



# Contracting for Net Zero: Construction Documents and Bidding



All attendees have been placed on mute.



Use the **Question Section** on the webinar control panel to ask a question at anytime during the presentation.

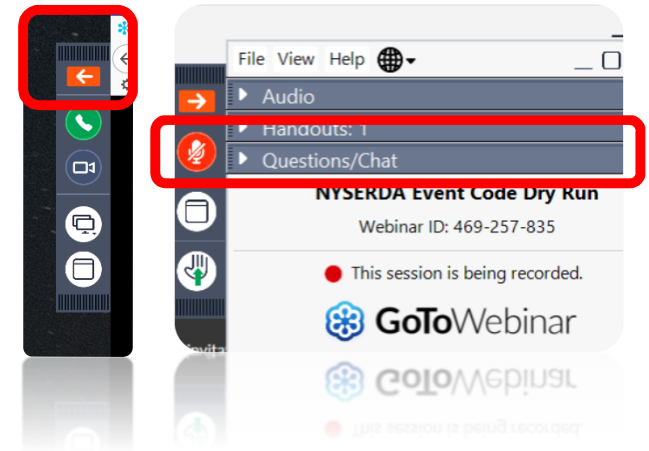


Q&A will take place at the end of each segment.



Webinar will be recorded and sent.

# Webinar Overview



Since 1972, Steven Winter Associates, Inc. has been providing research, consulting, and advisory services to improve the built environment for private and public sector clients.

Our services include:

- Energy Conservation and Management
- Sustainability Consulting
- Green Building Certification
- Accessibility Consulting

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We have over 125 staff across four office locations:  
New York, NY | Washington, DC | Norwalk, CT |  
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**Steven Winter Associates, Inc.**  
Improving the Built Environment Since 1972



We Make  
Buildings



Perform  
Better



By providing a whole-building  
approach to design and  
construction

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# Upon Completion of Module

You will receive the following items via email:

- AIA Certificate of completion-can also be used for:
  - PHI Credits
  - NYS PE CEUs
- PDF of final presentation
- Link to the webinar recording



## CERTIFICATE OF COMPLETION

THIS CERTIFICATE IS TO CERTIFY THAT

**Katie Zoppo**

PARTICIPATED IN

**Module 1: Overview of PH/Net Zero Building Concepts,  
Techniques and Benefits**

COURSE NUMBER  
**M10OPHNZBCTAB**

ON  
**February 11<sup>th</sup>, 2020**

LOCATION  
**New Paltz, NY**

EARNING  
**4 AIA CES Learning Unit/HSW**



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# Learning Objectives

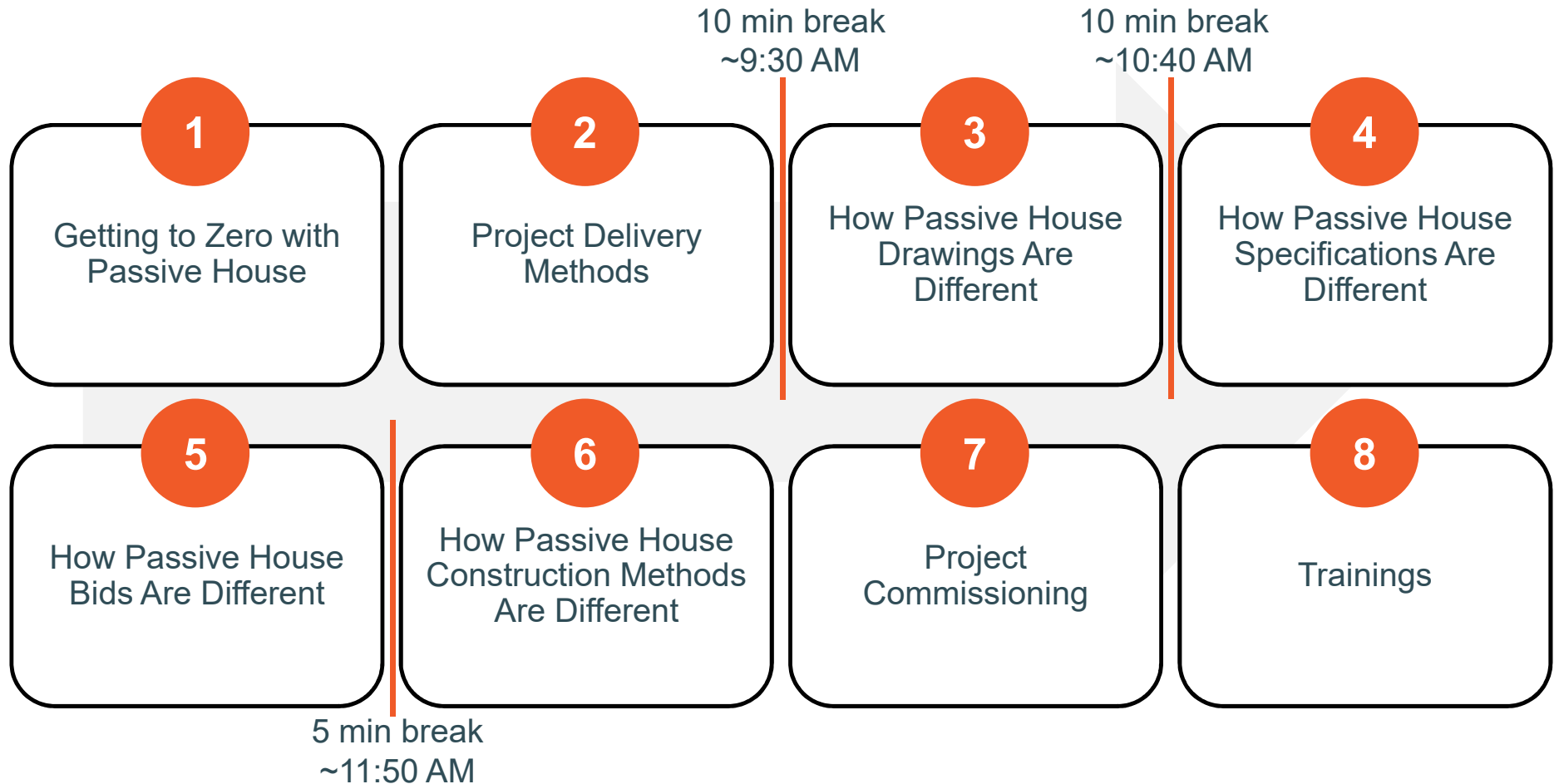
**Understand** net zero carbon goals for SUNY

**Discuss** project delivery methods and working within the confines of Design-Bid-Build to meet SUNY's net zero carbon goals

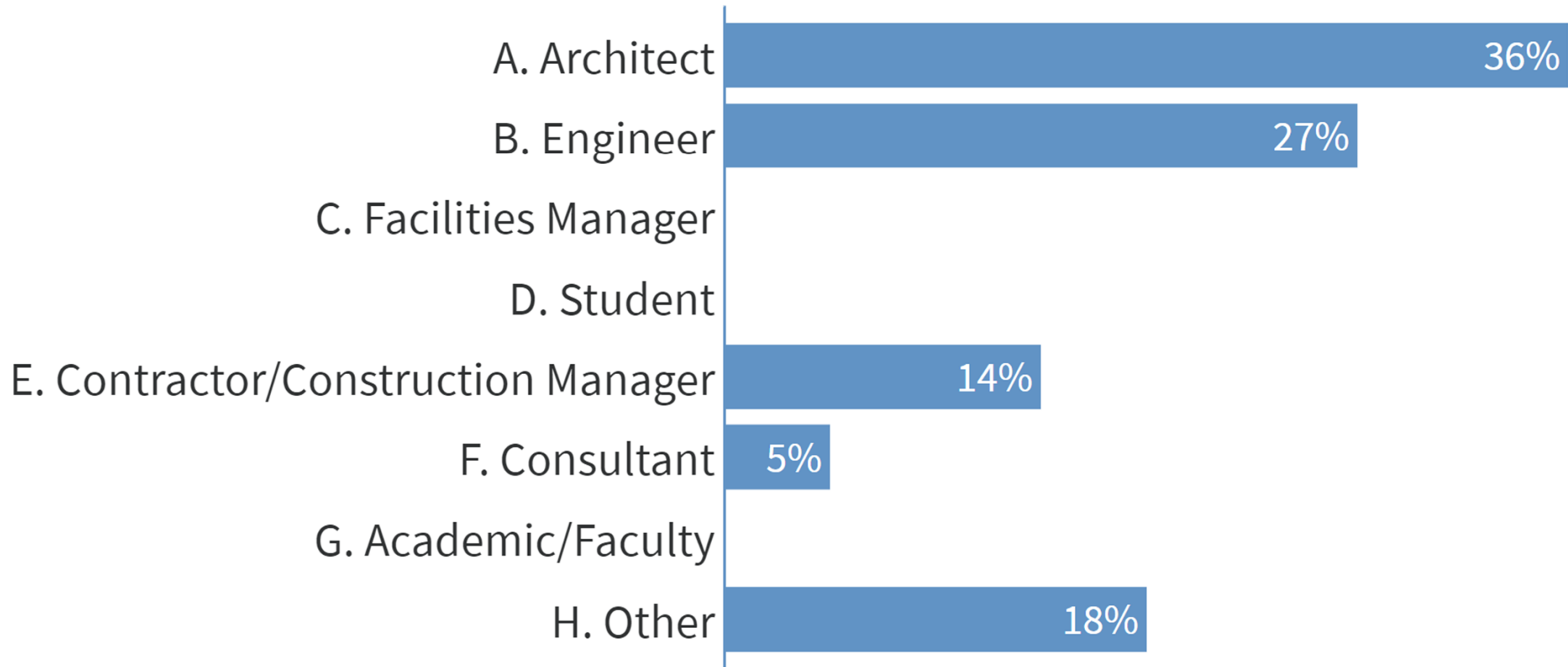
**Review** how to incorporate high performance into construction documents to reduce EUIs

**Examine** lessons learned from past projects for improved outcomes on high performance buildings

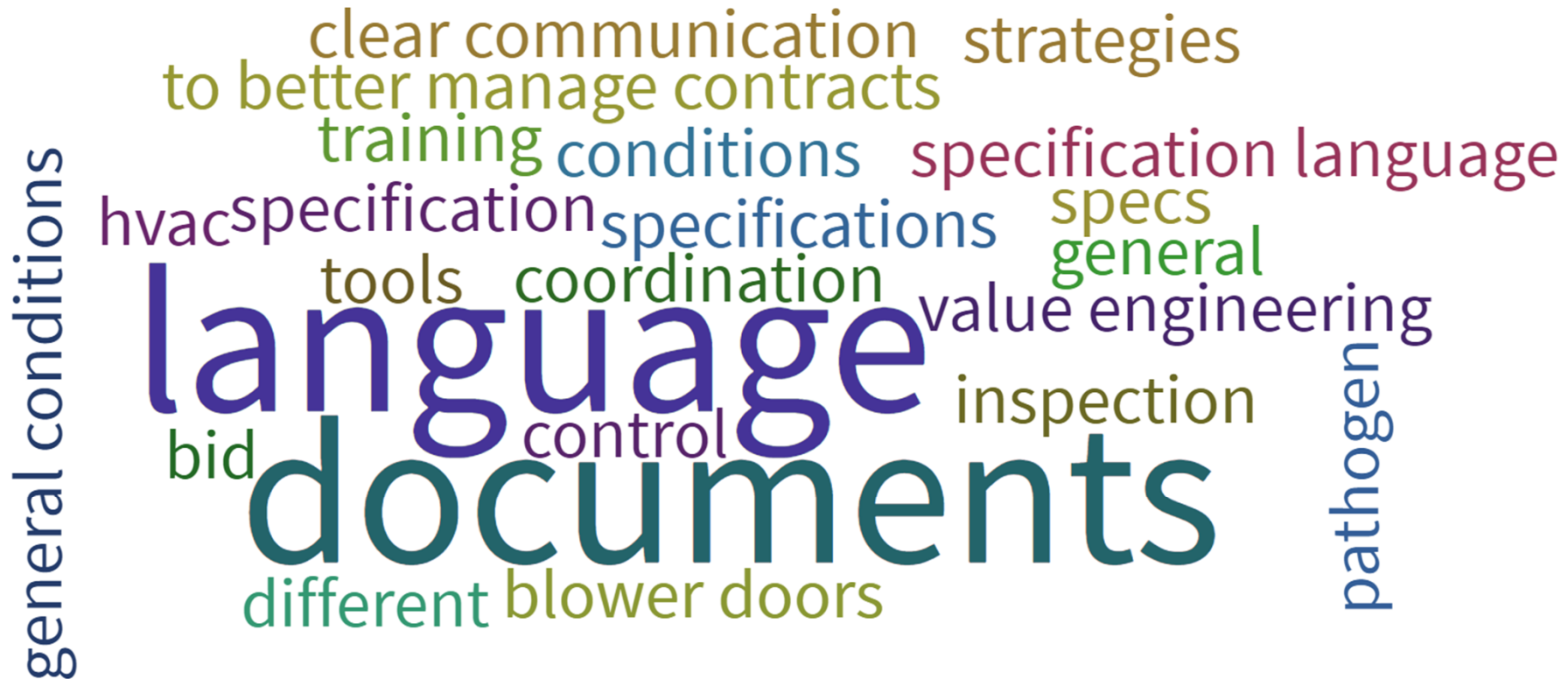
# Overview of Presentation



## What is your profession?



What is the one thing you were hoping to learn about today?



high performance drawings(different

*Coykendall Science Building*



## Why we are here: Directive 1B-2

- 2018 Chancellor calls for all new buildings to be zero-net-carbon & deep energy retrofits for existing buildings
- 2018 SUCF issued Directive 1B-2
  - Purpose: define and identify goals for Net Zero Carbon (NZC) new buildings and Deep Energy Retrofits (DER) of existing buildings.
  - Function: outlines the project target goals and provides direction for project designs.
  - Metrics: Site Energy as the measure of performance and energy consumption.

## Why we are here: Directive 1B-2

- Design and construct highly energy efficient buildings which **significantly reduce energy consumed** below an energy code standard for new buildings or energy usage for an existing building.
- In the case of insufficient project funding, the design goal will be to design the building as NZC “capable” where: the design achieves the energy use intensity **(EUI) limit using HVAC equipment** and systems that can be electrically powered from **renewable energy sources**.

### **New Building Performance goals:** Site Energy Use Intensity (EUI) limits

Classroom building	50 kBTU/ft <sup>2</sup> /year
Office building	50 kBTU/ft <sup>2</sup> /year
Laboratory building	150 kBTU/ft <sup>2</sup> /year
Residence Hall	32 kBTU/ft <sup>2</sup> /year

# These Trainings

- **Module 1:** Overview of PH and Net Zero
- **Module 2:** Construction Methods and High-Performance Products and Details
- **Module 3:** Air Barrier Development & Implementation
- **Module 4:** Net Zero HVAC Strategies and Controls + DHW
- **Module 5:** Construction Documents and Bidding
- **Module 6:** Deep Energy Retrofits
- **Module 7:** Refrigerant Management in Design, Construction, and Operations
- **Module 8:** Construction Manager/Subcontractor/Tradesperson Training

# Clarifications

We may use Passive House and Net-Zero interchangeably

Passive House principles are a great pathway to achieving Net-Zero

# Getting to Zero with Passive House

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## What is Passive House (PH)?

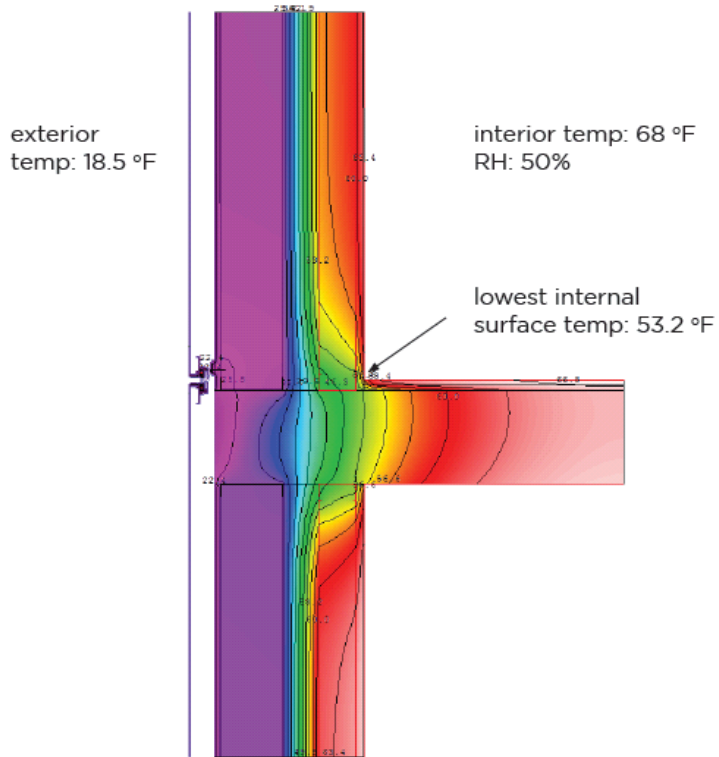
- First and foremost, PH is a building standard
- Applies to New & Existing buildings
- The most rigorous energy efficiency certification available
- Performance-based approach
- Attention to insulation continuity and reduction of thermal bridges
- Emphasis on balanced ventilation

## Goals of PH

- Building durability
- Energy \$ reduction
- Optimal thermal comfort
- Superior indoor air quality
- Carbon emissions reductions



## Comfort Criteria

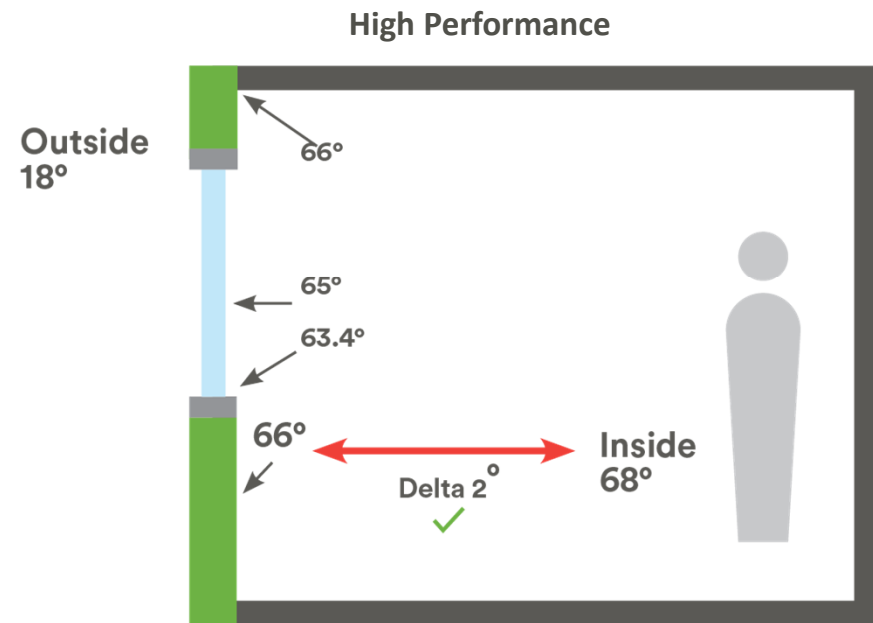
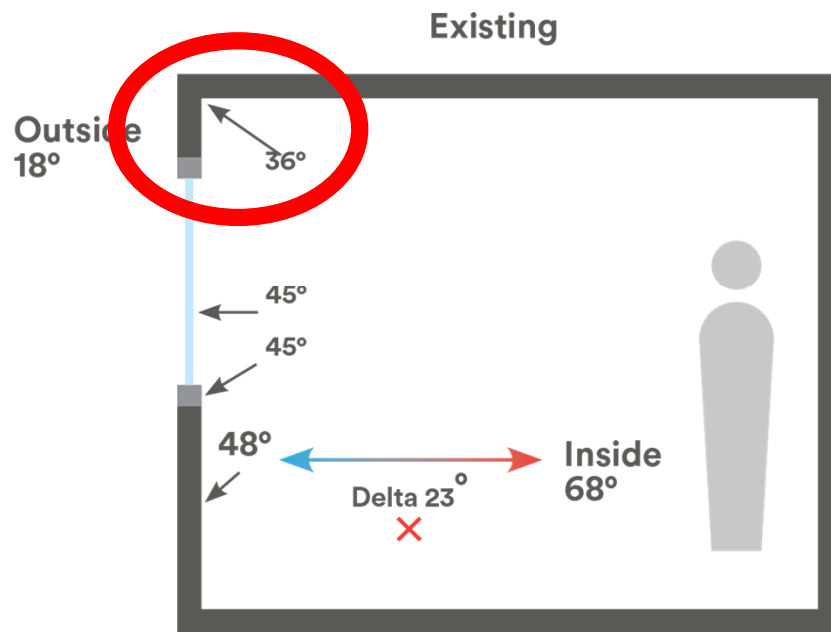


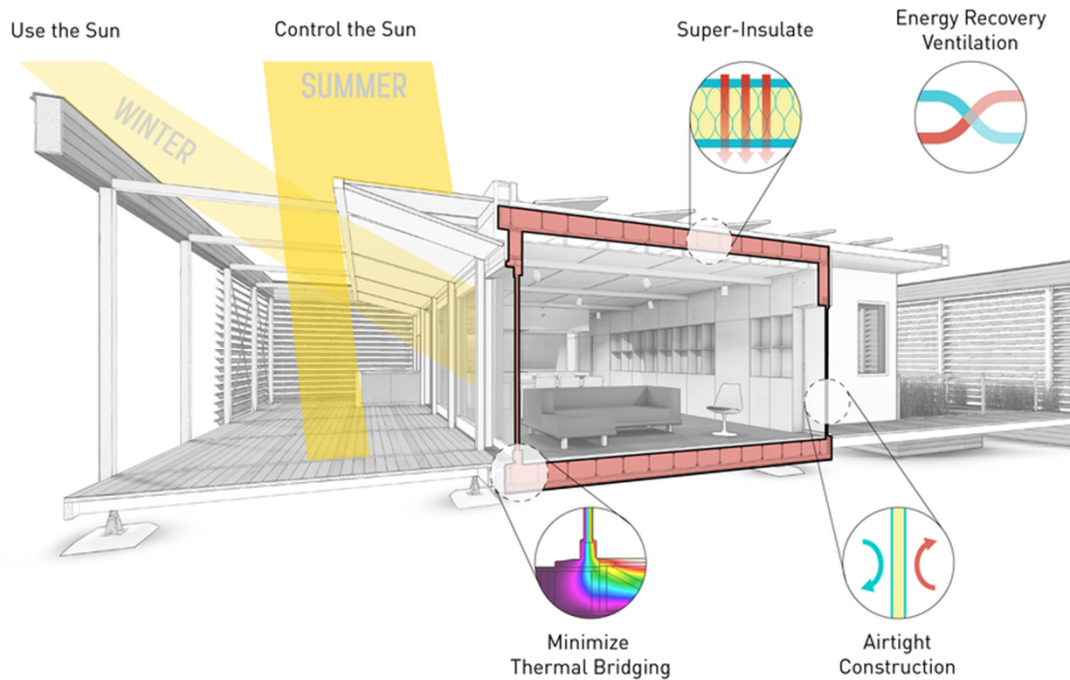
A-11 Option 2  
At risk for condensation

- Interior surface temperatures should not deviate by more than 7.6°F from the average operative temperature on the inside;
- the surface temperature must not be lower than 55.4°F or greater than 132°F at any point;
- the surface temperature of the floor must be between 66°F and 81°F.

# Comfort

## Thermal Comfort and Interior Temperatures





The SURE House

Winner of the 2015 D.O.E. Solar Decathlon

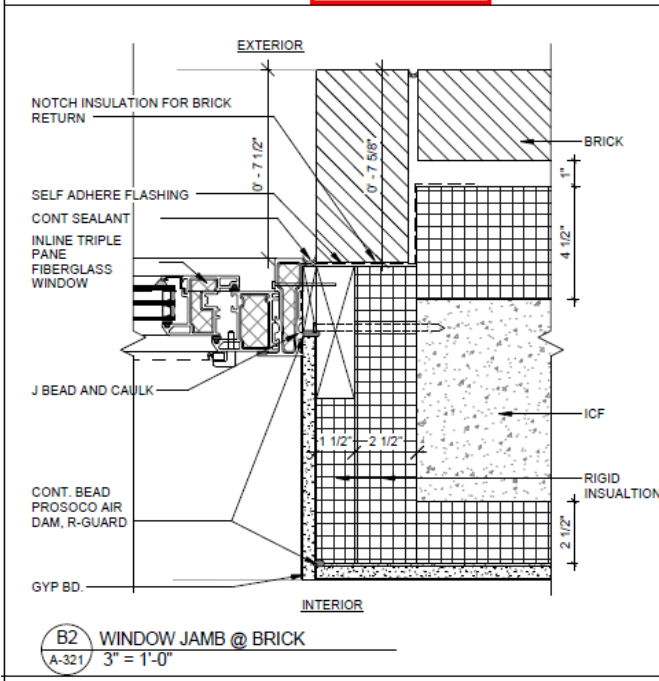
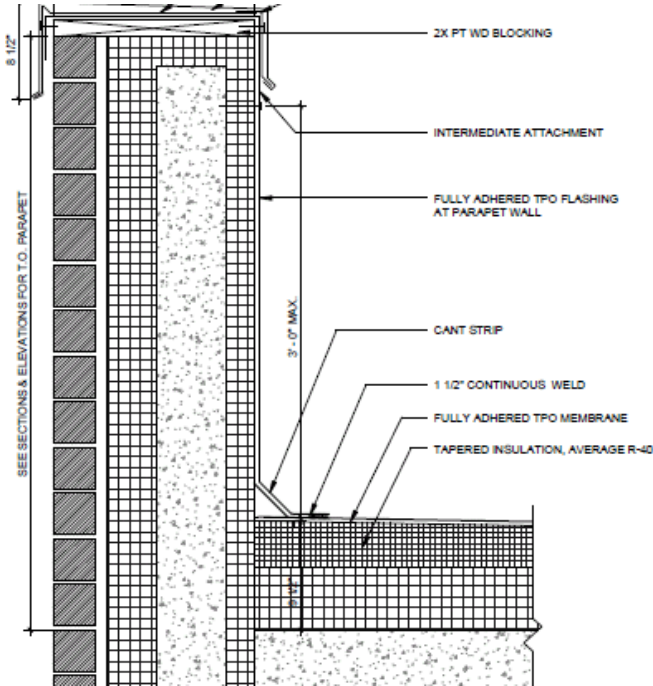
[www.surehouse.org](http://www.surehouse.org)

## Passive House Principals

- Thermal insulation continuity
- Thermal bridge free construction
- Solar control
- Airtightness
- Balanced mechanical ventilation



# Continuous Insulation



- Basic Components

- Gauge (manometer)

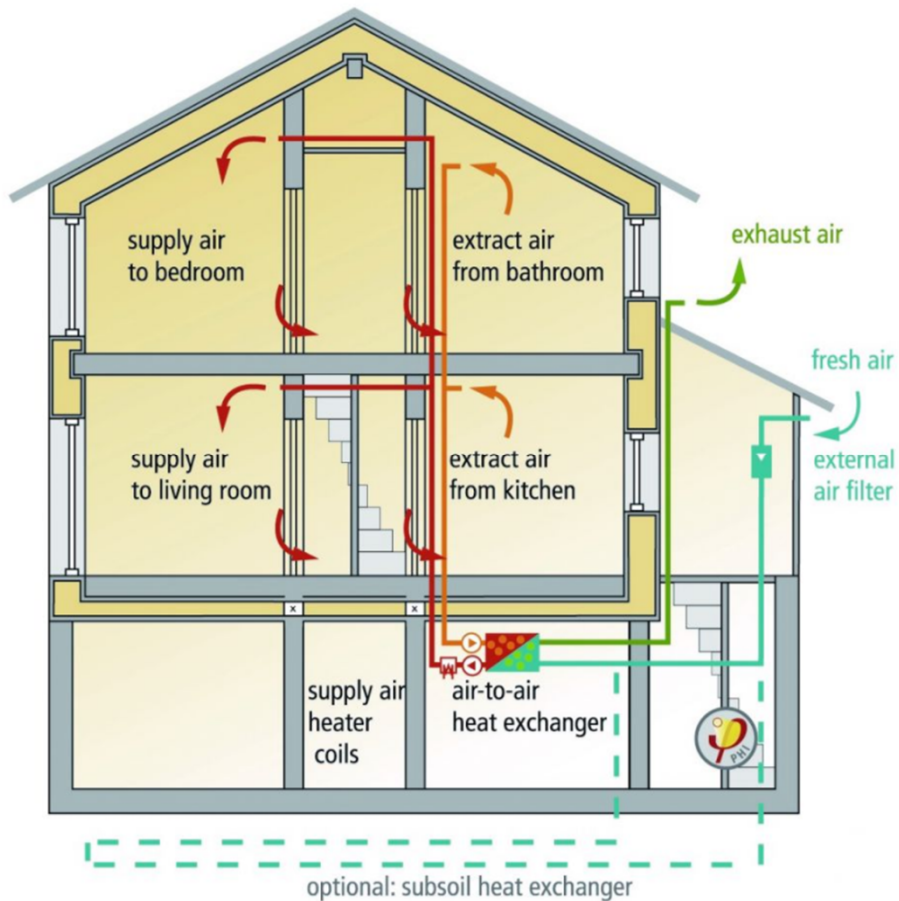
- Shroud

- Frame

- Fan

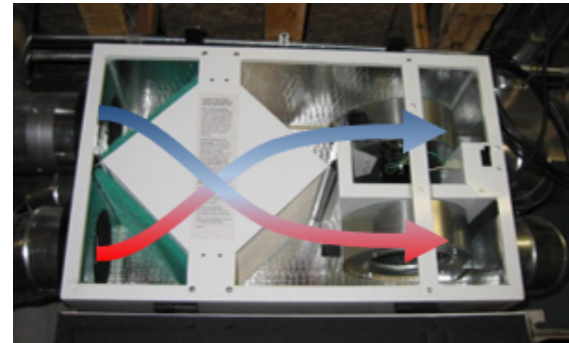


## Air-Tightness Blower Door Testing



## Balanced Ventilation and Heat/Energy Recovery

- Provide fresh, filtered air 24 hours a day
- Heat exchanger +75% Efficient
- Highly insulated and air-sealed ductwork

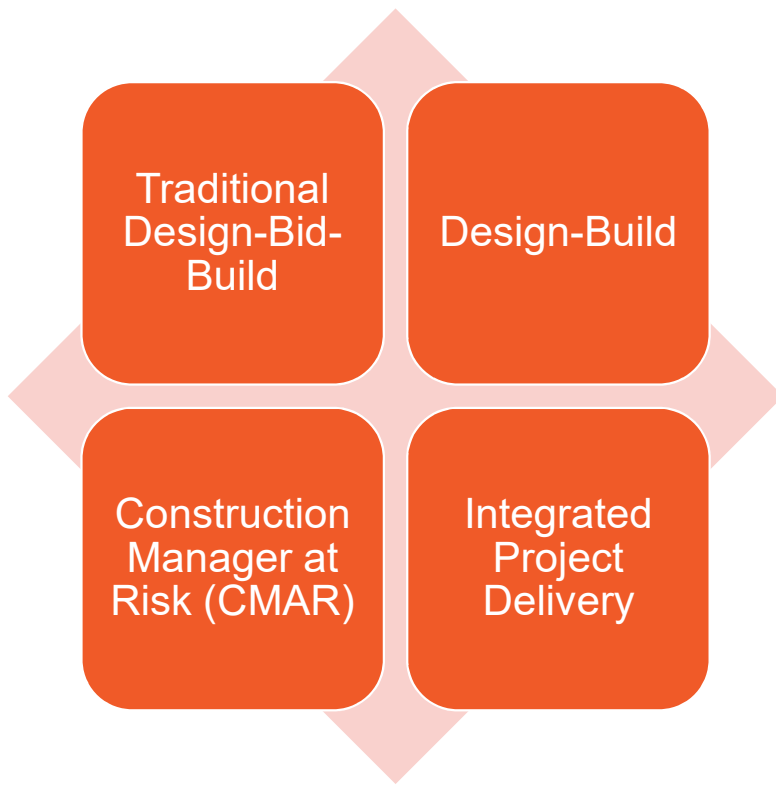


Questions?



# Project Delivery Methods

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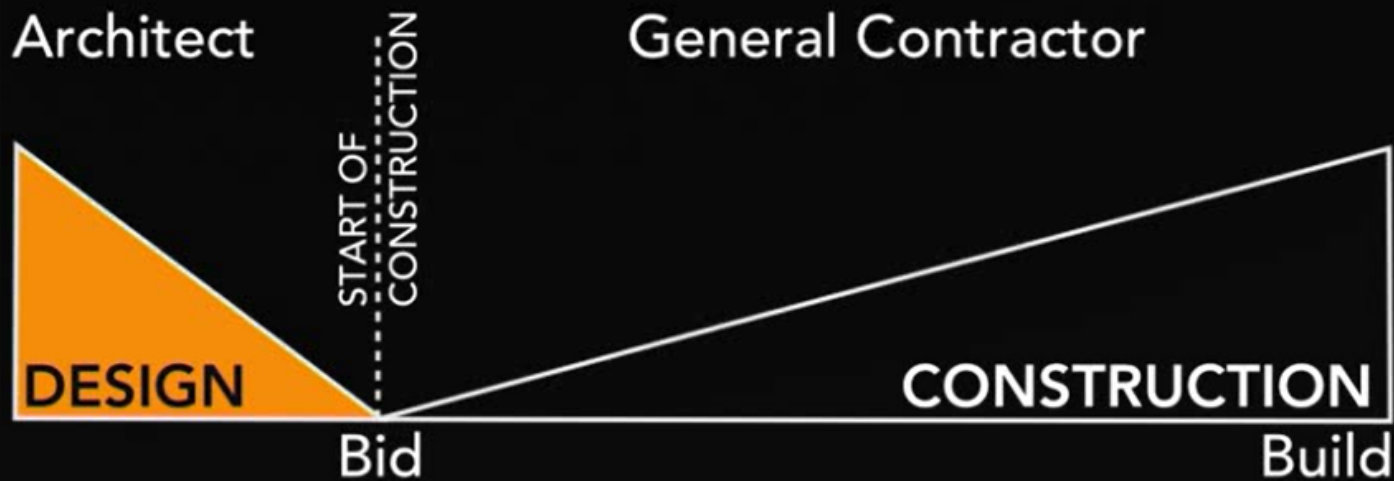


# Construction Management Project Delivery Methods

# Traditional Design-Bid-Build

- Owner contracts with **separate entities** for design and construction
- After design is completed, the project is put out for a **contractor bid**
- Awarded to **lowest responsible bidder**
- State projects for the most part follow the Design-Bid-Build delivery method
- This presentation will outline various tools for State projects to advance Net-Zero agenda from concept through implementation in the confines of DBB

# Traditional Design-Bid-Build



Traditional Design-Bid-Build

# Traditional Design-Bid-Build: Challenges

- **Miscommunication** between the owner, the architect and the construction company can happen.
- Costs can add up if extra drawings or **redesigns** are necessary.
- The bidding process can prolong the construction timeline.
- Since the lowest bidder usually wins the construction contract, quality isn't prioritized.

# Design Build

- Design-build offers better opportunities for integration of design with cost-effective construction methods because the design and construction are carried out by the same team.
- **Cuomo signs design-build bill to speed up city construction projects**
  - "Design-build means less red tape and more new-and-improved libraries, roads and bridges," the mayor tweeted on New Year's Eve. "Now we'll be able to save time and money on critical projects that truly matter to New Yorkers."
  - <https://www.crainsnewyork.com/politics/cuomo-signs-design-build-bill-speed-city-construction-projects>

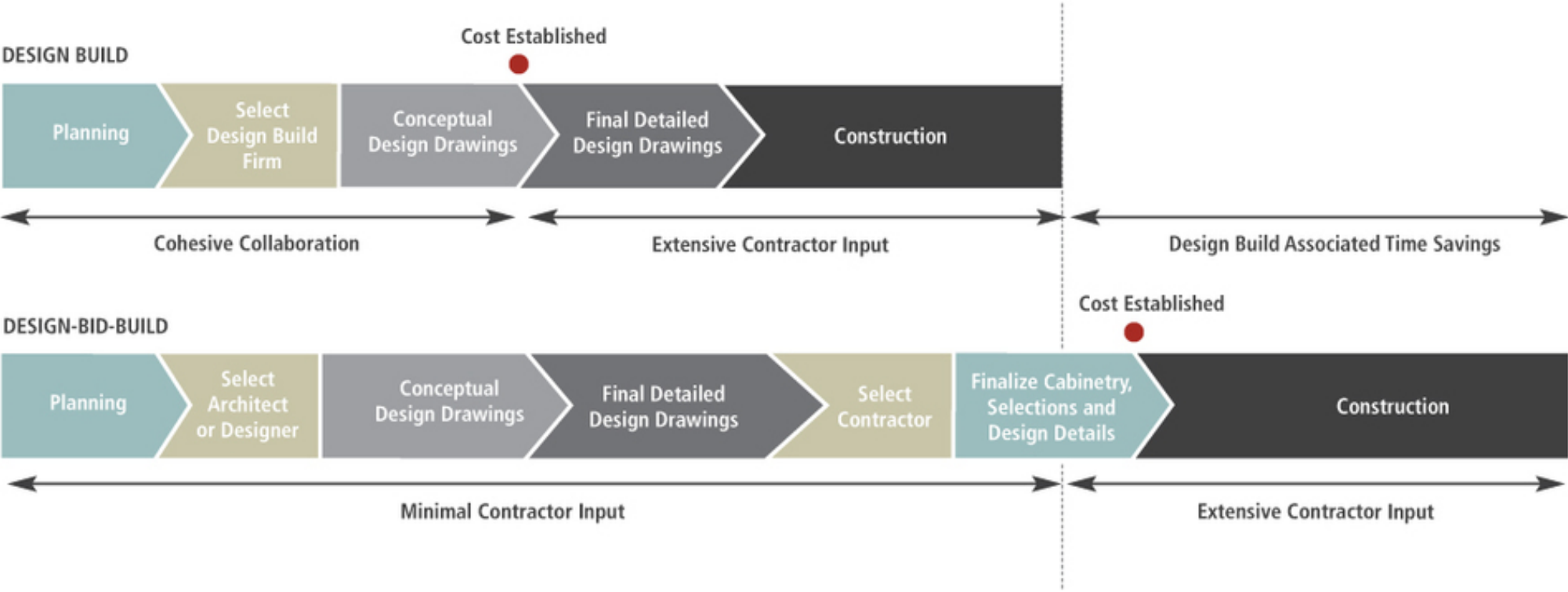
# Design Build - Challenges

- Limitations – **owner loses some** involvement in the design details.
- Initial specifications outlined by the owner need to really convey what is desired
- Impact on innovation and changes during construction
- Insurance requirements – contractor led DB teams that partner with architects, engineers

# Progressive Design Build

- Facilitates **involvement** of the design-build team during the **earliest stages of the owner's project development**, ensuring they are part of the project team developing design solutions.
- This promotes the **greatest amount of collaboration** between the three key players in a construction contract – the owner, the designer and the contractor.
- While a project design is usually 35 percent complete (or more) by the time a design-builder is procured in the traditional two-step design-build process, **PDB adds the design-builder to the owner's team even earlier in the design phase**. When the design is somewhere between 50 and 75 percent complete, the design-builder issues a Guaranteed Maximum Price (GMP).
- The other major feature of PDB is that the design-builder is selected almost entirely on qualifications. “Since the design-build team is working collaboratively with the owner in PDB, **risks** can be **identified** and **mitigated earlier** in the design phase resulting in a GMP that reflects the actual cost to construct the project.”

# DBB vs. DB



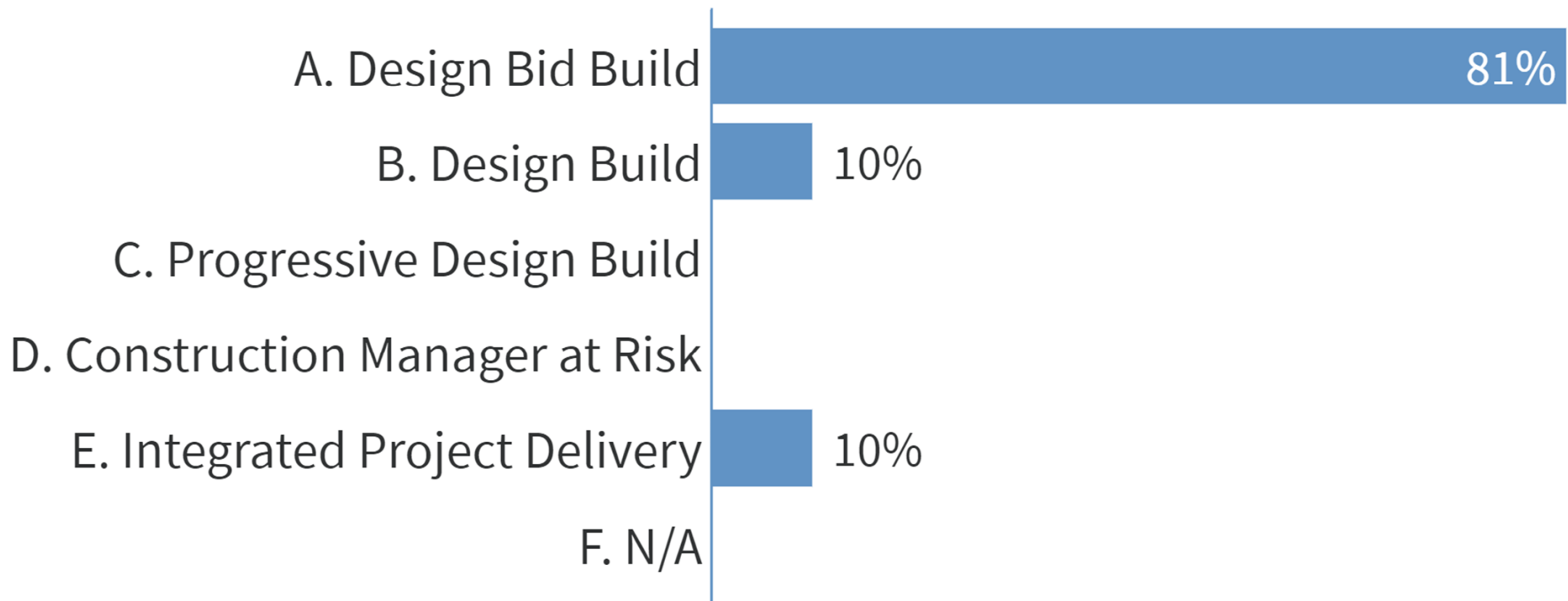
# Construction Manager at Risk (CMAR)

- Owner, architectural/engineering (A/E) team, and contractor are brought together as **one project team** as early as possible in the design process.
- **Contractor acts as a consultant** during the design phase with the owner's interest in mind.
- Owner negotiates a guaranteed maximum price for construction costs.
- The **contractor becomes part of the project team** as early as possible in the process, preferably no later than concept design.

# Integrated Project Delivery

- “A project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the knowledge, talents and insights of all participants to reduce waste and optimize efficiency through all phases of design, fabrication, and construction”
- **Multi-party contract** between the owner, designer, and contractor
- The contract properly assigns risk to the party best equipped to handle it, while **incentivizing the entire team** to work together to complete the design and construction of the project

# What project delivery method do you most commonly see on your projects?



# Building Owner

- SUNY administration, SUCF executives
- YOU (Owner) set the tone for the entire project
- Make Net-Zero a goal from the very beginning
- Enforce the Chancellors goals of Net-Zero
- Engage with design professionals that are committed to the same goals



Pre-  
Design

# Strategies for State DBB Projects

- **Delegate design** to more specialized consultants
  - Shifts responsibility
  - Can bring in contractors & consultants earlier in design
- Pre-bid meeting(s) that include Net-Zero **specific training**
  - Many early LEED campus projects used this strategy
  - **Bidders required to attend** an informational meeting about the project goals and methods to be used to meet those goals
  - Use meeting to also help teams **understand** the scope and set clear **expectations**
- Require a minimum level of high performance **experience** from project team members
  - e.g. must have worked on at least one LEED project
- EUI Targets
  - Include EUI targets are part of project requirements
  - Build confidence in the EUI target with examples of buildings that have published low EUIs.

# Strategies for State DBB Projects

- Set priorities along with wish lists
  - EUI goals
  - Zero net energy
  - Replicability
  - Not to exceed budget
- Overall Goal
- Non-negotiables
- High priority items
  
- Include these and make them clear in RFQs / RFPs

# RFP - Examples

- SustainNYC
  - <https://rew-online.com/city-issues-rfp-for-400-unit-passive-house-development-in-east-harlem/>
- 425 Grand Concourse
  - <https://www1.nyc.gov/site/hpd/about/projects-detail.page?project=425%20Grand%20Concourse>
- Betances V
  - <https://nyrej.com/breaking-ground-begins-100m-passive-house>

# Design Specifications Options for State DBB Projects

- Develop Standard Specs
  - DASNY Standard Specs, as an example
- Incorporate into SUNY - SUCF Program Directives
- See NYC School Construction Authority (SCA) Design Standards, as a potential starting point
- Align any disconnects between the different agencies. Recommend everyone sits down together and gets on the same page (if hasn't happened already)

# Design Specifications Options for State DBB Projects

## PROGRAM DIRECTIVES



State University  
**CONSTRUCTION FUND**

State University Plaza  
**353 BROADWAY**  
**ALBANY, NEW YORK 12245**

Tel: **518.320.3200**  
**www.sucf.suny.edu**

The screenshot shows the website's navigation bar with links for About, Opportunities, Projects, Resources, and Contact. Below the navigation bar is a 'Program Directives' section with a dropdown menu. The dropdown menu lists the following items:

- Introduction to the Fund's Program Directives
- 1A Design Phase Guides
- 1B Code Requirement Guides
- 1C General Procedures
- 1D General Guides
- Division 2 - Civil/Site Directives
- Division 3 - Concrete
- Division 4 - Masonry
- Division 5 - Metals
- Division 7 - Thermal and Moisture Protection

Below the dropdown menu, there are three bullet points:

- 7.1 Roofing and Reroofing
- 7.2 Reroofing - Agenda for Roofing Removal and Reroofing Conference
- 7.3 New Construction - Agenda for Pre-roofing Conference

## DASNY's Standard Specifications

- Asbestos Removal (Upstate)
- Asbestos Removal (NYC)
- Asbestos Removal CMM (CMM projects only)
- Asbestos Removal (CUNY)
- Asbestos Removal (Minor projects only)
- Firestopping Specification
- Identification and Disposal of Hazardous Waste
- Mold Remediation
- Non-Liquid PCB Material Removal
- Removal and Disposal of Lead-Containing Paint
- Removal and Disposal of Universal Waste and Fluorescent Lamps
- DASNY Standard Roofing Warranty

# NYC SCA Examples

Overview

**Design Requirements**

Standard Details

Room Planning Standards

Specifications

Title Sheet

The Design Requirements define the acceptable and expected design practice for SCA consultants and in-house Architects and Engineers, and are generally organized by discipline and building system. Each requirement under "Description/Design Approach" may meet or exceed applicable code requirements.

- For the list of deviations requested by designers that were not accepted, please [click here](#).

The Design Requirements are available on this website in PDF format. The Design Requirements can be viewed in their entirety or each technical division can be seen individually. When the PDF is opened, you can save it to your desired destination for future reference; **File --> Save As**. On the left side are the Bookmarks that allow you to jump to the desired section or page. For your convenience, you can also print specific sections from the Bookmark column; **Right Mouse Click** on the specific section and select **Print Page(s)**.

Coming Changes:

The SCA/s HVAC Standards are in the process of being revised to incorporate Displacement Induction Units (DIU).

In order to view the Design Requirements, you must have Adobe Acrobat Reader installed on your computer. If you do not have Adobe Acrobat Reader installed, follow the link below to install the latest version of [Adobe Acrobat Reader](#).

<http://www.nycsca.org/design/design-standards#Overview-82>

The Standard Details are to be used as an aid in creating Contract Documents and are based on the SCA Standard Specifications and Design Requirements. They are to be modified to suit actual project conditions.

In order to view the Standard Details, you must have a working version of Adobe Acrobat Reader installed. You may download the latest viewer for free by following this link: [Adobe Acrobat Reader](#).

To download AutoCAD \*.dwg files, please go to the [Downloads](#) page and under the Standard Details section, you can download and extract each group in it's entirety.

- [Complete List of Standard Details](#)

<a href="#">01 - General and Supplementary Requirements</a>	<a href="#">09 - Finishes</a>
<a href="#">02 - Sitework</a>	<a href="#">10 - Specialties</a>
<a href="#">03 - Concrete</a>	<a href="#">11 - Equipment</a>
<a href="#">04 - Masonry</a>	<a href="#">12 - Furnishings</a>
<a href="#">05 - Metals</a>	<a href="#">15 - Fire Protection Systems</a>
<a href="#">06 - Wood and Plastics</a>	<a href="#">15 - Heating Ventilating and Air Conditioning</a>
<a href="#">07 - Thermal and Moisture Protection</a>	<a href="#">15 - Plumbing and Drainage</a>
<a href="#">08 - Doors and Windows</a>	<a href="#">16 - Electrical</a>

# NYC SCA Examples

The Standard Specifications define the materials acceptable for use in New York City Public Schools, and are based on and complement the Design Requirements. For projects that have a system that is not included in the specification, the designer is to create the section based on the formatting. Deviations from the standards on capacity projects must be approved through the Deviations Committee.

The Standard Specifications are available in Word format and are to be edited as applicable for all projects.

General Requirements in the Division 1 section are not to be changed, revised, edited or omitted for projects.

Supplementary Requirements in the Division 1 section are to be edited as required for the project.

In order to view the Standard Specifications, you must download and install an MS Word Viewer or have a working version of MS Word 97 or later installed. You may download the latest viewer for free by following this link: [Microsoft Word Viewer MS Word Viewer](#).

- [Complete List of Standard Specifications](#)

**01 - General and Supplementary Requirements**

02 - Sitework

03 - Concrete

04 - Masonry

05 - Metals

06 - Wood and Plastics

07 - Thermal and Moisture Protection

08 - Doors and Windows

09 - Finishes

10 - Specialties

11 - Equipment

12 - Furnishings

13 - Special Construction

14 - Conveying System

15 - Fire Protection Systems

15 - Heating, Ventilating and Air Conditioning

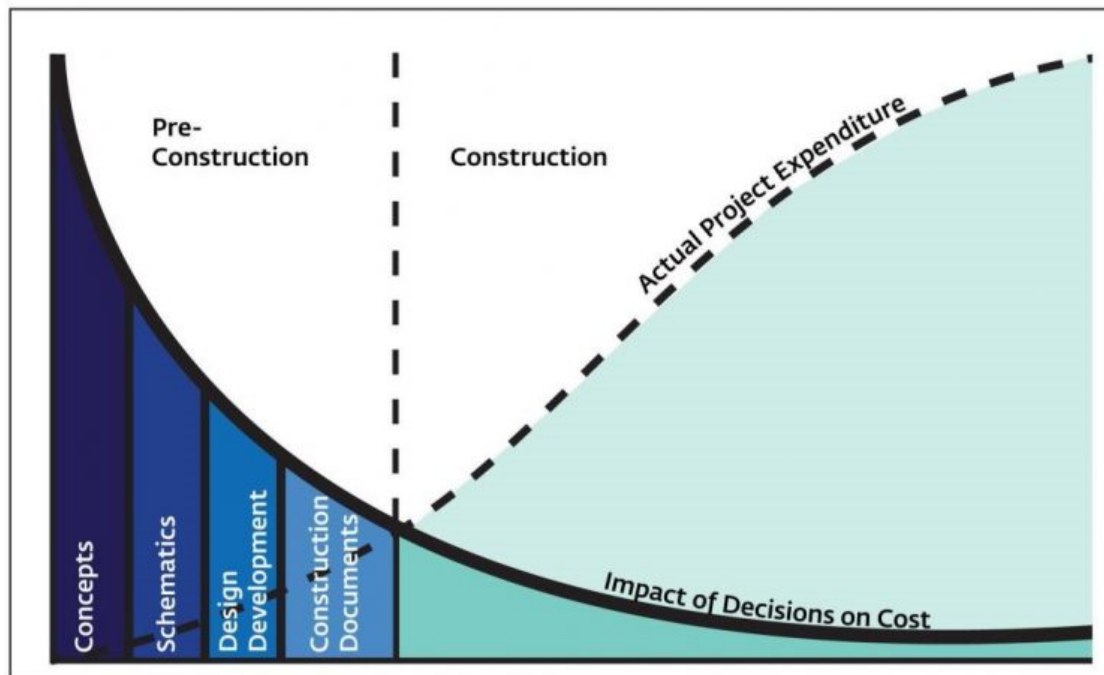
15 - Plumbing and Drainage

16 - Electrical

# NYC SCA Examples

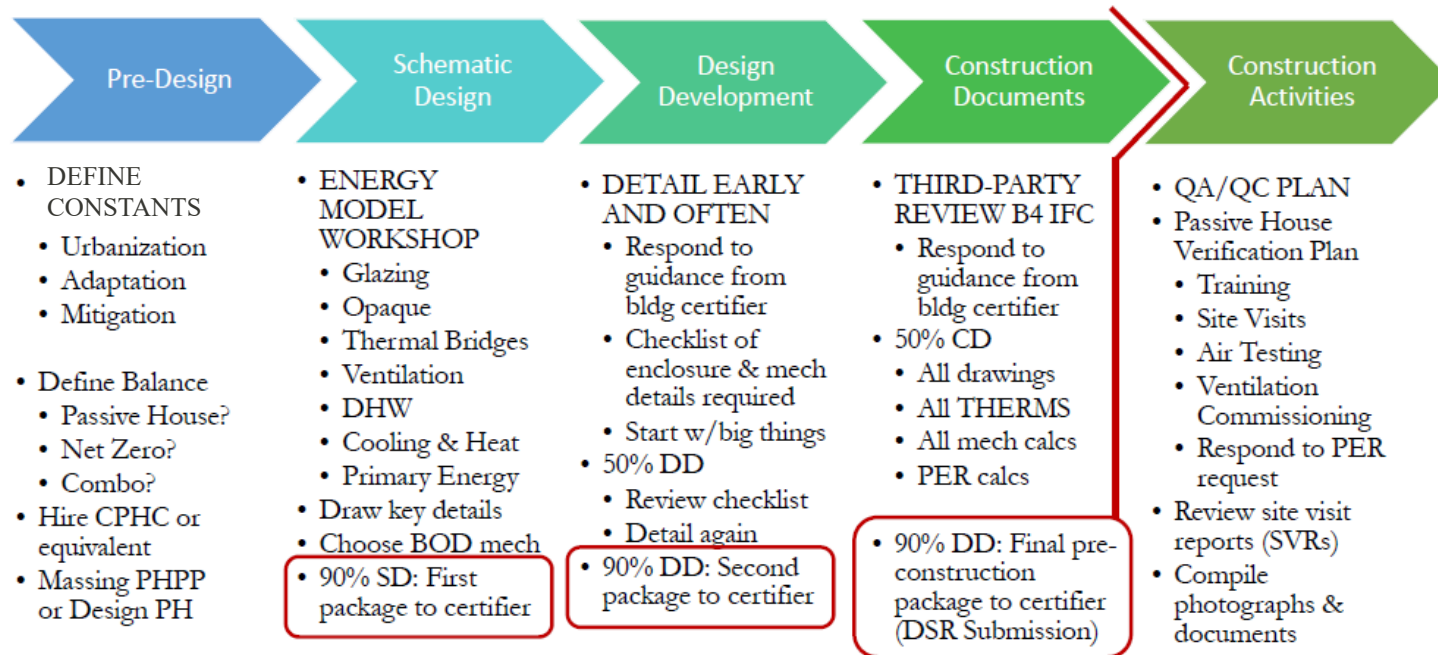
# Early Engagement

Greatest Value Created During Preconstruction



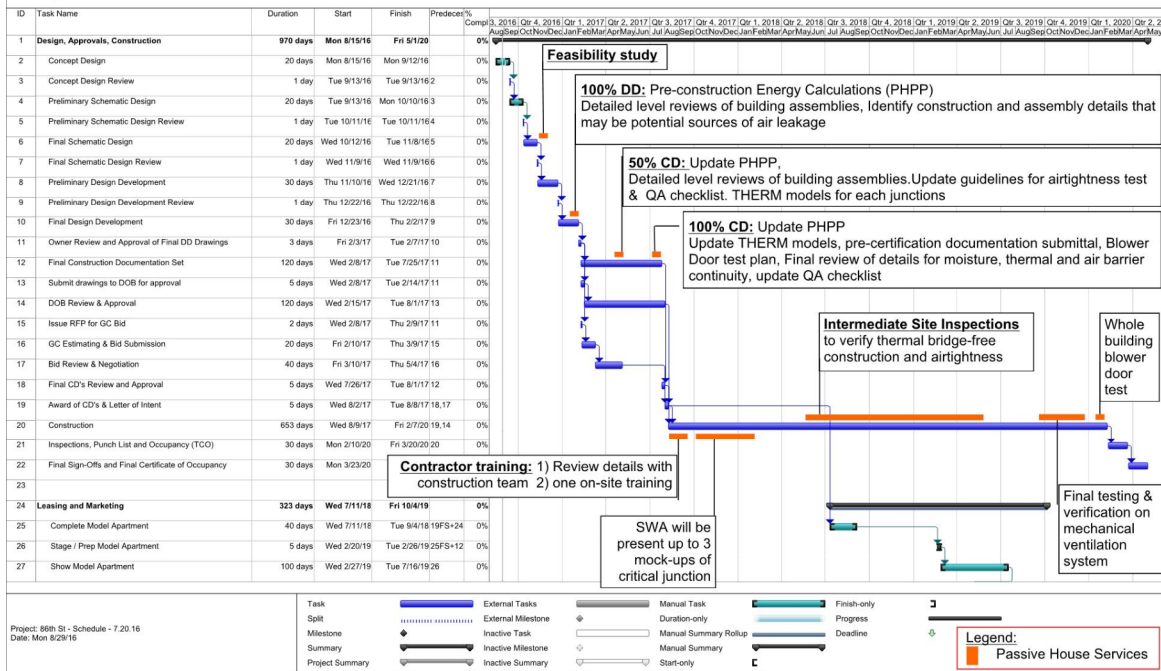
- Front loaded design
- Project team needs to work very closely together
- Design decision making during pre-construction
- Many projects **succeed with first time PH team** members if the owner & architect are committed

# Integrating Net Zero



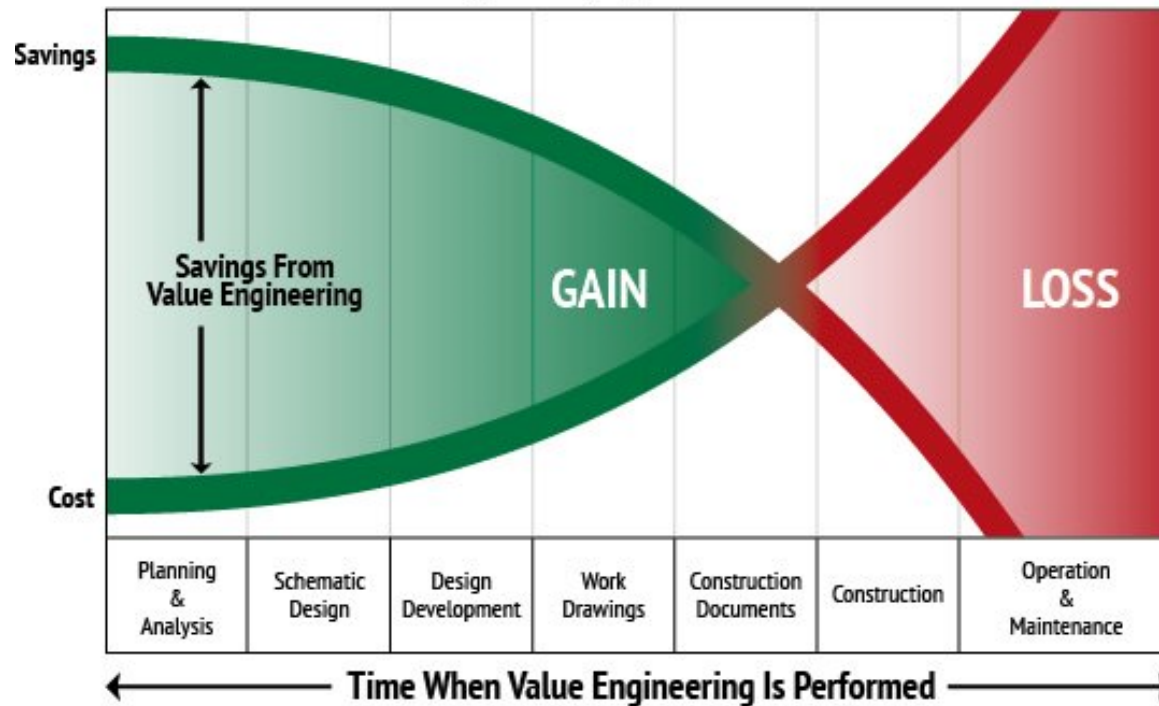
Credit: RDH

# Project Management



# Integrating Net Zero

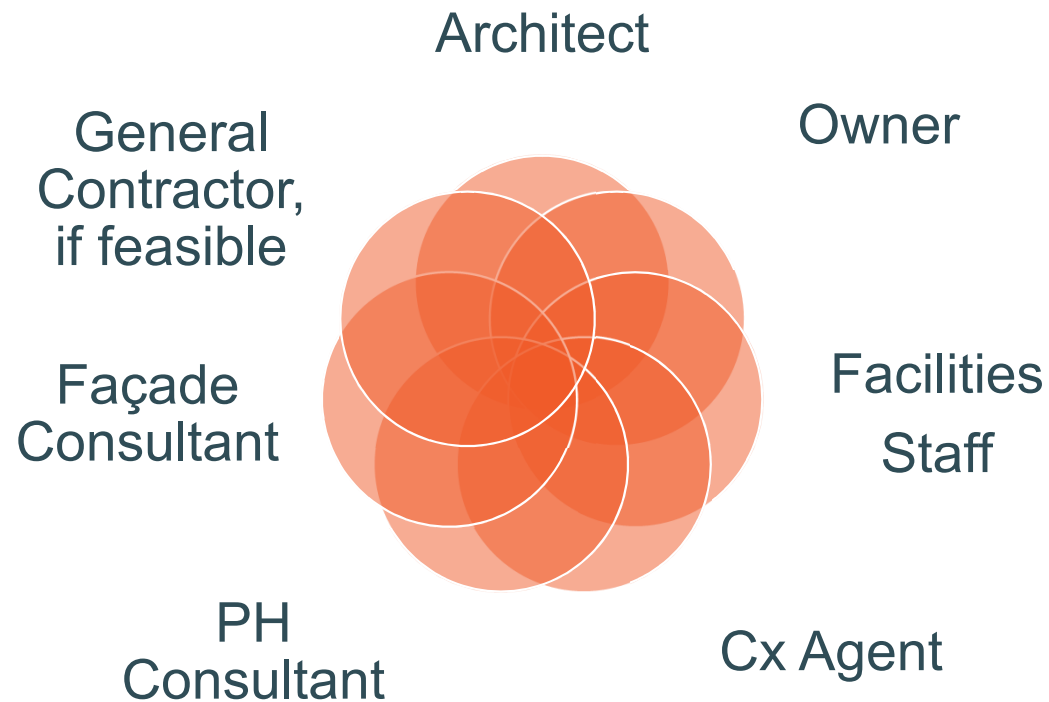
## Potential Value of Value Engineering Applications



# Value Engineering

- Be careful!

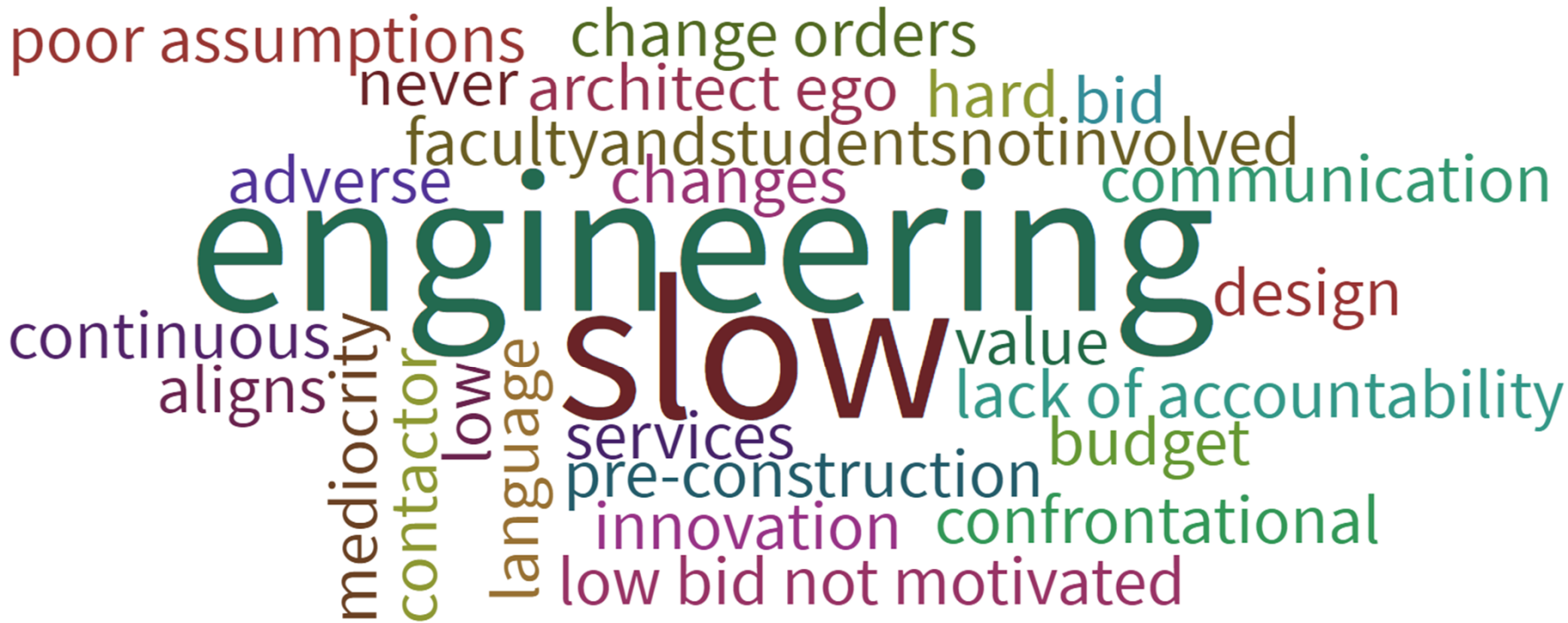
# Who should be included from the beginning



# Traditional Design-Bid-Build

- Under Design-Bid-Build, the entire design team needs to work very closely to ensure all criteria is incorporated into the contract documents

# What are some limitations of the Traditional Design-Bid-Build method?



Questions?



10 Minute Break

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# What's different in drawings of Passive House Buildings - Design

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## Details!

- Many PH details are a **variation** of 'typical' or 'standard' details
- Details to date are commonly not the same from project to project for building envelope items
- This could be more standardized as PH details become the norm and repeatable

That's not  
how we  
normally  
do things.

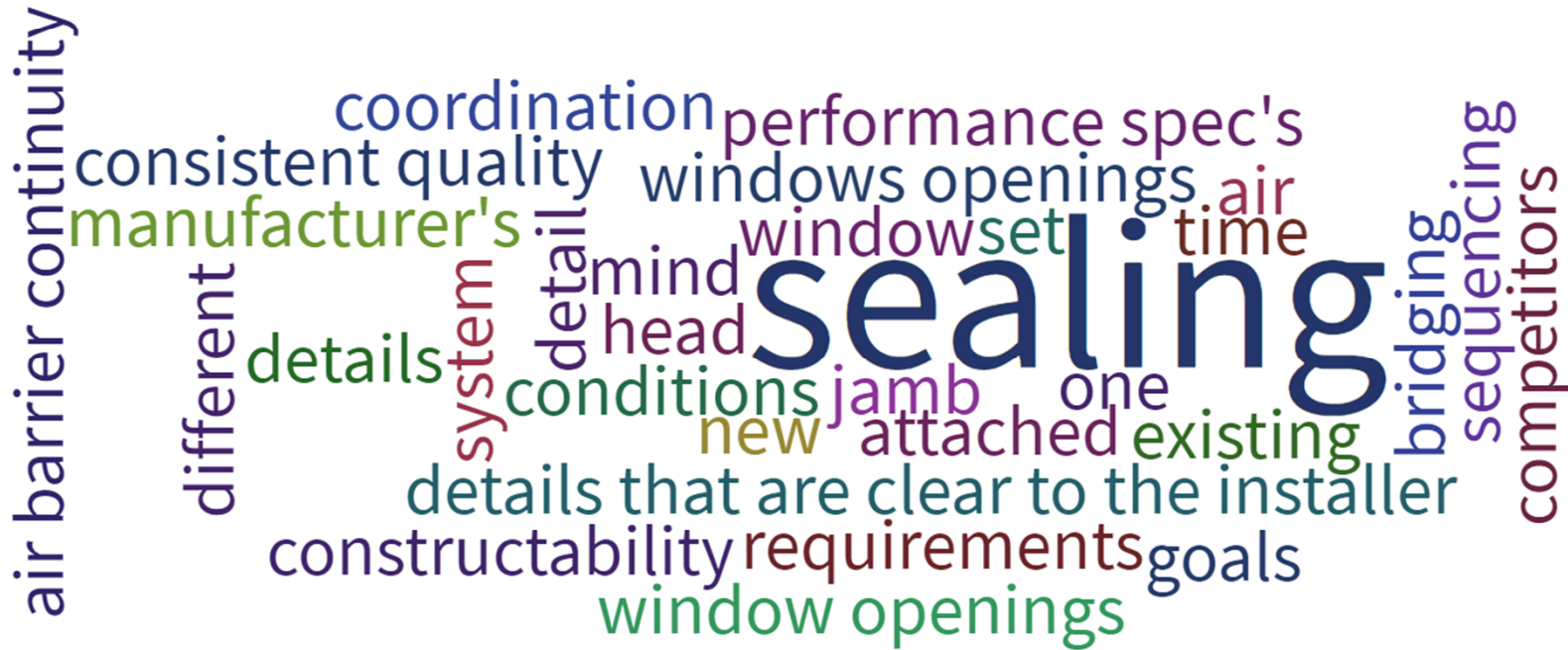
## Mindset

- Designers and installers need to have a mind shift in thinking
- Keep the larger goals in mind while finding solutions to the smaller details
- Be open to new ideas and ways of solving problems

# Approach

- Need to take the **Building as a System** Approach
- Changes to one system will impact others
  - e.g. reduced insulation, impact on mechanical equipment sizing
- Under Design-Bid-Build, the entire design team needs to work very closely to ensure all criteria is incorporated into the contract documents

# What do you see as the toughest part of providing specific drawing details for a project?



# Checklists

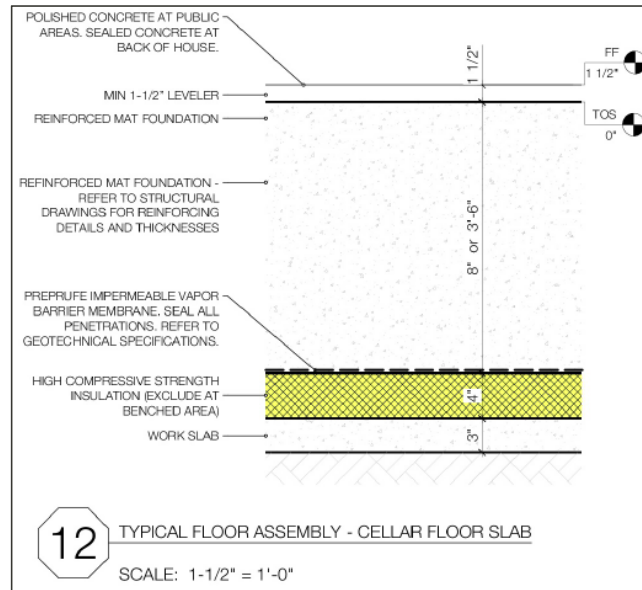
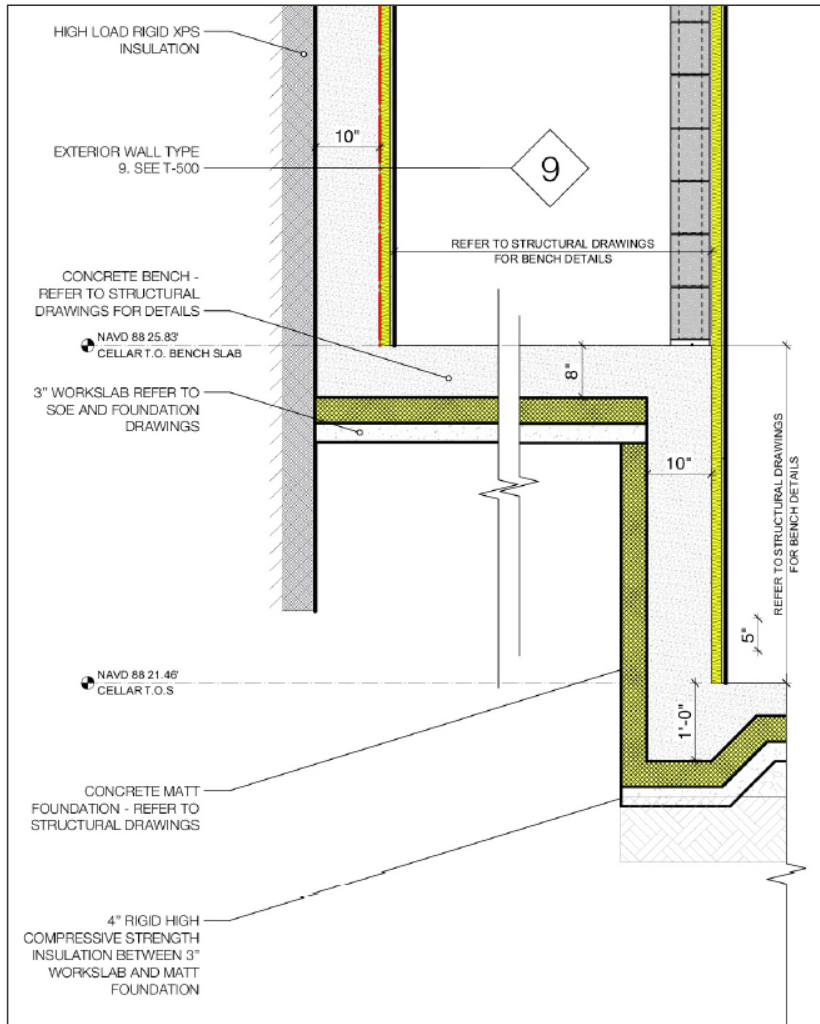
		Steven Winter Associates, Inc. Improving the Built Environment Since 1972		Developer - Architect - MEP - General Contractor - Civil Engineer - Sustainability Consultant - SWA	
Project Name:					
Select Building Type					
Select Project Scope					
Address:					
Date:					
Updated by:					
Program	Responsible Party	SWA Plan Review Comments: XX% CD Set	Dwg/Spec:	Team Response:	
Building Envelope	PHI/PHIUS				
Ventilation	PHI/PHIUS				
≥ 75% heat recovery efficiency, confirmed either according to PHI or approved formulas.	PHI/PHIUS	Provide cut sheets and include efficiency ratings on mechanical schedules.			
Typical 24/7 operation total supply and exhaust flows are +/- 15% or 15 CFM of design values and within 10% of each other.	PHI/PHIUS				
Dedicated ductwork must be installed for the ventilation system. Heating/cooling distribution ductwork may not be utilized.	PHI/PHIUS				
Size the ERV such that the standard operating flow rate is approximately 50% of the maximum flow of the unit to optimize efficiency. This is a recommendation not a requirement.					
When reviewing an HRV/ERV design, please note that continuous flow at 50% max capacity is "desired" if maximum performance is to be achieved. If HRV/ERV is sized to maximum capacity or outside the 3rd Party tested range by PHI/PHIUS/AHRV/HV1 a derated efficiency will have to be used.	PHI/PHIUS				
If Swegon Gold RX ERV is selected, confirm the wheel component and request the wheel component AHRI certificate. Run the AHRI data through "PHIUS AHRI Extrapolation Calculator" to confirm the heat recovery efficiency. Must be ≥ 75%.	PHIUS				
Exhaust only fans and outdoor makeup air must be kept to a minimum and should be limited to spaces such as the trash compactor room and commercial laundry rooms. All other spaces being exhausted should be connected to an ERV.	PHI/PHIUS	Look for exhaust only locations and confirm if acceptable with the model.			
ERV/HRV fan motors should consume ≤ 0.765 W/cfm at the highest power setting.	PHI/PHIUS				
Where flow rates will significantly exceed recommended daily average levels of 0.3 to 0.5 air changes per hour, controls must be installed to reduce flow rates when ventilation is not needed - i.e., CO2, moisture or occupancy sensors, timers, etc. The average daily ventilation flow rate for the building should not exceed 0.5 ACH.	PHI/PHIUS	Typically for common spaces such as community rooms, exercise rooms, etc.			
Ducts between an interior ERV/HRV and the exterior must be insulated					

- **Development** and use of **Design Checklists** can help projects ensure high performance criteria is being incorporated into the design
- Allows transparency in where specific details are located in the drawing sets & specs and responsible parties for criteria incorporation

# Building Envelope

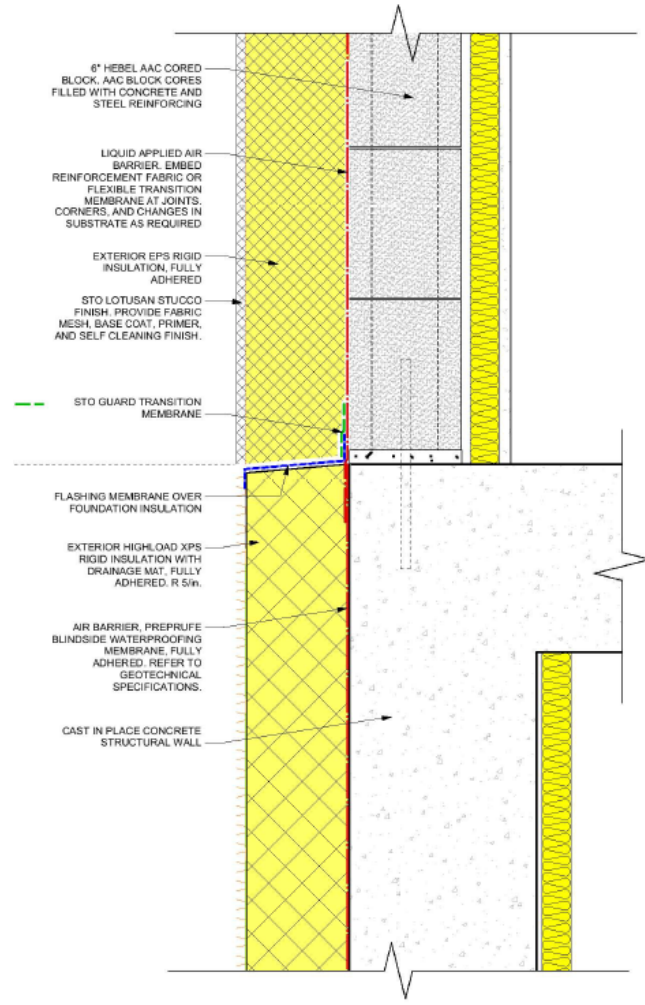
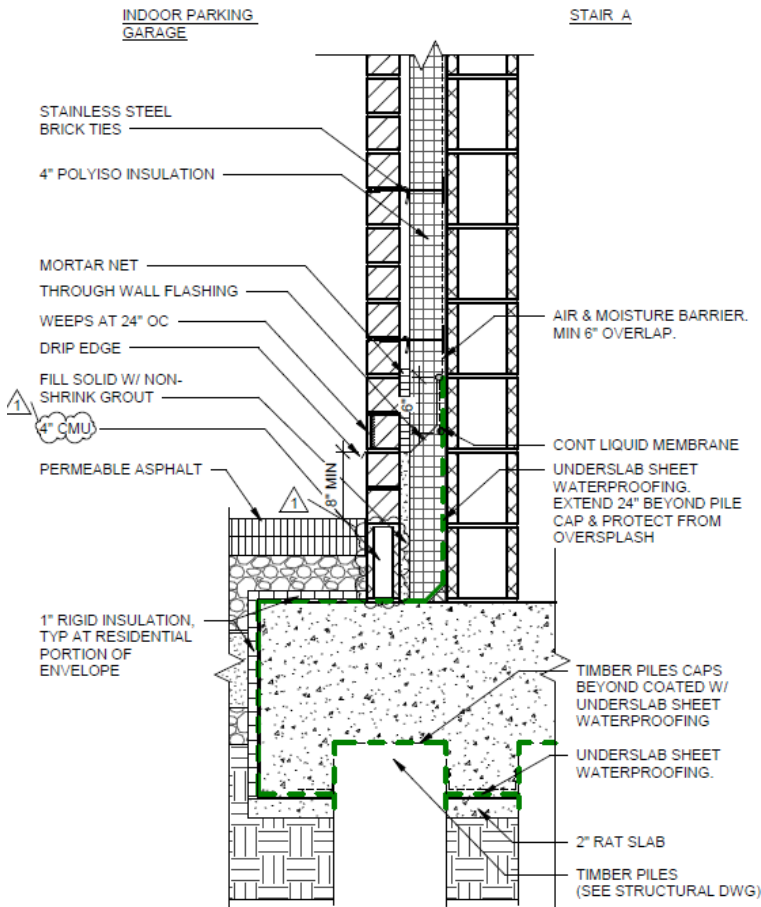
- Take a step back & think of the building as a box, regardless of the actual geometry





# Details – Foundation Under slab

PH Details

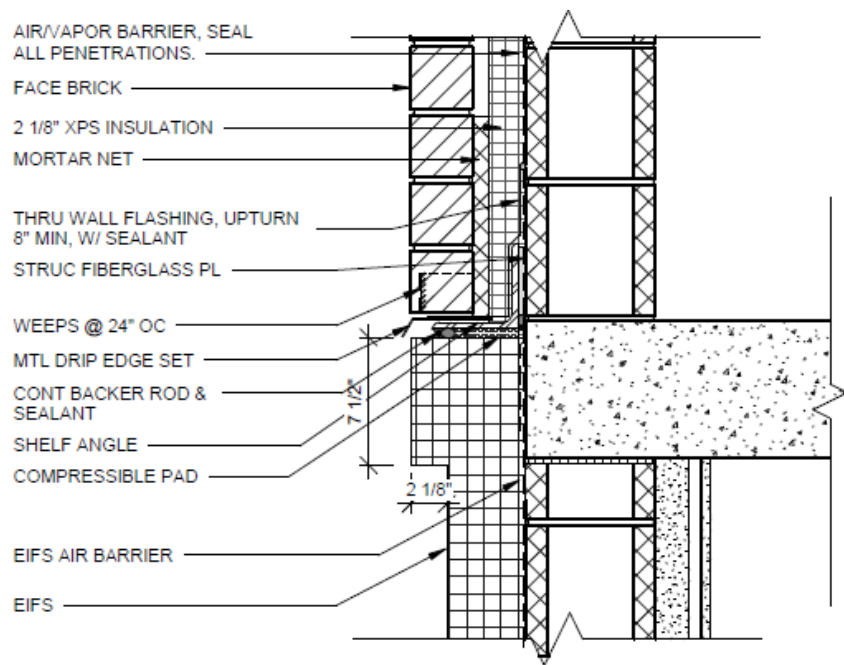


# Details – Foundation

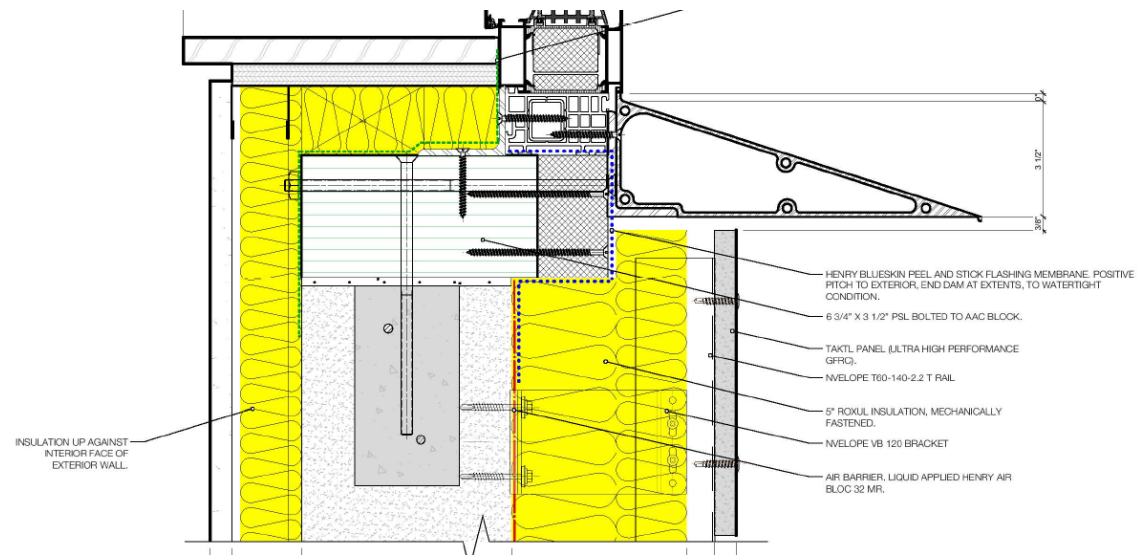
**2** FOUNDATION TO ABOVE GRADE AIR BARRIER TRANSITION DET  
SCALE: 3" = 1'-0"

PH Details

# Details – Wall Types

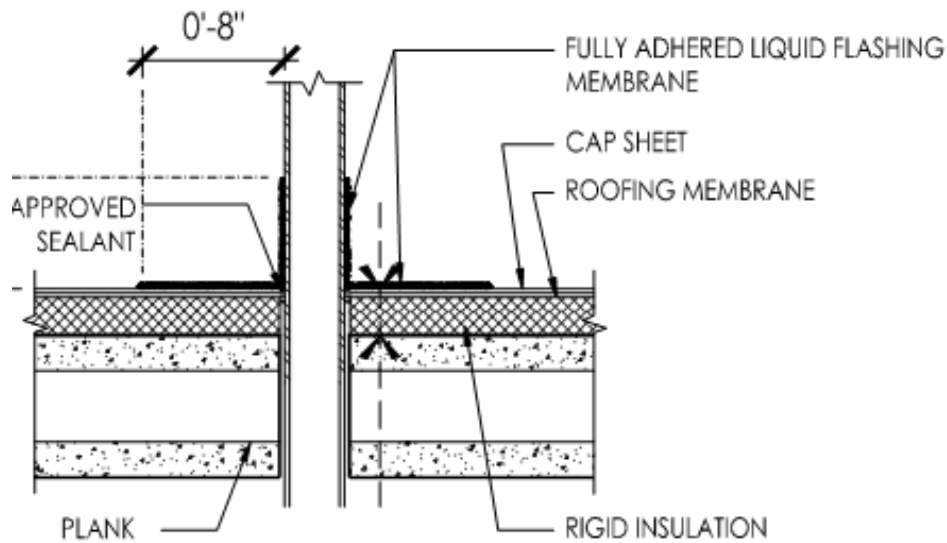


PH Detail

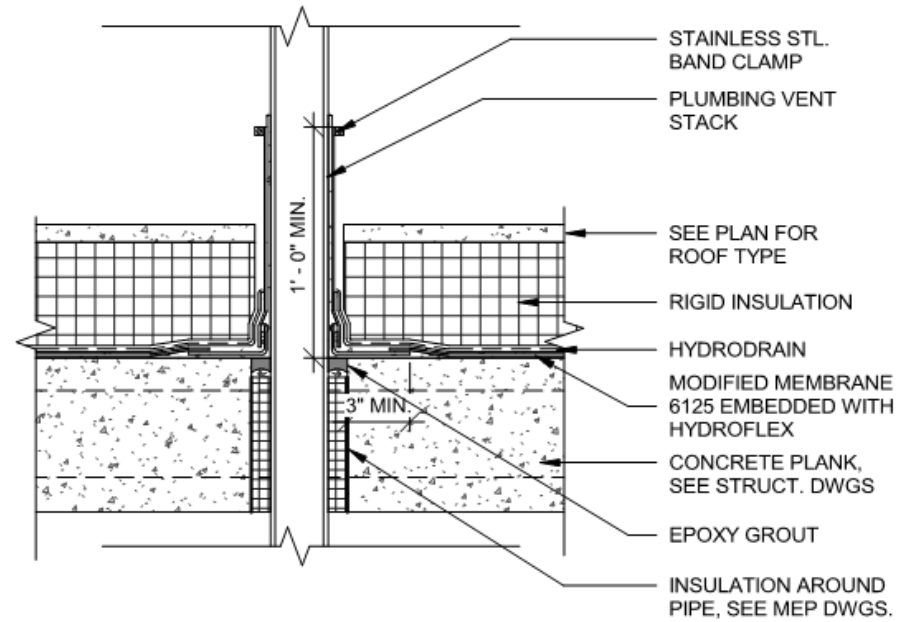


PH Detail

# Roof Insulation

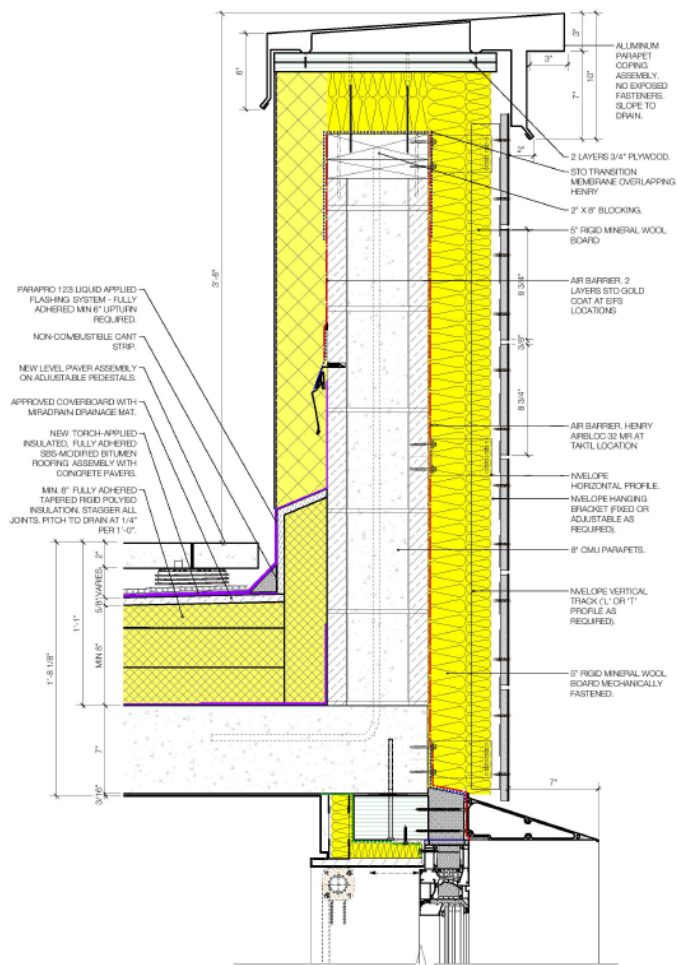
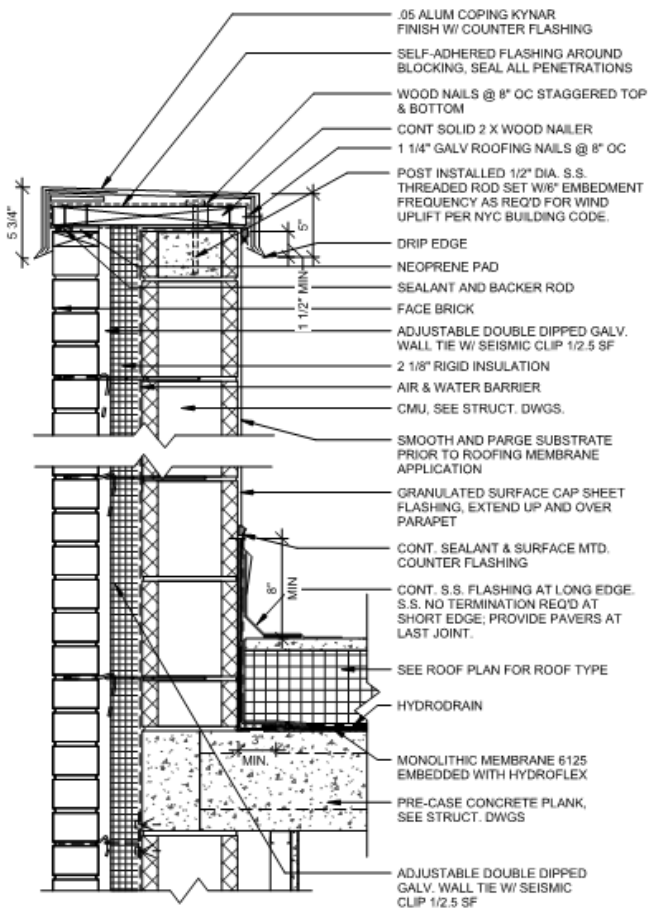


Traditional detail



A3 SECTION DETAIL @ PLUMBING VENT STACK  
A-331 1 1/2" = 1'-0"

PH Detail



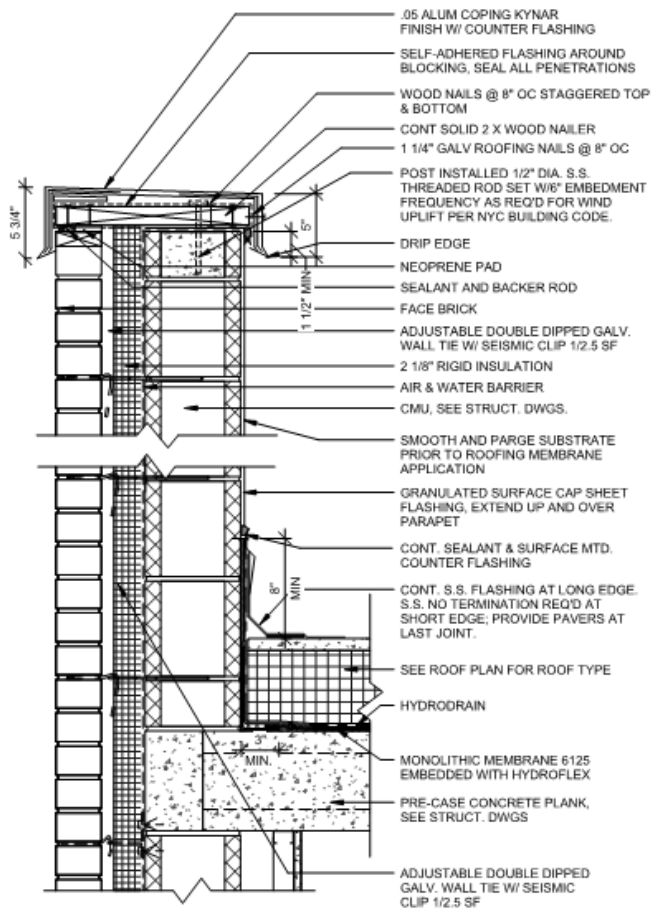
A1 PARAPET DETAIL - BRICK  
A-310 1 1/2" = 1'-0"

Traditional detail

4 TYPICAL PARAPET DETAIL  
Scale: 3/4" = 1'-0"

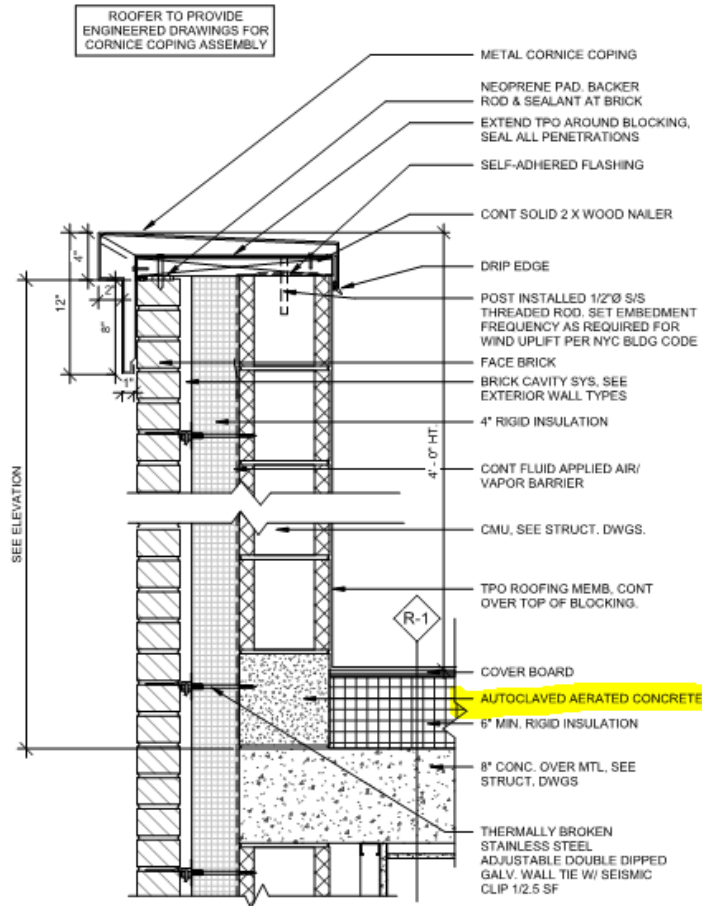
PH Detail

# Typical Parapet



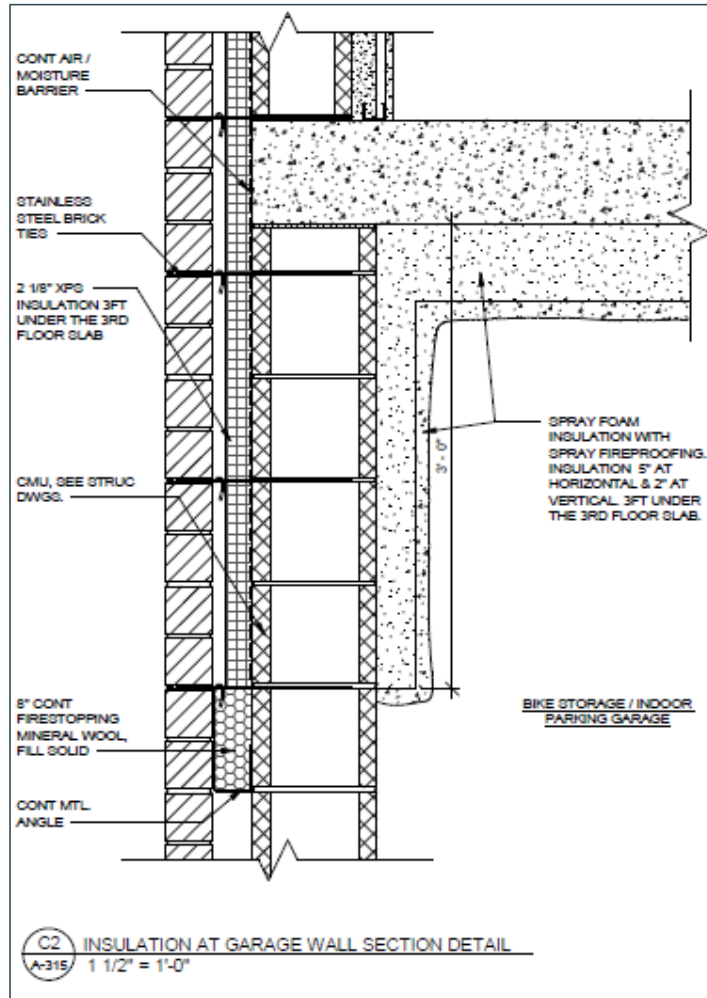
**A1** PARAPET DETAIL - BRICK  
 A-310 1 1/2" = 1'-0"

Traditional detail



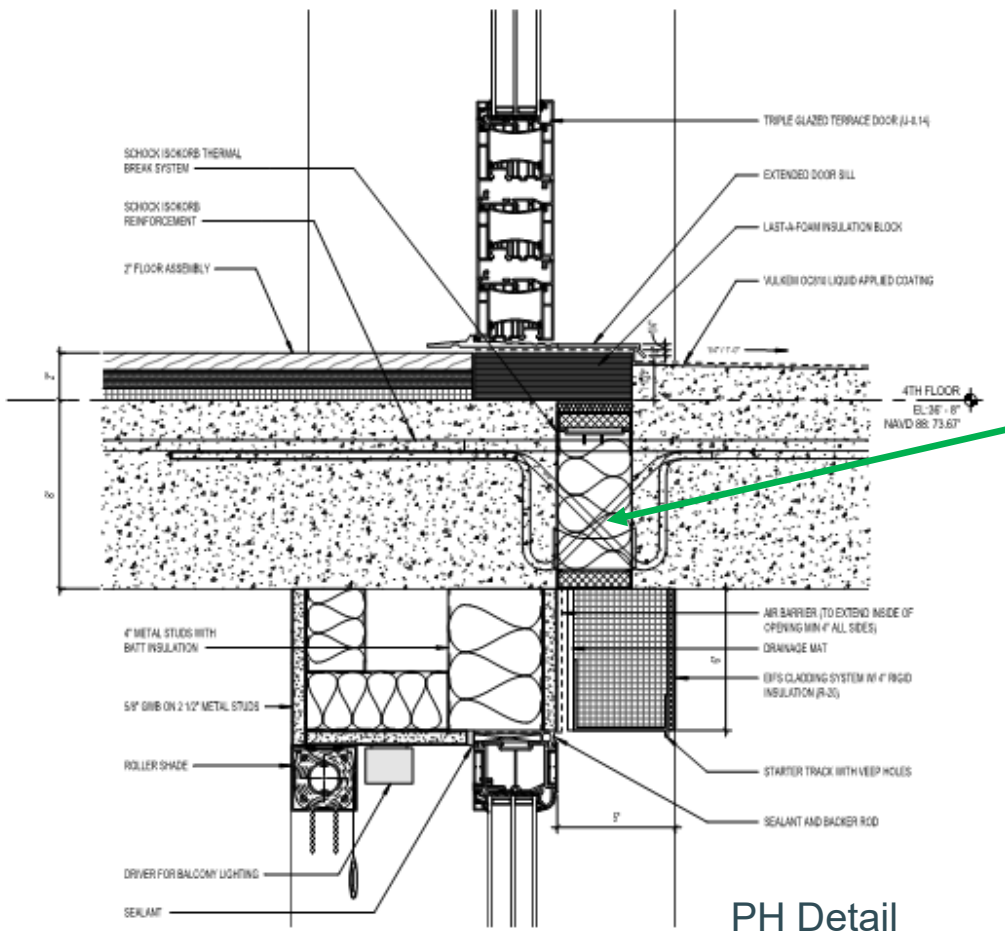
PH Detail

# Typical Parapet



# Typical Garage

PH Detail



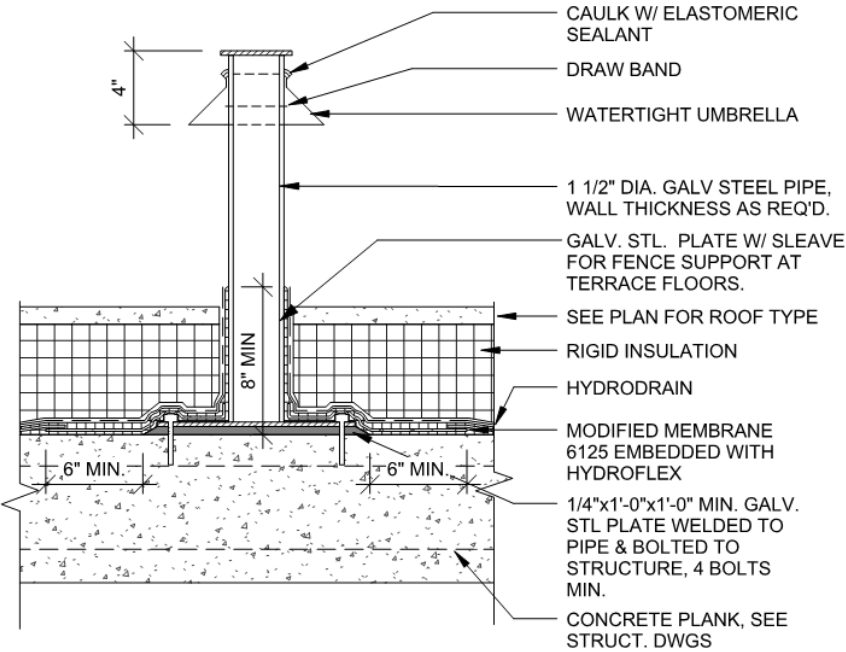
PH Detail

SECTION AT BALCONY DOOR / WINDOW HEAD | 8  
 3" = 1'-0" | A-420(0)

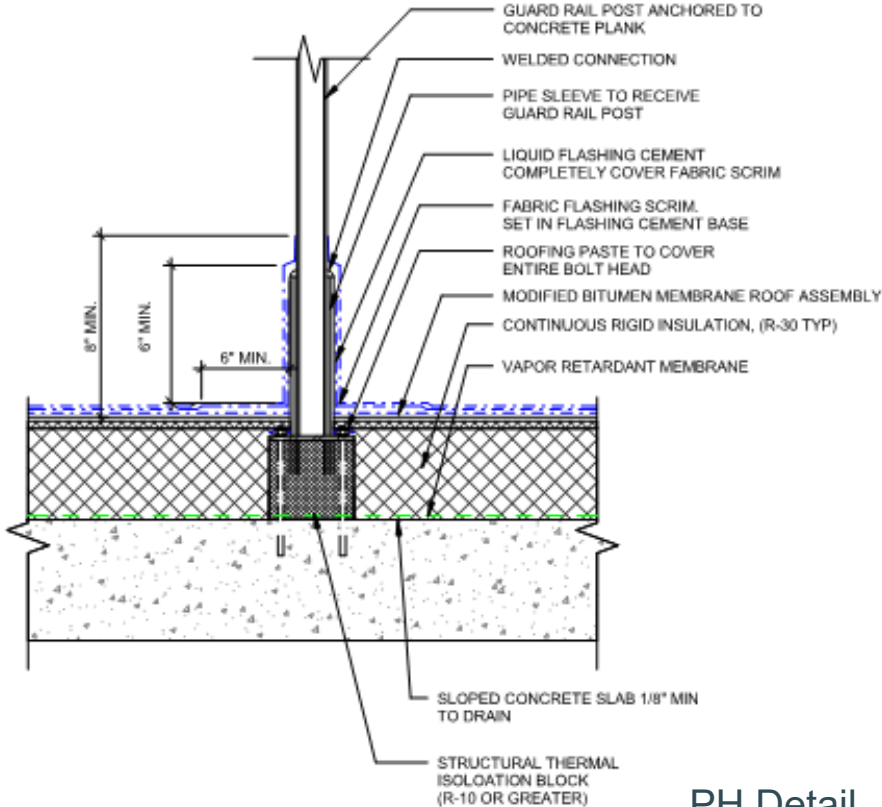
# Balcony Thermal Breaks



# Pipe Support



Traditional detail

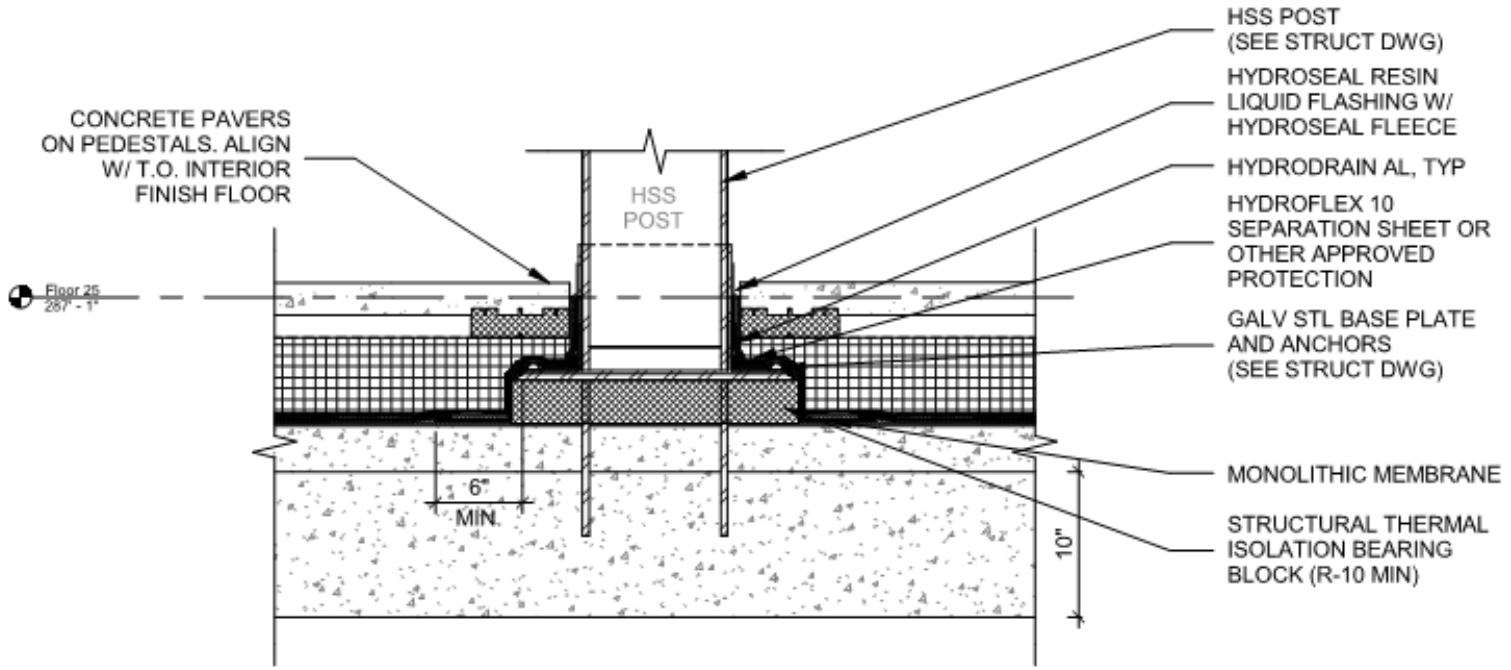


PH Detail

**B3** SECTION DETAILS @ PIPE SUPPORT  
A-330 1 1/2" = 1'-0"

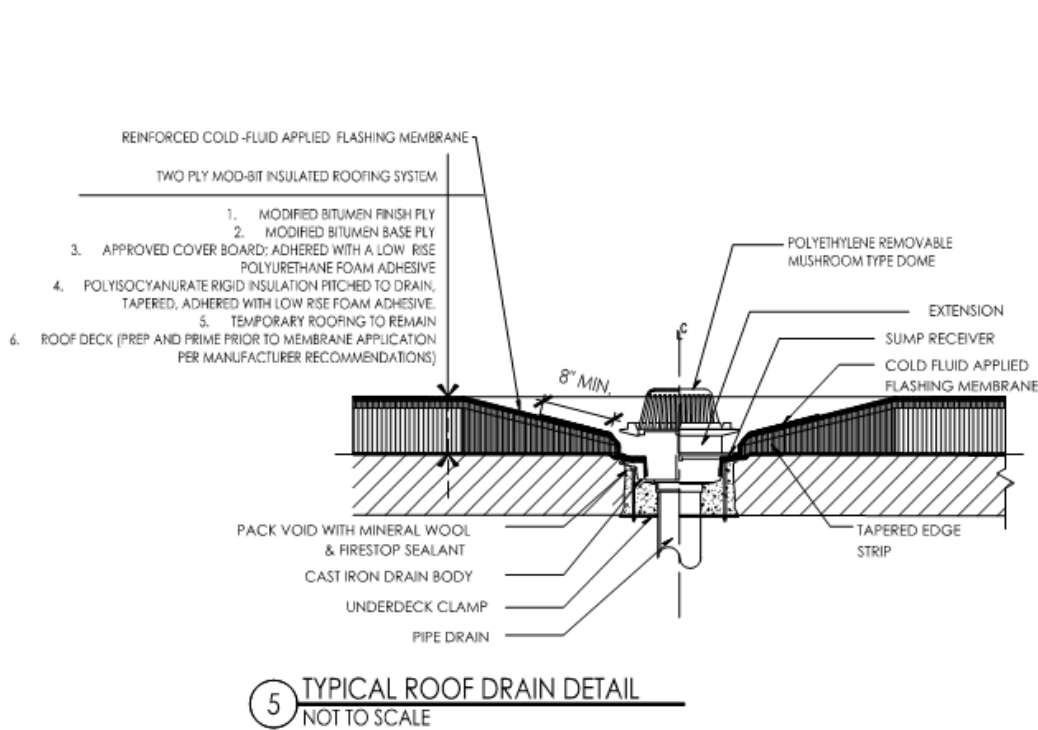
**7** Section Detail - Guardrail Pitchpocket  
1 1/2" = 1'-0"

# Structural Roof Penetrations

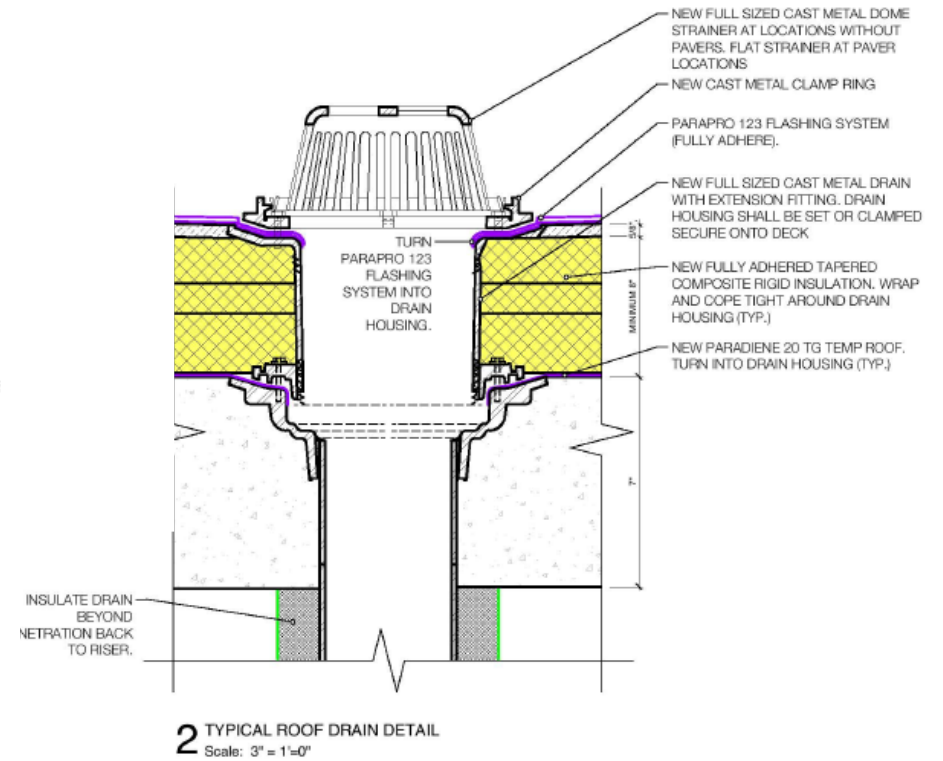


PH Detail

# Roof Drain

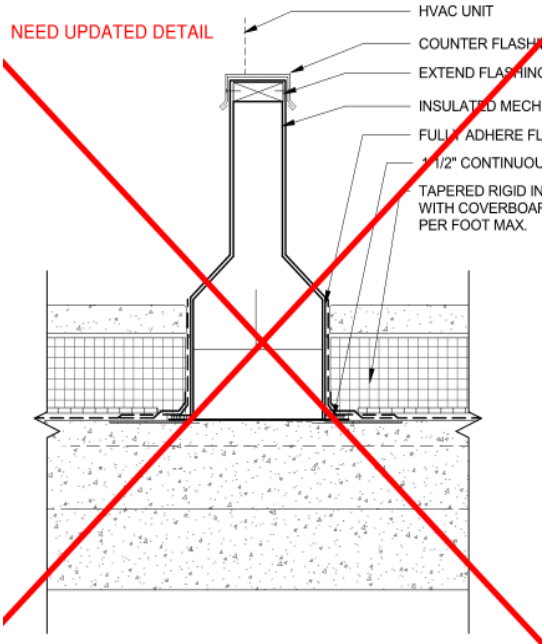


Traditional detail



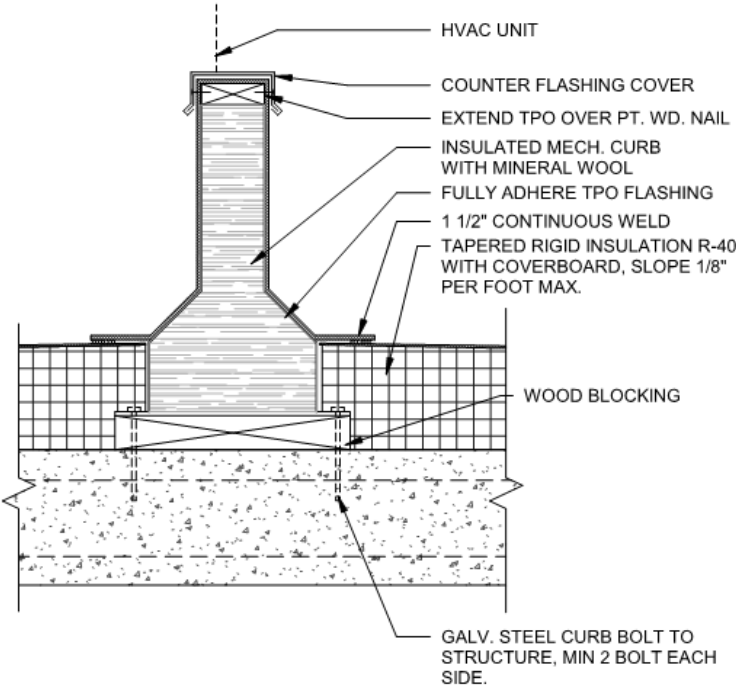
PH Detail

# Mechanical Curb



A4 MECH EQUIPMENT SUPPORT DETAIL  
A-331 1 1/2" = 1'-0"

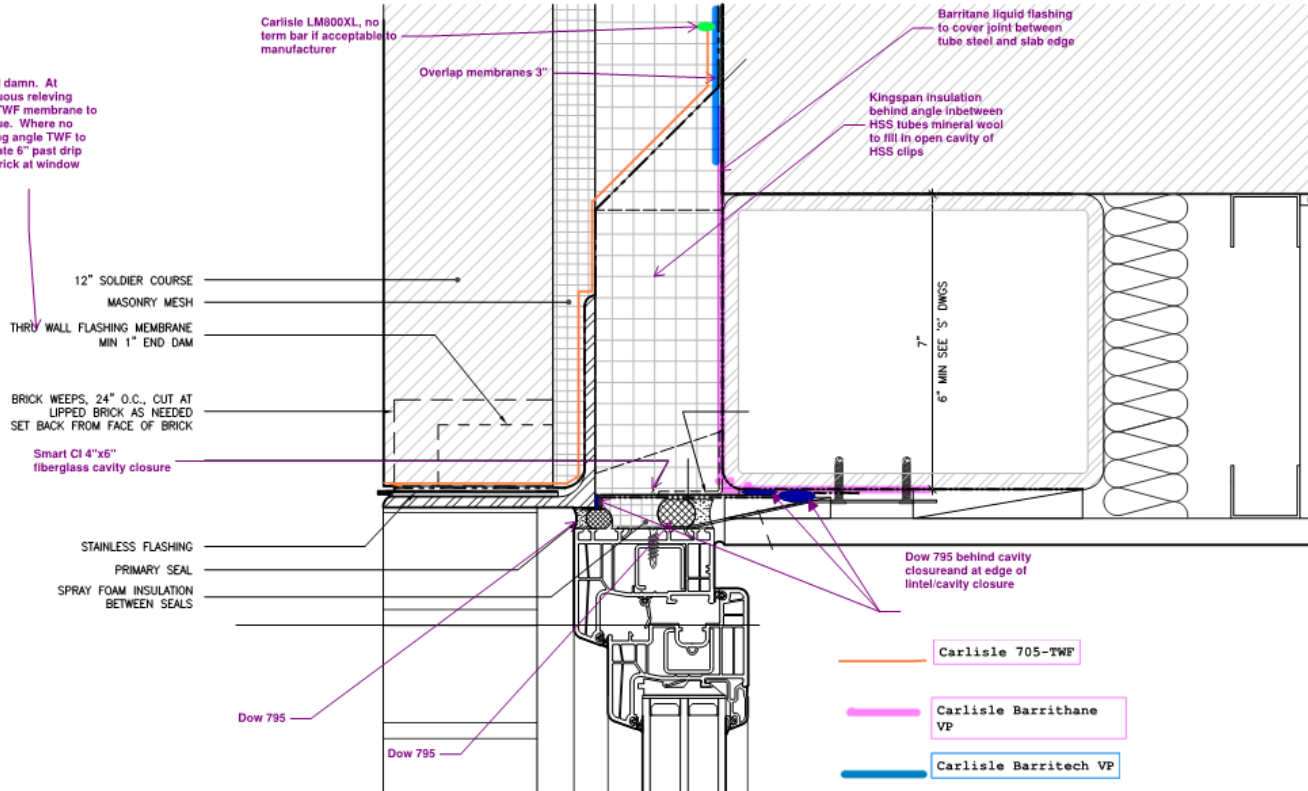
Traditional detail



C1 MECH CURB AT ROOF  
A-330 1 1/2" = 1'-0"

PH Detail

No end dam. At continuous relieving angle TWF membrane to continue. Where no relieving angle TWF to terminate 6" past drip edge/brick at window jamb

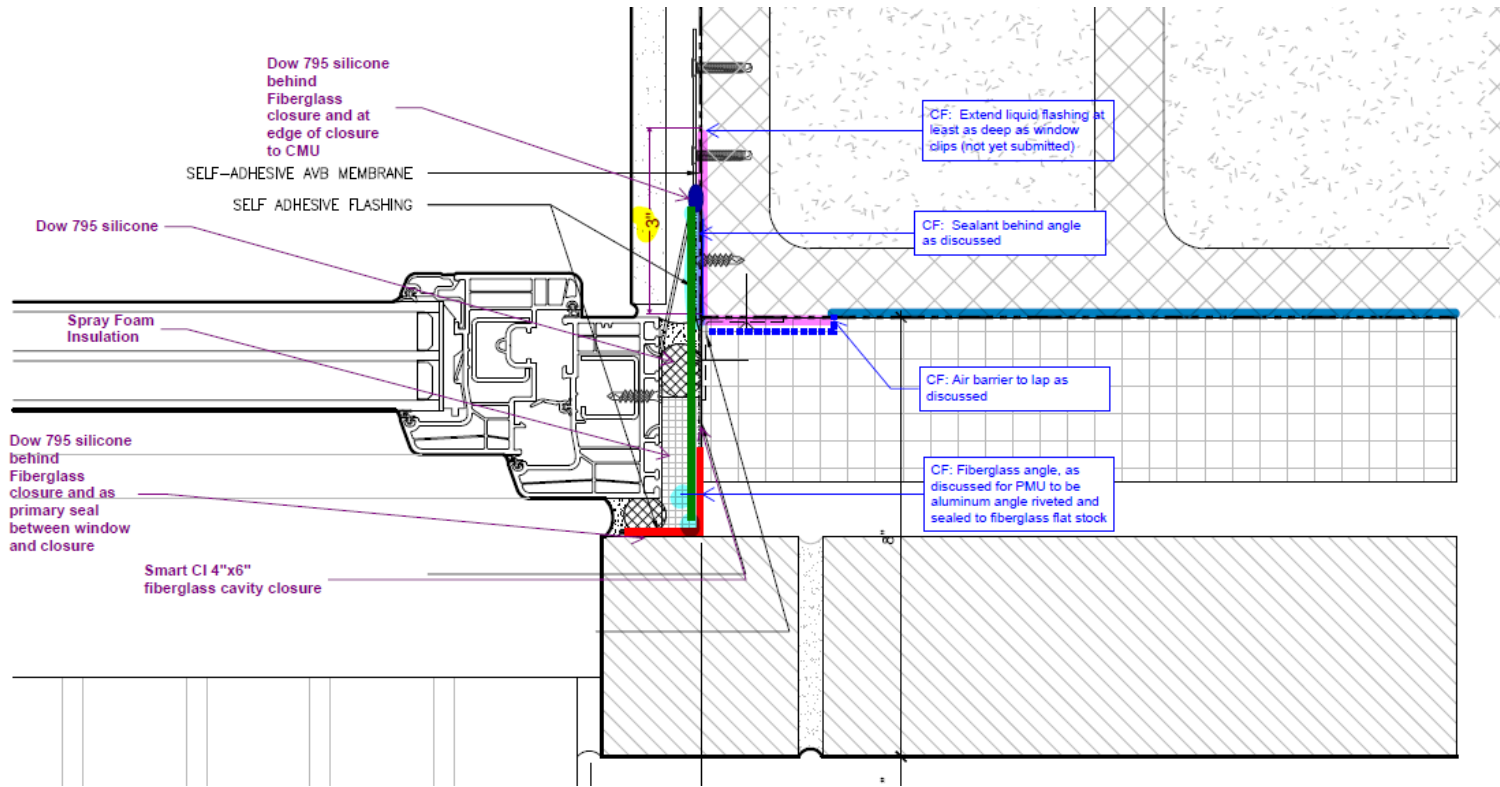


# Window Head Detail

01 PMU HEAD  
SCALE 6"=1'-0"

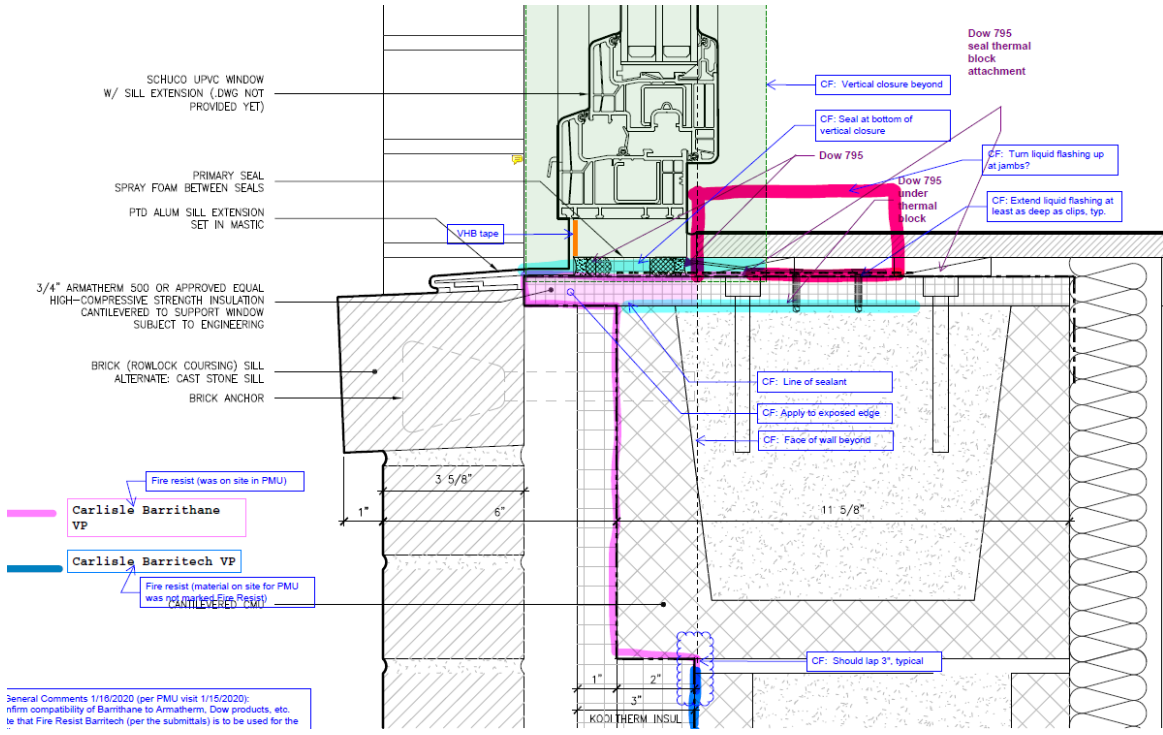
PH Detail

# Window Jamb Detail

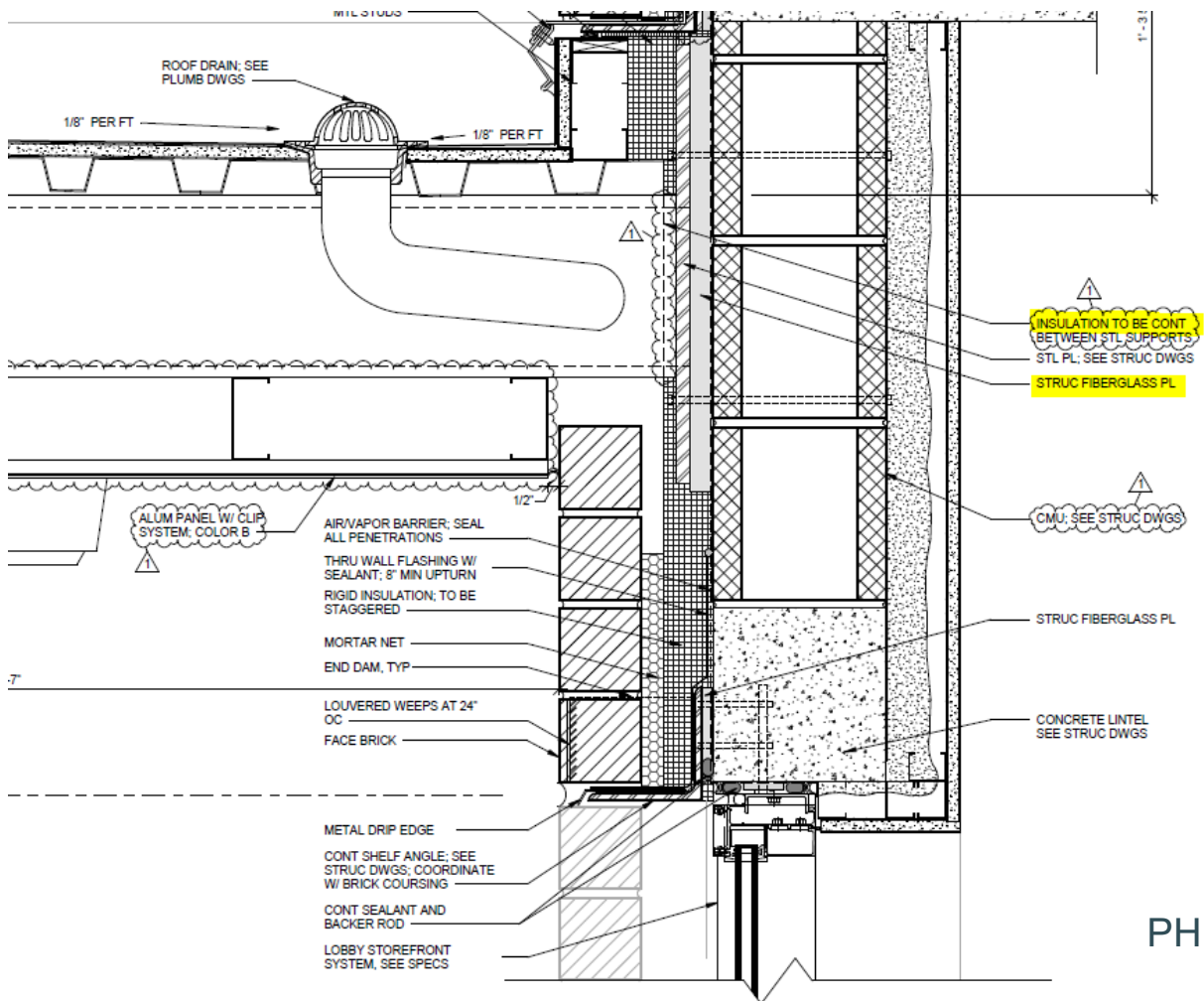


PH Detail

# Window Sill Detail

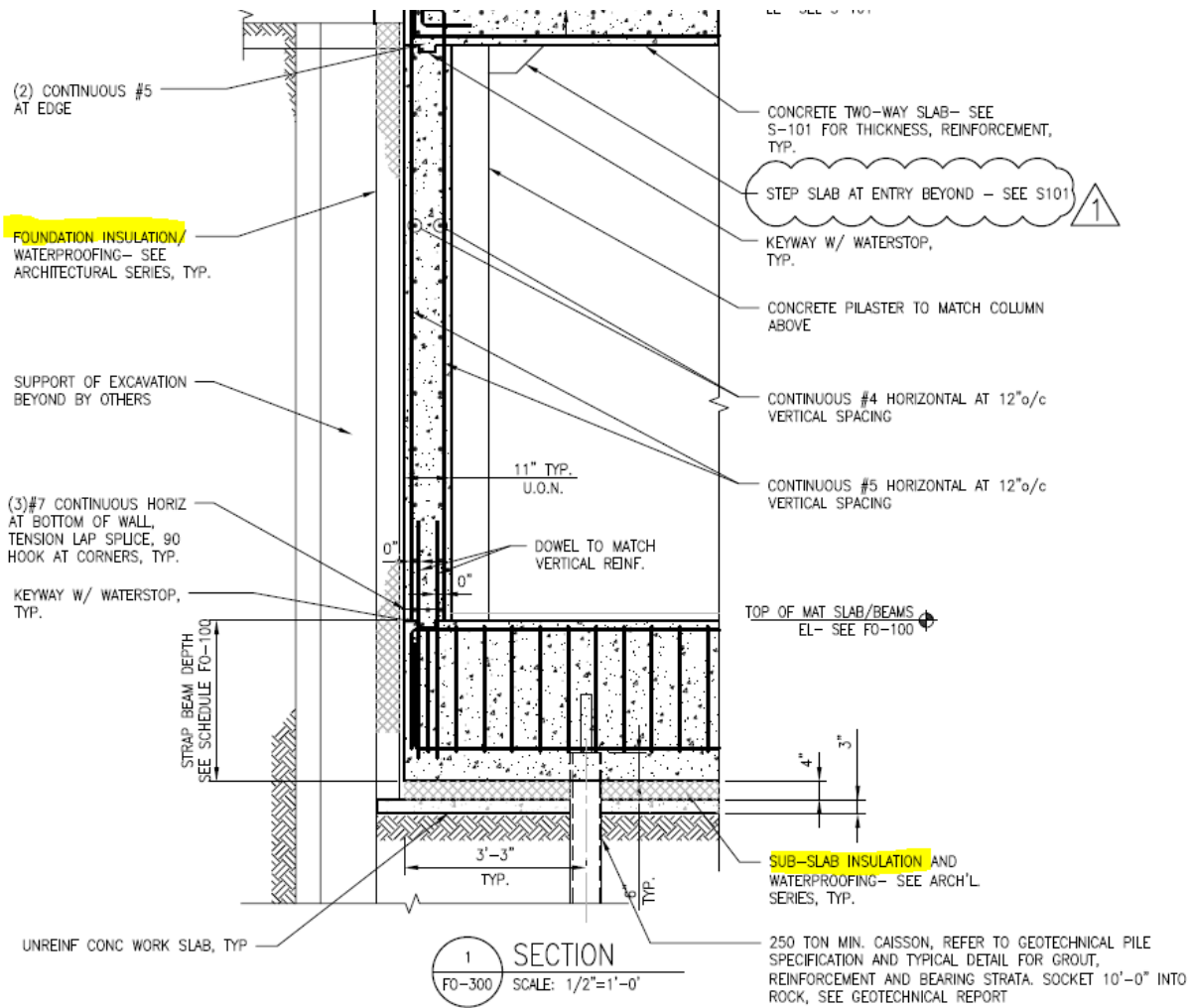


PH Detail



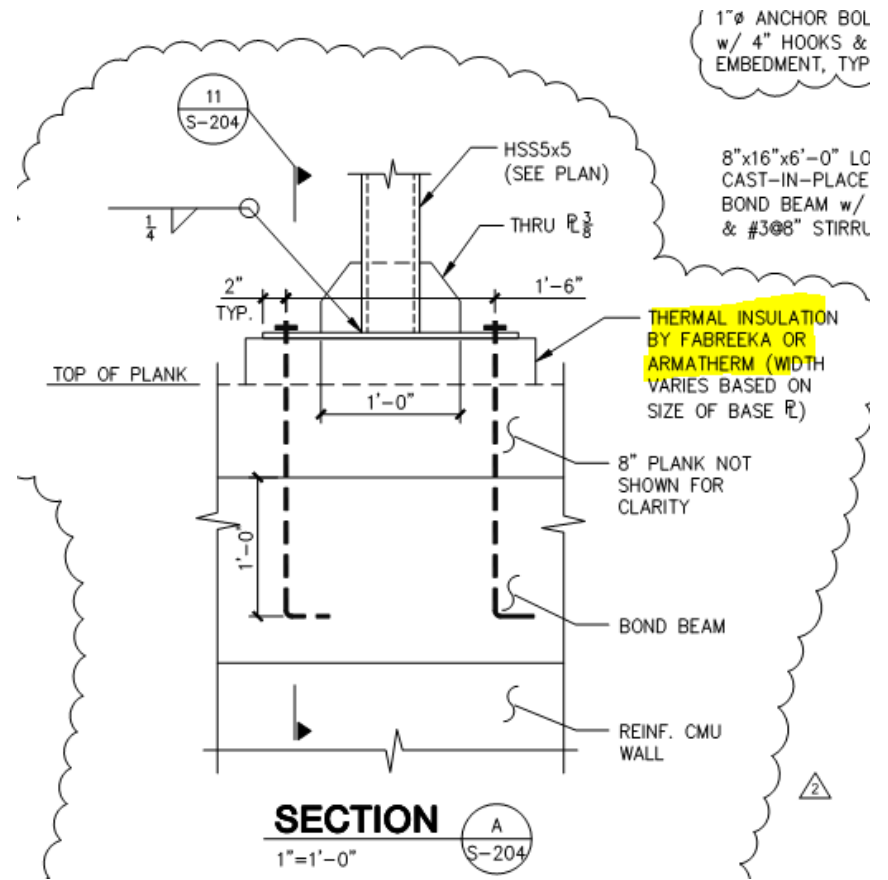
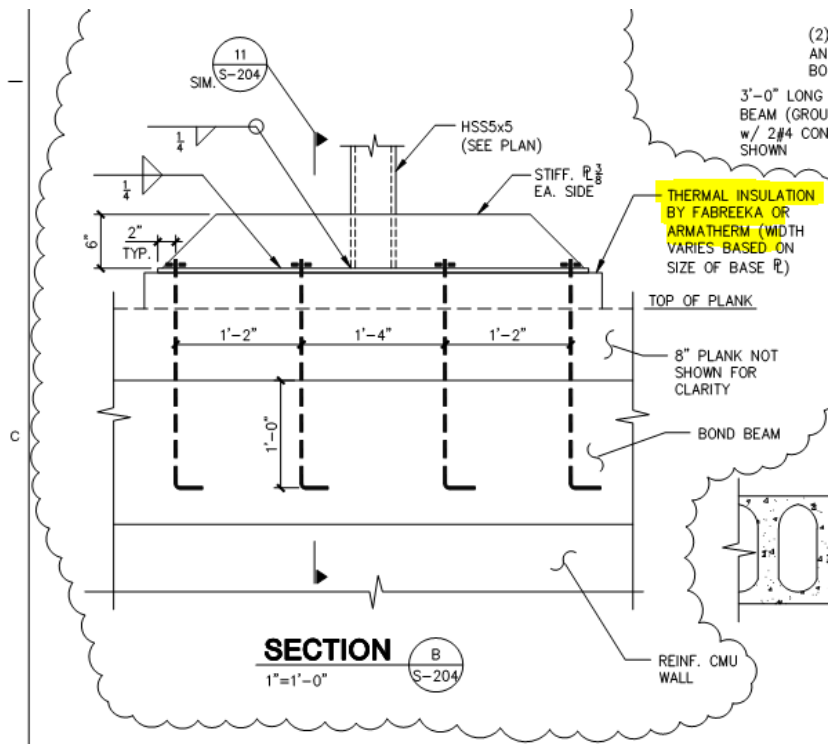
# Canopy Detail

PH Detail



# Structural Overlaps

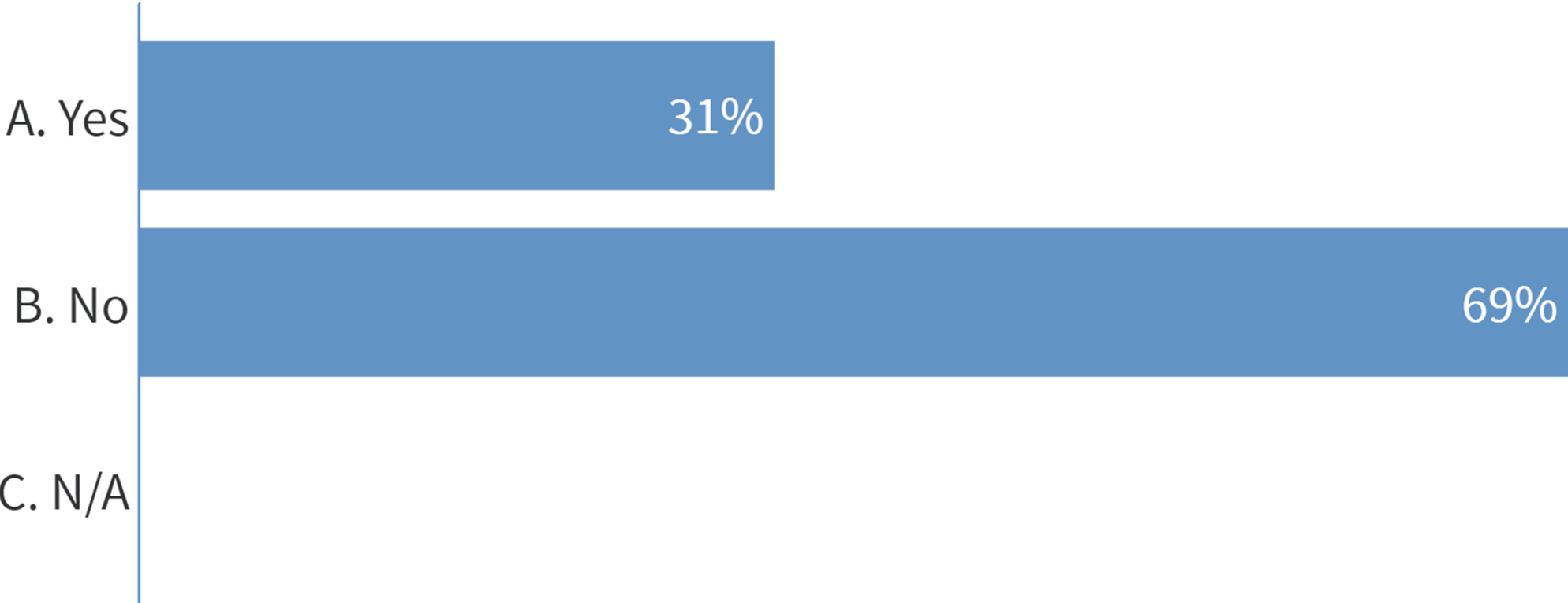
# Structural Overlaps



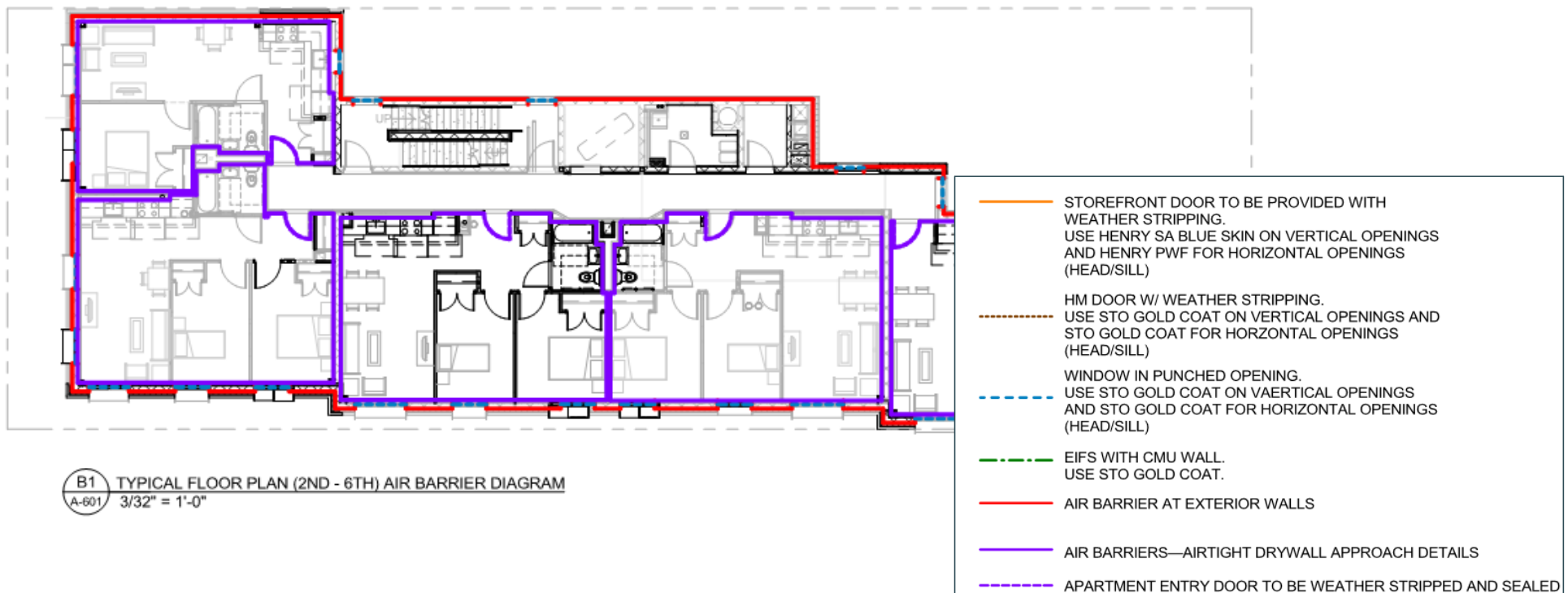
# Air Barrier

- Air Barrier Continuity Diagrams
  - Both in Plan and Section
  - Clearly address complicated air barrier application areas
- Air Sealing Details
  - For whole building
  - SWA Air Sealing Guide – focused on compartmentalization
- Thermal bridging and air sealing

# Have you commonly seen Air Barrier Continuity Diagrams included in drawings for projects that you are working on?



# Air Barrier Continuity Diagrams

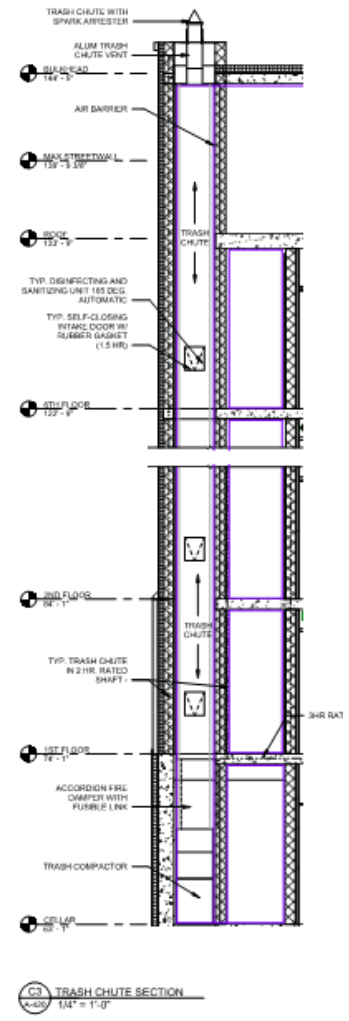
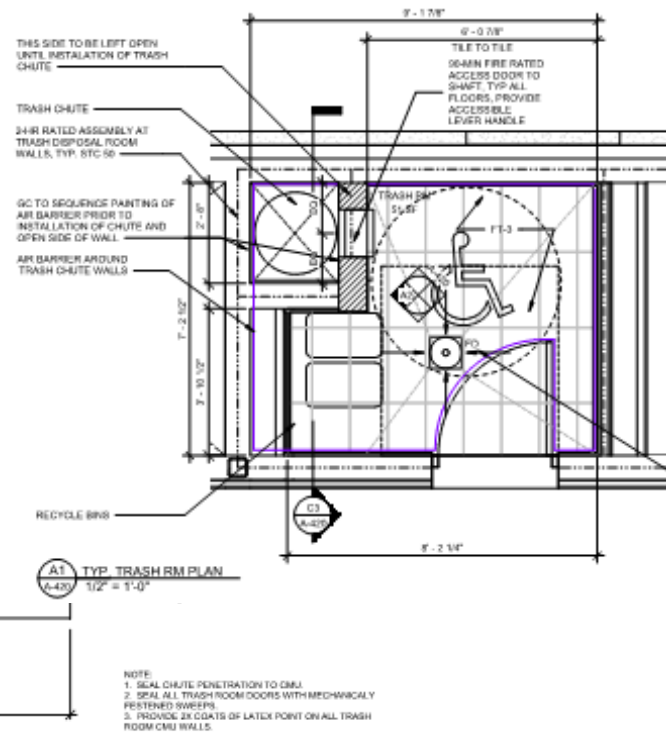
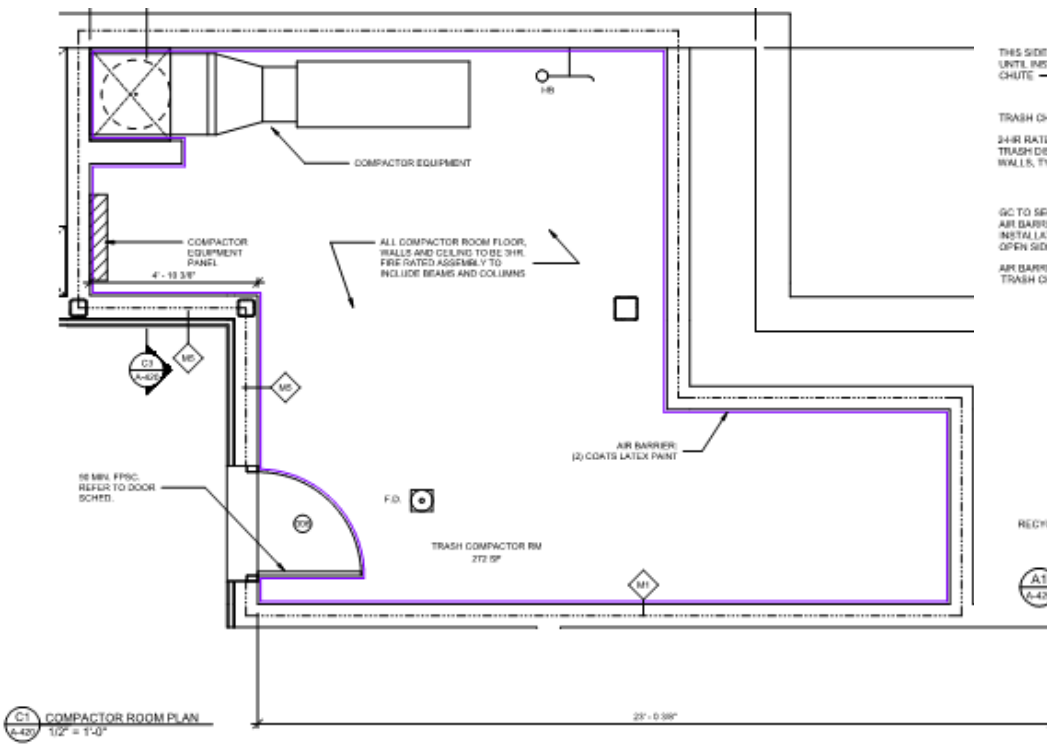




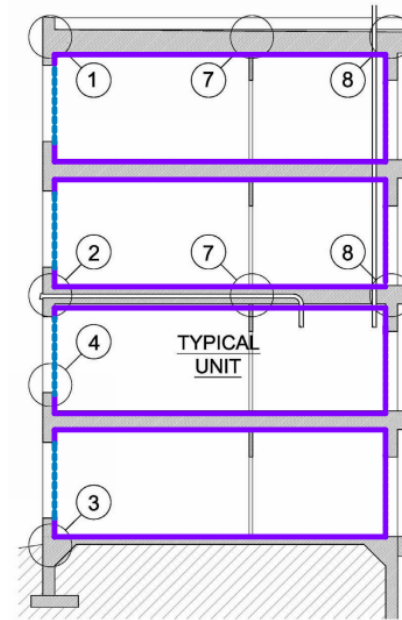
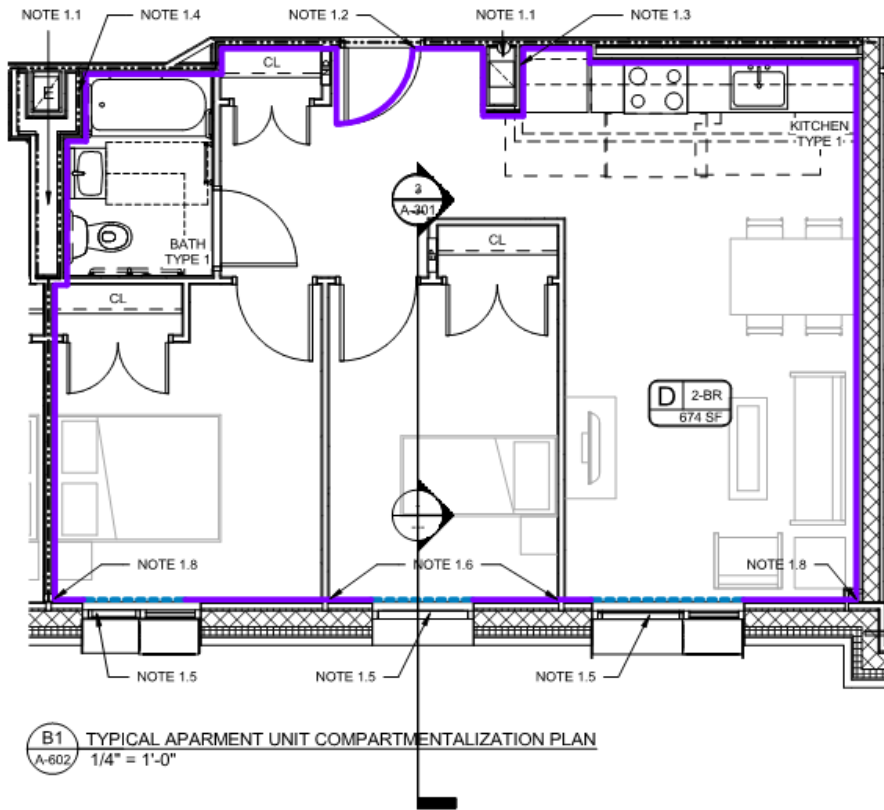
- AIR/VAPOUR BARRIER AT EXTERIOR WALLS
- DAMPPROOFING
- WINDOW IN FINISHED OPENING  
USE STO GOLD COAT ON VERTICAL OPENINGS  
AND STO GOLD COAT FOR HORIZONTAL  
OPENINGS (HEAD/SILL)
- AIR BARRIERS—AIRTIGHT DRYWALL APPROACH DETAILS

# Air Barrier Continuity Diagrams

# Air Barrier Continuity Diagrams – Problem Areas, e.g. Trash Chutes



# Air Barrier Continuity - Compartmentalization



**B1** SECTION KEY TO BUILDING  
SOLENTS

**LEGEND**

- AIR BARRIERS—AIRTIGHT DRYWALL APPROACH DETAILS
- DOOR WEATHER STRIPPING & AIR SEALING
- WINDOW AIR BARRIER CONT


# Air Sealing Guides

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## AIR SEALING GUIDE

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### MULTIFAMILY MASONRY CONSTRUCTION



**We Make Buildings Perform Better**

Steven Winter Associates, Inc. provides research, consulting and advisory services to improve commercial, residential and multifamily built environments for private and public sector clients. We specialize in energy, sustainability and accessibility consulting as well as certification, research & development and compliance services. Our engineers and architects have led the way since 1972 in the development of best practices to achieve high performance buildings. As a matter of course, we collaborate with our clients to produce the most cost-effective and innovative solutions.

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1825 Connecticut Ave. NW, Suite 600, Washington, DC 20009	202-628-6100

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## AIR SEALING GUIDE

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### MULTIFAMILY STEEL CONSTRUCTION



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## AIR SEALING GUIDE

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### MULTIFAMILY WOOD CONSTRUCTION



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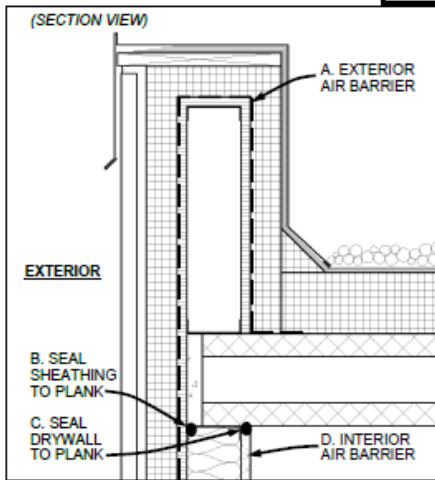
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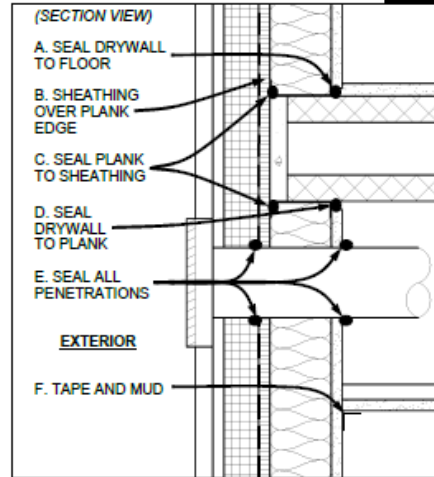
61 Washington Street, Norwalk, Connecticut 06854	203-857-0200
307 7th Avenue, Suite 1701, New York, NY 10001	212-564-5800
1825 Connecticut Ave. NW, Suite 600, Washington, DC 20009	202-628-6100

# Air Sealing Guide Samples

**1** EXTERIOR WALL - PARAPET  
(GRAVEL STOP SIMILAR)



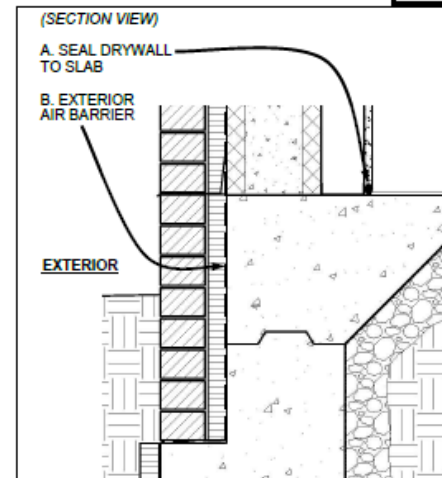
**2** EXTERIOR WALL - MIDDLE



**Notes:**

B, C. Intent: reduce leakage between the exterior and

**3** EXTERIOR WALL - BOTTOM



**Notes:**

A. Intent: reduce leakage between wall cavity and apartment

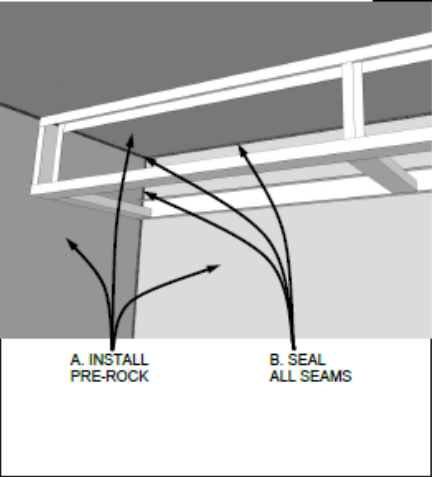
A. Option: self-leveling subfloor (i.e. gypcrete)  
- Seal any remaining gaps between self-leveling subfloor and drywall with caulk

**Responsibilities:**

Drywall: A  
Envelope: B

# Air Sealing Guide Samples

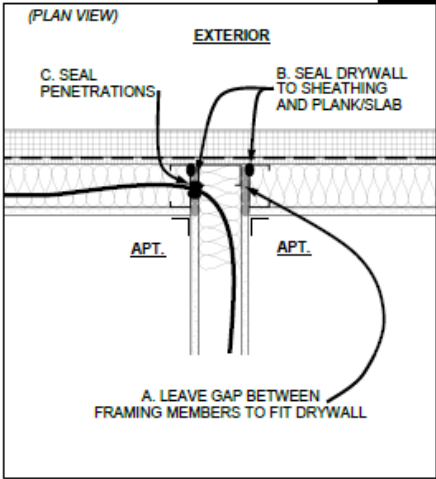
## 11 SOFFIT PRE-ROCK



**Notes:**  
 A, B. Intent: reduce leakage through soffit  
 A. Install pre-rock BEFORE framing the soffit

**Responsibilities:**  
 Drywall: A, B

## 6 ALTERNATE - DEMISING / INTERIOR WALL AT EXTERIOR WALL



**Notes:**  
 A, B, C. Intent: reduce leakage between exterior / corridor wall and demising / interior wall  
 C. Includes pipes, wires, etc.

**Responsibilities:**  
 Framing: A  
 Drywall: B  
 Mech/Elec/Plumb: C

# MEP ITEMS - MECH

**SPLIT INDOOR AIR-CONDITIONING UNIT SCHEDULE - BASED ON DAIKIN**

UNIT NO.	AREA SERVED	TOTAL QTY	FAN		INDOOR UNIT				EVAPORATOR COIL			HEAT PUMP OP		
			CFM	ESP	ELECTRICAL DATA			MOUNTING TYPE	APPROX. WEIGHT	EAT		TOTAL COOLING (MBH)	EAT	TOT HEAT (ME)
					V/PH/HZ	MCA	MOP			LBS	DB (°F)			
AHU-A1	APARTMENTS	5	290	-	208/1/60	.4	15	WALL	26	80	67	12.0	70	13
AHU-A	APARTMENTS	22	450	.8	208/1/60	1.4	15	HORIZONTAL	62	80	67	12.0	70	13
AHU-B	APARTMENTS	21	635	.8	208/1/60	1.6	15	HORIZONTAL	80	80	67	18.0	70	20
AHU-C	APARTMENTS	3	688	.8	208/1/60	1.8	15	HORIZONTAL	80	80	67	24.0	70	27
AHU-D	APARTMENTS	5	1094	.8	208/1/60	2.8	15	HORIZONTAL	102	80	67	30.0	70	34
AHU-L-1	GYM	1	688	.8	208/1/60	1.8	15	HORIZONTAL	80	80	67	24.0	70	27
AHU-L-2	LOBBY	1	688	.8	208/1/60	1.8	15	HORIZONTAL	80	80	67	24.0	70	27
AHU-1-1	RETAIL	1	2047	.8	208/1/60	9.5	15	HORIZONTAL	302	80	67	72.0	70	81.0
AHU-1-2	RETAIL	1	2047	.8	208/1/60	9.5	15	HORIZONTAL	302	80	67	72.0	70	81.0
AHU-25-1	EMR	1	1835	-	208/1/60	.4	15	WALL	31	80	67	18.0	-	-
AHU-25-2	EMR	1	1835	-	208/1/60	.6	15	WALL	31	80	67	24.0	-	-
AHU-C-2	TRASH	1	403	-	208/1/60	-	-	WALL	22	80	67	12.0	-	-
AHU-C-3	IT	1	403	-	208/1/60	-	-	WALL	22	80	67	12.0	-	-

**NOTES:**

- UNITS SHALL HAVE DISCONNECT SWITCHES, INTERNAL CONDENSATE PUMP, DRAIN PANS, LEAK DETECTORS, HANGERS, AND WALL MOUNTED THERMOSTAT.
- PROVIDE 7-YEAR WARRANTY ON COMPRESSOR AND 1-YEAR WARRANTY ON PARTS.
- PROVIDE HEADERS AND OTHER REFRIGERANT PIPING ACCESSORIES AS REQUIRED BY THE MANUFACTURER.
- REFER TO MECHANICAL PIPING RISER DIAGRAM FOR INDOOR AND OUTDOOR UNIT PAIRING.
- PROGRAMMABLE THERMOSTAT SHALL BE CAPABLE OF STARTING AND STOPPING THE SYSTEM FOR SEVEN DIFFERENT DAILY SCHEDULES PER WEEK AND RETAINING THEIR PROGRAMMING AND TIME SETTING DURING THE LOSS OF POWER FOR AT LEAST 10 HOURS. ADDITIONALLY, THE CONTROLS SHALL HAVE A MANUAL OVERRIDE THAT ALLOWS TEMPORARY OPERATION OF THE SYSTEM FOR UP TO 2 HOURS.
- ALL AHU FANS MOTORS SHALL MEET THE REQUIREMENTS OF C403.2.10.1 FOR OPTION #1. (HP<CFM\*0.0011)

**SPLIT OUTDOOR AIR-CONDITIONING UNIT SCHEDULE - BASED ON DAIKIN**

UNIT NO.	CONDENSING UNIT						MODEL	EFFICIENCY		APPROX WEIGHT	DIMENSIONS LxWxH
	ELECTRICAL DATA			COOLING CAPACITY (MBH)	HEATING CAPACITY (MBH)	APPROX. WEIGHT (LBS)		IEER	COP		
	V/PH/HZ	MCA	RLA				CONDENSING UNIT			IEER	COP
ACCU-M-1	208/3/60	116.9	80.6	312	351	1560	REYQ312TJU	17.8	3.2	1560	86X29X67
ACCU-M-2	208/3/60	116.9	80.6	312	351	1560	REYQ312TJU	17.8	3.2	1560	86X29X67
ACCU-M-3 (RETAIL)	208/3/60	55	38.8	144	162	780	REYQ144TJU	20.7	3.6	780	43X29X67
ACCU-R-1	208/3/60	123.8	83.6	336	378	1560	REYQ336TJU	17.0	3.2	1560	86X29X67
ACCU-R-2	208/1/60	16.5	7.1	18	-	150	RZR18PVJU9	17.6 SEER	-	150	36X14X31
ACCU-R-3	208/1/60	16.5	10.3	24	-	150	RZR24PVJU9	18.6 SEER	-	150	36X14X31
ACCU-M-4	208/1/60	16.5	10.3	24	-	150	RZQ24PVJU9	16.5	-	150	36X14X31
ACCU-M-5	208/1/60	8.8	5.3	12	-	75	RXS12LVJU	23.0 SEER	-	150	36X14X31
ACCU-M-6	208/1/60	8.8	5.3	12	-	75	RXS12LVJU	23.0 SEER	-	150	36X14X31

**NOTES:**

- UNITS SHALL HAVE DISCONNECT SWITCHES
- PROVIDE 7-YEAR WARRANTY ON COMPRESSOR AND 1-YEAR WARRANTY ON PARTS.
- PROVIDE HEADERS AND OTHER REFRIGERANT PIPING ACCESSORIES AS REQUIRED BY THE MANUFACTURER.
- REFER TO MECHANICAL PIPING RISER DIAGRAM FOR INDOOR AND OUTDOOR UNIT PAIRING.
- PROVIDE DAIKIN INTELLIGENT CONTROLLER WITH PROPORTIONAL POWER DISTRIBUTION OPTION. GC SHALL COORDINATE CONNECTION OF CONDENSER POWER METER AND DAIKIN INTELLIGENT CONTROLLER. COORDINATE DAIKIN INTELLIGENT CONTROLLER OUTPUT WITH TENANT BILLING CONTROLS VENDOR (QUADLOGIC).
- PROVIDE ACCU-M-5, ACCU-M-6, ACCU-R-2 AND ACCU-R-3 WITH LOW AMBIENT WIND BAFFLE.
- ACCU-M-4, ACCU-M-5, ACCU-M-6 (ACCUS INSTALLED BELOW WALKABLE LOUVER) WIND BAFFLE SHALL BE DIRECTED UPWARD.

# MEP ITEMS - MECH

ENERGY RECOVERY VENTILATOR																		
NO.	SERVICE	LOCATION	EXHAUST CFM	SUPPLY CFM	S.A.T. (°F) SUMMER/ WINTER	SUPPLY FAN		EXHAUST FAN		ELECTRICAL DATA				WEIGHT LB.	FAN POWER EFFICIENCY W/CFM	EFFICIENCY	MANUFACTURER MODEL	REMARKS
						ESP	H.P.	ESP	H.P.	MCA	MFS	VOLTS	PH					
ERV-1	APARTMENTS	ROOF	895	895	79/63	0.75	1.5	0.75	1.5	12.8	15	240	1	680	0.74	84.5%	SWEGON GOLD RX 05	FLEXIBLE, DUCT CONNECTIONS
ERV-2	APARTMENTS	ROOF	1,980	1,980	78/63	0.75	3.2	0.75	3.2	31.3	35	480	3	1,658	0.54	86.0%	SWEGON GOLD RX 14	FLEXIBLE, DUCT CONNECTIONS
ERV-3	APARTMENTS	ROOF	1,560	1,510	79/62	0.75	1.5	0.75	1.5	12.8	15	240	1	1,373	0.63	84.0%	SWEGON GOLD RX 11	FLEXIBLE, DUCT CONNECTIONS
ERV-4	APARTMENTS	ROOF	1,580	1,580	79/63	0.75	1.5	0.75	1.5	12.8	15	240	1	1,373	0.66	85.5%	SWEGON GOLD RX 11	FLEXIBLE, DUCT CONNECTIONS
ERV-5	CORRIDORS	ROOF	1,250	1,260	79/62	0.75	1.5	0.75	1.5	12.8	15	240	1	849	0.67	83.5%	SWEGON GOLD RX 08	FLEXIBLE, DUCT CONNECTIONS

PROVIDE:

- DISCONNECT AND TRANSFORMER PACKAGED.
- ENTHALPIC HIGH EFFICIENCY.
- EXHAUST MOTORIZED DAMPER.
- SUPPLY MOTORIZED DAMPER.
- DIRTY FILTER SENSOR.
- PAINTED EXTERIOR FINISH.
- PROVIDE ERV-2 WITH TRANSFORMER OPTION FOR 208V OPERATION.
- ALL ERV UNITS SHALL BE SUPPLIED WITH MERV-8 FILTERS.

# MEP ITEMS - MECH

## MECHANICAL CONSTRUCTION PLAN - 22ND - 23RD FLOOR

1 SCALE: 1/4"=1'-0"

### KEY NOTES

- ① HANG NEW AHU FROM SLAB ABOVE. REFER TO MANUFACTURER SPECIFICATIONS FOR MOUNTING REQUIREMENTS. SIZE AND CONNECT RS/RL LINES PER MANUFACTURER'S SPECIFICATIONS. PROVIDE FLEXIBLE DUCT CONNECTIONS FOR ALL DUCTWORK CONNECTING TO AHUS. PROVIDE AUXILIARY CONDENSATE PUMP WITH DRIP PAN AND LEAK DETECTOR.
- ② PROVIDE AMERICAN ALDES MODEL CAR-II WITH 4" REGULATING ELEMENT FACTORY CALIBRATED TO INDICATED CFM. REGULATOR SHALL BE LOCATED WITHIN 12" OF GRILLE/PLENUM BOX ASSEMBLY. CONTRACTOR SHALL PROVIDE 6" DEEP PLENUM BOX AT GRILLE/DIFFUSER. MOUNT GRILLE TO REGISTER BOX FLUSH WITH WALL/CEILING. REFER TO MANUFACTURER INSTALLATION SPECIFICATIONS. PROVIDE ALL REQUIRED MOUNTING HARDWARE AND DUCT TRANSITIONS.



### NOTES:

1. ALL EQUIPMENT LOCATIONS, DUCTWORK AND PIPING ROUTINGS SHALL BE COORDINATED AND DETERMINED IN FIELD WITH ALL OTHER TRADES PRIOR TO CONSTRUCTION TO AVOID ANY POSSIBLE CONFLICTS DURING INSTALLATION.
2. ALL ERV DUCTWORK SHALL BE SEALED USING THE AEROSEAL PROCESS OR EQUIVELANT.
3. COORDINATE ALL EXTERIOR DUCTWORK TERMINATIONS TO MAINTAIN 10 FOOT CLEARANCE FROM THE PROPERTY LINE AND 10 FOOT ABOVE ADJOINING GRADE.
4. ALL EXTERIOR TERMINATIONS SHALL BE PROVIDED WITH WIRE MESH & WEATHERPROOF LOUVERS U.O.N.
5. PROVIDE REFRIGERANT PIPING FROM ALL AC UNITS (EVAPORATORS) TO BRANCH CONTROLLERS ACCORDING TO MANUFACTURER'S RECOMMENDATIONS (TYP).
6. ALL REFRIGERANT PIPING TO BE RUN FROM BRANCH CONTROLLER TO CONDENSING UNIT LOCATED ON SETBACK ROOF. REFER TO RISER DIAGRAM M-500.00 FOR FURTHER DETAILS.
7. PROVIDE EACH EVAPORATOR WITH A CONDENSATE DRAIN LINE PITCHED AT LEAST 1/18" PER FOOT, ROUTED TO CONDENSATE RISER IN WALL OR EVAPORATOR ENCLOSURE.
8. PROVIDE CONDENSATE DRAIN FOR BRANCH CONTROLLER ROUTED TO CONDENSATE RISER.
9. MAINTAIN MFG. RECOMMENDED SERVICE CLEARANCE FOR ALL EQUIPMENT. COORDINATE WITH ARCHITECT FOR ACCESS PANEL SPECS AND LOCATION.
10. PROVIDE CLEAR OPENINGS ABOVE CEILING FOR RETURN AIR BACK TO EVAPORATOR FOR DUCTED EVAPORATORS.
11. PROVIDE ACCESS PANEL FOR ALL FD, FSD, & MANUAL BALANCING DAMPERS.
12. PROVIDE MONITORING FOR TEMPERATURE AND HUMIDITY LEVELS IN TENANT ACCESSIBLE BUILDING SPACES. EQUIPMENT SPECIFIED BY OTHERS.
13. PROVIDE MONITORING FOR TEMPERATURE, RELATIVE HUMIDITY, AND CO2 LEVELS AND THERMOSTAT READINGS IN HABITABLE SPACES. EQUIPMENT SPECIFIED BY OTHERS.
14. INSULATE ALL INTERIOR DUCTWORK BETWEEN ERV AND EXTERIOR TO R-8. TAPING OF ALL SEAMS AND INSULATION IS TO BE CONTINUOUS.
15. INSULATE ALL EXTERIOR DUCTWORK TO R-10.
16. JOINTS, LONGITUDINAL AND TRANSVERSE SEAMS AND CONNECTIONS IN DUCTWORK SHALL BE SEALED. DUCTS SHALL BE SEALED TO THE SHEETROCK BEHIND REGISTERS AT ALL LOCATIONS.

# MEP ITEMS - MECH

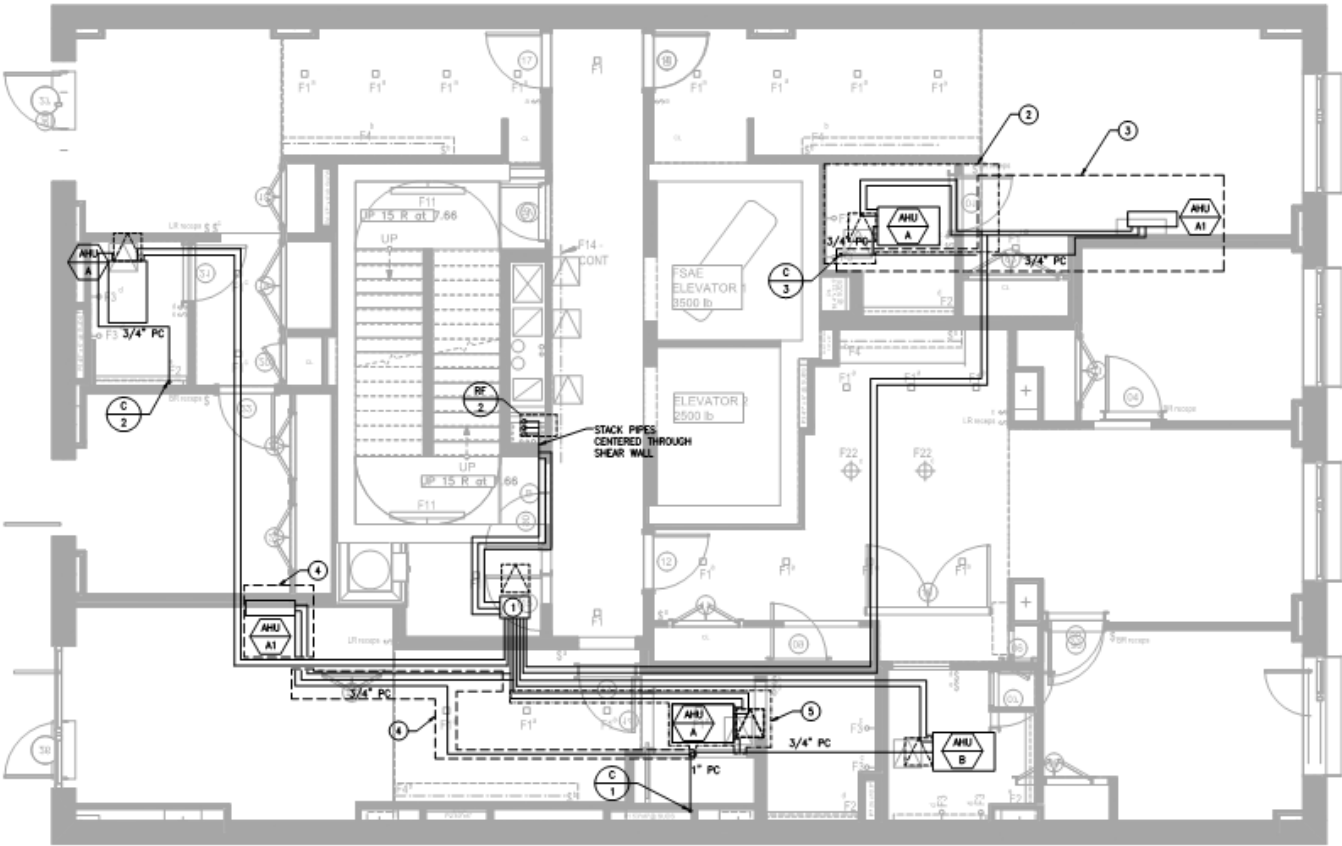
PIPING INSULATION	
HOT WATER PIPING (TEMP: 105° F. AND HIGHER)	PROVIDE 1½" PIPE INSULATION FOR PIPES EQUAL OR LESS THAN 1½". PROVIDE 2" INSULATION FOR PIPES GREATER THAN 1½"
CONDENSATE DRAIN PIPING	PROVIDE ½" PIPE INSULATION FOR COPPER PIPING. NO INSULATION REQUIRED IF PVC PIPE IS USED.
REFRIGERANT PIPING	PROVIDE 1½" ARMAFLEX INSULATION
HEAT PUMP LOOP PIPING	PROVIDE 1" PIPE INSULATION FOR PIPES EQUAL TO OR GREATER THAN 1". PROVIDE ½" INSULATION FOR PIPES LESS THAN 1".

<i>DUCTWORK INSULATION SCHEDULE</i>					
SERVICE	LOCATION	THICKNES S	MATERIAL	FINISH	MIN. R-VALUE
SUPPLY/RETURN	CONCEALED	1-1/2"	D-1	VAPORSEAL	R-6
SUPPLY/RETURN	UNCONDITIONED SPACE	2"	D-1	VAPORSEAL	R-6

\*NOTE: PROVIDE 4" OF INSULATION FOR ALL DUCTWORK BETWEEN ERV AND BUILDING EXTERIOR

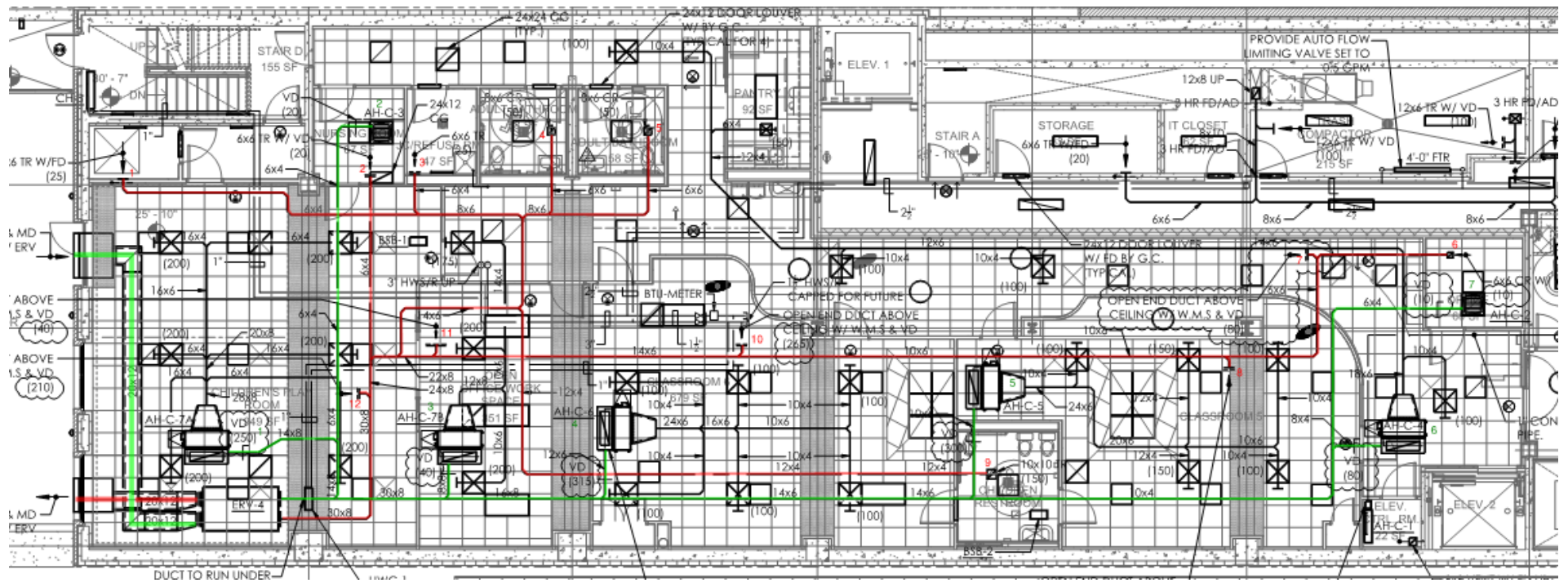


# MEP ITEMS - MECH

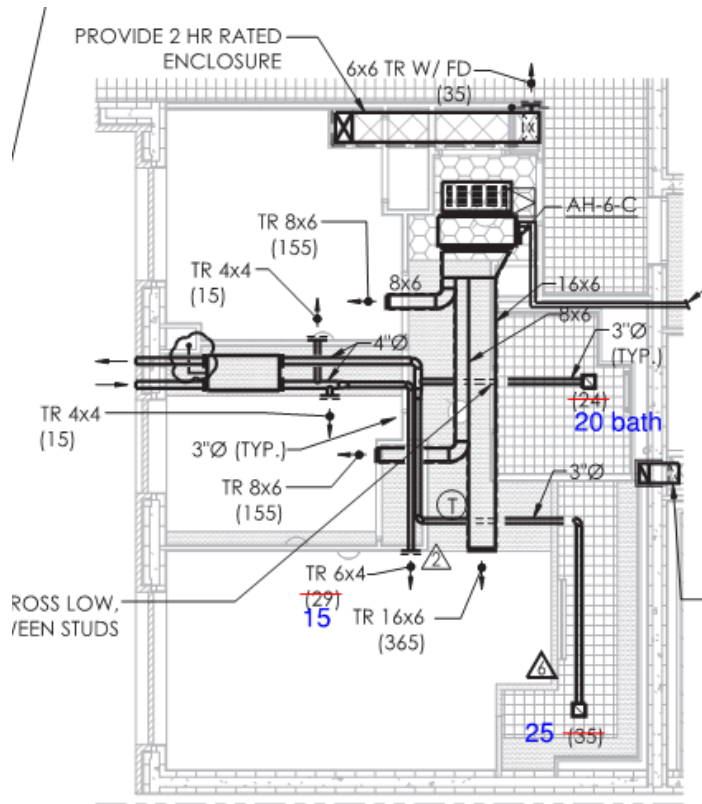


**M**ECCHANICAL PIPING PLAN - 2ND - 7TH FLOOR  
1 SCALE: 1/4"=1'-0"

# MEP ITEMS - MECH

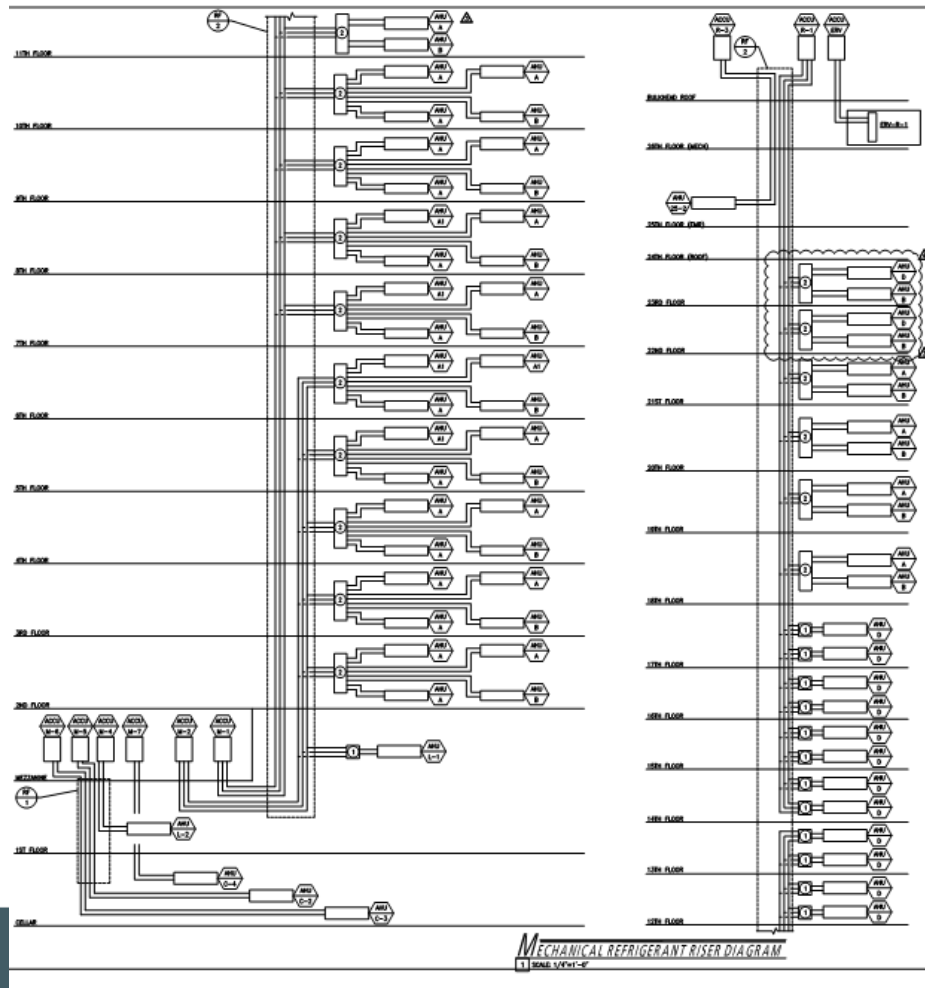


# MEP ITEMS - MECH





# MEP ITEMS - MECH



### PLAN NOTES

1. ALL RISER SHALL BE PROVIDED WITH INTERNAL LEAK DETECTOR AND CONDENSATE PUMP.
2. REFER TO MANUFACTURER SPECIFICATIONS FOR ALL REPRESENT PIPING SIZES AND REQUIRED SOCKET JOINTS AND VALVES.
3. REFER TO RISER DRAWING FOR AHU-CONDENSER REFRIGERANT PIPING DETAILS.
4. ALL REPRESENT PIPING RISERS SHALL BE LOCKED IN INDEPENDENT FIRE RATED SHAFTS.

### KEY NOTES

- ① BROWNS SINGLE PORT BRANCH SELECTOR BOX, REFER TO MANUFACTURER SPECIFICATIONS FOR INSTALLATION.
- ② BROWNS MULTI PORT BRANCH SELECTOR BOX, REFER TO MANUFACTURER SPECIFICATIONS FOR INSTALLATION.
- ③ BROWNS SINGLE PORT BRANCH SELECTOR BOX, REFER TO MANUFACTURER SPECIFICATIONS FOR INSTALLATION.

MECHANICAL REFRIGERANT RISER DIAGRAM	
DATE:	20/NOV/2011
PROJECT NO:	2010.040
DRAWN BY:	J.C.
CHEK BY:	DR
DWG NO:	
<b>M-501.03</b>	
PAGE: 07 of 20	
JOB APPLICATION NUMBER	
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# MEP ITEMS - MECH

## CONTROL SYSTEM NARRATIVE:

HEATING SYSTEM CONSISTS OF (2) LAARS HOT WATER BOILERS. BOILERS ARE CONTROLLED VIA TEKMAR CONTROL PANEL WITH OUTDOOR TEMPERATURE RESET AND NIGHT SET BACK.

EACH APARTMENT UNIT IS PROVIDED WITH HYDRONIC FIN TUBE RADIATORS, WHICH ARE OPERATED BY MOTORIZED CONTROL VALVES, AND AUTOFLOW LIMITING VALVES, AS SHOWN ON DETAIL SHEET M-401.

## SPLIT TYPE AC SYSTEM

1. PROGRAMMABLE THERMOSTAT SHALL START AND STOP AH UNITS.
2. THERMOSTAT SHALL CYCLE COMPRESSOR TO MAINTAIN ROOM DESIRED SETTING.

## FIN TUBE RADITORS

1. THERMOSTAT SHALL OPERATE A HOT WATER CONTROL VALVE TO MAINTAIN DESIRED ROOM TEMPERATURE SETTING.

## COMMISSIONING:

OWNER SHALL ENGAGE A REGISTERED DESIGN PROFESSIONAL OR APPROVED AGENCY TO PROVIDE COMMISSIONING SERVICES IN COMPLIANCE WITH SECTION C408 OF 2016 NYCECC. THE SPECIFICATIONS SHALL BE PROVIDED BY THE COMMISSIONING AGENCY AND TO BE SUBMITTED WITH DESIGN DOCUMENTS FOR BID. UPON COMPLETION OF FINAL COMMISSIONING THE COMMISSIONING AGENCY SHALL PROVIDE A REPORT NOTING THE COMPLETION OF COMMISSIONED SYSTEMS STATED BELOW:

## SYSTEMS AND ASSOCIATED CONTROLS TO BE COMMISSIONED:

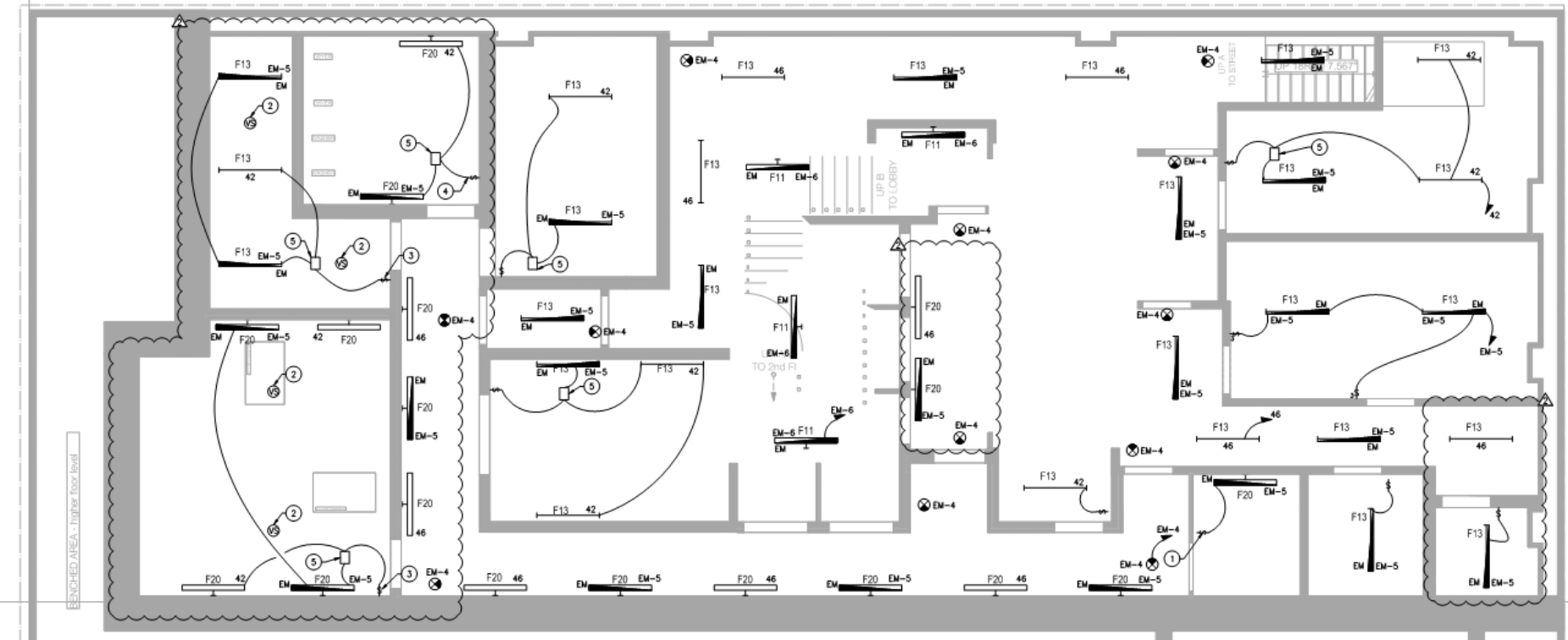
1. HEATING, COOLING, AIR HANDLING AND DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS, INSULATION AND THEIR RELATED AIR QUALITY MONITORING SYSTEMS.
2. AIR, WATER, AND OTHER ENERGY RECOVERY SYSTEMS.
3. MANUAL OR AUTOMATIC CONTROLS, WHETHER LOCAL OR REMOTE, ON ENERGY USING SYSTEMS INCLUDING BUT NOT LIMITED TO TEMPERATURE CONTROLS, SETBACK SEQUENCES, AND OCCUPANCY BASED CONTROL, INCLUDING ENERGY MANAGEMENT FUNCTIONS OF THE BUILDING MANAGEMENT SYSTEM.
4. PLUMBING, INCLUDING INSULATION OF PIPING AND ASSOCIATED VALVES, DOMESTIC AND PROCESS WATER PUMPING, AND MIXING SYSTEMS.
5. MECHANICAL HEATING SYSTEMS AND SERVICE WATER HEATING SYSTEMS.
6. REFRIGERATION SYSTEMS.
7. RENEWABLE ENERGY AND ENERGY STORAGE SYSTEMS.
8. OTHER SYSTEMS, EQUIPMENT AND COMPONENTS THAT ARE USED FOR HEATING, COOLING OR VENTILATION AND THAT AFFECT ENERGY USE.
9. AUTOMATIC LIGHTING SYSTEMS AS PER SECTION C408.3

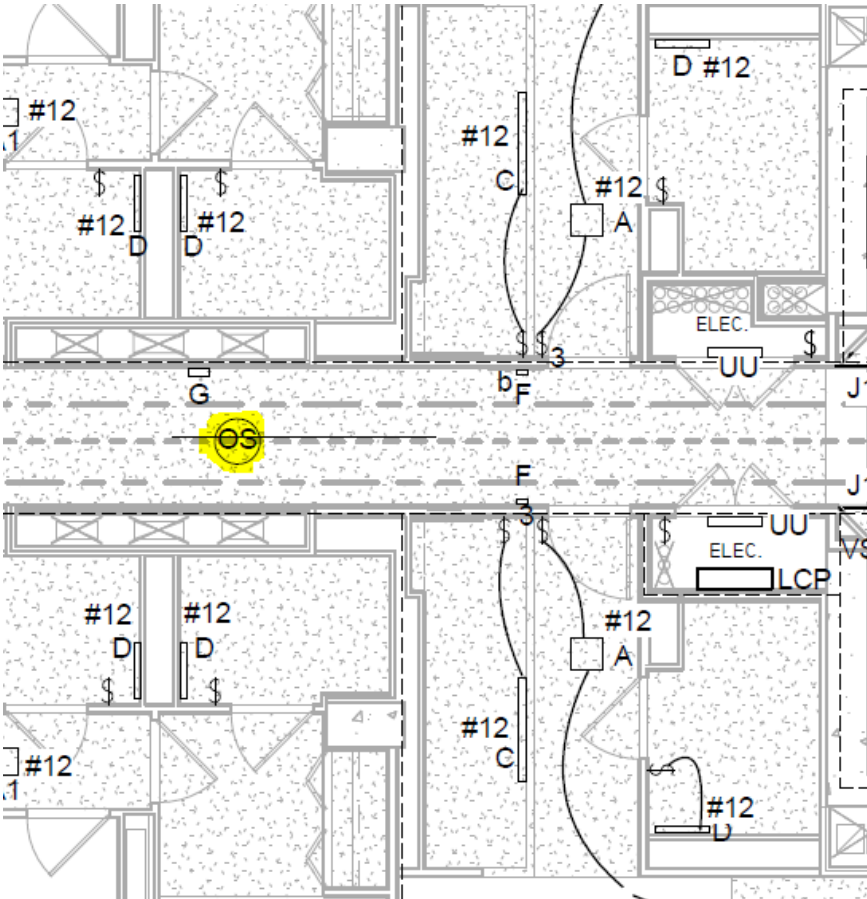
TYPE	LOCATION	DESCRIPTION	MANUFACTURER	MODEL NO	QUANTITY	LAMP TYPE	FIXTURE INFORMATION		EFFICACY (LUMEN/WATT)		
							WATTAGE	VOLTAGE	REQUIRED	PROVIDED	
<b>INTERIOR</b>											
A	APT. FOYER / CORRIDOR	CEILING SURFACE MOUNTED	DMF LIGHTING	DRD54R10930EM	40	LED	12W	120V	40	83	DWELLING I
B	APT. KITCHEN	WALL MOUNTED	PHILIPS LIGHTING	FSS220L830-UNV-DIM	60	LED	17W	120V	50	123	MOUNT CEF
C	APT. BATHROOM	WALL MOUNTED	SUNPARK ELECTRONICS	FL5324D-3000K	36	LED	19W	120V	50	75	MOUNT CEF
D	APT. BEDROOM / LIVING ROOM	WALL MOUNTED	LAMAR LIGHTING	VESCL-1550-55-30	91	LED	17W	120V	50	72	MOUNT @ É
E	CORRIDOR	CEILING SURFACE MOUNTED	DMF LIGHTING	DRD5S8R20930	19	LED	24W	120V	50	83	OCCUPANC
E-EM	CORRIDOR	CEILING SURFACE MOUNTED	DMF LIGHTING	DRD5S8R	21	LED	24W	120V	50	83	PROVIDE SI
F	TRASH ROOM	SURFACE MOUNTED	LAMAR LIGHTING	VOL-48-M-FA-30-AS	6	LED	25W	120V	50	138	
F-EM	STAIRWELL LANDINGS	SURFACE MOUNTED	LAMAR LIGHTING	VOL-48-M-FA-30-AS-EM	19	LED	25W	120V	50	138	OCCU-SMAI FULLY LIP L
G	UTILITY ROOMS	RIGID STEM MOUNTED	LAMAR LIGHTING	SSLED48-30-FO-BLANK	8	LED	35W	120V	50	118	
G-EM	UTILITY ROOMS	RIGID STEM MOUNTED	LAMAR LIGHTING	SSLED48-30-FO-BLANK-EM	15	LED	35W	120V	50	118	VACANCY É
H	EXERCISE & LAUNDRY ROOMS	CEILING MOUNTED	RAB LIGHTING	PANEL2X2-41YN	12	LED	41W	120V	50	95	
H-EM	EXERCISE & LAUNDRY ROOMS	CEILING MOUNTED	RAB LIGHTING	PANEL2X2-41YN-EM	4	LED	41W	120V	50	95	
J	CORRIDOR - CELLAR	SURFACE MOUNTED	RAB LIGHTING	BOA2S	4	LED	17W	120V	50	85	SUSPENDE
J-EM	CORRIDOR - CELLAR	SURFACE MOUNTED	RAB LIGHTING	BOA2S	4	LED	17W	120V	50	85	SUSPENDE
L-C	LOBBY - COVE LIGHT	SURFACE MOUNTED	I2SYSTEMS LIGHTING	CP48	4	LED	12W	120V	40	98	LOBBY & C
L-D	LOBBY - DOWNLIGHT	RECESSED	RAB LIGHTING	ND4R20D20W + NDLED4RD-50YHC-W-X	6	LED	20W	120V	40	65	
L-D EM	LOBBY - DOWNLIGHT	RECESSED	RAB LIGHTING	ND4R20D20W/E2 + NDLED4RD-50YHC-W-X	7	LED	20W	120V	40	65	90 MIN. EM
L-W	LOBBY - WALL WASH	RECESSED	RAB LIGHTING	ND4R20D + NDLED4RD-WYHC-WX	2	LED	20W				
U	ELEVATOR PIT	SURFACE MOUNTED	RAB LIGHTING	VXBRLLED13DG	2	LED	13W	120V	40	48	ELEVATOR
W	EXIT SIGN	CEILING SURFACE MOUNTED	EATON/COOPER	ES7-2-S-PA-R-C	7	LED	4.6W	120V	40		LESS THAN
W1	EXIT SIGN	CEILING SURFACE MOUNTED	EATON/COOPER	TPX-7-2-R	12	LED	1W	120V	40		LESS THAN
<b>EXTERIOR</b>											
M-EM	EXTERIOR DECORATIVE LIGHT	SURFACE MOUNTED	LIGMAN	UMT-31426-M-W30	2	LED	12W	120V	40	49	WALL MOUN MASIMUN H
S	EXTERIOR LIGHT	SURFACE MOUNTED	RAB LIGHTING	SLIM-12-N	7	LED	12W	120V	40	99	
S-EM	EXTERIOR LIGHT	SURFACE MOUNTED	RAB LIGHTING	SLIM-12-N	3	LED	12W	120V	40	99	EMERGENC
X	EXTERIOR DOWNLIGHT	CEILING SURFACE MOUNTED	LIGMAN	UNI-80621	2	LED	30W	120V	50	100	COMPLIES I
X-EM	EXTERIOR DOWNLIGHT	CEILING SURFACE MOUNTED	LIGMAN	UNI-80621	1	LED	30W	120V	50	100	COMPLIES I
Z	EXTERIOR EXIT SIGN	CEILING SURFACE MOUNTED	EATON/COOPER	LPXW-7-1-R-SD	2	LED	3.3W	120V	40		LESS THAN

# MEP ITEMS – ELEC

- ALL LAMP SUPPLIED W/ FIXTURE SHALL BE PREMIUM BRAND LAMPS, SYLVANIA OR G.E.
- ALL FIXTURES WITH "EM" DESIGNATION SHALL PROVIDED WITH INTEGRATED EMERGENCY BATTERY PACK.
- ALL FIXTURES WITH "EM" DESIGNATION SHALL BE CONNECTED TO AN INVERTER.
- LIGHTING SCHEDULE FOR INFORMATION ONLY. REFER TO ARCHITECTURAL DRAWINGS AND FIXTURE SCHEDULE FOR EXACT TYPES, QUANTITIES, LOCATIONS AND CONTROLS. CONTRACTOR SHALL ADVISE OF ANY DISCREPANCIES BETWEEN THIS SCHEDULE AND ARCHITECTURAL LIGHTING FIXTURE SCHEDULE. ARCHITECTURAL FIXTURE SCHEDULE TAKES PRECEDENCE.

# MEP ITEMS – ELEC





LIGHTING CONTROL NARRATIVES:

1. EXTERIOR LIGHTING SHALL BE CONTROLLED VIA PHOTOCELL AND ASTRONOMICAL TIMECLOCK THROUGH A RELAY CONTACTOR. EXTERIOR LIGHTS SHALL TURN ON FROM DUSK TO SUNRISE. IT SHALL AUTOMATICALLY TURN OFF WHEN SUFFICIENT DAYLIGHT IS AVAILABLE.
2. STAIRCASE LIGHTING SHALL HAVE INTEGRAL OCCUPANCY SENSOR AND BI-LEVEL BALLAST TO REDUCE LIGHTING POWER BY 50% WITHIN 20 MINUTES OF ALL OCCUPANTS LEAVING THE CONTROLLED AREA.
3. PUBLIC LOBBY AND CORRIDOR LIGHTING:
  - a. LIGHTING IN RESIDENTIAL LOBBY SHALL BE CONTROLLED BY PRESET PROGRAMMABLE SYSTEM WITH TIME CLOCK FEATURE; PROGRAMMER IN PACKAGE ROOM FOR (5) ZONES.
  - b. RESIDENTIAL CORRIDOR LIGHTING SHALL BE DIMMABLE AND CONTROLLED BY A LIGHTING CONTROL PANEL WITH TIMECLOCK FEATURES. FIXTURES SHALL BE ON 100% DURING DAYTIME HOURS AND DIMMED TO 50% DURING LATE NIGHT HOURS.
- CLINIC WAITING AREA AND CORRIDOR:
  - a. LIGHTING CONTROL IN CLINIC WAITING AREA WILL BE VIA A PRESET PROGRAMMABLE SYSTEM WITH TIME CLOCK FEATURE
  - b. CORRIDOR: LIGHTING TO BE NON-DIMMING, WITH TWO (2) ZONES TOTAL TO BE CONTROLLED BY TIME CLOCK. ONE OF THESE ZONES SHALL COMPRISE ONE HALF OF THE FIXTURES (ALTERNATING) TO BE SHUT OFF DURING LATE NIGHT HOURS, AND MAY BE CONTROLLED SEPARATELY FOR LATE NIGHT ACCESS OR MAINTENANCE WITH A MANUAL OVERRIDE.
4. AS PER ASHRAE 90.1 SECTION 9.4.1.1(h) EXCEPTION 2., LIGHT REDUCTION CONTROL IS NOT REQUIRED FOR EQUIPMENT ROOMS AND ELECTRICAL & MECHANICAL ROOMS.
5. CEILING/WALL MOUNTED VACANCY (MANUAL ON/AUTO OFF) AND OCCUPANCY (AUTO ON/AUTO OFF) SENSORS ARE PROVIDED TO AUTOMATICALLY TURN OFF ALL LIGHTS WITHIN 20 MINUTES OF ALL OCCUPANTS LEAVING THE SPACE.
6. BI-LEVEL LIGHTING CONTROL AND DIMMING ARE USED FOR GENERAL LIGHTING THROUGHOUT NON RESIDENTIAL SPACES TO PROVIDE AT LEAST ONE INTERMEDIATE STEP IN LIGHTING POWER IN ADDITION TO FULL 'ON' AND FULL 'OFF'.
7. DAYLIGHT HARVESTING SENSORS ARE PROVIDED IN SPACES MATCHING THE GUIDELINES SPECIFIED IN 9.4.1.1(c) EACH SPACE SHALL HAVE A ROOM CONTROLLER TO CONTROL LIGHTS IN THE 'NON-DAYLIGHT' AND 'DAYLIGHT' ZONES.
9. LOBBY SHALL BE CONTROLLED VIA TIMECLOCK WITH A LOCAL OVERRIDE.
10. PROVIDE LUTRON GRAFIK EYE OR SIMILAR APPROVED LIGHTING DIMMING CONTROLS.
10. THE RETAIL SPACES SHALL HAVE (1) ZONE, NON-DIMMABLE FOR ALL WORK LIGHTING CONTROLLED VIA OCCUPANCY SENSOR WITH AUTOMATIC PHOTOCELL CONTROL OF DAYLIGHT ZONES.

# MEP ITEMS – ELEC

CONTROL DEVICE NOTES:

1. ALL CONTROL DEVICES (PHOTOCENTROLS HAVE BEEN PROPERLY LOCATED, FIELD-CALIBRATED, AND SET FOR APPROPRIATE SETPOINT AND THRESHOLD LIGHT LEVELS.
2. DAYLIGHT CONTROLLED LIGHTING LOADS ADJUST TO APPROPRIATE LIGHT LEVELS IN RESPONSE TO AVAILABLE DAYLIGHT.
3. THE LOCATION WHERE CALIBRATION ADJUSTMENTS ARE MADE IS READILY ACCESSIBLE ONLY TO AUTHORIZED PERSONNEL.










A 3RD PARTY COMMISSIONING AGENT WILL VERIFY THE CONTRACTOR HAS COMPLETED THIS SETUP AND ADJUSTMENT.

## LIGHTING CONTROL NARRATIVE

AREA	
CORRIDOR	CEILING MOUNTED AUTOMATIC OCCUPANCY SENSOR WILL TURN LIGHT OFF AUTOMATICALLY AFTER 20 MINUTES OF OCCUPANTS LEAVING THE SPACE, AND BE MANUAL 'ON' OR AUTO-'ON' TO NO MORE THAN 50% OF LIGHT FIXTURES.
EXTERIOR LIGHTING	PHOTOCELL TO TURN LIGHTS ON, TIME CLOCK TO TURN LIGHTS OFF. FACADE AND LANDSCAPE LIGHTING TO SHUT OFF AND OTHER LIGHTING TO BE REDUCED BY 30% DURING RESTRICTED HOURS.
STAIRWELL LIGHTING	BI-LEVEL LIGHTING CONTROL BY OCCUPANCY SENSOR OPERATES AT A LOW STANDBY LIGHT LEVEL AND FULLY LIT UPON OCCUPANCY
MULTI-PURPOSE ROOMS, BIKE ROOM, STORAGE ROOMS, JANITOR CLOSETS, ETC.	WALL MOUNTED VACANCY SENSOR MANUALLY 'ON' AND AUTOMATICALLY 'OFF' OR LOW VOLTAGE CEILING MOUNTED VACANCY SENSOR MANUALLY 'ON' BY LOW VOLTAGE SWITCH AND AUTOMATICALLY 'OFF'.

# MEP ITEMS – ELEC

### LIGHTING CONTROL SYMBOL LIST

	OCCUPANCY SENSOR (CEILING MOUNTED): SENSOR SWITCH CM-11 (LOW VOLTAGE) AND POWER PACK WATTSTOPPER WT SERIES (LOW VOLTAGE) AND POWER PACK FOR CORRIDOR AREAS
	DAYLIGHT CONTROL SENSOR (CEILING MOUNTED): SENSOR SWITCH CM-PC (LOW VOLTAGE) AND POWER PACK WATTSTOPPER LS-301 (LOW VOLTAGE) AND POWER PACK PROVIDED NEAR WINDOWS OF APPLICABLE SPACES
	VACANCY SENSOR WITH DUAL TECHNOLOGY (WALL MOUNTED): SENSOR SWITCH WSD-PDT (LINE VOLTAGE) WATTSTOPPER UW-100 (LINE VOLTAGE) (WATTSTOPPER - OPERATION MUST BE SET WITH DIP SWITCHES) PROVIDED IN SMALL OFFICE OR BATHROOM OF APPLICABLE SPACE
	VACANCY SENSOR WITH DUAL TECHNOLOGY (CEILING MOUNTED): SENSOR SWITCH CM-PDT-10 (LOW VOLTAGE) AND POWER PACK WATTSTOPPER DT-300 (LOW VOLTAGE) AND POWER PACK PROVIDE LOW VOLTAGE WALL STATIONS/SWITCHES AS INDICATED ON THE DRAWINGS, PROVIDED IN LARGE AREAS
	SINGLE POLE LIGHT SWITCH
	LOW VOLTAGE VACANCY SWITCH: SENSOR SWITCH SWITCHPOD, SENSOR INTERFACE SWITCH, MANUAL/AUTO ON, SP0DM
	OVERRIDE SWITCH
	PHOTO CELL
	TIME CLOCK

# MEP ITEMS – PLUMBING

## DOMESTIC WATER HEATER/BOILER SCHEDULE

EQUIPMENT TAG	STORAGE (GAL.)	RECOVERY (GPH)	TEMPERATURE RISE (°F)	GAS		OIL		INDIRECT		ELECTRICAL			MANUFACTURER	EFFICIENCY	OPERATING WEIGHT (LBS.)	REMARKS
				GAS PRESSURE	MBH INPUT	GPH	MBH INPUT	HEATING MBH	BOILER GPM	VOLTS	PHASE	KW				
WH/C-1, WH/C-2, WH/R-1, WH/R-2, WH/R-3, WH/R-4	100	233	100	3.5"	199,900	--	--	--	--	120	1	--	PVI CONQUEST 20L 100A-GCL	97% (MEETS ANSI Z201.10.3 REQUIREMENTS)	1520	PROVIDED WITH ASME HLW STAMP

### NOTES:

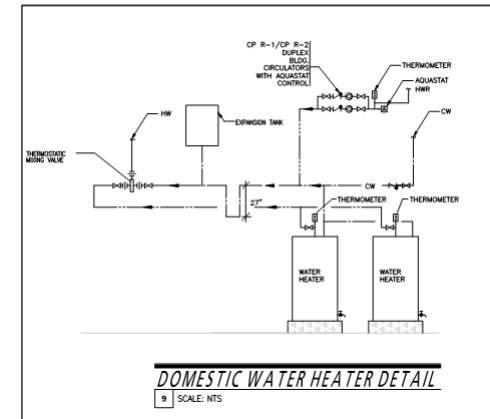
- 15 YEAR TANK AND HEAT EXCHANGER WARRANTY.
- PROVIDE THERMOSTATIC MIXING VALVE TMV/C-1 FOR LOW ZONE WATER HEATERS AND TMV/R-1 FOR HIGH ZONE WATER HEATERS.
- PROVIDE AIR BLEED VALVES FOR EACH HW WATER HEATER
- PROVIDE EACH WATER HEATER GROUP WITH 32 GALLON THERMAL EXPANSION TANK ET/C-1, ET/R-1 & ET/R-2, AMTROL MODEL WX-203. PROVIDE LOW WATER PRESSURE SWITCH FOR MID ZONE WATER HEATER.

## PUMP SCHEDULE

EQUIPMENT TAG	LOCATION	SERVICE	PUMP TYPE	FLUID	GPM	HEAD (FT)	ELECTRICAL				MANUFACTURER	REMARKS
							HP	VOLTAGE	PHASE	RPM		
CP/C-1 CP/C-2	CELLAR WATER HEATER ROOM	LOW ZONE DOMESTIC	INLINE	WATER	10	9.5	1/8	115	1	1725	TACO MODEL 111	DUPLEX ARRANGEMENT
CP/R-1, CP/R-2, CP/R-3, CP/R-4	ROOF MECHANICAL ROOM	MID ZONE & HIGH ZONE DOMESTIC	INLINE	WATER	5	3.6	1/12	115	1	1725	TACO MODEL 110	DUPLEX ARRANGEMENT
DB/C-1	CELLAR WATER HEATER ROOM	DOMESTIC	DUPLEX	WATER	130(EA.)	300	20(EA.)	208	3	1750	SYNCFLO 1300TMSL130VFD-GAF	PACKAGED DUPLEX SYSTEM
SE/C-1	CELLAR	SANITARY	DUPLEX	WASTE	50(EA.)	18	1(EA.)	208	3	1725	LITTLE GIANT MODEL 16S-CIM	--
ESP/C-1	ELEVATOR SUMP	ELEVATOR	SIMPLEX	WASTE	50	19	1/2	208	1	3600	STANCOR OIL-MINDER SE-50	--
GB/C-1	ROOF	GENERATOR	SIMPLEX	NATURAL GAS	950 CFH	9"W.C.	1/4	120	1	3500	ACCARDI GENPAC MD-101-N4-REG-UPS	--

### NOTES:

- CIRCULATOR PUMPS (CP/C-1, CP/C-2, CP/R-1, CP/R-2) INSTALLED WITH FACTORY PROVIDED AQUASTAT SET TO RECIRCULATE HOT WATER AT 95°F.
- SEWER EJECTOR PUMP, SEP/C-1 TO BE PROVIDED WITH 3'x7'D EJECTOR PIT AND BASIN COVER AND DUPLEX NEMA 1 CONTROL PANEL ALDERON MODEL 3210.
- DOMESTIC BOOSTER PUMP SPECIFIED AS A PACKAGED SYSTEM. ALTERNATES MUST INCLUDE ALL ITEMS PROVIDED IN THE SYNCFLO PACKAGE BY DEFAULT.
- DOMESTIC BOOSTER PUMP TO BE PROVIDED WITH 90 GALLON CUSHION TANK, CT/R-1, LOCATED AT ROOF LEVEL FOR HIGH ZONE.
- GAS BOOSTER PUMP TO BE PROVIDED WITH EMERGENCY TRANSFER SWITCH & 2200VA 120/1/60 UPS BY MANUFACTURER. COORDINATE INSTALLATION WITH ELECTRICAL CONTRACTOR.
- GAS BOOSTER TO BE INSTALLED ON THE ROOF WITHIN WEATHER PROOF ENCLOSURE ACCARDI MODEL MD101-ODE.



# MEP ITEMS – PLUMBING

## PLUMBING PIPING INSULATION

MATERIAL	MANUFACTURER	SERVICE	INSULATION THICKNESS	COMMENTS
FLEXIBLE ELASTOMERIC	AEROFLOX USA INC.; AEROCEL ARMACELL LLC; AP ARMAFLEX RBX CORPORATION; INSUL-SHEET 1800; INSUL-TUBE 180	DOMESTIC HOT & RE-CIRCULATED HOTWATER	1" FOR PIPES < 1.5" 1½" FOR PIPES ≥ 1.5"	1) FLAME SPREAD RATING INDEX SHALL BE 25 OR LESS.  2) SMOKE DEVELOPED INDEX SHALL BE 50 OR LESS.  3) PIPE INSULATION SHALL NOT BE INTERRUPTED BY PIPE SUPPORTS OR PIPE SERVICE.
		DOMESTIC COLD WATER (POTABLE)	1"	
		STORMWATER & OVERFLOW	1"	
		ROOF DRAIN AND OVERFLOW DRAIN BODIES	1"	
		EXPOSED SANITARY DRAINS	1"	
MINERAL-FIBER	FIBREX INSULATIONS INC.; COREPLUS 1200. JOHNS MANVILLE; MICRO-LOK. KNAUF INSULATION; 1000 PIPE INSULATION. OWENS CORNING; FIBERGLAS PIPE INSULATION	DOMESTIC HOT & RE-CIRCULATED HOTWATER	1" FOR PIPES < 1.5" 1½" FOR PIPES ≥ 1.5"	
		DOMESTIC COLD WATER (POTABLE)	1"	
		STORMWATER & OVERFLOW	1"	
		ROOF DRAIN AND OVERFLOW DRAIN BODIES	1"	
		EXPOSED SANITARY DRAINS	1"	
POLYOLEFIN	ARMACELL LLC; TUBOLIT NOMACO INC.; IMCOLOCK, IMCOSHEET, NOMALOCK & NOMAPLY RBX CORPORATION; THERMA-CELL	DOMESTIC HOT & RE-CIRCULATED HOTWATER	1" FOR PIPES < 1.5" 1½" FOR PIPES ≥ 1.5"	
		DOMESTIC COLD WATER (POTABLE)	1"	
		STORMWATER & OVERFLOW	1"	
		ROOF DRAIN AND OVERFLOW DRAIN BODIES	1"	
		EXPOSED SANITARY DRAINS	1"	



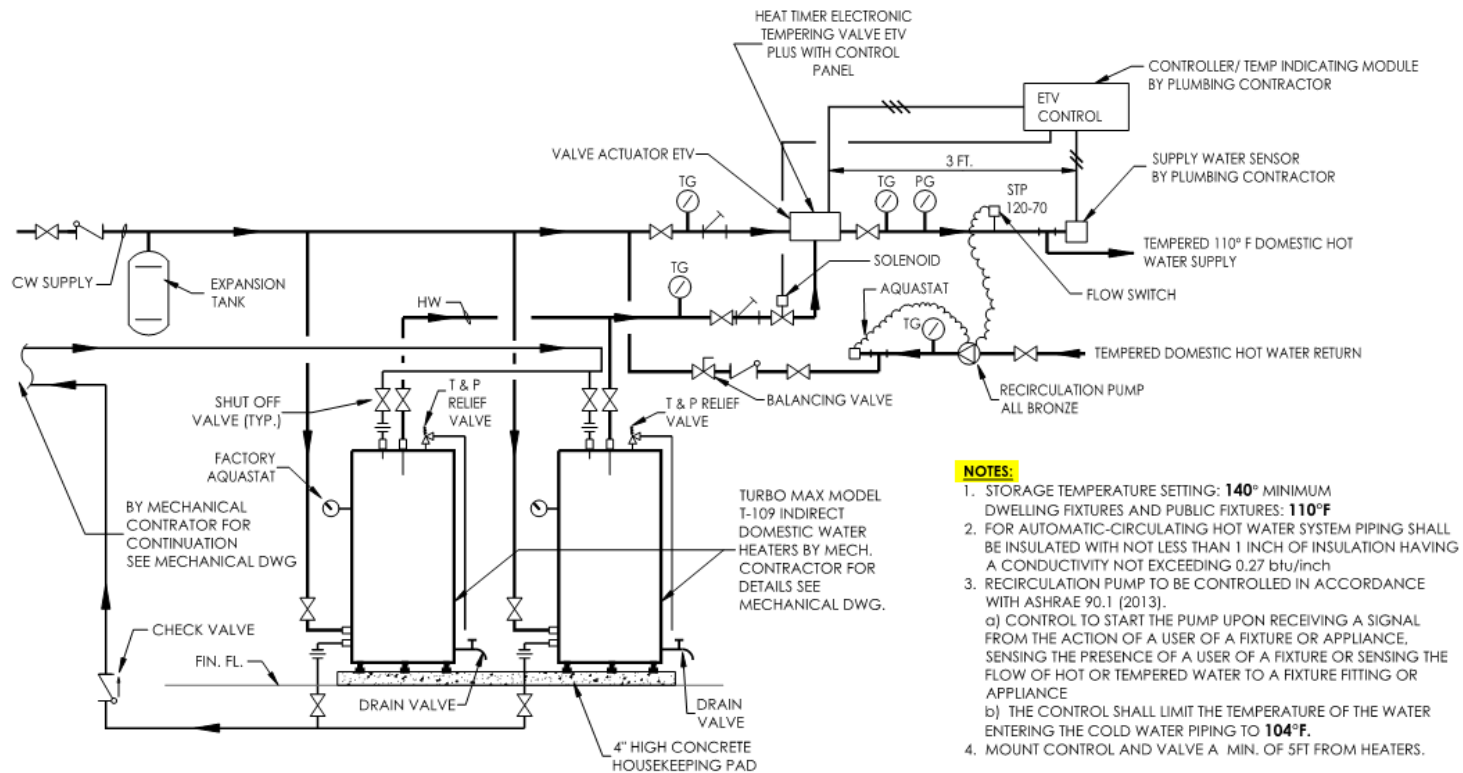
1.5" diameter hot water piping observed with only 1.0" thick insulation, 9<sup>th</sup> floor



# MEP ITEMS – PLUMBING

PLUMBING FIXTURE SCHEDULE									
FIXTURE TAG	FIXTURE TYPE	FIXTURE MANUFACTURER/ MODEL NO.	MATERIAL	DESCRIPTION	MINIMUM PLUMBING CONNECTION SIZE				REMARKS
					WASTE/ SANITARY	VENT	COLD WATER	HOT WATER	
WC	WATER CLOSET	TO BE COORDINATED WITH ARCHITECT. REFER TO ARCHITECTURAL PLANS FOR ADDITIONAL INFORMATION.	VITREOUS CHINA. COLOR: AS SELECTED BY ARCHITECT.	TO BE COORDINATED WITH ARCHITECT. REFER TO ARCHITECTURAL PLANS FOR ADDITIONAL INFORMATION.	4"	2"	1-1/4"	--	MAXIMUM WATER CONSUMPTION: 1.28 GPF OR EQUIVALENT DUAL FLUSH (PER NYC PLUMBING CODE TABLE 604.4)
	BOTTOM OUTLET								
	FLUSH VALVE								
LAV	LAVATORY	TO BE COORDINATED WITH ARCHITECT. REFER TO ARCHITECTURAL PLANS FOR ADDITIONAL INFORMATION.	VITREOUS CHINA. COLOR: AS SELECTED BY ARCHITECT.	TO BE COORDINATED WITH ARCHITECT. REFER TO ARCHITECTURAL PLANS FOR ADDITIONAL INFORMATION.	2"	1-1/2"	1/2"	1/2"	MAXIMUM WATER CONSUMPTION: .25 GALLONS PER CYCLE
SH	SHOWER ASSEMBLY	TO BE COORDINATED WITH ARCHITECT. REFER TO ARCHITECTURAL PLANS FOR ADDITIONAL INFORMATION.	--	TO BE COORDINATED WITH ARCHITECT. REFER TO ARCHITECTURAL PLANS FOR ADDITIONAL INFORMATION.	3"	1-1/2"	1/2"	1/2"	MAXIMUM WATER CONSUMPTION: 2.0 GPM AT 80 PSI
UR	WATER CLOSET	TO BE COORDINATED WITH ARCHITECT. REFER TO ARCHITECTURAL PLANS FOR ADDITIONAL INFORMATION.	VITREOUS CHINA. COLOR: AS SELECTED BY ARCHITECT.	TO BE COORDINATED WITH ARCHITECT. REFER TO ARCHITECTURAL PLANS FOR ADDITIONAL INFORMATION.	3"	1-1/2"	1-1/4"	--	MAXIMUM WATER CONSUMPTION: .5 GALLONS PER FLUSHING CYCLE
	FLUSH VALVE								
		TO BE COORDINATED WITH ARCHITECT. REFER TO		TO BE COORDINATED WITH ARCHITECT. REFER					

# MEP ITEMS – PLUMBING



#### NOTES:

1. STORAGE TEMPERATURE SETTING: **140°** MINIMUM  
DWELLING FIXTURES AND PUBLIC FIXTURES: **110°F**
2. FOR AUTOMATIC-CIRCULATING HOT WATER SYSTEM PIPING SHALL BE INSULATED WITH NOT LESS THAN 1 INCH OF INSULATION HAVING A CONDUCTIVITY NOT EXCEEDING 0.27 btu/inch
3. RECIRCULATION PUMP TO BE CONTROLLED IN ACCORDANCE WITH ASHRAE 90.1 (2013).
  - a) CONTROL TO START THE PUMP UPON RECEIVING A SIGNAL FROM THE ACTION OF A USER OF A FIXTURE OR APPLIANCE, SENSING THE PRESENCE OF A USER OF A FIXTURE OR SENSING THE FLOW OF HOT OR TEMPERED WATER TO A FIXTURE FITTING OR APPLIANCE
  - b) THE CONTROL SHALL LIMIT THE TEMPERATURE OF THE WATER ENTERING THE COLD WATER PIPING TO **104°F**.
4. MOUNT CONTROL AND VALVE A MIN. OF 5FT FROM HEATERS.

DOMESTIC HOT WATER AND ELECTRONIC MIXING VALVE PIPING DETAIL

# Commissioning

Cx Requirements	LEED 2009 Fundamental	LEED V4 Fundamental	LEED Enhanced	NYSEDA NCP	2014/2016 NYCECC	NYS Green Building Tax Credit
Owner's Project Requirements (Current Facility Requirements)	X	X*	X			
Basis of Design	X	X*	X			X
Commissioning Plan	X	X	X	X	X	X
Design Review	Ensure Design Docs call for Cx	X*	X	Ensure Design Docs call for Cx	Ensure Design Docs call for Cx	Ensure Design Docs call for Cx
Submittal Review			X			
Prefunctional Checklists	X	X	X	X		Certificate of Readiness
Testing and Balancing Review					\	X
Site Inspections	X	X	X			X
Functional Tests	X	X	X	X	X	
Systems Manual Review			X		\	\
Staff training Oversight/Verification			X			X
Commissioning Report	X	X	X	X	Preliminary report at CO, Final Report within specified time	X
Recommissioning			Warranty Walkthrough			

\*Must include Envelope

# Commissioning

## COMMISSIONING:

OWNER SHALL ENGAGE A REGISTERED DESIGN PROFESSIONAL OR APPROVED AGENCY TO PROVIDE COMMISSIONING SERVICES IN COMPLIANCE WITH SECTION C408 OF 2016 NYCECC. THE SPECIFICATIONS SHALL BE PROVIDED BY THE COMMISSIONING AGENCY AND TO BE SUBMITTED WITH DESIGN DOCUMENTS FOR BID. UPON COMPLETION OF FINAL COMMISSIONING THE COMMISSIONING AGENCY SHALL PROVIDE A REPORT NOTING THE COMPLETION OF COMMISSIONED SYSTEMS STATED BELOW:

### SYSTEMS AND ASSOCIATED CONTROLS TO BE COMMISSIONED:

1. HEATING, COOLING, AIR HANDLING AND DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS, INSULATION AND THEIR RELATED AIR QUALITY MONITORING SYSTEMS.
2. AIR, WATER, AND OTHER ENERGY RECOVERY SYSTEMS.
3. MANUAL OR AUTOMATIC CONTROLS, WHETHER LOCAL OR REMOTE, ON ENERGY USING SYSTEMS INCLUDING BUT NOT LIMITED TO TEMPERATURE CONTROLS, SETBACK SEQUENCES, AND OCCUPANCY BASED CONTROL, INCLUDING ENERGY MANAGEMENT FUNCTIONS OF THE BUILDING MANAGEMENT SYSTEM.
4. PLUMBING, INCLUDING INSULATION OF PIPING AND ASSOCIATED VALVES, DOMESTIC AND PROCESS WATER PUMPING, AND MIXING SYSTEMS.
5. MECHANICAL HEATING SYSTEMS AND SERVICE WATER HEATING SYSTEMS.
6. REFRIGERATION SYSTEMS.
7. RENEWABLE ENERGY AND ENERGY STORAGE SYSTEMS.
8. OTHER SYSTEMS, EQUIPMENT AND COMPONENTS THAT ARE USED FOR HEATING, COOLING OR VENTILATION AND THAT AFFECT ENERGY USE.
9. AUTOMATIC LIGHTING SYSTEMS AS PER SECTION C408.3

COMMISSIONING PLAN SHALL FOLLOW ALL NECESSARY STEPS AS PER SECTION C408.2.1 OF 2016 NYCECC.

- Ensure Cx Statement is included on all relevant sections (e.g. Mechanical, Electrical, & Plumbing cover sheets)

Questions?



10 Minute Break

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# What's different in specifications of Passive House Buildings - Design

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## Details!

- Many PH specs are a variation of 'typical' or 'standard' specs
- There are a few new spec sections to be included to cover high performance building criteria along with the more typical sections

# Specification Development

- Developed during the **design phase** of the project. Timelines of when developed varies project by project.
- Contractors who sign a contract to complete parts of the work scope put in writing that they will **fulfill the spec** and planned their budgets accordingly
- Changes later will result in **change orders** which are often costly and want to be **avoided**

# Specifications - Realities

- Often recycled from previous projects
  - Example: footer not updated to reflect the correct project
- Don't align with what is shown on the drawings
  - Example: section on metal panels is included, when not being used on the project
- Reference incorrect or outdated codes or standards
  - Example: references to LEED when it's a Passive House project
- Some architects utilize spec writer firms
  - Disconnect between the actual design team and the person preparing the specs
- Does everyone actually read all the specs? 😊

# My biggest concern with specifications is:

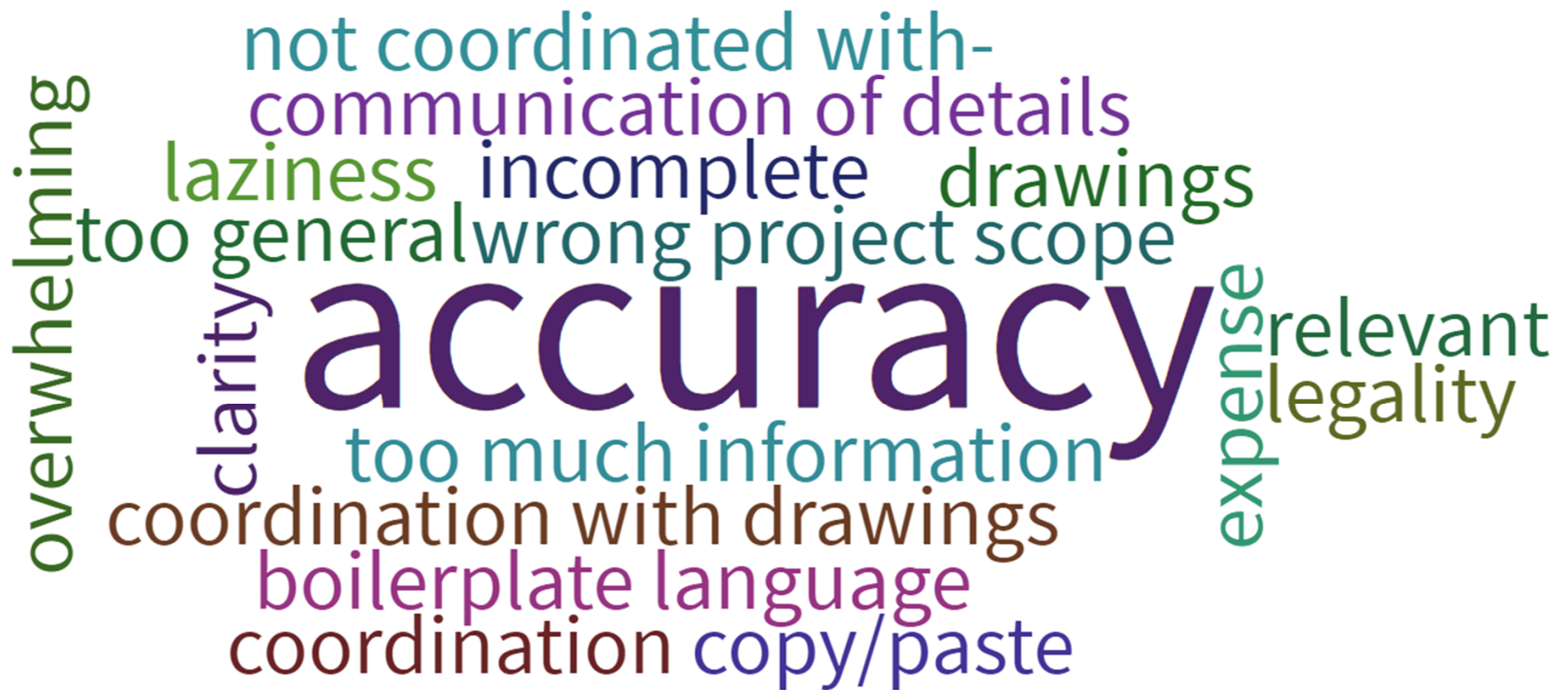


TABLE OF CONTENTS – 1614-1741 THRID AVE & 801 EAST 181 <sup>ST</sup> STREET			
DIVISION 01	GENERAL REQUIREMENTS	Pages	Date
011000	SUMMARY	3	5/17/19
012600	CONTRACT MODIFICATION PROCEDURES	3	5/17/19
012900	PAYMENT PROCEDURES	5	5/17/19
013100	PROJECT MANAGEMENT AND COORDINATION PROCEDURES	10	5/17/19
013200	CONSTRUCTION PROGRESS DOCUMENTATION	11	5/17/19
013223	PHOTOGRAPHIC DOCUMENTATION	3	5/17/19
013300	SUBMITTAL PROCEDURES	19	5/17/19
014000	QUALITY REQUIREMENTS	11	5/17/19
014100	MODEL DWELLING UNIT	3	5/17/19
014200	REFERENCES	5	5/17/19
014201	AIR BARRIER SYSTEM REQUIREMENTS	5	5/17/19
015000	TEMPORARY FACILITIES AND CONTROLS	12	5/17/19
016000	PRODUCT REQUIREMENTS	9	5/17/19
017300	EXECUTION	9	5/17/19
017329	CUTTING AND PATCHING	5	5/17/19
017419	CONSTRUCTION WASTE	2	5/17/19
017700	CLOSEOUT PROCEDURES	5	5/17/19
017710	ATTIC STOCK	3	5/17/19
017823	OPERATION AND MAINTENANCE DATA	8	5/17/19
017839	PROJECT RECORD DOCUMENTS	5	5/17/19
017900	DEMONSTRATION AND TRAINING	6	5/17/19
018113.1	SUSTAINABLE DESIGN REQUIREMENTS (EGC MAPES)	13	5/17/19
018113.2	SUSTAINABLE DESIGN REQUIREMENTS (EGC THIRD AVE)	15	5/17/19
018113.3	SUSTAINABLE DESIGN REQUIREMENTS (PASSIVE HOUSE)	2	5/17/19
018114	VOC LIMITS FOR ADHESIVES, SEALANTS, PAINTS, AND COATINGS	4	5/17/19
019113	COMMISSIONING GENERAL REQUIREMENTS	12	5/17/19

# Referencing Specifications – Divisions & Sections

DIVISION 07	THERMAL AND MOISTURE PROTECTION		
071300	DETENTION TANK WATERPROOFING	5	5/17/19
071326	FOUNDATION WATERPROOFING	10	5/17/19
071600	DAMPROOFING	4	5/17/19
072610	UNDER SLAB VAPOR BARRIER	2	5/17/19
072100	THERMAL INSULATION	6	5/17/19
072410	EXTERIOR FINISH SYSTEMS	12	5/17/19
072432	PROPERTY-LINE WALL, SURFACE TREATMENTS	10	5/17/19
072616	UNDERSLAB VAPOR BARRIER	3	5/17/19
072702	FLUID APPLIED MEMBRANE	11	5/17/19
074213	ALUMINUM METAL PLATE PANELS	8	5/17/19
074288	ALUMINUM WINDOW FIN	8	5/17/19
075423	THERMOPLASTIC POLYOLEFIN (TPO) ROOFING	11	5/17/19
076200	SHEET METAL FLASHING AND TRIM	7	5/17/19
077200	ROOF ACCESSORIES	9	5/17/19
078100	APPLIED FIREPROOFING	8	5/17/19
078413	PENETRATION FIRESTOPPING	8	5/17/19
079200	JOINT SEALANTS	9	5/17/19

## 3-Part Spec

- Each Section is subdivided into three distinct Parts:

General

Products

Execution

- May contain requirements that are:
  - **Prescriptive** (types of materials used, how installation is executed)
    - “All ducts seams are to be sealed with mastic.”
  - **Performance** (operational requirements)
    - “All ducts to be pressure tested to 0.1 in W.C. with a max leakage rate of \_\_\_\_”
  - **Proprietary** (material manufacturer/make requirements)
    - “Rooftop ERV to be Swegon brand.”

- *3 Part Spec is really important! Other formats may be missing significant information.*

# 3-Part Spec Sample

## SECTION 072702

### FLUID-APPLIED MEMBRANE, AIR AND VAPOR BARRIERS

#### PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- 1.2 SUMMARY
- A. Work Included: The Work of this Section includes, but is not limited to the following:
- Fluid-applied membrane air and vapor barriers.
- B. Related Work Specified Elsewhere:
- Section 072415 - Exterior Insulation and Finish System (EIFS) for air barrier behind EIFS.
  - Section 014100 - Model Dwelling Unit and Exterior Wall Mockup Test Procedure.
- C. Refer to Division 1 Summary and Section 018113 for 2015 Enterprise Green Communities Criteria with NYC HPD Overlay Certification (August 2016) The Contractor shall comply with requirements in the GREEN COMMUNITIES CHECKLIST for all materials and work for which they are responsible.
- 1.3 DEFINITIONS
- A. ABAA: Air Barrier Association of America.
- B. Air and Vapor Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air and vapor movement through the wall.
- 1.4 PERFORMANCE REQUIREMENTS
- A. General: Air and vapor barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air and vapor barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- Whole building envelope air leakage shall not exceed 0.08 CFM @ 50 pascals of pressure. See Section 018113.1 Sustainable Design Requirements: Passive House.
- B. Testing: Final air leakage testing will be conducted by the Owner's specified testing agent per PHUS standards using approved blower door equipment at a test

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- B. Warranty Period: Manufacturer's standard Ten (10) year material warranty.

#### PART 2 - PRODUCTS

- 2.1 FLUID-APPLIED MEMBRANE, AIR AND VAPOR BARRIER
- A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier: synthetic polymer membrane.
- Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - Synthetic Polymer Membrane: Henry Company's "Air-Bloc 21" is trowel grade, "Air-Bloc 21S" is spray grade, and "Air-Bloc 21FR" is fire resistive, for use in fire-rated wall assemblies.
      - Henry Company, Air-Bloc 21 or 21S.
  - Physical and Performance Properties:
    - Membrane Air Permeance: Not to exceed 0.004 cfm x sq. ft. of surface area at 1.57-lb/sq. ft. pressure difference; ASTM E 2178.
    - Membrane Vapor Permeance: Not to exceed 0.1 perm; ASTM I: 96.
- 2.2 FLUID-APPLIED FLASHING MEMBRANE
- A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier: synthetic polymer membrane.
- Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - Henry Company, Air-Bloc J.F.
    - Or approved equal.
- 2.3 SELF-ADHERING TRANSITION MEMBRANE
- A. Self-adhering Transition Membrane: SBS modified bitumen, self-adhering sheet membrane with a cross-laminated polyethylene film.
- Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - Henry Company, Bluskin SA, Basis of Design.
    - Or Approved Equal.
  - Physical and Performance Properties:
    - Thickness: 40 mils min.
    - Air Leakage: Not to exceed 0.0001 CFM/sq. ft.
    - Vapor Permeance: Not to exceed 0.03 perms per ASTM E96.
    - Low temperature flexibility: Pass @ -30°C to CGSB 37-GP-56M;
    - Elongation: 200% min. to ASTM D412;
    - Tensile Strength (Membrane): 500 psi minimum.
    - Tensile Strength (Film): 5000 psi minimum.

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- G. Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- H. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0625-inch-thick, and Series 300 stainless-steel fasteners.

#### PART 3 - EXECUTION

- 3.1 EXAMINATION
- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
- Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
  - Verify that concrete and masonry has cured and aged for minimum time period recommended by air and vapor barrier manufacturer.
  - Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
  - Verify that masonry joints are flush and completely filled with mortar.
  - Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 SURFACE PREPARATION
- A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air and vapor barrier application.
- B. Mask off adjoining surfaces not covered by air and vapor barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids with substrate patching membrane.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply manufacturer approved sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air and vapor barrier.
- H. Fluid applied membrane to be applied a minimum of 14 days after curing of substrate, or per manufacturer's recommendation, whichever is longer.

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# Architectural Sections

VOLUME 1		50% Janus
000002	Project Directory	X
003000	Geotechnical Data - GEODESIGN	X
003000b	Geotechnical Courtyard Ramp Memo - GEODESIGN	X
008000	Supplemental general conditions	X
<b>DIVISION 1 - GENERAL REQUIREMENTS</b>		
012020	Progress Meetings	X
012600	Modification Procedures	X
012900	Application For Payment	X
013100	Coordination	X
013200	Construction Progress Documentation	X
013300	Submittals	X
014000	Quality Requirements	X
014100	Testing and Inspection	X
014200	References	X
015000	Construction Facilities and Temporary Controls	X
015700	Traffic Regulation	X
016000	Product Requirements	X
017300	Execution Requirements	X
017329	Cutting and Patching	X
017419	Construction Waste Management - SWA	X
017700	Closeout Procedures	X
017823	Operating and Maintenance Data	X
018113	Sustainable Design Requirements: Passive House - SWA	X
018115	Air Sealing Guide for Multifamily Construction - SWA	X
018116	Sustainable Building Requirements: Enterprise Green Communities - SWA	X
018116a	Sustainable Design Requirements: Enterprise Green Communities Checklist - SWA	X
018117	VOC Limits - SWA	X
019113	General Commissioning requirements - SWA	X
<b>DIVISION 3 - CONCRETE</b>		
033000	Cast In Place Concrete - DCE	X
034000	Precast Concrete Hollow Core Plank - DCE	X
035300	Concrete Topping	X
033713	Shotcrete - AECOM	X
<b>DIVISION 4 - MASONRY</b>		
042000	Unit Masonry	X
042250	Autoclaved Aerated Concrete Units	X

DIVISION 5 - METALS				
051000	Structural Steel - DCE			X
054000	Cold Formed Metal Framing			X
055000	Miscellaneous Metals			X
055213	Pipe and Tube Railings - AECOM			X
057000	Ornamental Metals			X
<b>DIVISION 6 - WOOD, PLASTICS AND COMPOSITES</b>				
061533	Decking - AECOM			X
062000	Carpentry			X
064023	Architectural Woodwork			X
<b>DIVISION 7 - THERMAL AND MOISTURE PROTECTION</b>				
071300	Below Grade Sheet Waterproofing - GEODESIGN			X
071328	Self-adhering Underlayment Sheets for Above Grade Parapets - VIDARIS			X
071417	Cold Fluid Applied Membrane Canopy Roofing Assembly and Gutter Waterproofing (RT-4) - VIDARIS			X
071420	Elastomeric Coating			X
071616	Crystalline Waterproofing			X
072100	Thermal Insulation			X
072160	Structural Thermal Breaks			X
072419	Exterior Insulation and Finish System			X
072710	Interior Air Barrier			X
072711	Vapor Permeable Air Barrier Liquid Membrane			X
074120	Composite Wall Panels			X
075200	Hot Fluid Applied Membrane Protected Roofing (RT-2 & 3) - Vidaris			X
075551	Cold Fluid Applied Membrane Conventional Roofing (RT-1) - VIDARIS			X
075710	Waterproof Deck Membrane			X
076200	Flashing and Sheet Metal Work			X
077100	Roof Specialties and Accessories			X
078100	Sprayed Fire-Resistive Materials			X
078413	Firestops and Smoke seals			X
079200	Joint Sealers			X
079500	Expansion Control			X
<b>DIVISION 8 OPENINGS</b>				
081113	Steel Doors and Frames			X
081416	Flush Wood Doors			X
083113	Access Doors			X
084314	Custom Entrances and Storefronts			X
085113	Aluminum Windows - VIDARIS			X
085313	uPVC Windows - VIDARIS			X
087100	Finish Hardware			X
088000	Interior Glass and Glazing			X
089119	Fixed Louvers			X
<b>DIVISION 9 - FINISHES</b>				
092116	Gypsum Board Assemblies			X
092453	Acrylic Stucco System for AAC			X
093013	Tiling			X
095113	Acoustical Panel Ceilings			X

Name
Archive
042000 - Unit Masonry_SWA Comments.pdf
051200 - Structural Steel_SWA Comments.pdf
087100 Door Hardware Spec Mapes Rev#1 03 04 2019_SWA Comments.docx
220500 Plumbing Work_SWA Comments.pdf
266000 Electrical_SWA Comments.pdf
329300-DRAFT_50_PLANTS AND SOIL_hmg_SWA Comments.pdf
TOC_101918_SWA Comments.pdf
x014100 - model dwelling unit and exterior wall mockup test procedure_SWA Comments.pdf
x014201 air barrier system requirements_swa 2015-06-16_SWA Comments.pdf
x017700 - closeout procedures_SWA.pdf
x017820- operation and maintenance_SWA Comments.pdf
x017900 - demonstration and training_SWA Comments.pdf
x018114 voc limits_SWA Comments.pdf
x035300 gypsum based floor toppings_SWA Comments.pdf
x039000 - cocsealer_SWA Comments.pdf
x042000.1 - unit masonrymu_SWA.pdf
x061000 - rough carpentrym_SWA Comments.pdf
x062023 - interior finish carpentry_SWA Comments.pdf
x064023 - architectural woodwork_SWA Comments.pdf
x071600 - bituminous damproofing_SWA Comments.pdf
x072100 - thermal insulationddm_SWA Comments.pdf
x072413- eifs-drainable system_SWA Comments.pdf
x072616 - underlab vapor barrier - rjw_SWA Comments.pdf
x072702 - fluid applied membrane air and vapor barriers_SWA Comments.pdf
x075401-thermoplastic roofing_SWA Comments.pdf
x075500- hot fluid applied membrane roofing - NOT APPLICABLE_SWA.pdf
x076200 - sheet metal flashing and trimm_SWA Comment.pdf
x077200 - roof accessories2_SWA Comments.pdf
x078100 - applied fireproofing2_SWA Comments.pdf
x078413 - penetration firestopping2_SWA Comments.pdf
x081113 - hollow metal doors and framesm_SWA Comments.pdf
x081416 - wood doors2_SWA Comments.pdf
x085440 - vinyl windows - rjw_SWA Comments.pdf
x092116.23 - gypsum board shaft-wall assemblies2_SWA Comments.pdf
x092900 - gypsum board2_SWA Comments.pdf
x093000 - tilingm_SWA Comments.pdf
x095113 acoustical panel ceilings_SWA Comments.pdf
x096400 - wood flooring_SWA Comments.pdf

# Architectural Watch Out Items

- Acceptable **insulation products** are included and align with what's indicated on the drawings. Typically should avoid indicating thicknesses in spec.
- Language regarding **mock-ups** is included
- Ensure blower door **air tightness target** is included
- Window air tightness limits are included
- Weather stripping and door sweeps in the door hardware section
- AAC block strength class types (2, 4, 6) and structural overlap
- Armatherm product series
- Thermal bridges that may exist in seemingly unrelated sections
  - Permanent roof furniture, roof ship ladders

SECTION 051200  
STRUCTURAL STEEL

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section shall conform to the requirements of the Contract Documents, General and Supplementary Conditions and Division 1 Specification Sections apply to this Section. Provide materials, labor, equipment and services necessary to furnish, deliver and install all work of this Section as shown on the drawings, as specified herein, and/or as required by the job conditions.

1.2 SCOPE OF WORK

- A. Structural Steel required for this Work is indicated on the Drawings and specified herein and includes, but is not necessarily limited to:
1. All steel framing members, and lintels;
  2. All miscellaneous steel connectors;
  3. Prime painting of the steel which is not scheduled to be spray fireproofed;
  4. Galvanizing of the steel where indicated on the Drawings;
  4. Supply, fabrication, and erection of all the steel described above and shown on the drawings;
  5. Furnishing of anchor bolts, high strength anchor rods, cast-in anchorages, and grouting the steel base plates.
- B. "Structural Steel" is that work defined above and in the AISC Code of Standard Practice, and all steel shown on the Structural Drawings.
- C. Related Work Specified Elsewhere:
1. Section 03 30 00 – Cast In Place Concrete
  2. Section 03 41 00 – Structural Precast Concrete
  3. Section 04 23 00 – Reinforced Unit Masonry
  4. Section 05 31 00 – Steel Deck
  5. Section 07 81 00 – Fireproofing
  6. Section 07 84 13 – Firestopping

6. Thermal break pads where applicable

## Structural Sections

- Ensure thermal breaks are included where applicable
- Thermal breaks are also typ. indicated in Division 7 - Thermal Insulation
- General blanket statement in the summary section about anything through the insulation layer

# Mechanical Key Items

## DIVISION 23 - HVAC (COSENTINI, U.N.O.)

230000	HVAC Index	
230130.51	HVAC Air-Distribution System Cleaning	
230500	Common Work Results for HVAC	Cx
230511	Special Mechanical Systems	Cx
230512	Variable-Frequency Motor Controllers	Cx
230513	Common Motor Requirements for HVAC Equipment	Cx
230514	Enclosed Controllers	
230516	Expansion Fittings and Loops for HVAC Piping	
230517	Sleeves and Sleeve Seals for HVAC Piping	
230518	Escutcheons for HVAC Piping	
230519	Meters and Gages for HVAC Piping	Cx
230523	General Duty Valves for HVAC Piping	Cx
230529	Hangers, Supports, and Acc. for HVAC Piping & Equip.	
230547	Vibration Controls for Mechanical/Electrical Systems (Non-Seismic)	
230553	Identification for HVAC Piping, Ductwork, and Equipment	
230593	Testing, Adjusting, and Balancing for HVAC	Cx
230710	Fire Resistant Duct Enclosures	
230711	Fire Rated Sheet Metal Work	
230713	Duct Insulation	
230716	HVAC Equipment Insulation	
230719	HVAC Piping Insulation	Cx
230720	Acoustical Duct Lining and Duct Wrap	
230800	Commissioning of HVAC - SWA	Cx
230900	Instrumentation and Control for HVAC	Cx
230993	Sequence of Operations for HVAC Controls	Cx
232113	Hydronic Piping	Cx
232116	Hydronic Piping Specialties	Cx
232123	Hydronic Pumps	Cx
232300	Refrigerant Piping	Cx
233113	Metal Ducts	
233300	Air Duct Accessories	Cx
233413	Axial HVAC Fans	Cx

233416	Centrifugal HVAC Fans	Cx		X
233423	HVAC Power Ventilators		Cx	X
233433	Air Curtains	Cx		X
233600	Air Terminal Units	Cx		X
233713	Diffusers, Registers, and Grilles	Cx		X
234100	Particulate Air Filtration			X
235100	Breeching, Chimneys, Stacks, & Emergency Generator Exhaust			X
235700	Heat Exchangers for HVAC	Cx		X
237200	Air-to-Air Energy Recovery Equipment		Cx	X
237210	Packaged Energy Recovery Unit (100% Outside Air)		Cx	X
238120	Factory Fabricated Packaged Air Cooled AC Unit	Cx		X
238129	Variable Refrigerant Volume HVAC Systems	Cx		X
238216	Air Coils	Cx		X
238239.13	Cabinet Heaters	Cx		X
238239.16	Propeller Unit Heaters	Cx		X
238239.19	Wall and Ceiling Heaters (Electric)	Cx		X

# Mechanical Watch Out Items

- Aeroseal language, to be more descriptive
  - What is Aeroseal?
  - When to do it
  - Allowable leakage percentage
  - Marked up risers as part of the submittals
- Equipment, manufacturers, and efficiencies
- Testing, Adjusting, & Balancing (TAB)
  - Independent third party
  - NEBB, TABB
  - PHIUS vs. PHI requirements
  - Acceptable air flow tolerances

# Electrical Items

Not too much on electrical

Interior and exterior lighting fixtures

Lighting controls (sensors and locations)

# Plumbing Items

Pipe insulation sizes indicated are correct, or it defers to the drawings

Thermal conductivity (K factor) of pipe insulation aligns with modeling assumptions

Water flow rates (might only be on the drawings, not in specs)

# High Performance Sections – Ensure Are Included

- 018113 – Sustainable Design Requirements
- 014339 – Mock-up Requirements
- 072710 – Building Air Barrier System
- 072711 – Air Barrier Liquid Membrane
- 070523 – Pressure Testing An Air Barrier System For Air Tightness
- 072100 – Thermal Insulation
- 085113 – Windows
- 230593 – Testing, Adjusting, Balancing for HVAC
- 233113 – Metal Ducts (Aeroseal)
- 019113 – General Commissioning Requirements
  - 220800 – Commissioning of Plumbing
  - 230800 – Commissioning of HVAC
  - 260800 – Commissioning of Lighting

01 81 13.10 Sustainable Design Requirements: Passive House

PART 1 - GENERAL

1.1 SUMMARY

- A. Passive House requirements apply to the office floors, excluding the office lobby and office club spaces, and the common mechanical floor. The office lobby, office club spaces, and tower cores are not included as Passive House certified space.

**B.** Performance Criteria

1. Heating annual energy demand shall not exceed 4.75 kBtu/ft<sup>2</sup>-yr.
2. Cooling annual energy demand shall not exceed 4.75 kBtu/ft<sup>2</sup>-yr.
3. Annual source primary energy demand for this project shall be determined by PHI.
4. The air leakage of the exterior building envelope surrounding the office spaces shall not exceed 0.033 cfm per ft<sup>2</sup> of exterior façade @ 50 Pascals of pressure. The air leakage of the entire office floor shall not exceed 0.6 air changes per hour @ 50 Pascals of pressure.

**C.** Required Building Efficiency Values

1. HRV/ERV shall have a sensible efficiency no less than 75% when tested according to accepted practices as dictated by PHI.
2. Mechanical ventilation system exhaust and supply air flow must be within 10% of each other when the system is operating under standard conditions.
3. Opaque building component R-values calculated using PHPP procedure on the basis of EN 6946 with conductivity values according to national standards or building authority regulations. Values shall be as follows except as where noted in the drawings:
  - a. Roof R-value shall be ≥ R-30.
  - b. Opaque portions of walls shall be ≥ R-15 on average across all facades
  - c. Cantilever floors shall be ≥ R-30
4. Window (vision curtain wall) U-values calculated using PHPP procedure with computed values for the frame U-value (U<sub>f</sub>) and glass edge thermal bridge (Ψ<sub>g</sub>) in accordance with EN ISO 10077, the glazing U-value (U<sub>g</sub>) in accordance with EN ISO 673, and g-factor in accordance with EN ISO 410.
  - a. Effective window U-value shall be ≤ 0.220 Btu/hr-ft<sup>2</sup>-F on average across all facades.
  - b. Average vision glazing g-factor shall be = 0.29

1.2 SUBMITTALS

A. Certification Documentation:

1. Complete PHPP excel file.
2. Documentation of the thermal bridge coefficients used in the PHPP according to ISO 10211.
3. Verification of the airtight building envelope in accordance with EN ISO 13829.
4. Measured flow rates of each register the total of which must be less than 10% imbalance between the total extract and total supply rates. Commissioning and balancing the ventilation system by third party contractor.
5. Photo documentation of elements related to PH certification including neighboring shading objects, foundation insulation, wall assembly, roof insulation, and mechanical equipment.

B. Test Results:

1. Final air leakage testing will be conducted by the owners specified testing agent per DIN EN 13829 using approved blower door equipment at a test pressure of 50 Pascals (1.044 psf).

# 018113 - Sustainable Design Requirements

## **RP #1: Include a Measureable Energy Goal in the RFP and Contract**

Energy requirements should be included in prominent parts of the RFP (and later in the contract) and reinforced throughout the document. In the RFP, the owner states the mission of the building and defines the focus of the design team for the project. The RFP should outline a specific, aggressive, and measureable target. This goal should be presented in context with other project requirements.

### **Energy Goal Options**

The following options for energy goals are presented in order of most to least effective for reducing total annual energy use.

- Whole-building EUI target: A building's energy use per unit area, most commonly given in kBtu/ft<sup>2</sup>/yr.
- Net zero energy building: A building with greatly reduced energy needs through efficiency gains such that the balance of energy needs can be supplied with renewable technologies.
- Percent savings relative to a baseline: Typically, energy cost savings compared to a well-documented baseline representing the code minimum form of the building design.
- Sustainability rating system requirement: An example is Leadership in Energy and Environmental Design (LEED), which encourages wise use of land, materials, water, and energy, while promoting occupant comfort.

# **EUI** goals of projects

[https://www1.eere.energy.gov/buildings/publications/pdfs/rsf/performance\\_based\\_how\\_to\\_guide.pdf](https://www1.eere.energy.gov/buildings/publications/pdfs/rsf/performance_based_how_to_guide.pdf)

## How-To Guide for Energy-Performance-Based Procurement

An Integrated Approach for Whole Building High  
Performance Specifications in  
Commercial Buildings



**EUI** goals of  
projects

[https://www1.eere.energy.gov/buildings/publications/pdfs/rsf/performance\\_based\\_how\\_to\\_guide.pdf](https://www1.eere.energy.gov/buildings/publications/pdfs/rsf/performance_based_how_to_guide.pdf)

SECTION 01 43 39

MOCK-UP REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. This section includes general information for use of mock-ups. Refer to technical sections for more product-specific mock-up requirements.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division of Specifications sections apply to this section.
- B. Related sections include, but are not limited to the following:
  - 1. Section 04 05 13: Masonry Mortar
  - 2. Section 04 20 00: Unit Masonry
  - 3. Section 04 72 00: Architectural Cast Stone
  - 4. Section 07 21 00: Continuous Insulation Wall Panels
  - 5. Section 07 24 10: Exterior Insulation and Finish System
  - 6. Section 07 42 00: Exterior Stone Cladding
  - 7. Section 07 42 13: Metal Composite Material Panels

- C. After award of all subcontracts for separate components and materials of the "exterior wall systems" and on basis of preliminary approval of materials and variations to proposed design, construct full-scale mock-ups for review.

- D. Level of interior finishes shall be reviewed as well and agreed upon at the mock-up.

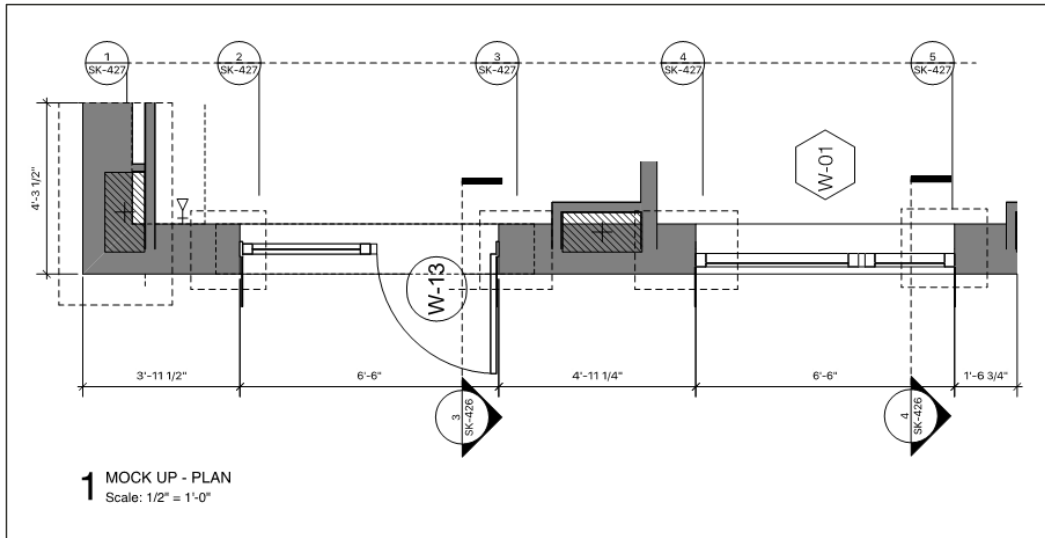
1.03 SUBMITTALS

- A. Quality Control Submittals
  - 1. Mock-up Plan: Copy of proposed locations for each mock-up.
  - 2. Locate mock-ups so they do not interfere with the progress of construction.

1.04 DEFINITIONS

- A. Mock-ups (General): Full-size physical assemblies that are constructed on-site. Mock-ups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances.
  - 1. Mock-ups are not Samples.
  - 2. Unless otherwise indicated, approved mock-ups establish the standard by which the Work will be judged.

# 014339 - Mock-up Requirements



# 014339 - Mock-up Requirements

## 211 W 29th Street - Mockup Vendor Contact List

COMPONENT	CONTACT	NOTES
Cladding: Taktl Panels	Katherine Lynn Design + Applications Consultant, Northeast katherine.lynn@taktl-llc.com T 646-789-5626   M 609-462-0173 175 Varick Street   New York, NY 10014 taktl-llc.com	Taktl Standard in Platinum - 2 textures, 2 finishes (4 types total)
Rainscreen Attachment: NVELOPE	Dave Sommer (206) 226-2311 cell international@nvelope.us dave@interra-facade.com	NV-1 System
Back Up Wall: Hebel AAC	Ricardo Gomez Director of Operations Telefon +1-2104023223 Mobil +1-2108658620 ricardo.gomez@xella.com Xella Aircrete North America, Inc Sales 900 Schneider Dr. US78108 Cibolo, Texas www.hebel-usa.com	6" Cored AAC and U Block
Sunshade: DAMS Inc	Shawn Bowman, CSI   National Director of Sales and Marketing DAMS Incorporated - D. Architectural Metal Solutions Incorporated 5919 W. 118th St.   Alsip, IL 60803 office: 708-224-4311   fax: 708-388-9392   mobile: 708-793-9107 shawn.bowman@damsinc.com   damsinc.com	Custom Extrusion and Flat Plate Aluminum
Windows & Doors: Fentrend	Sean Kennedy, CPHC Supplier/Client Manager sean@fentrend.com // 646.665.1478	One of Three options: Schuco AWS 90S1 Zola Alu 90 Aluprof MB104
Door Sill: Alumat	Frank Hegan fhegan@ct-sol.com	Alumat MFAT
Insulation: Roxul (or Thermafiber)	SHAWN TORBERT, LEED AP, CPHD, CSI NY METRO SPECIFICATIONS MANAGER   ROXUL INC. Cell: (732) 887-4079 www.roxul.com	Cavity Rock DD and Comfort Batt
Waterproofing: Option 1 Henry	Han-Hui Ling   Territory Sales Manager CDT   HENRY COMPANY   P 214 886 3662   www.henry.com	Airbloc 32, Blueskin and Airbloc 21
Waterproofing: Option 2 Prosoco	Guy Mazza 917-865-8751 guy.mazza@prosoco.com Regional Sales Manager Prosoco	Cat-5 System with Fast Flash and Joint Filler
Structural Thermal Break Materials: Armadillo Inc	Rob Haley Armadillo NV 419 Sawyer Street New Bedford, MA 02746 www.armadillonvinc.com 800-580-3984 rob@armadillonv.com	Armatherm FRR or Armatherm 500-150

# 014339 - Mock-up Requirements



# Airtightness

- Achieving whole **building air tightness** is an overall goal that impacts **many trades**
  - Foundation waterproofing contractor
  - Above grade air barrier / waterproofing contractor
  - Roofing contractor
  - Window contractor
  - Storefront / entry doors
  - Carpenter
  - Spray foam installer (if applicable)
  - MEP trades, since it's assumed they will need to penetrate the exterior air barrier at some point to run various services

\*\*\*\*\*  
 USACE / NAVFAC / AFCEC / NASA UFGS-07 27 10.00 10 (August 2019)  
 -----  
 Preparing Activity: USACE UFGS-07 27 10.00 10 (May 2014)  
 UNIFIED FACILITIES GUIDE SPECIFICATIONS  
 References are in agreement with UMRL dated October 2019  
 \*\*\*\*\*

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 SECTION 07 27 10.00 10  
 BUILDING AIR BARRIER SYSTEM  
 08/19

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  - 1.3.3 Air Barrier Component
  - 1.3.4 Air Barrier Envelope
  - 1.3.5 Air Barrier Material
  - 1.3.6 Air Barrier System
  - 1.3.7 Air Leakage Rate
  - 1.3.8 Air Leakage
  - 1.3.9 Air Permeance
  - 1.3.10 Environmental Separator
  - 1.3.11 Vapor Permeance
- 1.4 PREPARATORY PHASE OR PRECONSTRUCTION CONFERENCE
- 1.5 SUBMITTALS
- 1.6 AIR BARRIER ENVELOPE SURFACE AREA AND LEAKAGE REQUIREMENTS
- 1.7 AIR BARRIER INSPECTOR
- 1.8 DESIGN REVIEW

PART 2 PRODUCTS

- 2.1 AIR BARRIER

PART 3 EXECUTION

- 3.1 QUALITY CONTROL

# 0727100 - Building Air Barrier System

## SECTION 072710 BUILDING AIR BARRIER SYSTEM

### 1.1 SUMMARY

This Section specifies the construction and quality control of the installation of an air barrier system. Construct the air barrier system indicated, taking responsibility for the means, methods, and workmanship of the installation of the air barrier system. The air barrier must be contiguous and connected across all surfaces of the enclosed air barrier envelope indicated. The maximum leakage requirements of individual air barrier components and materials are specified in the other specification sections covering these items.

This section also defines the maximum allowable leakage of the final air barrier system. The workmanship must be adequate to meet the maximum allowable leakage requirements of this specification. Test the assembled air barrier system to demonstrate that the building envelope is properly sealed and insulated. Passing the air barrier system leakage test will result in system acceptance.

The whole building air barrier systems must meet the 0.6 ACH leakage rate per Passive House requirements. The allowable leakage rate is at a differential test pressure of 50 Pa.



## 0727100 - Building Air Barrier System



SECTION 072711

VAPOR PERMEABLE AIR BARRIER LIQUID MEMBRANE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. The Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the vapor permeable air barrier liquid membrane as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
1. Vapor permeable air barrier (flat black) applied over CMU and sheathing.
  2. Materials and installation to bridge and seal the following air leakage pathways and gaps:
    - a. Connections of the walls to the roof.
    - b. Connections of the walls to the foundations.
    - c. Seismic and expansion joints.
    - d. Openings and penetrations of window frames, storefront, curtain wall.
    - e. Door frames.
    - f. Piping, conduit, duct and similar penetrations.
    - g. Masonry ties, screws, bolts and similar penetrations.
    - h. All other air leakage pathways in the building envelope.

1.3 RELATED SECTIONS

- A. Construction Waste Management – Section 017419.
- B. Sustainable Design Requirements: Passive House – Section 018113.
- C. Air Sealing Guide for Multifamily Construction – Section 018115a.
- D. Sustainable Design Requirements, Enterprise Green Communities – Section 018116 and 018116a.
- E. VOC Limits – Section 018117.
- F. Commissioning General Requirements – Section 019113.
- G. Unit masonry - Section 042000.
- H. Cold formed metal framing – Section 054000.
- I. Structures Steel – Division 5.

# 072711 - Air Barrier Liquid Membrane

PART 2 PRODUCTS

2.1 MATERIALS

- A. Primary air and rain barrier membrane for temperatures above 20 degrees F and rising shall be Air-Bloc 17MR manufactured by Henry; a UV resistant one component water based elastomeric emulsion membrane, fire resistant and designed for permanent exposure, trowel or spray applied, having the following characteristics:
1. Air permeability: 0.0016 CFM/ft<sup>2</sup> @ 1.57lbs/ft<sup>2</sup> to ASTM E2178 and ASTM E283 and have no increased air leakage when subjected to a sustained wind load of 10.5 lbs/ft<sup>2</sup> for 1 hour and gust wind load pressure of 62.8 lbs/ft<sup>2</sup> for 10 seconds when tested at 1.6 lbs/ft<sup>2</sup> to ASTM E331,
  2. Water vapor permeance: 11.6 perms to ASTM E96 Method B when tested at 58 mils dry film thickness,
  3. Rating 0 - No fungal growth as tested to ASTM D 5590,
  4. Surface Burning: NFPA Class A, UBC Class 1, Flame Spread 25, Smoke Developed 85 to ASTM E84,
  5. UV Resistance: Passes 73 Cycles to ASTM D4799 Cycle B (Q-UV),

Vapor Permeable Air Barrier Liquid Membrane  
072711-4

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DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 07 05 23

PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS

08/19

PART 1 GENERAL

- 1.1 SUMMARY
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    - 1.6.2.1 Pressure Test Agency
    - 1.6.2.2 Thermographer Qualifications
  - 1.6.3 Test Instruments and Date of Last Calibration
  - 1.6.4 Test Reports
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  - 1.7.1 Rain
  - 1.7.2 Wind

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  - 2.1.1 Blower Door Fans and Trailer Mounted Fans
  - 2.1.2 Digital Gages as Test Instruments
- 2.2 THERMAL IMAGING CAMERA REQUIREMENTS

PART 3 EXECUTION

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  - 3.1.1 Field Work

SECTION 07 05 23 Page 1

# 070523 - Pressure Testing An Air Barrier System For Air Tightness



SECTION 072100

THERMAL INSULATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the thermal insulation as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Insulation under slabs-on-grade.
2. Foundation wall insulation.
3. Cavity wall insulation within masonry cavity.
4. Board Insulation.
5. Blanket insulation.
6. Closed cell spray insulation.
7. Attachment devices.

1.3 RELATED SECTIONS

- A. Construction Waste Management – Section 017419.
- B. Sustainable Design Requirements: Passive House – Section 018113.
- C. Air Sealing Guide for Multifamily Construction – Section 018115a.
- D. Sustainable Design Requirements, Enterprise Green Communities – Section 018116 and 018116a.
- E. VOC Limits – Section 018117.
- F. Commissioning General Requirements – Section 019113.
- G. Masonry - Section 042000.
- H. Roof insulation - Section 075200.
- I. Firestops and smoke seals - Section 078413.
- J. Acoustical insulation - Section 092900.
- K. Earthwork - Section 312000.

Thermal Insulation  
072100-1

# 072100 - Thermal Insulation

2.2 CAVITY WALL INSULATION WITHIN MASONRY CAVITY

A. Insulation within masonry cavity shall be a mineral wool fibre board insulation equal to "Cavity Rock" made by Roxul Inc. or approved equal conforming to the following:

1.	ASTM C 612	Mineral Fiber Block and Board Thermal Insulation	Type 4B, Complies
2.	MEA Approval	New York City Approval	236-05-M
3.	ASTM E 136	Behavior of Materials at 750 Deg. C (1382 deg. F.)	Non-Combustible
4.	ASTM E 84 (UL 723)	Surface Burning Characteristics	Flame Spread = 0 Smoke Developed = 0
5.	ASTM C 356	Linear Shrinkage	<2% @ 1200 deg. F.
6.	ASTM #96	Water Vapor Transmission, Desiccant Method	1895 ng Pa. s. m <sup>2</sup>
7.	ASTM C 1104	Moisture Sorption	0.03%
8.	ASTM C 518 (C 177)	R-value/inch @ 75 deg. F.	4.2 hr.ft.2F/Btu
9.	Density	ASTM C 303	4.5 lbs./cu. ft.



SECTION 072100

THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Work Included: The Work of this Section includes, but is not limited to the following:
  - 1. Foam- plastic board insulation.
  - 2. Glass- fiber blanket insulation.
  - 3. Spray foam insulation.
  - 4. Polyisocyanurate board insulation.
  - 5. Fiberglass/composite thermal break.
  - 6. Plastic thermal break.
  - 7. Structural insulated sheathing panel.
  - 8. Under slab on grade insulation.

# 072100 - Thermal Insulation

- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. AGM Industries, Inc.; TACTOO Adhesive.
- b. Gemco; Tuff Bond Hanger Adhesive.

2.9 FIBERGLASS COMPOSITE THERMAL BREAK

- A. Provide the following: Fiberglass reinforced laminate composite thermal break of dimension indicated on the Drawings, or as selected by the Architect. Thermal break shall have a per inch R-value of 0.56 BTU/Hr./sq.ft./in/deg F = 1.8.

- 1. Manufacturer: Fabreka International, Inc. or approved equal.

2.10 PLASTIC THERMAL BREAK

- A. Provide the following: Plastic thermal break of size indicated on the Drawings with a minimum of R-1.8 per inch., or as selected by the Architect.

- 1. Manufacturer: Fabreka - TTM or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that is not subject to rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fill voids with insulation. Remove projections that interfere.
- D. Provide sizes to fit applications indicated and selected thicknesses, widths, and lengths. Apply single layer of insulation unless multiple layers are otherwise shown or required.

3.3 INSTALLATION OF INSULATION CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, comply with manufacturer's instructions. If no specific method is indicated, bond units to substrates by mechanical anchorage to provide permanent placement and support.



17 May 2019  
072100 5

# 085113 - Windows

## SECTION 085113

### ALUMINUM WINDOWS

#### PART 1 - GENERAL

##### 1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.
- B. Work shall comply with governing agencies having jurisdiction.

##### 1.2 SUMMARY

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the engineering, detailing, fabrication and installation of the aluminum and glass windows as shown on the drawings and/or specified herein.
- B. This section includes but is not limited to the following:
  - 1. Unitized four-sided captured shop-glazed windows consisting of head and sill receptors, mullions, fixed insulated glass units, operable vents, glazing accessories, trim and other items commonly regarded as components of "windows".
  - 2. Continuous head receptor and subsill assemblies shall be part of the base bid.
  - 3. Operable portions shall have a minimum of an AW rating, with class to be determined based upon design wind loads, and shall comply with all local requirements for light and natural ventilation.
  - 4. Operable vents will be inswing casement.
  - 5. Terrace doors meeting specified accessibility and performance requirements.
  - 6. Windows shall be capable of accepting screens.
  - 7. Window system (glass and frame) shall meet New York City CEQR Technical Manual acoustical requirements.
  - 8. Approved Child Fall Prevention devices on all operable windows.
  - 9. Sightlines should meet the design intent shown on drawings.
  - 10. Glass and glazing in conjunction with the work of this Section.
  - 11. All necessary steel or aluminum members where required to support, strengthen and/or reinforce aluminum members that are not specifically called out as structural steel on the structural or architectural drawings.

E. Performance and Testing: Except as otherwise indicated, windows shall comply with air infiltration tests, water resistance tests and applicable load tests specified in ANSI/AAMA 101/I.S. 2 for each type of classification of window units and their specifications as required in each case. The most restrictive criteria shall apply.

F. Air Leakage: Air infiltration/exfiltration shall conform to the following requirements when tested in accordance with ASTM E 283. At a differential static test pressure of 6.24 PSF:

- 1. Fixed windows: Maximum 0.06 CFM/SF of window area.
- 2. Operable Vents and doors: Maximum 0.10 CFM/SF of vent/door area.

- A. Thermal performance and condensation resistance, including thermal models and U-factor calculations shall be performed in accordance with European ISO standards for project specific panel sizes. Thermal analysis shall be done in THERM or equivalent software. Calculations shall include project specific glass, frame profiles, receptors, and glazing spacers. Thermal models shall identify overall system performance as well as vision glass assembly U-factors independently and in addition to spandrel glass assembly U-factors.
  - 1. Thermal performance of the following window components shall also be provided:
    - a. Center of glass U-factor in accordance with EN ISO 673.
    - b. Center of glass g-value in accordance with EN ISO 410.
    - c. Frame U-factor (Uf) in accordance with EN ISO 10077-2.
    - d. Glass edge thermal bridge ( $\Psi_g$ ) in accordance with EN ISO 10077-2.
- B. Submit Quality Assurance/Quality Control Program for the manufacture and installation of the wall system and insulated glass units, prior to start of Work.
- C. Test Reports:
  - 1. Submit product test reports from a qualified independent testing agency evidencing compliance of glazed aluminum window system with requirements based on comprehensive testing of manufacturer's current system. For each type of aluminum window, submit the following:
    - a. Air leakage and water infiltration testing.
    - b. Structural performance testing.
    - c. AAMA 910 Lifecycle testing.
  - 2. Reports for field testing of sealant.
  - 3. Field test reports from a qualified independent inspecting and testing agency indicating compliance with performance requirements.
  - 4. Test reports showing compliance with the acoustic performance requirements.



## 085113 - Windows

<https://www.swinter.com/party-walls/how-to-talk-windows-with-a-passive-house-nerd/>

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DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

11/15

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- 1.3 WORK DESCRIPTION
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# 230593 - Testing, Adjusting, Balancing for HVAC

## 1.8 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB, or TABB. The entity shall be an independent testing, adjusting and balancing entity, single source of responsibility to test adjust and balance building systems to produce design objectives. Services shall include checking installation for conformity to design, measurement and establishment of capacities of the mechanical systems as required to meet design specifications and recording and reporting the results. The entity shall have at least one Professional Engineer registered in the State in which the services are to be performed and certified by NEBB or AABC as a Testing and Balancing Engineer.
1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB or TABB.
  2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB or TABB as a TAB technician.

- B. TAB Conference: Meet with Architect Owner Construction Manager Commissioning Authority on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide 10 working days' advance notice of scheduled meeting time and location.

1. Agenda Items:
  - a. The Contract Documents examination report.
  - b. The TAB plan.
  - c. Coordination and cooperation of trades and subcontractors.
  - d. Coordination of documentation and communication flow.

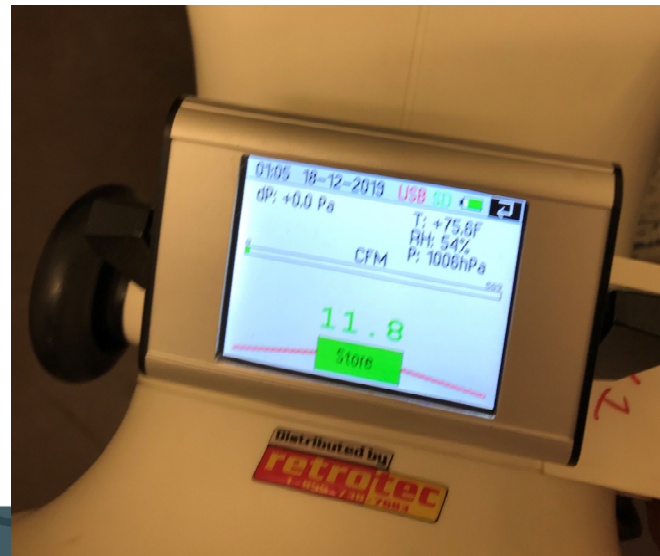
# 230593 - Testing, Adjusting, Balancing for HVAC

## 3.24 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 5 percent.
  2. Air Outlets and Inlets: Plus or minus 5 percent Where Multiple air outlets serve a single space, tolerance for total shall be plus 5 minus 10 percent.
  3. Heating-Water Flow Rate: Plus or minus 5 percent.
  4. Cooling-Water Flow Rate: Plus or minus 5 percent.

Manufacturer:	Zehnder					
Model:	COMFOAIR 200					
Location:	Apt 6C Closet					
Drawing	Area Served	Supply/ Return	Grille		CFM	
			Type	Size	Design	Actual
27	Apt 6C	ERV Supply	SWR	6x4	15	15
28	Apt 6C	ERV Supply	SWR	6x4	15	15
30	Apt 6C	ERV Supply	SWR	6x4	15	15
32	Apt 6C	KX	SWG	6x6	25	25
33	Apt 6C	TX	CG	6x6	20	20

## 230593 - Testing, Adjusting, Balancing for HVAC



### **Aeroseal Duct Sealing Specification Fractional Leakage**

1. Duct Preparation
  - a. Inspect air distribution systems for major leakage sites and significant accumulation of debris or debris
  - b. Remove all debris and significant dust and dirt (>1/8 inch deep) in air distribution system using a NADCA approved duct cleaning method
  - c. Ensure adequate structural support for new and existing ductwork, including structural integrity of all mechanical duct joints and transitions per SMACNA standards.
  - d. Temporarily remove or protect from aerosol particles building controls, fire and smoke sensors as recommended by manufacturer.
  - e. Temporarily disable fire alarms and notify appropriate authorities.
  - f. Temporarily isolate air-moving equipment and block off air inlets and outlets, and other devices and appurtenances as recommended by the manufacturer.
  - g. Protect occupied spaces from aerosol particles using manufacturer procedures.
  - h. All work shall be done in a substantial and workmanlike manner by factory trained technicians.
2. Duct Sealing
  - a. Repair all major leakage sites greater than 1/2 inch across using mastic and fiberglass mesh tape per SMACNA standards
    - i. Mastic and fiberglass mesh tape shall meet UL 181 standards.
  - b. Seal existing ductwork from the inside using automated aerosolized sealant injection.
    - i. Manufacturer: Aeroseal, LLC
    - ii. Application must be performed by a manufacturer approved service provider
    - iii. Sealant shall comply with UL Outline Scope 1381
    - iv. Sealant must cure with 2 hours with no VOC off-gassing thereafter
    - v. Sealant shall remain elastic after curing
    - vi. Sealant shall be deposited substantially at areas of leakage only
  - c. Provide pre-sealing, post-sealing and sealing profile reports for all duct sections sealed.
  - d. Repair all injection and test holes in existing ductwork using patching plates sealed tight per SMACNA standards.
  - e. Any injection ports in duct board shall be made and repaired using pumpkin-cuts
  - f. Any insulation (internal or external) shall be replaced on the patching plate.
3. Duct Testing
  - a. Provide pre-sealing and post-sealing leakage profile reports indicating percentage reduction of leakage for supply, return and exhaust ductwork and shafts.
  - b. Use manufacturer calibrated blower fan box with digital manometer to measure leakage before and after sealing.

# 233113 - Metal Ducts (Aeroseal)

- c. Following completion of air handling unit installations, duct repairs, and duct sealing, test all ductwork to insure that the air distribution system is properly sealed.
  - i. The supply ducts shall have air losses of less than 3% of the total air flow volume measured at the fan or air-moving device.
  - ii. The return ducts shall have air losses of less than 3% of the total air flow volume measured at the fan or air-moving device.
  - iii. The exhaust ducts shall have air losses of less than 5% of the total air flow volume measured at the fan or air-moving device.
  - iv. Ducts shall be leak tested at a static pressure that is as close as possible to the system average operating static pressure. Duct test pressure should not exceed the lesser of the duct static pressure construction class, the duct system design static pressure or 2.5 in. w.g.
4. Duct Reassembly and Cleanup
  - a. Reinstall building controls and smoke detectors.
  - b. Enable fire alarms and notify appropriate authorities.
  - c. Remove blocking, reinstall grills and registers, and enable air handling fans.
  - d. Cleanup sealant residue that may have adhered to surfaces in occupied areas as recommended by the Manufacturer.
  - e. All work shall be done in a substantial and workmanlike manner by factory-trained technicians.
5. Warranty
  - a. The Contractor shall warrant that the aerosol sealant application will be free from defects for a period of 3 years from date of the sealing application. If defects should occur during this period, the Contractor shall repair or replace the defective duct seals, including the direct labor costs for performing the repair or replacement, at no additional cost to the Owner.

## SECTION 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section includes commissioning process requirements for systems, assemblies, and equipment. Steven Winter Associates has been retained by Ownership as a 3<sup>rd</sup> party commissioning agent (CxA) to oversee the following contractor requirements.
- B. Applicable Codes and Standards:
  - 1. 2016 New York City Energy Code
  - 2. ASRHAE 90.2 2013 with NYC Amendments
- C. The following are to be commissioned:
  - 1. Systems required under 2016 NYC ECC Commissioning:
    - a. Heating, cooling, air handling and distribution, ventilation, and exhaust systems, and their related air quality monitoring systems.
    - b. Air, water, and other energy recovery systems.
    - c. Manual or automatic controls, whether local or remote, on energy using systems including but not limited to temperature controls, setback sequences, and occupancy-based control, including energy management functions of the building management system.
    - d. Plumbing, including insulation of piping and associated valves, domestic and process water pumping, and mixing systems.
    - e. Mechanical heating systems and service water heating systems.
    - f. Renewable energy and energy storage systems.
    - g. Other systems, equipment and components that are used for heating, cooling or ventilation and that affect energy use.
    - h. Lighting Controls

#### 1.2 OVERVIEW OF CONTRACTORS' RESPONSIBILITIES

- A. Attend construction and coordination meetings.
- B. Provide information requested by the CxA for commissioning documentation including, but not limited to the documentation outlined in sections 1.5, 1.6, 3.2, and 3.6.
- C. Provide measuring instruments and logging devices to record test data and provide data acquisition equipment to record data for the complete range of testing for the required test period. Provide necessary measuring locations and test holes, along with approved plugs, as directed by the CxA.
- D. For variable refrigerant flow systems:
  - 1. Provide pressure and vacuum testing procedures to CxA prior to conducting these tests.
  - 2. Provide startup report template prior to startup to allow for CxA comments.
- E. Perform functional commissioning tests at the direction of the CxA. General & subcontractors shall be present along with equipment manufacturer if equipment has local controls or is

GENERAL COMMISSIONING REQUIREMENTS

01 91 13 - 1

# 019113 - General Commissioning Requirements

SECTION 220800

COMMISSIONING OF PLUMBING

PART 1 GENERAL

1.1 SUMMARY

- A. See Section 019113 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 019113.
- B. Each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.
- C. Startup reports shall be filed for record and submitted to the Commissioning Authority for review prior to and during functional performance testing.
- D. The domestic water heating and domestic and process water pumping are to be commissioned including commissioning activities for the following specific items:
  - 1. Controls and all equipment items.
  - 3. Piping systems including pumps, valves and other components.
  - 4. Variable frequency drives.
  - 5. Documented balancing of hot water recirculation systems (pressure ports required over pumps for flow verification).
  - 6. Mixing valves.
  - 7. Sump pumps and sewage ejectors
  - 8. Booster pumps and tank fill systems
  - 9. Rep to be present for all Cx testing

END OF SECTION

# 220800 - Commissioning Plumbing

SECTION 230800

COMMISSIONING OF HVAC

PART 1 GENERAL

1.1 SUMMARY

- A. See Section 019113 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 019113.
- B. Each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.
- C. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:
  - 1. Control system.
  - 2. Major and minor equipment items.
  - 3. Piping systems and equipment.
  - 4. Ductwork and accessories.
  - 5. Terminal units.
  - 6. Variable frequency drives.
- D. VRF Systems Commissioning
  - 1. Detailed documentation of 600 psig 24-hr refrigerant pressure tests and 500 micron evacuation are required prior to weighing in charge.
  - 2. Detailed as-built refrigerant piping drawings and line length calculations for additional charge required must be submitted for CxA review.
  - 3. Manufacturer's representative must provide startup report for all VRF systems
  - 4. Manufacturer's representative must be present for CxA led functional testing of the VRF systems. Representative shall be knowledgeable and experienced with the system including the service tool used for detailed commissioning and troubleshooting.
  - 5. Trend reports and output reports from the VRF system to be provided to CxA upon request on up to 2 separate occasions.
  - 6. See 019113 for additional detail, VRF rep to be a part of the project's commissioning team and participate in Cx meetings as needed.

1.2 REFERENCE STANDARDS

- A. ASHRAE Guideline 1.1 - The HVAC Commissioning Process; 2007

END OF SECTION

# 230800 - Commissioning of HVAC

SECTION 260800

COMMISSIONING OF LIGHTING

PART 1 GENERAL

1.1 SUMMARY

- A. See Section 019113 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 019113. The Energy Code referenced in this section is the code outlined in 019113.
- B. Each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.
- C. The following systems will be commissioned:
  - 1. All automatic lighting control systems (including, but not limited to timers, occupancy sensors, photocells)
  - 2. Bi-level switching, daylight switching controls and other manual controls as required by Energy Code.
  - 3. Photovoltaic system (including thorough startup and checkout documentation from the installing contractor.)
- D. Subcontractor or installer is responsible for providing detailed sequence of operations and controls layout for all lighting controls and combination of lighting controls to be commissioned, prior to functional testing. The following information must be provided:
  - 1. Layouts indicating location of all lighting controls and calibration systems
  - 2. Time-out delay setpoints for occupant sensor controls
  - 3. Schedule for time-switch controls
  - 4. Detailed sequences for combination lighting controls
- D. As referenced in 019113, prior to passing final inspection, the installing contractor or manufacturer representative shall test the lighting system to ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer's instructions. Final Testing must be witnessed by the Commissioning Provider
  - 1. Where occupant sensor controls are provided, the following procedures shall be performed:
    - a. Certify that the occupant sensor has been located and aimed in accordance with manufacturer recommendations.
    - b. For projects with seven or fewer occupant sensors, each sensor shall be tested.
    - c. For projects with more than seven occupant sensors, testing shall be done for each unique combination of sensor type and space geometry. Where multiples of each unique combination of sensor type and space geometry are provided, not less than 10 percent, but in no case less than one, of each combination shall be tested unless the code official or design professional requires a higher percentage to be tested. Where 30 percent or more of the tested controls fail, all remaining identical combinations shall be tested.
    - d. Where occupant sensor controls include status indicators, verify correct operation.
    - e. The controlled lights turn off or down to the permitted level within the required time.
    - f. For auto-on occupant sensor controls, the lights turn on to the permitted level when an occupant enters the space.
    - g. For manual-on occupant sensor controls, the lights turn on only when manually activated.

# 260800 - Commissioning of Lighting

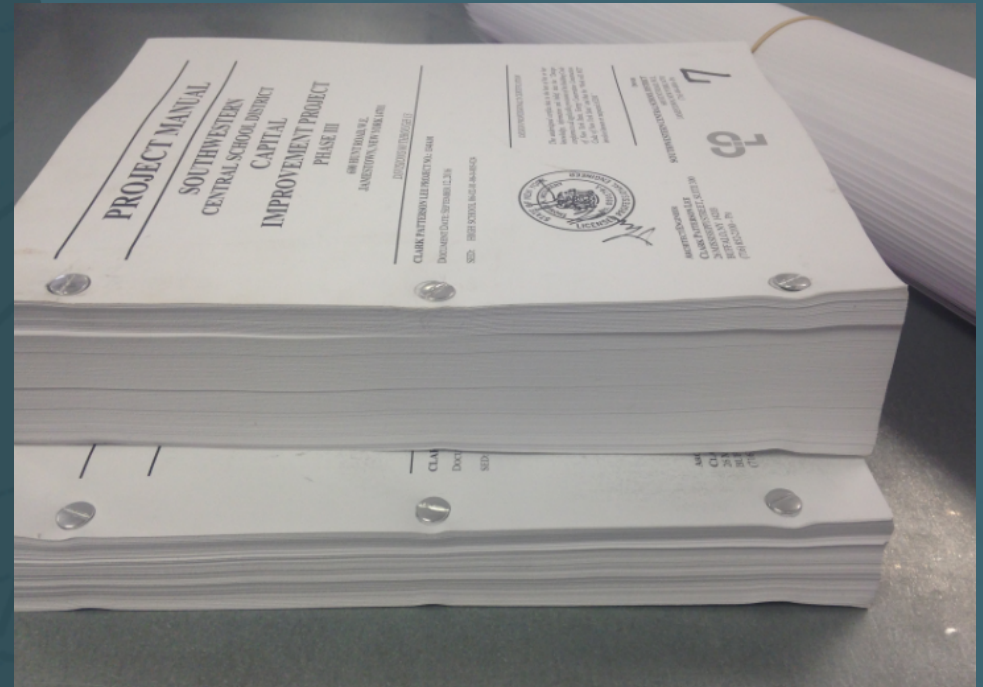
- h. The lights are not incorrectly turned on by movement in adjacent areas or by HVAC operation.
- 2. Where time-switch controls are provided, the following procedures shall be performed:
  - a. Confirm that the time-switch control is programmed with accurate weekday, weekend and holiday schedules.
  - b. Provide documentation to the owner of time-switch controls programming including weekday, weekend, holiday schedules, and set-up and preference program settings.
  - c. Verify the correct time and date in the time switch.
  - d. Verify that any battery back-up is installed and energized.
  - e. Verify that the override time limit is set to not more than 2 hours.
  - f. In a simulated occupied condition, all lights can be turned on and off by their respective area control switch.
  - g. In a simulated occupied condition, the switch only operates lighting in the enclosed space in which the switch is located.
  - h. In a simulated unoccupied condition, nonexempt lighting turns off.
  - i. In a simulated occupied condition, manual override switch allows only the lights in the enclosed space where the over-ride switch is located to turn on or remain on until the next scheduled shutoff occurs.
  - j. Additional testing as specified by the registered design professional.
- 3. Where daylight responsive controls are provided, the following shall be verified:
  - a. Control devices have been properly located, field calibrated and set for accurate setpoints and threshold light levels.
  - b. Daylight controlled lighting loads adjust to light level set points in response to available daylight.
  - c. The locations of calibration adjustment equipment are readily accessible only to authorized personnel.
- E.
- F. As referenced in 019113, provide the following O&M information as required by the Energy Code.
  - 1. Operation and maintenance manuals for each piece of lighting equipment. Required routine maintenance actions, cleaning and recommended re-lamping shall be clearly identified.
  - 2. Submittal data indicating all selected options for each piece of lighting equipment and lighting controls.
  - 3. A schedule for inspecting and recalibrating all lighting controls.
  - 4. A narrative of how each system is intended to operate, including recommended set points.
- G. The commissioning authority shall provide documentation to the building owner within 90 days of receipt of the first certificate of occupancy certifying that the installed lighting controls meet documented performance criteria.

END OF SECTION

Questions?



# What's different in Passive House Buildings - Bid



# Drawings

- Key items just discussed are what to look for when preparing bids!



# Drawings - Architectural

- Increased insulation thicknesses
- Specified air barrier materials and tapes
- High performance windows, doors, storefronts, curtain walls
- Thermal break materials and locations
- Mock-ups and other required performance testing
- Whole building blower door test planning & assistance
- Mandatory training for subs



# Drawings - Mechanical

- Aeroseal for duct work sealing
- High performance HVAC equipment (e.g. ERVs)
- Constant airflow regulators (CAR)
- Mock-ups and other required performance testing
- Commissioning activities
- True TAB performance requirements
- Mandatory training for subs



# Drawings - Electrical

- Lighting controller sensors types and locations
  - Interior and exterior
- LED lighting fixtures
- Commissioning activities
- Mandatory training for subs



# Drawings - Plumbing

- Higher efficiency DHW equipment
- DHW equipment controls
- Pipe insulation requirements
- Commissioning activities
- Mandatory training for subs



# Specifications

Specifications can be thousands of pages

Keep focus on the key 'above and beyond' sections previously discussed

Does every single spec section get fully read by bidders?

## Costs for Bids

- Will need to contact manufacturers directly for 'uncommon' items
  - Swegon ERVs
  - Pro Clima or other specialty tapes
  - Armatherm thermal breaks
  - Schock Isokorb thermal isolators
  - High performance windows (e.g. Schuco, Rehau)
  - Façade attachment clips & systems
- Historical data will be difficult for new products

# Costs

Cost increase estimates range, really depend on the 'baseline' building

Stealth Passive House presentation by Kaplan Thompson  
*Boring, Invisible, Everywhere*

Don't get frightened, it's not that hard and has been done by someone somewhere already

Stuff projects should be doing already

Reach out, ask questions

# Product Lead Times

- Product lead times need to be taken into account, especially when putting together the project schedule
- Once awarded the project, submit long lead time items very early in the project
  - ERVs
  - VRF systems
  - Window and storefront systems

# Account for Trainings

- Training for GC and subs can come in different forms
- Ensure time is allocated for these
  - Full Passive House Tradesperson training
  - Half day seminar
  - 1 hour presentation at job site trailer for foreman and installers

What do you think is most needed to help estimators prepare bids for high performance projects?

Word cloud content:

- better drawings
- non-domestic procurement
- clear details
- scopework
- good clear specs
- easier means for take-off
- clear documents
- summary
- exemplar examples
- specs
- review meetings
- clear and complete specs
- details

Questions?



# 5 Minute Break

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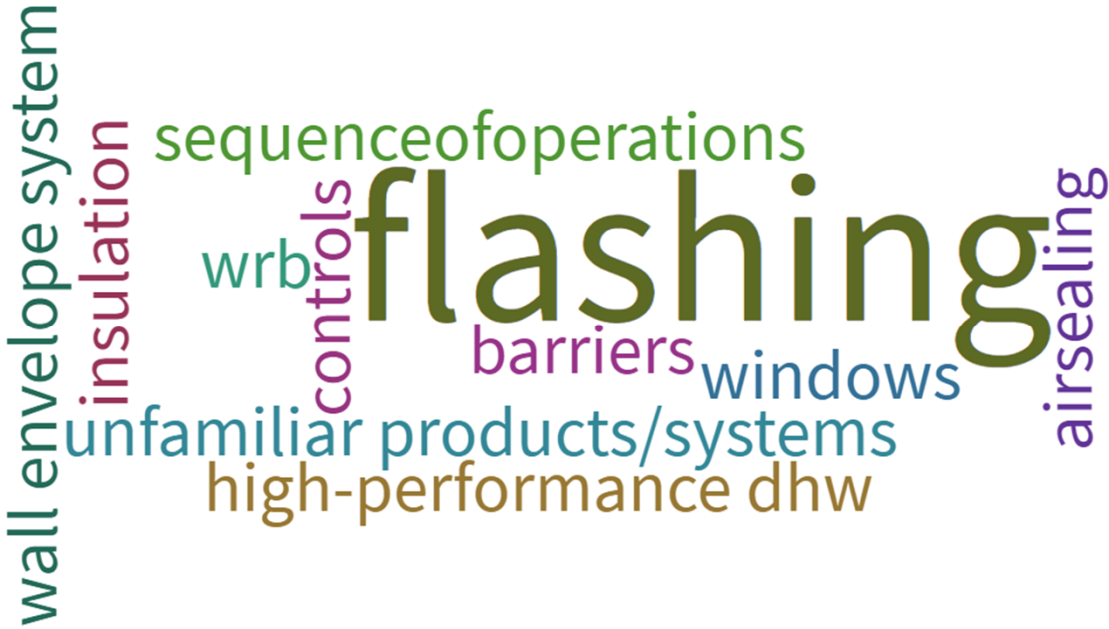
# What's different in Passive House Buildings – Construction Methods

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# Keep An Eye Out



Name something that you think is particularly difficult to be installed properly on a project.



# Building Envelope – Below Grade



# Building Envelope – Above Grade



# Building Envelope – Above Grade



# Building Envelope - Roof



# Building Envelope – Thermal Breaks



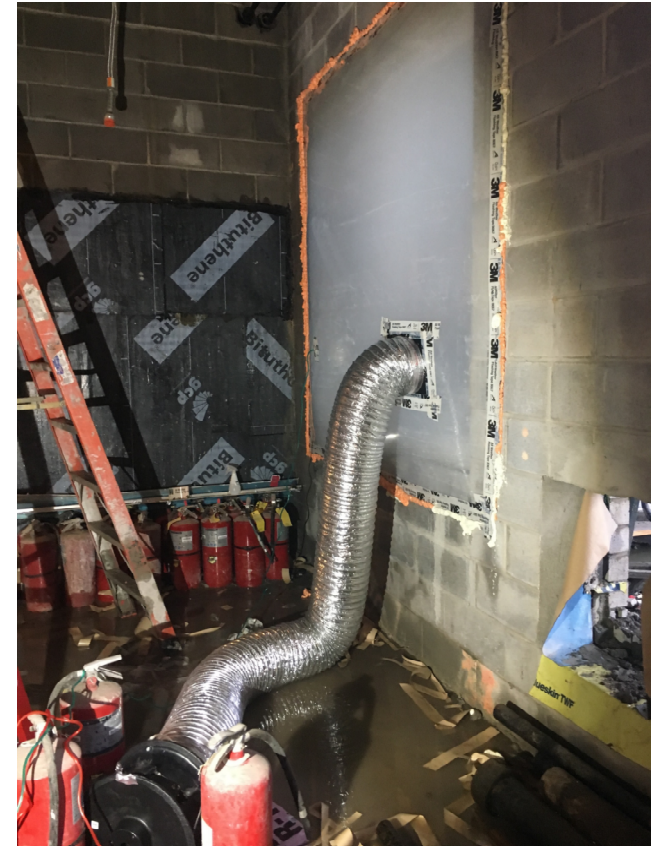


## Thermal Breaks – Balcony

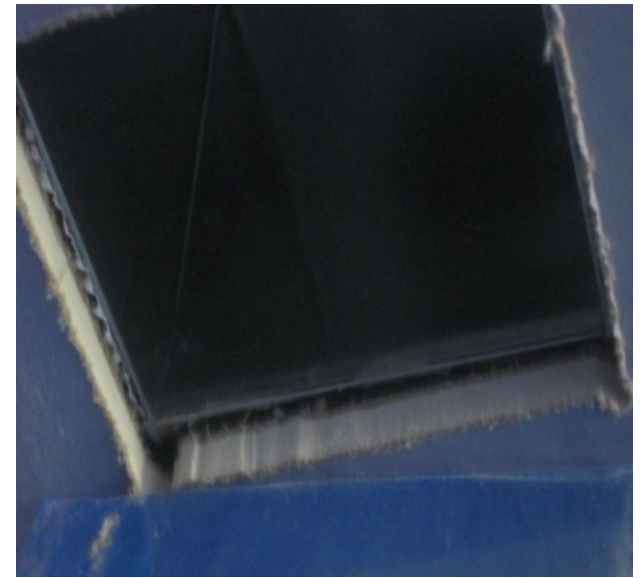
# Windows & Doors



# Testing & More Testing



# Duct Sealing



# Aeroseal

Before



After



AEROSEAL

Sealant Injector

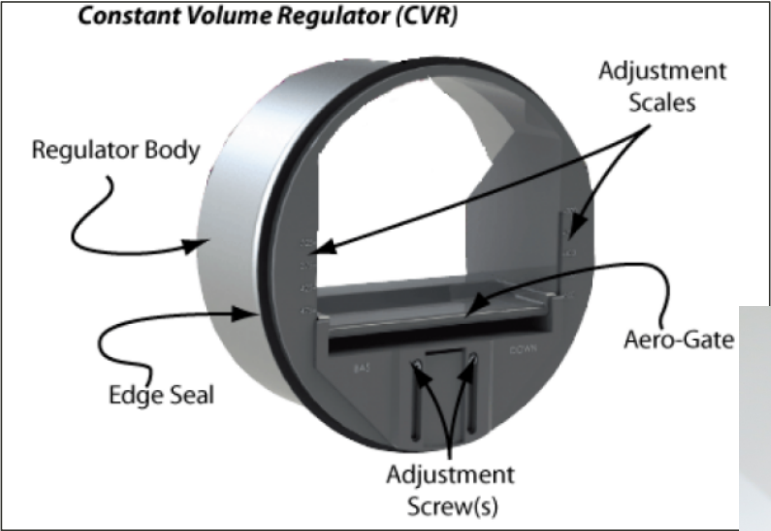
Laptop for Automated Control & Diagnostics

Fan uninged for Access to Shaft

# Ventilation Units



# Constant Airflow Regulators



# Duct Insulation

- Good



- Bad



Questions?



# Project Commissioning

---

# Commissioning

- Commissioning
  - (ASHRAE Guideline 1) the process of ensuring that systems **are designed, installed, functionally tested**, and capable of being **operated** and **maintained** to perform in conformity with the design intent. In this guideline, commissioning begins with planning and includes design, construction, start-up, acceptance and training, and can be applied throughout the life of the building.
- Retrofit Commissioning
  - Commissioning of systems or subsystems that have been part of a **retrofit**.
- Retro-commissioning
  - Commissioning of **existing** building systems.
- Recommissioning
  - The process of maintenance checks and functional performance testing throughout the life of the building to ensure performance is maintained **after initial commissioning** testing is completed.
- Ongoing/Continuous Commissioning
  - Monitoring equipment operation and/or energy consumption **continuously** in order to find and correct problems **immediately** as they arise

# Commissioning



- Benefits
  - Bridge the link between design and operation
  - Operational savings
  - Tenant comfort
  - Get what you paid for
- Some owners more interested than others

# Commissioning

Cx Requirements	LEED 2009 Fundamental	LEED V4 Fundamental	LEED Enhanced	NYSERDA NCP	2014/2016 NYCECC	NYS Green Building Tax Credit
Owner's Project Requirements (Current Facility Requirements)	X	X*	X			
Basis of Design	X	X*	X			X
Commissioning Plan	X	X	X	X	X	X
Design Review	Ensure Design Docs call for Cx	X*	X	Ensure Design Docs call for Cx	Ensure Design Docs call for Cx	Ensure Design Docs call for Cx
Submittal Review			X			
Prefunctional Checklists	X	X	X	X		Certificate of Readiness
Testing and Balancing Review					\	X
Site Inspections	X	X	X			X
Functional Tests	X	X	X	X	X	
Systems Manual Review			X		\	\
Staff training Oversight/Verification			X			X
Commissioning Report	X	X	X	X	Preliminary report at CO, Final Report within specified time	X
Recommissioning			Warranty Walkthrough			

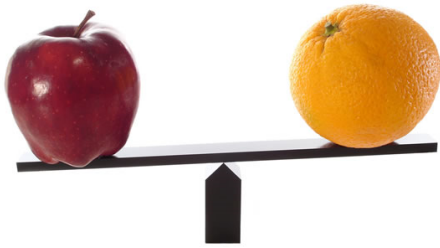
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# Commissioning - General

- Education early in the project is important
- Clear communication needs to be established
- Buy in of contractor and sub-contractors is vital
- In-house person from the contractor responsible for Cx activities is beneficial



# Inspectors/Commissioning Agents



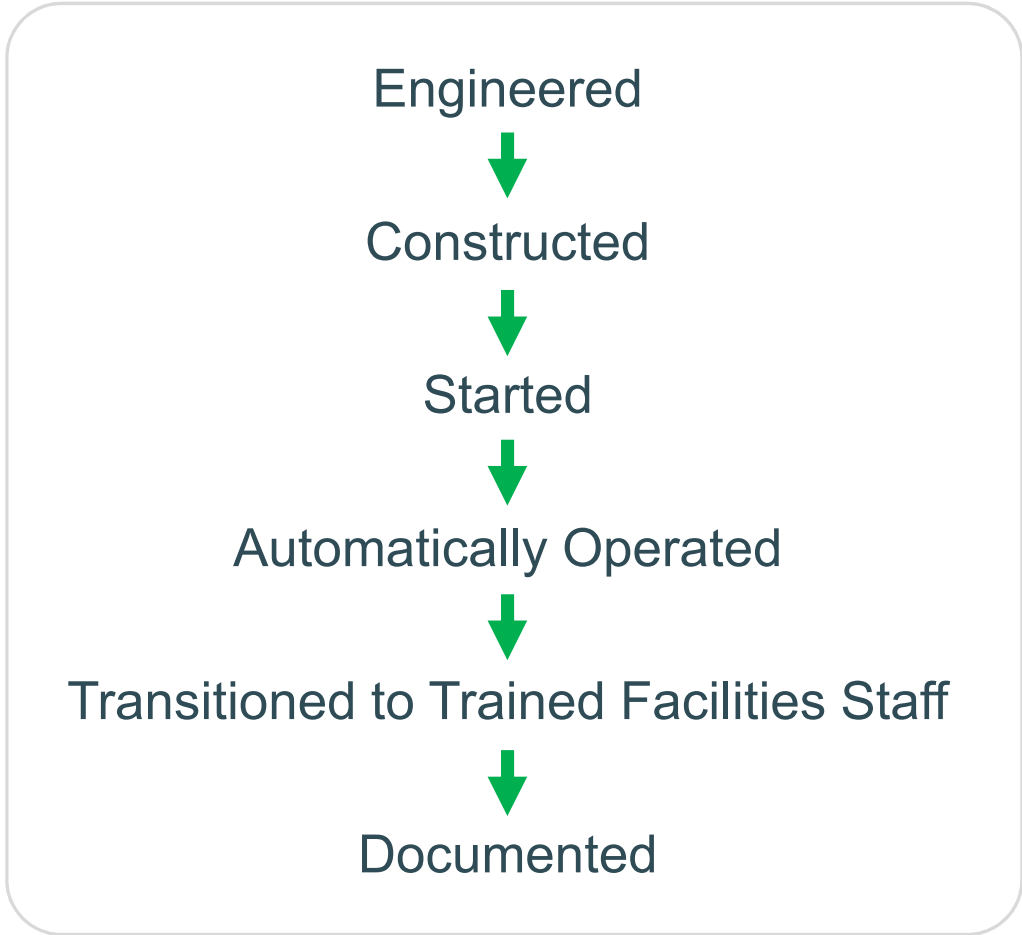
- Familiarity with specific building types and systems
- Serve as an independent and objective advocate for the building owner
- Plan and coordinate the commissioning activities
- Keep track of issues log items and follow up
- Like anything else, not all are created equal

## Cx Benefits

- Energy savings 10-20% range (Alliance to Save Energy)
- Higher occupant satisfaction
- Improved indoor air quality
- Get what you pay for (again)



- You're getting all this new stuff, it should work properly!



# General Process Overview

# Engineered

- Key items
  - Commissioning statement on the drawings
  - Equipment efficiencies
  - Domestic hot water set points
  - Equipment sizing
  - Daylight zones and sensors

## Engineered (Continued)

- Cx agent can help facilitate a more in depth review
  - Owner's Project Requirements (OPR) Meeting
  - Sequence of operation discussions
  - Cx specification sections
  - Suggest energy saving alternatives
  - Coordinated and consistent layouts

# Engineered → Constructed (Submittals)



- Cx agent involvement in submittal reviews
  - Does submittal match drawings or is it a substitution?
  - Is design intent being satisfied?



## Inspections & Testing Start

- Kickoff meeting with construction team at the job site
- List of items for inspection and timelines
- Open communication for scheduling and issues

# Constructed → Operated



- Cx agent involvement in Operation Staff Training
- Training is conducted by the installing contractor
- The CxA verifies and adds information related to optimizing performance or recommissioning



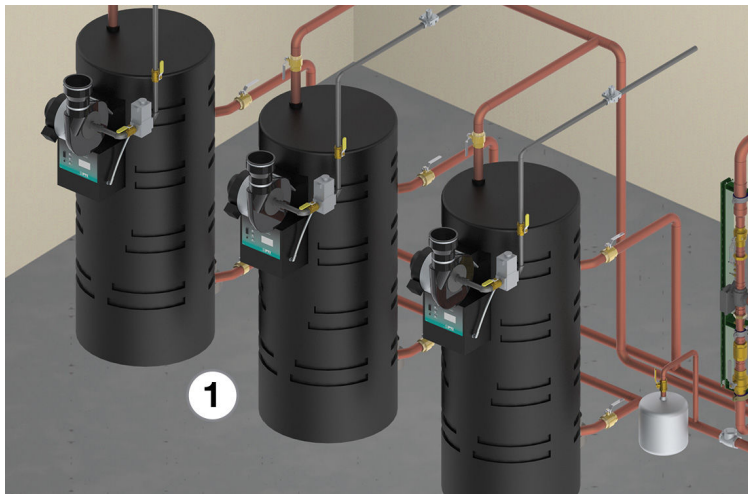
## HVAC

- Are boiler controls properly programmed and operating as intended?
- Are balancing valves installed?
- Do thermostats have proper programmable capabilities where applicable?
- Do ventilation systems provide the intended CFM flow rates?
- Has testing & balancing been performed for air and water systems?
- Does equipment location allow access for maintenance?



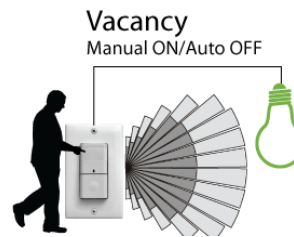
## Domestic Hot Water

- Are pipes and valves properly insulated?
- Is hot water being stored at an appropriate temperature?
- Is hot water being delivered at an appropriate temperature?
- Mixing valve working correctly?
- Are pumps operating as intended and the correct size?
- Are any flow controls properly set up?



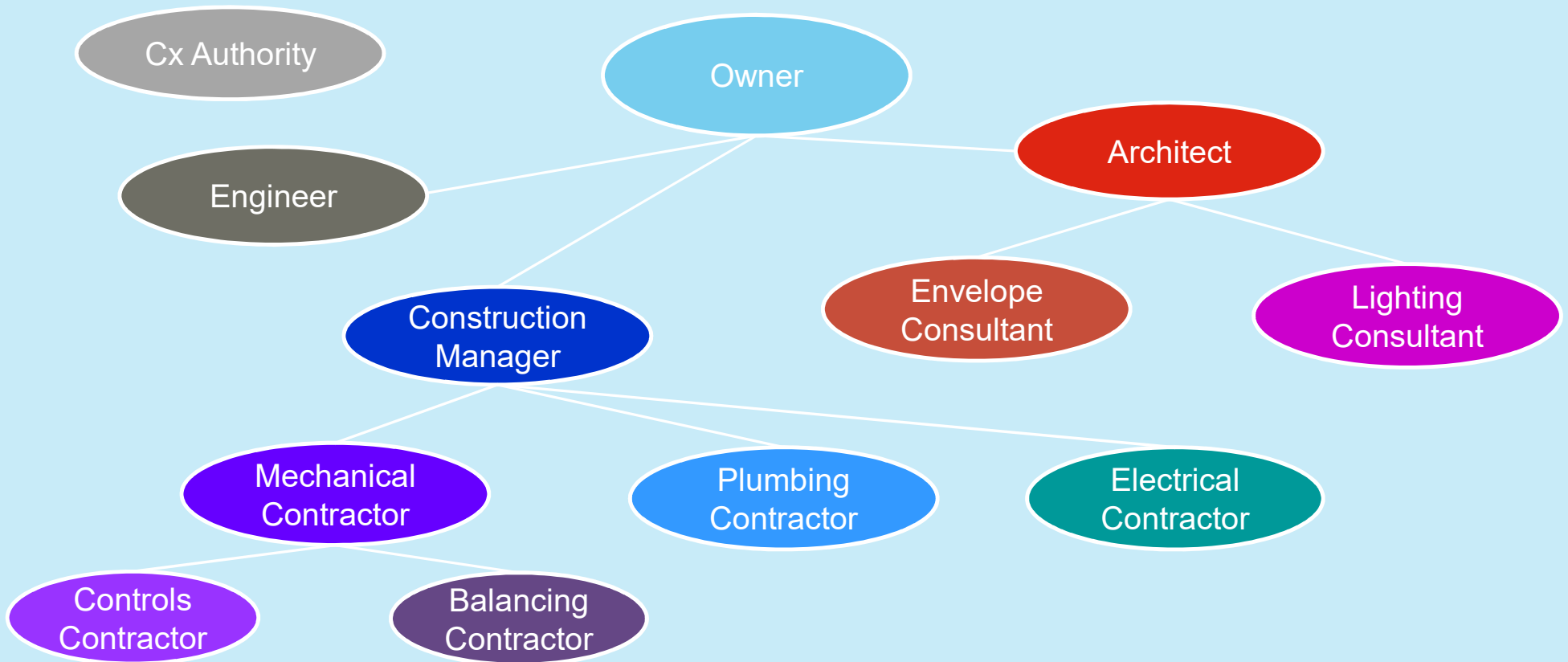


## Lighting



- Are occupant sensor controls located and aimed properly?
- Are occupancy vs. vacancy controls installed in the correct locations?
- Are time-switched lighting controls properly programmed?
- Are daylight responsive controls working?

# Common Issues – Communication



# Change Orders & Lessons Learned

---

## Lessons learned from past projects

- Glazing on site
- Aeroseal too early
- Final air flow rates & TAB
- Demand Controlled Ventilation (DCV) getting properly set up
- Product changes & substitutions
- Pipe insulation sizes
- VRF tags, wiring, and thermostats
- Non-adjustable Constant Airflow Regular (CAR) dampers
- Hot water piping to toilet

# Glazing On Site

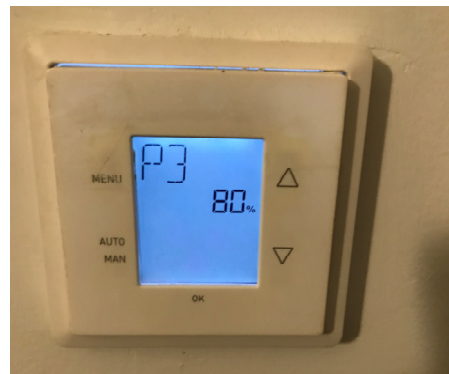


# Aeroseal Too Early



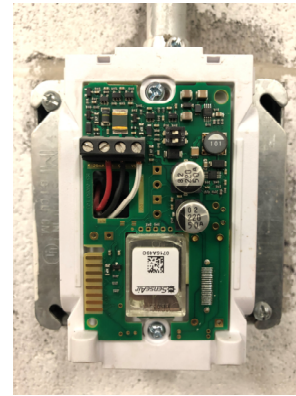
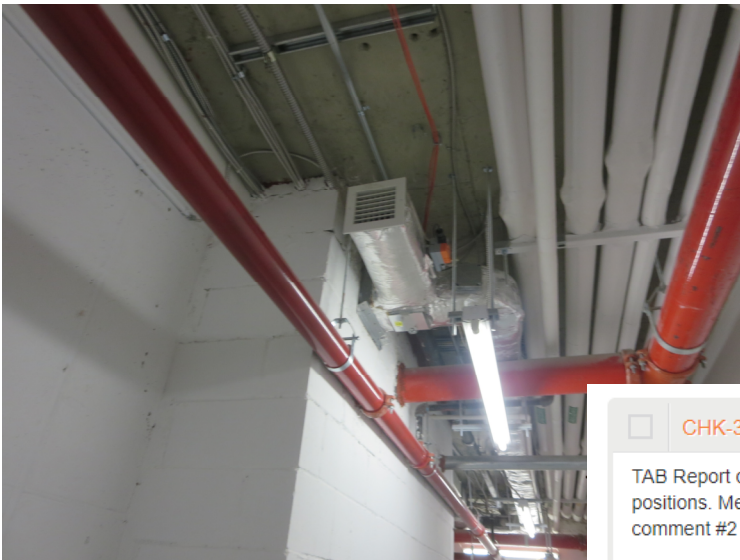
# Final Air Flow Rates & TAB

Manufacturer:		Zehnder				
Model:		COMFOAIR 200				
Location:		Apt 6C Closet				
Drawing	Area Served	Supply/ Return	Grille		CFM	
			Type	Size	Design	Actual
27	Apt 6C	ERV Supply	SWR	6x4	15	15
28	Apt 6C	ERV Supply	SWR	6x4	15	15
30	Apt 6C	ERV Supply	SWR	6x4	15	15
32	Apt 6C	KX	SWG	6x6	25	25
33	Apt 6C	TX	CG	6x6	20	20



# DCV Set Up

- Demand Controlled Ventilation (DCV) getting properly set up



**CHK-3-2** **PENDING VERIFICATION** Actions Watch

TAB Report dated 2019-09-27 does not include measurements with DCV dampers at their minimum/low positions. Measurements should be provided at both min and max positions. (See also EP Engineering comment #2 on their review)

Additionally, the actual programmed damper positions (i.e. % open) should be noted for each damper at min and max positions.

---

SOURCE [Checklist 3, TAB Reports Received, Line 2](#)

ERV-R-1

Comments 3 Files 0 View Details >

ASSIGNED TO <a href="#">Mechanical Contractor</a>	
ASSET <a href="#">ERV-R-1</a>	
DISCIPLINE <a href="#">Testing and Balancing</a>	
DRAWING <a href="#">TAB Report 2019-09-27</a>	
DUE DATE <a href="#">10/29/2019</a>	
CREATED BY <a href="#">Chris Lyle</a>	
IDENTIFIED ON <a href="#">10/15/2019 9:34 AM</a>	

# Product Changes and Substitutions

XPS AT BRICK CAVITY - R 3.6



## THERMAX™ Sheathing

### 1. PRODUCT NAME

THERMAX™ Sheathing

**2. MANUFACTURER**  
The Dow Chemical Company  
Dow Building Solutions  
200 Larkin  
Midland, MI 48674  
1-866-583-BLUE (2583)  
Fax 1-989-832-1465  
www.dowbuildingsolutions.com

### 3. PRODUCT DESCRIPTION

THERMAX™ Sheathing is a non-structural, rigid board insulation consisting of a glass-fiber-infused polyisocyanurate foam core laminated between 1.0 mil smooth, reflective aluminum facers on both sides. The glass-fiber reinforcement contributes to improved fire performance and dimensional stability. In the USA THERMAX™ Sheathing can be installed exposed to the interior without a thermal barrier. In Canadian construction THERMAX™ exposed to the interior must be covered with a thermal barrier.

### SUSTAINABILITY DATA

THERMAX™ Sheathing is manufactured from 100% renewable power and has a zero ozone depleting potential. The use of THERMAX™ Sheathing helps reduce the carbon footprint of commercial buildings and can contribute to LEED Credits.

### 4. TECHNICAL DATA

#### APPLICABLE STANDARDS

- THERMAX™ Sheathing meets ASTM C1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board, Type I, Class 2 and CAN/ULC S704-11. Applicable standards include:
  - C803 – Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation
  - C209 – Standard Test Methods for Cellular Fiber Insulating Board
  - ASTM D2842 Standard Test Method for Water Absorption of Rigid Cellular Plastics
  - C318 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
  - D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics

- D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
- E96 – Standard Test Method for Water Vapor Transmission of Materials
- D1623 – Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics

#### FIRE INFORMATION

THERMAX™ Sheathing products should be used only in strict accordance with product application instructions. THERMAX™ products are combustible and must be installed in accordance with local building codes. For more information, consult (M)KDS and/or call Dow at 1-866-583-BLUE (2583). In an emergency, call 1-989-636-4400.

TABLE 1: SIZES, R-VALUES AND EDGE TREATMENTS FOR THERMAX™ SHEATHING

Nominal Thickness		Thermal Properties		Board Size Availability		Edge Treatment Options
US (in)	Canada (mm)	R-value	R <sub>si</sub>	US (ft)	Canada (mm)	
0.50	•	3.3	0.56	4' x 8', 4' x 12'	1220 x 2440	Square Edge
0.75	•	5.0	0.88	4' x 8', 4' x 12'	1220 x 2440	Square Edge
1	•	6.5	1.14	4' x 8', 4' x 12'	1220 x 2440	Square Edge
1.6	•	9.8	1.73	4' x 8', 4' x 12'	1220 x 2440	Square Edge, DripCap
1.59	3/8	10.1	1.76	4' x 8', 4' x 12'	1224 x 2440	Square Edge, DripCap
2	5/16	13.0	2.33	4' x 8', 4' x 12'	1225 x 2440	Square Edge, DripCap
3.5	64	15.8	2.76	4' x 8', 4' x 12'	1206 x 2440	Square Edge, DripCap
3	7/8	18.8	3.26	4' x 8', 4' x 12'	1227 x 2440	Square Edge, DripCap
3.5	88	21.3	3.76	4' x 8', 4' x 12'	1228 x 2440	Square Edge, DripCap
4	102	24.0	4.22	4' x 8', 4' x 12'	1229 x 2440	Square Edge, DripCap

XPS EIFS - R 5

System Bulletin



## StoTherm® ci XPS Lotusan®

Decorative cladding with continuous air/moisture barrier and continuous insulation for heat, air and moisture control



### System Description

StoTherm ci XPS Lotusan is a decorative and protective exterior wall cladding that provides superior air and weather tightness with excellent thermal performance and durability. It incorporates continuous insulation and a continuous air/moisture barrier with Sto's high performance finishes in a fully tested wall cladding assembly.

### Uses

StoTherm ci XPS Lotusan can be used in residential or commercial wall construction where energy efficiency, superior aesthetics, air and moisture control are essential. The superior compressive strength and low water absorption of Dow Panel Core 20 insulation make it appropriate for institutional, or other projects where increased durability is desired.

### Features

- Design versatility** Aesthetic and curb appeal easy to achieve
- Self-cleaning properties** Reduced maintenance, extended time to recoat
- Continuous XPS insulation, R-5 per inch** Increased durability, reduced heating and cooling costs
- Quick set adhesive, no mechanical fasteners** Fast installation, no thermal bridging
- Continuous air and moisture barrier** Protects against mold and moisture problems
- Fully tested compatible components** No experimenting with untested designs

### Properties

- Weight (not including sheathing and frame)** < 2 psf (10 kg/m<sup>2</sup>)
- Thickness (insulation)** 1 - 6 inches (25-152 mm)
- R-value (not including sheathing and frame)** 5.0 - 30 ft<sup>2</sup>·h·°F / Btu (0.88 - 5.28 m<sup>2</sup>·K / W)
- Wind Load Resistance** Tested up to ± 175 psf (8.27 kPa)
- Construction Types** I-V, NFPA 285 tested for Types I-IV

### Warranty

15 year Limited Warranty

### Maintenance

Requires periodic cleaning to maintain appearance, repair to cracks and impact damage if they occur, recoating to enhance appearance of weathered finish. Sealants and other façade components must be maintained to prevent water infiltration.

Substrate: Glass Mat Gypsum sheathing in compliance with ASTM C 1177, Exterior or Exposure I wood-based sheathing (plywood or OSB), code compliant concrete, concrete masonry, or portland cement plaster, existing structurally sound, uncoated brick or other masonry wall construction.

- 1) StoGuard® Air and Moisture Barrier
- 2) Sto TurboStick™ Spray Foam Adhesive
- 3) Dow STYROFOAM™ Panel Core 20 Insulation Board
- 4) Sto Mesh (embedded in Sto Base Coat)
- 5) Sto BTS® Xtra Base Coat
- 6) Sto Primer Sand (optional)
- 7) Sto Textured Finish: StoSt® Lotusan®



Page 1 of 2



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NEOPOR® by BASF

## NEOPOR® GPS TECHNICAL PROPERTIES

FOR NORTH AMERICA

Neopor® GPS rigid foam is today's energy-efficient and cost-effective insulation solution for architects, builders and contractors.

Property	Unit	Neopor GPS F5300 Plus
ASTM C578 Classification		Type I
Compressive Resistance	at yields of 10% deformation in psi (min)	10.0
Thermal Resistance	*F ·ft <sup>2</sup> · h/BTU (°C · m <sup>2</sup> /W) at 75°F *F ·ft <sup>2</sup> · h/BTU (°C · m <sup>2</sup> /W) at 40°F	5.0 5.2
Water Vapor Permeance	Max perm (ng/Pa · s · m <sup>2</sup> )	4.0
Water Absorption by Total Immersion	Max volume % absorbed	1.1
Flexural Strength	psi	25.0
Density	lbs/ft <sup>3</sup> (min)	.90

### Please note:

R means resistance to heat flow. The higher the R-value, the greater the insulating power. The technical and physical metrics provided in this table are reference values for insulation products made of Neopor GPS. The values and properties may vary depending on how they are processed and produced. **The R-Value properties are based on 1-1/16 in thickness.**

# Pipe Insulation Sizes

## Pi-Piper® THE PIPE SIZER™

The Pipe Sizer Provides a Viable Solution To Measuring Pipe Sizes



The Pipe Sizer Provides a Quick Solution for Measuring Pipe Size (diameters)

- <http://www.pi-piper.com/>



1.5" diameter hot water piping observed with only 1.0" thick insulation, 9<sup>th</sup> floor



# VRF Tags, Wiring, and Thermostats

TST-64-2 CLOSED HIGH Actions Watch

Per [REDACTED] The laundry room and trash room split system control wiring to their respective outdoor units are crossed. Please correct wiring and ensure the correct outdoor units are connected to the correct indoor units.

SOURCE [Test 64, Attempt 2, Line 21](#)

Unit is not heating or cooling?

Comments 2 Files 0

TST-61-2 CLOSED Actions Watch

Per [REDACTED] all VRF thermostats in the building are programmed by default to control to the return air temperature. All units should be controlled to the space temperature since most units do not have ducted returns, but rather plenum returns, the temperatures of which do not accurately reflect space temperatures.

Please reprogram all apartment thermostats to control to space temperature (as measured by the thermostat).

SOURCE [Test 61, Attempt 1, Line 18](#)

Space Temperature

Comments 2 Files 0 View Details

ASSIGNED TO	Mechanical Contractor
ASSET	VRF Indoor Unit
DISCIPLINE	Mechanical
DRAWING	
DUE DATE	10/10/2019
CREATED BY	Chris Lyle
IDENTIFIED ON	9/26/2019 10:49 AM



TST-10-1 CLOSED Actions Watch

The thermostat in Apt 5B (construction 4B) was reading 69 when SWA measured 63. Please calibrate sensors.

SOURCE [Test 10, Attempt 1, Line 11](#)

Space Temperature

Comments 2 Files 0 View Details

ASSIGNED TO	Mechanical Contractor
ASSET	AHU Apt 4B
DISCIPLINE	Mechanical
DRAWING	
DUE DATE	11/19/2019
CREATED BY	Chris Lyle
IDENTIFIED ON	11/5/2019 10:35 AM

# Non-Adjustable CAR Dampers



# Hot Water Piping to Toilet



## Lessons learned from past projects

- Scenarios like these are not ideal
- However, use them to learn how to do things better on future projects



Questions?



# Trainings

---

## Providing Passive House training for General Contractor, site supers and sub-consultants

- Certified Passive House Tradesperson written into specs (potentially)
  - [https://passiv.de/en/03\\_certification/05\\_certified-tradesperson/05\\_certified-tradesperson.htm](https://passiv.de/en/03_certification/05_certified-tradesperson/05_certified-tradesperson.htm)
- Other trainings can vary from 1 hour to full in depth sessions
- Key take-aways are the basics of PH and the understanding of how it directly impacts each respective trade

How do you see getting the most buy-in from contractors?

A word cloud of terms related to contractor buy-in. The words are arranged in a roughly triangular shape, with 'money' at the top and 'focusing' at the bottom. The words are in various colors including purple, green, brown, and blue.

money  
challenge  
clearspecs  
phtradesman requirement  
preconstruction time  
schedule line items communication  
scopestraining  
focusing

# Formal Class



# Construction Trailer Trainings



# Construction Trailer Trainings



# Construction Trailer Trainings



# Training for Contractors

Review project specific details

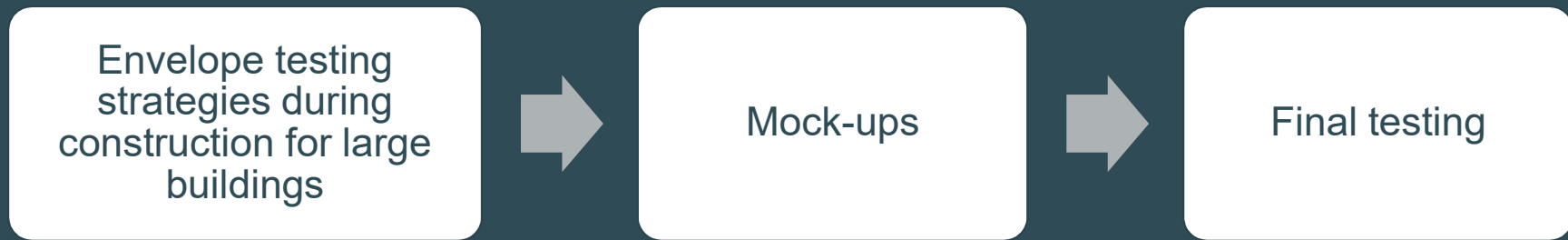
Think 'how does this impact me.' Typically 2 sessions: One architectural, one MEP

# Training for Contractors

Not enough to say 'follow spec'

Need to include training so everyone understands the project goals and specific roles & responsibilities

# QA/QC



# Envelope testing strategies during construction for large buildings

- Window mockup testing
- Interim guarded blower door testing, if feasible
- Interim whole building test if schedule and sequencing allows
- Envelope compartmentalization and window testing
- Unique component testing
- Whole building blower door test

# Mock-ups



# Mock-ups

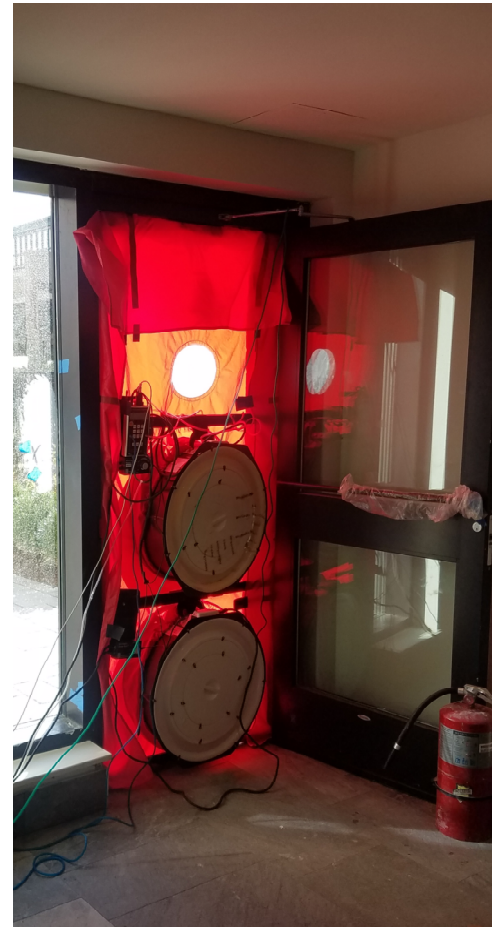




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45-19 ROCKAWAY BEACH BLVD., QUEENS, NY 11691  
REV 1

APRIL 17, 2018  
UPDATED 10/16/2019



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& planning**

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- **Module 6:** Deep Energy Retrofits: Strategies for Gut Rehab or Full Occupancy Retrofits
- **Module 7:** Beyond Hydrofluorocarbons (HFCs): Refrigerant Management in Design, Construction, and Operations
- **Module 8:** Construction Manager/Subcontractor/Tradesperson Training: Classroom and Field Training

Register here: <https://www.newpaltz.edu/sustainability/view-programs-and-progress/zero-net-carbon-training/workshop-schedule-registration--details/>

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## Contact Us

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307 7th Ave., New York, NY 10001



Michael O'Donnell, Senior Building  
Systems Consultant | CEM, BPI  
MFBA



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212.564.5800 x1360



[www.swinter.com](http://www.swinter.com)



# Resources

- High Performance Walls Guide - <http://www.swinter.com/wp-content/uploads/High-Performance-Walls-2019-reformatted.pdf>
- [https://www1.eere.energy.gov/buildings/publications/pdfs/rsf/performance\\_based\\_how\\_to\\_guide.pdf](https://www1.eere.energy.gov/buildings/publications/pdfs/rsf/performance_based_how_to_guide.pdf)
- <https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs>
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