

# MSBA Commissioning Roundtable

Post-Occupancy  
Evaluation  
Presentation  
April 29, 2020

## Meeting Agenda:

- ❖ Introduction
  - Sarah Przybylowicz, MSBA  
Sarah.Przybylowicz@MassSchoolBuildings.org
- ❖ Pilot Overview and POE Implementation
  - Chris Alles, MSBA
- ❖ Process and Development
  - Brooke Trivas, Brad Rogers, Perkins & Will
- ❖ Pilot Visits and Summary of Findings
  - Brad Jones, Cadmus
- ❖ Discussion and Survey

# Post-Occupancy Pilot Program

## *Historic Timeline*

- Internal Kick-off
- Establish Pilot Scope
- Identify Participants
- Pilot Recommendation

FY17

- Pilot Test
- District Outreach
- Develop Application
- Initial Building Visits
- Analyze Data
- Designer Roundtable
- Pilot Extension

FY18

- Establish Scope
- District Outreach
- Consultant Procurement
- Building Visits to Observe Operation/Performance (Performed by Cadmus)
- Thorough Review of the MSBA Process, Guidelines, Data Collection Opportunities (Performed by Perkins & Will)
- Consultant Collaboration

FY19

- Consultant Collaboration
- Final Reporting
- Implementation Approval
- Ongoing Development
- Onboarding & Startup
- POE Commencement

FY20/21

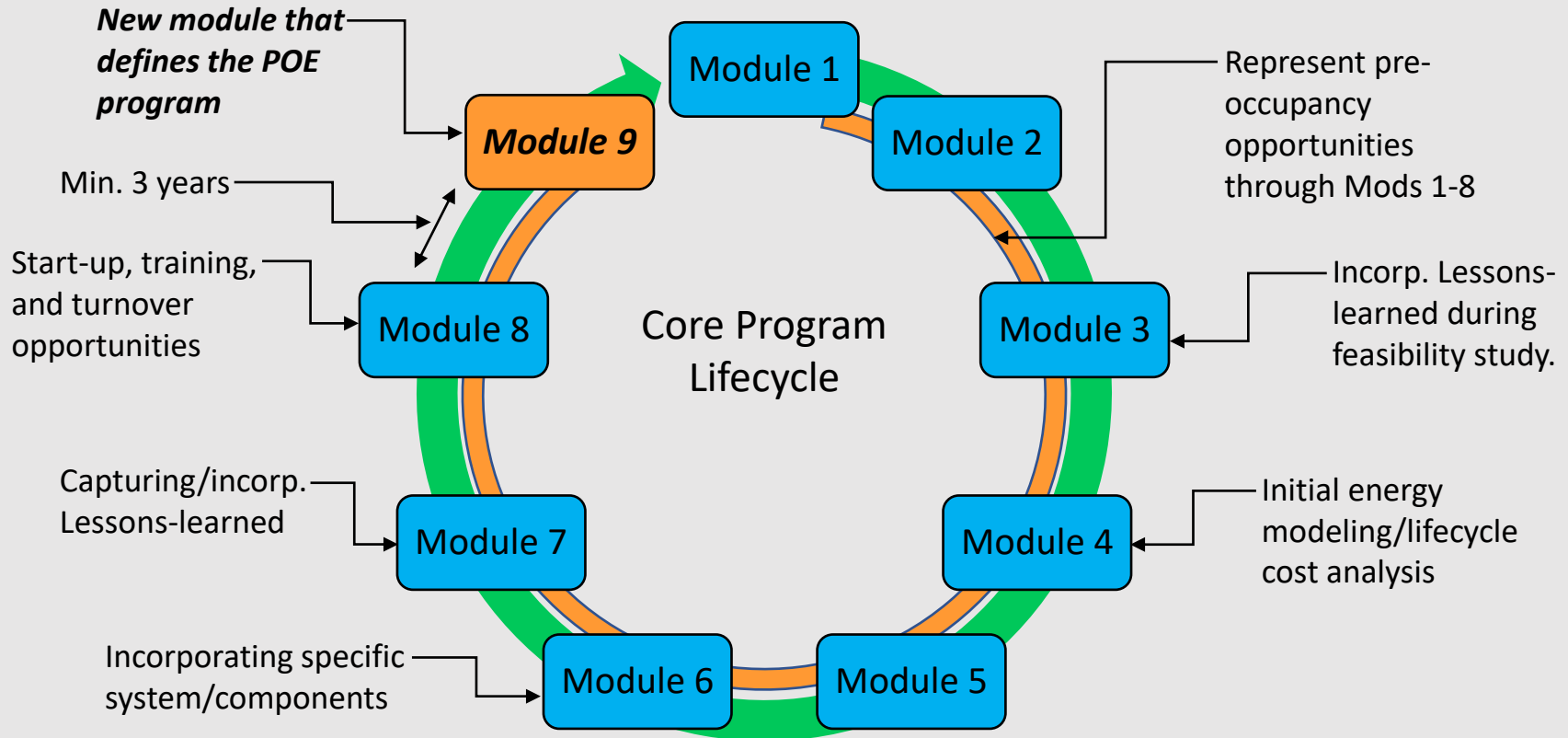
# MSBA's Support for Public School Construction

*Learning from the experience and protecting the investment!*



“To establish a process intended to focus on understanding that Core Program projects that have received a grant from the MSBA are operating and performing per the intended design”

# Adding 'Module 9' to Core Program Projects



# MSBA Post-Occupancy Pilot Program - Building Visits

## Sample Findings & Recommendations

“White Roofs – The majority of new schools are equipped with white roofs for their benefits of reducing heat island effect and earning points under LEED or CHPS. However, the white roof materials pose slip and fall hazards when moisture is present (dew, rain, snow, and ice).”

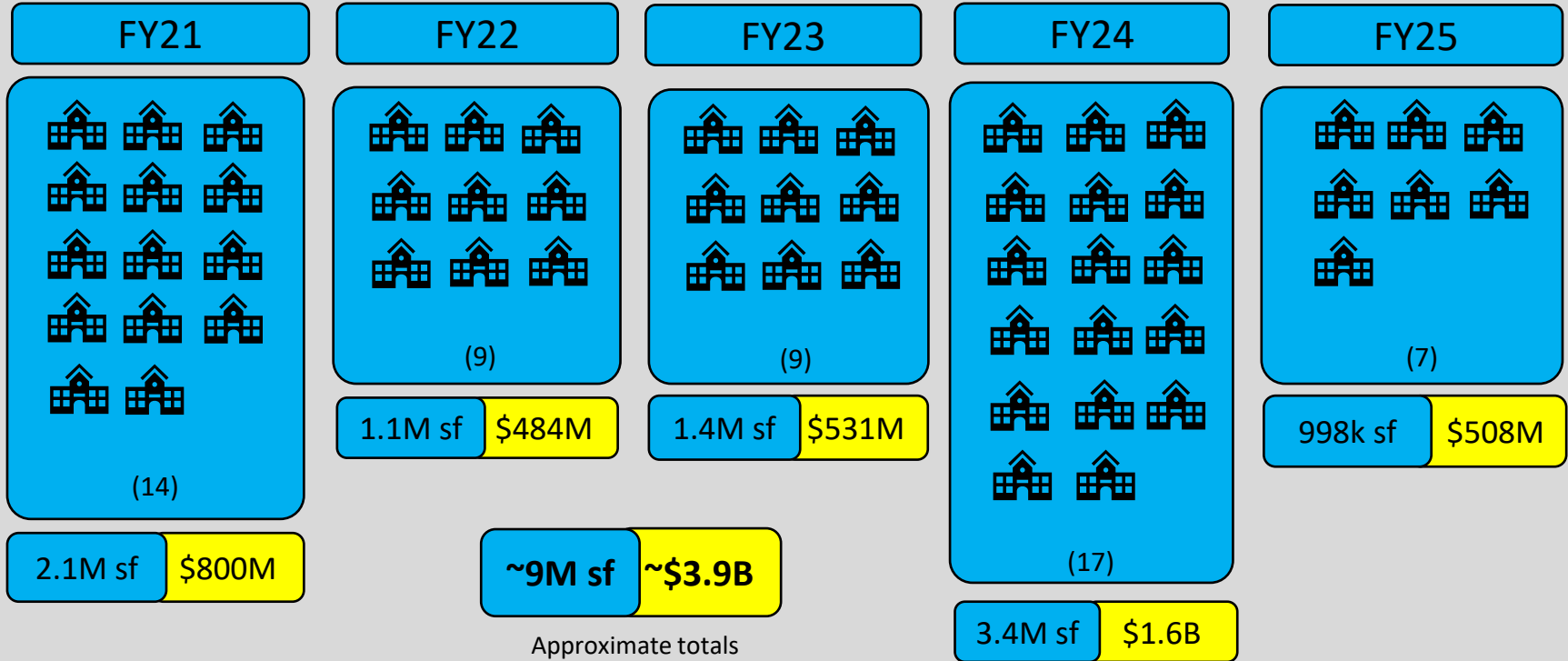
“Training at Project Turnover - Dissatisfaction with current training processes at project turnover; Spread sessions out over time; Engage building staff on walkthroughs early; Consider requiring OPMs take responsibility for coordination; Staff felt that training at handoff was short, poorly formatted, and generally of low use.”

“Lighting controls - Centralized lighting control systems are not user-friendly; Consider integration with HVAC controls, they are generally easier for O&M staff to monitor and adjust.”

“Submetering - Buildings have submetering systems that have been designed and installed but it appears they are not being used. 43% of the buildings surveyed have energy submetering installed, but none of the building staff monitor or use the submetering systems.”

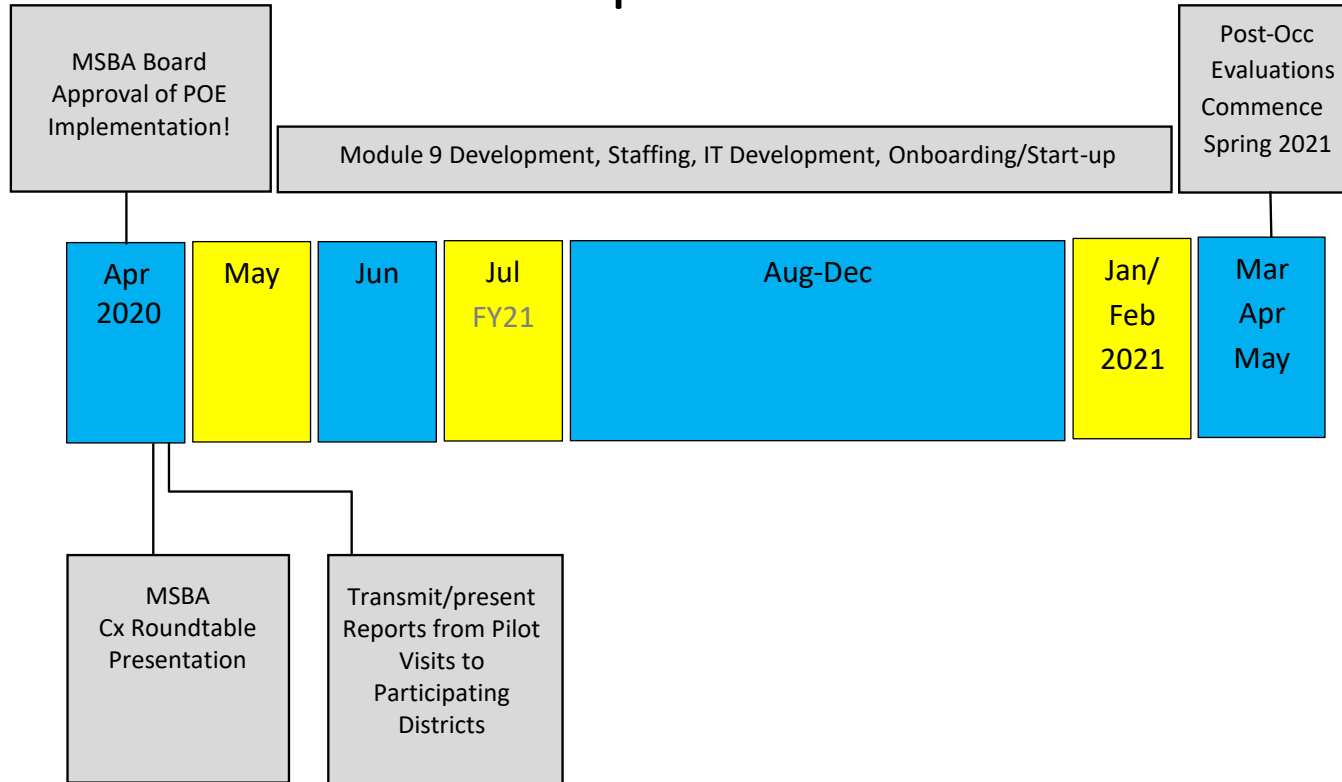
# MSBA Post-Occupancy Evaluation Program

## Projected POE's & Associated Construction Cost (FY21 -FY25)\*



\*Based on project schedules, this assumes an average of 11.2 evaluations or (12) per year. Assume 50-60 evaluations through FY25.

# MSBA Post-Occupancy Evaluation Program Anticipated Roll-out



# MSBA Post-Occupancy Evaluation Pilot

Perkins&Will





## Agenda

- 01 — Project Overview
- 02 — POE Process Recommendations
- 03 — Data Collection Tactics
- 04 — Database & Dashboard
- 05 — Report Template
- 06 — Next Steps



Massachusetts School Building Authority Mission

**Partner with Massachusetts communities to support the design and construction of educationally-appropriate, flexible, sustainable, and cost-effective public school facilities.**

**A systematic study of site systems, building performance, and human experience measured against pre-established objectives to understand the impacts of the built environment.**

## Mixed Method

Enables in depth understanding of complex issues **while increasing the validity and reliability** of data collected.



## Multi-Perspective

Build a **richer understanding of how the built environment is performing** from multiple perspectives.



## Project Objectives

1

Establish a POE process,  
**specific to MSBA-funded K-  
12 schools**

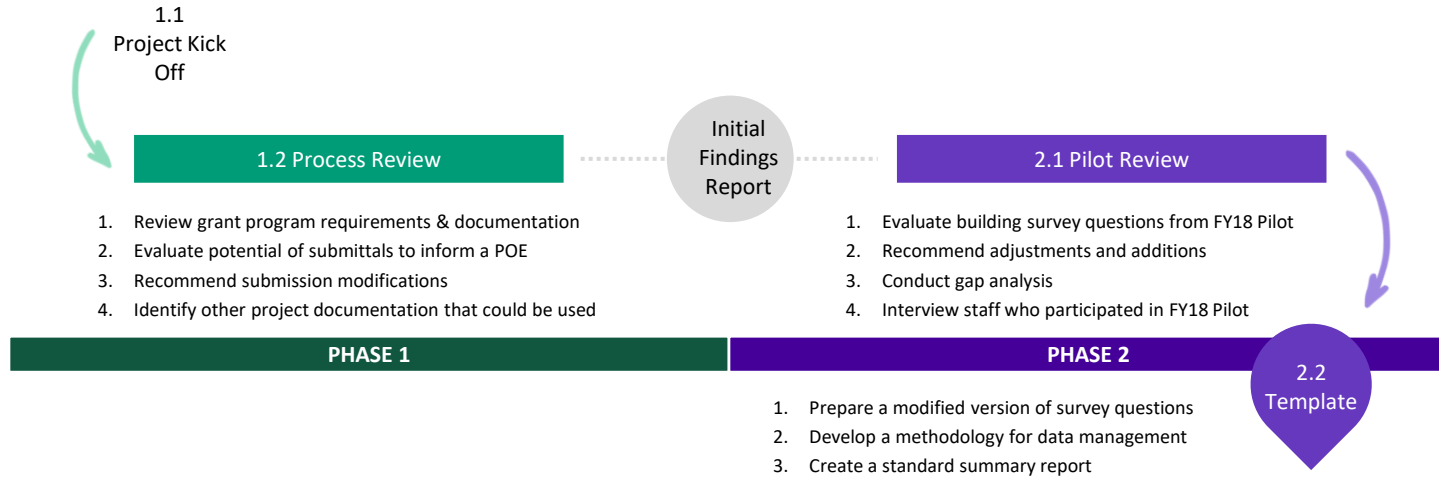
2

Understand if the schools  
funded by the Authority are  
**operating and performing  
as designed.**

3

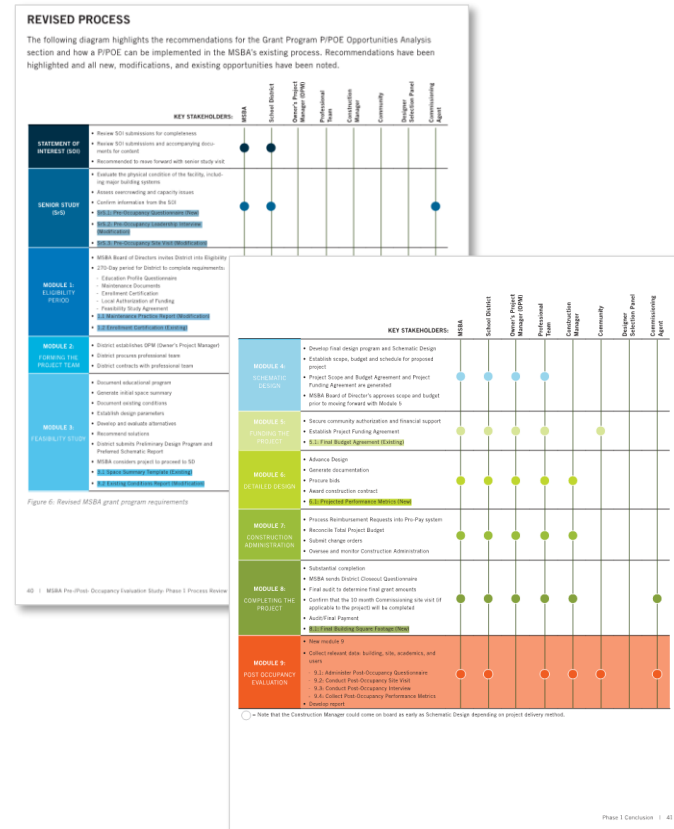
**Measure the impact of  
design** on site systems,  
building performance, and  
human experience.

## Project Schedule



## Phase 1: Process Review

Phase 1 identified opportunities for the MSBA to collect data during Modules 1-8



## Phase 2 identified opportunities to improve data collection in the existing POE process



Create a  
baseline



Reduce  
number of  
questions



Gather  
multiple  
perspectives



Make survey  
anonymous



Implement  
rating scales



Develop mixed  
method

# POE Process Recommendations



## POE Process Recommendations

**01**

**Create Module 9** — Post Occupancy Evaluation as part of the standard grant funding process

**02**

Expand on POE Pilot by implementing **multiple data collection tactics**, including a site visit, pre-visit questionnaire, and an online survey

**03**

**Capture data submitted in Modules 1-8** as part of the POE process to compare actual outcomes vs original intent

**04**

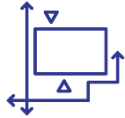
Co-locate POE data for all completed schools in a **central database with an online dashboard** for comparison and analysis of trends

**05**

Summarize POE findings in a **standard report template** that will be used for each school

## Proposed process

Modules 1-8 Form



Online Survey



Pre-Visit  
Questionnaire

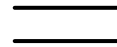


Site Visit



**Post Occupancy Evaluation  
Central Database**

- Web-based Reporting Dashboard
- Standard Building POE Report



**Provide actionable items for  
District's to address, and lessons  
learned to improve future MSBA  
funded projects**

# Data Collection Tactics

# Four data collection tactics.

## Modules 1-8 Form

Data from 2 modules  
15 total questions

## Online Survey

5 respondent groups  
35 total questions

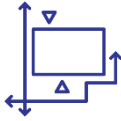
## Pre-Visit Questionnaire

4 respondent groups  
84 total questions

## Site Visit

1 day visit  
Team assigned by MSBA

## Modules 1-8 Form



**Recommendation** — Capture data points already collected during Modules 1-8 and utilize it in the POE process to measure the performance of the new building compared to the design intent.

**Tool** — Develop a form that collects specific data points already submitted in Modules 1-8 and feeds into the central POE database like the form used in the FY18 POE Pilot.

**Respondents** — MSBA and Design Team.

**Timeline** — To be completed during Modules 3 & 6.

**Implementation** — MSBA to provide the appropriate forms to the design teams and log data as it is submitted during Modules 3 & 6. Design team to record data points about projected building performance during Module 6.

**Analysis** — MSBA to log data from in central POE database from the proposed questions for Modules 3, 6, & 9. This includes reviewing the appropriate submittal documents and recording the specified data points. Summarize findings in the POE summary report.

Perkins & Will

### Modules 1-9 Form Questions

The following questions were identified during Phase 1 as questions that capture data points already collected during Modules 1-8 plus new data from the proposed Module 9 that can be utilized in the POE process to measure the performance of the new or renovated building compared to the design intent.

#### Module 3

##### Existing Building Performance Metrics

The following were identified as being opportunities to add questions to the Maintenance Practice Report to collect existing building performance metrics.

1. **EUI:** Please provide the total usage from previous year's electricity bill. [text][year] [number]  
Note: We will calculate EUI using this and the response to the total GSF.
2. **Water Usage:** Please provide the total usage from previous year's water bill. [units - multiple choice] [number]  
[multiple choice-unit] [number]
3. **Utility Costs:** Please provide any other utilities bills from the previous year (industrial gas, etc) [multiple choice - type] [multiple choice-unit] [number]

##### Existing & Projected Enrollment Metrics

The following questions were identified as being opportunities to record the existing and projected enrollment numbers submitted through the Enrollment Certification.

4. What is the existing number of students enrolled in the school? [number]
5. What is the existing number of staff members who work in the school? [number]
6. What is the projected number of students enrolled in the new or renovated building? [number]

##### Existing Building Efficiency Metrics

The following questions were identified as opportunities to utilize the data collected in the Space Summary Template to record existing square footage allocation and building efficiency metrics.

7. What is the gross square footage (GSF) of the existing building? [number] [GSF of Space Summary Template]
8. What is the net square footage (NSF) of the existing building? [number] [NSF of Space Summary Template]
9. What is the existing grossing factor? [number] [GFO of Space Summary Template]

#### Module 6

##### Projected Design Performance Metrics

The following questions were identified as opportunities to ask the design team to submit final projected building performance metrics during the detailed design module.

10. **EUI:** What is the projected total electricity usage of the new or renovated building? [text][year] [number]  
Note: We will calculate EUI using this and the response to the total GSF.
11. **Water Usage:** What is the projected water usage of the new or renovated building? [units - multiple choice] [number]

##### Projected Building Efficiency Metrics

The following questions were identified as opportunities to utilize the data collected in the Space Summary Template to record projected square footage allocation and building efficiency metrics.

12. What is the projected gross square footage (GSF) of the new or renovated building as submitted in the Space Summary Template at the end of Module 6? [number] [GSF of Space Summary Template]

26

27

Image: Example screen shot of Module 1-9 Form

## Online Survey



**Recommendation** — Collect subjective data from multiple perspectives through an online survey to develop a comprehensive understanding of how the facility is functioning and measure effectiveness of the new building.

**Tool** — Utilize a third-party survey tool to streamline survey administration and analysis.

**Respondents** — Multiple respondents have been identified including: School and District leadership, facilities personnel, teachers and staff, students, and parents. Each audience will respond to a set of questions that is appropriate for them.

**Timeline** — The survey should remain open for a 2-week period to assure participants have ample time to respond.

**Implementation** — MSBA to schedule online survey deployment with district, provide district with survey communications, deploy online survey, monitor responses, and troubleshoot any problems.

**Analysis** — MSBA to download raw survey data, summarize overall findings and input those into the central POE database and POE summary report.

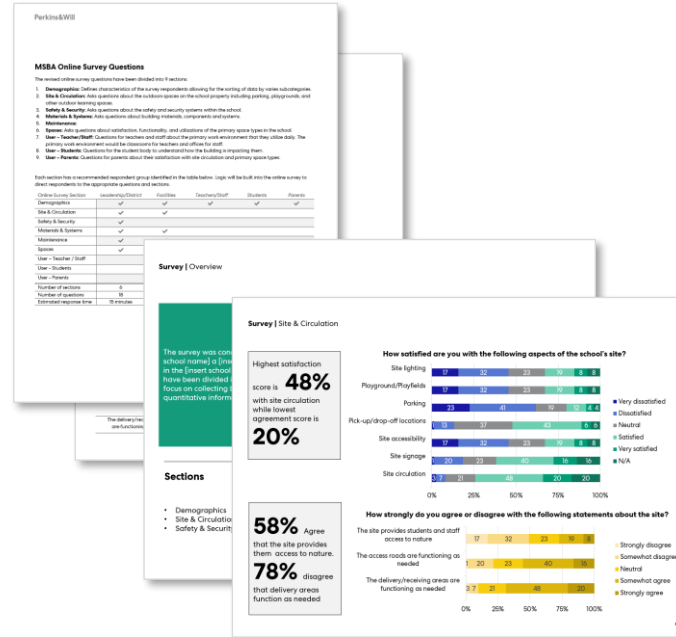


Image: Example screen shot of Online Survey questions and Survey Summary Template

## Pre-Visit Questionnaire



**Recommendation** — Create a form that collects information from select individuals prior to the MSBA site visit.

**Tool** — Develop a form that collects data and feeds into the central POE database like the form used in the FY18 POE Pilot.

**Respondents** — MSBA and School and District leadership.

**Timeline** — To be completed before the site visit to provide the MSBA with insight to how the building is performing prior to being on site.

**Implementation** — MSBA to send form to School. District leadership and fill out the MSBA section of the form.

**Analysis** — MSBA to review content submitted, note anything important to follow-up on during site visit, input data into central database and the POE summary report.

The image shows three overlapping screenshots of the 'Perkins&Will Pre-Visit Questionnaire' form. The top screenshot shows the title and introductory text. The middle screenshot shows the MSBA section with a list of 24 numbered questions covering topics like project completion, budget, and school type. The bottom screenshot shows a checklist of building features and a section for community access.

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**Pre-Visit Questionnaire**

The following questions were identified from the previous PVE survey as questions that collect objective data that could be filled out in a form by one person in one day.

**MSBA**

Note: These have been revised with and changed CADMS reports, and MSBA feedback.

Pre-visit Questionnaire: MSBA project team member (Questions 1-10, 11-20)

Demographics

1. Measurement Type [Multiple choice]
2. Substantial Completion Date [Date]
3. Final Board Approved Total Facilities Grant
4. Occupancy Date [Date]
5. How the project administration schedule? [Multiple choice]
6. Commissioning Complete [Yes/No]
7. Estimated Project Budget at Schematic Design
8. Final Total Project Costs [Number]
9. Final Construction Costs [Number]
10. Final Cost/SF [Number]
11. How the project on budget? [Yes/No]
12. Project Status [Open/Construction/In Use/Other]
13. Final Gross Square Footage [Number]
14. Final Net Square Footage [Number]
15. Board Approved Final P&I Amount [Number]
16. Address/Proposed Address [Text]
17. School Type [Multiple choice]
18. Breaker Configuration (Design) [Multiple choice]
19. Breaker (Design) [Number]
20. OPIAC [Text]
21. Commissioning Consultant [Text]
22. Designer [Text]
23. Contractor / CM [Text]
24. MEPF Engineer [Text]

**Perkins&Will**

6. What is your current enrollment? [Number]
7. What is your current grade configuration? [Multiple choice]

**Parking/Storage**

1. What time of day was peak usage?
  - Early morning 8:00am-9:00am
  - Mid-morning 10:00am-12:00pm
  - Early afternoon 12:00pm-2:00pm
  - Late Afternoon 3:00pm-4:00pm
  - Evening After 4:00pm
2. Discharge how full is the parking lot?
  - 0% - 20% full
  - 20% - 50% full
  - 50% - 75% full
  - 75% - 90% full
  - 90% full
3. During peak usage how full is the parking?
  - 0% - 20% full
  - 20% - 50% full
  - 50% - 75% full
  - 75% - 90% full
  - 90% full
4. Any other notes or observations about it?

**Building Performance & Systems**

8. RFI Please provide the total usage from Note: We will calculate EUI using this data.
9. Water Usage Please provide the total.
10. Utility Costs Please provide any other utility [Multiple choice and number]

**Space Utilization**

11. Adaptations and Modifications How many (Selected questions 7b, 8c, 14a, 10a, 10b, 11c)

File Check
Library/Media Center

**Perkins&Will**

Classroom	
Stage	
Computer Lab	
Gymnasium	
Auditorium	
Administrative	
General Classrooms	
Science Labs	
Special Education	
Art	
Music	
Vocational Classrooms	
Vocational Shop	
Non-Traditional Classrooms	
Storage	

12. If you indicated "significant" for the previous question, please list the space and describe the significant adaptations/modifications that were made and why they occurred.
13. Community Access: What spaces are used by the community? (Selected Questions 8c, 9c, 10c, 10d)

Library/Media Center	Gymnasium	Science Labs	Vocational Classrooms
Art	Auditorium	Special Education	Vocational Shop
Stage	Administrative	Art	Storage
Computer Lab	General Classrooms	Music	Non-Traditional Classrooms

Image: Example screen shot of Pre-Visit Questionnaire

## Site Visit



**Recommendation** — Continue to conduct one day non-invasive site visit with two MSBA employees. One to ask the district questions and take necessary photos and the other to log information in the site visit form on a tablet.

**Tool** — Edit the existing FY18 POE Pilot application with the revised site visit questions.

**Respondents** — MSBA

**Timeline** — To be conducted after the online survey is administered and the pre-visit questionnaire is received. Any spaces or topics that might have had low scores from the survey can be followed up on during the site visit.

**Implementation** — MSBA to schedule site visit with district, fill out form and document findings while on site.

**Analysis** — MSBA to save form and any supporting photographs from the visit, input data into central database, and summarize findings in the POE summary report.

Perkins&Will

**Site Visit Questions**

The following questions/topics are recommended to be collected by the MSBA through a one-day non-invasive site visit. Some of the questions were identified from the previous FY18.

**Site & Conditions**

Pick-up and Drop-off

5. What was the average wait time during drop-off?

- No wait time
- 0-5 minutes
- 6-10 minutes
- 11-15 minutes
- 16-20 minutes
- 21-30 minutes
- Over 30 minutes

6. What was the average wait time during pickup?

- No wait time
- 0-5 minutes
- 6-10 minutes
- 11-15 minutes
- 16-20 minutes
- 21-30 minutes
- Over 30 minutes

7. How is the traffic flowing?

- Very poor
- Poor
- Neutral
- Good
- Very good

8. Are there any cars parked?

- High
- Moderate
- Low
- None

9. Any other notes or observations about drop-off or pick-up?

10. Functionality: Rate the functionality of the following:

Site element	Very dysfunctional	Disfunctional	Functional	Very functional
Site drainage				
Site signage				
Site lighting				
Site safety				

11. Any other notes or observations about site district.

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**Maintenance**

12. Describe general observations about site maintenance practices. (Revised question 40) (Free)

13. Describe general observations about building maintenance. (Revised question 41) (Free)

14. Describe how maintenance procedures are tracked. (Revised question 44 of 10/1/2016) (Free)

**Safety & Security**

15. Is there an emergency vehicle access? (Revised question 16) (Yes/No)

16. Is there a surveillance camera coverage? (Revised question 17) (Yes/No)

17. Is there an accessible alarm system? (Revised question 18) (Yes/No)

18. Is there a vestibule? (Revised question 53) (Yes/No)

19. Is there an insect/dust/pest system in place? (Revised question 45) (Yes/No)

20. Is there a smoke/CO system in place? (Revised question 46) (Yes/No)

21. Functionality: Rate the functionality of the following:

System	Very dysfunctional	Disfunctional	Functional	Very functional
Entry into the building for students				
Entry into the building for teachers & staff				
Entry into the building for visitors				

22. Are there any other notes or observations about entry into the building?

**Building Performance**

23. Adaptations and Modifications: Have there been any adaptations or modifications to the following space area related to building performance? (Revised question 47) (Free)

Space	No Changes	Slight Changes	Moderate Changes	Significant Changes	NA
Library/Media Center					
Cafeteria					
Stages					
Computer Lab					
Gymnasium					
Auditorium					
Administrative					
General Classroom					
Science Labs					
Special Education					
Art					
Music					
Vocational Classroom					
Vocational Shop					
Non-Traditional Classroom					
Storage					

24. If you indicated "significant" for the previous question, please list the space and describe the significant adaptations/modifications that were made and why they occurred. (Free)

25. Any other notes or observations about glass cover.

Image: Example screen shot of Site Visit questions



# Database & Dashboard

## Data Tables and Fields

### Modules 1-8 Form

- **Building ID**
- Square footage
- Building capacity
- Design enrollment
- Budget
- Program

+/- 30 fields

### Online Survey

- **Building ID**
- Demographics
- Site & Circulation
- Safety & Security
- Materials & Systems
- Maintenance
- Spaces
- User – Teacher/Staff
- User – Student
- User – Parent

+/- 30 fields

### Pre-Visit Questionnaire

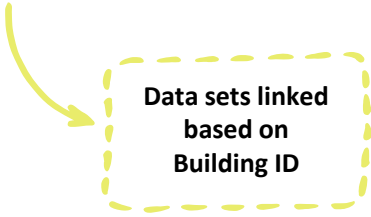
- **Building ID**
- Grant information
- Current enrollment
- Project team
- Enrollment
- Configuration
- Programs
- Parking
- Building performance
- Space modifications
- Community uses
- Operating costs

+/- 50 fields

### Site Visit

- **Building ID**
- Site & Circulation
- Site Systems
- Maintenance
- Safety & Security
- Building Performance
- Space Utilization
- Metering

+/- 40 fields



**Data sets linked  
based on  
Building ID**

## Example Data Table

Building ID	Square Footage	Year Completed	Budget	Design Enrollment	Grade Levels	Other Fields...
Building 1						
Building 2						
Building 3						
Building 4						
Building 5						

**Example Form**

Building ID: \_\_\_\_\_

Square Footage: \_\_\_\_\_

Year Completed: \_\_\_\_\_

Budget: \_\_\_\_\_

Design Enrollment: \_\_\_\_\_

Additional Fields (see appendix)

Forms populate  
each row of the  
table

Each building is  
a row in the  
table

## The online survey will be summarized before loading into the central database

Raw data:  
100's of responses x  
30 questions



Processing functions to  
calculate averages and  
totals – e.g. overall  
teacher satisfaction



Averages and totals loaded into  
central database.

Each school gets a single average  
or total value for each question

# Dashboard Mockup



Images: Example screenshot of dashboard mockup

# POE Report Template

# Standard Building POE Report Template

### Data Collection Tactics

Note: Nothing to fill out on this page, this is a standard introduction.

#### Modules 1-8

Topics:

- Building performance
- Square footage
- Design enrollment
- Budget
- Program

#### Online Survey

Topics:

- Demographics
- Site & Circulation
- Safety & Security
- Materials & Systems
- Maintenance
- Spaces
- User - Teacher/Staff
- User - Student
- User - Parent

#### Pre-Visit Questionnaire

Topics:

- Grant information
- Project team
- Enrollment
- Configuration
- Programs
- Parking
- Maintenance
- Building systems
- Space utilization
- Community uses
- Operating costs
- Commissioning

#### Site Visit

Topics:

- Site & circulation

### Key Findings

85% very good

Note: This is an example of how this page could be populated.

#### 1 Educational Appropriate

The new learning environment supports the school's curriculum. Parents reported that the new learning environment supports their child's learning needs and teachers reported it supports their productivity.

- 82% Supports child's learning needs
- 63% Supports productivity

#### 2 Flexible

Teachers and leadership reported that the new learning environment responds to the curriculum. The new learning environment is flexible allows occupants to control the temperature and lighting qualities as needed.

- 78% Responds to the curriculum
- 15% Lighting control is very good
- 60% Temperature control is very good

#### 3 Sustainable

The new facility has achieved LEED Gold and is performing better than projected, decreasing the buildings impact on the environment.

EUR (\$/TJ/year)

Actual	83
Projected	90
Existing	120

#### 4 Cost Efficient

The new building met the overall project budget. The cool air square foot is "x" which is below the average MBIA project. The new efficient building systems are helping the district reduce overall operating costs.

Final Cost per SF

Actual	200
Projected	210
Existing	250

#### 5 User Satisfaction

Overall, users are satisfied with the new learning environment and a sense of community. 70% of users are satisfied with the new environment.

- 85% Teacher/Staff Satisfaction
- 67% Leadership/District Satisfaction

### Survey Teachers, Staff, Leadership, District

Rate how each specified aspect is currently performing in the new learning environment

Aspect	Avg. Score (out of 5)
Access to natural light	4
Access to views to the outside	4
Visual comfort of lighting	3
Air quality	4
Artificial lighting	5
Lighting Control	2
Daylight dimming	3
Thermal Comfort	4
Temperature Control	4
Noise Levels	2
Sound Transmission	4
Classroom technology	5

Very poor = Poor = Neutral = Good = Very Good

How strongly do you agree or disagree with the following statements

- Satisfaction with new learning environment: 85%
- Responds to the curriculum: 67%
- Supports productivity: 54%
- Supports health and well-being: 75%
- Supports the culture and identity of the school: 90%
- Promotes a sense of community: 79%

% agreement

Images: Example screenshot of Standard Building POE Report Template

# Next Steps for Program Development



## Next Steps

**Based on the recent approval by the MSBA Board of Directors to implement an MSBA Post-Occupancy Evaluation Program for Core Program projects, Perkins & Will remains committed to the ongoing collaboration with MSBA staff to assist in making this process a successful reality.**

**01**

**Discuss with the community -**  
commissioning, design,  
and facility maintenance

**02**

**Develop the logistics and technology** platforms to support the process

**03**

**Test the new process** and adjust as needed prior to going live in 2021.

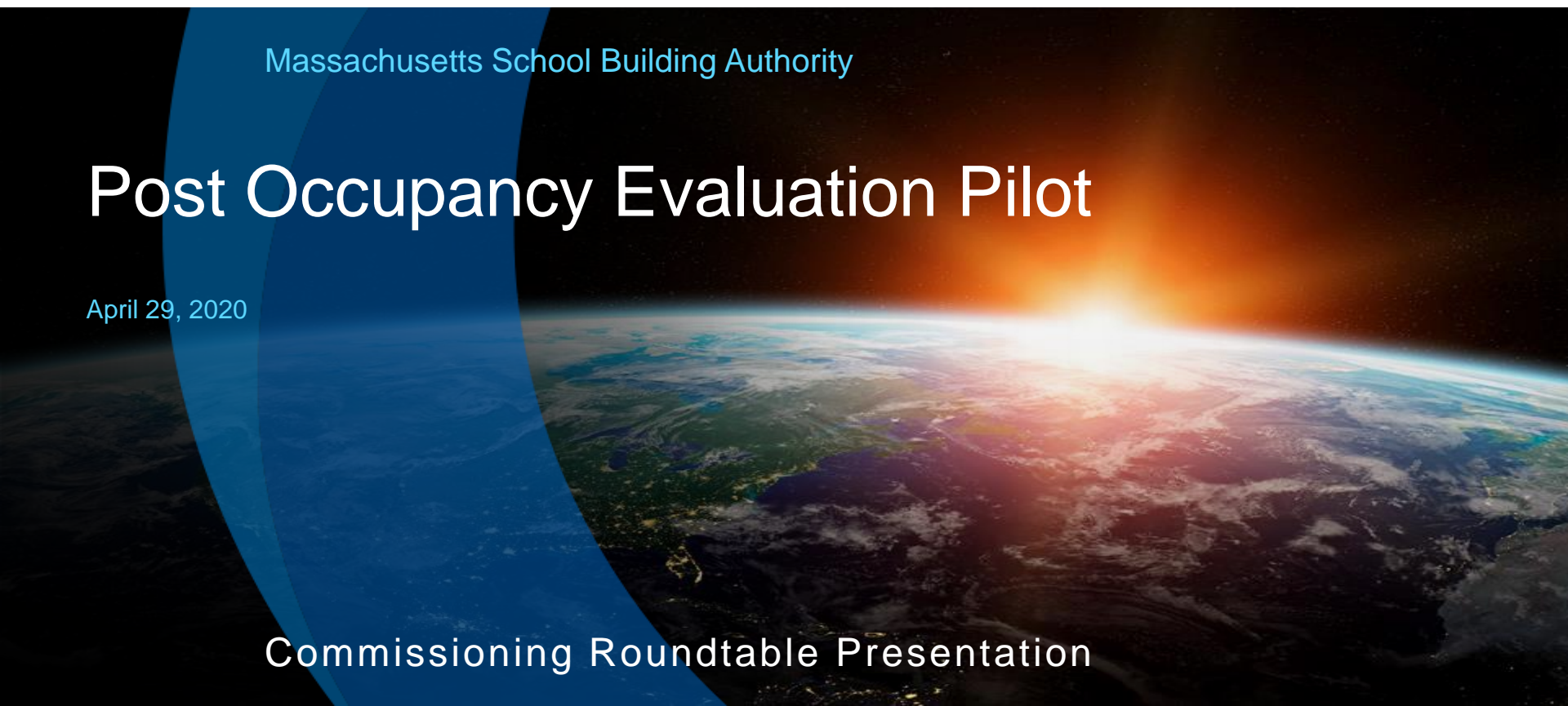
# CADMUS

Massachusetts School Building Authority

## Post Occupancy Evaluation Pilot

April 29, 2020

Commissioning Roundtable Presentation



# Agenda

## Post Occupancy Pilot Process Themes from Findings

# Post Occupancy Pilot: Overview

- 14 Districts Participated
- Construction completion 2011-2015
- High Schools: Qty. 6
- Middle Schools: Qty 6
- Elementary Schools: Qty 2
- Areas of focus
  - Heating/Boiler Systems
  - Building Automation Controls
  - Lighting Controls
  - Building Envelope

# Post Occupancy Process: Preparation

<b>Outreach to Districts</b>	<ul style="list-style-type: none"><li>• MSBA Introduction</li><li>• Information Sheet</li></ul>
<b>Utility Data</b>	<ul style="list-style-type: none"><li>• Signed Data Release Forms</li><li>• Data File Sharing<ul style="list-style-type: none"><li>• Monthly Summary, 15-minute Interval</li></ul></li></ul>
<b>MSBA File Transfer</b>	<ul style="list-style-type: none"><li>• Schematic Design Documents</li><li>• Bid Documents</li><li>• As-built Documents</li><li>• Commissioning Reports</li></ul>
<b>Preliminary Call</b>	<ul style="list-style-type: none"><li>• Introductions, Contact Information</li><li>• Pilot Process Intent and Overview</li><li>• School &amp; Building System Information</li><li>• Site Visit Coordination</li></ul>

# Post Occupancy Process: Implementation

<b>Site Visit</b>	<ul style="list-style-type: none"><li>• 24-48 Hours Advance Confirmation</li><li>• One Day</li><li>• Administrative Staff, Facilities Staff</li><li>• Meeting / Discussion</li><li>• Walkthrough – Systems, Roof, Mech/Elec Rooms</li></ul>
<b>Site Visit Follow-up</b>	<ul style="list-style-type: none"><li>• Clarifications</li><li>• Meter / Data Retrievals</li></ul>
<b>Individual School Reports</b>	<ul style="list-style-type: none"><li>• Overall Analysis</li><li>• Benchmarking – How do they compare?</li><li>• Recommendations for School – Energy, O&amp;M</li></ul>
<b>Overall MSBA Report</b>	<ul style="list-style-type: none"><li>• MSBA Post Occupancy Process Feedback</li><li>• Use of Facilities / Systems – Design Considerations?</li><li>• Commissioning / Training / Turnover Enhancements</li></ul>

# School Report Highlights

<b>Energy Performance</b>	<ul style="list-style-type: none"><li>• Overall Analysis</li><li>• Benchmarking – How do they compare?</li><li>• Energy Management</li><li>• Points of Interest</li></ul>
<b>System Performance</b>	<ul style="list-style-type: none"><li>• Summary and Analysis</li><li>• Recommendations for School</li></ul>
<b>O&amp;M Assessment</b>	<ul style="list-style-type: none"><li>• Overall Analysis</li><li>• Benchmarking – How do they compare?</li><li>• Recommendations for School</li></ul>
<b>Feedback to MSBA</b>	<ul style="list-style-type: none"><li>• MSBA Process Feedback</li><li>• Use of Facilities / Systems – design considerations?</li><li>• Commissioning / Training / Turnover</li></ul>

# Next Steps - Schedule

<b>Finalize Analysis</b>	<ul style="list-style-type: none"><li>• Complete</li></ul>
<b>Individual School Reports</b>	<ul style="list-style-type: none"><li>• Finalize and Distribute to Districts</li><li>• Coordinate District Webinar Presentations</li></ul>
<b>Overall Report</b>	<ul style="list-style-type: none"><li>• Finalize and Submit to MSBA</li></ul>
<b>MSBA Support</b>	<ul style="list-style-type: none"><li>• Supplemental Information</li></ul>



# O&M Assessment - Scale

4	• Best Practices are Implemented
3	• Activities Generally Performed
2	• Limited Activities Performed
1	• Opportunity for Improvement

# O&M Assessment Results

Category	Average	Minimum	Maximum
HVAC (5 Criteria)	2.9	2.0	3.9
Building Automation/Controls (6 Criteria)	2.8	1.8	3.1
Lighting Controls (5 Criteria)	2.9	2.6	3.2
Preventive Maintenance (2 Criteria)	3.2	3.2	3.1
Energy Management (2 Criteria)	1.5	1.4	1.6

# Satisfaction - Scale

4	• Very Satisfied
3	• Generally Satisfied
2	• Limited Satisfaction
1	• Dissatisfied

# Satisfaction Feedback Results

Category	Average
Overall School	3.9
HVAC	3.4
HVAC Controls	3.0
Lighting Controls	2.7
Building Envelope	3.4
Project Turnover Training	2.4
Roof Access	3.1

# Findings – Sample Theme #1

Operational Recommendations for Schools		
Performance Feedback		
Condensing Boilers	Schedules	Lighting Controls
<ul style="list-style-type: none"><li>• High efficiency based on lower water temperatures</li><li>• Systems not set to operate at condensing conditions</li><li>• <b>Guidance on settings and impact</b></li></ul>	<ul style="list-style-type: none"><li>• You can't save more energy than shutting something off</li><li>• System schedules don't match building schedules</li><li>• <b>How to see this from data &amp; guidance on potential adjustments</b></li></ul>	<ul style="list-style-type: none"><li>• Lighting control system interfaces are not user friendly and are generally not used</li><li>• <b>Develop standard operating procedures for lighting system adjustments</b></li></ul>

# Findings – Sample Theme #2

Design Feedback		
Design Decisions that Impact O&M		
Roof Access	Storage Space	White Roofs
<ul style="list-style-type: none"><li>• Equipment placed on roof needs to be maintained</li><li>• Ladder access is common, but not suitable for moving filters and other materials</li><li>• Design focus and maximizing sf within the grossing factor</li></ul>	<ul style="list-style-type: none"><li>• Lack of storage</li><li>• Engage with O&amp;M staff on adequate storage space for maintenance equipment and supplies</li><li>• Maximizing sf within the grossing factor</li></ul>	<ul style="list-style-type: none"><li>• White roofs pose slip and fall hazard when moisture is present (dew, rain, snow, etc)</li><li>• Material selection</li><li>• Improved walk-way pad layout for circulation and work area around equipment</li></ul>

# Findings – Sample Theme #2

Design Feedback		
Design Decisions that Impact O&M		
Submetering	HVAC Controls	Lighting
<ul style="list-style-type: none"><li>• Buildings have submetering but it is not being used.</li><li>• Ensure meter management plan with individuals responsible are addressed in design</li><li>• Tie in other standard meters</li></ul>	<ul style="list-style-type: none"><li>• Districts are burdened with unique systems in each building.</li><li>• Guidance on proprietary specifications for district wide agreements</li></ul>	<ul style="list-style-type: none"><li>• Centralized lighting control systems are not user-friendly</li><li>• Consider integration with HVAC controls</li><li>• Ensure robust training requirements are specified</li></ul>

# Findings – Sample Theme #3

MSBA Process Feedback		
Commissioning		
Reports	Training	Training
<ul style="list-style-type: none"><li>• Commissioning documentation not being used by O&amp;M staff</li><li>• Enhance direct contact between CxA and O&amp;M staff</li></ul>	<ul style="list-style-type: none"><li>• Dissatisfaction with current training processes</li><li>• Spread sessions out over time</li><li>• Engage building staff on walkthroughs early</li><li>• OPM coordination</li></ul>	<ul style="list-style-type: none"><li>• O&amp;M staff turnover is common, so people receiving training are not with district</li><li>• Outsourced maintenance</li><li>• Plan for changing staff &amp; outsourced maintenance</li></ul>





Thank you!

# Discussion

To ask a question, please use the “Raise Hand” feature.

Please take a moment before you leave the meeting to complete few survey questions.

For additional information regarding MSBA’s POE Program, please contact Chris Alles at [chris.alles@massschoolbuildings.org](mailto:chris.alles@massschoolbuildings.org)

For general information regarding MSBA’s Cx Roundtable, please contact Sarah Przybylowicz at [sarah.przybylowicz@massschoolbuildings.org](mailto:sarah.przybylowicz@massschoolbuildings.org)

Thank you for your participation!