment in NYC. The high-performance windows and glazing and continuously insulated façade offer improved thermal comfort, as well as, better acoustic performance, protecting tenant's from the noise pollution associated with the neighboring MetroNorth regional rail line.

The residences are located on floors 3-9 with the ground and 2nd floor being reserved for lobby and tenant space leased to one of the oldest settlement houses in NYC, Union Settlement, a benefit to the tenants and the broader community. Tenants have access to amenities including a private roof terrace on the tenth floor, a public outdoor courtyard connecting all buildings in the development, laundry, fitness room, computer room, and party room equipped with warming kitchen.

The building podium is a brick façade in keeping with the neighborhood context and the floors above are clad in EIFS, a cost-effective system for maximizing thermal performance. The windows are high-performance uPVC frames with triple-glazed, low-e coated IGUs. The building is served by a low-energy VRF heating and cooling system, and a centralized ventilation strategy with energy recovery ventilation.

Responsible project participants

Architect	Handel Architects, Louis Koehl, CPHD, AIA Deborah Moelis, CPHD, AIA Ryan Lobello, CPHD, AIA Handel Architects | World-class Architecture
Implementation planning	-
Building systems	Cosentini Associates Cosentini Associates - Home
Structural engineering	Desimone Consulting Engineers DeSimone Consulting Engineers | Bridging Science and Humanity (de-simone.com)
Building physics	-
Passive House project planning	Steven Winter Associates Home - Steven Winter Associates, Inc. (swinter.com)
Construction management	L&M Builders L+M Development Partners LLC. | Real Estate Development | Affordable HousingConstruction - L+M Development Partners LLC. | Real Estate Development | Affordable Housing (lmdevpartners.com)

Certifying body

Passivhaus Institut Darmstadt
www.passiv.de

Certification ID

6369	Project-ID (www.passivehouse-database.org) Projekt-ID (www.passivhausprojekte.de)

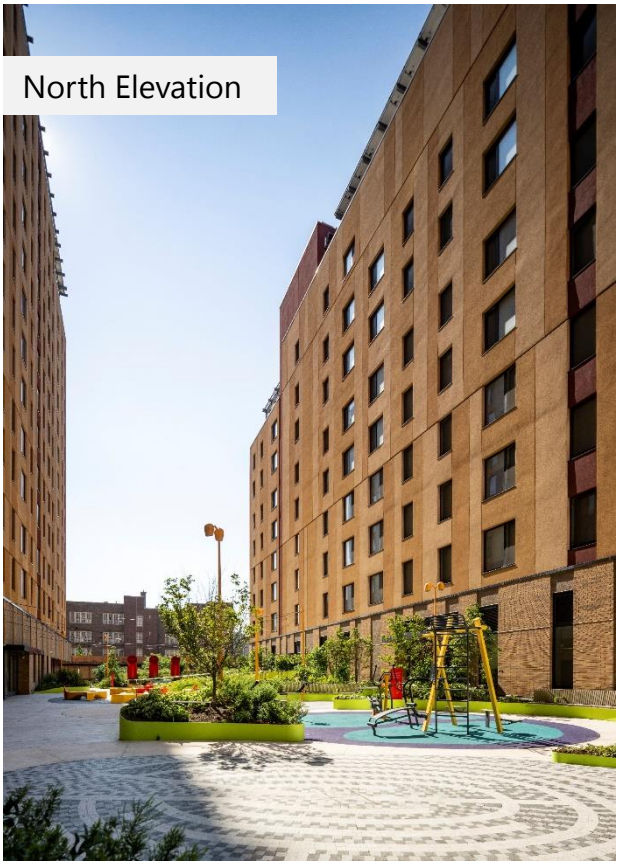
Author of project documentation

Passivhaus Institut Darmstadt
www.passiv.de

Date	Signature
20.11.2023	

1. Exterior Photos

North Elevation

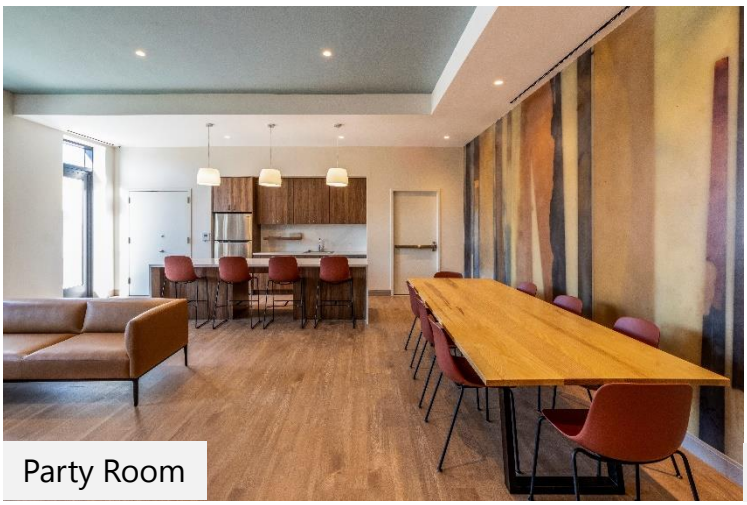


© Handel Architects

West Elevation

© Handel Architects

2. Interior Photos



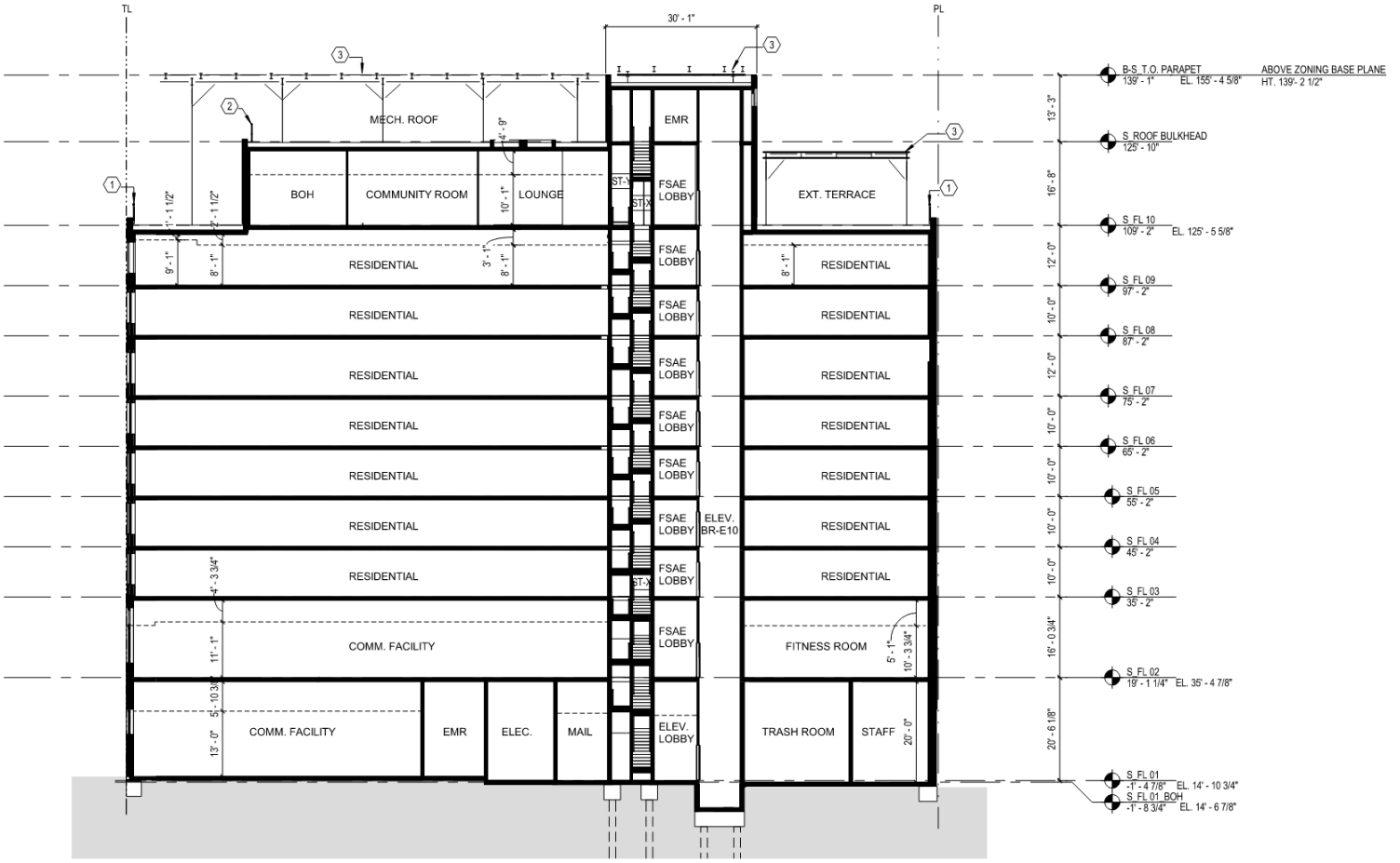
Party Room

© Handel Architects

Lobby

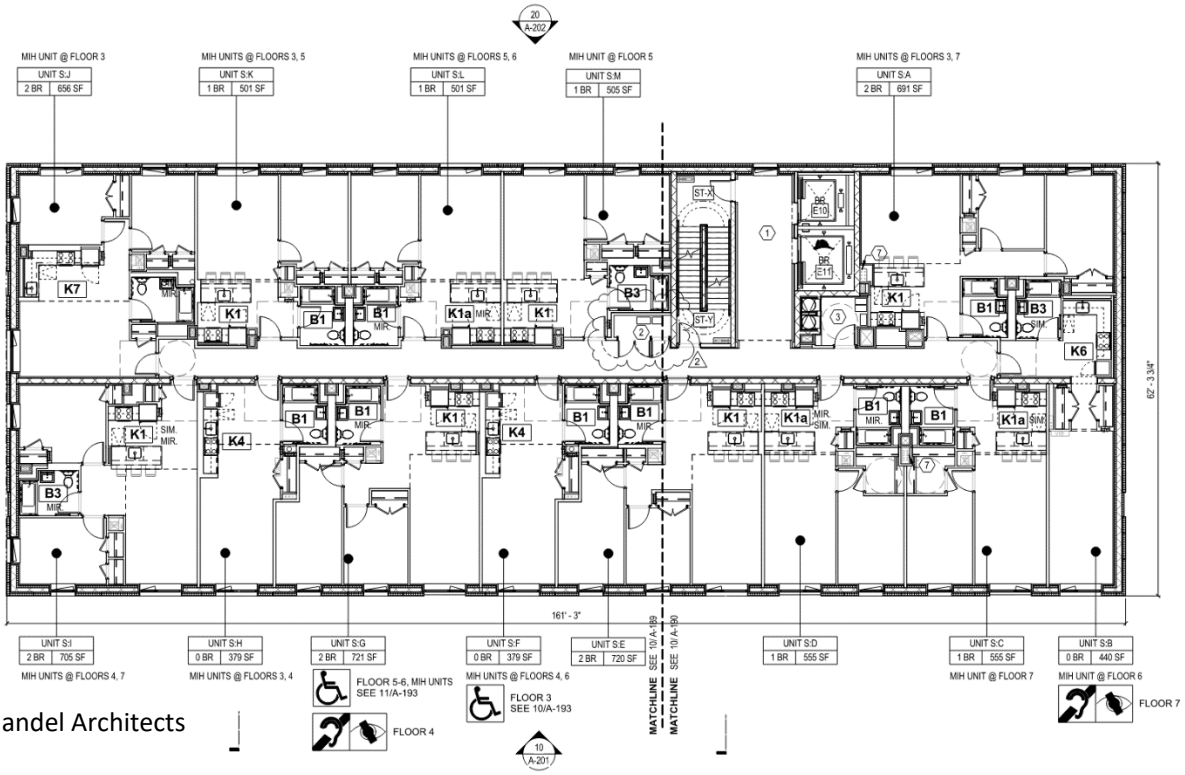
© Handel Architects

3. Section



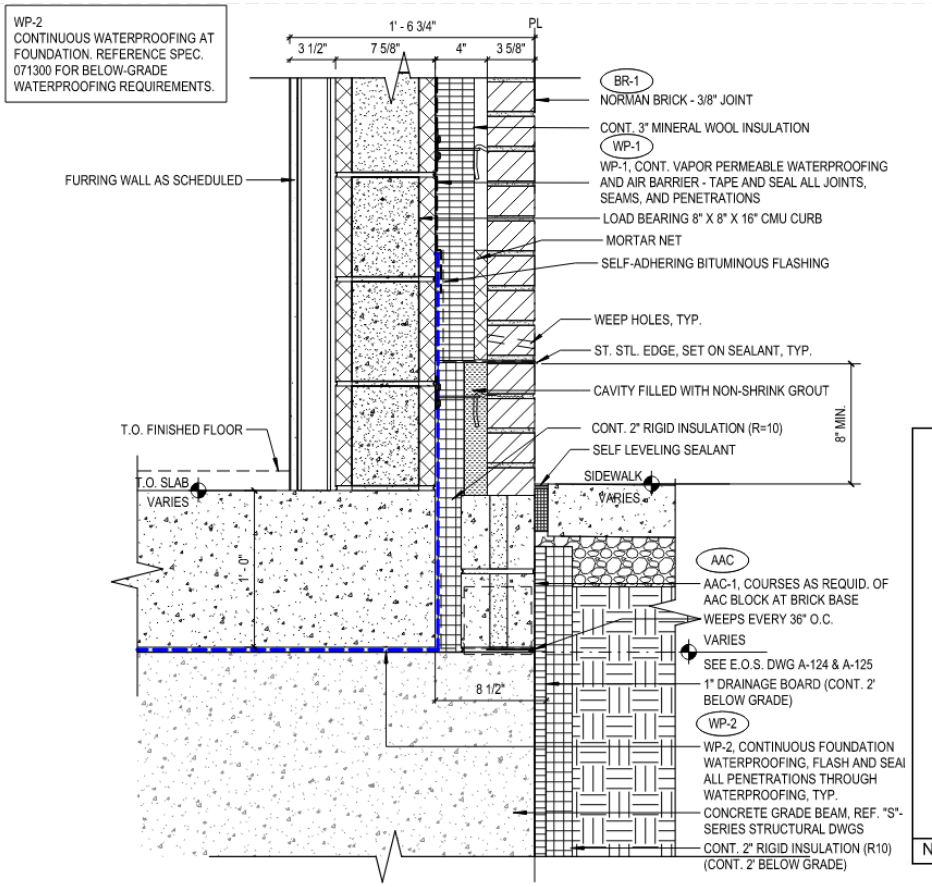
© Handel Architects

4. Floor Plan



© Handel Architects

5. Floor Slab meeting Exterior Wall

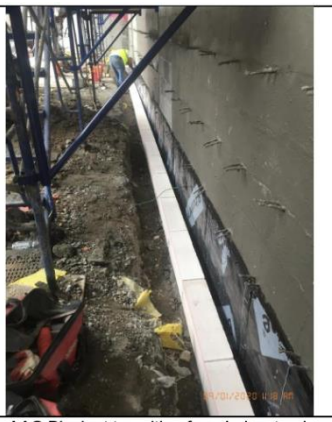


© Handel Architects

B-S, WT-1C - TYPICAL FOUNDATION DETAIL 10

1 1/2" = 1'-0"

At base of wall, brick is supported on AAC block acting as a thermal break. Face of grade beam is insulated with R-10 insulation, slab on grade has no insulation below.



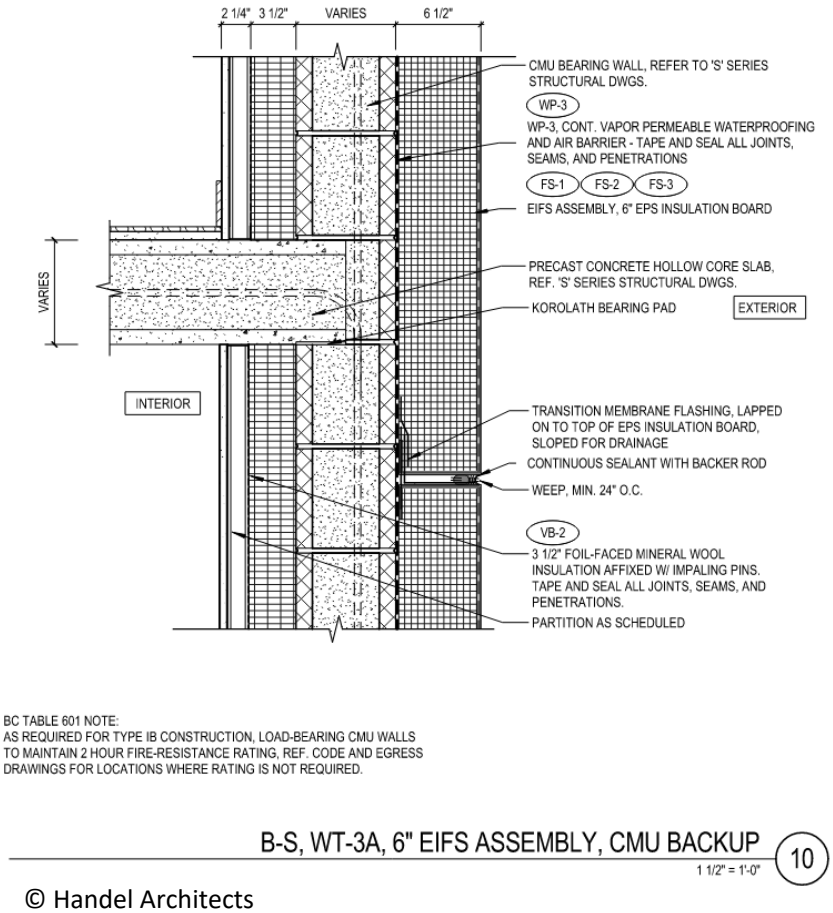
Notes: Overview AAC Block at transition from below to above grade

Building data					R-value floor slab/basement ceiling	R_f	1,6	hr.ft².°F/BTU
Area of ground floor slab / basement ceiling	A	5277	ft²		TBs floor slab / basement ceiling	Ψ_B*l	0,00	BTU/hr.°F
Perimeter length	P	130,0	ft		R-value floor slab / basement ceiling i	R_f'	1,6	hr.ft².°F/BTU
Charact. dimension of floor slab	B'	81,2	ft		Equivalent thickness floor	d_t	1,8	ft

Floor slab type (select only one)								
x	**Slab on grade**							
	Perimeter insulation width/depth	D	8,40	in	Orientation of perimeter insulation	horizontal		
	Perimeter insulation thickness	d_n	2,00	in	(check only one field)	vertical	x	
	Perimeter insulation therm. resistance	R per inch	5,000	hr.ft².°F/BTU.in				
	Heated basement or floor slab completely / partially below ground level							
	Basement wall height below ground level	z		ft	R-Value wall below ground	R_{wB}		hr.ft².°F/BTU
	Unheated basement							
	Height aboveground wall	h		ft	R-Value wall above ground	R_W		hr.ft².°F/BTU
	Basement wall height below ground level	z		ft	R-Value wall below ground	R_{WB}		hr.ft².°F/BTU
	Air change unheated basement	n	0,20	1/hr	R-Value basement floor slab	R_{fB}		hr.ft².°F/BTU
	Air flow basement	V		ft³				
	Suspended floor above a ventilated crawl space (at max. 1.6 ft below ground)							
	R-Value crawl space	R_{Crawl}		hr.ft².°F/BTU	Area of ventilation openings	εP		ft²
	Height of crawl space wall	h		ft	Wind velocity at 10 m height	v	8,9	mph
	R-Value crawl space wall	R_W		hr.ft².°F/BTU	Wind shield factor	f_W	0,05	-

Additional thermal bridge heat losses at perimeter					Steady-state fraction	$\Psi_{P,stat}$*l		BTU/hr.°F
Phase shift	β		Months		Harmonic fraction	$\Psi_{P,harm}$*l	0,000	BTU/hr.°F

6. Wall Construction



BC TABLE 601 NOTE:
AS REQUIRED FOR TYPE IB CONSTRUCTION, LOAD-BEARING CMU WALLS TO MAINTAIN 2 HOUR FIRE-RESISTANCE RATING, REF. CODE AND EGRESS DRAWINGS FOR LOCATIONS WHERE RATING IS NOT REQUIRED.

B-S, WT-3A, 6" EIFS ASSEMBLY, CMU BACKUP 10

1 1/2" = 1'-0"

Exterior wall includes 6" EPS insulation on exterior side with 3.5" mineral wool insulation on interior side. Air barrier is the waterproofing membrane behind the EIFS system. There is an additional vapor control layer on the interior side of mineral wool, in the form of foil-facing.

Assembly no.	Building assembly description					Interior insulation?
04ud	WT-3A EIFS					

Heat transmission resistance [hr.ft².F/BTU]

Orientation of building element: 0,738174337 — interior R_{si}: 0,74

Adjacent to: 0,227130565 — exterior R_{se}: 0,23

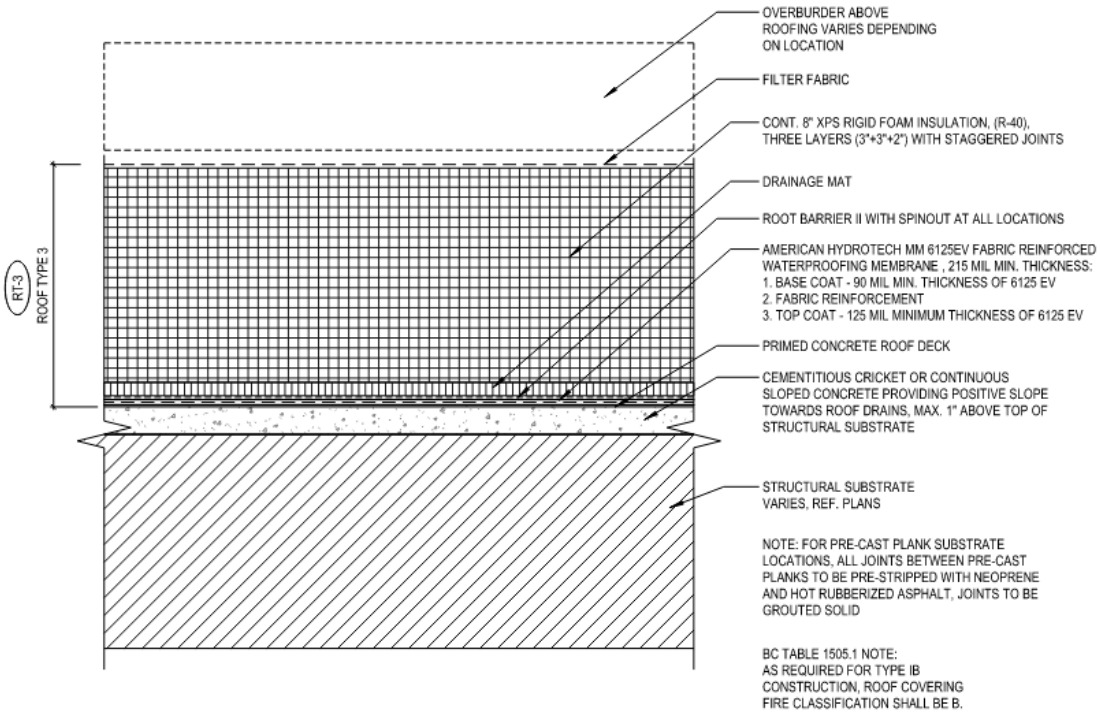
Area section 1	R per inch	Area section 2 (optional)	R per inch	Area section 3 (optional)	R per inch	Thickness [in]
EPS	3,85					6,00
CMU	0,14					7,64
Mineral Wool (continuous)	4,20					3,50
Air Gap	0,57					1,63
Interior Gyp	0,90					0,63

Percentage of sec. 1: 100% — Percentage of sec. 2: — Percentage of sec. 3: — Total: 19,39 in

U-value supplement: — BTU/hr.ft².°F

R-value: 41,3 hr.ft².°F/BTU

7. Roof Construction



RT-3 - IRMA ROOF ASSEMBLY, REF. SPEC SE

Notes: Overview XPS roof insulation in progress

Roof assembly is comprised of 8" XPS insulation with various overburdens (green roof, pedestal pavers, interlocking pavers).

Assembly no.	Building assembly description					Interior insulation?
09ud	RT-03 IRMA Roof R-40					

Heat transmission resistance [hr.ft².F/BTU]

Orientation of building element 0,681391696 — interior R_{si} 0,68

Adjacent to 0,227130565 — exterior R_{se}: 0,23

Area section 1	R per inch	Area section 2 (optional)	R per inch	Area section 3 (optional)	R per inch	Thickness [in]
XPS	5,00					8,00
Concrete Slab	0,06					10,00

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			18,00 in

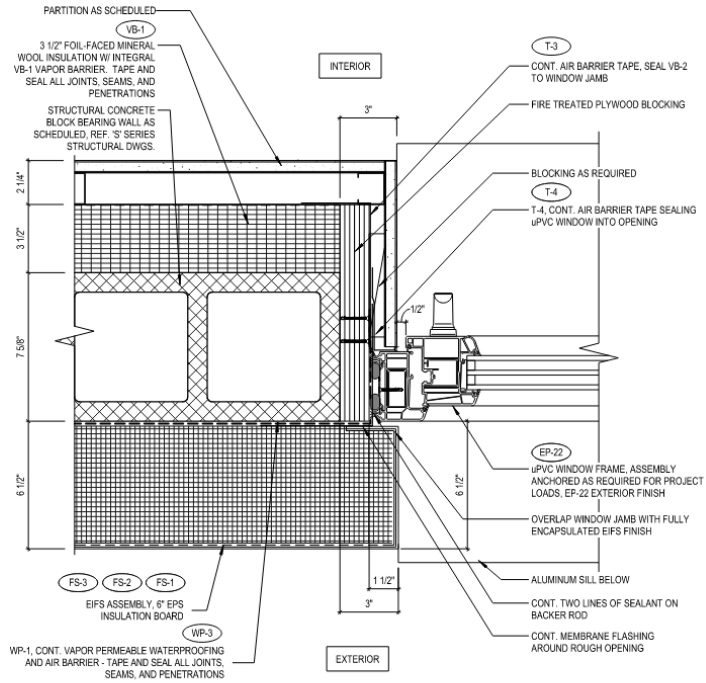
U-value supplement [ ] BTU/hr.ft².°F

R-value: 41,5 hr.ft².°F/BTU

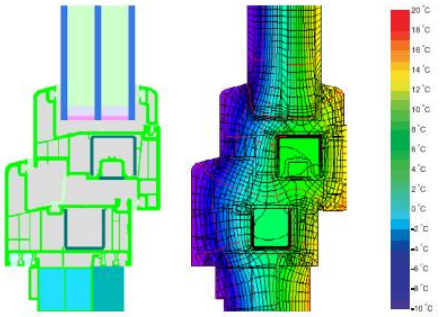
8. Fenestration

SUPERA 83 PASSIVE PROFILE

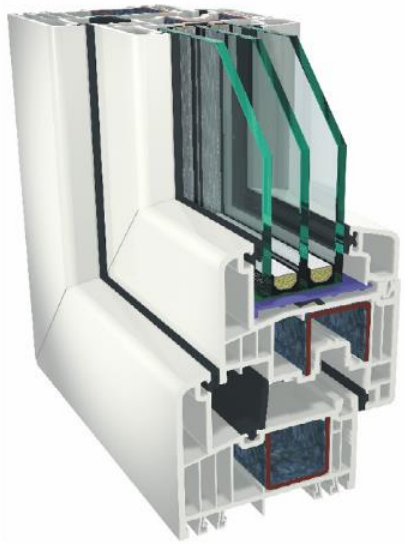
INTUS achieves Passive House Institute (PHI) Certification through our thermally efficient Supera 83 Passive profile and high performance triple glazing. By using this method versus expensive super insulated profiles, INTUS is able to affordably achieve PHI Certification for any climate zone in the U.S., Central America, and areas of Canada. With its steel reinforced profile, Supera 83 Passive is stronger structurally and can achieve certification at greater heights.



B-S, WT-3, uPVC WINDOW JAMB, OPERABLE (12)



Calculation Model Isothermal Model



https://database.passivehouse.com/en/components/details/window/intus-windows-supera-83-passive-1495ws84

Window frames

ID	Description	U_f-Value left	right	bottom	above
		BTU/hr.ft²°F	BTU/hr.ft²°F	BTU/hr.ft²°F	BTU/hr.ft²°F
01ud	Fixed (L/R) uPVC D	0,174	0,174	0,185	0,174
02ud	Operable (L/R) uPVC D	0,206	0,206	0,209	0,206
03ud	SF window - Kawneer 1600 UT fiberglass PP	0,910	0,910	0,850	0,850
04ud	SF door - Kawneer 350T Insulpour Thermal Medium Stile	1,250	1,250	1,250	1,250
05ud	Fixed (single) Aluminum C	0,546	0,546	0,544	0,544
06ud	Operable (single) Aluminum C	0,546	0,546	0,544	0,544
07ud	Operable (single) uPVC D	0,206	0,206	0,209	0,206
08ud	Fixed (single) uPVC D	0,174	0,174	0,185	0,174
09ud	Terrace door - Kawneer 2000T	0,850	0,850	0,850	0,850
10ud					

Make-up Name	Glass 1 & Coating	Glass 2 & Coating	Visible Light: Transmittance Visible (τ_V %)	Visible Light: Reflectance ρ_V % out	Visible Light: Reflectance ρ_V % in	Solar Energy: Transmittance Solar (τ_e %)	Solar Energy: Reflectance ρ_e % out	Solar Energy: Solar Factor (g%)	Solar Energy: Secondary Heat Transfer (qi)	Thermal Properties: U-Value U_g W/m²·K [3 decimals]
CG 44.2 x 18 x 4 x 16 x 6 CG	Guardian ExtraClear (CE)	ClimaGuard® 1.0+ (CE) on Guardian ExtraClear (CE)	62.5	24.1	24.3	31.3	36.2	36.9	5.7	0.496

Calculation Standard: EN 410:2011 / EN 673:2011

CG 44.2 x 18 x 4 x 16 x 6 CG

Outdoors

GLASS 1	Guardian ExtraClear (CE) Thickness = 5/32" (4mm)	#1 ----- #2 -----
INTERLAYER 1	PVB Clear 0.76mm (CE)	
GLASS 2	Guardian ExtraClear (CE) Thickness = 5/32" (4mm)	#3 ----- #4 ClimaGuard® 1.0+ (CE)
GAP 1	10% Air, 90% Argon, 18mm	
GLASS 3	Guardian ExtraClear (CE) Thickness = 5/32" (4mm)	#5 ----- #6 -----
GAP 2	10% Air, 90% Argon, 16mm	
GLASS 4	Guardian ExtraClear (CE) Thickness = 1/4" (6mm)	#7 ClimaGuard® 1.0+ (CE) #8 -----

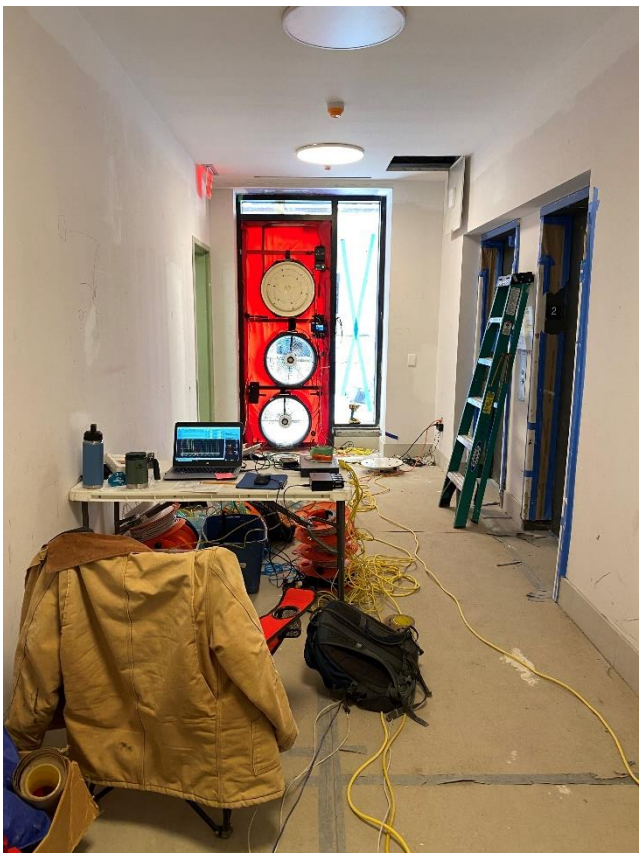
Total Unit (Nominal) = 52.762 mm Slope = 90°

Estimated Nominal Glazing Weight: 43.6 kg/m²

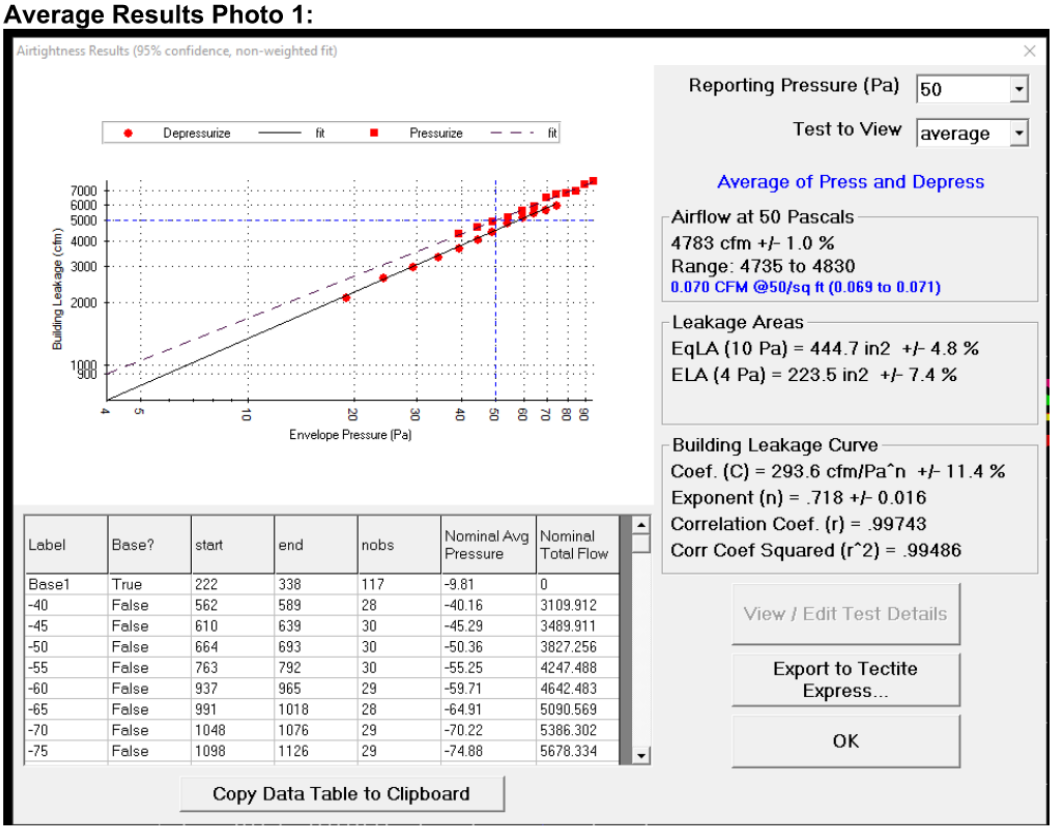
Indoors

9. Airtightness

Guarded blower door tests were performed by Steven Winter Associates (SWA) after the first residential floor was fully sealed. SWA performed a final blower door test upon substantial completion of the building.



Average Results Photo 1:



Label	Base?	start	end	nobs	Nominal Avg Pressure	Nominal Total Flow
Base1	True	222	338	117	-9.81	0
-40	False	562	589	28	-40.16	3109.912
-45	False	610	639	30	-45.29	3489.911
-50	False	664	693	30	-50.36	3827.256
-55	False	763	792	30	-55.25	4247.488
-60	False	937	965	29	-59.71	4642.483
-65	False	991	1018	28	-64.91	5090.569
-70	False	1048	1076	29	-70.22	5386.302
-75	False	1098	1126	29	-74.88	5678.334

Airtightness is provided by continuous vapor-permeable air barrier at drainage plane of all exterior wall assemblies (brick and EIFS). These tie into the roofing membrane at all roofs and into the concrete floor slab which acts as the c

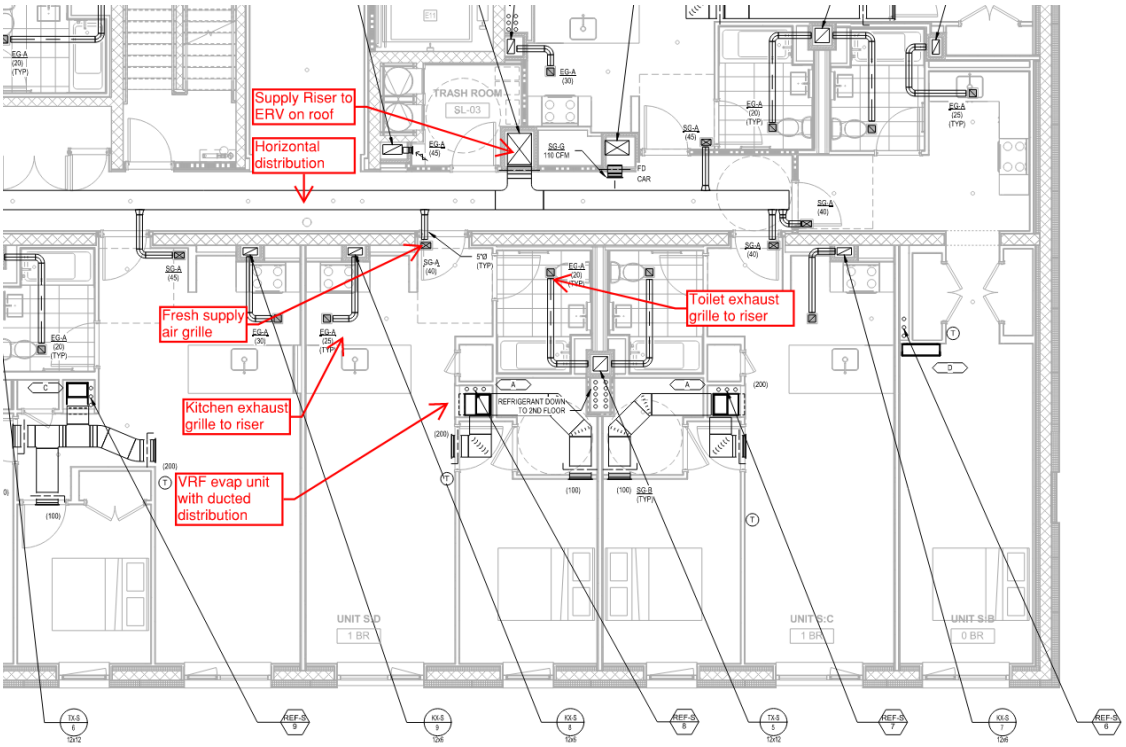
10. Ventilation Unit

There are multiple energy recovery ventilation units on the project. All provided by Swegon and equipped with MERV 13 filtration.

Ductwork that is located on the exterior of the builing is insulated with continuous insulation exceding R-10

Ventilation units with heat recovery				
	Recommended specifications to start planning: Frost protection: Yes; Humidity recovery: Yes	75 %		0,76
ID	Description	Effective heat recovery efficiency	Humidity recovery efficiency	Electric efficiency
	User defined area	%	%	W/cfm
01ud	SWEGON GOLD RX 35	86,0%	69,5%	0,75
02ud	SWEGON GOLD RX 11	75,0%	56,0%	0,35
03ud	Exhaust only	0,0%	0,0%	0,72
04ud	Trash room ERV - Swegon GOLD ARX 05	86,5%	67,5%	0,54

11. Ventilation Distribution



Air supply is delivered to each apartment near the entrance. From here it is pulled into the VRF evaporator return and blown via ductwork to the living spaces (living rooms and bedrooms). Return air is extracted from kitchens and bathrooms.

Ventilation units are centrally located on the roof and delover air to the apartments via large vertical ducts connecting to horizontal ducts running in each corridor. These ducts branch into indivudal aprtments.

The ventilation network was sealed with a product called Aeroseal. This product releases an aerosol adhesive into pressurized ductwork sealing holes as thin as a hair. The result is an 85-95% reduction in ductwork leakage.

Certificate of Completion

Duct Sealing Performed For:

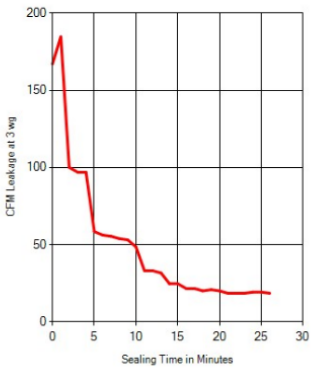
Sendero Verde
60 E 112
NY, NY 10029

Aeroseal Technician	**Nick Magliano**
Aeroseal Case ID	**3707**
Date of Seal	**11/17/2020**

Sealing Results

SMACNA Level	**8**
Initial CFM	**166.7**
Final CFM	**18.6**
Target CFM	**21.90**
Operating Pressure	**3 wg**
Surface Area	**1726.3 ft²**
Duct Leakage Reduction	**88.8%**

Aeroseal Sealing Profile



Model	
Duct Type	**Exhaust**
System Description	**Sendero Group 5**
Seal Description	**Sendero Group 5**
Hardware	**Gen2**

AEROSEAL®
Duct Sealing From The Inside

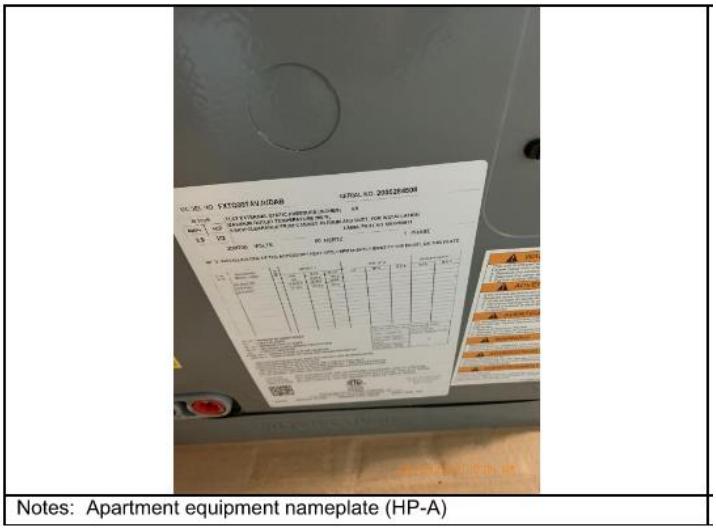
Duct Sealing Performed By:

R&S United Services
15 West Ranick Drive
Amityville NY 11701

12. Heating and Cooling

Heating and cooling is provided by a low-energy Daikin VRF system. Condensers are located on the roof and evaporator units are located inside the apartments in closets. These indoor units duct air from a central location to all habitable rooms. Refrigerant is run in vertical risers from condensers to evaporators.

Notes: Overview outdoor units on 10th floor east side roof



Notes: Apartment equipment nameplate (HP-A)

The indoor evaporator units fit nicely into closets within each apartment.

13. Building Costs

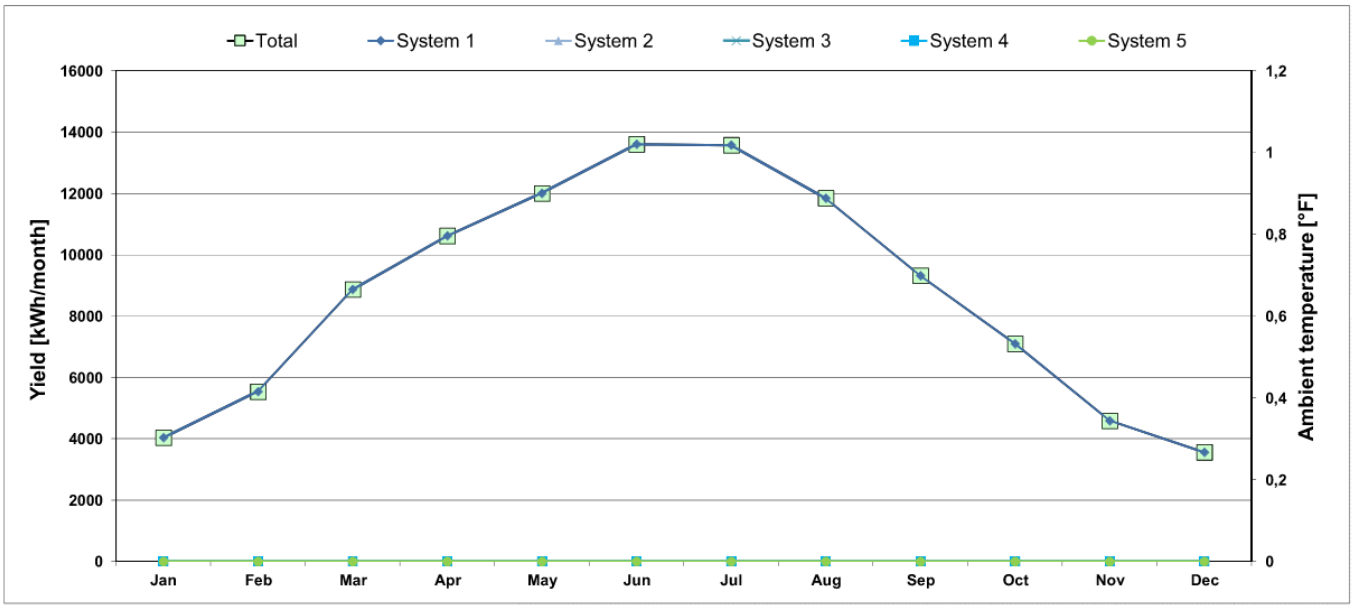
It is estimated that pursuing Passive Hosue certification for this project resulted ina 6.5% premium over the cost of a comparable building designed to meet local energy and building codes.

14. Literature

13. Photovoltaic System

The building grid-electricity dmeand is reduced by the incorporation of PV panels on the roof. The electrical design allows these panels to provide elecricity directly to the house meter powering corridors lighting.

							Total	
Annual electricity yield after the inverter, absolute	**104687**						**104687**	kWh/yr
Related to projected building footprint area	**10,40**						**10,40**	kWh/ft²A_{Projec}
Specific PE factor (non-renewable primary energy)	0,32							kWh_{prim_ne}/kWh_{Final}
Specific CO_2 equivalent emissions of the system	0,1076							lb/kWh
CO2-equivalent emissions according to 1-CO2 factors GEMIS 4.6 (Germany)	30003,4						30003,4	lb/yr
PE-Faktor nach 1-PE-factors (non-renewable) PHI Certification	0,00					0,00	0,00	BTU_{prim}/BTU_l



14. Building Costs

It is estimated that pursuing Passive Hosue certification for this project resulted ina 6.5% premium over the cost of a comparable building designed to meet local energy and building codes.

15. Literature

15. PHPP Summary

Passive House Verification

Building:	Sendero Verde - Building B South		
Street:	E 112th Street & Park Ave		
Postcode/City:	10029	New York City	
Province/Country:	Unites States	US-United States of America	
Building type:	Residential		
Climate data set:	US0055b-New York		
Climate zone:	4: Warm-temperate	Altitude of location:	16 ft
Home owner / Client:	L+M Development		
Street:	1865 Palmer Ave #203		
Postcode/City:	10538	Larchmont	
Province/Country:	New York	US-United States of America	

Architecture:	Handel Architects		
Street:	120 Broadway, 6th Floor		
Postcode/City:	10271	New York City	
Province/Country:	NY	US-United States of America	
Mechanical engineer:	Cosentini Consulting Engineers		
Street:	2 Pennsylvania Plaza		
Postcode/City:	10121	New York City	
Province/Country:	NY	US-United States of America	
Energy consultancy:	Steven Winter Associates		
Street:	307 7th Avenue, Suite 1701		
Postcode/City:	10001	New York City	
Province/Country:	NY	US-United States of America	
Certification:	Passive House Institute		
Street:	Rheinstr. 44/46		
Postcode/City:	64283		
Province/Country:	Darmstadt, Germany	DE-Germany	

Year of construction:	2020	Interior temperature winter [°F]:	68,0	Interior temp. summer [°F]:	77,0
No. of dwelling units:	85	Internal heat gains (IHG) heating case [BTU/(hr.ft²)]:	0,93	IHG cooling case [BTU/(hr.ft²)]:	1,24
No. of occupants:	197,0	Specific capacity [BTU/F per ft² TFA]:	23,2	Mechanical cooling:	x

Specific building characteristics with reference to the treated floor area

				Criteria	Alternative criteria	Fullfilled?[2]
	Treated floor area ft²	54900				
Space heating	Heating demand kBTU/(ft²yr)	4,10	≤	4,75	-	yes
Space cooling	Cooling & dehum. demand kBTU/(ft²yr)	4,43	≤	6,66	6,66	yes
	Frequency of excessively high humidity (> 0.012 lb/lb) %	0,0	≤	10		yes
Airtightness	Pressurization test result n_{50} 1/hr	0,4	≤	0,6		yes
Moisture protection				yes		
	Smallest temperature factor $f_{Rsi=1.42\ hr.ft^2.F/BTU}$ -	0,79	≥	0,65		yes
Thermal Comfort	All requirements fulfilled? -			yes		yes
Non-renewable Primary Energy (PE)	PE demand kBTU/(ft²yr)	46,13	≤	58,50		yes

[2] Empty field: Data missing; '-': No requirement

I confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The PHPP calculations are attached to this verification.

Passive House Classic? yes

Task:	First name:	Surname:	Signature:
2-Certifier	Dragos	Arnautu	

Certificate ID	Issued on:	City:
35884-35968_PHI_PH_20220825_DA	25.08.22	Darmstadt