

MEMORANDUM

To: Massachusetts Program Administrators (PAs), Massachusetts Energy Efficiency Advisory Council (EEAC) Consultants

From: Betty Tolkin and Katherine Weber, NMR Group

Cc: Monica Nevius, NMR Group; Zack Tyler, NMR Group; Lynn Hoefgen, NMR Group; Allen Lee, Cadmus Group; Althea Koburger, Cadmus Group

Date: June 29, 2018

Re: Analyses of Immediate Code Compliance Support Initiative Residential Classroom Training Surveys—February 14 through April 19, 2018 (TXC53)

BACKGROUND & SUMMARY OF KEY FINDINGS

This memo provides analyses of the immediate survey responses collected through paper surveys, registration data, and poll questions from two Code Compliance Support Initiative (CCSI) residential trainings. These are the first surveys to be collected since implementation of the CCSI passed from CLEAResult to Performance Systems Development (PSD). One training was held on February 14, 2018 in conjunction with Nantucket Builders' Association; the second training was held on April 19, 2018 in conjunction with the Massachusetts Building Commissioners and Inspectors Association. Both trainings focused on the residential 2015 IECC code (which became mandatory in Massachusetts at the beginning of 2017) and solar-ready provisions (which became mandatory at the beginning of 2018).

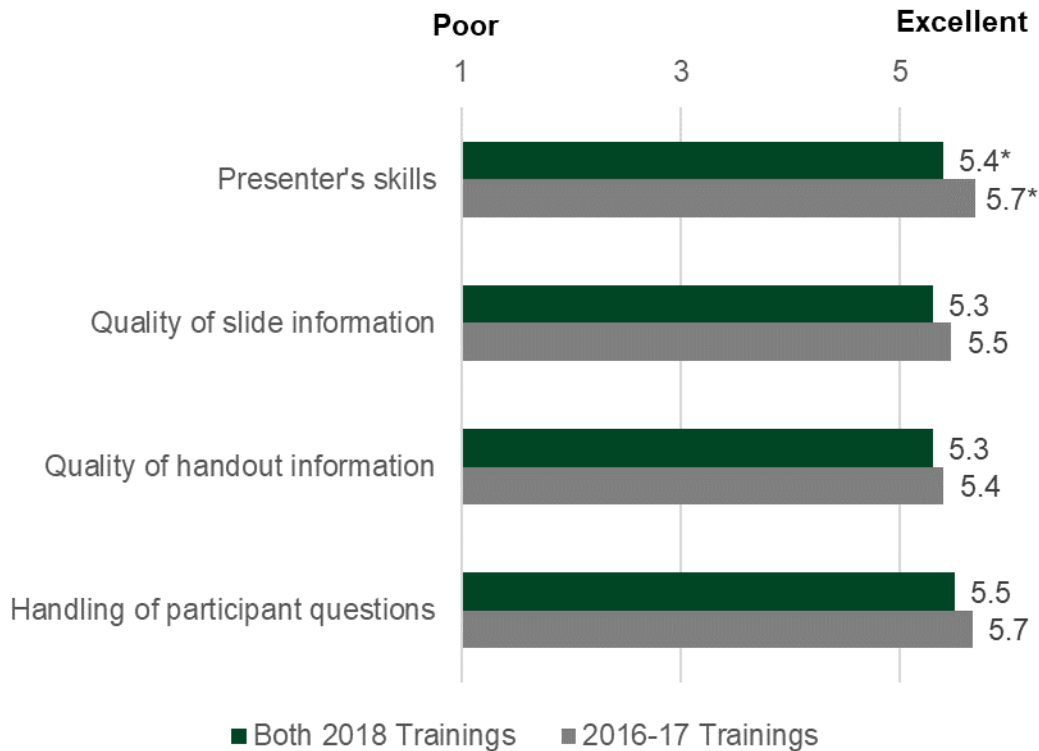
Forty-three percent of the estimated 143 attendees filled out paper survey forms. Of these survey respondents, 47 were building code officials and the remaining 15 fell into the general category of builders, architects, contractors, equipment suppliers, and others, referred to as "building professionals." Not everyone who turned in a survey form answered all the questions. The number of respondents for each individual survey question is shown in the tables throughout this memo.

Many of the immediate survey questions are the same as those fielded in the trainings conducted under the previous contractor, CLEAResult. Where applicable, we compare responses to those provided by trainees from the 28 residential trainings on the 2015 IECC energy code held from August 10, 2016 through November 21, 2017 and note where there are statistically significant differences.

Below we summarize the key findings from the immediate survey responses collected during two residential 2015 IECC trainings held in 2018. The detailed findings on which these are based can be found in Appendix A.

- **Training attendees have responded to the surveys distributed at PSD trainings at notably lower rates than to the surveys distributed at CLEAResult trainings.** Almost half (47%) of the approximately 99 code official attendees filled out immediate survey forms. Just over a third (34%) of the approximately 44 building professional attendees filled out immediate survey forms. The overall response rate to surveys distributed at the PSD trainings, 43%, is much lower than the 68% response rate from the residential trainings on the 2015 IECC held between August 10, 2016 and November 21, 2017. The lower response rates may be due to the trainings for building professionals having been held during dinner, or that the length of all the classroom trainings in 2018 was half that of 2016-17 (three hours in 2016-17 versus 1.5 hours in 2018).
- **While respondents provided generally positive feedback on the quality of the trainings, the feedback on the presenter's skills was less positive than for previous residential trainings.** On a 6-to-1 scale, in which 6 is excellent and 1 is poor, mean ratings ranged from 5.3 for the slides and handouts to 5.5 for the handling of participant questions. Almost all respondents (97%) indicated they would recommend the training to others. The latest training quality ratings, while quite high, are lower than the ratings for the 2015 IECC residential trainings conducted from August 2016 through November 2017 ([Figure 1](#)). In the case of the presenter's skills, the difference is statistically significant at the 95% confidence level. The quality ratings shown in [Figure 1](#) reflect 58 responses from the 2015 IECC trainings conducted in 2018 and 458 responses from the 2015 IECC trainings conducted in 2016 and 2017.

Figure 1: Mean Quality Ratings – Residential Trainings in 2018 and 2015 IECC Trainings in 2016-2017



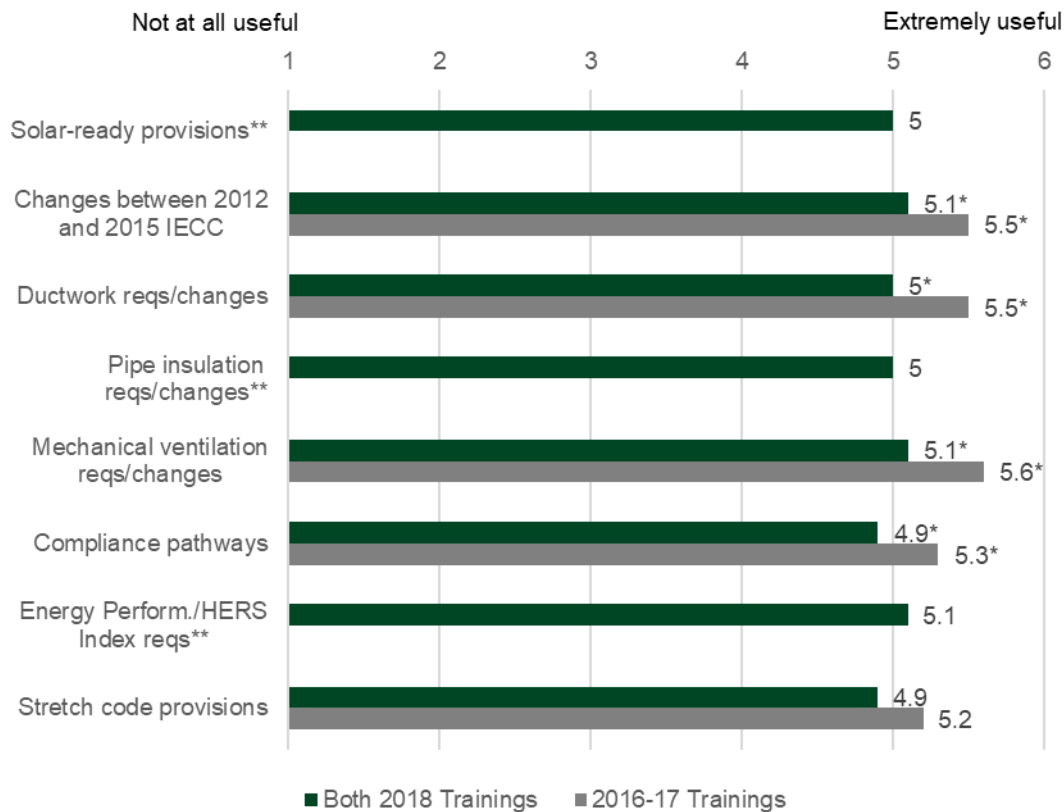
*Means are significantly different (p < 0.05).

- Using two different in-classroom response systems for all trainings since December 2014, all **training attendees indicated that an average of just over three-fifths of the permits they drew, or which were drawn in their jurisdictions, were for retrofit projects, and three out of five of these retrofits were energy-related.** Building code officials provided similar responses to the rest of trainees overall.
- **Attendees at the 2018 residential trainings perceived the trainings as less useful than attendees at the 2016 and 2017 residential trainings. It is possible that this may be due in part to the shorter length of the 2018 training.** While the 2018 usefulness ratings were quite high, Figure 2 shows they were lower than the ratings for the 2015 IECC residential trainings conducted from August 2016 through November 2017. In four areas—changes in the IECC, ductwork, mechanical ventilation, and compliance pathways—the differences are statistically significant at the 95% level. The drop in average ratings of the usefulness of information about changes between the 2012 and 2015 IECC may be due to the 2015 IECC code having been mandatory for over a year at the time of these trainings. This seems unlikely, however, as we did not see a similar drop in usefulness ratings over time in the immediate surveys from the 2012 IECC trainings held between 2014 and the spring of 2016, during which time there was a similar maturation of the code. For the 2012

IECC Envelope and Building Science trainings held from January through April of 2016, the usefulness ratings of most components were similar to that for all 2012 IECC trainings held from 2014 through the spring of 2016, while the usefulness ratings of the HVAC and Indoor Air components were generally higher. The drop in the average usefulness rating of the other three topics may be due in some part to the shorter length of the classroom trainings in 2018. The usefulness ratings shown in Figure 2 reflect 60 responses from the 2018 residential trainings and 151 to 428 responses from the 2015 IECC trainings conducted in 2016 and 2017.

- NMR calculated an overall measure of usefulness by averaging the responses for the various areas examined in all the trainings. **For the residential 2015 IECC trainings in 2018, the mean usefulness** (on a 6-to-1 scale, in which 6 is extremely useful and 1 is not at all useful) **is 5.0, compared to 5.2 for all 2015 IECC residential trainings held in 2016 and 2017; the difference is statistically significant at the 95% level.**

Figure 2: Mean Usefulness Rating of Residential Training Components in 2018



*Means are significantly different (p < 0.05). **Question was only asked in 2018.

- **Attendees found the solar ready provisions to be the most important new information provided by the trainings.** While the Massachusetts building energy code remains based on the 2015 IECC, the “solar ready” provision (i.e., the requirement that a section of the roof or building overhang in new homes is

designated and reserved for the future installation of a solar photovoltaic or solar thermal system) went into effect at the beginning of 2018. Building code officials also noted information on mechanical ventilation systems and air exchanges, while building professionals cited HERS Index requirements.

- **Attendees would appreciate more practical examples and field applications.** While relatively few respondents (13 out of 62) offered additional comments, they most often cited the need for practical applications.
- **There were 983 unique attendees at the CCSI 2015 IECC trainings between August 10, 2016 and April 19, 2018.** Four-hundred-ninety-six individuals attended only residential trainings, 294 attended only commercial trainings, and 193 individuals attended both residential and commercial trainings.
- **The sponsors may want to consider longer classroom trainings.** While there is an argument for offering shorter trainings in light of the fact that the energy code based on the 2015 IECC has been in effect since the beginning of 2017, the decline in usefulness ratings and the desire for more practical applications would argue for longer trainings. Longer classroom trainings would certainly be more essential in about a year should a new code be expected to take effect.

NMR provided summaries of the findings from the immediate residential training surveys to the sponsors and EEAC every other month in 2014, three times in 2015, and twice each in 2016 and 2017. These interim deliverables are designed to provide early feedback to PAs, EEAC, and implementers on how well specific aspects of the trainings are being received. We are providing this memo after collecting fewer responses than in the past in order to provide timely feedback after the switch in implementation contractors. A listing of the residential and commercial immediate survey memos previously provided can be found in [Appendix B](#).

Appendix A Detailed Findings

A.1 USEFULNESS AND QUALITY

- The surveys asked respondents to rate the usefulness of eight components of the trainings on a 1-to-6 scale, in which 6 is extremely useful and 1 is not at all useful. The 2018 usefulness ratings were quite high on average, with respondents overwhelmingly rated all the training components at 4 or higher (Table 1).
- For all but one of the training components examined in both 2018 and in surveys of 2016 and 2017 trainings, the mean 2018 usefulness ratings (between 4.9 and 5.1) were significantly lower than the mean ratings for 2016 and 2017 (between 5.2 and 5.6).¹ This difference is statistically significant at the 95% level.
- As *Means are significantly different ($p < 0.05$).
- Table 2 shows, most respondents who responded to questions about the newness of the training presented indicated that all the training components were new, at least in part.

¹ Three of the areas in the surveys used in 2018 were not part of the 2016-17 surveys.

Table 1: Usefulness Ratings for Residential Training Components

Training Component	Number of Respondents			Rating of Usefulness for Residential Trainings in 2018 (percent)						Mean Ratings for 2018 Trainings			2016-17 Trainings	
	All	Code Off.	Build/Prof.	6 – Extr. Useful	5	4	3	2	1—Not at all Useful	All	Code Off.	Build Prof.	No. of Resp	Mean
Solar-ready provisions	60	46	14	43%	28%	23%	3%	0%	3%	5.0	5.0	4.9	na	na
Changes between 2012 and 2015 IECC	60	46	14	41%	33%	20%	2%	2%	2%	5.1*	5.1	5.0	245	5.5*
Ductwork reqs/changes	60	46	14	37%	37%	18%	6%	0%	2%	5.0*	5.0	4.9	151	5.5*
Pipe insulation reqs/changes	60	46	14	37%	33%	21%	7%	0%	2%	5.0	5.0	4.9	na	na
Mechanical ventilation reqs/changes	60	46	14	47%	25%	20%	8%	0%	0%	5.1*	5.0	5.4	151	5.6*
Compliance pathways	60	46	14	33%	33%	27%	5%	0%	2%	4.9*	4.8	5.1	278	5.3*
Energy Perform./HERS Index reqs	59	46	13	45%	27%	19%	5%	2%	2%	5.1	5.0	5.2	na	na
Stretch code provisions	59	45	14	39%	31%	19%	8%	0%	3%	4.9	4.9	5.1	428	5.2

*Means are significantly different (p < 0. 05).

Table 2: Whether the Residential Training Components Were New

Training Component	All			Code Officials				Building Professionals				Mean for 2016-17		
	<i>n</i>	All or Most	Some	None	<i>n</i> *	All or Most	Some	None	<i>n</i> *	All or Most	Some	None	<i>n</i>	Yes
Solar-ready provisions	40	40%	57%	3%	32	37%	60%	3%	8	4	4	0	na	na
Changes between 2012 and 2015 IECC	39	28%	67%	5%	31	32%	61%	7%	8	1	7	0	133	65%
Ductwork reqs/changes	39	13%	72%	15%	31	13%	68%	19%	8	1	7	0	77	44%
Pipe insulation reqs/changes	39	15%	67%	18%	31	13%	68%	19%	8	2	5	1	na	na
Mechanical ventilation reqs/changes	39	13%	77%	10%	30	10%	77%	13%	9	2	7	0	78	44%
Compliance pathways	38	18%	66%	16%	30	17%	63%	20%	8	2	6	0	166	33%
Energy Perform./HERS Index reqs	38	13%	76%	11%	29	10%	80%	10%	9	2	6	1	na	na
Stretch code provisions	37	22%	62%	16%	29	21%	58%	21%	8	2	6	0	243	34%

*The number of responses is shown where sample size is less than 20.

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- Respondents also gave high ratings to the quality of the presentations (Table 3), with mean ratings ranging from 5.3 to 5.6 on a 6-to-1 scale, in which 6 is excellent and 1 is poor. The highest ratings went to the presenter’s skills and handling of participant questions. Almost all respondents said they would recommend the training to others.
- The latest training quality ratings, while quite high, are lower than the ratings for the 2015 IECC residential trainings conducted from August 2016 through November 2017; in the case of the presenter’s skills, the difference is statistically significant at the 95% level.

Table 3: Quality of Trainings
(Mean ratings on a 6 to 1 scale)

General Category	2/14	4/19	Both 2018 Trainings	2016-17 Trainings
<i>n</i>	14	44	58	458
Presenter’s skills	5.6	5.4	5.4*	5.7*
Quality of slide information	5.4	5.3	5.3	5.5
Quality of handout information	5.3	5.3	5.3	5.4
Handling of participant questions	5.6	5.5	5.5	5.7
<i>n</i> **	13	45	58	436
Percent recommending training to others	85%	100%	97%	98%

*Means between groups significantly different ($p < 0.05$).

**Different numbers of respondents replied to this separate question than provided ratings above.

A.2 USE OF TRAINING

- Almost all (91%) code officials expect to have more than ten housing units permitted in their jurisdictions under 2015 IECC in 2018. Most building professionals expect to work on fewer than five units permitted under 2015 IECC; this may be due to building professionals working on more existing units (Table 4).

Table 4: Housing Units Expected Under 2015 IECC for Residential Trainees

Number of Housing Units	Expected units permitted in 2018		Expected units completed in 2018	
	Code officials	Building professionals	Code officials	Building professionals
<i>n</i> *	34	9	33	6
Less than five	3%	5	9%	3
Five to ten	6%	3	6%	1
Eleven to 100	56%	1	52%	2
More than 100	35%	0	33%	0

*The number of responses is shown where sample size is less than 20.

- When considering more specific dates, only about one-half of code officials and building professionals had already worked on or inspected a home permitted under 2015 IECC before the spring of 2018 (Table 5). Again, this may be due to trainees working on renovations not covered by the code or, for building professionals, they may simply not be aware of the code under which homes are permitted.

Table 5: When First Expect to Inspect or Work on a Home Permitted under 2015 IECC

Estimated Time Period	Code officials	Building professionals
<i>n</i> *	45	13
Before January 2018	29%	3
January through March 2018	20%	3
April through June 2018	29%	1
July through September 2018	9%	4
October through December 2018	11%	2
Don't know	2%	0

*The number of responses is shown where sample size is less than 20.

- However, as shown in Table 6, seven out of ten respondents said they expected to use the training immediately, with an additional one-quarter saying they expected to

use it within the next six months. These responses are fairly consistent with those provided to date, indicating that the trainings are providing trainees with useful information that has immediate applications.

Table 6: Expected First Use Training Information

Expected First Use of Training Information	2018 Residential Trainings			2016 to 2017 Trainings		
	Code Officials	Building professionals	Total	Code Officials	Building professionals	Total
<i>n</i> *	44	13	57	278	156	434
As soon as I return to work	70%	9	70%	64%	57%	62%
Sometime in the next three months	14%	0	11%	25%	24%	25%
In the next four to six months	11%	3	14%	9%	14%	11%
In the next seven to twelve months	2%	0	2%	1%	3%	2%
More than a year from now	2%	1	3%	0%	2%	1%
Not likely to ever use it	0%	0	0%	0%	0%	0%

*The number of responses is shown where sample size is less than 20.

A.3 MOST IMPORTANT NEW INFORMATION AND OTHER QUALITATIVE DATA

- Not surprisingly, both building code officials and building professionals found the solar ready provisions to be the most important new information provided by the trainings (Table 7). While the Massachusetts building energy code remains based on the 2015 IECC, the “solar ready” provision (i.e., the requirement that a section of the roof or building overhang in new homes is designated and reserved for the future installation of a solar photovoltaic or solar thermal system) went into effect at the beginning of 2018. Building code officials also noted information on mechanical ventilation systems and air exchanges, while building professionals cited HERS Index requirements.

Table 7: Most Important New Information Provided by the Trainings
(Percent; multiple response)

General Category	Building Code Officials	Building Professionals	All Trainees
<i>n*</i>	30	12	42
Solar ready provisions	33%	6	38%
Mechanical ventilation systems and air exchanges	30%	0	21%
2015 IECC code changes	13%	1	12%
Everything - general overview	13%	0	10%
HERS Index requirements	0	3	7%
Stretch code requirements	3%	1	5%
Pipe insulation requirements	3%	1	5%
Codes apply to new homes and additions	3%	1	5%
Air leakage information	0	1	2%

*The number of responses is shown where sample size is less than 20.

- Building code officials mostly said the trainings provided them with information useful for code enforcement and they would use this information during their plan review and building inspections and relay it to builders and contractors. Building professionals mostly said they would use this information during the construction process to make projects code compliant (Table 8).

Table 8: How Information Provided by the Trainings Will Be Used
(Percent; multiple response)

General Category	Building Code officials	Building professionals	Total
<i>n*</i>	21	9	30
General knowledge for code enforcement	33%	1	27%
Building inspections	24%	0	17%
Plan review	19%	0	13%
Relay to builders and homeowners	14%	0	10%
Use knowledge of solar readiness	10%	0	7%
Stay updated on code changes	5%	1	7%
Enforce/comply with ventilation requirements	5%	1	7%
New construction work	0%	2	7%
Approve permits for solar panels	5%	0	3%
Stretch code knowledge	5%	0	3%
Comply with electric requirements	0%	1	3%
Become a HERS rater	0%	1	3%

*The number of responses is shown where sample size is less than 20.

- Comments and suggestions for improving the trainings most often called for including more practical examples and field applications; one code official suggested having two projectors with the second set of slides providing example pictures of the written material. (This may not be practical in a classroom training, but it is an interesting concept). Several respondents also noted that the trainings and instructor were knowledgeable and provided useful information (Table 9).

Table 9: Additional Comments and Suggestions to Improve Trainings
(Multiple response; number of responses)

General Category	Building Code Officials	Building Professionals
<i>n</i>	11	2
Include more practical examples/field applications	3	1
Training and instructor were helpful/knowledgeable	2	1
Have second presenter and two projectors	1	0
Provide a frequently-asked-questions (FAQ) handout	1	0
Provide handouts with larger fonts	1	0
Provide checklists for inspections and plan review	1	
Gear presentations more to the needs of building inspectors	1	0
Provide more information on HVAC and ventilation materials	1	0
Provide more information on ductwork	1	0
The code is too burdensome for building departments	1	0

A.4 PROJECT TYPES AND LOCATIONS

- Just over three-fifths of the permits the respondents drew, or that were drawn in their jurisdictions, were for retrofit projects. Three out of five retrofits were energy-related (Table 10).
- Note that the questions asked for the portion of energy-related retrofit permits as a percent of a percent. Based on this, for all attendees, 37% of all permits would be for energy-related retrofits (0.62 times 0.60). Building code officials provided similar responses to trainees in all types of occupations.

Table 10: Proportion of Retrofit Building Permits
(Percent)

Percentage of all building permits issued	All trainees		Building code officials only	
	Retrofit portion	Portion of energy-related retrofit permits	Retrofit portion	Portion of energy-related retrofit permits
<i>n</i>	877	955	611	434
None	3%	3%	1%	2%
20%	11%	16%	8%	16%
40%	14%	18%	24%	24%
60%	25%	21%	21%	27%
80%	38%	25%	34%	25%
100%	9%	17%	12%	6%
Mean	62%	60%	63%	55%

- Survey respondents who attended the 2018 trainings examined here work in cities and towns across eastern Massachusetts.² Building professionals most often cited Nantucket, due to the location of the 2/14 training (Table 11).
- Of the 38 locations listed in Table 11, 23 use the stretch code and 15 use the code based on the 2015 IECC. Of the 59 respondents who indicated specific locations on their survey forms, 33 worked in at least one stretch code location.

² Attendees could list up to three municipalities on the survey forms.

Table 11: Cities and Towns Represented in the May through November 2017 Trainings

(Number of responses; multiple response; * indicates stretch code location)

City or Town	Code Officials	Building Prof.	Total	City or Town	Code Officials	Building Prof.	Total
Acton*	1		1	Lowell*	2		2
Barnstable		1	1	Methuen	1		1
Bedford*	3		3	Middleton	1		1
Beverly*	1		1	Nantucket		15	15
Billerica	1		1	North Andover*	2		2
Boston*	6		6	North Reading	2		2
Burlington	1		1	Peabody	1		1
Chelmsford*	2		2	Quincy*	1		1
Concord*	2		2	Salem*	1		1
Essex*	1		1	Sandwich		1	1
Everett*	2		2	Siasconset		1	1
Ft. Devens	1		1	Swampscott*	1		1
Georgetown	1		1	Tewksbury*	1		1
Gloucester*	1		1	Topsfield*	1		1
Harvard*	1		1	Watertown*	1		1
Haverhill	2		2	Wenham*	1		1
Ipswich	1		1	West Newbury*	1		1

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City or Town	Code Officials	Building Prof.	Total	City or Town	Code Officials	Building Prof.	Total
Lexington*	3		3	Wilmington	2		2
Littleton*	1		1	Winchester*	1		1

A.5 UNIQUE ATTENDEES – ALL TRAININGS

- The team calculated the number of unique trainees for all 2015 IECC trainings from August 10, 2016 through April 19, 2018 by using trainee enrollment data and completed immediate surveys. As shown in Table 12, 496 individuals have attended only residential trainings, 294 have attended only commercial trainings, and 193 individuals have attended both residential and commercial trainings.
- Over one-half of unique attendees have been code officials; the trainings have also had sizable numbers of architects in attendance. As would be expected, builders (described as those overseeing the entire construction of a home or building), and building contractors responsible for specific aspects of construction, have been much more likely to attend residential trainings. Trainees listed as “other” most often described themselves as engineers, facilities managers, or consultants to the PAs.

Table 12: Numbers of Unique Training Attendees – 8/10/16 to 4/19/18
(Number of attendees)

Position	2015 IECC Residential Training Only	2015 IECC Commercial Training Only	2015 IECC Both Res. and Com. Training	Total Unique Training Attendees
Architect or design engineer	71	80	10	161
Builder (Oversees the entire construction of a home or building)	52	23	6	81
Building code official	227	117	167	511
Building contractor	64	13	2	79
Equipment supplier	7	2	0	9
HERS rater or energy efficiency consultant	32	14	1	47
Other	37	44	7	88
Position not known*	6	1	0	7
Total unique training attendees	496	294	193	983

*Includes individuals who did not indicate their position on the registration form and a small number of individuals who attended the trainings (and filled out the immediate paper surveys), but did not register.

Appendix B

Table 13: Listing of Immediate Survey Memos Delivered

Date	Residential Immediate Surveys	Commercial Immediate Surveys
2012 IECC Trainings		
10/31/14	X	
12/29/14		X
3/13/15	X	
4/30/15		X
7/10/15	X	
7/31/15		X
12/23/15	X	
12/30/15		X
9/26/16	X	
12/5/16		X
2015 IECC Trainings		
12/21/16 (final on 1/9/17)	X	
12/30/16 (final on 1/24/17)		X
5/30/17 (final on 6/13/17)	X	
6/14/17 (final on 6/28/17)		X
1/26/18 (final on 3/6/18)	X	
2/5/18 (final on 3/6/18)		X
6/1/18	X	