CHARLES D. BAKER
GOVERNOR

KARYN E. POLITO
LIEUTENANT GOVERNOR

JAY ASH
SECRETARY OF HOUSING AND ECONOMIC DEVELOPMENT

Commonwealth of Massachusetts
Division of Professional Licensure
Office of Public Safety and Inspections
1 Ashburton Place, Rm 1301 • Boston • Massachusetts • 02108

JOHN C. CHAPMAN
UNDERSECRETARY OF CONSUMER AFFAIRS AND BUSINESS REGULATION

CHARLES BORSTEL
COMMISSIONER, DIVISION OF PROFESSIONAL LICENSURE

BOARD OF BUILDING REGULATIONS AND STANDARDS

NOTICE OF MEETING

In accordance with the provisions of G.L. c. 30A § 20, notice is hereby given that the Board of Building Regulations and Standards (BBRS) will convene a regular monthly meeting and statutory public hearing on:

November 14, 2018 @ 10:00 a.m. until approximately noontime @
The Boston Society of Architects Office
290 Congress Street in Boston.

Posted on November 6, 2018

It is anticipated that the topics shown below will be discussed at the aforementioned meeting:

AGENDA

Roll Call, by BBRS Chair:

John Couture, Chair	☐ present ☐ absent	Robert Anderson, or designee	☐ present ☐ absent
Kerry Dietz, Vice Chair	☐ present ☐ absent	Peter Ostroskey, or designee	☐ present ☐ absent
Richard Crowley, Second Vice Chair	☐ present ☐ absent	Michael McDowell	☐ present ☐ absent
Steve Frederickson	☐ present ☐ absent	Susan Gleason	☐ present ☐ absent
Kevin Gallagher	☐ present ☐ absent	Lisa Davey	☐ present ☐ absent
Cheryl Lavalley	☐ present ☐ absent		

Public Hearing Proposals

Change Proposals Relating to Energy Code Requirements

Code change proposal are attached to this agenda in the order in which they appear below.

- **Proposal Number 11-1-2018** – Consider revising Sections R401.2 and R407.
  Proponent: Kevin Rose, *Mass Save*

- **Proposal Number 11-2-2018** – Consider revising Section r402.4.
  Proponent: Kevin Rose, *Mass Save*

- **Proposal Number 11-3-2018** – Consider revising Sections R806.5, and 1203.1.2.3.
  Proponent: Christopher Alphen, *Dolphin Insulation*

- **Proposal Number 11-4-2018** – Consider revising Sections C401.2, C403.7 and C403.8.
  Proponent: Brenden Giza-Sisson, *Mass Save*

- **Proposal Number 11-5-2018** – Consider revising Sections C401.2 and C405.2.3.
  Proponent: Brenden Giza-Sisson, *Mass Save*

- **Proposal Number 11-6-2018** – Consider revising Sections C401.2, C405.4 and C406.3.
  Proponent: Brenden Giza-Sisson, *Mass Save*

- **Proposal Number 11-7-2018** – Consider revising Section C405.
- **Proponent:** Brenden Giza-Sisson, *Mass Save*

- **Proposal Number 11-8-2018** – Consider revising Section C405.3.2.
  Proponent: Brenden Giza-Sisson, *Mass Save*

- **Proposal Number 11-9-2018** – Consider revising Section C405.2.2.1.
  Proponent: Glenn Heinmiller, *International Association of Lighting Designers*

- **Proposal Number 11-10-2018** – Consider revising Section C406.4.
  Proponent: Glenn Heinmiller, *International Association of Lighting Designers*

- **Proposal Number 11-11-2018** – Consider revising Section C503.1.
  Proponent: Glenn Heinmiller, *International Association of Lighting Designers*

Change Proposals Relating to Swimming Pool Code Requirements

- **Proposal Number 11-12-2018** – Consider revising Section 305 of the *International Swimming Pool & Spa Code* (ISPSC).
  Proponent: Tom Moberg, Town of Acton

Change Proposals Relating to Residential Code Requirements Large Additions

- **Proposal Number 11-13-2018** – Consider Sections R313.2, AJ102.3 and add AJ102.3.2.
  Proponent: Fire Prevention\Fire Protection (FPFP) Committee

Editorial Change Proposals Relating to Varied Code Sections

These changes have identified by code users as requiring correction.

- **Proposal Number 11-14-2018** – Consider correcting Sections 305.2 and 308.6.1 having to do with day care age requirements.
  Proponent: OPSI Building Inspectors Gordon Bailey & David Holmes

- **Proposal Number 11-15-2018** – Consider correcting Sections AF103.4.2 and 103.4.3 having to do with radon control requirements.
  Proponent: Mike Grover, City of Cambridge

- **Proposal Number 11-16-2018** – Discuss meaning of Section 501.1 Note 3 pertaining to construction requirements for hospitals and nursing homes.
  Proponent: Mark Hughes, Town of Framingham

Regular Meeting

1. **Review\Vote** approval of October 9, 2018 BBRS draft meeting minutes.
2. **Review\Vote** approval of September 19, 2018 BOCC draft meeting minutes.
3. **Discuss** locking arrangements and associated hardware installed to protect against active shooter or other threatening situations in a building\structure.
4. **Discuss** progress relating to the next edition of 780 CMR.
5. **Discuss Code Change Proposal Number 5-7-2018** – Regarding developing a swimming pool installers license\certification based on the ***Association of Pool & Spa Professionals*** (APSP) standards.
6. **Discuss** Advisory Committee make-up.
   a.) Cannabis
   b.) Geotechnical
   c.) Fire Prevention\Fire Protection (FPFP)
   d.) Others
7. **Discuss** progress of Manufactured Buildings Study Group.
8. **Discuss** approval of 135 new CSLs issued in the month of September, 2018.
9. **Discuss\Vote**
   CSL Average Passing Score\Medical\Military\Age or Continuing Education Requirements.
   a.) xxx
10. **Discuss** 2019 meeting dates.
11. **Discuss** BCAB and full Board Training.
12. **Discuss** other matters not reasonably anticipated 48 hours in advance of meeting.

11-1-2018

The Commonwealth of Massachusetts
Department of Public Safety
Board of Building Regulations and Standards
One Ashburton Place, Room 1301
Boston, Massachusetts 02108-1618

Phone (617) 727-3200
Fax (617) 727-5732
www.mass.gov/dps

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Daniel Bennett
Secretary

Matthew Moran
Commissioner

Richard Crowley
Chairman

Robert Anderson
Administrator

MASSACHUSETTS STATE BUILDING CODE – CODE AMENDMENT FORM

Impacted code:	☐ 10th Edition Base Code ☒ 10th Edition Residential Code	State Use Only	
Date Submitted:	**10/12/18**	Date Received:	
Code Section:	**R 401.2, R407**	Code Change Number:	111-2018
Name of proponent:	**Kevin Rose**		
Company / Organization represented, if any:	**Mass Save** Check ☐ if representing self		
Address (number, street, city, state, ZIP):	**Mass Save is a collaborative of Massachusetts' natural gas and electric utilities and energy efficiency service providers, including Berkshire Gas, Blackstone Gas Company, Cape Light Compact, Columbia Gas of Massachusetts, Eversource, Liberty Utilities, National Grid and Unitil.**		
Telephone number:	**781.907.3595**		
Email address:	**Kevin.Rose@nationalgrid.com**		

PLEASE CHECK OFF THE TYPE OF AMENDMENT PROPOSED

☒ Change existing section language ☒ Add new section ☐ Delete existing section and substitute
☐ Delete existing section, no substitute ☐ Other, Explain: _____

PLEASE TYPE THE PROPOSED AMENDMENT BELOW. If you propose to change a section, please copy the original text from either the relevant model code and/or MA amendment. Indicate, with a strikethrough, the text that you propose to delete. Please also indicate any new text in both *italic* and red font. Finally, for each proposal submitted, please provide the justification items requested below. Completed code amendment forms may be emailed to Felix Zemel, Director of Code Development and Manufactured Buildings at felix.zemel@state.ma.us. Please attach additional pages as necessary.

Existing language and Proposed changes:

1) Amend section R401.2 as follows:

R401.2 Compliance
Projects shall comply with the following:

1. Sections R401 through R404 *and R407*.
2. Section R405 and the provisions of Sections R401 through R404 indicated as "Mandatory"
3. The energy rating index (ERI) approach in Section R406.

2) Add new section R407 as follows:

R407 Additional Efficiency Packages

R407.1 Requirements (Prescriptive)
Projects shall comply with at least one of the following:

1. *More efficient HVAC performance in accordance with Section R407.2*
2. *Heat recovery ventilation (HRV) system in accordance with Section R403.6.1. The Exception in R403.6.1 shall not be applied if used for compliance with this Section.*
3. *High efficiency water heater or solar thermal hot water heater in accordance with Section R407.3*

R407.2 More efficient HVAC performance. *Heating and cooling equipment shall meet at least one of the following efficiency requirements:*

1. *Gas, propane or oil-fired furnaces shall have a minimum AFUE of 95%*
2. *Gas, propane or oil-fired boilers shall have a minimum AFUE of 95%*
3. *Closed-loop ground source heat pump with a minimum COP of 3.5.*

R407.3 High efficiency water heating or solar thermal hot water heater. *Hot water heating systems shall meet one of the following:*

1. *Natural gas or propane water heating with a minimum Uniform Energy Factor (UEF) of 0.87 or electric heat pump hot water heater with a minimum UEF of 2.2 in accordance with DOE 10 CFR Part 430, Subpart B, Appendix E. On-demand natural gas or propane water heaters shall not include any buffer tank or hot water storage capacity outside the water heater itself.*
2. *A solar thermal hot water heating system with a minimum of 40 square feet of gross collection area. The solar hot water heating panels shall have a total solar resource fraction that is not less than 75%.*

3) Add new Referenced Standard to Chapter 6 [RE] as follows:

Background and rationale: This proposal seeks to secure a nontrivial increase in efficiency for homes built to the new state energy code compared to the current code while providing builders with flexibility in how to achieve this added efficiency. The proposal promotes more efficient heating and water heating equipment without violating federal equipment preemption laws associated with the miniumum efficiency levels provided by NAECA. This is achieved by making these improvements optional and including a third option that requires mechanical ventilation be delivered by an HRV. Making HRV optional serves to promote balanced ventilation – an integral strategy for the ultra-low energy use homes – without mandating it. The "choose one of three options" structure of this section intentionally mirrors the first version of Section C406 of the commercial code.

The efficiency levels proposed are derived from a rigorous, third party study from 2016 of 146 new homes built in Massachusetts. Below is justification information for both the heating and water heating options.

- Heating: Tables 51, 52, 53, and 54 show that the median AFUE of gas and propane furnaces and boilers installed in Massachusetts is consistently 95-96% regardless of the code the home was built to (whereas the three oil furnaces and boilers in this sample had an AFUE of 83-85%). Table 57 whoes that there was only one ground source heat pump included in the sample, and it had a COP of 4.0. As such the target COP was reduced to 3.5 to avoid being too aggressive.
- Water heating: Table 73 shows the average and median Energy Factor for all fossil fuel indirect water heaters was 0.87. Instantaneous solutions deliver higher Energy Factors than 0.87 for almost all of the 43 products in the sample. And, for 16 heat pump water heaters in the sample, the median Energy Factor was 2.45. As with the the ground source heat pump efficiency level below, we have reduced the efficiency target for heat pump water heaters to 2.2, which was selected to ensure alignment with Energy Star product certification requirements across all productsizes and capacities. Notably, we have proposed using the "new" Uniform Energy Factor (UEF) as the metric for water heaters and have provided a supporting reference standard.

The basis of this requirement and the source of the solar thermal requirement is the 2016 Stretch Code Supplement to the 2016 New York State Energy Conservation Construction Code. Development of this resource was led by New Buildings Institute.

Pros of the proposed change: First, it reduces electricity and/or gas cost for owners/occupants of new homes. Second, it better aligns stringency of Prescriptive path with HERS path (R406) while providing builders with flexibility for achieving this added efficiency. Third, it mirrors Section C406 to simplify ease of use of the code for code officials, builders, designers, subcontractors, and others who work on both residential and commercial projects.

Cons of the proposed change: Increases first cost for home builder.

Estimated impact on life safety: Choosing either the *More efficient HVAC performance* or the *High efficiency water heating or solar thermal hot water heater* options would, by nature of the efficiency levels set, require either sealed combustion or technologies that do not require combustion. All such solutions significantly or completely reduce the life safety risks associated with backdrafting of combustion byproducts into the living space. Chooseing the HRV option, on the other hand, replaces the typical incumbent exhaust-only strategy for mechanical ventilation with a balanced ventilation system. Balanced ventilation has the benefit of improving the quality of the air supplied to a home by drawing the air directly from outside (as opposed to drawing it in a much less controlled manner through cracks and gaps in wall cavities as in exhaust-only approaches).

Estimated impact on cost: Incremental cost for this measure is difficult to measure due to the wide array of compliance options available.

287 17th Street, Suite 300
Oakland, CA 94612
Tel: (510) 834-6420
Fax: (510) 834-6421
www.kw-engineering.com

Technical Contact
Alison Farmer, PhD
(510) 229-5649
afarmer@kw-engineering.com

Memo: VAV Lab Exhaust Controls

Expedited Services: Applicability of CA Title 24 2019 CASE Report Results to MA Market
Date: September 23, 2018
Client Contact: Brendan Giza-Sisson, david.giza-sisson@eversource.com

Summary

The goal of this Expedited Services assignment was to assess the reasonability of the energy savings estimates in the CASE report for the 2019 version of California Title 24 on variable speed lab exhaust fan control, and the applicability of these estimates to the Massachusetts lab market. We also address some specific questions posed by Eversource.

We find that most of the CASE study carries across to the Massachusetts market with little modification. We recommend that a suitable formulation of the 2019 Title 24 lab exhaust efficiency requirements be investigated as a supplement to the requirements of ASHRAE 90.1.

While we have some concerns relating to the detailed CASE savings calculations, we believe that these potential issues have led to conservative savings estimates. As a cross-check on overall savings, we developed a separate analysis for wind-responsive induction exhaust fan systems in the Boston area. Our results of ~3 kWh/yr/sf of lab space are in line with the CASE report results for California. A control scheme responsive to exhaust stream chemical concentration would likely lead to similar or greater savings.

The design of all types of exhaust stacks is typically very conservative. While it was not included in 2019 Title 24, a requirement for wind-responsive controls for traditional exhaust stacks could provide significant additional energy savings.

Additional Details

Brief summary of results:

For induction exhaust fan systems, which cannot easily meet the new Title 24 prescriptive upper limit on exhaust fan power at design conditions, the CASE report predicted savings of ~4-5 kWh/yr/sf of lab space due to wind-responsive VAV operation. For traditional (non-induction) exhaust stack systems, the report predicted savings of ~1 kWh/yr/sf of lab space due to the lower power requirements of new systems designed to meet the maximum fan power allowance.

Information reviewed:

1) Codes and Standards Enhancement (CASE) Initiative: Variable Exhaust Flow Control – Final Report, August 2017
2) ASHRAE 90.1-2013
3) CA Title 24 Part 6, 2016
4) Discussions with CASE report author over email
5) Discussion with CPP Wind staff via phone call.

General validity of CASE report assumptions and methodology:

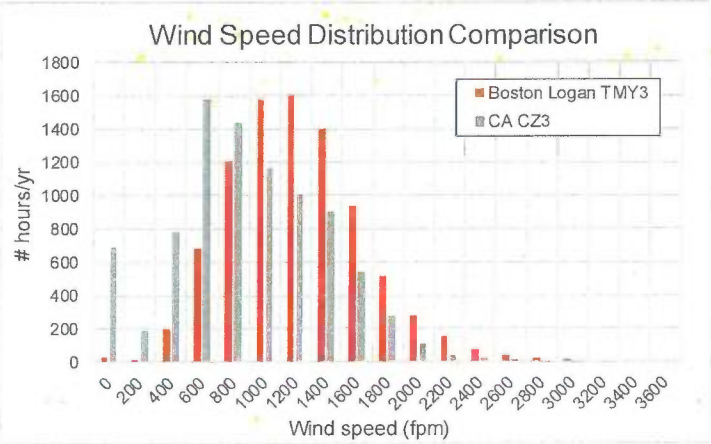
The report used a set of spreadsheet calculations based on several assumptions about exhaust fan system design and lab building design and operations. While kW Engineering did not have access to the calculation details or fan selections in baseline or proposed cases, the general assumptions appear reasonable. However, some potential issues were identified:

1) Lab sizes taken from the Center for Energy Efficient Labs (CEEL) Market Assessment (ETCC) report: the CASE study interpreted these lab sizes as corresponding to total lab areas within buildings. However, the areas given in the CEEL report represented individual lab suites within buildings. The new Title 24 requirement for wind-responsive systems does not apply to exhaust systems less than 10,000 cfm in size (corresponding to lab areas less than around 5,000-10,000 sf). All else being equal, systems with lower exhaust airflow experience lower plume rise; therefore, savings projections derived from these systems would be conservative.
2) Highly variable savings projections between California climate zones: There is no clear reason for the factor of >50-times difference between the savings projections for CZ2 (highest) and CZ14 (lowest) savings projection. The author of the report (via email conversations) did not provide an explanation for this difference, leading to concerns that some of the savings calculations could include potential issues. It appears likely that these issues would have made the savings projections more conservative.

Differences between existing MA and CA code requirements:

1) Apparent lack of applicability of Title 24 to lab occupancy: despite the name, the "L" occupancy classification, to which the CASE report states that Title 24 does not apply, is not the classification assigned to the majority of lab space in California. The majority of lab space is classified as B occupancy; typically only labs with high chemical storage requirements receive L classifications. This apparent difference between California and Massachusetts is not significant.
2) Absence of current fan power limitations for lab exhaust in Title 24: ASHRAE 90.1 includes explicit (prescriptive) fan power allowances for lab exhaust systems. Reducing these allowances might result in exhaust fan power savings for new systems; however, these savings could be accommodated in other aspects of the ventilation system design (which may already operate at variable fan speed, reducing the annual energy impact of any design changes). On a per-unit-area basis, the CASE savings associated with variable exhaust fan speed operation (for induction systems) significantly exceed those associated with the introduction of simple fan power allowances. Regardless of the existing code allowance for lab exhaust systems in ASHRAE 90.1, any wind-responsive variable speed exhaust fan operation is expected to result in significant percentage savings for exhaust fan systems of any type (except for very tall traditional stacks for which the design stack velocity is close to zero).

3) Differing wind patterns between MA and CA: on average, Massachusetts is windier than California. However, because exhaust fan systems are typically designed in a conservative manner (such that a large fraction of hours of the year do not require design stack velocity), it is not expected that this difference will result in significantly lower savings for the Boston area.



Location	ASHRAE 1% design wind speed	Average wind speed	% of hours with wind speed < 60% of 1% speed
CA CZ3 (Oakland)	23.6 mph = 2080 fpm	780 fpm	78%
Boston Logan TMY3	26.0 mph = 2290 fpm	1070 fpm	77%

Approximate Savings Calculation

We developed rough savings estimate for wind-responsive lab exhaust fan control (versus a baseline of constant exhaust fan speed operation with bypass) for Boston; see the table below. It is assumed that the majority of lab space in Massachusetts is in the greater Boston area. We performed this calculation as a cross-check on the CASE results; the calculation is designed to be conservative.

System Properties			
Induction exhaust fan bhp	0.0013	bhp/cfm	From fig 3 of CASE report; typical for 4" TSP at design conditions
Induction exhaust fan power	1.1	W/cfm	Assuming 90% motor efficiency
Typical lab ventilation rate	1.0	cfm/sf	Also used for lab exhaust rate during normal occupied hours
Exhaust fan power intensity	1.1	W/sf	of lab space (multiplying the two rows above)
Base case			
Exhaust fan power (all times)	1.1	W/sf	Bypass damper operates to keep stack velocity constant
Annual exhaust fan usage	9.4	kWh/sf	
Proposed case			
Occupied mode exhaust fan power	1.1	W/sf	No credit taken for design using dispersion study or off-design flow
Occupied hours/yr	2000	hours/yr	8h/weekday, same as CASE report
Unocc ventilation rate	0.6	cfm/sf	Assuming 40% flow reduction (typical for newer lab buildings)
Unocc exhaust fan power	0.30	W/sf	When permitted by wind conditions; power law index of 2.5 (very approx)
Unocc hours/yr	6760	hours/yr	
Fraction of low wind speed hours	77%	of hours	when wind speed is less than 60% of 1% design speed (for Boston)
Fraction of buildings with high neighbors	20%	of bldgs	Cases where stack velocity reduction is not permitted
Hours with reduced stack velocity	4164	hours/yr	From above three rows
Annual exhaust fan usage	6.2	kWh/yr/sf	
Energy Savings			
Annual exhaust fan savings	**3.2**	**kWh/yr/sf**	