Park District of Oak Park Carroll Community Center: PHIUS SOURCE ZERO

TBDA TOM BASSETT-DILLEY ARCHITECTS

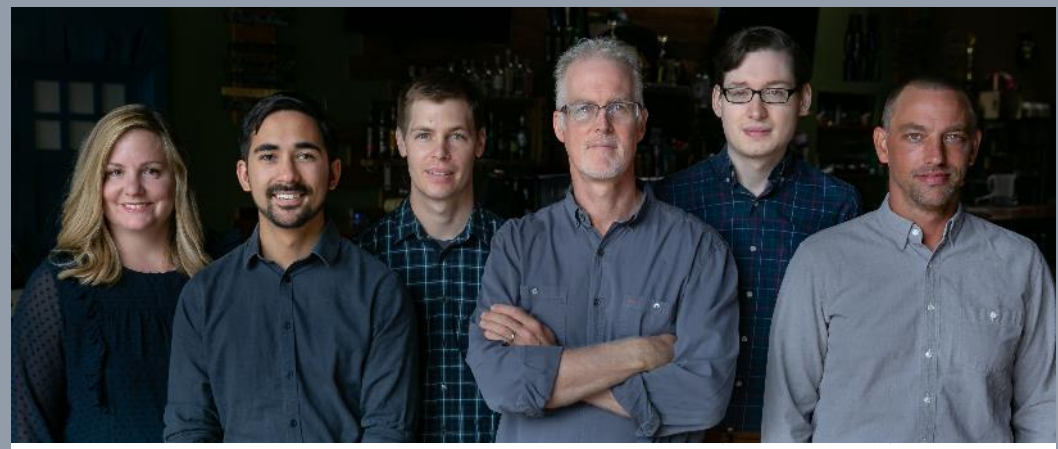
ECO ACHIEVERS Building Wisdom

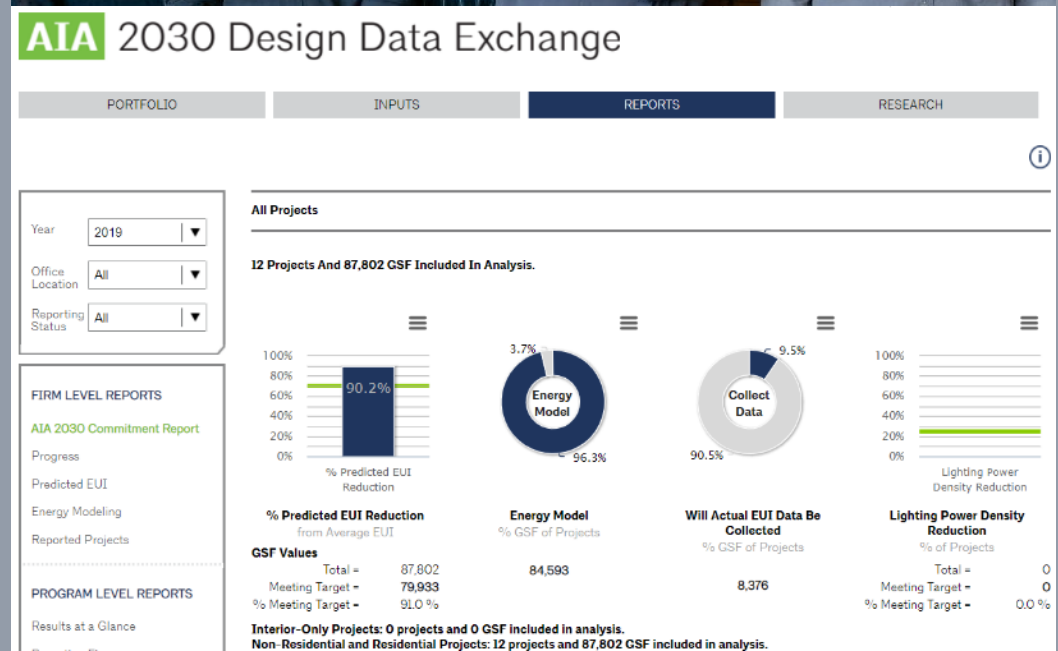
Tom Bassett-Dilley Architects (TBDA)

Est. 2006 to pursue ecological design

Our mission:

- Healthy – Beautiful – Efficient Buildings for a clean-energy future
- Certified Passive House Consultants
- Passive House, LEED, GreenStar, DOE ZERH certified buildings
- Architecture 2030 Signatory, making reduction targets for the past three years thanks to projects like Carroll Center.





Eco Achievers (EA)

- Provide enhanced code and performance testing, green building certification, and green finance consulting to residential projects of any size. At this time, the only commercial projects we work on are PHIUS projects.

- Our staff hold rater/verifier certifications for Passive House, LEED, ENERGY STAR, DOE ZERH, NGBS, WI Green Built Homes, Enterprise Green Communities.

- We are a WBE with offices in Chicago and Detroit.

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Carroll Center
Before photos,
After rendering

Original John Van Bergen 1920's structure, added onto in 1940's and '70's

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Funding

Initial idea from owner:

- Least expensive way to add needed program.
- PDOP Board: “Can’t we do better with energy efficiency?”
- TBDA and PDOP: pursue ICECF Net Zero Building Grant to pay for upgrades and be a case study.
- Grant was approved for $577,800 of the $1.7M build cost.

Illinois Clean Energy
community foundation

About the Foundation | Energy Program | Natu

Net Zero Energy Building Program

The Foundation’s **Net Zero Energy Building Program** will award grants to new construction or retrofit projects that achieve site net zero energy performance or better, over the course of a year. Buildings must, at a minimum, offset all of their energy consumption with on-site generation from renewable resources. Grants will be paid incrementally, with full payment contingent on actual building performance.

The program goal is to encourage exemplary buildings that bring together beautiful design and careful construction to maximize energy efficiency, showcase renewable energy and, by educating the public and professionals, help pave the way for a larger shift in the building sector. The Foundation aims to fund projects that demonstrate that net zero energy buildings are realistic and achievable. These flagship projects will add to the knowledge base on net zero building design and operation.

Eligibility & Funding | How to Apply | Resources

https://www.illinoiscleanenergy.org/energy-program/net-zero-energy-building-program

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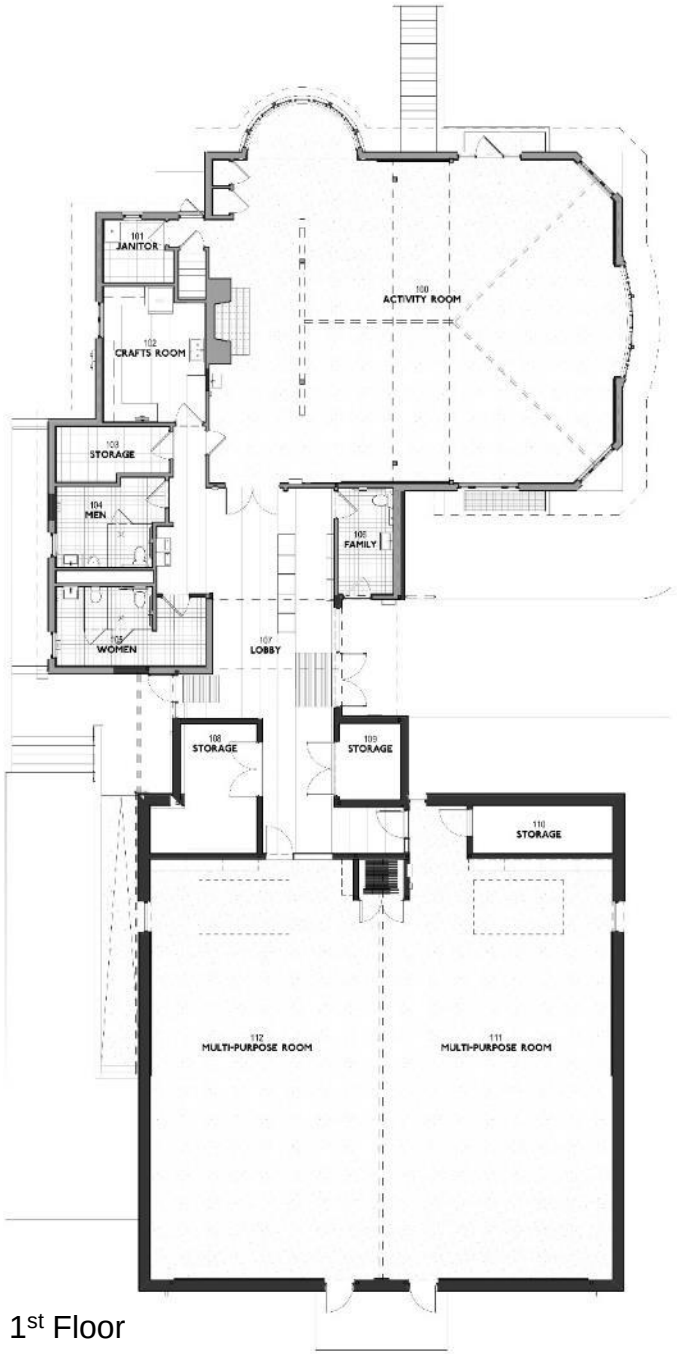
Plans

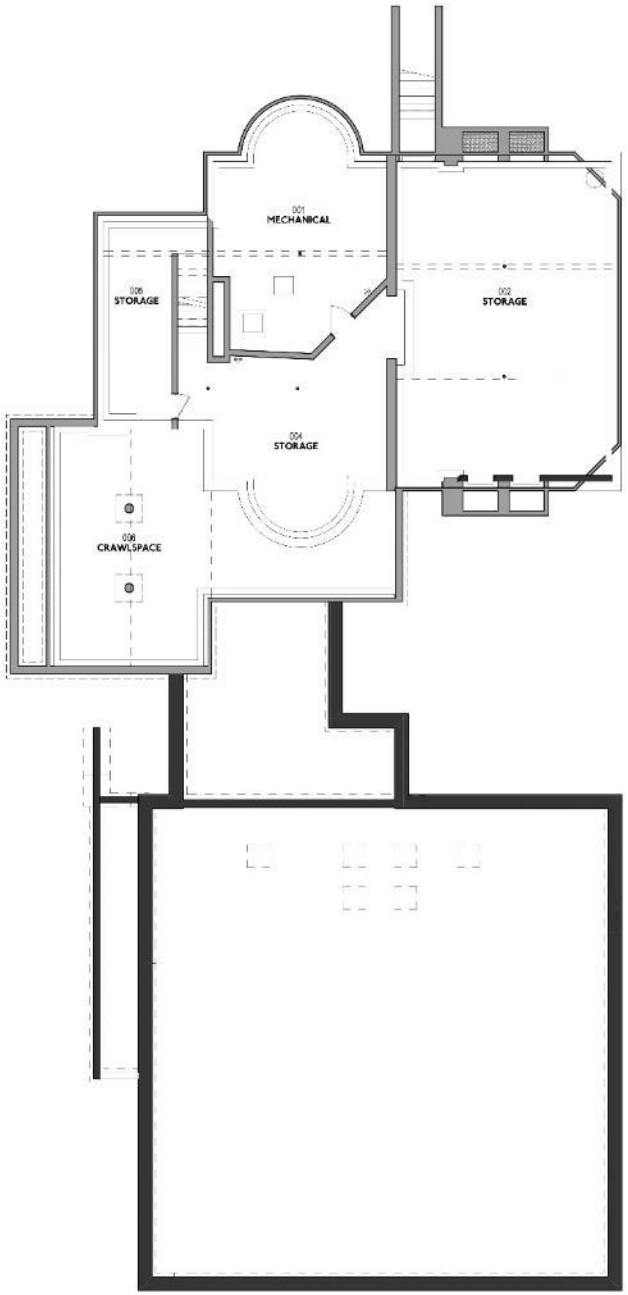
Program:

- 3 daycare rooms (movable partition)
- After-school kids' activity rooms
- Evening programming: adult classes
- Summer camps
- Large room for PDOP all-staff gathering

iCFA: 7,667 s.f.
Envelope/iCFA: 2.7



1st Floor



Basement

Carroll Center
New Wall Section

Roof Assembly (R-48.4):

- Airtight Membrane Roof over 8” Polyiso.on Metal Deck + joists

Wall Assembly (R-27.3):

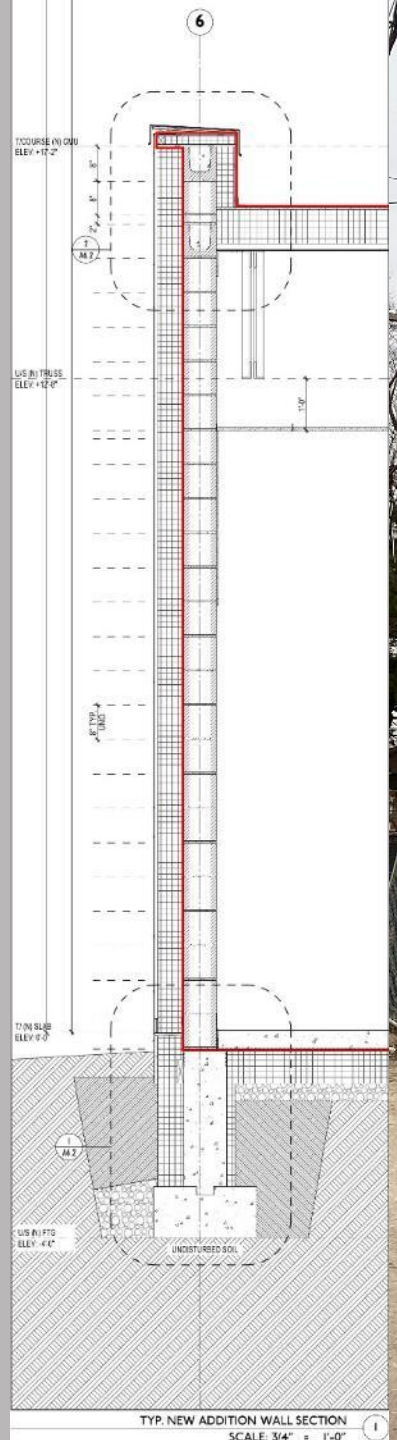
- Fiber Cement Board rainscreen over 6” Mineral Wool Insulation on 8” Concrete Masonry Unit with Fluid-applied Air Barrier

Slab Assembly (R-35.6):

- 4” Concrete Slab/Vapor Barrier over 8” Type-IX EPS Insulation on gravel

Foundation Assembly (R-36.3):

- 6” Type-IX EPS Insulation



Carroll Center Retrofit Wall Section

Roof Assembly (R-45.5):

- (E) 2x4 Rafters with (N) 2x8 Rafters Sistered for 1” Deflection. Cavity Filled with 8-1/4” Closed Cell Spray Foam

Wall Assembly (R-28.6):

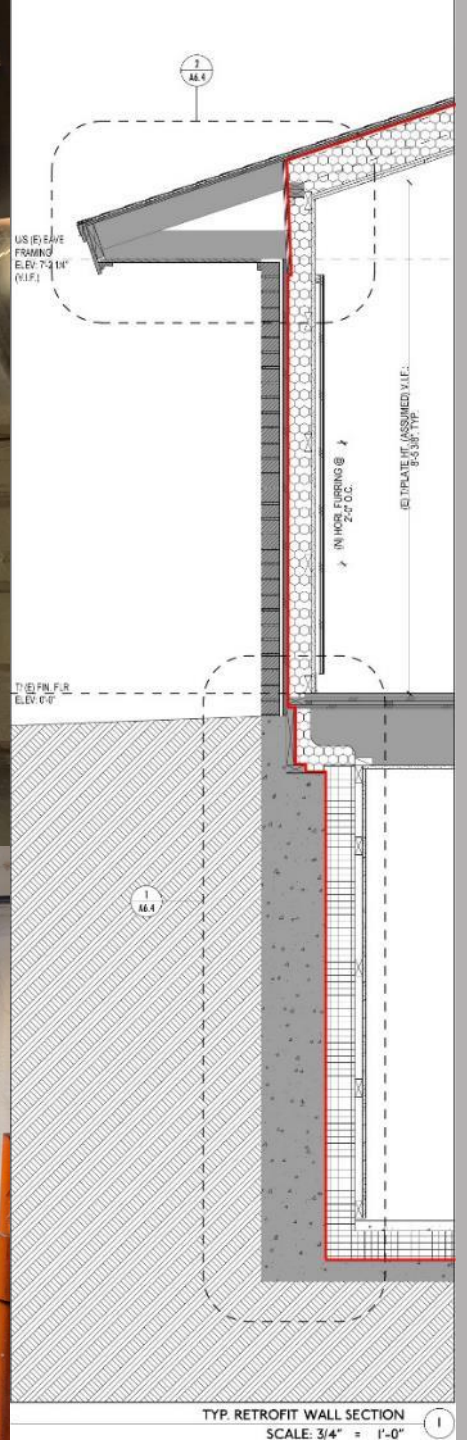
- (E) Brick over (E) 2x4 Studs with (N) 2x2 Cross Furring with 5” Closed Cell Spray Foam and 5/8” Gypsum Board

Slab Assembly (R-27.7):

- (N) 2” Concrete Slab on 6” EPS Insulation on (E) Concrete Slab

Foundation Assembly (R-28.0):

- (E) Concrete Foundation w/ 6” EPS Insulation, 2x Furring and 5/8” Gypsum Board



Carroll Center Retrofit: to foam or not to foam

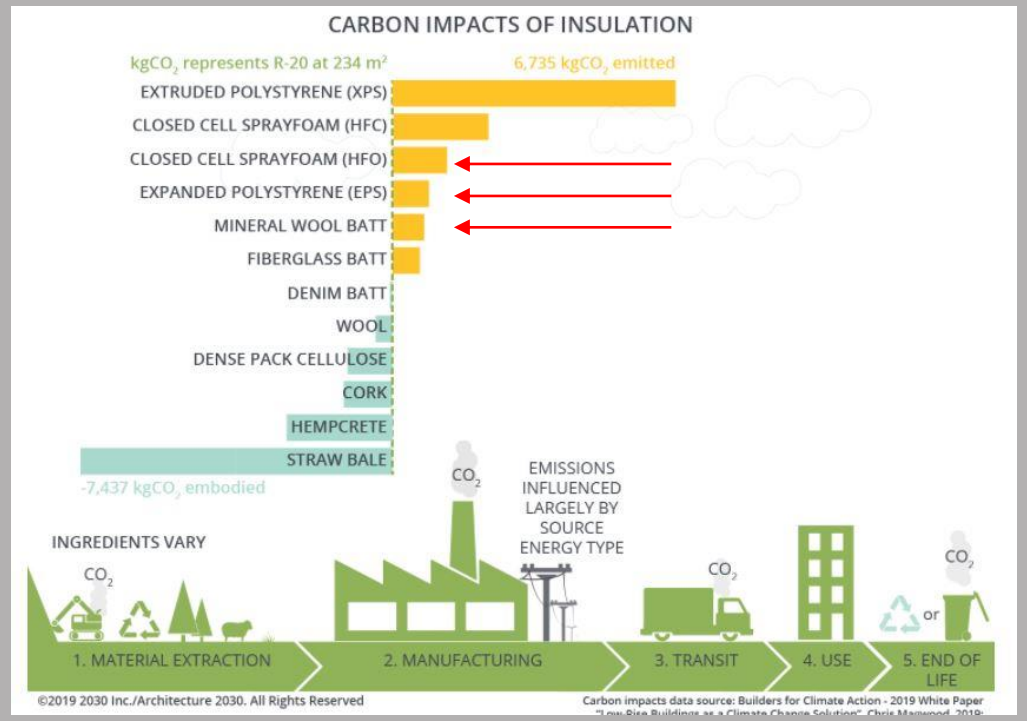
PROS:

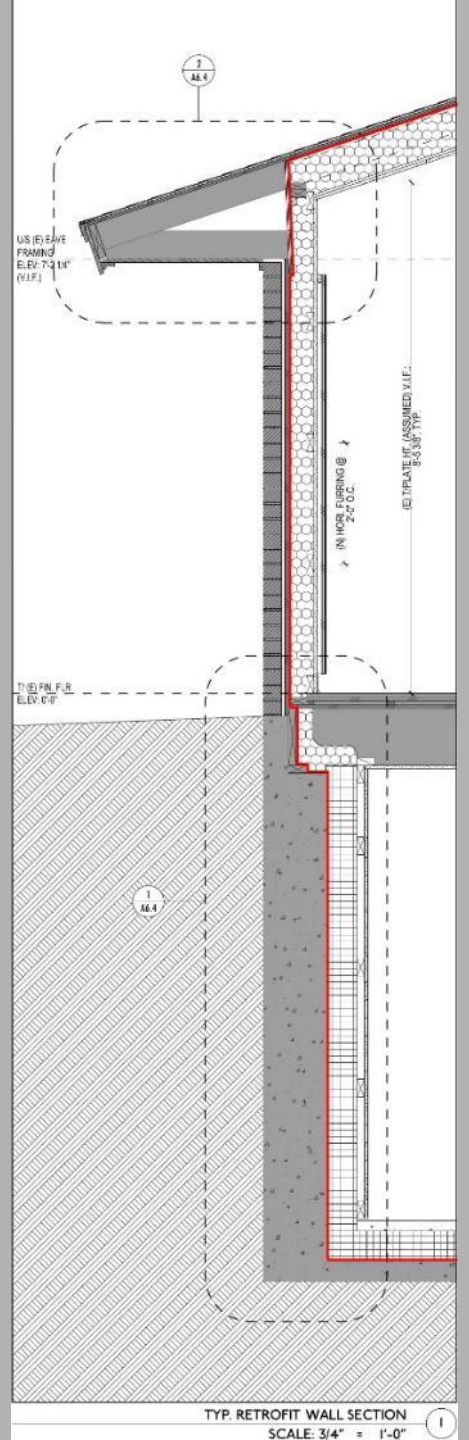
- Quick-easy
- Works with sealants to make air barrier
- High R-value
- Conforms to the contorted geometry

CONS:

- Higher embodied carbon: petroleum
- Toxicity at application (and potentially after)
- Reuse not possible at demo

We decided to use HFO-blown foam.





Carroll Center
Retrofit Air Sealing

<u>Air Barrier Plan:</u>

- Seal major cracks and use AeroBarrier to reach PH airtightness.
- A diligent GC that understands the challenges and concepts makes all the difference. Builder, CPHC, Architect in one team had many benefits

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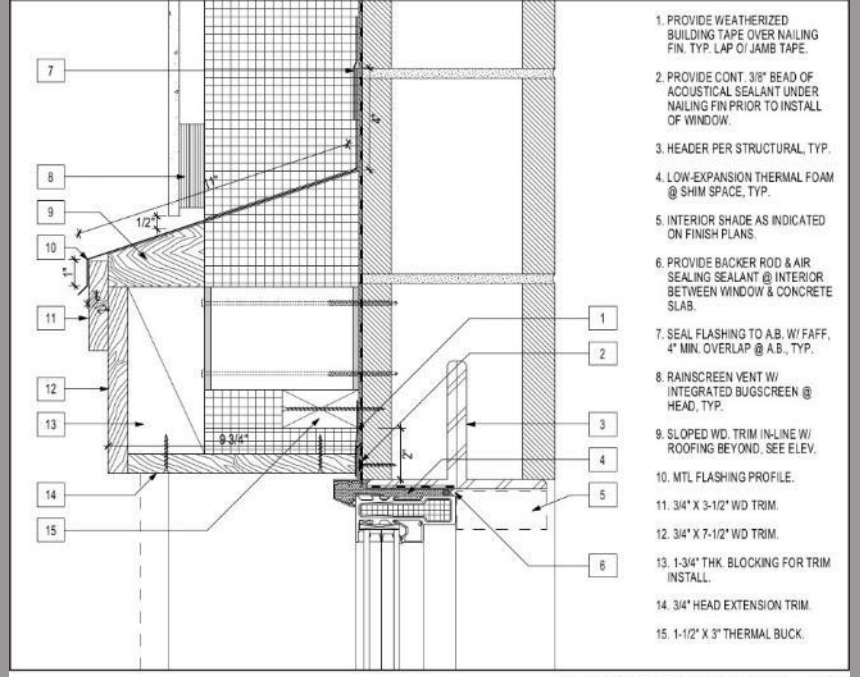
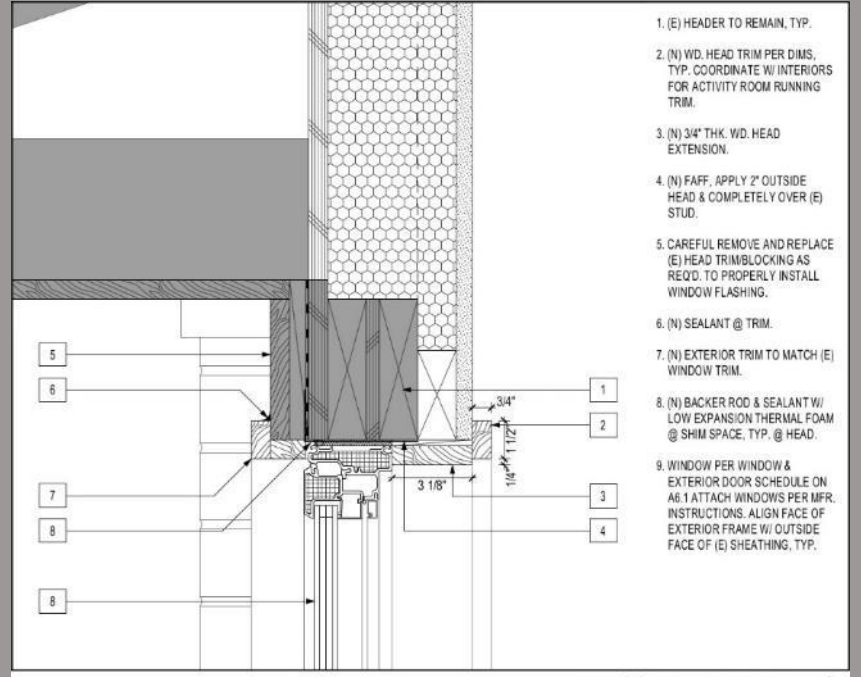
Carroll Center Window Details

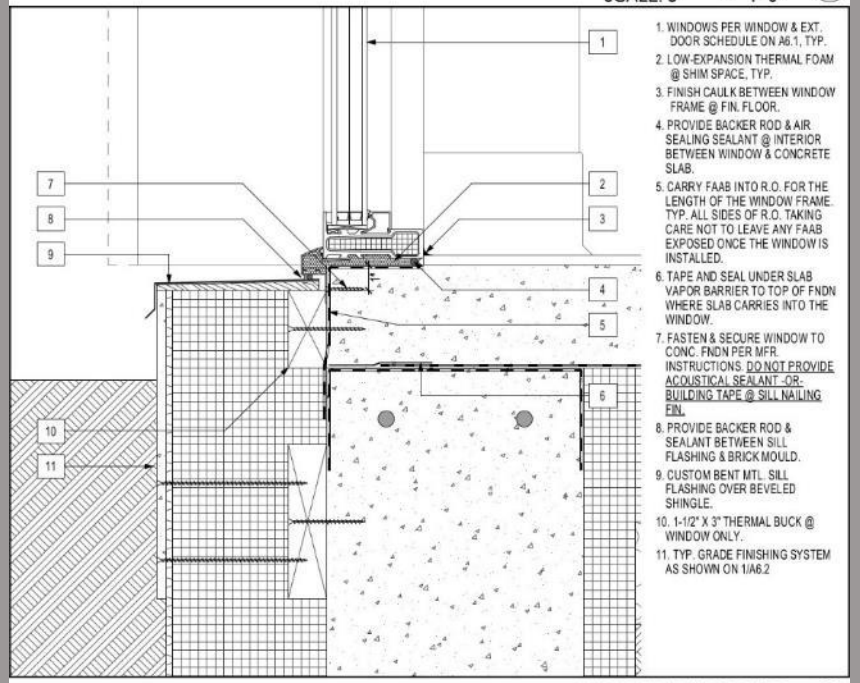
Alpen Fiberglass Ribbon Windows at new, Alpen Zenith 925 Windows at retrofit



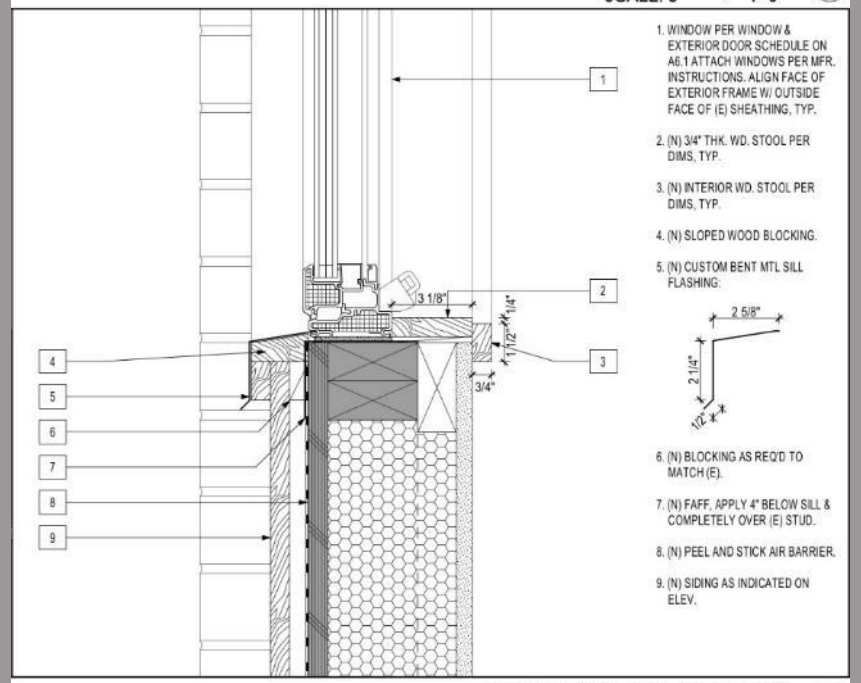
TYP. CMU WINDOW HEAD 3
SCALE: 3" = 1'-0"



TYP. (R) WINDOW HEAD 3
SCALE: 3" = 1'-0"



TYP. CMU WINDOW SILL 1
SCALE: 3" = 1'-0"



TYP. (R) WINDOW SILL @ PANELING 1
SCALE: 3" = 1'-0"

Carroll Center Mechanicals

Heating & Cooling:

(4) Climatemaster TE Ground Loop Heat Pumps

- EER: 26.7
- COP: 4.4

Ventilation:

RenewAire HE-2XINV

- Efficiency: 76%
- 1000 CFM Ventilation

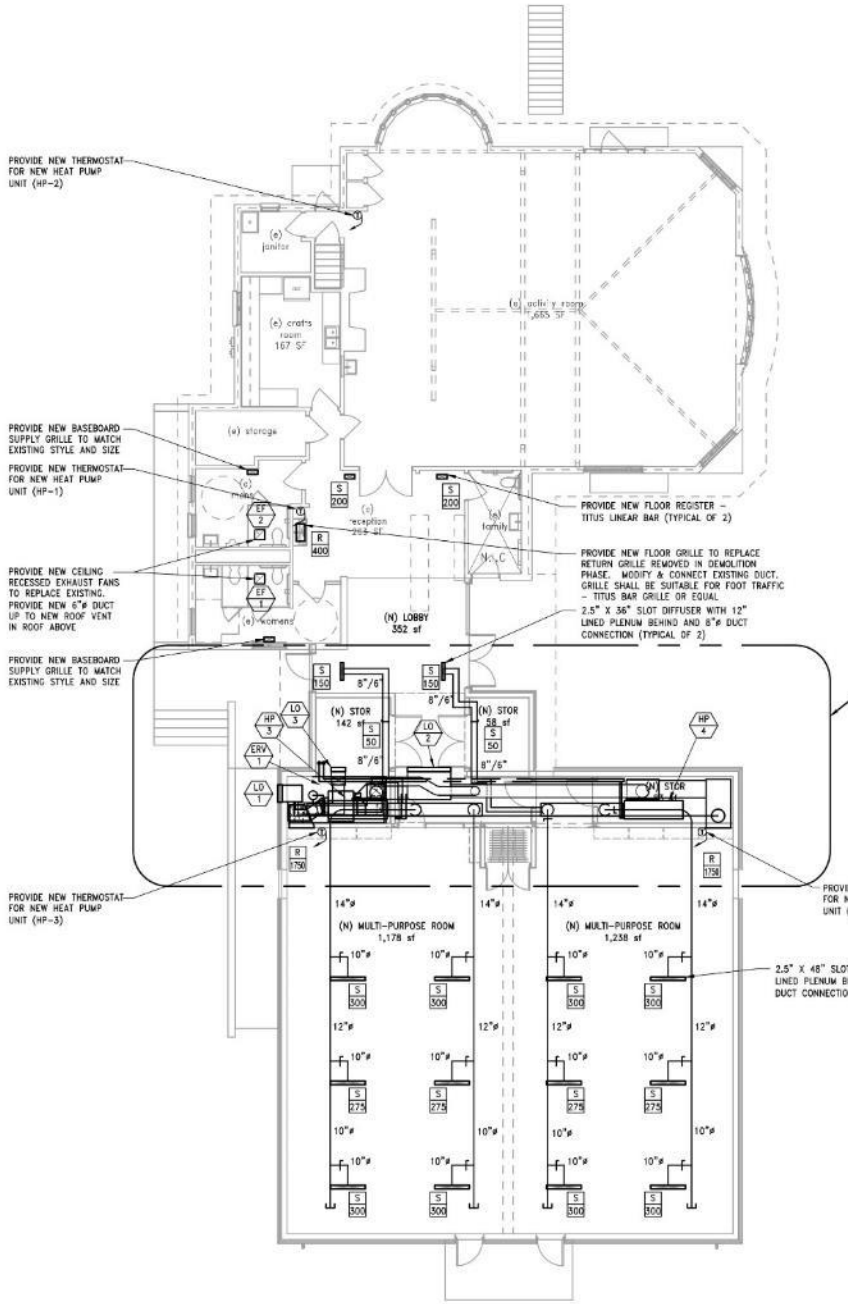
DHW:

40 Gallon Electric Water Heater

- Efficiency: 92%

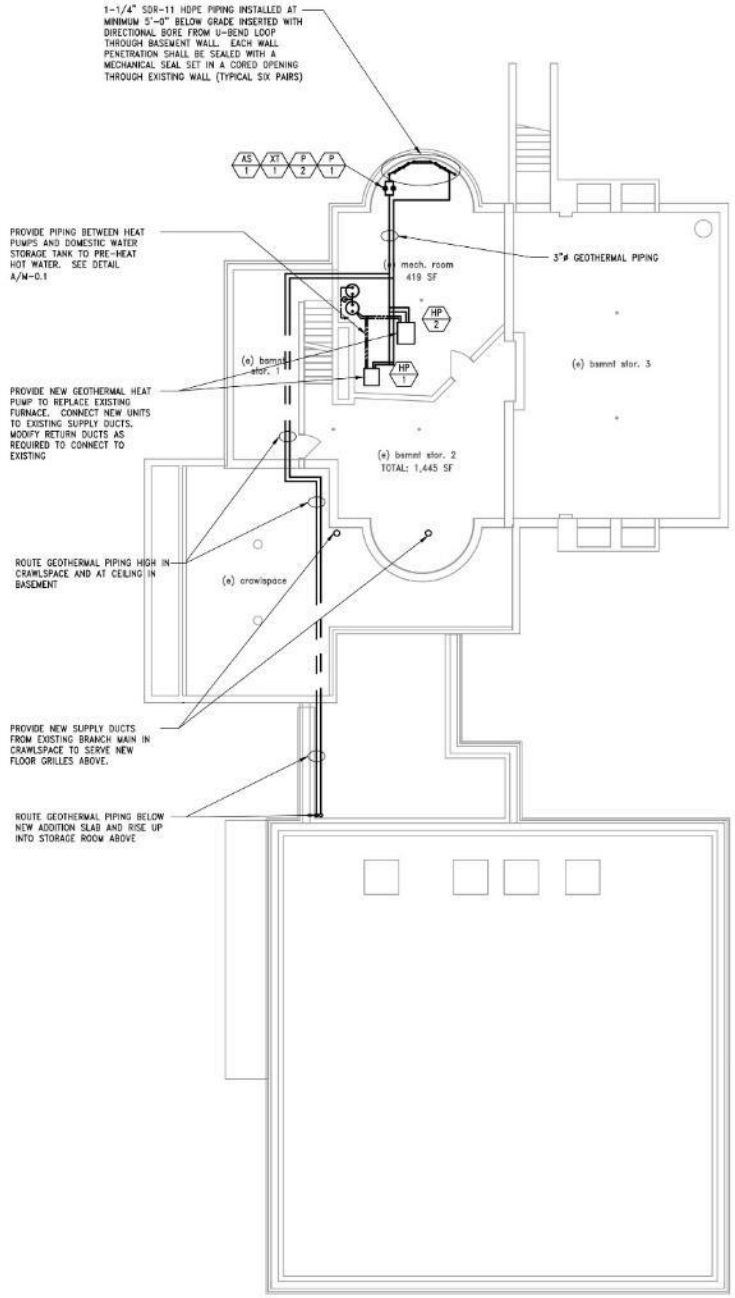
Solar:

27kW Rated Array (35,633 kWh/yr per PVWatts)



FIRST FLOOR MECHANICAL PLAN

SCALE : 1/8" = 1'-0"



BASEMENT MECHANICAL PLAN

SCALE : 1/8" = 1'-0"

Carroll Center
Mechanical Verification Challenges

<u>Combined Ductwork:</u>

- Technically allowed for PHIUS certification
- VERY difficult to verify flow rates
- Difficult to confirm that both ventilation AND heating and cooling supply are meeting requirements

<u>Non-Continuous Ventilation:</u>

- Commercial buildings tend to have non-continuous ventilation.
- Gravity dampers for outdoor air can not be taped during blower door testing on non-continuous ventilation

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Construction Photos: exist. concrete

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Construction Photos: retrofit

Construction Photos: new abv grade

Construction Photos: air barrier/exist.

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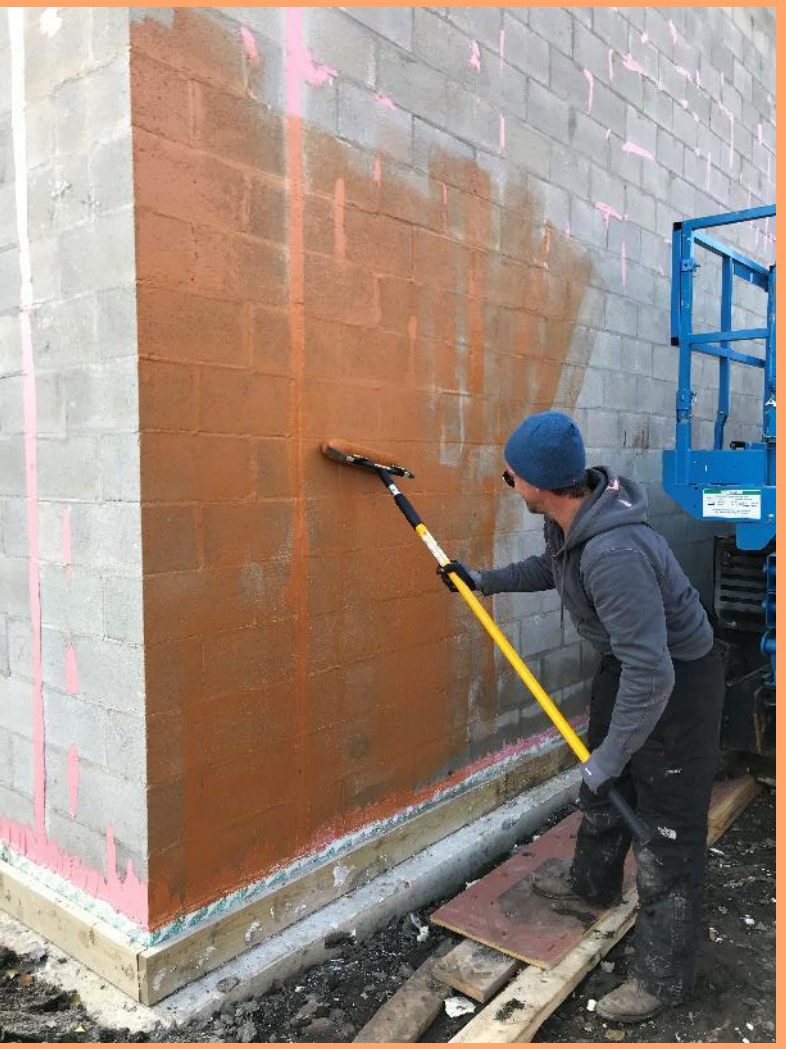
Construction Photos: air barrier/new



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Construction Photos: air barrier performance

BUILDING LEAKAGE TEST

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Building Wisdom

Date of Test: 5/8/2020 Test File: Carroll Center MC Blower Door- 2020.5.8

Technician: Jeffrey Parker
Project Number:

Customer: Building Address: Carroll Center
Oak Park, IL

Test Results at 50 Pascals:	Depressurization	Pressurization	Average
cfm (Airflow)	982	1083	1033
ACH50			
cfm/ft² (Surface Area)	0.0478	0.0527	0.0503

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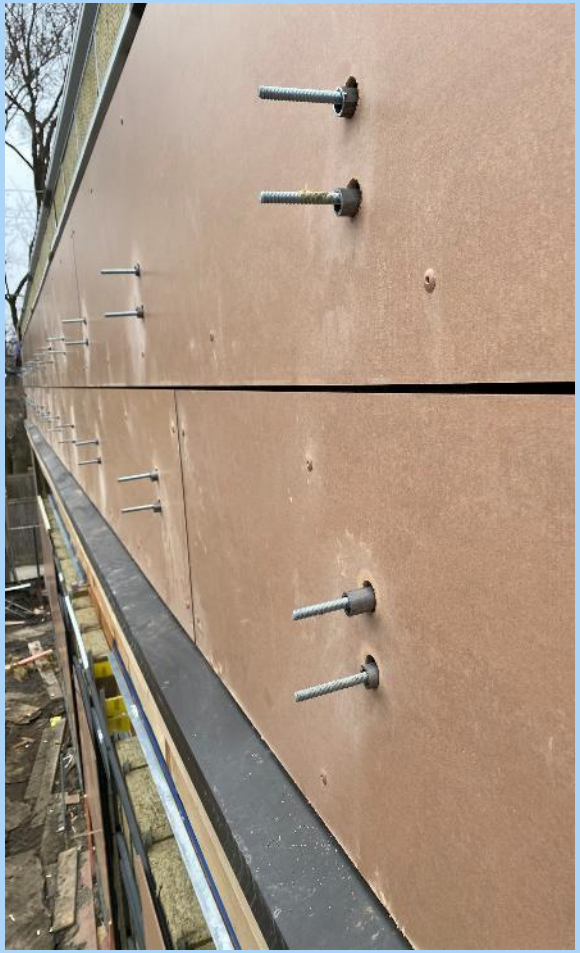
Construction Photos: solar

Sunmodo “SunShield” PV rack system and roof ballasted
Total panels: 79 Mission panels @ 310W, estimated 12-20% overproduction



Monitored data: 88% overproduction (Covid use partly)

Thank you—questions?

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