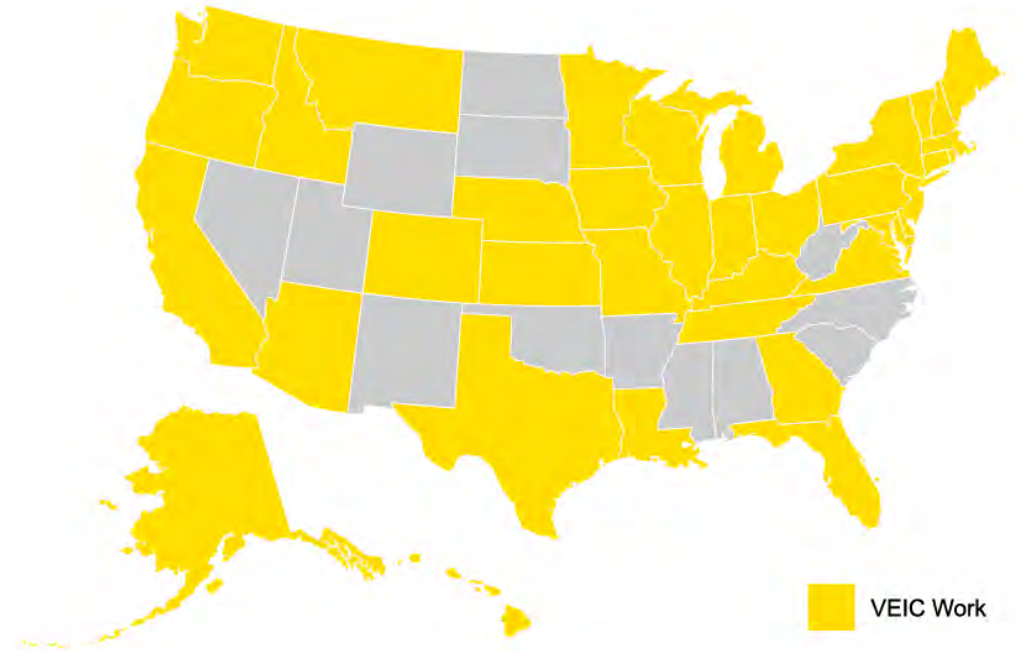


About VEIC

- Nonprofit founded in 1986
- 300+ Employees
- Locations: VT, DC, OH, NY
- Design, deliver, and evaluate programs nationwide:
 - Energy efficiency
 - Transportation
 - Renewable energy



Our Customers:

- Utilities
- Businesses
- Government
- Foundations
- Environmental & Consumer Groups

Passive House Services VEIC Offers

- Policy Support
- Certified Passive House Consulting (CPHC)
- Passive House rating
- Incremental cost studies for Passive House buildings
- Modeling and technical assistance
- Post occupancy monitoring and analysis of performance

BECx vs. PH Rating

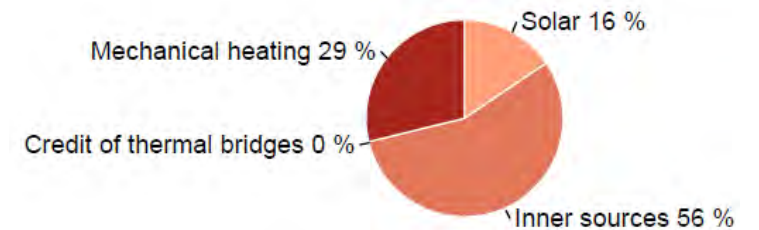
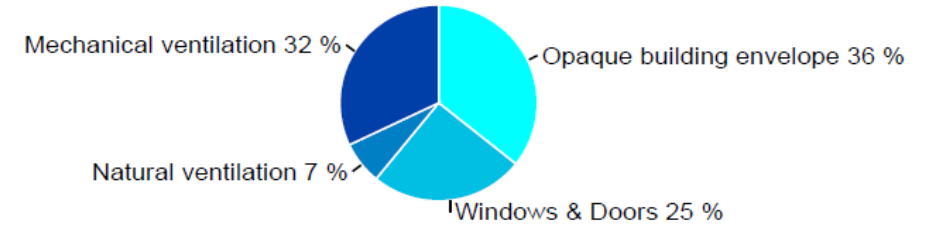


How Building Envelope Commissioning differs from PHIUS

| Included services | BECx | PHIUS R/V |
|---|---------------|-------------|
| Engage with the design and construction teams to ensure building enclosure meets Owner's Project Requirements - components and systems are properly detailed, specified and installed on-site | X | X |
| Provide progress and final testing of building envelope systems and assemblies | X | Final-focus |
| Provide guidance and verification for meeting requirements of applicable programs (PHIUS, ESTAR, IaP, WS, ZERH) | | X |
| Submit documentation for certification. Note where documentation deviates from built condition. | | X |
| Ensure systems are meeting the specified performance criteria post installation. | Per contract? | |

Why Certify?

- Cost optimize design with modeling
 - First costs and operational costs
- Hold team accountable for final outcome
 - Passive House immediately,
 - Net Zero after a year of performance data
- Third party verification, QA/ QC
 - Bonus: experience of verifier organization
- Celebration and Recognition for the success in a quickly evolving market



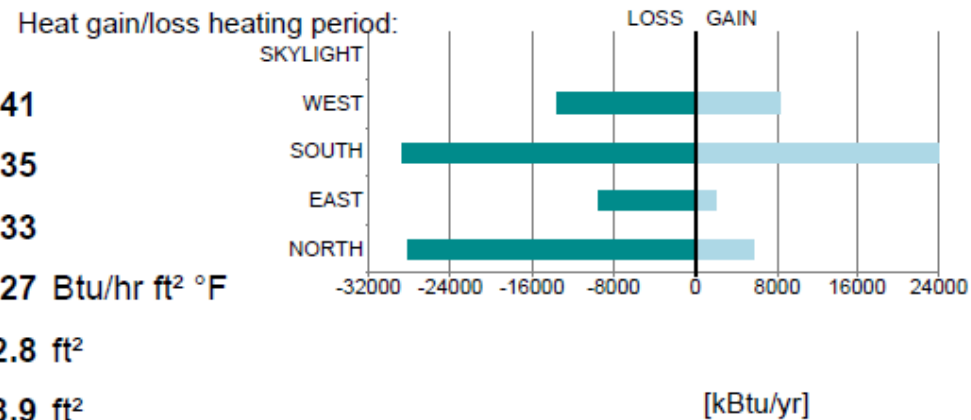
Passive House Modeling Coordination

Things get complicated...
when the pre-certification energy
model is being created at the same
time that construction is happening.

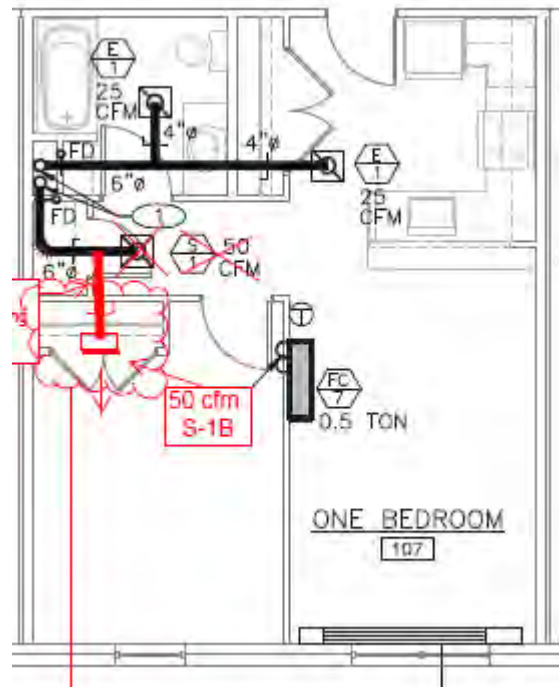


Windows

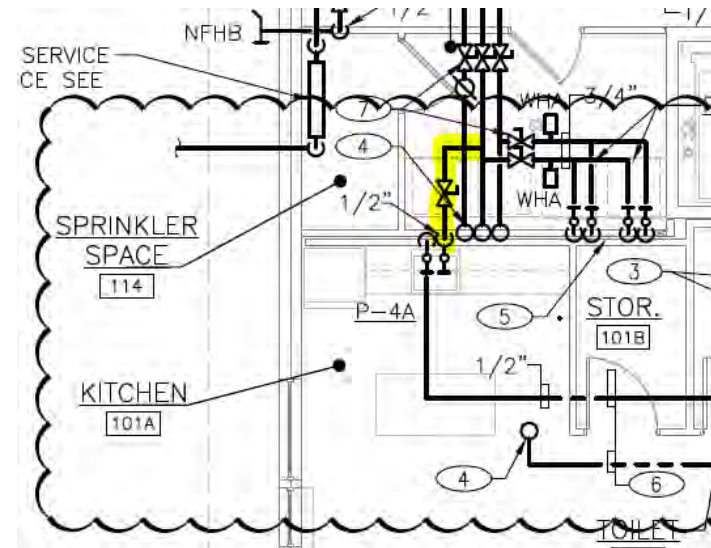
| | |
|---|---------------------------------------|
| Average SHGC: | 0.41 |
| Average solar reduction factor heating: | 0.35 |
| Average solar reduction factor cooling: | 0.33 |
| Average U-value: | 0.227 Btu/hr ft² °F |
| Total glazing area: | 1,432.8 ft² |
| Total window area: | 1,908.9 ft² |



Last Minute Changes are Expensive



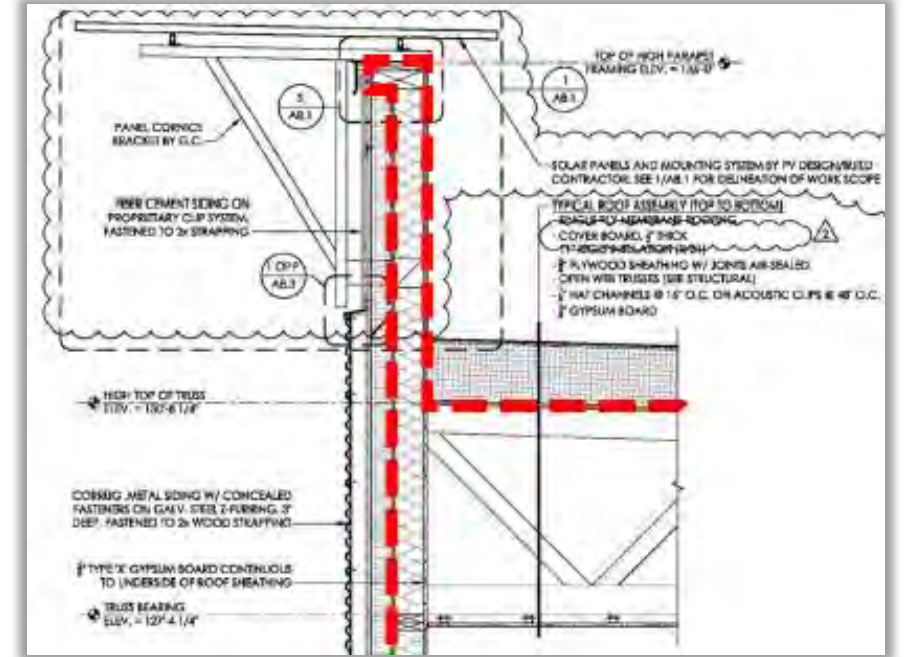
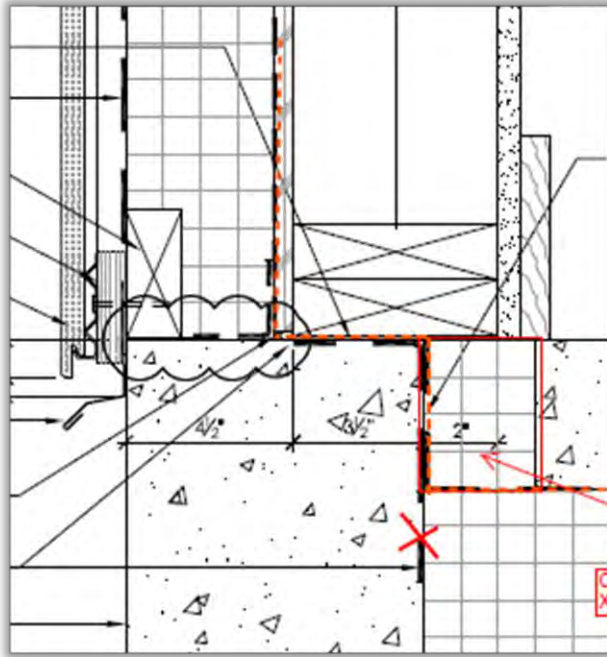
Ventilation



Domestic Hot Water

... But sometimes can't be avoided

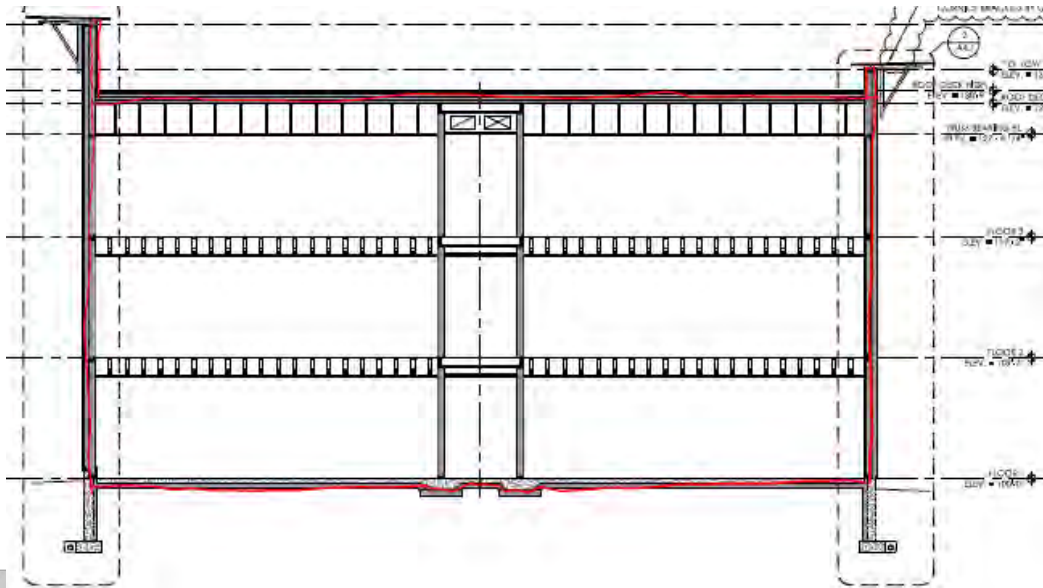
Reconciling Details with Reality



Passive House Air Leakage

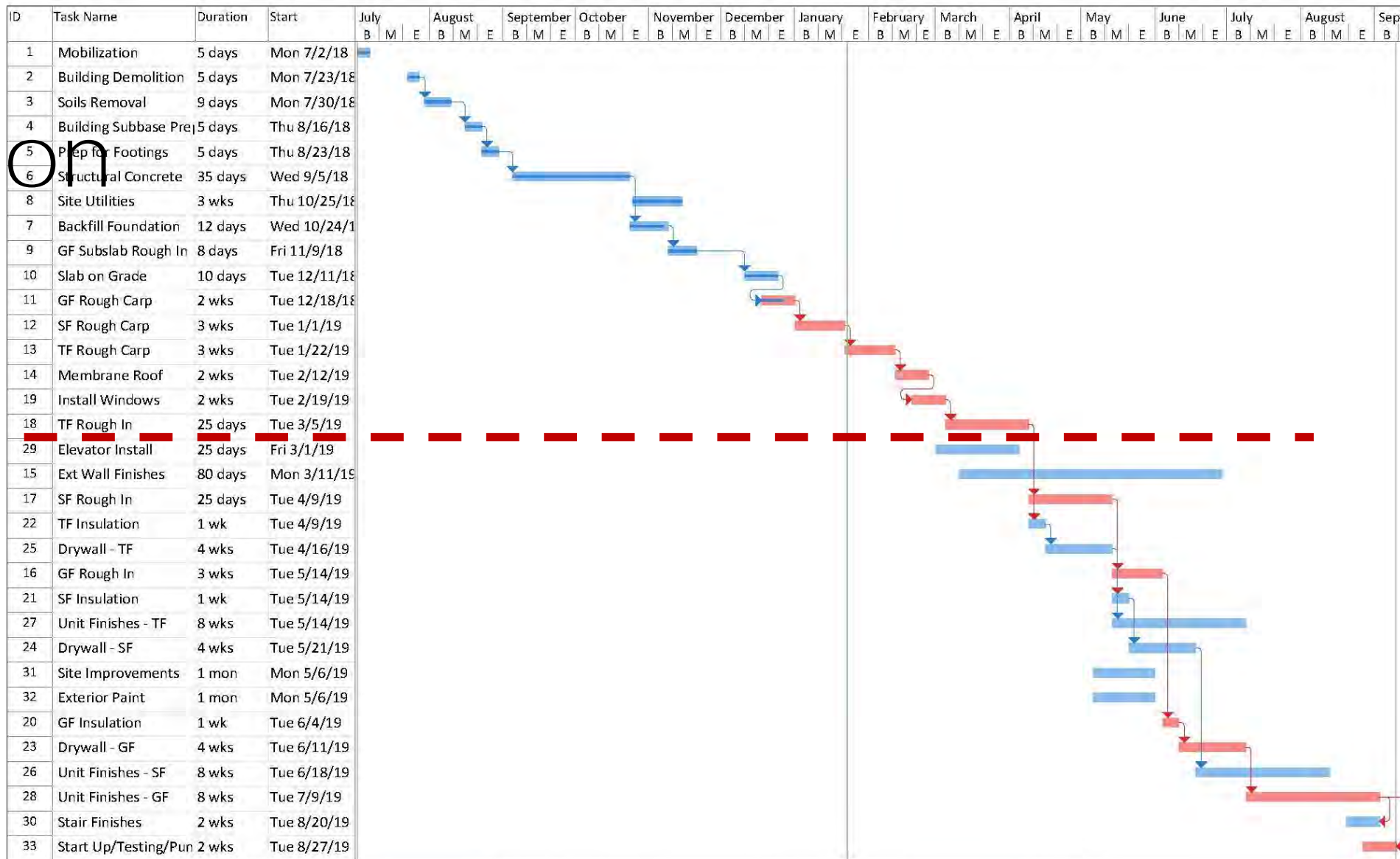
Whole-building preliminary blower door test vs. progress tests:

Ensure target is reached -or- optimize schedule?



Construction

- Began Summer 2018
- Anticipated completion Summer 2019



ESTES & GALLUP
INCORPORATED

Project: 14 Tracy Street 01_22_19
Date: Wed 1/23/19

| | | | | | |
|-----------------|--------------------|--------------------|-----------------------|----------------|-----------------|
| Task | External Milestone | Inactive Milestone | Manual Summary Rollup | Critical Split | Progress |
| Split | Inactive Task | Inactive Summary | Manual Summary | Progress | Manual Progress |
| Milestone | Inactive Milestone | Manual Task | Start-only | Progress | |
| Summary | Inactive Summary | Duration-only | Finish-only | Deadline | |
| Project Summary | Manual Task | Critical | Deadline | | |
| External Tasks | Duration-only | | Critical | | |



BANK
PARKING
ONLY

BANK
PARKING
ONLY

EAST COAST
RENT A FENCE
800-667-7411

NO
PARKING













TRACY COMMUNITY HOUSING

Developer: Twin Pines Housing
White River Junction, VT 05001

Architect: Mackay Architects
Waitsfield, VT 05673

Construction Manager: Estes & Gallup, Inc.
Lyne, NH 03768

Financed by:

- New Hampshire Housing
- Southern New England Housing Partnership

A construction schedule board with a grid of dates and task descriptions.



TRACY COMMUNITY HOUSING
Developer: City of Tracy
100 West Avenue, 01507
Building Administrator:
Marilyn M. Johnson
Construction Manager: Susan G. O'Neil, Inc.
www.tracyhousing.com

SPONSORS:
Massachusetts Housing Finance Bank
Bank Boston
CDFA



TRACY COMMUNITY HOUSING





TRACY COMMUNITY HOUSING

Developer: Twin Pines Housing
White River Junction, VT 05001

Architect: Mackay Architects
Waitsfield, VT 05673

Construction Manager: Estes & Gallup, Inc.
Lyme, NH 03768

Financed by:

- Mascoma Bank
- FHLBank Boston
- CDFA

PERMITS

| NO. | DATE | STATUS | DESCRIPTION |
|-----|------------|--------|-------------|
| 1 | 12/15/2023 | ISSUED | Site Plan |
| 2 | 12/15/2023 | ISSUED | Site Plan |
| 3 | 12/15/2023 | ISSUED | Site Plan |
| 4 | 12/15/2023 | ISSUED | Site Plan |
| 5 | 12/15/2023 | ISSUED | Site Plan |
| 6 | 12/15/2023 | ISSUED | Site Plan |
| 7 | 12/15/2023 | ISSUED | Site Plan |
| 8 | 12/15/2023 | ISSUED | Site Plan |
| 9 | 12/15/2023 | ISSUED | Site Plan |
| 10 | 12/15/2023 | ISSUED | Site Plan |
| 11 | 12/15/2023 | ISSUED | Site Plan |
| 12 | 12/15/2023 | ISSUED | Site Plan |
| 13 | 12/15/2023 | ISSUED | Site Plan |
| 14 | 12/15/2023 | ISSUED | Site Plan |
| 15 | 12/15/2023 | ISSUED | Site Plan |
| 16 | 12/15/2023 | ISSUED | Site Plan |
| 17 | 12/15/2023 | ISSUED | Site Plan |
| 18 | 12/15/2023 | ISSUED | Site Plan |
| 19 | 12/15/2023 | ISSUED | Site Plan |
| 20 | 12/15/2023 | ISSUED | Site Plan |



COMMUNITY HOUSING
CDFA

Informational sign with multiple columns of text and a small graphic.

TWIN PINES HOUSING

NO PARKING



TWIN PINES HOUSING
www.twinpineshousing.org

NO PARKING







Lessons Learned

- Certification Agreed to from Day 1- (Ideal world!)
- Certification fees = barrier (Individual donor enabled project to move forward toward PHIUS certification)



\$
\$\$
\$\$\$
\$\$\$\$



Lessons Learned

- Sequencing Work– large multi-family, testing, trades, tight timelines
- Design:
 - ASHP design
 - DHW runs
 - PHIUS and NZE envelope the same
 - Sizing solar and design integration

Lessons Learned

- Metering / Utility regulations
 - Monthly meter fees v. larger electrical service
 - 3-phase to site
 - Solar divided between tenant use
 - Unpredictable tenant use
- Utility rebates unknown until completed– Liberty Utilities
- Extra funding points, increase in cap of \$10,000/unit

Project Located in Vermont?

- No extra points allowed on applications
- No max \$/unit for projects
- Efficiency Vermont - Provide financial support/incentives

NESEA Pro Tour – November 8th, 2019

Thank you & Questions?



NESEA BE March 14, 2019
Andrew Winter– andrew@tphtrust.org
Bill Maclay– bill@maclayarchitects.com
Laura Bailey– laura@maclayarchitects.com
Karen Bushey– VEIC, ksbushey@veic.org

MaclayArchitects
CHOICES IN SUSTAINABILITY