THE NEW GRAVITY PROJECT

How Onion Flats is Driving NZE Affordable Housing Nationwide

ONION FLATS DEVELOPMENT

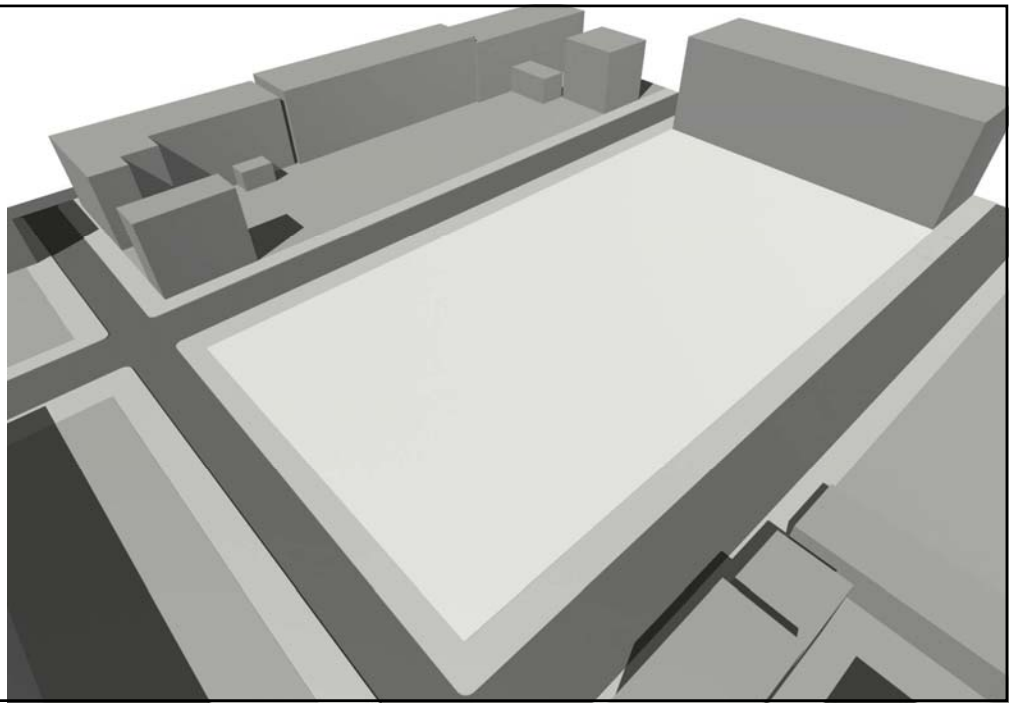
ONION FLATS ARCHITECTURE

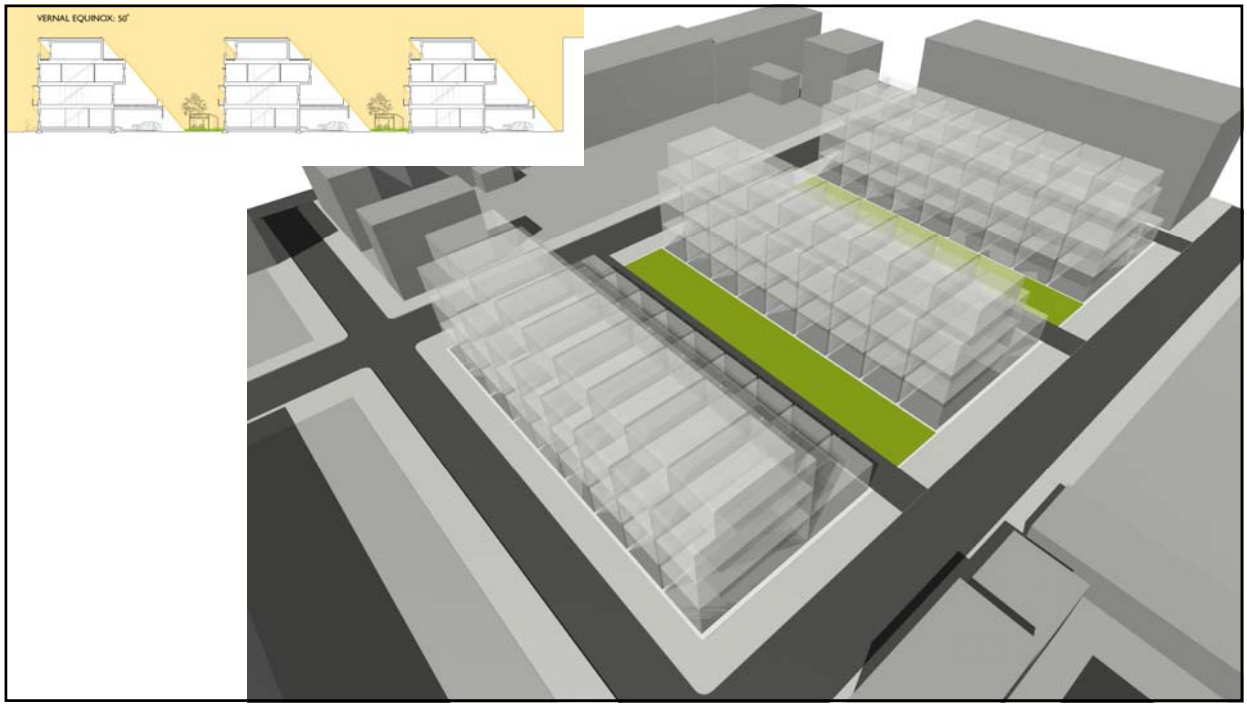
ONION FLATS CONSTRUCTION

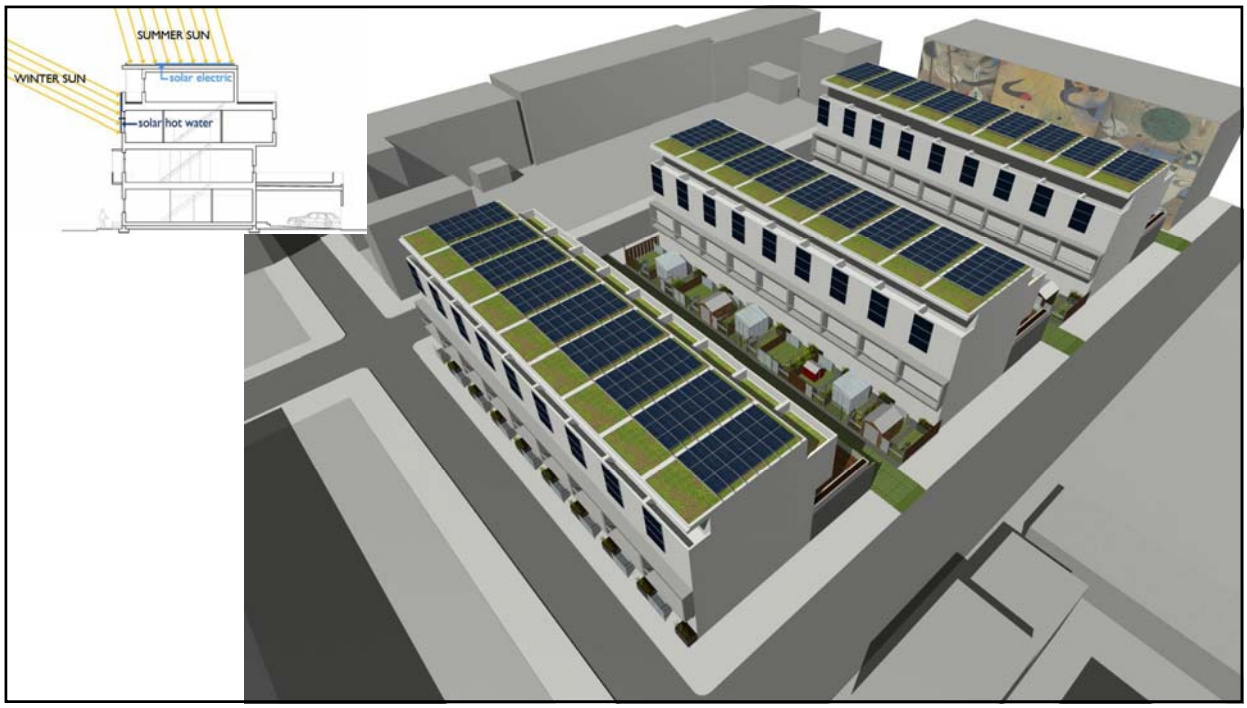
GREEN ROOFS GRASS SOLAR SYSTEMS

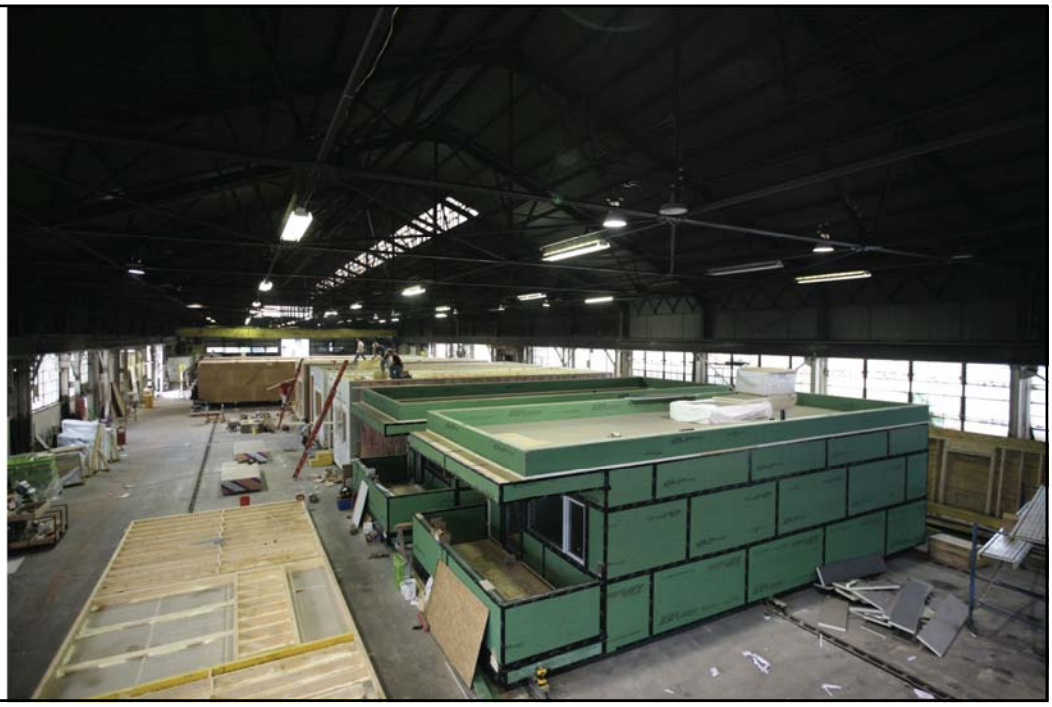
1997 - *2019*

STABLE FLATS 2015: 26 townhomes




VERNAL EQUINOX: 50°


SUMMER SUN
WINTER SUN
solar electric
solar hot water



FINAL AIRFLOW **.49 ACH 50**

MaGrann ASSOCIATES

ENERGY/BUILDING CONSULTANTS & ENGINEERS

One Crescent Drive • Philadelphia, PA 19112 • 1-888-MAGRANN • www.magrann.com

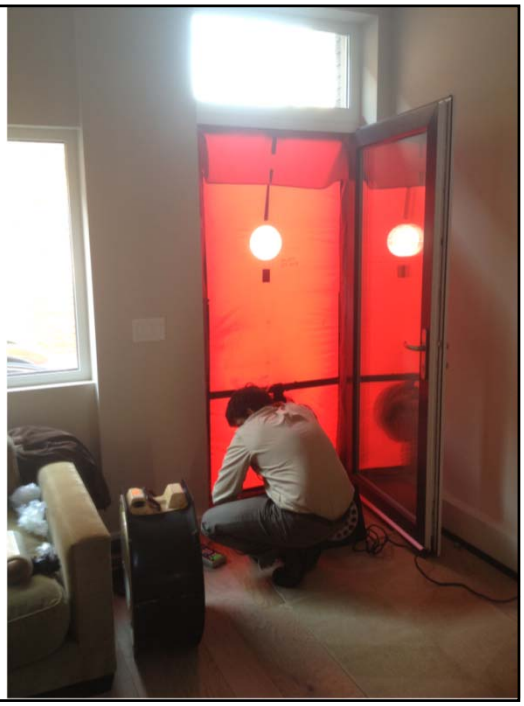
New Jersey • Pennsylvania • Kentucky • Ohio

BUILDING LEAKAGE TEST COMPARISON

Test #1		Test #2	
Test File:	Depressurization File	Test File:	Pressurization File
Date of Test:	7/5/2012	Date of Test:	7/5/2012
Customer:	Onion Flats, LLC 111 West Norris Street Philadelphia, Pennsylvania 19122	Customer:	Onion Flats
Phone:	215-783-5591		

Test Results

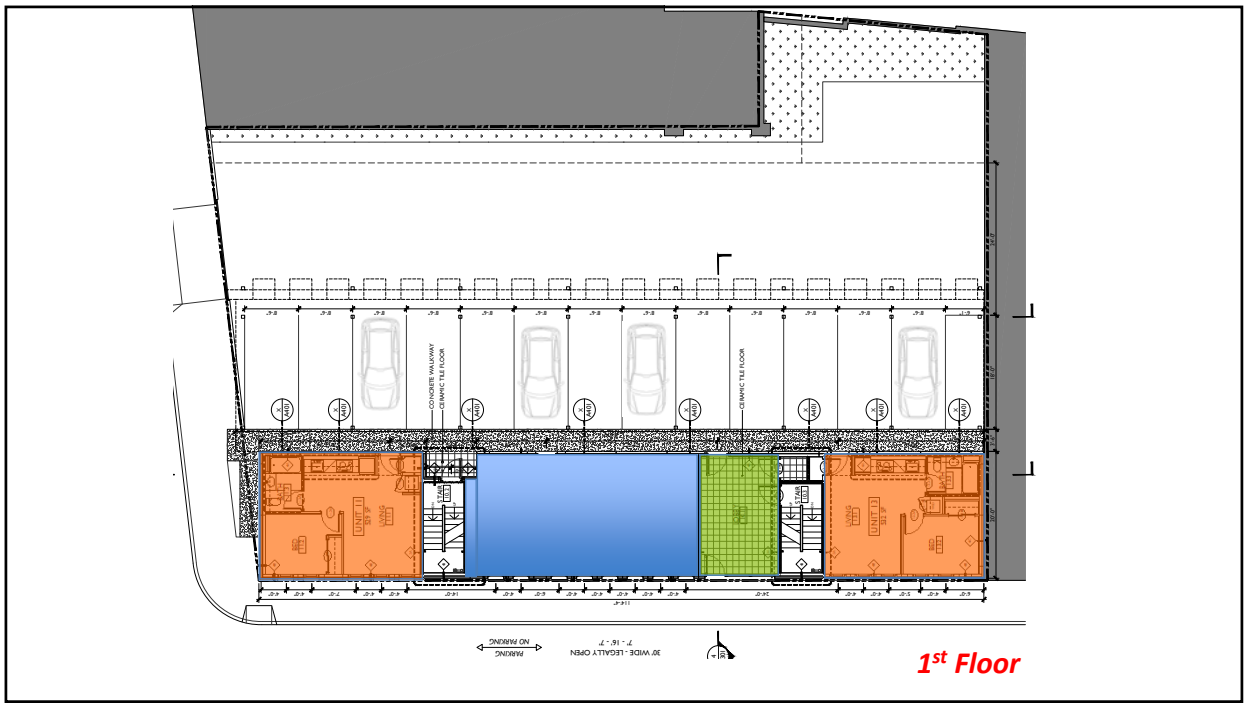
	Test #1	Test #2	Change	Percent
1. Airflow at 50 Pascals:	293 CFM 0.48 ACH	201 CFM 0.33 ACH	-92 CFM -0.15 ACH	-31.4 % -31.4 %

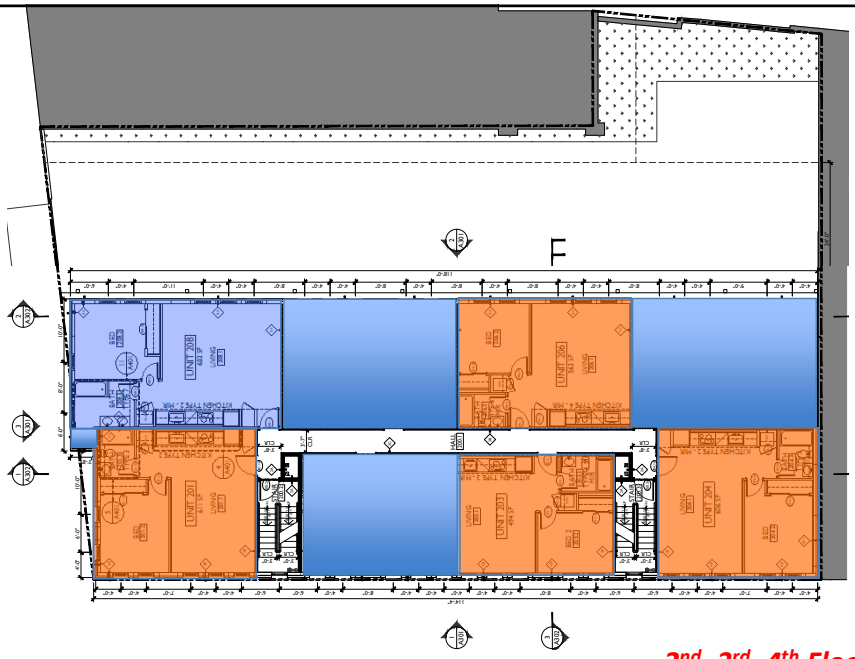


** 12 Months of Measured Data*

Address	TFA sf	12 Months kWh Total	PV kWh	NET	COST $/Yr
235 George	1908	13,088	4172	8916	$1079 $90/m
Typical Code Building		40,068	68% BETTER		$4407 $367/m

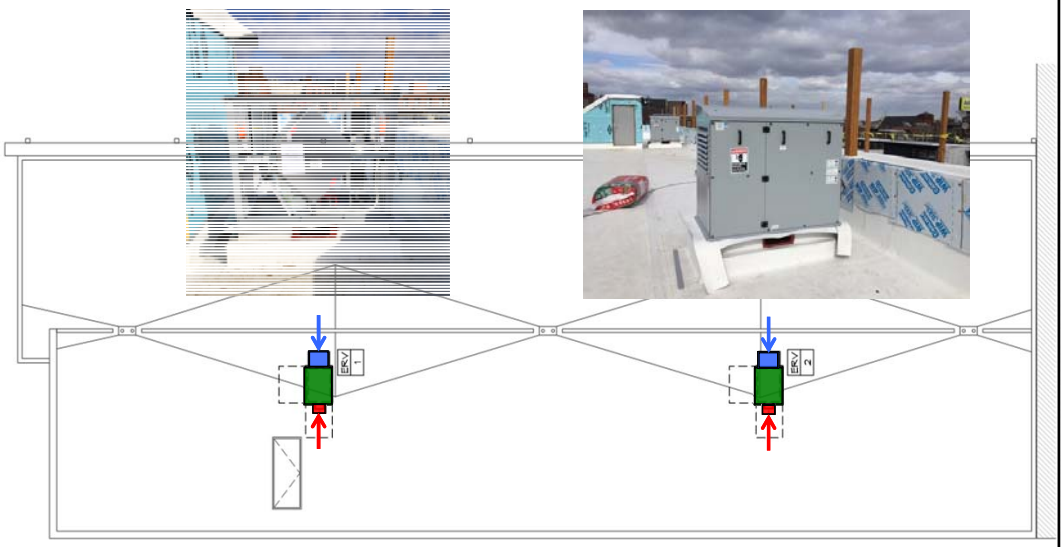
PHASE 1
THE FACTORY
1999
PHASE 3
THE BATTERY
2017
PHASE 2
THIN FLATS
2008
CAPITAL FLATS : 3 PHASES, 42 UNITS, 18 YEARS


1st Floor

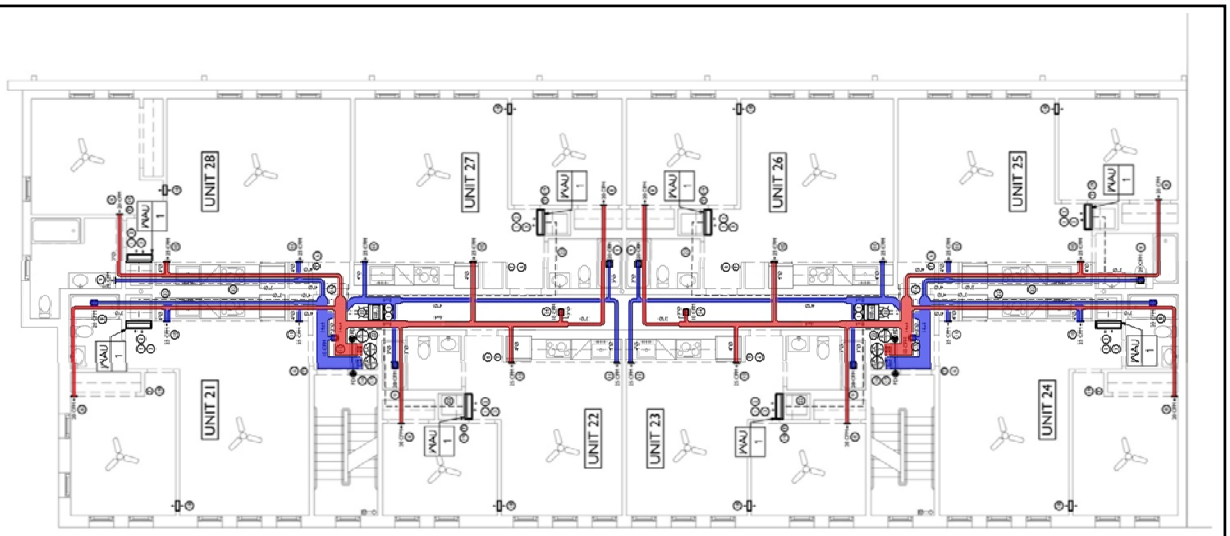


2nd, 3rd, 4th Floors

ONE WAY
STOP



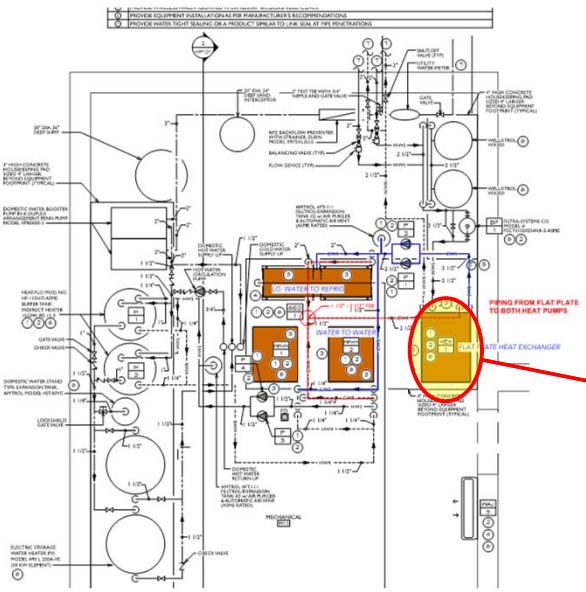
Balanced/Centralized Ventilation, 2 Ventacity 2000cfm ERVs



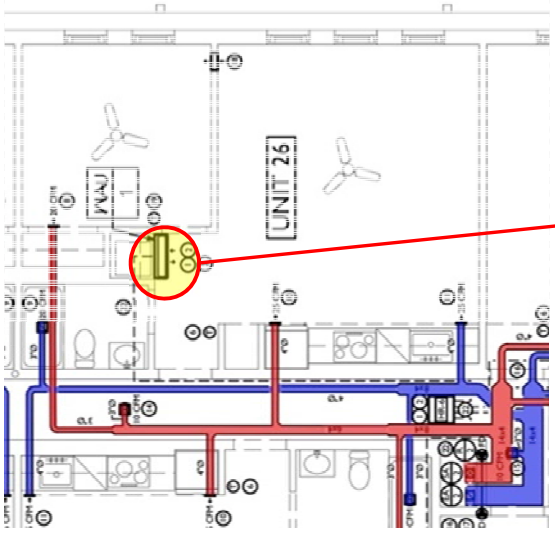
2nd-4th Floors

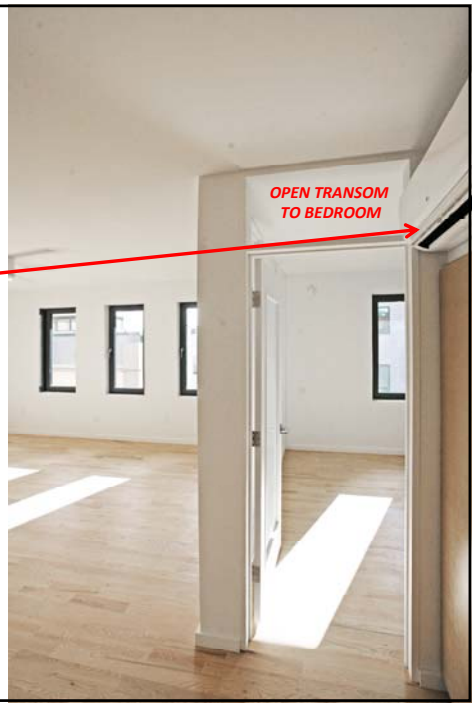
Balanced/Centralized Ventilation, 2 Ventacity 2000cfm ERVs

GEOTHERMAL



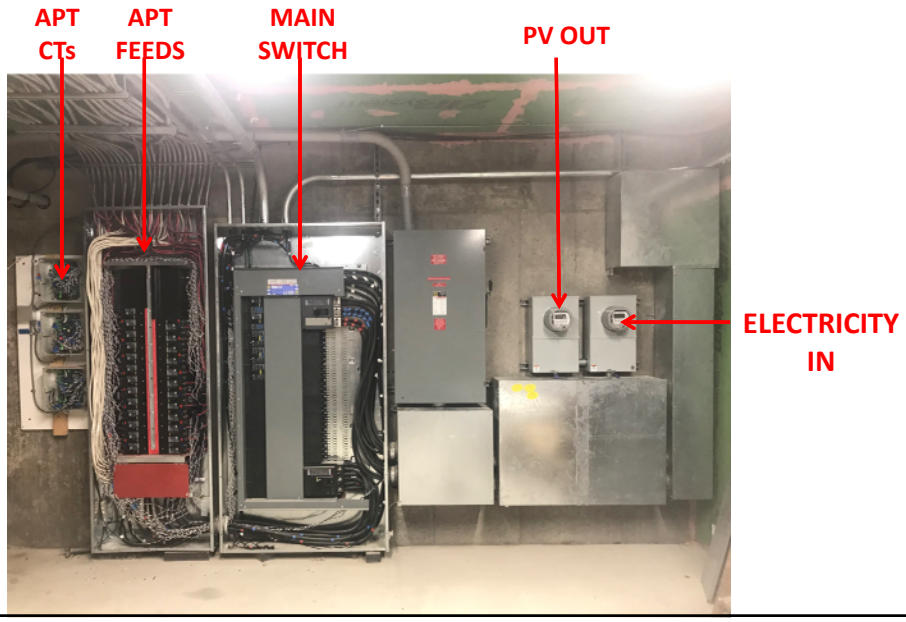
FLAT PLATE HEAT EXCHANGER





Ductless Evaporator located next to open transom and intentionally located above laundry for easy connection of condensate drain

ONE METER: Metering vs Monitoring - Why double up??



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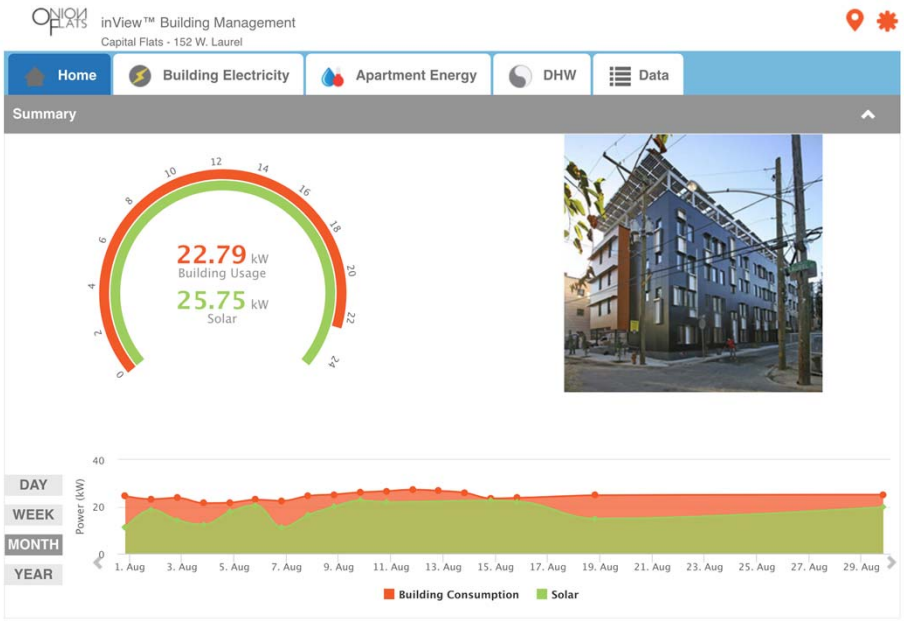
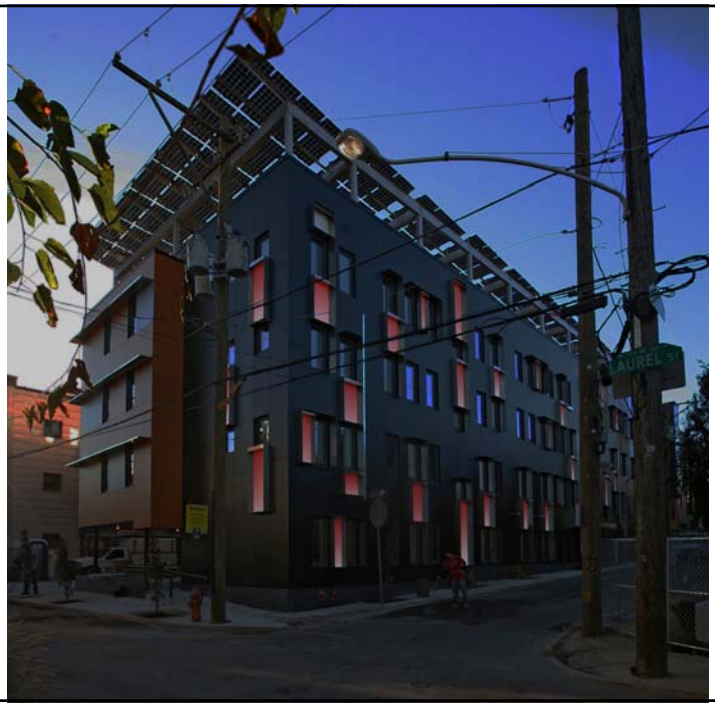


FINAL BLOWER DOOR TEST
Sept 29, 2017
.53 ACH50

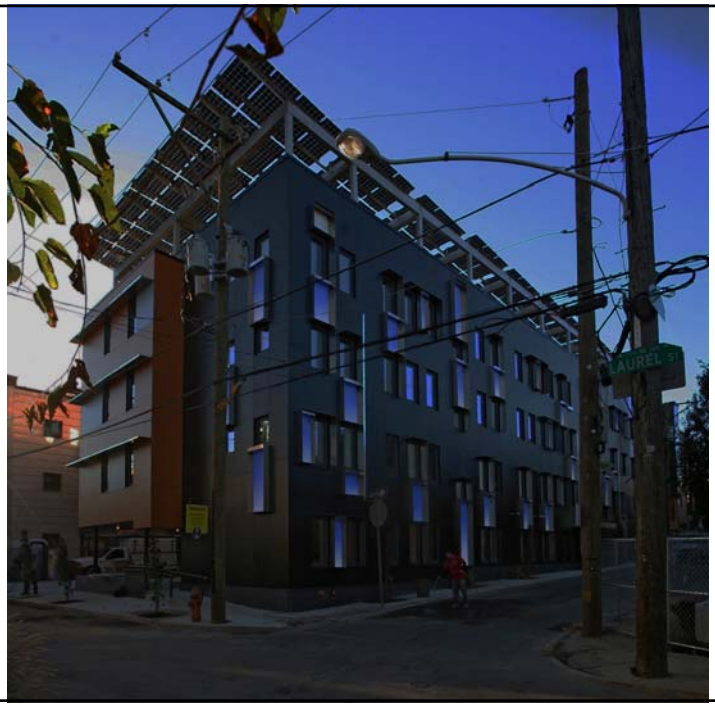
Meeting the Energy Budget

Cautionary YELLOW!!!

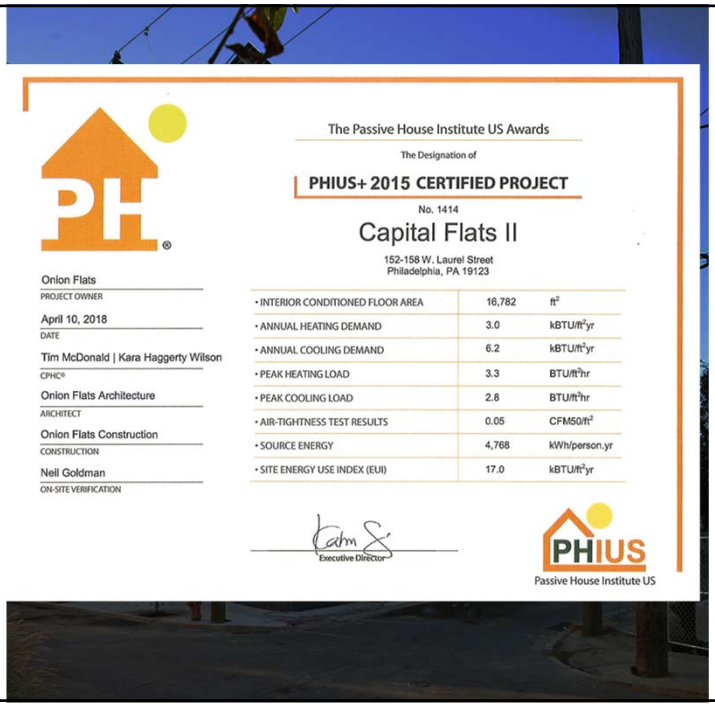


BLOWING the energy budget!!

WHO'S WHO???



A beautiful night sky



The Passive House Institute US Awards

The Designation of

PHIUS+ 2015 CERTIFIED PROJECT

No. 1414

Capital Flats II

152-158 W. Laurel Street
Philadelphia, PA 19123

Onion Flats
PROJECT OWNER

April 10, 2018
DATE

Tim McDonald | Kara Haggerty Wilson
CPHC®

Onion Flats Architecture
ARCHITECT

Onion Flats Construction
CONSTRUCTION

Neil Goldman
ON-SITE VERIFICATION

• INTERIOR CONDITIONED FLOOR AREA	16,782	ft^2
• ANNUAL HEATING DEMAND	3.0	$kBTU/ft^2yr$
• ANNUAL COOLING DEMAND	6.2	$kBTU/ft^2yr$
• PEAK HEATING LOAD	3.3	BTU/ft^2hr
• PEAK COOLING LOAD	2.8	BTU/ft^2hr
• AIR-TIGHTNESS TEST RESULTS	0.05	$CFM50/ft^2$
• SOURCE ENERGY	4,768	kWh/person.yr
• SITE ENERGY USE INDEX (EUI)	17.0	$kBTU/ft^2yr$

Executive Director

PHIUS
Passive House Institute US

Passive House verification

Building:	Capital Flats II
Street Address:	152-158 W Laurel Street / 935-937 N Hancock Street
City, State, Zip:	Philadelphia, PA
Country:	USA
Building type:	apartment building
Climate:	PHILA INT AP PA — Altitude of building site (feet above sea level): 17
Home owner / Client:	
Street Address:	
City, State, Zip:	
Architecture:	Onion Flats | Architecture
Street Address:	111 W Norris Street
City, State, Zip:	Philadelphia, PA 19122
Mechanical system:	
Street Address:	
City, State, Zip:	

Year of construction:	2016	Interior temperature winter:	68.0 °F	Enclosed volume V_e ft³	128293
No. of dwelling units:	25	Interior temperature summer:	77.0 °F	Mechanical cooling	x
No. of occupants:	53.0	Internal heat sources winter:	1.40 BTU/h.ft²		
Spec. capacity:	11 BTU/F per ft² TFA	Ditto summer:	1.92 BTU/h.ft²		

Specific building demands with reference to the treated floor area

					Requirements	Fulfilled?*
	Treated floor area	16782	ft²			
Space heating	Heating demand	2.35	kBTU/(ft²yr)	52% of	4.50 kBTU/(ft²yr)	yes
	Heating load	2.97	BTU/(hr.ft²)	71% of	4.20 BTU/(hr.ft²)	yes
Space cooling	Overall specif. space cooling demand	6.11	kBTU/(ft²yr)	98% of	6.26 kBTU/(ft²yr)	yes
	Cooling load	2.75	BTU/(hr.ft²)	59% of	4.70 BTU/(hr.ft²)	yes
	Frequency of overheating (> 77 °F)		%		-	-
Primary energy (Heating, cooling, auxiliary electricity; dehumidification, DHW, lighting, electrical appliances)		45.2	kBTU/(ft²yr)	68% of	66.8 kBTU/(ft²yr)	yes
	DHW, space heating and auxiliary electricity	24.6	kBTU/(ft²yr)		-	-
	Specific primary energy reduction through solar electricity		kBTU/(ft²yr)		-	-
Airtightness	Pressurization test result n_{50}	0.53	1/h		0.53 1/h	yes

* empty field: data missing; ☐ no requirement

Passive House?	yes

210 mods x 370 watts = 77 kW system

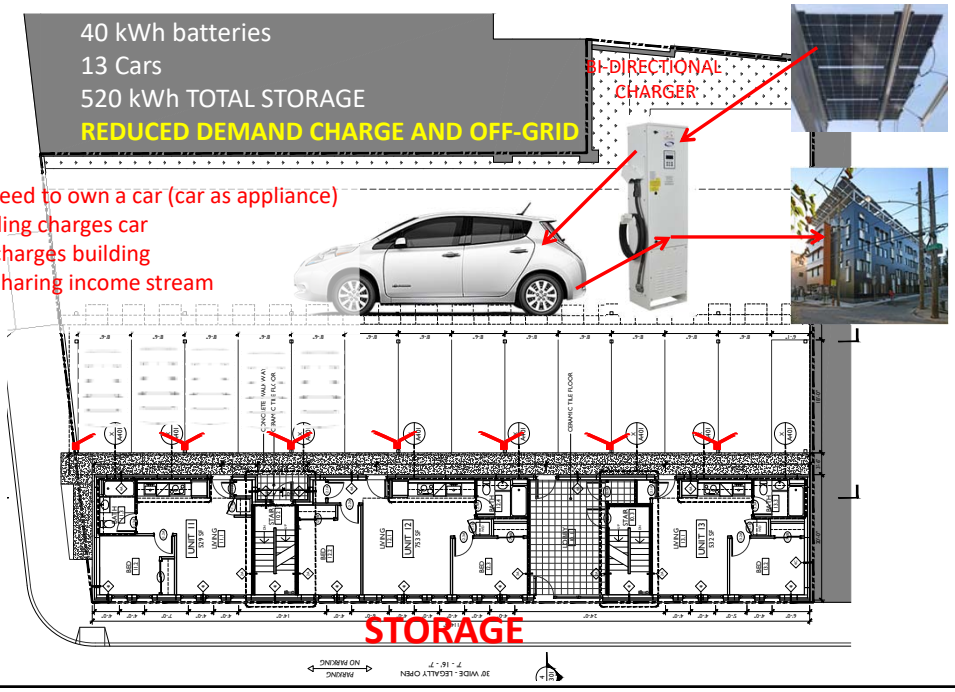
PHIUS+ 2015 Multi-Family Calculator	
*Results in green	
$iCFA_{TOTAL}$ (ft²)	16,782

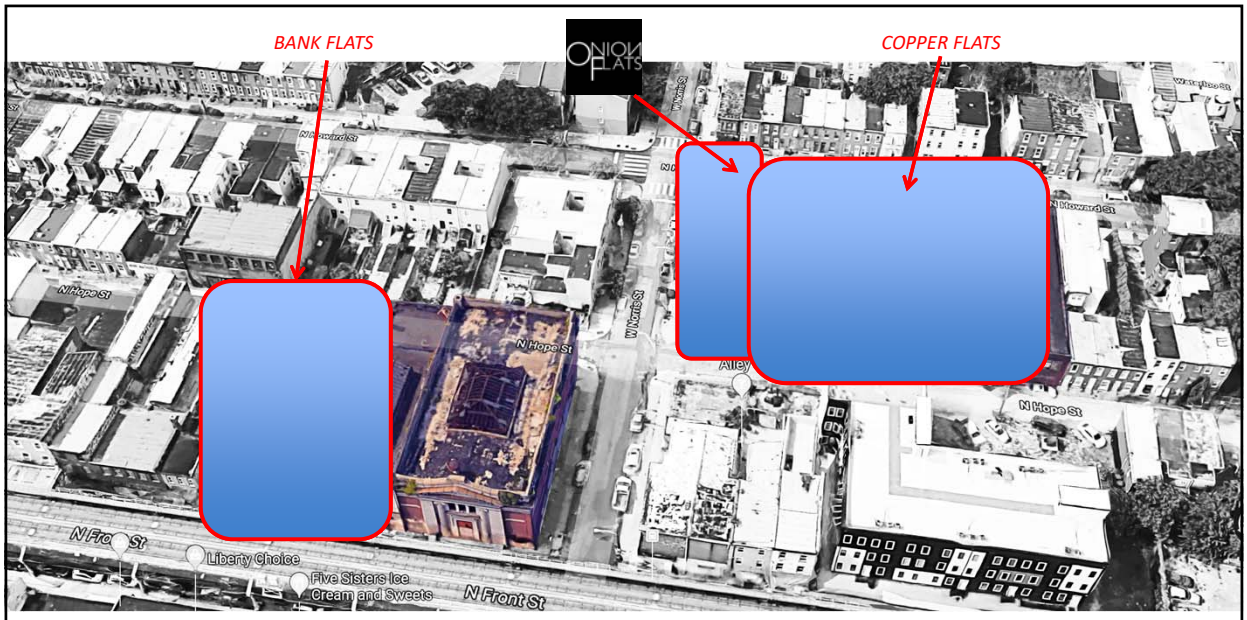
PV Utilization	
Site electricity (kWh/yr)	84085
Output from PV Watts (kWh/yr)	98554
http://pvwatts.nrel.gov	
Annual PV Output/Annual Electricity Demand	1.17
Utilization fraction from utilization curve	0.334
Primary Energy offset by PV (kBTU/ft²yr)	21.15

Primary Energy
45 kBTU/sf/yr
Site Energy: 84,085 kWh/yr
Output from PV 98,554 kWh/yr

40 kWh batteries
13 Cars
520 kWh TOTAL STORAGE
REDUCED DEMAND CHARGE AND OFF-GRID

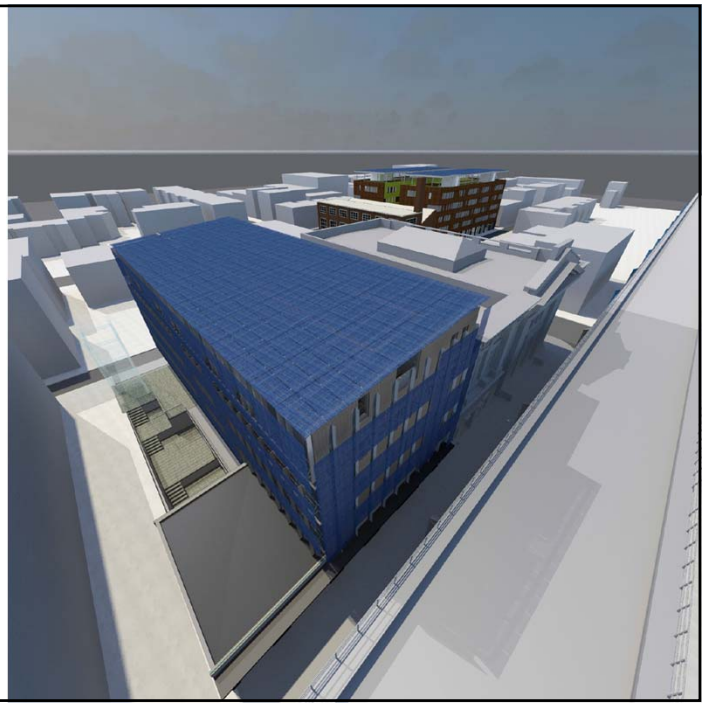
1. No need to own a car (car as appliance)
2. Building charges car
3. Car charges building
4. Car sharing income stream





BANK FLATS 2019: 28 units and retail

COPPER FLATS 2020: 88 units



BANK FLATS 2019: 28 units and retail

- *28 Apartments (300-450sf)*
- *24,141 sf*
- *R34 walls, Buildsmart system*
- *R 54 roof/floors*
- *.2 Uvalue windows DOUBLE PANE*
- *.28 SHGC*
- *DE-Centralized VentilationERV*
- *SEMI-Centralized Hot Water*
- *DE-Centralized heating/cooling*
- *DE-Centralized Electric Metering*
- *174 kw PV array to get to Net POSITIVE Energy*

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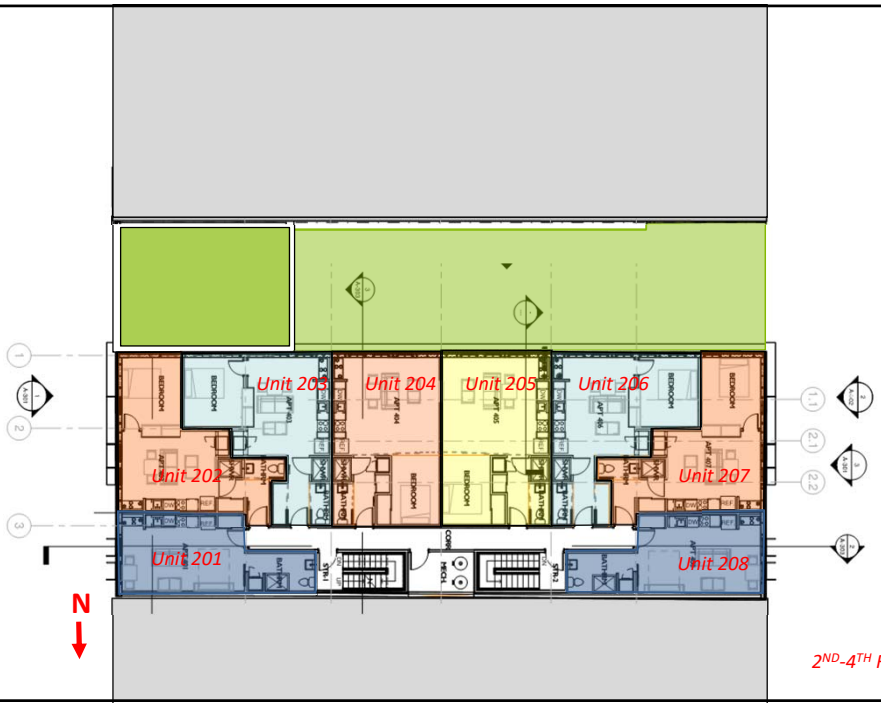
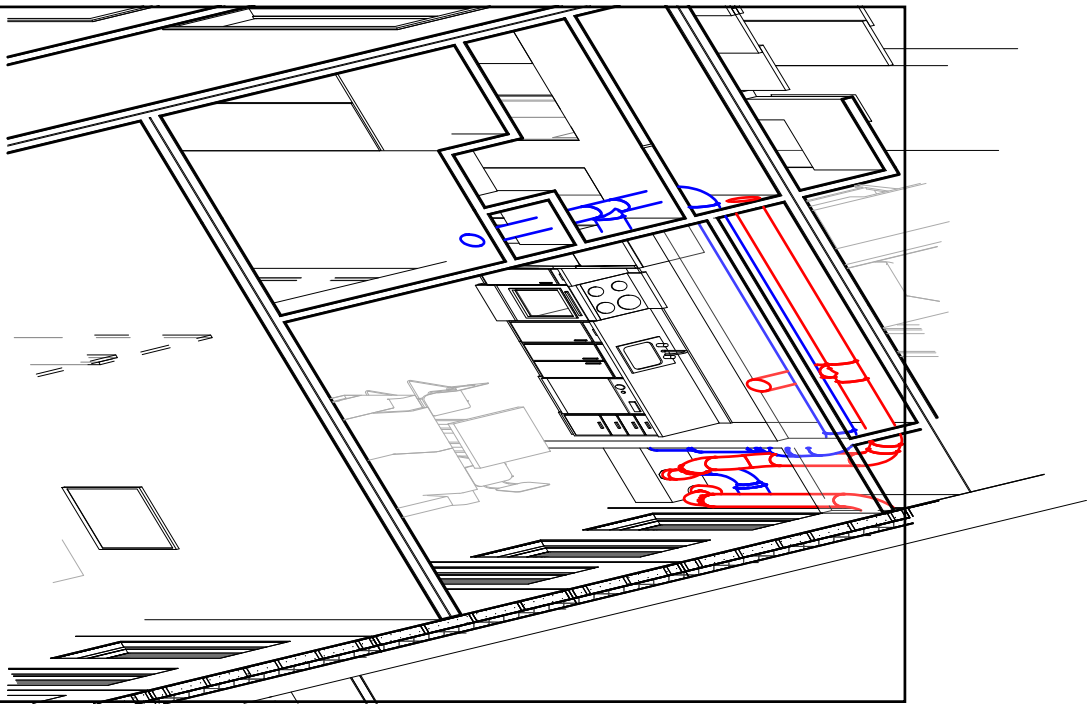


HEATING, COOLING, VENTILATION

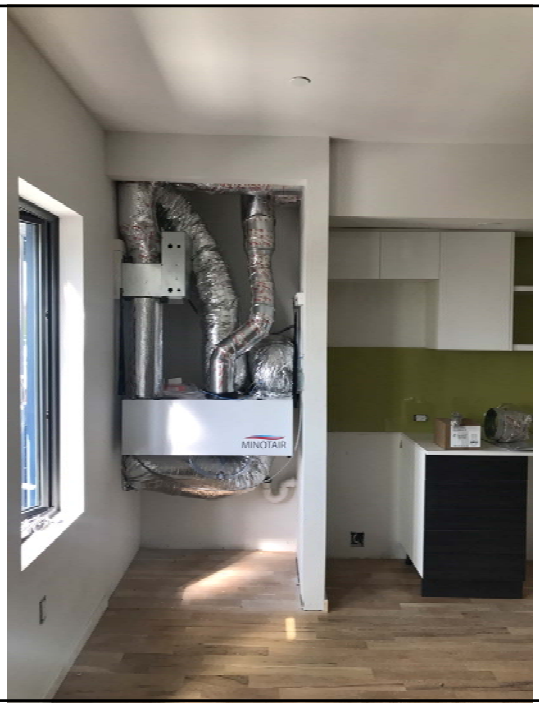
MINOTAIR

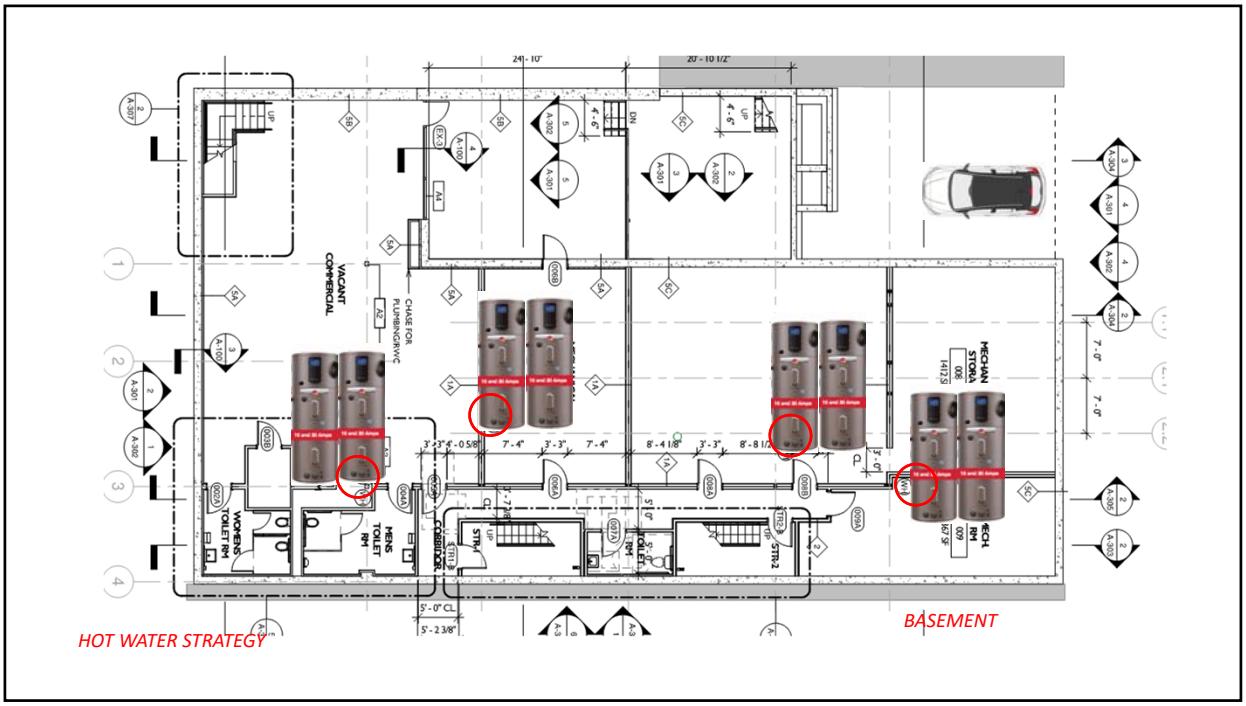
- *Decentralized*
- *Combination ERV, heating, cooling, dehumidification*
- *Condenser self-contained*
- *No separate HVAC needed for hallways*

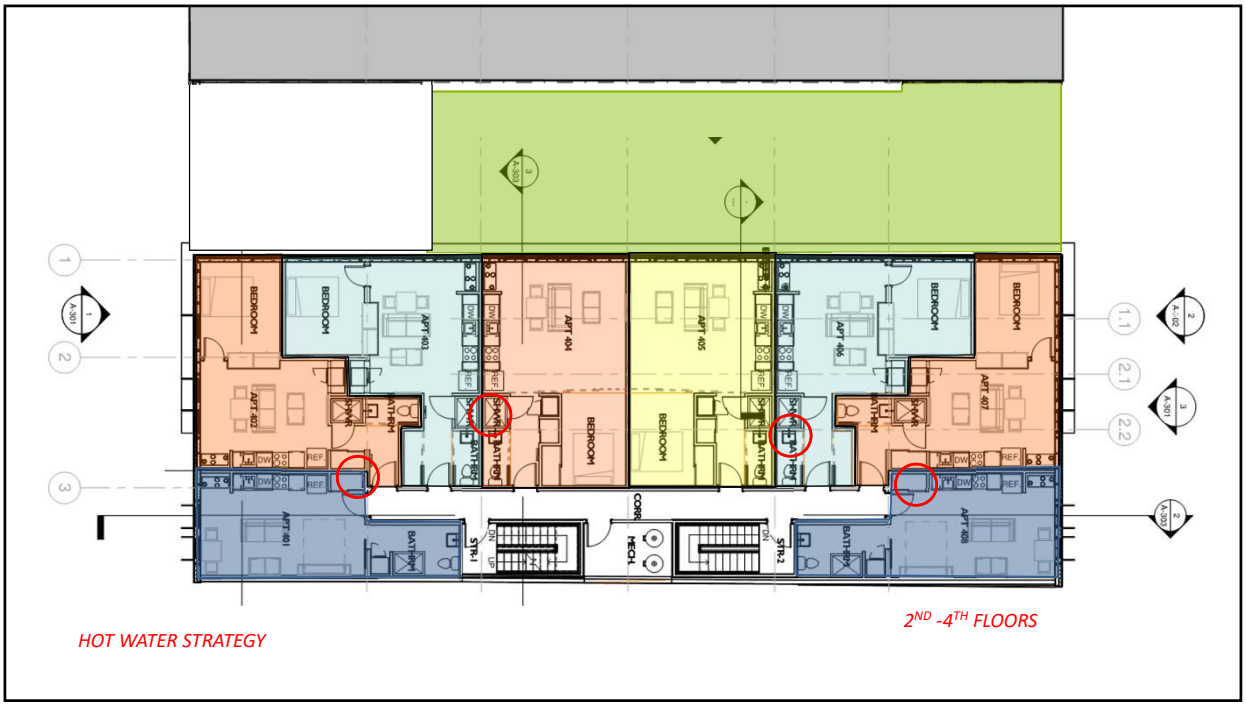
2ND-4TH FLOORS

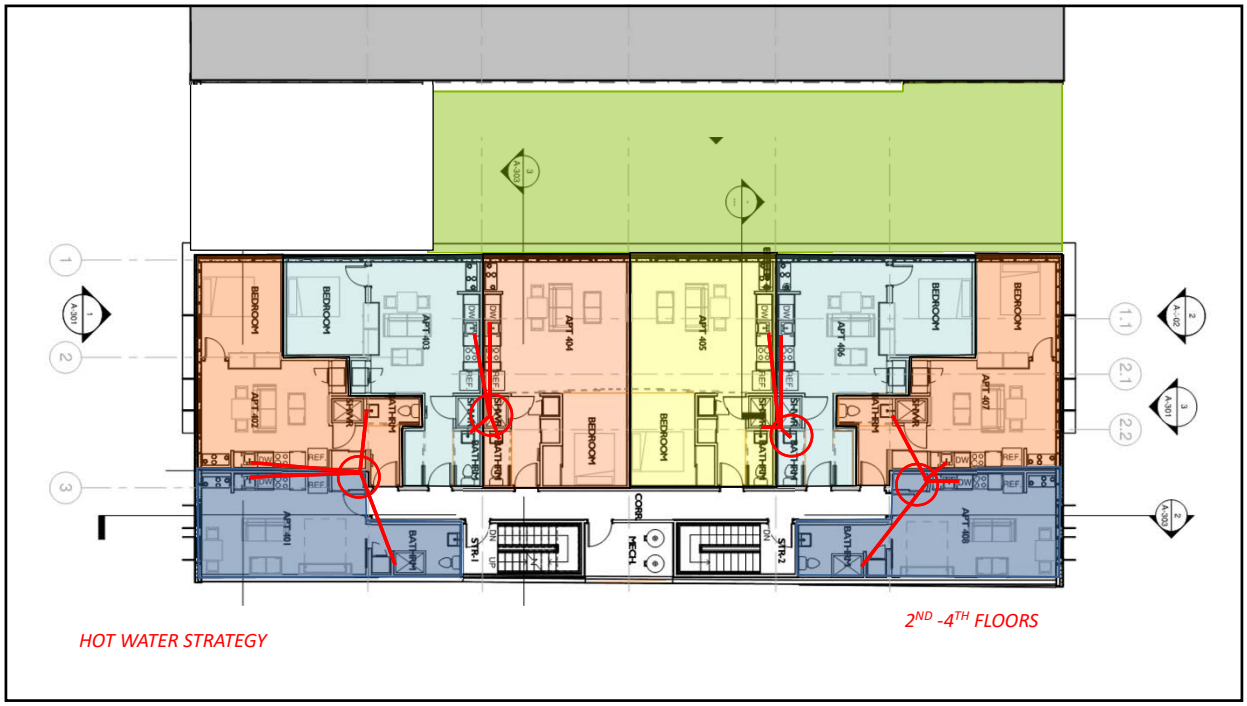


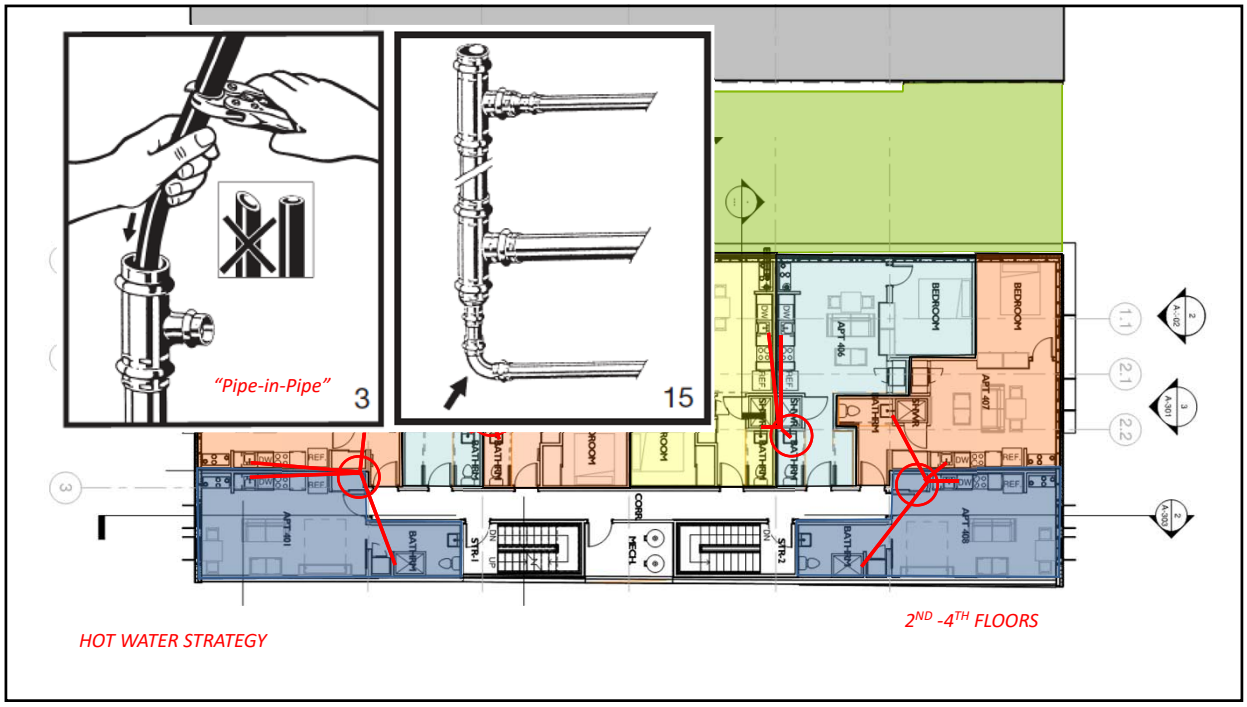
DUCTING STRAGETY

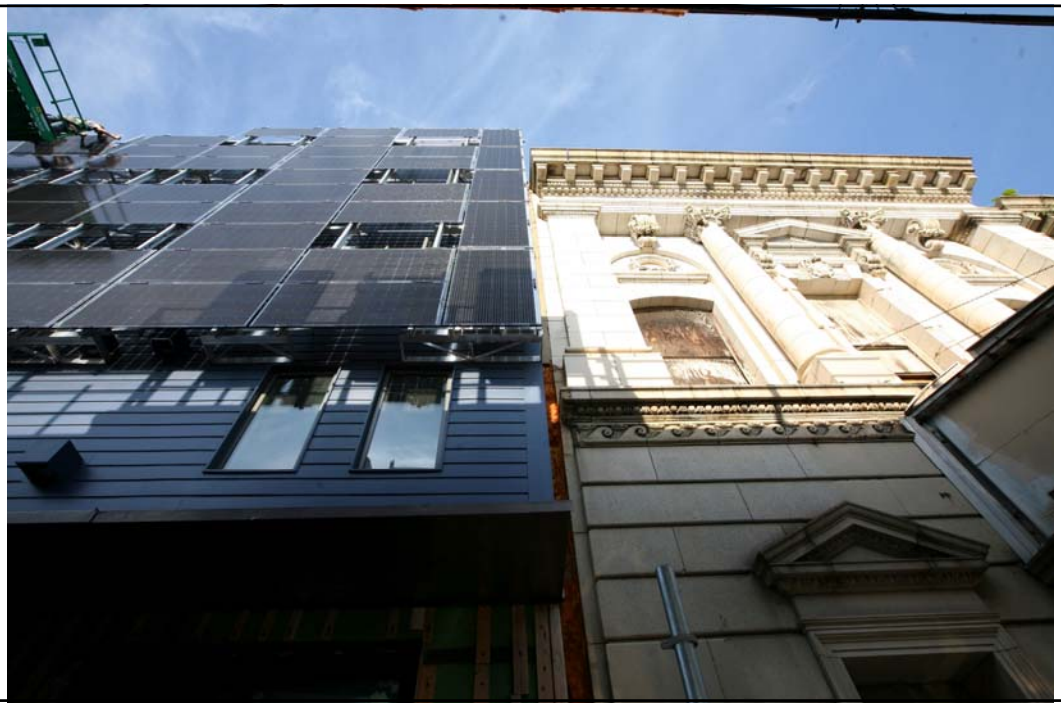

MINOTAIR

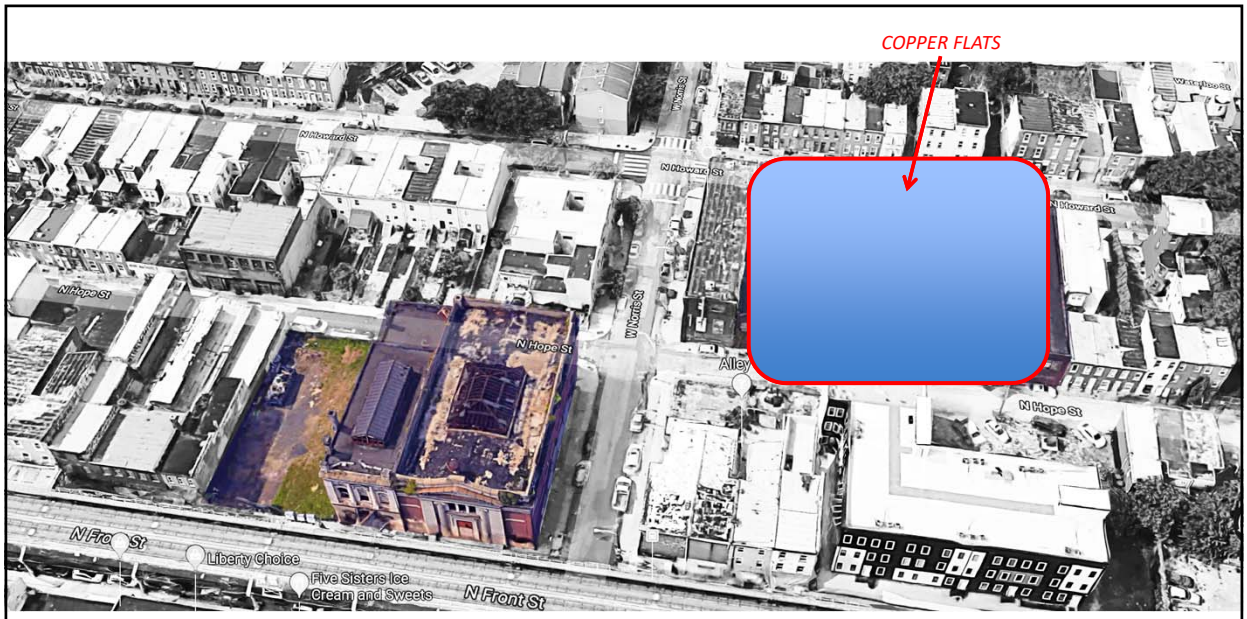

VACANT COMMERCIAL
CHASE FOR PLUMBING/HVAC
WOMENS TOILET RM
MENS TOILET RM
CORRIDOR
MECHAN STORA
MECH. RM
HOT WATER STRATEGY
BASEMENT


BEDROOM
APT 401
APT 402
APT 403
APT 404
APT 405
APT 406
APT 407
APT 408
BATHRM
CORR.
MECH.
HOT WATER STRATEGY
2ND -4TH FLOORS


HOT WATER STRATEGY
2ND -4TH FLOORS


"Pipe-in-Pipe"
3
15
HOT WATER STRATEGY
2ND -4TH FLOORS





COPPER FLATS 2020: 88 units

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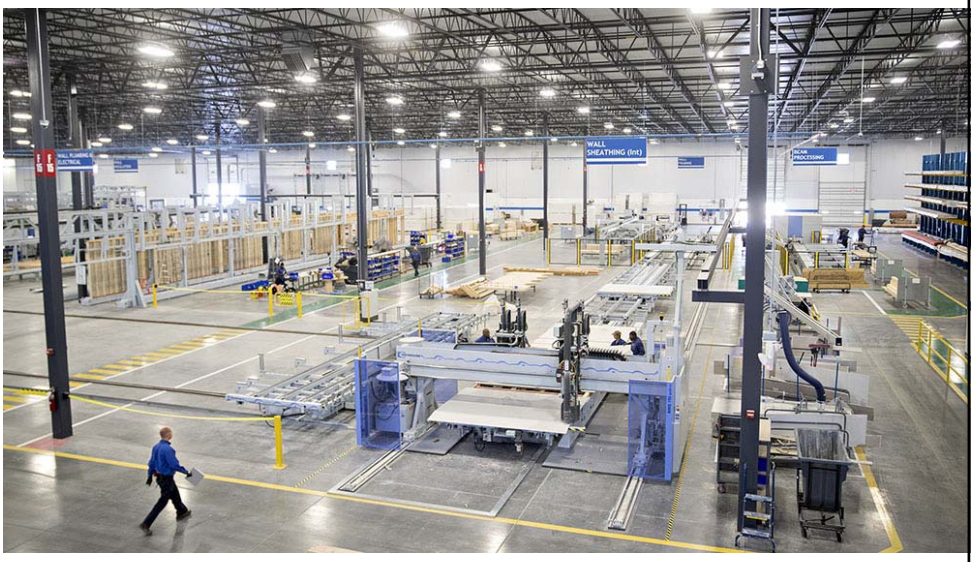
blueprint robotics

THE BLUEPRINT METHOD

COPPER FLATS 2020: 88 units

blueprint robotics



COPPER FLATS 2020: 88 units

BELFIELD HOMES
PHILADELPHIA, PENNSYLVANIA 19141

ONION FLATS

NON-PROFIT COMMUNITY ORGANIZATION
RAISE OF HOPE

PHILADELPHIA REDEVELOPMENT AUTHORITY

BELFIELD TOWNHOMES, 2006: 3 subsidized housing units

FIRST

CERTIFIED

PASSIVE HOUSE
IN
PENNSYLVANIA

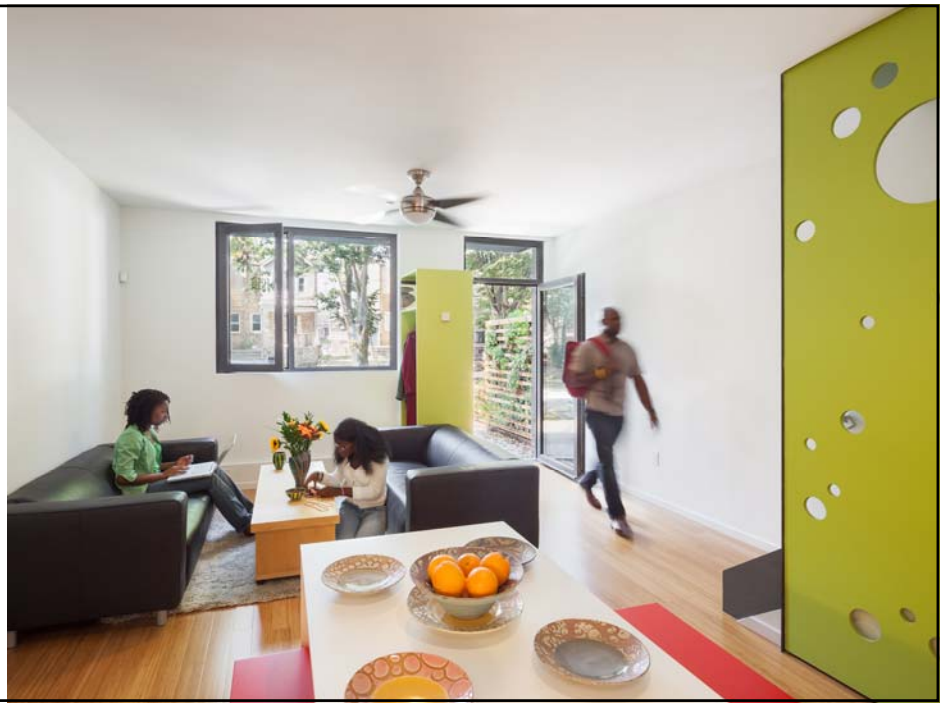
START: APRIL 20, 2012

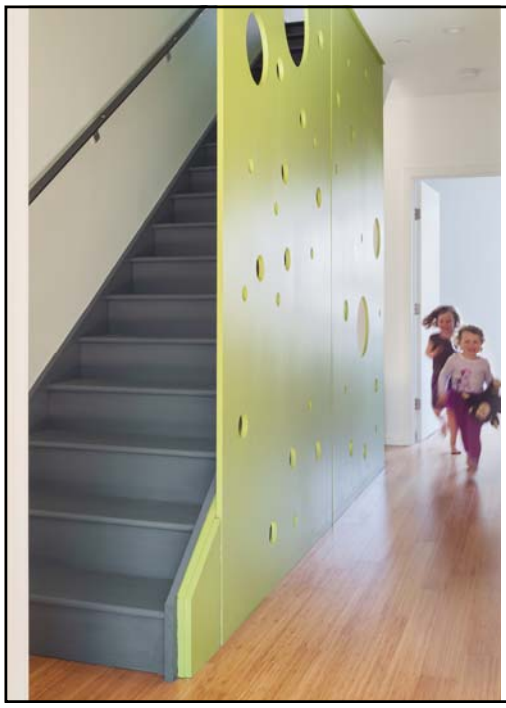
CERTIFICATE OF OCCUPANCY: JULY 20, 2012

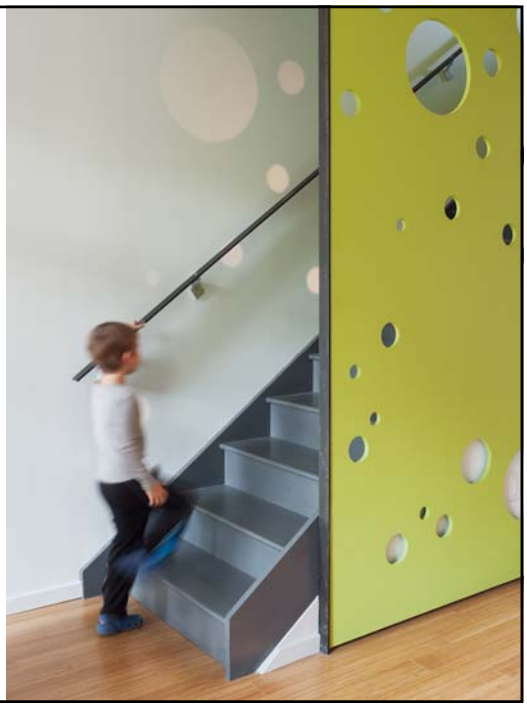
RECIPIENT OF THE
2014 INTERNATIONAL
PASSIVE HOUSE AWARD

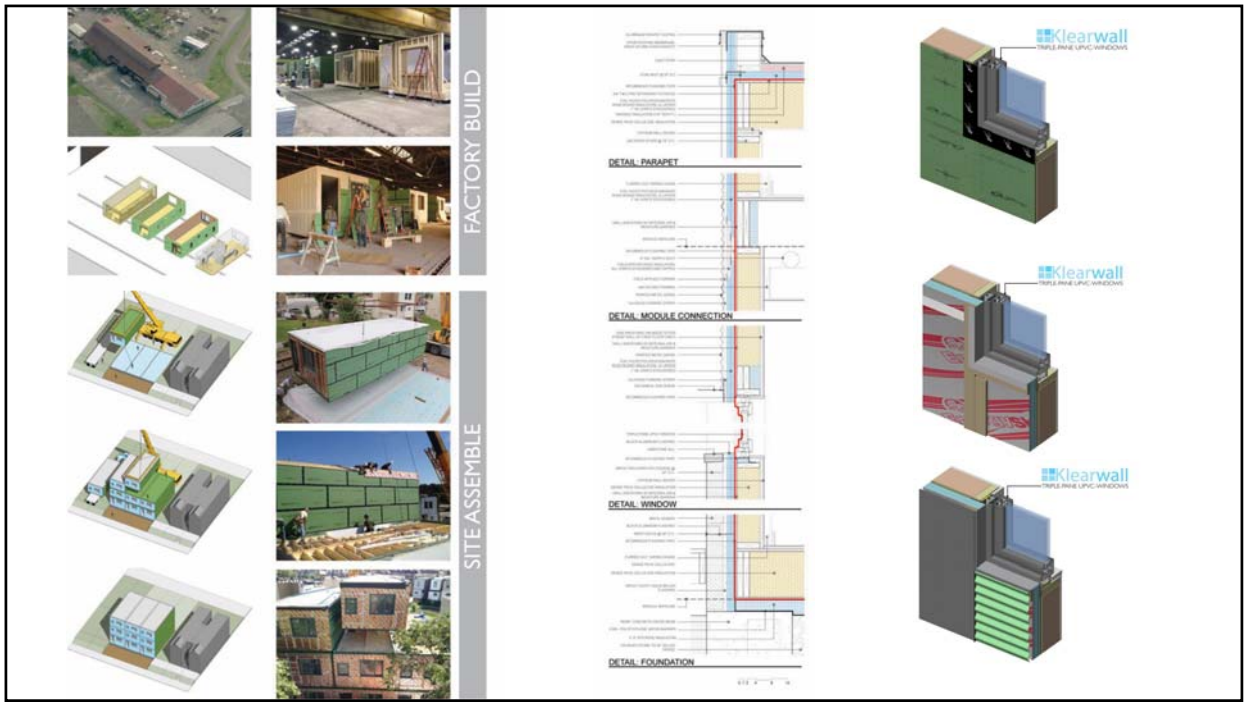
SECOND PLACE WINNER
2015 PHIUS AWARD
"AFFORDABLE HOUSING"

AIA
2013
HONOR
AWARD








FACTORY BUILD
SITE ASSEMBLE
DETAIL: PARAPET
DETAIL: MODULE CONNECTION
DETAIL: WINDOW
DETAIL: FOUNDATION
Klearwall
Klearwall
Klearwall

ENERGY/BUILDING CONSULTANTS & ENGINEERS
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New Jersey • Pennsylvania • Kentucky • Ohio

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Phone:	215-783-5591		

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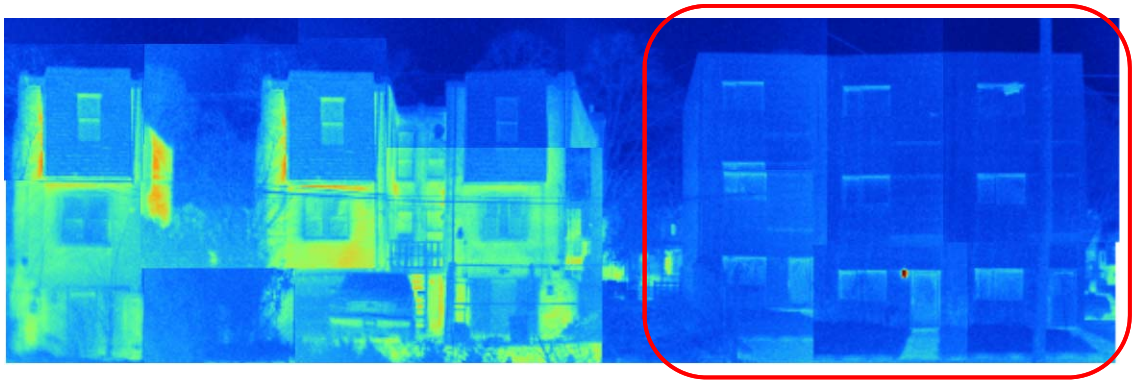
	0.48 ACH	0.33 ACH	-0.15 ACH	-31.4 %

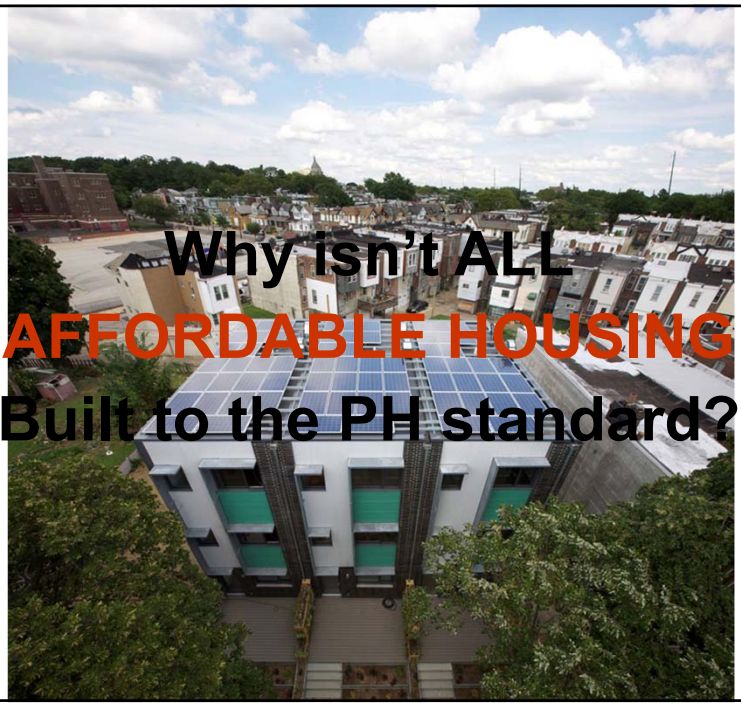
FINAL AIRFLOW: **0.405 ACH 50**

PASSIVE HOUSE MAX **0.6 ACH 50**



CONSTRUCTION COSTS

	PER UNIT	PROJECT TOTAL
GENERAL CONDITIONS	$1,500	$4,500
EXCAVATION & GRADING	$3,000	$9,000
FOUNDATIONS	$7,000	$21,000
HELICAL PIERS	$6,500	$19,500
SITE UTILITIES (WATER / SEWER / ELECTRIC)	$10,000	$30,000
SOLAR PV (5 KW PER HOUSE - 15KW TOTAL)	$15,000	$45,000
TOTAL SITE WORK	$43,000	$129,000
FRAMING / INSULATION / SHEETROCK / PAINT	$50,250	$150,750
EXT. WINDOWS & DOORS	$9,850	$29,550
MECHANICAL SYSTEM	$8,500	$25,500
PLUMBING & SPRINKLERS	$9,500	$28,500
ELECTRICAL	$5,500	$16,500
CABINETRY / COUNTERTOPS	$5,500	$16,500
APPLIANCES	$6,200	$18,600
HARDARE & FINISHES	$9,300	$27,900
EXTERIOR CLADDING	$4,500	$13,500
E-MONITORING	$1,900	$5,700
LABOR / INSPECTIONS / OH-P / DELIVERY / INSTALL	$95,000	$285,000
TOTAL MODULAR	$206,000	$618,000.00
TOTAL HARD COSTS	$249,000	$747,000.00
COST PER SQFT **(1920 SQFT x 3 HOMES = 5760 SQFT)**		**$129.69**

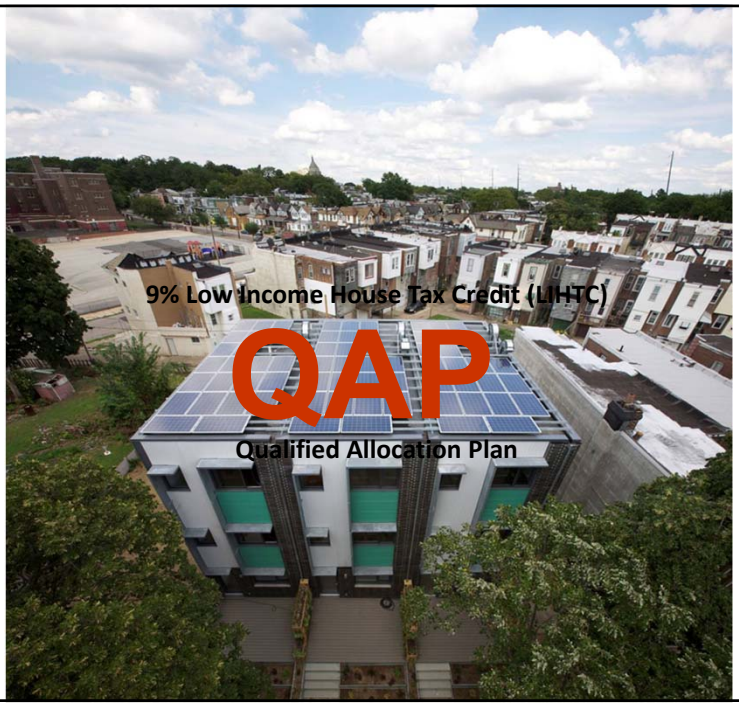

Why isn't ALL
AFFORDABLE HOUSING
Built to the PH standard?

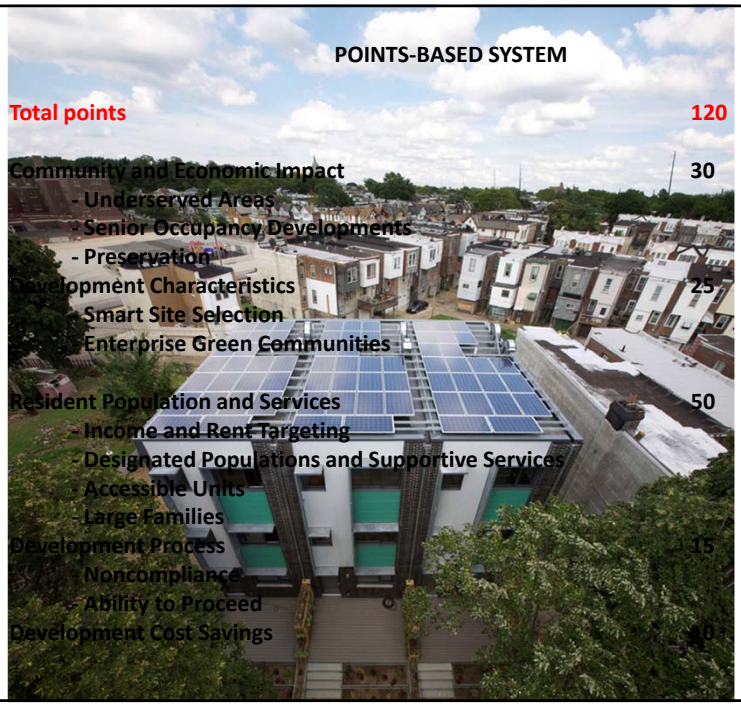
PHFA
PENNSYLVANIA HOUSING FINANCE AGENCY

MAKE ALL AFFORDABLE HOUSING
NET-ZERO-ENERGY-CAPABLE BY
2030

USE PASSIVE HOUSE AS THE TOOL

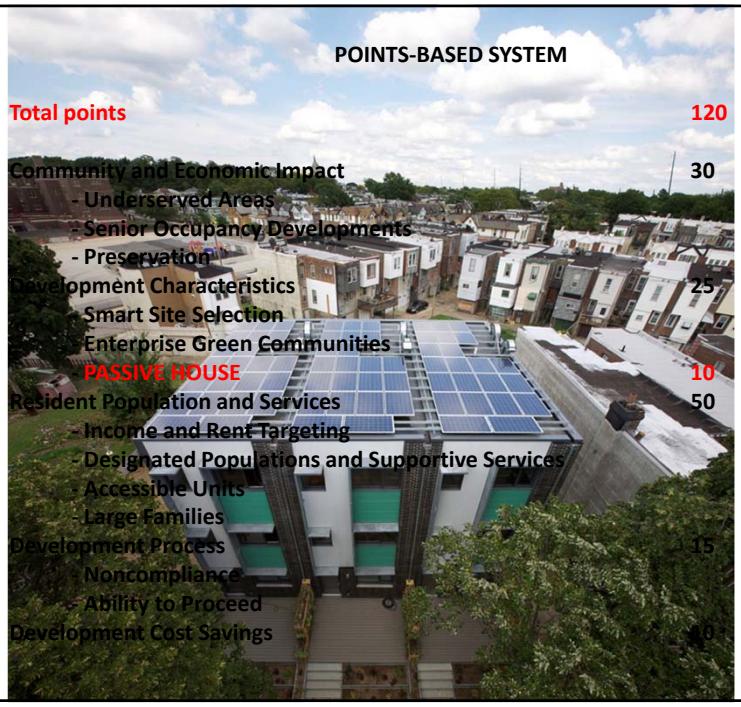
HOW?


9% Low Income House Tax Credit (LIHTC)
QAP
Qualified Allocation Plan



POINTS-BASED SYSTEM

Total points	**120**
Community and Economic Impact	30
- Underserved Areas	
- Senior Occupancy Developments	
- Preservation	
Development Characteristics	25
- Smart Site Selection	
- Enterprise Green Communities	
Resident Population and Services	50
- Income and Rent Targeting	
- Designated Populations and Supportive Services	
- Accessible Units	
- Large Families	
Development Process	15
- Noncompliance	
- Ability to Proceed	
Development Cost Savings	10



POINTS-BASED SYSTEM

Total points	**120**
Community and Economic Impact	30
- Underserved Areas	
- Senior Occupancy Developments	
- Preservation	
Development Characteristics	25
- Smart Site Selection	
- Enterprise Green Communities	
PASSIVE HOUSE	**10**
Resident Population and Services	50
- Income and Rent Targeting	
- Designated Populations and Supportive Services	
- Accessible Units	
- Large Families	
Development Process	15
- Noncompliance	
- Ability to Proceed	
Development Cost Savings	10

OCT 2014

"PASSIVE HOUSE points" introduced to PHFA 2015 QAP

FEB 2015

85 Multi-family project applications were received

JUNE 2015

39 projects awarded funding

38% applied as Passive House projects

8 Passive House Projects awarded funding

422 new Passive House/Net-Zero-Energy-Capable units in PA

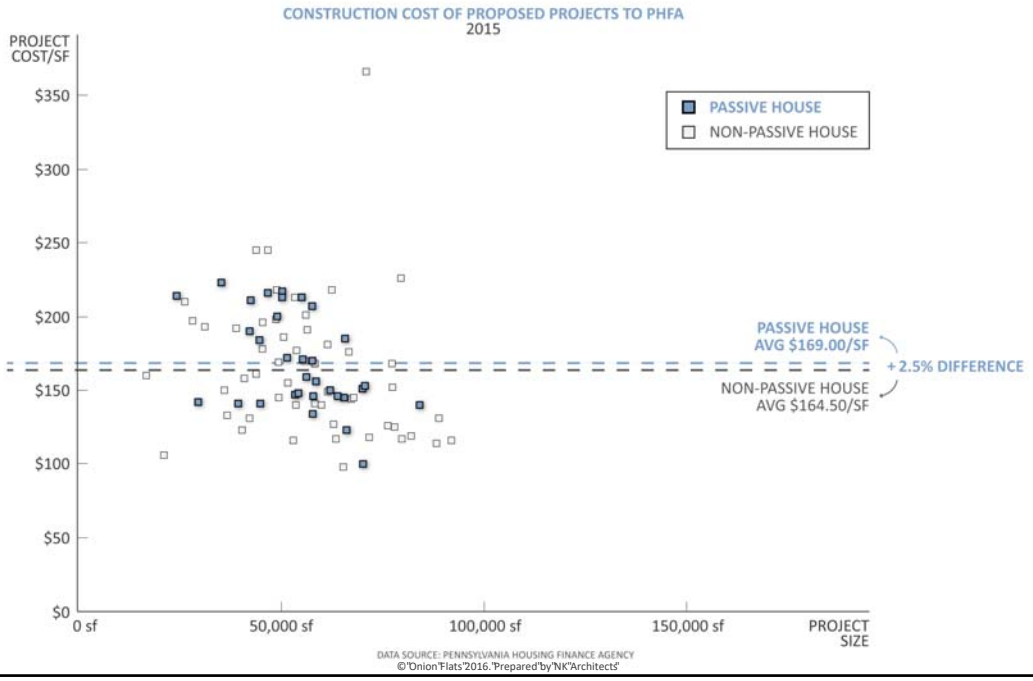
$COST$ "Negligibly different" from NON-PH projects

YEAR 1 2015 ***A NATIONAL Net-Zero-Energy Initiative by 2030***

Construction Cost Summary from PHFA Applications

2015 Costs

	Proj. No.	County	Climate Zone	Units (by BR Qty) 0	1	2	3	4+	Total Units	Bldg. Area	Constr. $	$ /Unit
Single Family / Townhouse	SF-1	Franklin	5A			33	21		54	70,218	7,051,522	130,584
	SF-2	Schuylkill	5A		3	9	5		17	21,151	2,238,725	131,690
	SF-3	Philadelphia	4A		5	19	31	5	60	79,795	9,363,626	156,060
	SF-4	Allegheny	5A			26	19		45	63,548	8,863,631	196,970
	SF-5	Lycoming	5A		16	34			50	66,147	8,141,437	162,829
	SF-6	Bradford	5A		10	24	16		50	62,956	7,964,823	159,296
	SF-7	Centre	5A			20	20		40	53,652	7,523,233	188,081
	SF-8	Lebanon	5A			46	16		62	84,168	11,742,459	189,395
	SF-9	Bradford	5A		2	26	12		40	59,954	8,369,296	209,232
	SF-10	Butler	5A		3	39	18		60	67,904	9,827,275	163,788
	SF-11	Erie	5A			9	34		43	53,454	7,870,669	183,039
	SF-12	Dauphin	5A		3	3	25	4	35	61,504	9,192,750	262,650
	SF-13	Berks	5A		22	20	16		58	62,097	9,305,340	160,437
	SF-14	Franklin	5A		7	25	24		56	77,469	11,791,991	210,571
	SF-15	Luzerne	5A		26	15	15		56	56,250	8,968,491	160,152
	SF-16	Union	5A		5	12	8	6	31	43,868	7,071,066	228,099
	SF-17	Chester	4A		48	12			60	58,349	9,809,238	163,487
	SF-18	Allegheny	5A		4	30	18		52	77,351	12,979,386	249,604
	SF-19	Berks	5A		10	21	11		42	57,722	9,785,000	232,976
	SF-20	Montgomery	4A		16	24	15		55	61,480	11,113,700	202,067
	SF-21	Delaware	4A		8	34	14		56	65,790	12,184,074	217,573
	SF-22	Philadelphia	4A			17	16	2	35	45,476	8,905,240	254,435
	SF-23	Allegheny	5A		14	9			23	28,205	5,552,583	241,417
	SF-24	Westmoreland	5A		28	8			36	43,872	8,331,567	231,432
	SF-25	Philadelphia	4A		10	19	11		40	46,757	11,453,809	286,345
Adaptive Reuse	AR-1	Lehigh	5A		34	4	11		49	65,339	6,392,809	130,465
	AR-2	Erie	5A		29	16			45	53,021	6,152,972	136,733
	AR-3	Philadelphia	4A	12	54				66	77,975	9,751,707	147,753
	AR-4	Allegheny	5A	2	49	4			55	65,577	9,514,764	172,996
	AR-5	Delaware	4A		53				53	51,690	8,030,480	151,510
	AR-6	Philadelphia	4A		44				44	49,406	8,361,579	190,036
	AR-7	Montgomery	4A		33	3	7		43	55,832	9,468,816	220,205
	AR-8	Philadelphia	4A			28	10		38	53,840	9,515,893	250,418
	AR-9	Dauphin	5A	5	17	6			28	45,434	8,075,064	288,395
	AR-10	Allegheny	5A		33	3			36	50,664	9,436,523	262,126
	AR-11	Philadelphia	4A		46				46	56,478	10,795,027	234,675
	AR-12	Philadelphia	4A		27	10			37	48,768	9,658,098	261,030
	AR-13	Philadelphia	4A		30	21			51	62,509	13,609,683	266,857
	AR-14	Washington	4A		17	7			24	35,299	7,856,113	327,338
	AR-15	Philadelphia	4A		62				62	70,991	25,995,741	419,284
Multi-Story / Elevator	MS-1	Northumberland	5A		35				35	40,397	4,276,084	122,174
	MS-2	Dauphin	5A		22	14	14		50	88,314	10,055,562	201,111
	MS-3	Dauphin	5A		18	59			77	92,000	10,668,511	138,552
	MS-4	Lancaster	5A		46	6			52	71,758	8,456,719	162,629
	MS-5	Blair	5A		33	20			53	82,070	9,727,007	183,528
	MS-6	Chester	4A		46	15			61	76,340	9,638,964	158,016
	MS-7	Lancaster	5A		13	39	26		78	88,910	11,681,226	149,759
	MS-8	Clearfield	6A		24	6			30	42,254	5,551,584	185,053
	MS-9	Indiana	5A		40				40	36,743	4,898,995	122,475
	MS-10	Bradford	5A		50	6			56	57,817	7,738,172	138,182
	MS-11	Cambria	5A		32	11			43	44,887	6,341,616	147,479
	MS-12	Dauphin	5A		38	16			54	58,335	8,201,250	151,875
	MS-13	Mifflin	5A		30	4			34	39,447	5,559,187	163,506
	MS-14	Fayette	5A		12	12			24	29,586	4,192,325	174,680
	MS-15	Allegheny	5A		24	12	13		49	67,340	9,698,634	197,931
	MS-16	Lackawanna	5A		44	4			48	49,460	7,159,738	149,161
	MS-17	Lehigh	5A		54	7			61	63,949	9,318,159	152,757
	MS-18	Centre	5A		37	11			48	57,959	8,490,644	176,888
	MS-19	Chester	4A		41	3	5		49	54,287	8,007,477	163,418
	MS-20	Fayette	5A		21	3			24	36,064	5,407,359	225,307
	MS-21	Chester	4A		61	3			64	70,083	10,557,500	164,961
	MS-22	Allegheny	5A		54	12			66	70,689	10,787,052	163,440
	MS-23	Allegheny	5A		40	6			46	58,617	9,134,790	198,582
	MS-24	Wayne	6A		36	4			40	40,959	6,460,530	161,513
	MS-25	Centre	5A			12	12		12	16,796	2,683,900	223,658
	MS-26	Beaver	5A		40	12			52	55,361	9,468,440	182,085
	MS-27	Lancaster	5A		51				51	51,500	8,871,635	173,954
	MS-28	Allegheny	5A		52	8			60	66,733	11,716,729	195,279
	MS-29	Montgomery	4A		40	4			44	44,687	8,202,314	186,416
	MS-30	Montgomery	4A		50				50	42,265	8,029,015	160,580
	MS-31	Crawford	5A		36	4			40	38,953	7,490,675	187,267
	MS-32	Philadelpia	4A		9	8	7		24	31,220	6,031,050	251,294
	MS-33	Westmoreland	5A		47				47	49,080	9,825,224	209,047
	MS-34	Philadelphia	4A		58	4			62	56,120	11,262,762	181,657
	MS-35	Philadelphia	4A	60					60	57,672	11,915,227	198,587
	MS-36	Philadelphia	4A		20	4			24	26,284	5,523,620	230,151
	MS-37	Philadelphia	4A		34	11			45	42,523	8,964,723	199,216
	MS-38	Philadelphia	4A		52				52	50,275	10,703,403	205,835
	MS-39	Philadelphia	4A		39	11			50	53,416	11,371,112	227,422
	MS-40	Philadelphia	4A		45	5			50	55,099	11,747,269	234,945
	MS-41	Philadelphia	4A		24				24	24,284	5,194,462	216,436
	MS-42	Philadelphia	4A		45				45	46,754	10,118,014	224,845
	MS-43	Philadelphia	4A		53				53	50,312	10,900,733	205,674
	MS-44	Philadelphia	4A		54				54	48,965	10,664,381	197,489
	MS-45	Philadelphia	4A	88					88	79,650	18,005,791	204,611



St, John Nueman
Phila, PA
52 Units

Wynne
Phila, PA
51 Units

Sacred Heart
Allentown, PA
61 Units

WhiteHall
Spring City, PA
49 Units

Hillcrest
Pittsburgh, PA
65 Units

Washington Square
Townhomes
Chambersburg, Pa
54 Units

Mann Edge
Lewistown, Pa
34 Units

7 Passive House Projects *COMPLETED*

Construction Cost Change from Application to Construction Completion

Proj. No.	Total Units	Residt'l Bldg. Area	$/SF @ Applic	$/SF @ Cost Cert	% Change
2015-443	51	62,509	$ 218	$ 186	-15%
2015-431	52	43,868	$ 296	$ 287	-3%
2015-436	23	28,205	$ 197	$ 193	-2%
2015-608	40	40,959	$ 158	$ 157	-1%
2015-810	35	61,504	$ 149	$ 149	-1%
2015-419	28	45,434	$ 178	$ 178	0%
2015-809	37	48,768	$ 198	$ 199	1%
2015-612	31	43,868	$ 161	$ 162	1%
2015-804	88	79,650	$ 226	$ 228	1%
2015-416	66	70,689	$ 153	$ 155	2%
2015-466	40	53,652	$ 140	$ 144	3%
2015-619	34	39,447	$ 141	$ 145	3%
2015-806	49	54,287	$ 148	$ 151	3%
2015-445	50	55,099	$ 220	$ 226	3%
2015-439	53	51,690	$ 155	$ 163	5%
2015-448	44	49,406	$ 169	$ 177	5%
2015-449	61	63,949	$ 149	$ 157	5%
2015-616	24	36,064	$ 150	$ 160	7%
2015-620	53	82,070	$ 119	$ 129	8%
2015-807	43	55,832	$ 170	$ 185	9%
2015-614	45	53,021	$ 116	$ 128	10%
2015-440	52	50,275	$ 213	$ 233	10%
2015-415	56	56,250	$ 159	$ 176	10%
2015-610	54	70,218	$ 100	$ 111	11%
2015-467	45	63,548	$ 139	$ 154	11%
2015-459	12	16,796	$ 160	$ 181	13%

NON-PASSIVE HOUSE

Application
$171 SF

Completion
$176 SF
3% Higher

PASSIVE HOUSE

Application
$161 SF

Completion
$168 SF
4% Higher

**NOTE 3-5% Contingency added to budgets after application*

Pennsylvania

94 Projects applied, 27 as Passive House projects

10 PH projects awarded

33 NON-PH projects awarded

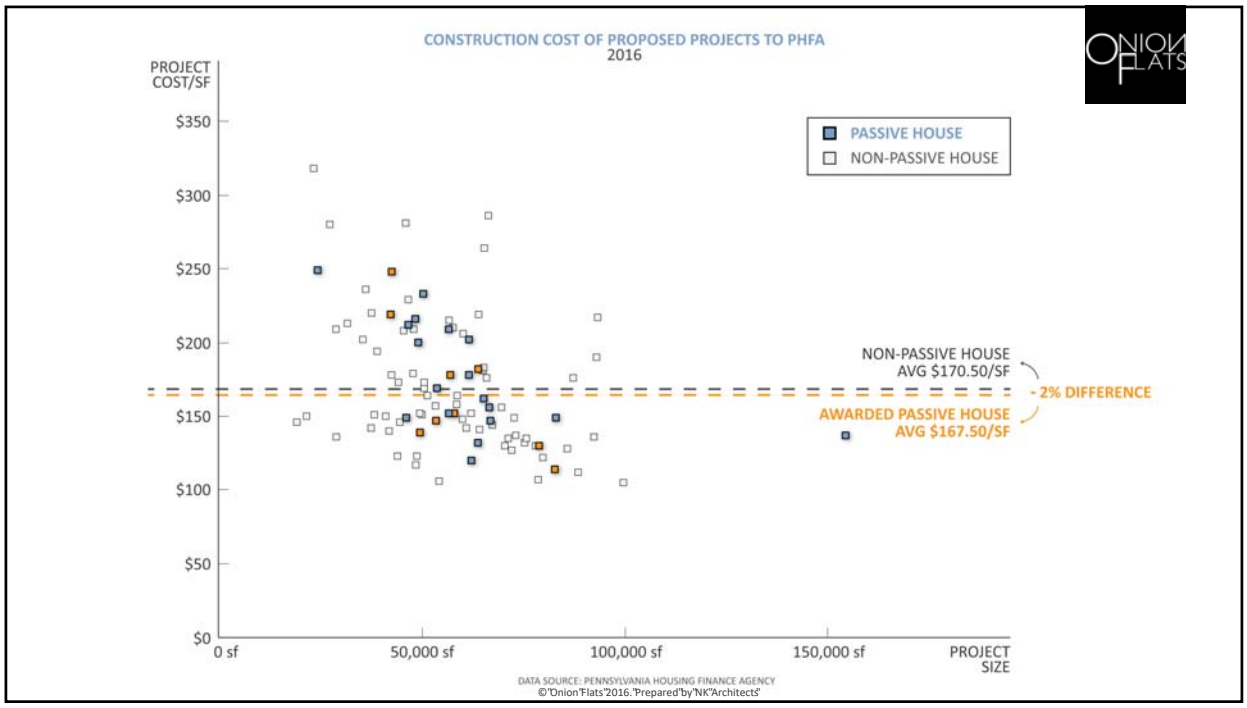
YEAR 2 2016 A NATIONAL Net-Zero-Energy Initiative by 2030

Construction Cost Summary for PHFA 2016 Applications

	Proj. No.	County	Climate Zone	Units by BR Qty 0	1	2	3	4+	Total Units	Resid. Bldg. Area	Resid. Constr. $	$ / Unit	$ / SF
Single Family / Townhouse	SF-01	Dauphin	5A		14	16	15	15	60	99,625	10,419,031	173,6	
	SF-02	Lebanon	5A		9	32	14		55	78,627	8,446,000	153,5	
	SF-03	Lycoming	5A		20	40			60	82,730	9,436,382	157,2	
	SF-04	Columbia	5A			7	17		24	48,499	5,669,777	236,2	
	SF-05	Philadelphia	4A		5	19	31	5	60	79,795	9,739,093	162,3	
	SF-06	Wyoming	5A			30	12		42	72,100	9,168,380	218,2	
	SF-07	Erie	5A		8	20	18		46	85,819	10,964,900	238,3	
	SF-08	Lancaster	5A		6	33	21		60	78,825	10,259,118	170,9	
	SF-09	Cumberland	5A			18	34		52	75,275	9,921,606	190,8	
	SF-10	Centre	5A		6	24	18		48	75,737	10,193,457	212,3	
	SF-11	Lehigh	5A		19	27	16		62	71,254	9,631,860	155,3	
	SF-12	Lancaster	5A		41	79	18		138	154,370	21,137,388	153,1	
	SF-13	Erie	5A			9	31		40	53,454	7,870,669	196,7	
	SF-14	Montgomery	4A			19	29		48	59,976	8,858,000	184,5	
	SF-15	Lebanon	5A			49	13		62	82,974	12,349,192	199,1	
	SF-16	Cumberland	5A			10	30	10	50	72,707	10,865,524	217,3	
	SF-17	Schuylkill	5A		1	11	5		17	21,544	3,225,548	189,7	
	SF-18	Berks	5A		10	21	11		42	57,722	8,755,000	208,4	
	SF-19	Berks	5A		22	20	16		58	62,097	9,440,383	162,7	
	SF-20	Franklin	5A		6	21	21		48	66,583	10,404,256	216,7	
	SF-21	Lehigh	5A		9	15	20	4	48	53,333	8,377,963	174,5	
	SF-22	Chester	4A		19	18	11		48	58,541	9,248,927	192,6	
	SF-23	Cumberland	5A		5	22	8		35	44,186	7,656,200	218,7	
	SF-24	Montgomery	4A		8	21	15	6	50	65,907	11,589,411	231,7	
	SF-25	Allegheny	5A		35	16	14		65	87,255	15,376,648	236,5	
	SF-26	Delaware	4A		8	34	14		56	65,212	11,914,849	212,7	
	SF-27	Philadelphia	4A			17	16	2	35	45,476	9,441,620	269,7	
	SF-28	Armstrong	5A			24			24	28,812	6,017,450	250,7	
	SF-29	Philadelphia	4A			28	14		42	47,964	10,022,268	238,6	
	SF-30	Philadelphia	4A		11	10	11		32	31,619	6,732,433	210,3	
	SF-31	Philadelphia	4A		8	19	24	4	55	66,383	19,011,723	345,6	
	SF-32	Philadelphia	4A	45					45	23,302	7,408,602	164,6	
Adaptive Reuse Bldgs.	AR-01	Monroe	5A		36	4			40	54,215	5,753,672	143,8	
	AR-02	Luzerne	5A	6	54	2			62	88,489	9,900,711	159,6	
	AR-03	Philadelphia	4A	12	54				66	77,978	10,123,117	153,3	
	AR-04	Allegheny	5A		33	8			41	70,409	9,181,888	223,9	
	AR-05	Butler	5A		44	18			62	73,114	10,046,992	162,0	
	AR-06	Washington	5A		24				24	41,046	6,169,663	257,0	
	AR-07	Allegheny	5A	2	49	4			55	65,190	10,592,039	192,5	
	AR-08	Delaware	4A		50				50	50,548	8,727,828	174,5	
	AR-09	Philadelphia	4A		60				60	65,041	11,803,992	196,7	
	AR-10	Philadelphia	4A		74				74	93,285	20,223,060	273,2	
	AR-11	Philadelphia	4A	20	37				57	63,960	14,005,881	245,7	
	AR-12	Perry	5A		28	3			31	36,152	8,548,665	275,7	

	Proj. No.	County	Climate Zone	0	1	2	3	4+	Total Units	Resid. Bldg. Area	Resid. Constr. $	$ / Unit	$ / SF
Multi-Story / Elevator Buildings	MS-01	Berks	5A		40	20			60	62,149	7,432,636	123,8	
	MS-02	Tioga	6A		34	6			40	48,735	5,999,734	149,9	
	MS-03	Dauphin	5A		35	2			37	43,964	5,421,065	146,5	
	MS-04	Bradford	5A		38	12	6		56	63,768	8,446,000	150,8	
	MS-05	Lancaster	5A		46	6			52	92,370	12,565,629	241,6	
	MS-06	Fayette	6A		12	12			24	28,904	3,942,323	164,2	
	MS-07	Cambria	5A		32	11			43	49,491	6,879,001	158,9	
	MS-08	Clearfield	6A		24	6			30	41,915	5,855,263	195,1	
	MS-09	Chester	4A		56	3			59	64,180	9,033,100	153,1	
	MS-10	Centre	5A		16	34			50	60,912	8,666,068	173,3	
	MS-11	Clinton	5A		28	4			32	37,454	5,333,806	166,6	
	MS-12	Allegheny	5A		24	12	13		49	67,340	9,698,634	197,9	
	MS-13	Luzerne	5A		32	3			35	44,543	6,503,636	185,8	
	MS-14	Dauphin	5A		20				20	19,157	2,803,860	140,1	
	MS-15	Butler	5A		68				68	66,845	9,821,302	144,4	
	MS-16	Westmoreland	5A		15	13	8		36	46,095	6,855,424	190,4	
	MS-17	Lackawanna	5A		12	12	8	4	36	50,019	7,560,000	210,0	
	MS-18	Northumberland	5A		32				32	38,240	5,789,694	180,9	
	MS-19	Centre	5A		37	11			48	57,959	8,781,136	182,9	
	MS-20	Lackawanna	5A		44	4			48	49,460	7,493,999	156,1	
	MS-21	Allegheny	5A		30	34			64	69,605	10,837,117	169,3	
	MS-22	Dauphin	5A		43	11			54	51,319	8,411,465	155,7	
	MS-23	Montgomery	4A		60				60	58,681	9,643,959	160,7	
	MS-24	Adams	5A		39	4			43	50,532	8,515,443	198,0	
	MS-25	Clarion	5A		48				48	53,668	9,090,720	189,3	
	MS-26	Allegheny	5A		40	6			46	56,969	10,124,143	220,0	
	MS-27	Allegheny	5A		28	8			36	42,500	7,582,274	210,6	
	MS-28	Chester	4A		47	13			60	61,551	10,982,435	183,0	
	MS-29	Delaware	4A		38	3			41	47,797	8,539,207	208,2	
	MS-30	Allegheny	5A		52	8			60	63,861	11,647,354	194,1	
	MS-31	Philadelphia	4A		37	44			81	93,000	17,635,125	217,7	
	MS-32	Crawford	5A		36	4			40	38,953	7,552,475	188,8	
	MS-33	Westmoreland	5A		47				47	49,080	9,801,657	208,5	
	MS-34	Bucks	4A		56	10			66	61,576	12,448,922	188,6	
	MS-35	Lycoming	5A		23	11			34	35,437	7,169,151	210,8	
	MS-36	Philadelphia	4A		61				61	60,137	12,416,322	203,5	
	MS-37	Bradford	5A		40	10			50	56,580	11,852,026	237,0	
	MS-38	Philadelphia	4A		58	4			62	57,653	12,079,768	194,8	
	MS-39	Philadelphia	4A		52				52	46,619	9,901,739	190,4	
	MS-40	Philadelphia	4A	60					60	56,672	12,174,301	202,9	
	MS-41	Philadelphia	4A		45				45	48,351	10,464,750	232,5	
	MS-42	Montgomery	4A		50				50	42,265	9,236,729	184,7	
	MS-43	Allegheny	5A		29	4			33	37,592	8,284,054	251,0	
	MS-44	Philadelphia	4A		46	4			50	46,640	10,701,164	214,0	
	MS-45	Philadelphia	4A		53				53	50,312	11,711,200	220,9	
	MS-46	Philadelphia	4A		34	11			45	42,520	10,560,747	234,6	
	MS-47	Philadelphia	4A		24				24	24,284	6,040,593	251,6	
	MS-48	Philadelphia	4A		60				60	65,340	17,249,402	287,4	
	MS-49	Luzerne	5A		36				36	27,296	7,653,000	212,5	
	MS-50	Philadelphia	4A		48				48	46,000	12,915,822	269,0	

YEAR 2 ***A NATIONAL Net-Zero-Energy Initiative by 2030***
2016



Morningside Crossing
Pittsburgh, PA
46 Units

Glassport
Glassport, PA
55 Units

Mt. Lebanon Sr. Housing
Pittsburgh, PA
60 Units

Roxbury Place
Johnstown, PA
43 Units

Westminster @ Windy
Phillipsburg, PA
48 Units

Parade St. Commons
Erie, PA
40 Units

The Willows
Landisville, PA
60 Units

Muncy Green
Muncy, PA
60 Units

Montgomery Park
Norristown, PA
50 Units

Anthony Wayne Senior
Phila, PA
45 Units

10 Passive House Projects *UNDER CONSTRUCTION*

Pennsylvania

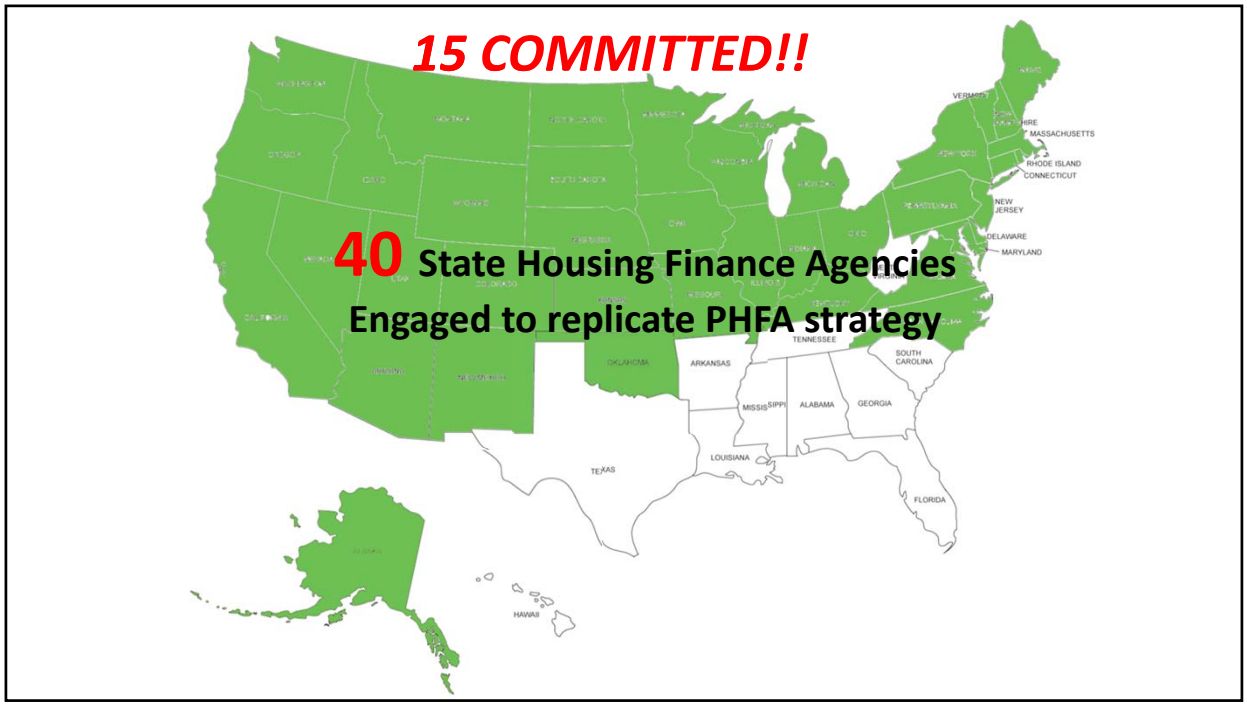
40 Projects Awarded funding

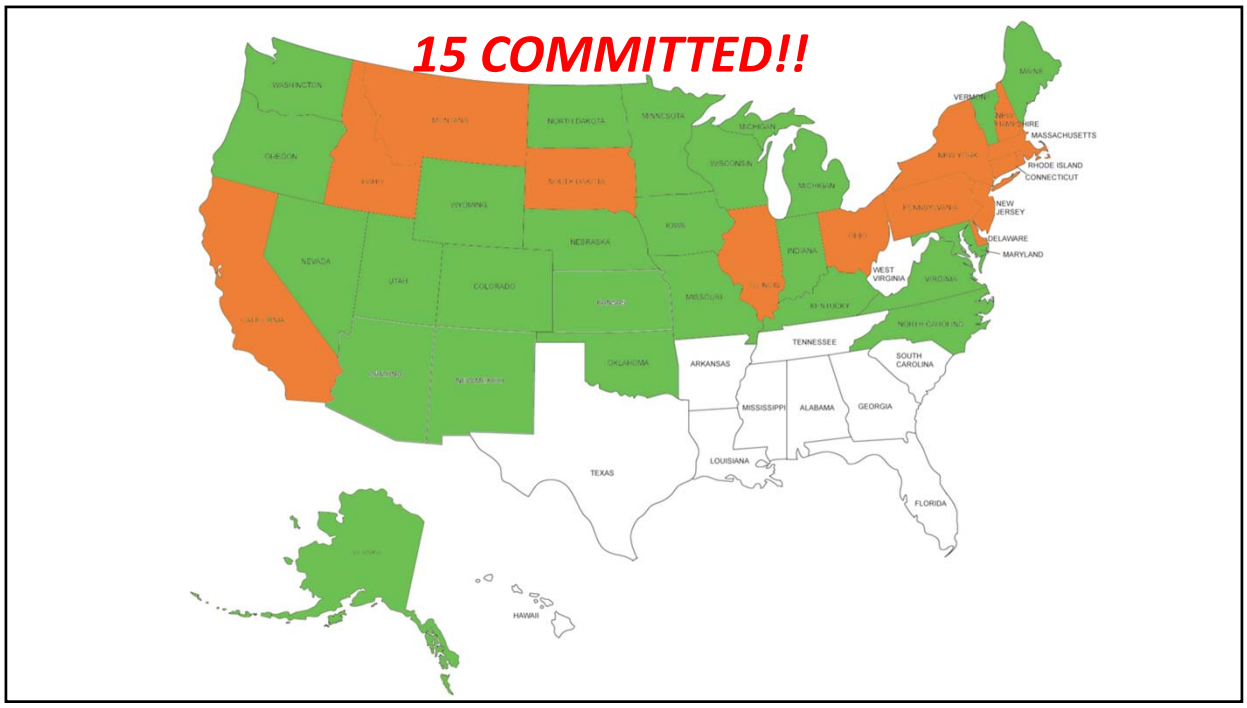
8 PH projects awarded

32 NON-PH projects awarded

YEARS 3-4
2017-18

A NATIONAL Net-Zero-Energy Initiative by 2030


15 COMMITTED!!
40 State Housing Finance Agencies
Engaged to replicate PHFA strategy
VERMONT
MASSACHUSETTS
RHODE ISLAND
CONNECTICUT
NEW JERSEY
DELAWARE
MARYLAND
TENNESSEE
SOUTH CAROLINA
ARKANSAS
MISSISSIPPI
ALABAMA
GEORGIA
LOUISIANA
TEXAS
FLORIDA
HAWAII


15 COMMITTED!!
WASHINGTON
OREGON
MONTANA
NORTH DAKOTA
MINNESOTA
WISCONSIN
MICHIGAN
WYOMING
NEBRASKA
IOWA
NEVADA
UTAH
COLORADO
INDIANA
MISSOURI
WEST VIRGINIA
VIRGINIA
KENTUCKY
NORTH CAROLINA
TENNESSEE
OKLAHOMA
ARKANSAS
SOUTH CAROLINA
MISSISSIPPI
ALABAMA
GEORGIA
LOUISIANA
TEXAS
FLORIDA
HAWAII
VERMONT
MASSACHUSETTS
RHODE ISLAND
CONNECTICUT
NEW JERSEY
DELAWARE
MARYLAND

15 COMMITTED!!

PENNSYLVANIA

NEW YORK

NEW JERSEY

D.C.

DELAWARE

CALIFORNIA

CONNECTICUT

RHODE ISLAND

NEW HAMPSHIRE

OHIO

ILLINOIS

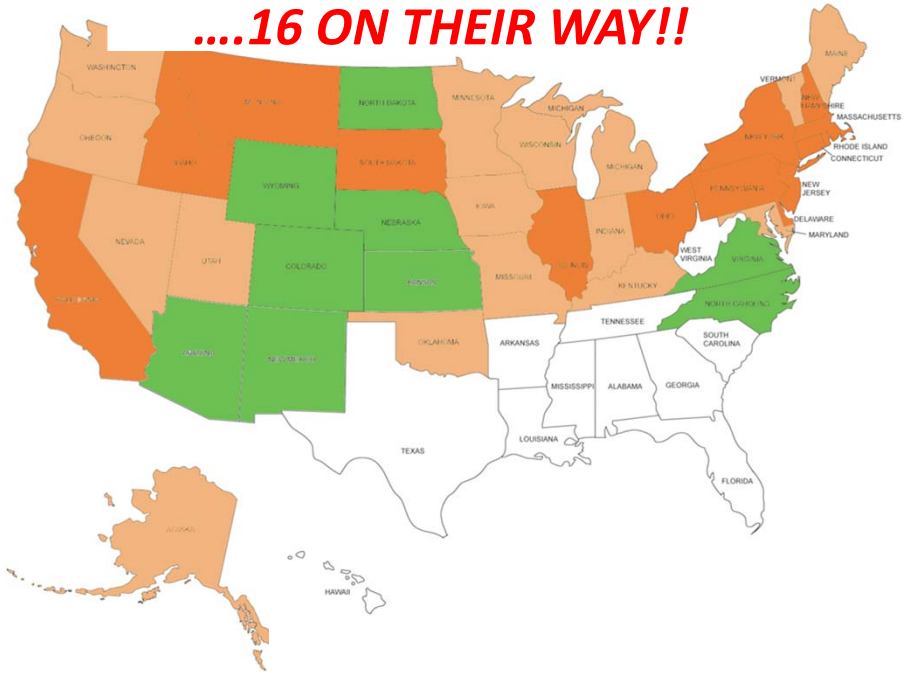
MONTANA

SOUTH DAKOTA

VERMONT

IDAHO

….16 ON THEIR WAY!!



GREEN
BUILDING
UNITED

2019 NEW GRAVITY HOUSING CONFERENCE

August 2-3rd @ TEMPLE UNIVERSITY, Phila, PA

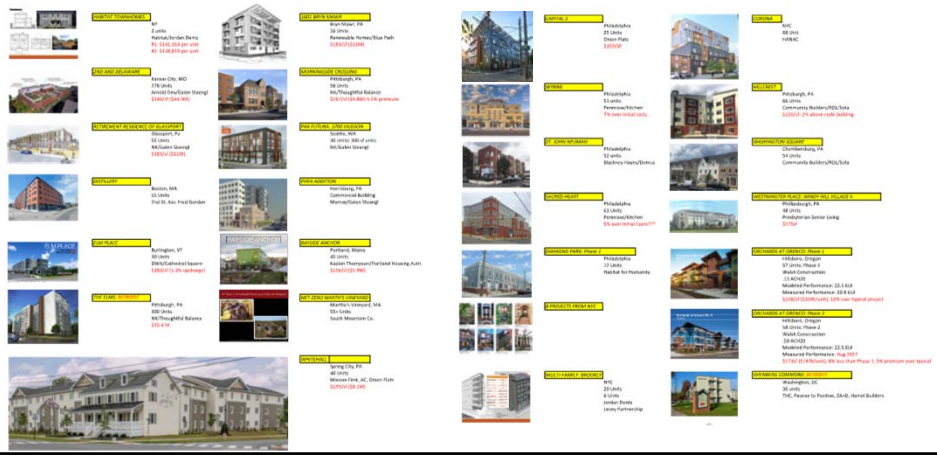
Temple University Science Education and Research Center

TIME	AUGUST 3rd SCHEDULE		
7:30 - 8:30	Registration, Breakfast, and Expo		
8:30 - 9:15	Welcome: Alex Dewi, Tim McDonald, Wade Romberger, Holly Glauser		
	Track 1	Track 2	Track 3
Session 1 9:30 - 10:30	Orchards at Orenco and Beyond: Finding our way to higher levels of efficiency while managing costs OREGON	PHFA Passive House Multi-Family Experience: What makes sense, what doesn't, and recommendations for future im PHFA	Real World Challenges of Passive House in the Mainstream Market NY
10:30 - 11:00	Coffee and Expo		
Session 2 11:00 - 11:45	St. John Neumann Place II: Why, how, and would we do it again PA	Affordable Housing: An oxymoron or realistic expectation? PA	Affordable Passive House Multi-Family: A report from two guinea pigs PHFA
Session 3 11:50 - 12:35	How to Deliver Performance and Value: A method for cost effective high performance construction PHFA	Passive House Inspired Affordable Housing: What does the performance data tell us? MASS	Two Architects and Their Stunning Successes with Passive Houses: Affordable Multi-Family and Olde Port Condos VERMONT MAINE
12:35 - 1:00	Lunch and Expo		
1:00 - 1:45	Keynote Speaker: Jonathan F.P. Rose (Welcome from Homer Robinson)		
Session 4 2:00 - 2:45	Path to Net Zero Housing from Policy to Practice: Lessons from the District of Columbia DC	Keeping the Affordability in Affordable Multi-Family Passive House Projects PHFA	Strategies for Ventilating Multi-Family Buildings Seeking Multiple Certifications WISCONSIN
Session 5 2:50 - 3:35	Using Passive House to Give Old Affordable Housing Retrofits Superior Performance and Increased Occupant Benefits PA WASH	Habitat for Humanity: Pushing the envelope PA	Centralized vs. Decentralized Ventilation Throwdown
3:45 - 4:15	Keynote Speaker: Sebastian Moreno-Vacca		
4:30 - 6:00	Happy Hour on Vendor Floor		

TIME	AUGUST 4th SCHEDULE		
7:30 - 8:30	Breakfast on Vendor Floor		
8:30 - 9:15	Keynote Speaker: Lois Arena		
	Track 1	Track 2	Track 3
Session 6 9:20 - 10:20	The PHFA Building Passive House Addition PHFA	Measured vs. Modeled Performance of PHIUS Affordable Multi-Family Projects	The Distillery Project: A 65-unit passive house retrofit in Boston MASS
Session 7 10:30 - 11:30	Outside the (Big) Box: An example of rural, affordable, multi-family, and non-traditional projects MAINE	Affordable Multi-Family Passive House Design and Construction: 68-unit 8-story senior housing NY	Developing a PHFA Funded LIHTC Project: Passive house benefits while minimizing construction PHFA
11:30 - 12:00	Coffee and Expo		
Session 8 12:00 - 1:00	The Trim Tab Effect: Six multi-family passive house projects across the country PA MISSOURI	Whitehall, The PHFA Project, and Prefabrication: One of the magnificent seven ways to elegantly skin a multi-family passive house and PHFA	Zero Net Energy Possible Affordable Housing on Martha's Vineyard MASS
1:00 - 1:30	Lunch		
1:30 - 2:15	Keynote Speaker: Zack Semke		
2:15 - 2:30	Closing Remarks		
Tour 1 3:00 - 5:00	Capital II		
Tour 2 3:00 - 5:00	Wynne Theater		
Tour 3 3:00 - 5:00	Saint John Neumann II		

Over 40 Projects, mostly BUILT, presented!

- *Cost data being collected and compared to "typical" costs from multiple regions*
- *Performance Data beginning to be collected*
- *Developing 'MANUAL' of cost-effective envelops/systems/strategies for multi-family PH*



AFFORDABLE HOUSING

AFFORDABLE HOUSING

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Architects, Engineers, Builders

AFFORDABLE HOUSING

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Architects, Engineers, Builders

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MARKET-RATE HOUSING

Catalyst for radical and significant transformation of the HOUSING INDUSTRY…..

AFFORDABLE HOUSING

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Architects, Engineers, Builders

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MARKET-RATE HOUSING

ONION FLATS

THANK

YOU

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QUESTIONS

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215.783.5591