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# Massachusetts Electric and Gas Program Administrators

## Cross-Cutting Code Compliance Support Initiative Evaluation Reports

**March 16, 2016**

**Prepared by:**

**NMR Group, Inc. and Cadmus**

NMR Group, Inc.

# Massachusetts Electric and Gas Program Administrators

## Cross-Cutting Code Compliance Support Initiative Evaluation Reports

**March 16, 2016**



Part of the Special and Cross-Cutting Evaluation Program Area

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# ANALYSES OF IMMEDIATE CODE COMPLIANCE SUPPORT INITIATIVE RESIDENTIAL TRAINING SURVEYS – MARCH THROUGH JUNE 2015

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| **TO:** | Massachusetts Program Administrators (PAs), Massachusetts Energy Efficiency Advisory Council (EEAC) Consultants |
| **FROM:** | Betty Tolkin and Joanne O'Donnell, NMR Group |
| **SUBJECT:** | Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys—March through June 2015 |
| **CC:** | Pam Rathbun, Tetra Tech; Lynn Hoefgen, NMR Group; Allen Lee, Cadmus Group; Holly Farah, Cadmus Group, Sara Wist, Cadmus Group |
| **DATE:** | July 10, 2015 |

This memo provides analyses of the immediate survey responses collected through paper surveys, registration data, and Audience Response Systems (ARS) from seven CCSI residential trainings held from March through June 2015. Conservation Services Group (CSG), the CCSI contractor, held four trainings on Envelope and Building Science (EBS) on March 5, March 24, May 1, and June 5. CSG held three trainings on HVAC and Indoor Air Quality (HVAC-IAQ) on April 2, May 14, and May 29. Out of an estimated 245 training attendees, 197 filled out paper survey forms.

Of the survey respondents, 69 were building code officials and the remaining 128 fell into the general category of builders, architects, contractors, equipment suppliers, and others. The preponderance of builders and others is largely due to a large number of attendees at the March 5th training held in conjunction with the annual Northeast Sustainable Energy Association (NESEA) Building Energy conference. 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 appropriate table.

The tables in this memo are similar to the ones provided on 10/31/14, 12/29/14, and 3/13/15. Most of the statistics provided in this memo are from the March through June 2015 residential trainings. In addition, we provide some overall statistics based on cumulative responses from all 30 residential trainings held from September 2014 through June 2015; these are labeled as "Sep to Jun." This memo highlights how responses have evolved over the 30 residential trainings held through June of 2015. It is important to note that the March through June attendees provided fairly positive feedback on the residential trainings, similar to the immediate survey responses for the earlier trainings. The most frequent suggestions for improvement, as shown in Table 13, are to provide more detail on code requirements, examples of how to apply the code, and handouts of the slides used in the presentations. The latter is a frequent suggestion from all respondents dating back to September 2014.

As outlined in the amended work plan dated May 5, 2015, NMR provided summaries of the findings from the immediate residential training surveys to the PAs and EEAC every other month in 2014 and after every five or six trainings in 2015. Cadmus has provided two summaries of findings from the immediate commercial training surveys to date. 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.

## USEFULNESS AND QUALITY

The surveys asked respondents to rate the usefulness of eight to ten components of the trainings on a 1-to-6 scale in which 6 is extremely useful and 1 is not at all useful. As shown in Table 1, mean ratings for EBS training components ranged from 4.8 to 5.4, while mean ratings for HVAC-IAQ training components ranged from 4.9 to 5.4 (Table 3). In general, the ratings from the March through June trainings are slightly higher than the ratings for all trainings from September through June.

The survey respondents still overwhelmingly rated all the training components listed as 4, 5, or 6 in terms of usefulness. The most highly rated components were ventilation (HVAC-IAQ), ductwork (HVAC-IAQ), and air barrier and insulation installation (EBS). Builders and others gave slightly higher mean ratings than code officials to the various training components; again, MassSave incentives were, not surprisingly, quite more useful for builders.

The immediate surveys also asked if the material in the various components was new to the respondents (Table 2 and Table 4). As was the case in the earlier trainings, fewer respondents answered this question than provided ratings of usefulness. The training components most likely to contain new information for the attendees were Mass Save New Construction incentives (EBS), the cost of change from 2009 to 2012 IECC (EBS), mechanical systems and equipment for new homes (HVAC-IAQ), system sizing (HVAC-IAQ), and a case study of high-performance enclosures (EBS). For most training components, builders and others were more likely than code officials to say the material was new to them.

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys – March through June 2015…*

**Table 1. Usefulness Ratings for Envelope Building Science Training Components**

| | | Rating of Usefulness for Mar thru Jun (percent) | | | | | | | Mean Ratings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Training Component | n | 6—Extr Use | 5 | 4 | 3 | 2 | 1—Not at all Use | NA/ Don't Know | Mar thru Jun | September thru June | | |
| | | | | | | | | | | All | Code Officials | Builders/Others |
| Cost of change: 2009 to 2012 IECC | 121 | 34% | 25% | 15% | 9% | 2% | 2% | 13% | 4.8 | 4.5 | 4.3 | 4.7 |
| Prescriptive, trade-off, performance compliance paths | 122 | 41% | 39% | 13% | 5% | 1% | 1% | 1% | 5.1 | 4.9 | 4.9 | 4.9 |
| Insulation | 125 | 50% | 37% | 10% | 2% | 1% | 0% | 0% | 5.3 | 5.1 | 5.1 | 5.2 |
| The Enclosure: foundation, etc. | 125 | 50% | 31% | 14% | 3% | 2% | 2% | 0% | 5.3 | 5.0 | 5.0 | 5.1 |
| Air barrier and insulation installation | 127 | 57% | 27% | 13% | 2% | 1% | 0% | 0% | 5.4 | 5.2 | 5.2 | 5.2 |
| Blower door testing | 126 | 41% | 25% | 22% | 10% | 2% | 0% | 0% | 5.0 | 4.9 | 4.9 | 4.9 |
| Case study - High performance enclosures | 116 | 41% | 27% | 16% | 7% | 3% | 0% | 6% | 5.0 | 4.8 | 4.8 | 4.8 |
| Lighting requirements | 119 | 37% | 26% | 23% | 7% | 4% | 0% | 3% | 4.9 | 4.6 | 4.6 | 4.6 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stretch code | 117 | 40% | 25% | 17% | 8% | 5% | 3% | 2% | 4.8 | 4.6 | 4.5 | 4.7 |
| Mass Save New Construction incentives | 118 | 40% | 26% | 19% | 10% | 2% | 0% | 3% | 5.0 | 4.7 | 4.5 | 4.8 |

**Table 2. Whether the Envelope Building Science Training Components Were New**

| Component | March thru June | | September through June | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | All | | Code Officials | | Builders and Others | |
| | n | Yes | n | Yes | n | Yes | n | Yes |
| Cost of change: 2009 to 2012 IECC | 80 | 60% | 224 | 40% | 125 | 30% | 99 | 53% |
| Prescriptive, trade-off, performance compliance paths | 78 | 41% | 228 | 26% | 128 | 17% | 100 | 38% |
| Insulation | 77 | 21% | 272 | 15% | 163 | 15% | 109 | 14% |
| The Enclosure: foundation, etc. | 77 | 27% | 222 | 20% | 123 | 19% | 99 | 21% |
| Air barrier and insulation installation | 78 | 29% | 225 | 24% | 126 | 24% | 99 | 24% |
| Blower door testing | 77 | 25% | 221 | 19% | 122 | 16% | 99 | 23% |
| Case study - High performance enclosures | 72 | 44% | 203 | 39% | 113 | 39% | 90 | 40% |
| Lighting requirements | 74 | 39% | 260 | 31% | 154 | 29% | 106 | 34% |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Stretch code | 74 | 34% | 204 | 23% | 113 | 17% | 91 | 30% |
| Mass Save New Construction incentives | 74 | 62% | 260 | 45% | 154 | 41% | 106 | 51% |

**Table 3. Usefulness Ratings for HVAC Indoor Air Quality Training Components**

| | | Rating of Usefulness for Mar thru Jun (percent) | | | | | | | Mean Ratings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Training Component | n | 6— Extr Use | 5 | 4 | 3 | 2 | 1— Not at all Use | NA/ Don't Know | Mar thru Jun | September thru June | | |
| | | | | | | | | | | All | Builders /Others | Code Officials |
| 2012 IECC overview | 58 | 46% | 36% | 12% | 0% | 2% | 2% | 2% | 5.3 | 5.2 | 5.3 | 5.2 |
| Indoor air quality | 58 | 45% | 38% | 13% | 2% | 0% | 0% | 2% | 5.3 | 5.1 | 5.2 | 5.1 |
| Ventilation | 58 | 52% | 33% | 10% | 3% | 0% | 0% | 2% | 5.4 | 5.3 | 5.5 | 5.2 |
| Ductwork | 58 | 50% | 36% | 9% | 3% | 0% | 0% | 2% | 5.4 | 5.3 | 5.5 | 5.2 |
| Stretch code | 56 | 29% | 20% | 21% | 7% | 3% | 2% | 18% | 5.1 | 5.0 | 5.1 | 5.0 |
| System sizing* | 55 | 38% | 24% | 25% | 7% | 4% | 0% | 2% | 4.9 | 4.8 | 4.8 | 4.8 |
| Mechanical systems/equipment for | 56 | 39% | 29% | 20% | 5% | 2% | 0% | 5% | 5.1 | 5.0 | 5.2 | 4.9 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| super-efficient homes | | | | | | | | | | | | |
| Lighting requirements | 57 | 28% | 32% | 21% | 11% | 3% | 0% | 5% | 4.9 | 4.8 | 4.9 | 4.8 |
| Mass Save New Construction incentives | 58 | 36% | 29% | 19% | 9% | 0% | 0% | 7% | 5.1 | 5.0 | 5.3 | 4.8 |

**Table 4. Whether the HVAC Indoor Air Quality Training Components Were New**

| Component | March thru June | | September through June | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | All | | Code Officials | | Builders and Others | |
| | n | Yes | n | Yes | n | Yes | n* | Yes |
| 2012 IECC overview | 35 | 29% | 125 | 36% | 95 | 31% | 30 | 53% |
| Indoor air quality | 35 | 31% | 120 | 30% | 91 | 31% | 29 | 28% |
| Ventilation | 35 | 23% | 153 | 28% | 114 | 27% | 39 | 31% |
| Ductwork | 35 | 34% | 154 | 26% | 115 | 22% | 39 | 38% |
| Stretch code | 31 | 32% | 108 | 26% | 85 | 20% | 23 | 48% |
| System sizing* | 34 | 50% | 112 | 33% | 85 | 32% | 27 | 37% |
| Mechanical systems/equipment for super-efficient homes | 34 | 47% | 146 | 42% | 110 | 41% | 36 | 44% |
| Lighting requirements | 33 | 27% | 146 | 29% | 110 | 25% | 36 | 42% |
| Mass Save New Construction incentives | 35 | 40% | 149 | 40% | 113 | 40% | 36 | 42% |

Respondents also gave high ratings to the quality of the presentations (Table 5), with mean ratings ranging from 4.4 to 5.8 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 the lowest ratings—but still higher than the middle of the scale—went to the quality of the handout information. Almost all respondents (ranging from 89% to 100%) said they would recommend the training to others. The HVAC-IAQ training on 5/29 experienced some technical difficulties, which have not occurred in any other trainings since September of 2014, leading to a start time delay of more than one-half hour. This is reflected in the lower quality ratings for 5/29. Even so, the latest training quality ratings are similar to ratings for all residential trainings from September through June with the presenter's skills getting the highest rating and the quality of handout information getting the lowest rating. Moreover, recent trainees are also more likely than trainees from previous sessions to say they would recommend the trainings to others.

**Table 5. Quality of Trainings**
(mean ratings on a 6 to 1 scale)

| General Category | 3/5 EBS | 3/24 EBS | 4/2 HVAC-IAQ | 5/1 EBS | 5/14 HVAC-IAQ |
|---|---|---|---|---|---|
| n | 71 | 26 | 22 | 26 | 18 |
| Presenter's skills | 5.6 | 5.8 | 5.7 | 5.7 | 5.8 |
| Quality of slide information | 5.2* | 5.5 | 5.5 | 5.5 | 5.6 |
| Quality of handout information | 4.6 | 5.1 | 4.6 | 4.9 | 5.2 |
| Handling of participant questions | 5.3 | 5.7 | 5.7 | 5.6 | 5.8 |
| n | 73 | 26 | 22 | 26 | 18 |
| Percent recommending training to others | 93% | 96% | 100% | 100% | 100% |

| General Category | 5/29 HVAC-IAQ | 6/5 EBS | All Trainings Mar thru Jun | All Trainings Sep thru Jun | |
|---|---|---|---|---|---|
| n | 19 | 13 | 195 | 817 | |
| Presenter's skills | 5.3 | 5.6 | 5.6 | 5.6 | |
| Quality of slide information | 4.9 | 5.3 | 5.3* | 5.2* | |
| Quality of handout information | 4.4 | 4.5 | 4.7 | 4.7** | |
| Handling of participant questions | 5.2 | 5.7 | 5.5 | 5.4* | |
| n | 19 | 13 | 197 | 826 | |

| | | | | | |
|---|---|---|---|---|---|
| Percent recommending training to others | 89% | 100% | 96% | 93% | |

* Two respondents did not provide ratings for this area.
** Seven respondents did not provide ratings for this area.

The training attendees also provided feedback on the training quality through an Audience Response System (ARS) used during the presentations to indicate how much the respondents agreed with certain statements on a scale of 1 (strongly agree) to 6 (strongly disagree). As shown in Table 6, most trainees strongly agreed or agreed that the trainer was organized, prepared, knowledgeable, and informative. Most also felt that the trainer kept an appropriate pace and encouraged participation. Finally, close to nine out of ten respondents strongly agree or agree that they would recommend the training to others. While the ARS statements are not directly comparable to the paper survey questions in Table 5, the responses confirm that, in general, the respondents rate the quality of the trainings fairly highly. The mean ratings for March through June are slightly better than the ratings for all the trainings that have used an ARS.

**Table 6. ARS Ratings of Training Quality**

| | | Agreement with Statement (Percent) | | | | | | Mean | |
|---|---|---|---|---|---|---|---|---|---|
| | n* | 1—Strongly Agree | 2 | 3 | 4 | 5 | 6—Strongly Disagree | Mar thru Jun | Sep thru Jun |
| The trainer was organized and prepared | 148 | 72% | 15% | 3% | 2% | 1% | 7% | 1.6 | 1.7 |
| The trainer encouraged participation | 39 | 90% | 3% | 0% | 0% | 0% | 7% | 1.4 | 1.5 |
| The trainer was knowledgeable and informative | 102 | 76% | 16% | 6% | 0% | 1% | 1% | 1.4 | 1.6 |
| The trainer kept an appropriate pace | 36 | 75% | 14% | 0% | 3% | 5% | 3% | 1.6 | 1.6 |
| I would recommend this training | 108 | 68% | 18% | 9% | 2% | 2% | 1% | 1.5 | 1.7 |

*Not all statements were assessed at each training. Due to a system malfunction, ARS data are not available from the HVAC-IAQ training on May 29, 2015

## USE OF TRAINING

The immediate surveys asked respondents to estimate when they would be conducting final inspections of housing units permitted under 2012 IECC (building code officials) or have the units they were working on undergo final inspections (builders and others). However, close to

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one-half (48%) of September through June respondents work in cities and towns that have adopted the stretch code and thus could not answer this question. More than one-half (57%) of respondents during the March through June time period could not answer the question due to working in cities and towns that have adopted the stretch code.

Only 17 out of all 197 survey respondents indicated that they had at least some housing units currently permitted under 2012 IECC and 19 indicated that they had some final inspections of 2012 IECC units conducted. Table 7 shows the numbers of permitted units and inspections reported by the trainees who responded to this question for the March through June trainings; Table 8 shows the numbers of permitted units and inspections reported by all of the trainees who responded to this question from September through June.

**Table 7. Housing Units Permitted under 2012 IECC for March through June Trainees**

| | Currently permitted | | Final inspections to date | | Final inspections expected within one year | |
|---|---|---|---|---|---|---|
| Number of Housing Units | Code officials | Builders and others | Code officials | Builders and others | Code officials | Builders and others |
| n | 16 | 1 | 19 | 0 | 21 | 1 |
| Less than five | 4 | 1 | 9 | 0 | 24% | 1 |
| Five to ten | 3 | 0 | 2 | 0 | 14% | 0 |
| Eleven to 100 | 8 | 0 | 8 | 0 | 57% | 0 |
| More than 100 | 1 | 0 | 0 | 0 | 5% | 0 |

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

**Table 8. Housing Units Permitted under 2012 IECC for September through June Trainees**

| | Currently permitted | | Final inspections to date | | Final inspections expected within one year | |
|---|---|---|---|---|---|---|
| Number of Housing Units | Code officials | Builders and others | Code officials | Builders and others | Code officials | Builders and others |
| n* | 112 | 31 | 82 | 17 | 127 | 30 |
| Less than five | 23% | 84% | 43% | 14 | 13% | 77% |
| Five to ten | 30% | 10% | 23% | 2 | 20% | 17% |
| Eleven to 100 | 42% | 6% | 33% | 1 | 63% | 7% |
| More than 100 | 4% | 0% | 1% | 0 | 5% | 0% |

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

The surveys asked respondents who could not estimate the number of housing units under 2012 IECC and were not in stretch code communities to estimate when they would conduct a final inspection on such a unit or have a final inspection conducted on a unit they were working on. As shown in Table 9, close to one-half said they expect a final inspection in the next three months; more than one-fourth in roughly a year; and the remainder were unsure.

**Table 9. When Expect a Final Inspection on a 2012 IECC Unit**

(percent)

| | March through June | | | September through June | | |
|---|---|---|---|---|---|---|
| **Expected Final Inspection** | **Code Officials** | **Builders and Others** | **Total** | **Code Officials** | **Builders and Others** | **Total** |
| n | 32 | 15 | 47 | 199 | 71 | 270 |
| In the next three months | 59% | 2 | 45% | 49% | 34% | 45% |
| In the next four to six months | 9% | 1 | 9% | 20% | 11% | 17% |
| In the next seven to twelve months | 19% | 3 | 19% | 14% | 20% | 15% |
| More than a year from now | 0% | 2 | 4% | 2% | 10% | 4% |
| Unsure | 13% | 7 | 23% | 16% | 25% | 19% |

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

The surveys also included a simpler timing question—namely, when the respondents first expected to use something learned at the training. As shown in Table 10, a majority of respondents (62%) said they expect to use the training immediately with an additional 23% saying they expected to use it within the next three months. These responses are very similar to those provided after all the trainings from September through June. These consistent responses indicate that the trainings are providing useful information with immediate applications even for attendees in areas that have not adopted 2012 IECC.

**Table 10. When Expect to First Use Training Information**

(percent)

| | March through June | | | September through June | | |
|---|---|---|---|---|---|---|
| **Expected Use of Training** | **Code Officials** | **Builders and Others** | **Total** | **Code Officials** | **Builders and Others** | **Total** |
| n | 67 | 125 | 192 | 537 | 322 | 859 |
| As soon as I walk out the door | 73% | 53% | 62% | 73% | 55% | 66% |
| Sometime in the next three months | 18% | 26% | 23% | 16% | 28% | 20% |
| In the next four to six months | 6% | 13% | 10% | 7% | 11% | 9% |
| In the next seven to twelve months | 2% | 4% | 3% | 2% | 4% | 3% |
| More than a year from now | 0% | 1% | 1% | 2% | 2% | 2% |
| Not likely to ever use it | 1% | 1% | 1% | 0% | 0% | 0% |

## MOST IMPORTANT INFORMATION AND OTHER QUALITATIVE DATA

Respondents who attended the EBS trainings found the 2012 IECC code changes (also most often mentioned by respondents attending the HVAC-IAQ trainings), insulation requirements, air sealing information and air barrier information to be the most important new information provided by the trainings, while those attending the HVAC-IAQ trainings considered ventilation requirements and options, duct sealing, and indoor air quality being the most important new information provided (Table 11). Other areas mentioned moderately often included building envelope requirements (EBS) and the technical support, web resources, and manuals available (HVAC-IAQ).

**Table 11. Most Important New Information Provided by the Trainings (March through June)**

(percent; multiple response)

| General Category | EBS | HVAC-IAQ | All Trainings |
|---|---|---|---|
| n | 107 | 50 | 157 |
| 2012 IECC code changes | 23% | 20% | 22% |
| Air barrier information | 15% | 0% | 10% |
| Insulation requirements | 11% | 0% | 8% |
| Air sealing information | 10% | 0% | 7% |
| Stretch code information | 6% | 6% | 6% |
| Everything—general overview | 5% | 8% | 6% |
| Ventilation requirements and options | 1% | 14% | 5% |
| Duct sealing | 0% | 12% | 4% |
| Indoor air quality requirements | 1% | 10% | 4% |
| Building envelope requirements | 7% | 0% | 4% |
| Reaffirmation of current knowledge | 5% | 4% | 4% |
| No new information | 5% | 4% | 4% |
| Technical support, web resources, and manuals available | 0% | 8% | 3% |
| Blower door testing | 3% | 0% | 2% |
| Mass Save incentives | 2% | 2% | 2% |
| Radon information | 1% | 0% | 1% |
| Duct testing | 0% | 2% | 1% |
| Duct insulation | 1% | 2% | 1% |
| HERS rating information | 1% | 0% | 1% |
| Best practices | 0% | 4% | 1% |
| How to integrate energy efficiency measures | 1% | 0% | 1% |
| Importance of homeowner education | 1% | 0% | 1% |
| Other | 3% | 4% | 3% |

Building code officials mostly said they would use this information during their inspections, for code enforcement, and reviewing initial building plans. Builders and others mostly said they would use this information during the construction process, integrate it into designs, and as a general reference (Table 12). The responses from the March through June trainings are fairly similar to those from the earlier trainings, except that builders and others (who included a sizable number of architects) in the latest trainings were more likely to say they would integrate what they had learned into designs and as a general reference. These trainings also had a number of HERS raters who said they would use the information during audits.

**Table 12. How Information Provided by the Trainings Will Be Used**

(percent; multiple response)

| | March through June | | | September through June | | |
|---|---|---|---|---|---|---|
| General Category | Code Officials | Builders and Others | Total | Code Officials | Builders and Others | Total |
| n | 48 | 85 | 133 | 299 | 214 | 513 |
| During inspections | 38% | 0% | 14% | 46% | 2% | 28% |
| During construction process/apply to building practices | 0% | 31% | 20% | 2% | 38% | 17% |
| During initial planning | 10% | 2% | 5% | 14% | 7% | 12% |
| Relay to builders or contractors | 8% | 4% | 5% | 14% | 7% | 11% |
| Code enforcement | 25% | 0% | 9% | 18% | 0% | 11% |
| Integrate into design | 0% | 18% | 11% | 1% | 14% | 7% |
| As a reference | 8% | 21% | 17% | 4% | 10% | 6% |
| Educate homeowners | 4% | 4% | 4% | 5% | 6% | 5% |
| Permit approval | 4% | 0% | 2% | 6% | 2% | 4% |
| New construction applications | 0% | 1% | 1% | 2% | 3% | 2% |
| Making projects code compliant | 0% | 5% | 2% | 0% | 4% | 2% |
| Current projects | 2% | 6% | 5% | 1% | 4% | 2% |
| Planning/promoting equipment sales | 0% | 4% | 2% | 0% | 3% | 1% |
| During audits/HERS ratings | 0% | 6% | 4% | 0% | 2% | 1% |
| Focusing on air sealing/air barriers | 2% | 1% | 2% | 0% | 0% | 0% |
| Other | 21% | 22% | 22% | 10% | 18% | 13% |

The "Other" category includes better communication with construction officials, integration into training curricula, updating company materials, training staff, and meeting client needs.

Asked to provide additional comments and suggestions for improving the trainings, the few attendees who replied most often said they appreciated the fact that the training was provided. The most frequent suggestions for improvement in the March through June trainings were to provide more details on code requirements and to provide handouts of the slides used (the latter is a frequent suggestion from all respondents dating back to September 2014 (Table 13).

**Table 13. Additional Comments and Suggestions to Improve Trainings**

(percent; multiple response)

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| | March thru June Trainings | | | All Trainings Sep thru Jun |
|---|---|---|---|---|
| General Category | EBS | HVAC-IAQ | All Trainings | |
| n | 40 | 21 | 61 | 231 |
| Appreciated the training | 53% | 48% | 51% | 36% |
| Provide handouts of the slides used | 13% | 5% | 10% | 15% |
| Provide more detail on code requirements | 15% | 29% | 20% | 13% |
| Provide examples of how to apply code | 10% | 0% | 7% | 6% |
| Provide additional trainings in the future | 3% | 0% | 2% | 5% |
| Extend the training session time | 0% | 0% | 0% | 3% |
| Improve slide image quality | 5% | 0% | 3% | 3% |
| Provide more up to date information | 0% | 0% | 0% | 3% |
| Further focus on the stretch code and related changes | 0% | 10% | 3% | 2% |
| Limit distracting side conversations | 0% | 0% | 0% | 2% |
| Provide more trainings for contractors | 0% | 5% | 2% | 2% |
| Provide checklists | 0% | 5% | 2% | 2% |
| Give examples of products to use to meet requirements | 0% | 0% | 0% | 1% |
| Shorten training session time | 5% | 0% | 3% | 1% |
| Other | 15% | 14% | 15% | 19% |

The “Other” category includes providing more information on energy savings and CO2 reduction, providing trainings sooner after code adoption, educating homeowners, having larger training rooms, focusing on costs and benefits, having more trainings on trainings on Manuals J, S and D, providing more information about incentives, and better organizing presentations.

## TRAINING ATTENDEE DATA

Over one-third of the March through June training attendees who completed surveys work as building code officials; there continues to be increase in the proportion of attendees who are not code officials over earlier trainings. The increase in architects is largely due to their attendance at the training held in conjunction with a Northeast Sustainable Energy Association (NESEA) Conference on March 5. Table 14 presents more detailed self-descriptions of the trainees' positions.

**Table 14. Training Attendees**

(percent)

| | March thru June Trainings | | | All Trainings Sep thru Jun |
|---|---|---|---|---|
| Position | EBS | HVAC-IAQ | All Trainings | |
| n* | 117 | 55 | 172 | 803 |
| Building code official | 22% | 58% | 34% | 55% |
| Builder (oversees the entire construction of a home or building) | 11% | 4% | 9% | 18% |
| Architect or design engineer | 28% | 9% | 22% | 10% |
| HERS rater or energy efficiency consultant | 9% | 16% | 11% | 5% |
| Building contractor | 13% | 0% | 9% | 5% |
| Other | 17% | 13% | 16% | 7% |

a. *Does not include training attendees who filed out paper surveys but either did not register for the trainings or did not indicate their occupation when registering.

Trainees in the "other" category include wholesale product distributors, remodelers, property managers, and various employees of the PAs and implementers.

As in the earlier trainings, the majority of code officials, builders, and architects trained from March through June have been in their present positions for at least ten years (Table 15). However, the March through June trainings also had large numbers of HERS rater/energy efficiency consultants and trainees in the other category who have been at their present positions for five years or less.

**Table 15. Years in Present Position for March through June Trainees**

(percent)

| Position | n | Less than 1 year | 1 to 5 years | 6 to 10 years | 11 to 15 years | 16 to 20 years | More than 20 years |
|---|---|---|---|---|---|---|---|
| Building code official | 69 | 10% | 16% | 10% | 16% | 20% | 28% |
| Builder (oversees the entire construction of a home or building) | 20 | 0% | 5% | 5% | 15% | 5% | 70% |
| Building contractor | 18* | 1 | 3 | 5 | 2 | 3 | 4 |
| Architect or design engineer | 52 | 2 | 6 | 10 | 17 | 8 | 57 |
| HERS rater or energy efficiency consultant | 22 | 32 | 32 | 4 | 0 | 27 | 5 |
| Equipment supplier | 6* | 2 | 0 | 1 | 0 | 0 | 3 |
| Other | 41 | 12 | 44 | 10 | 7 | 19 | 17 |

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

Residential trainings held from December through June used ARS to develop estimates of the proportion of all building permits that are drawn for retrofit projects and, for the retrofit projects, the proportion of building permits that are energy-related. As shown in Table 16, the respondents indicated an average of almost two-thirds of the permits they drew or were drawn in their jurisdictions were for retrofit projects and close to three out of five retrofits are energy-related. Building code officials provided similar responses to all trainees.

**Table 16. Proportion of Retrofit Building Permits**

(percent)

| | All trainees | | Building code officials only | |
|---|---|---|---|---|
| **Percentage of all building permits issued** | **Retrofit portion** | **Portion of energy-related retrofit permits** | **Retrofit portion** | **Portion of energy-related retrofit permits** |
| n | 338 | 313 | 135 | 125 |
| None | 2% | 3% | 2% | 0% |
| 20% | 9% | 21% | 13% | 26% |
| 40% | 16% | 16% | 14% | 19% |
| 60% | 30% | 17% | 30% | 23% |
| 80% | 36% | 24% | 38% | 25% |
| 100% | 7% | 19% | 3% | 7% |
| Mean | 62% | 58% | 60% | 53% |

The survey respondents work in cities and towns across Massachusetts (they could list up to three municipalities on the survey forms). The March through June trainees work across Massachusetts; Boston, Cambridge, and Newton are listed most frequently (Table 17).

**Table 17. Cities and Towns Represented in the March through June Trainings**

(number of responses; multiple response)

| City or Town | Code Officials | Builders and Others | Total | City or Town | Code Officials | Builders and Others | Total |
|---|---|---|---|---|---|---|---|
| Acton | 0 | 2 | 2 | Boxford | 0 | 1 | 1 |
| Agawam | 0 | 1 | 1 | Braintree | 0 | 1 | 1 |
| Amesbury | 0 | 1 | 1 | Bridgewater | 0 | 1 | 1 |
| Amherst | 0 | 1 | 1 | Brockton | 0 | 5 | 5 |
| Andover | 0 | 2 | 2 | Brookline | 6 | 3 | 9 |
| Arlington | 0 | 3 | 3 | Buckland | 0 | 1 | 1 |
| Ashburnham | 0 | 1 | 1 | Cambridge | 0 | 13 | 13 |
| Attleboro | 0 | 1 | 1 | Canton | 0 | 1 | 1 |
| Barre | 0 | 1 | 1 | Charlton | 2 | 0 | 2 |
| Belmont | 0 | 3 | 3 | Chelsea | 4 | 0 | 4 |
| Bernardston | 0 | 2 | 2 | Cohasset | 0 | 1 | 1 |
| Beverly | 0 | 2 | 2 | Concord | 0 | 4 | 4 |
| Bolton | 1 | 1 | 2 | Dighton | 3 | 0 | 3 |
| Boston | 22 | 1 | 23 | Dunstable | 1 | 0 | 1 |

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys – March through June 2015…*

| City or Town | Code Officials | Builders and Others | Total | City or Town | Code Officials | Builders and Others | Total |
|---|---|---|---|---|---|---|---|
| Boxborough | 0 | 1 | 1 | East Longmeadow | 0 | 1 | 1 |
| Easthampton | 0 | 1 | 1 | Holyoke | 0 | 1 | 1 |
| Easton | 0 | 1 | 1 | Hudson | 0 | 1 | 1 |
| Edgartown | 0 | 4 | 4 | Hull | 0 | 1 | 1 |
| Essex | 2 | 1 | 3 | Ipswich | 0 | 1 | 1 |
| Fall River | 2 | 0 | 2 | Lakeville | 0 | 1 | 1 |
| Falmouth | 0 | 2 | 2 | Leominster | 0 | 1 | 1 |
| Framingham | 1 | 3 | 4 | Lexington | 0 | 5 | 5 |
| Freetown | 1 | 0 | 1 | Lincoln | 1 | 0 | 1 |
| Fitchburg | 0 | 2 | 2 | Longmeadow | 0 | 3 | 3 |
| Gloucester | 2 | 2 | 4 | Lowell | 0 | 1 | 1 |
| Grafton | 2 | 0 | 2 | Lunenburg | 2 | 0 | 2 |
| Great Barrington | 0 | 1 | 1 | Lynn | 1 | 0 | 1 |
| Greenfield | 0 | 3 | 3 | Malden | 0 | 1 | 1 |
| Groton | 1 | 0 | 1 | Manchester | 0 | 3 | 3 |
| Hamilton | 0 | 2 | 2 | Mansfield | 0 | 1 | 1 |
| Hanover | 0 | 1 | 1 | Marblehead | 2 | 3 | 5 |

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys – March through June 2015…*

| City or Town | Code Officials | Builders and Others | Total | City or Town | Code Officials | Builders and Others | Total |
|---|---|---|---|---|---|---|---|
| Haverhill | 1 | 2 | 3 | Marlboro | 0 | 1 | 1 |
| Hingham | 0 | 2 | 2 | Marshfield | 0 | 5 | 5 |
| Holden | 2 | 0 | 2 | Medford | 0 | 2 | 2 |
| Methuen | 0 | 1 | 1 | Norwell | 0 | 1 | 1 |
| Middleton | 0 | 1 | 1 | Norwood | 2 | 0 | 2 |
| Millbury | 1 | 0 | 1 | Oak Bluffs | 0 | 2 | 2 |
| Millis | 0 | 1 | 1 | Oakham | 1 | 0 | 1 |
| Milton | 0 | 1 | 1 | Palmer | 0 | 1 | 1 |
| Nahant | 0 | 1 | 1 | Peabody | 0 | 1 | 1 |
| Nantucket | 0 | 2 | 2 | Pittsfield | 0 | 2 | 2 |
| Natick | 0 | 2 | 2 | Plymouth | 0 | 1 | 1 |
| Needham | 1 | 1 | 2 | Quincy | 1 | 0 | 1 |
| New Bedford | 0 | 1 | 1 | Raynham | 1 | 0 | 1 |
| Newbury | 0 | 3 | 3 | Salem | 0 | 2 | 2 |
| Newburyport | 2 | 9 | 11 | Salisbury | 0 | 2 | 2 |
| Newton | 1 | 12 | 13 | Scituate | 0 | 3 | 3 |
| North Andover | 1 | 2 | 3 | Sharon | 0 | 1 | 1 |

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys – March through June 2015…*

| City or Town | Code Officials | Builders and Others | Total | City or Town | Code Officials | Builders and Others | Total |
|---|---|---|---|---|---|---|---|
| North Reading | 1 | 0 | 1 | Shelburne | 0 | 1 | 1 |
| Northampton | 0 | 2 | 2 | Sherborn | 0 | 2 | 2 |
| Northboro | 1 | 3 | 4 | Shrewsbury | 1 | 0 | 1 |
| Northbridge | 1 | 0 | 1 | Somerville | 1 | 5 | 6 |
| Northfield | 0 | 2 | 2 | Southwick | 0 | 1 | 1 |
| Springfield | 0 | 8 | 8 | Wellesley | 1 | 3 | 4 |
| Stockbridge | 0 | 1 | 1 | West Bridgewater | 1 | 0 | 1 |
| Stoughton | 0 | 1 | 1 | West Newbury | 0 | 3 | 3 |
| Stow | 0 | 1 | 1 | West Springfield | 0 | 2 | 2 |
| Swampscott | 1 | 2 | 3 | Westboro | 0 | 1 | 1 |
| Sudbury | 0 | 1 | 1 | Westford | 2 | 1 | 3 |
| Templeton | 1 | 0 | 1 | Westminster | 0 | 2 | 2 |
| Topsfield | 0 | 1 | 1 | Weston | 0 | 3 | 3 |
| Townsend | 1 | 0 | 1 | Westwood | 1 | 1 | 2 |
| Uxbridge | 1 | 0 | 1 | Wilbraham | 0 | 1 | 1 |
| Vineyard Haven | 0 | 1 | 1 | Williamstown | 0 | 2 | 2 |
| Walpole | 1 | 1 | 2 | Winchester | 0 | 5 | 5 |

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys – March through June 2015…*

| City or Town | Code Officials | Builders and Others | Total | City or Town | Code Officials | Builders and Others | Total |
|---|---|---|---|---|---|---|---|
| Waltham | 0 | 6 | 6 | Winthrop | 1 | 0 | 1 |
| Watertown | 1 | 0 | 1 | Worcester | 4 | 3 | 7 |
| Wayland | 3 | 1 | 4 | | | | |

## UNIQUE ATTENDEES – ALL TRAININGS

The team calculated the number of unique trainees for all trainings from September 23, 2014 through June 17, 2015 by using trainee enrollment data and completed immediate surveys. As shown in Table 18, residential trainings had 870 unique attendees and the commercial trainings had 427 unique attendees; 144 individuals have attended both residential and commercial trainings. More than four out of ten unique attendees have been code officials; the trainings have also had sizable numbers of architects in attendance. Builders, described as those overseeing the entire construction of a home or building, and building contractors responsible for specific aspects of construction, as would be expected, have been much more likely to attend residential trainings. Trainees listed as "other" most often described themselves as engineers or consultants to the PAs. This table will be updated for each memo, residential and commercial, provided on the immediate training surveys.

**Table 18. Numbers of Unique Training Attendees**

(Number of attendees)

| Position | All Residential Trainings | All Commercial Trainings | All Trainings— Both Res and Com |
|---|---|---|---|
| Building code official | 443 | 162 | 493 |
| Builder (oversees the entire construction of a home or building) | 117 | 8 | 124 |
| Architect or design engineer | 89 | 88 | 162 |
| Building contractor | 53 | 13 | 64 |
| HERS rater or energy efficiency consultant | 37 | 28 | 64 |
| Equipment supplier | 18 | 18 | 31 |
| Other | 58 | 54 | 106 |
| Position not known* | 55 | 56 | 109 |
| Total unique training attendees | 870 | 427 | 1153 |

*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.

# ANALYSES OF IMMEDIATE CODE COMPLIANCE SUPPORT INITIATIVE RESIDENTIAL TRAINING SURVEYS—SEPTEMBER THROUGH DECEMBER 2015

| | |
|---|---|
| **TO:** | Massachusetts Program Administrators (PAs), Massachusetts Energy Efficiency Advisory Council (EEAC) Consultants |
| **FROM:** | Betty Tolkin and Joanne O'Donnell, NMR Group |
| **SUBJECT:** | Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys—September through December 2015 |
| **CC:** | Pam Rathbun, Tetra Tech; Lynn Hoefgen, NMR Group; Allen Lee, Cadmus Group; Holly Farah, Cadmus Group, Althea Koburger, Cadmus Group |
| **DATE:** | December 24, 2015 |

This memo provides analyses of the immediate survey responses collected through paper surveys, registration data, and Audience Response Systems (ARS) from nine CCSI residential trainings held from September through December of 2015. CLEAResult, the CCSI contractor, held four trainings on Envelope and Building Science (EBS) on September 29, October 7, October 20, and December 10. CLEAResult held five trainings on HVAC and Indoor Air Quality (HVAC-IAQ) on September 18, September 29, October 29, November 12, and December 1. Out of an estimated 197 training attendees, 146 filled out paper survey forms.

Of the survey respondents, 70 were building code officials and the remaining 76 fell into the general category of builders, architects, contractors, equipment suppliers, and others. 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 appropriate table.

The tables in this memo are similar to the ones provided on 10/31/14, 12/29/14, 3/13/15, and 7/10/15. Most of the statistics provided in this memo are from the September through December 2015 residential trainings. In addition, we provide some overall statistics based on cumulative responses from all 38 residential trainings held from September 2014 through December 2015; these are labeled as "2014 to 2015." This memo highlights how responses have evolved over the 38 residential trainings held through December of 2015.

It is important to note that the September through December of 2015 attendees provided fairly positive feedback on the residential trainings, similar to the immediate survey responses for the earlier trainings. The most recent immediate survey respondents rated individual components of the trainings slightly higher in terms of usefulness than in past trainings, as shown in Table 1 and Table 3. The most recent attendees also rated the trainings' quality higher than earlier attendees, as shown in Table 5, most likely due to the enhancement of the handouts provided at these trainings. The most frequent suggestions for improvement, as shown in Table 13, are to provide more detail on code requirements and provide more trainings for contractors. The September through December of 2015 trainees were more likely to say they would relay the information provided to builders, contractors, and homeowners and to suggest providing more trainings for contractors than earlier trainees. If these improved responses are maintained, it may indicate that CLEAResult may have successfully responded to earlier survey feedback and made the trainings more useful.

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys—September through December 2015…*

As outlined in the amended work plan dated May 5, 2015, NMR provided summaries of the findings from the immediate residential training surveys to the PAs and EEAC every other month in 2014 and is providing three such summaries in 2015. Cadmus has provided three summaries of findings from the immediate commercial training surveys to date. 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.

## USEFULNESS AND QUALITY

The surveys asked respondents to rate the usefulness of eight to ten components of the trainings on a 1-to-6 scale in which 6 is extremely useful and 1 is not at all useful. As shown in Table 1, mean ratings for EBS training components ranged from 5.0 to 5.6, while mean ratings for HVAC-IAQ training components ranged from 4.7 to 5.4 (Table 3). The most recent September through December usefulness ratings for the EBS trainings are higher for every component than the ratings for all the trainings in 2014 and 2015. The most recent usefulness ratings for the HVAC-IAQ trainings are also higher for most components than the ratings for all the trainings in 2014 and 2015, but the differences are not as large as for the EBS components.

The survey respondents overwhelmingly rated all the training components listed as 4, 5, or 6 in terms of usefulness. The most highly rated components were air barrier and insulation installation (EBS), the enclosure and foundation (EBS), insulation (EBS), blower door testing (EBS), and ventilation (HVAC-IAQ). Builders and others gave slightly higher mean ratings than code officials to the various training components.

The immediate surveys also asked if the material in the various components was new to the respondents (Table 2 and Table 4). As was the case in the earlier trainings, fewer respondents answered this question than provided ratings of usefulness. The EBS components were generally more likely than the HVAC-IAQ components to be new for the respondents. The training components most likely to contain new information for the attendees were a case study of high-performance enclosures (EBS), the cost of change from 2009 to 2012 IECC (EBS), and Mass Save New Construction incentives (EBS and HVAC-IAQ). For most components in both types of trainings, builders and others were more likely than code officials to say the material was new to them.

**Table 19. Usefulness Ratings for Envelope Building Science Training Components**

| | | Rating of Usefulness for Sep thru Dec (percent) | | | | | | | Mean Ratings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Training Component | n | 6—Extr Use | 5 | 4 | 3 | 2 | 1—Not at all Use | NA/ Don't Know | Sep thru Dec | 2014 through 2015 | | |
| | | | | | | | | | | All | Code Officials | Builders /Others |
| Cost of change: 2009 to 2012 IECC | 68 | 37% | 25% | 13% | 4% | 3% | 1% | 16% | 5.0 | 4.6 | 4.4 | 4.8 |
| Prescriptive, trade-off, performance compliance paths | 70 | 44% | 43% | 7% | 4% | 0% | 1% | 0% | 5.2 | 5.0 | 4.9 | 5.0 |
| Insulation | 70 | 56% | 37% | 4% | 1% | 0% | 1% | 0% | 5.4 | 5.2 | 5.1 | 5.2 |
| The Enclosure: foundation, etc. | 69 | 62% | 32% | 4% | 0% | 0% | 1% | 0% | 5.5 | 5.1 | 5.1 | 5.2 |
| Air barrier and insulation installation | 70 | 63% | 34% | 1% | 0% | 0% | 1% | 0% | 5.6 | 5.3 | 5.2 | 5.3 |
| Blower door testing | 69 | 57% | 36% | 4% | 1% | 0% | 1% | 0% | 5.4 | 4.9 | 4.9 | 5.0 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Case study - High performance enclosures | 66 | 41% | 35% | 12% | 3% | 0% | 2% | 8% | 5.2 | 4.9 | 4.9 | 4.9 |
| Lighting requirements | 67 | 42% | 33% | 15% | 9% | 0% | 1% | 0% | 5.0 | 4.7 | 4.7 | 4.7 |
| Stretch code | 68 | 44% | 32% | 13% | 4% | 1% | 1% | 3% | 5.1 | 4.7 | 4.6 | 4.8 |
| Mass Save New Construction incentives | 68 | 46% | 32% | 12% | 4% | 1% | 1% | 3% | 5.2 | 4.7 | 4.6 | 4.9 |

**Table 20. Whether the Envelope Building Science Training Components Were New**

| Component | Sep thru Dec | | 2014 through 2015 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | All | | Code Officials | | Builders and Others | |
| | n | Yes | n | Yes | n | Yes | n | Yes |
| Cost of change: 2009 to 2012 IECC | 38 | 47% | 262 | 41% | 139 | 31% | 123 | 52% |
| Prescriptive, trade-off, performance compliance paths | 40 | 40% | 268 | 28% | 144 | 19% | 124 | 39% |
| Insulation | 41 | 24% | 313 | 16% | 180 | 17% | 133 | 15% |
| The Enclosure: foundation, etc. | 40 | 30% | 262 | 21% | 139 | 21% | 123 | 22% |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Air barrier and insulation installation | 41 | 37% | 266 | 26% | 143 | 25% | 123 | 27% |
| Blower door testing | 42 | 33% | 263 | 22% | 139 | 19% | 124 | 25% |
| Case study - High performance enclosures | 37 | 51% | 240 | 41% | 127 | 40% | 113 | 42% |
| Lighting requirements | 39 | 36% | 299 | 32% | 170 | 31% | 129 | 33% |
| Stretch code | 39 | 21% | 243 | 22% | 128 | 18% | 115 | 27% |
| Mass Save New Construction incentives | 40 | 48% | 300 | 45% | 171 | 43% | 129 | 48% |

**Table 21. Usefulness Ratings for HVAC Indoor Air Quality Training Components**

| | | Rating of Usefulness for Sep thru Dec (percent) | | | | | | | Mean Ratings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Training Component | n | 6—Extr Use | 5 | 4 | 3 | 2 | 1—Not at all Use | NA/ Don't Know | Sep thru Dec | 2014 thru 2015 | | |
| | | | | | | | | | | All | Code Officials | Builders /Others |
| 2012 IECC overview | 72 | 51% | 29% | 13% | 3% | 1% | 0% | 3% | 5.3 | 5.2 | 5.2 | 5.3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Indoor air quality | 72 | 54% | 32% | 10% | 3% | 1% | 0% | 0% | 5.3 | 5.2 | 5.2 | 5.2 |
| Ventilation | 72 | 57% | 29% | 8% | 4% | 1% | 0% | 0% | 5.4 | 5.3 | 5.3 | 5.4 |
| Ductwork | 71 | 49% | 31% | 11% | 7% | 1% | 0% | 0% | 5.2 | 5.3 | 5.2 | 5.3 |
| Stretch code | 70 | 29% | 34% | 7% | 13% | 4% | 1% | 11% | 4.7 | 4.7 | 4.6 | 4.7 |
| System sizing* | 67 | 40% | 30% | 13% | 12% | 1% | 1% | 1% | 4.9 | 4.8 | 4.8 | 4.9 |
| Mechanical systems/equipment for super-efficient homes | 70 | 44% | 29% | 14% | 6% | 1% | 1% | 4% | 5.1 | 5.0 | 4.9 | 5.1 |
| Lighting requirements | 66 | 38% | 23% | 21% | 8% | 3% | 2% | 6% | 4.9 | 4.8 | 4.7 | 4.7 |
| Mass Save New Construction incentives | 66 | 42% | 21% | 17% | 8% | 3% | 3% | 6% | 4.9 | 4.9 | 4.8 | 5.1 |

**Table 22. Whether the HVAC Indoor Air Quality Training Components Were New**

| Component | Sep thru Dec | | 2014 through 2015 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | All | | Code Officials | | Builders and Others | |
| | n | Yes | n | Yes | n | Yes | n | Yes |
| 2012 IECC overview | 42 | 29% | 167 | 34% | 119 | 26% | 48 | 54% |
| Indoor air quality | 41 | 20% | 161 | 27% | 115 | 26% | 46 | 30% |
| Ventilation | 40 | 18% | 193 | 26% | 137 | 24% | 56 | 30% |
| Ductwork | 41 | 12% | 195 | 23% | 139 | 19% | 56 | 34% |
| Stretch code | 40 | 23% | 148 | 25% | 108 | 19% | 40 | 43% |
| System sizing | 39 | 28% | 151 | 32% | 108 | 31% | 43 | 33% |
| Mechanical systems/equipment for super-efficient homes | 39 | 31% | 185 | 39% | 133 | 40% | 52 | 38% |
| Lighting requirements | 39 | 23% | 185 | 28% | 134 | 23% | 51 | 39% |
| Mass Save New Construction incentives | 37 | 35% | 186 | 39% | 136 | 40% | 50 | 36% |

Respondents also gave high ratings to the quality of the presentations (Table 5), with mean ratings ranging from 5.0 to 6.0 on a 6-to-1 scale in which 6 is excellent and 1 is poor. The highest ratings went to the presenter's skills. Almost all respondents (ranging from 88% to 100%) said they would recommend the training to others. The latest training quality ratings are similar to ratings for all residential trainings from 2014 through 2015, with the presenter's skills getting the highest rating and the quality of handout information getting the lowest rating. The handout information ratings from the most recent respondents are, however, higher than those from all 2014 and 2015 respondents. This is likely due to the availability of the slides for September and October trainees who requested them and an enhanced handout package starting on November 9, 2015. The new handouts include about two-thirds of the slides used in the trainings (picture slides are excluded) and other information. Moreover, recent trainees are also more likely than trainees from previous sessions to say they would recommend the trainings to others.

**Table 23. Quality of Trainings**
(mean ratings on a 6 to 1 scale)

| General Category | 9/19 HVAC-IAQ | 9/29 EBS | 9/29 HVAC-IAQ | 10/7 EBS | 10/20 EBS | 10/29 HVAC-IAQ |
|---|---|---|---|---|---|---|
| n | 7 | 17 | 9 | 17 | 17 | 26 |
| Presenter's skills | 5.9 | 5.6 | 5.7 | 5.5 | 5.5 | 5.6 |
| Quality of slide information | 5.7 | 5.4 | 5.6 | 5.6 | 5.6 | 5.2 |
| Quality of handout information | 5.6 | 5.0 | 5.0* | 5.5 | 5.4 | 5.0* |
| Handling of participant questions | 5.7 | 5.5 | 5.6 | 5.6 | 5.7 | 5.5 |
| n | 7 | 16 | 8 | 17 | 17 | 23 |
| Percent recommending training to others | 100% | 94% | 88% | 94% | 100% | 96% |

| General Category | 11/12 HVAC-IAQ | 12/1 HVAC-IAQ | 12/10 EBS | All Trainings Sep thru Dec | All Trainings 2014 thru 2015 | |
|---|---|---|---|---|---|---|
| n | 11 | 20 | 21 | 145 | 962 | |
| Presenter's skills | 6.0 | 5.7 | 5.7 | 5.7 | 5.6 | |
| Quality of slide information | 5.5 | 5.4 | 5.5 | 5.4 | 5.2 | |
| Quality of handout information | 5.3 | 5.5 | 5.5 | 5.3 | 4.8 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Handling of participant questions | 5.9 | 5.5 | 5.7 | 5.6 | 5.5 | |
| n | 11 | 20 | 21 | 140 | 966 | |
| Percent recommending training to others | 100% | 100% | 100% | 97% | 94% | |

* One respondent did not provide ratings for this area.

The training attendees also provided feedback on the training quality through an Audience Response System (ARS) used during the presentations to indicate how much the respondents agreed with certain statements on a scale of 1 (strongly agree) to 6 (strongly disagree)[1]. As shown in Table 6, most trainees strongly agreed that the trainer was organized, prepared, knowledgeable, and informative. Most also felt that the trainer kept an appropriate pace and encouraged participation. Finally, close to nine out of ten respondents strongly agreed or agreed that they would recommend the training to others. While the ARS statements are not directly comparable to the paper survey questions in Table 5, the responses confirm that, in general, the respondents rate the quality of the trainings fairly highly. Moreover, the mean ratings for September through December are slightly better than the ratings for all the previous trainings that had used an ARS.

**Table 24. ARS Ratings of Training Quality**

| | | Agreement with Statement (Percent) | | | | | | Mean | |
|---|---|---|---|---|---|---|---|---|---|
| | n* | 1—Strongly Agree | 2 | 3 | 4 | 5 | 6—Strongly Disagree | Sep thru Dec | 2014 thru 2015 |
| The trainer was organized and prepared | 121 | 77% | 14% | 2% | 1% | 5% | 2% | 1.5 | 1.7 |
| The trainer encouraged participation | 56 | 70% | 20% | 7% | 0% | 3% | 0% | 1.5 | 1.5 |
| The trainer was knowledgeable and informative | 64 | 73% | 20% | 2% | 2% | 3% | 0% | 1.4 | 1.5 |
| The trainer kept an appropriate pace | 35 | 88% | 9% | 0% | 0% | 3% | 0% | 1.2 | 1.5 |
| I would recommend this training | 68 | 79% | 9% | 4% | 2% | 3% | 3% | 1.5 | 1.7 |

[1] Due to a system malfunction, ARS data was not collected from the 10/29 HVAC-IAQ training

*Not all statements were assessed at each training.

## USE OF TRAINING

The immediate surveys asked respondents to estimate when they would be conducting final inspections of housing units permitted under 2012 IECC (building code officials) or have the units they were working on undergo final inspections (builders and others). However, more than one-half (56%) of 2014 through 2015 respondents work in cities and towns that have adopted the stretch code and thus could not answer this question. Similarly, 59% of respondents during the September through December 2015 time period could not answer the question because they work in cities and towns that have adopted the stretch code.

Only 12 out of all 146 survey respondents indicated that they had at least some housing units currently permitted under 2012 IECC and 16 indicated that they had some final inspections of 2012 IECC units conducted. Table 7 shows the numbers of permitted units and inspections reported by the trainees who responded to this question for the September through December 2015 trainings; Table 8 shows the numbers of permitted units and inspections reported by all of the trainees who responded to this question from 2014 through 2015.

**Table 25. Housing Units Permitted under 2012 IECC for September through December 2015 Trainees**

| | Currently permitted | | Final inspections to date | | Final inspections expected within one year | |
|---|---|---|---|---|---|---|
| Number of Housing Units | Code officials | Builders and others | Code officials | Builders and others | Code officials | Builders and others |
| n* | 8 | 4 | 12 | 4 | 8 | 3 |
| Less than five | 1 | 0 | 3 | 0 | 2 | 0 |
| Five to ten | 1 | 2 | 3 | 2 | 1 | 1 |
| Eleven to 100 | 2 | 2 | 3 | 2 | 2 | 2 |
| More than 100 | 4 | 0 | 3 | 0 | 3 | 0 |

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

**Table 26. Housing Units Permitted under 2012 IECC for 2014 through 2015 Trainees**

| | Currently permitted | | Final inspections to date | | Final inspections expected within one year | |
|---|---|---|---|---|---|---|
| Number of Housing Units | Code officials | Builders and others | Code officials | Builders and others | Code officials | Builders and others |
| n | 120 | 35 | 94 | 21 | 135 | 33 |
| Less than five | 23% | 74% | 40% | 67% | 13% | 70% |
| Five to ten | 29% | 14% | 23% | 19% | 19% | 18% |
| Eleven to 100 | 41% | 11% | 32% | 14% | 61% | 12% |
| More than 100 | 8% | 0% | 4% | 0% | 7% | 0% |

The surveys asked respondents who could not estimate the number of housing units under 2012 IECC and were not in stretch code communities to estimate when they would conduct a final inspection on such a unit or have a final inspection conducted on a unit they were working on. As shown in Table 9, more one-third said they expect a final inspection in the next three months; more than one-fourth in roughly a year; and the remainder were unsure. The most recent trainees appear to be less likely than all of the trainees who responded to this question from 2014 through 2015 to be working with 2012 IECC units; however, this observation is based on a fairly small number of respondents.

**Table 27. When Expect a Final Inspection on a 2012 IECC Unit**

(percent)

| | September through December | | | 2014 through 2015 | | |
|---|---|---|---|---|---|---|
| Expected Final Inspection | Code Officials | Builders and Others | Total | Code Officials | Builders and Others | Total |
| n | 17 | 9 | 26 | 216 | 80 | 296 |
| In the next three months | 7 | 2 | 35% | 49% | 33% | 44% |
| In the next four to six months | 3 | 1 | 15% | 19% | 11% | 17% |
| In the next seven to twelve months | 2 | 1 | 12% | 13% | 19% | 15% |
| More than a year from now | 0 | 0 | 0% | 1% | 9% | 3% |
| Unsure | 5 | 5 | 38% | 17% | 29% | 20% |

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

The surveys also included a simpler timing question—namely, when the respondents first expected to use something learned at the training. As shown in Table 10, more than one-half of respondents (55%) said they expect to use the training immediately with an additional 33% saying they expected to use it within the next three months. The overall percentage of those expecting to use what they had learned in the training within three months is very similar to that provided from all the trainings from 2014 through 2015. These consistent responses indicate that the trainings are providing useful information with immediate applications even for attendees in areas that have not adopted 2012 IECC.

**Table 28. When Expect to First Use Training Information**

(percent)

| | September through December | | | 2014 through 2015 | | |
|---|---|---|---|---|---|---|
| Expected Use of Training | Code Officials | Builders and Others | Total | Code Officials | Builders and Others | Total |
| n | 69 | 74 | 143 | 552 | 393 | 945 |
| As soon as I walk out the door | 57% | 54% | 55% | 67% | 55% | 62% |
| Sometime in the next three months | 29% | 37% | 33% | 20% | 29% | 24% |
| In the next four to six months | 13% | 9% | 11% | 9% | 11% | 10% |
| In the next seven to twelve months | 0% | 0% | 0% | 2% | 4% | 2% |
| More than a year from now | 1% | 0% | 1% | 2% | 1% | 2% |
| Not likely to ever use it | 0% | 0% | 0% | 0% | 0% | 0% |

## MOST IMPORTANT INFORMATION AND OTHER QUALITATIVE DATA

Respondents who attended the EBS trainings found the 2012 IECC code changes, insulation requirements, and air barrier information to be the most important new information provided by the trainings, while those attending the HVAC-IAQ trainings considered ventilation options and requirements, duct sealing, and 2012 IECC code changes the most important new information provided (Table 11). Other areas mentioned moderately often included duct placement sizing and testing (HVAC-IAQ), which are likely code changes if 2015 IECC is adopted (EBS), and HERS rating information (EBS).

**Table 29. Most Important New Information Provided by the Trainings (September through December 2015)**

(percent; multiple response)

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys—September through December 2015…*

| General Category | EBS | HVAC-IAQ | All Trainings |
|---|---|---|---|
| n | 46 | 44 | 90 |
| Ventilation options and requirements | 0% | 39% | 19% |
| 2012 IECC code changes | 22% | 11% | 17% |
| Insulation requirements | 17% | 5% | 11% |
| Air barrier information | 20% | 0% | 10% |
| Duct sealing | 7% | 14% | 10% |
| Everything—general overview | 13% | 7% | 10% |
| Duct work, including duct placement, sizing, and testing | 2% | 9% | 5% |
| Level of detail provided | 4% | 5% | 4% |
| 2012 to 2015 IECC code changes | 7% | 0% | 3% |
| HERS rating information | 7% | 0% | 3% |
| Air sealing information | 4% | 2% | 3% |
| Air infiltration or leakage | 4% | 2% | 3% |
| Reaffirmation of current knowledge | 2% | 5% | 3% |
| HVAC requirements | 0% | 7% | 3% |
| Building envelope and foundation options/requirements | 4% | 0% | 2% |
| Blower door testing | 4% | 0% | 2% |
| Vapor barriers | 4% | 0% | 2% |
| Technical support, web resources, and manuals available | 2% | 2% | 2% |
| Mass Save incentives | 2% | 2% | 2% |
| Stretch code information | 2% | 0% | 1% |
| Areas to review in-field | 0% | 2% | 1% |
| ASHRAE standards | 0% | 2% | 1% |
| Window requirements | 0% | 2% | 1% |
| Opportunity for discussion | 0% | 2% | 1% |

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys—September through December 2015…*

| | | | |
|---|---|---|---|
| No new information | 2% | 2% | 2% |
| Other | 2% | 2% | 2% |

Building code officials mostly said they would use this information during their inspections and relay it to builders and contractors. Builders and others mostly said they would use this information during the construction process, during the design phase, and during audits and HERS ratings (Table 12). The responses from the September through December 2015 trainings are fairly similar to those from the earlier trainings, except that both types of respondents in the latest trainings were more likely to say they would relay the information provided to builders, contractors, and homeowners. The HVAC-IAQ trainings also had a number of HERS raters who said they would use the information during audits.

**Table 30. How Information Provided by the Trainings Will Be Used**

(percent; multiple response)

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys—September through December 2015…*

| | September through December | | | 2014 through 2015 | | |
|---|---|---|---|---|---|---|
| **General Category** | **Code Officials** | **Builders and Others** | **Total** | **Code Officials** | **Builders and Others** | **Total** |
| n | 39 | 42 | 81 | 338 | 256 | 594 |
| During inspections | 33% | 2% | 17% | 45% | 2% | 26% |
| During construction process/apply to building practices | 13% | 31% | 22% | 3% | 36% | 17% |
| Relay to builders or contractors | 23% | 10% | 16% | 15% | 7% | 12% |
| During initial planning | 15% | 7% | 11% | 14% | 7% | 11% |
| Code enforcement | 18% | 0% | 9% | 18% | 0% | 10% |
| Integrate into design | 3% | 17% | 10% | 1% | 15% | 7% |
| As a reference | 0% | 7% | 4% | 3% | 9% | 6% |
| Educate homeowners | 8% | 7% | 7% | 5% | 6% | 5% |
| Permit approval | 5% | 0% | 2% | 6% | 2% | 4% |
| New construction applications | 0% | 7% | 4% | 1% | 4% | 2% |
| Current projects | 0% | 5% | 2% | 1% | 4% | 2% |
| Making projects code compliant | 0% | 2% | 1% | 0% | 4% | 2% |
| During audits/HERS ratings | 0% | 10% | 5% | 0% | 4% | 2% |
| During construction process applied to HVAC work | 5% | 7% | 6% | 1% | 1% | 1% |
| Other | 13% | 12% | 12% | 11% | 20% | 14% |

The training attendants provided a number of unique responses which form the "other" category. These include better communication with construction officials, integration into training curricula, updating company materials, providing training for staff, meeting client needs, doing heat load calculations, more accurately estimating project costs, differentiating one's company from competitors, and planning or promoting equipment sales. These diverse responses reflect the diversity of the training attendees and the numerous ways the trainings can be used, in addition to enhancing code compliance.

Asked to provide additional comments and suggestions for improving the trainings, the few attendees who replied most often said they appreciated the fact that the training was provided. The most frequent suggestions for improvement in the September through December trainings were to provide more details on code requirements and provide more trainings for contractors. As noted earlier, the suggestion to provide handouts of the slides used was addressed in early November (Table 13). Examples of areas where the respondents wanted more details include air barriers, different ventilation products, and using Manuals J and S. The suggestion to provide more trainings for contractors is particularly popular for the most recent training attendees; one respondent noted that contractor trainings should be offered free of charge and at times and locations convenient to contractors. Similar suggestions for offering more trainings for contractors were reported in the follow-up interviews of residential trainees completed in November of 2015.[2]

[2] NMR Group Inc., *Follow-up Interviews with CCSI Residential Training Attendees Draft Report*, November 24, 2015.

**Table 31. Additional Comments and Suggestions to Improve Trainings**

(percent; multiple response)

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys—September through December 2015…*

| | September thru December Trainings | | | All Trainings 2014 thru 2015 |
|---|---|---|---|---|
| General Category | EBS | HVAC-IAQ | All Trainings | |
| n* | 14 | 21 | 35 | 266 |
| Appreciated the training | 6 | 33% | 62% | 36% |
| Provide more detail on code requirements | 4 | 24% | 26% | 6% |
| Provide handouts of the slides used | 1 | 5% | 10% | 14% |
| Provide more trainings for contractors | 2 | 5% | 9% | 1% |
| Improve slide image quality | 1 | 5% | 6% | 3% |
| Provide additional trainings in the future | 0 | 10% | 6% | 2% |
| Training room uncomfortable | 0 | 10% | 6% | 1% |
| Change focus to 2015 IECC code | 1 | 0% | 3% | 0% |
| Provide examples of how to apply code | 0 | 5% | 3% | 15% |
| Provide more up to date information | 0 | 5% | 3% | 5% |
| Extend the training session time | 0 | 5% | 3% | 3% |
| Further focus on the stretch code and related changes | 0 | 0% | 0% | 3% |
| Provide checklists | 0 | 0% | 0% | 3% |
| Give examples of products to use to meet requirements | 0 | 0% | 0% | 2% |
| Limit distracting side conversations | 0 | 0% | 0% | 2% |
| Shorten training session time | 0 | 0% | 0% | 1% |

| | | | | |
|---|---|---|---|---|
| Other | 1 | 14% | 11% | 18% |

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

The "Other" category includes providing more information on energy savings and $CO_2$ reduction, providing trainings sooner after code adoption, creating a glossary of the terms used in the trainings, lengthening the trainings and having hands-on exercises, having more trainings available in western Massachusetts, educating homeowners, having larger training rooms, having training rooms with tables to make taking notes easier, focusing on costs and benefits, having more trainings on trainings on Manuals J, S and D, providing more information about incentives, and better organizing presentations.

## TRAINING ATTENDEE DATA

Nearly one-half of the September through December training attendees who completed surveys work as building code officials. Code officials and building contractors were more likely to attend HVAC-IAQ trainings, while builders and architects were more likely to attend EBS trainings. Table 14 presents more detailed self-descriptions of the trainees' positions.

**Table 32. Training Attendees**

(percent)

| | September thru December Trainings | | | All Trainings 2014 thru 2015 |
|---|---|---|---|---|
| **Position** | **EBS** | **HVAC-IAQ** | **All Trainings** | |
| n* | 73 | 73 | 146 | 949 |
| Building code official | 38% | 59% | 49% | 54% |
| Builder (oversees the entire construction of a home or building) | 22% | 3% | 12% | 17% |
| Architect or design engineer | 16% | 4% | 10% | 10% |
| HERS rater or energy efficiency consultant | 7% | 5% | 6% | 5% |
| Building contractor | 3% | 18% | 10% | 6% |
| Other | 14% | 11% | 12% | 8% |

b. *Does not include training attendees who filed out paper surveys but either did not register for the trainings or did not indicate their occupation when registering.

Trainees in the "other" category include building design consultants, sales representatives, remodelers, and program managers.

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys—September through December 2015…*

As in the earlier trainings, the majority of builders and architects trained from September through December 2015 have been in their present positions for at least ten years (Table 15). However, more than one-third of the code officials at the most recent trainings have been at their present positions for five years or less.

**Table 33. Years in Present Position for September through December 2015 Trainees**

(percent)

| Position | n | Less than 1 year | 1 to 5 years | 6 to 10 years | 11 to 15 years | 16 to 20 years | More than 20 years |
|---|---|---|---|---|---|---|---|
| Building code official | 60 | 8% | 27% | 18% | 10% | 14% | 23% |
| Builder (oversees the entire construction of a home or building) | 17* | 0 | 1 | 0 | 1 | 2 | 13 |
| Building contractor | 15* | 1 | 1 | 2 | 1 | 1 | 9 |
| Architect or design engineer | 15* | 0 | 0 | 0 | 2 | 1 | 12 |
| HERS rater or energy efficiency consultant | 10* | 2 | 2 | 1 | 3 | 0 | 2 |
| Equipment supplier | 2* | 0 | 0 | 1 | 0 | 0 | 1 |
| Other | 12* | 0 | 1 | 3 | 3 | 0 | 5 |

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

Residential trainings held from December 2014 through December 2015 used ARS to develop estimates of the proportion of all building permits that are drawn for retrofit projects and, for the retrofit projects, the proportion of building permits that are energy-related. As shown in Table 16, the respondents indicated that an average of just over three-fifths of the permits they drew or were drawn in their jurisdictions were for retrofit projects and three out of five retrofits are energy-related. Building code officials provided similar responses to all trainees.

**Table 34. Proportion of Retrofit Building Permits**

(percent)

| | All trainees | | Building code officials only | |
|---|---|---|---|---|
| Percentage of all building permits issued | Retrofit portion | Portion of energy-related retrofit permits | Retrofit portion | Portion of energy-related retrofit permits |
| n | 469 | 442 | 184 | 172 |
| None | 2% | 3% | 2% | 1% |
| 20% | 11% | 17% | 14% | 22% |
| 40% | 14% | 18% | 12% | 21% |
| 60% | 28% | 17% | 29% | 23% |
| 80% | 37% | 27% | 40% | 24% |
| 100% | 7% | 18% | 2% | 9% |
| Mean | 62% | 60% | 60% | 55% |

The survey respondents work in cities and towns across Massachusetts (they could list up to three municipalities on the survey forms). The September through December trainees work across Massachusetts; Boston, Newton, and Wellesley are listed most frequently due to large numbers of builders and others attending. Pittsfield had the largest number of code officials attending (Table 17).

**Table 35. Cities and Towns Represented in the September through December Trainings**

(number of responses; multiple response)

| City or Town | Code Officials | Builders and Others | Total | City or Town | Code Officials | Builders and Others | Total |
|---|---|---|---|---|---|---|---|
| Acton | 0 | 3 | 3 | Cambridge | 0 | 6 | 6 |
| Adams | 2 | 0 | 2 | Canton | 2 | 1 | 3 |
| Amesbury | 0 | 1 | 1 | Cheshire | 1 | 0 | 1 |
| Amherst | 0 | 2 | 2 | Chicopee | 4 | 0 | 4 |
| Arlington | 0 | 1 | 1 | Clarksburg | 2 | 0 | 2 |
| Ashburnham | 0 | 1 | 1 | Concord | 1 | 6 | 7 |
| Attleboro | 0 | 1 | 1 | Dalton | 1 | 0 | 1 |
| Auburn | 0 | 1 | 1 | Dartmouth | 0 | 1 | 1 |
| Belmont | 1 | 1 | 2 | Deerfield | 2 | 0 | 2 |
| Berlin | 0 | 1 | 1 | Dennis | 0 | 1 | 1 |
| Beverly | 0 | 1 | 1 | East Longmeadow | 1 | 0 | 1 |
| Bolton | 0 | 1 | 1 | Eastham | 0 | 1 | 1 |
| Boston | 1 | 9 | 10 | Easthampton | 4 | 1 | 5 |
| Brewster | 0 | 3 | 3 | Egremont | 0 | 2 | 2 |

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys—September through December 2015…*

| City or Town | Code Officials | Builders and Others | Total | City or Town | Code Officials | Builders and Others | Total |
|---|---|---|---|---|---|---|---|
| Brookline | 0 | 8 | 8 | Fairhaven | 0 | 1 | 1 |
| Byfield | 0 | 1 | 1 | Falmouth | 0 | 1 | 1 |
| Florida | 1 | 0 | 1 | Hudson | 0 | 1 | 1 |
| Framingham | 0 | 3 | 3 | Hyannis | 0 | 1 | 1 |
| Franklin | 0 | 3 | 3 | Lancaster | 0 | 1 | 1 |
| Gardner | 2 | 0 | 2 | Lanesborough | 1 | 0 | 1 |
| Georgetown | 0 | 1 | 1 | Lawrence | 1 | 0 | 1 |
| Gill | 0 | 1 | 1 | Leicester | 0 | 1 | 1 |
| Gloucester | 0 | 3 | 3 | Lee | 1 | 0 | 1 |
| Granville | 2 | 0 | 2 | Lenox | 1 | 1 | 2 |
| Great Barrington | 1 | 2 | 3 | Lexington | 0 | 4 | 4 |
| Greenfield | 0 | 1 | 1 | Lincoln | 1 | 0 | 1 |
| Hadley | 4 | 1 | 5 | Littleton | 0 | 2 | 2 |
| Hamilton | 0 | 2 | 2 | Longmeadow | 0 | 1 | 1 |
| Harwich | 0 | 3 | 3 | Lowell | 0 | 1 | 1 |
| Hatfield | 0 | 2 | 2 | Marlboro | 0 | 2 | 2 |

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys—September through December 2015…*

| City or Town | Code Officials | Builders and Others | Total | City or Town | Code Officials | Builders and Others | Total |
|---|---|---|---|---|---|---|---|
| Haverhill | 0 | 1 | 1 | Marshfield | 0 | 1 | 1 |
| Hinsdale | 1 | 0 | 1 | Medfield | 1 | 0 | 1 |
| Holliston | 0 | 3 | 3 | Medford | 2 | 1 | 3 |
| Holyoke | 0 | 2 | 2 | Medway | 0 | 3 | 3 |
| Hopkinton | 0 | 1 | 1 | Melrose | 0 | 2 | 2 |
| Mendon | 0 | 1 | 1 | Plainfield | 2 | 0 | 2 |
| Milford | 1 | 1 | 2 | Plainville | 0 | 1 | 1 |
| Millville | 0 | 1 | 1 | Peabody | 0 | 1 | 1 |
| Monson | 1 | 0 | 1 | Pittsfield | 7 | 0 | 7 |
| Monterey | 1 | 0 | 1 | Plymouth | 1 | 1 | 2 |
| Natick | 0 | 2 | 2 | Quincy | 3 | 0 | 3 |
| Needham | 0 | 4 | 4 | Revere | 1 | 0 | 1 |
| New Ashford | 2 | 0 | 2 | Richmond | 0 | 1 | 1 |
| New Bedford | 0 | 1 | 1 | Royalston | 1 | 0 | 1 |
| New Salem | 1 | 0 | 1 | Sandwich | 1 | 0 | 1 |
| Newbury | 0 | 1 | 1 | Sandisfield | 1 | 0 | 1 |

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys—September through December 2015…*

| City or Town | Code Officials | Builders and Others | Total | City or Town | Code Officials | Builders and Others | Total |
|---|---|---|---|---|---|---|---|
| Newburyport | 0 | 1 | 1 | Saugus | 1 | 0 | 1 |
| Newton | 0 | 12 | 12 | Seekonk | 0 | 1 | 1 |
| North Attleboro | 0 | 1 | 1 | Sharon | 1 | 0 | 1 |
| Northampton | 3 | 4 | 7 | Shrewsbury | 0 | 2 | 2 |
| Northbridge | 1 | 0 | 1 | Somerville | 1 | 1 | 2 |
| Norwood | 0 | 1 | 1 | Southampton | 2 | 0 | 2 |
| Orange | 1 | 0 | 1 | Southbridge | 2 | 0 | 2 |
| Orleans | 0 | 3 | 3 | Southwick | 2 | 0 | 2 |
| Sterling | 1 | 0 | 1 | Wendell | 1 | 0 | 1 |
| Stockbridge | 0 | 2 | 2 | Wellfleet | 0 | 1 | 1 |
| Stoneham | 0 | 1 | 1 | Wellesley | 0 | 10 | 10 |
| Stoughton | 0 | 1 | 1 | West Boylston | 0 | 1 | 1 |
| Sudbury | 0 | 8 | 8 | West Springfield | 0 | 1 | 1 |
| Templeton | 1 | 1 | 2 | Westboro | 1 | 0 | 1 |
| Tewksbury | 0 | 1 | 1 | Westford | 0 | 2 | 2 |
| Tolland | 3 | 0 | 3 | Westhampton | 1 | 0 | 1 |

*Analyses of Immediate Code Compliance Support Initiative Residential Training Surveys—September through December 2015…*

| City or Town | Code Officials | Builders and Others | Total | City or Town | Code Officials | Builders and Others | Total |
|---|---|---|---|---|---|---|---|
| Townsend | 2 | 4 | 6 | Westminster | 1 | 0 | 1 |
| Truro | 0 | 1 | 1 | Weston | 0 | 7 | 7 |
| Upton | 1 | 0 | 1 | Westwood | 2 | 1 | 3 |
| Uxbridge | 1 | 0 | 1 | Williamstown | 1 | 0 | 1 |
| Walpole | 2 | 0 | 2 | Winchester | 2 | 1 | 3 |
| Waltham | 1 | 0 | 1 | Worcester | 0 | 2 | 2 |
| Ware | 1 | 0 | 1 | | | | |

## Unique Attendees – All Trainings

The team calculated the number of unique trainees for all trainings from September 23, 2014 through December 10, 2015 by using trainee enrollment data and completed immediate surveys. As shown in Table 18, residential trainings had 1002 unique attendees and the commercial trainings had 505 unique attendees; 183 individuals have attended both residential and commercial trainings. More than four out of ten unique attendees have been code officials; the trainings have also had sizable numbers of architects in attendance. Builders, described as those overseeing the entire construction of a home or building, and building contractors responsible for specific aspects of construction, as would be expected, 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. This table will be updated for each memo, residential and commercial, provided on the immediate training surveys.

**Table 36. Numbers of Unique Training Attendees**

(Number of attendees)

| Position | All Residential Trainings | All Commercial Trainings | All Trainings— Both Res and Com |
|---|---|---|---|
| Building code official | 486 | 206 | 544 |
| Builder (oversees the entire construction of a home or building) | 135 | 8 | 142 |
| Architect or design engineer | 103 | 93 | 181 |
| Building contractor | 78 | 15 | 91 |
| HERS rater or energy efficiency consultant | 46 | 32 | 77 |
| Equipment supplier | 19 | 23 | 37 |
| Other | 78 | 72 | 143 |
| Position not known* | 57 | 56 | 109 |
| Total unique training attendees | 1002 | 505 | 1324 |

*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.

# IMMEDIATE COMMERCIAL CODE COMPLIANCE SUPPORT INITIATIVE TRAINING FEEDBACK (JANUARY – APRIL 2015 TRAININGS)

**TO:** Massachusetts Program Administrators (PAs), Massachusetts Energy Efficiency Advisory Council (EEAC) Consultants, and Conservation Services Group

**FROM:** Allen Lee, Sara Wist, Holly Farah, Althea Koburger, Cadmus

**SUBJECT:** Immediate Commercial Code Compliance Support Initiative Training Feedback (January-April 2015 Trainings)

**CC:** Pam Rathbun, Tetra Tech; Betty Tolkin, Joanne O'Donnell and Lynn Hoefgen, NMR Group

**DATE:** April 30, 2015

The Code Compliance Support Initiative (CCSI) seeks to improve compliance with residential and commercial building codes in Massachusetts over the long term. To support this goal, CCSI has made training sessions available for builders, subcontractors, architects, code officials, and other relevant audiences on the topics of IECC compliance, Stretch Code compliance, Advanced Buildings criteria, and Massachusetts program administrator incentives.

This memo provides analysis and feedback on the four CCSI commercial training sessions that occurred from January through April 2015, as well as selected statistics based on cumulative responses from all nine commercial trainings held from November 2014 through April 2015 (shown in Table 37).

**Table 37. Training Sessions – November–April**

(Number of trainings)

| Training | Nov–Dec 2015 | Jan–Apr 2015 |
|---|---|---|
| Envelope and Building Science (EBS) | 2 | 2 |
| Lighting, Lighting Controls, and Electric Provisions (LLC) | 3 | 1 |
| HVAC and Indoor Air Quality (HVAC) | 0 | 1 |
| Total | 5 | 4 |

This feedback is based on data collected during the registration process, through an Audience Response System (ARS), and from immediate surveys completed by participants.

As outlined in the work plan dated August 12, 2014, Cadmus provided summaries of the findings from the commercial training immediate surveys to the PAs and EEAC at the end of 2014 after five commercial trainings were completed, and is planning to provide updates after every four to six trainings in 2015. 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.

## TRAINING ATTENDEE DATA

Conservation Services Group (CSG), the CCSI contractor, held two commercial training sessions on Envelope and Building Science (EBS), one on February 12 and the other on March 5, 2015. One training session on HVAC and Indoor Air (HVAC) was held on February 24, 2015. Finally, one training session on Lighting and Lighting Controls (LLC) was held on April 2, 2015.

### Unique Attendees – All Trainings

The team calculated the number of unique trainees for all trainings from September 23, 2014 through April 2, 2015 by using trainee enrollment data and completed immediate surveys. As shown in Table 38, residential trainings had 805 unique attendees and the commercial trainings had 238 unique attendees; 83 individuals have attended both residential and commercial trainings. Close to one-half of the unique attendees have been code officials, though they have made up only one-third of commercial training attendees. The trainings have also had sizable numbers of builders (residential) and architects (commercial) in attendance. Trainees listed as "other" most often described themselves as engineers or consultants to the PAs. This table will be updated for each memo, residential and commercial, provided on the immediate training surveys.

**Table 38. Numbers of Unique Training Attendees**

(Number of attendees)

| Position | All Residential Trainings | All Commercial Trainings | All Trainings—Both Res and Com |
|---|---|---|---|
| Building code official | 422 | 79 | 446 |
| Builder (oversees the entire construction of a home or building) | 112 | 4 | 115 |
| Architect or design engineer | 79 | 59 | 124 |
| Building contractor | 48 | 6 | 52 |
| HERS rater or energy efficiency consultant | 27 | 22 | 48 |
| Equipment supplier | 17 | 12 | 25 |
| Other | 43 | 37 | 75 |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

| | | | |
|---|---|---|---|
| Position not known* | 57 | 19 | 75 |
| Total unique training attendees | 805 | 238 | 960 |

*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.

## Commercial Training Attendee Data

In total, 128 individuals enrolled in one or more of the January through April 2015 training sessions, for a total of 134 commercial training enrollment records. Based on information provided at the time of enrollment in commercial trainings, the largest group of training attendees during the current evaluation period work identified themselves as architects or design engineers, whereas most attendees of the previous trainings (November and December 2014) identified themselves as building code officials. The preponderance of architects and design engineers in the early 2015 trainings is due to the EBS training.

Table 39 presents more detailed self-descriptions of the commercial training attendees, based on enrollment data, for both the current evaluation period, as well as cumulative numbers from all commercial trainings offered from November 2014 through April 2015.

**Table 39. Training Enrollment***

(Percentage)

| Position | January thru April Trainings | | | | All Trainings Nov thru Apr |
|---|---|---|---|---|---|
| | EBS | HVAC | LLC | Total | |
| n | 76 | 41 | 17 | 134 | 285 |
| Architect or design engineer | 47% | 12% | 18% | 33% | 25% |
| Building code official | 14% | 51% | 53% | 31% | 38% |
| Program manager | 8% | 15% | - | 9% | 7% |
| HERS rater or energy efficiency consultant | 3% | 10% | 24% | 7% | 11% |
| Equipment supplier for new homes | 7% | - | - | 4% | 3% |
| Building contractor | 1% | 2% | - | 1% | 2% |
| Builder (oversees entire construction) | 1% | - | - | 1% | 2% |
| Other | 18% | 10% | 6% | 14% | 12% |

* Includes trainees who enrolled in multiple training sessions.

As with 2014 trainings, the majority of enrolled attendees have been in their present positions for at least 10 years (see

Table 40). Approximately one quarter of building code officials and more than half the architects or design engineers had more than 20 years of experience in their current position.

**Table 40. Years in Present Position***

(Percentage)

| Position | n** | < 1 year | 1-5 years | 6-10 years | 11-15 years | 16-20 years | > 20 years |
|---|---|---|---|---|---|---|---|
| Architect or design engineer | 23 | - | 13% | 13% | 17% | 4% | 52% |
| Building code official | 35 | 9% | 11% | 26% | 14% | 14% | 26% |
| Program manager | 8 | 4 | 2 | - | 1 | 1 | - |
| HERS rater or energy efficiency consultant | 8 | 3 | 3 | - | - | - | 2 |
| Equipment supplier for new homes | 4 | 1 | 1 | 2 | - | - | - |
| Building contractor | 1 | - | - | - | 1 | | |
| Builder (oversees entire construction) | - | - | - | - | - | - | - |
| Other | 9 | - | 3 | 2 | 1 | - | 3 |

* The number of responses is shown where the total respondent sample (n) size is less than 20.

** Does not include March 5 EBS respondents, as data was unavailable.

## ATTENDEE SURVEY DATA

Surveys designed to collect information on the attendees and feedback on the training were provided to attendees at the end of each training[3]. In total, 109 surveys were returned by training participants. Of the 109 surveys:

- 30 were from building code officials
- 79 fell into the other categories: builders, architects, contractors, and others.

Twelve trainees who were not found in the enrollment data returned surveys, and eight were returned with the name line blank. Since actual attendance is not tracked at the trainings, and because not all surveys were traceable to enrollment records, it is not possible to calculate an accurate survey return rate.

[3] Some participants who attended multiple 2015 training sessions returned surveys for more than one training.

## Usefulness and Quality

The surveys asked respondents to rate the usefulness of EBS, LLC, and HVAC training components on a 1-to-6 scale, in which 6 is very useful and 1 is not at all useful. As done for prior trainings, the survey respondents overwhelmingly rated all the training components listed as 4, 5, or 6 in terms of usefulness (shown in Table 41, Table 44, and

Table 47). The most highly rated components were code changes, efficient lighting options and techniques, and technical assistance options for the EBS, LLC, and HVAC trainings, respectively.

As shown in Table 42, average ratings for EBS training components ranged from 4.4 to 5.3. Average ratings for LLC training components were essentially the same, ranging from 4.4 to 5.2 (shown in Table 45). Average ratings for HVAC training components (shown in Table 48) were slightly lower than the other trainings, ranging from 4.2 to 4.8. In general, the ratings from the January and April trainings are slightly higher than the ratings for all trainings from November through April, suggesting that the ratings increased in the most recent period. We note that, in many cases, both the number of attendees and the sizes of samples responding to the surveys are so small that comparisons between results for the various groups should be considered indicative of differences, but not necessarily statistically significant.

Attendees were also asked whether these components provided new material (shown in Table 43, Table 46, and Table 49). As was the case in the earlier trainings, fewer respondents answered this question than provided ratings of usefulness. For the EBS trainings, the code change component of the training was most likely to contain new information for the attendees. For the LLC training, lighting recommendations (interior and exterior) and Mass Save incentive (whole building and system) information were most likely to be new information for attendees. HVAC training attendees most often identified information on ASHRAE 90.1 performance path and technical assistance options as new for them.

**Table 41. Usefulness Ratings for Envelope Building Science Training Components**

(percentage)

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

| Training Component | n | Rating of Usefulness (percentage) | | | | | | Not Covered |
|---|---|---|---|---|---|---|---|---|
| | | 6 - Very Useful | 5 | 4 | 3 | 2 | 1 - Not at all Useful | |
| Code changes | 63 | 54% | 25% | 14% | 6% | 0% | 0% | 0 |
| Air barriers | 64 | 50% | 33% | 14% | 3% | 0% | 0% | 0 |
| Insulation | 65 | 46% | 31% | 20% | 3% | 0% | 0% | 0 |
| Air leakage | 64 | 45% | 38% | 17% | 0% | 0% | 0% | 0 |
| Fenestration | 65 | 42% | 31% | 22% | 6% | 0% | 0% | 0 |
| Energy compliance options | 57 | 42% | 30% | 16% | 11% | 2% | 0% | 0 |
| Envelope provisions | 63 | 40% | 41% | 17% | 2% | 0% | 0% | 0 |
| Technical assistance options | 53 | 40% | 30% | 19% | 8% | 4% | 0% | 1 |
| Thermal bridging | 64 | 38% | 38% | 20% | 5% | 0% | 0% | 0 |
| Compliance options | 63 | 37% | 33% | 22% | 8% | 0% | 0% | 0 |
| Slabs | 65 | 34% | 38% | 23% | 5% | 0% | 0% | 0 |
| Energy modeling options | 58 | 33% | 33% | 21% | 9% | 5% | 0% | 0 |
| Dampers | 60 | 28% | 32% | 28% | 12% | 0% | 0% | 0 |
| Vestibules | 61 | 28% | 30% | 30% | 8% | 5% | 0% | 0 |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

| Training Component | n | Rating of Usefulness (percentage) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 6 - Very Useful | 5 | 4 | 3 | 2 | 1 - Not at all Useful | Not Covered |
| Case studies | 53 | 28% | 26% | 19% | 13% | 8% | 6% | 1 |
| Res. and Com. offers | 52 | 23% | 48% | 19% | 10% | 0% | 0% | 2 |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

**Table 42. Usefulness Ratings for Envelope Building Science Training Components**

(Mean)

| Training Component | Mean Ratings | | | |
|---|---|---|---|---|
| | Jan thru Apr | Cumulative (Nov–Apr) | | |
| | | All | Code Officials | Builders/ Others |
| Code changes | 5.3 | 5.1 | 4.6 | 5.3 |
| Air barriers | 5.3 | 5.2 | 4.9 | 5.4 |
| Air leakage | 5.3 | 5.2 | 4.9 | 5.4 |
| Envelope provisions | 5.2 | 5.2 | 5.0 | 5.2 |
| Insulation | 5.2 | 5.1 | 4.9 | 5.2 |
| Fenestration | 5.1 | 5.1 | 5.0 | 5.2 |
| Thermal bridging | 5.1 | 5.1 | 5.0 | 5.2 |
| Slabs | 5.0 | 5.1 | 5.0 | 5.1 |
| Energy compliance options | 5.0 | 5.0 | 4.7 | 5.1 |
| Compliance options | 5.0 | 4.9 | 4.6 | 5.0 |
| Technical assistance options | 4.9 | 4.9 | 4.8 | 4.9 |
| Res. and Com. offers | 4.9 | 4.8 | 4.7 | 4.8 |
| Energy modeling options | 4.8 | 4.8 | 4.7 | 4.9 |
| Dampers | 4.8 | 4.7 | 4.5 | 4.8 |
| Vestibules | 4.7 | 4.7 | 4.6 | 4.7 |
| Case studies | 4.4 | 4.4 | 4.7 | 4.3 |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

**Table 43. Were the Envelope Building Science Components New?**

(Percentage)

| Component | January thru April | | November through April | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | All | | Code Officials | | Builders and Others | |
| | n | Yes | n | Yes | n | Yes | n | Yes |
| Technical assistance options | 31 | 61% | 54 | 59% | 13 | 38% | 41 | 66% |
| Code changes | 36 | 58% | 61 | 59% | 14 | 43% | 47 | 64% |
| Case studies | 30 | 57% | 52 | 60% | 12 | 42% | 40 | 65% |
| Energy modeling options | 28 | 54% | 52 | 46% | 13 | 23% | 39 | 54% |
| Energy compliance options | 30 | 47% | 54 | 41% | 13 | 8% | 41 | 51% |
| Compliance options | 36 | 44% | 61 | 41% | 14 | 29% | 47 | 45% |
| Fenestration | 37 | 43% | 61 | 43% | 14 | 14% | 47 | 51% |
| Vestibules | 30 | 40% | 55 | 47% | 13 | 23% | 42 | 55% |
| Res. and Com. offers | 28 | 36% | 53 | 34% | 13 | 15% | 40 | 40% |
| Dampers | 31 | 32% | 55 | 38% | 13 | 15% | 42 | 45% |
| Envelope provisions | 36 | 31% | 61 | 34% | 14 | 21% | 47 | 38% |
| Thermal bridging | 37 | 30% | 62 | 31% | 14 | 29% | 48 | 31% |
| Air leakage | 36 | 28% | 60 | 33% | 14 | 14% | 46 | 39% |
| Insulation | 37 | 27% | 62 | 26% | 14 | 7% | 48 | 31% |
| Air barriers | 35 | 26% | 60 | 30% | 14 | 7% | 46 | 37% |
| Slabs | 37 | 22% | 62 | 24% | 14 | 14% | 48 | 27% |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

**Table 44. Usefulness Ratings for Lighting and Lighting Control Training Components**

(Percentage)

| Training Component | n | Rating of Usefulness (percentage) | | | | | | Not Covered |
|---|---|---|---|---|---|---|---|---|
| | | 6 - Very Useful | 5 | 4 | 3 | 2 | 1 - Not at all Useful | |
| Efficient lighting sources & techniques | 13 | 62% | 23% | 0% | 8% | 0% | 8% | 0 |
| Lighting zones | 13 | 54% | 23% | 0% | 15% | 8% | 0% | 0 |
| Lighting controls | 13 | 46% | 31% | 0% | 15% | 0% | 8% | 0 |
| Exterior lighting recs | 13 | 46% | 31% | 8% | 15% | 0% | 0% | 0 |
| Compliance issues & resources | 11 | 45% | 27% | 0% | 18% | 9% | 0% | 1 |
| Mass Save whole building incentives | 10 | 40% | 20% | 40% | 0% | 0% | 0% | 1 |
| Mass Save system incentives | 11 | 36% | 27% | 36% | 0% | 0% | 0% | 1 |
| Interior lighting recs | 12 | 33% | 50% | 8% | 8% | 0% | 0% | 0 |
| Stretch code | 11 | 27% | 9% | 36% | 27% | 0% | 0% | 2 |
| Electrical provisions | 13 | 23% | 38% | 15% | 15% | 8% | 0% | 0 |
| 2012 IECC overview | 13 | 23% | 38% | 31% | 8% | 0% | 0% | 0 |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

**Table 45. Usefulness Ratings for Lighting and Lighting Control Training Components**

(Mean)

| Training Component | Mean Ratings | | | |
|---|---|---|---|---|
| | Jan thru Apr | Cumulative (Nov–Apr) | | |
| | | All | Code Officials | Builders/ Others |
| Efficient lighting sources & techniques | 5.2 | 5.1 | 5.2 | 5.1 |
| Interior lighting recs | 5.1 | 5.1 | 5.2 | 5.1 |
| Exterior lighting recs | 5.1 | 5.0 | 5.0 | 4.9 |
| 2012 IECC overview | 4.8 | 4.9 | 4.7 | 5.1 |
| Stretch code | 4.4 | 4.5 | 4.4 | 4.6 |
| Lighting zones | 5.0 | 5.0 | 5.0 | 5.0 |
| Mass Save whole building incentives | 5.0 | 4.8 | 4.7 | 5.0 |
| Mass Save system incentives | 5.0 | 4.8 | 4.7 | 5.0 |
| Lighting controls | 4.9 | 5.1 | 5.1 | 5.0 |
| Compliance issues & resources | 4.8 | 4.9 | 4.7 | 4.8 |
| Electrical provisions | 4.5 | 4.8 | 4.7 | 4.8 |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

**Table 46. Were the Lighting and Lighting Control Components New?**

(Percentage)

| Component | January thru April | | November through April | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | All | | Code Officials | | Builders and Others | |
| | n | Yes | n | Yes | n | Yes | n | Yes |
| Exterior lighting recs | 8 | 63% | 40 | 58% | 19 | 58% | 21 | 57% |
| Mass Save system incentives | 8 | 63% | 39 | 54% | 20 | 65% | 19 | 42% |
| Mass Save whole building incentives | 8 | 63% | 39 | 54% | 20 | 65% | 19 | 42% |
| Interior lighting recs | 8 | 63% | 40 | 53% | 19 | 47% | 21 | 57% |
| Electrical provisions | 8 | 50% | 36 | 61% | 18 | 72% | 18 | 50% |
| Efficient lighting sources & techniques | 8 | 38% | 38 | 61% | 19 | 74% | 19 | 47% |
| Stretch code | 8 | 38% | 39 | 23% | 20 | 20% | 19 | 26% |
| Lighting controls | 8 | 25% | 39 | 46% | 20 | 55% | 19 | 37% |
| 2012 IECC overview | 8 | 25% | 40 | 40% | 20 | 40% | 20 | 40% |
| Lighting zones | 8 | 13% | 40 | 43% | 20 | 40% | 20 | 45% |
| Compliance issues & resources | 8 | 13% | 38 | 58% | 19 | 63% | 19 | 53% |

**Table 47. Usefulness Ratings for HVAC and Air Quality Training Components**

(Percentage)

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

| Training Component | n | Rating of Usefulness (percentage) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 6 - Very Useful | 5 | 4 | 3 | 2 | 1 - Not at all Useful | Not Covered |
| Circuit rider service | 16 | 50% | 19% | 13% | 6% | 6% | 6% | 8 |
| Technical assistance options | 24 | 42% | 25% | 17% | 4% | 8% | 4% | 2 |
| Mass Save incentives | 23 | 26% | 30% | 17% | 17% | 4% | 4% | 2 |
| Mechanical system code provisions | 27 | 26% | 41% | 22% | 4% | 7% | 0% | 0 |
| HVAC systems | 27 | 26% | 37% | 15% | 15% | 4% | 4% | 0 |
| Compliance methods | 25 | 24% | 36% | 24% | 8% | 4% | 4% | 1 |
| COMcheck software | 22 | 23% | 32% | 32% | 5% | 9% | 0% | 4 |
| HVAC efficiency | 27 | 22% | 44% | 22% | 7% | 4% | 0% | 0 |
| ASHRAE 90.1 performance path | 24 | 21% | 42% | 25% | 0% | 13% | 0% | 1 |
| Documentation | 25 | 20% | 32% | 28% | 8% | 12% | 0% | 2 |
| Compliance issues | 26 | 19% | 31% | 31% | 15% | 4% | 0% | 0 |
| Stretch code | 26 | 19% | 31% | 23% | 12% | 8% | 8% | 1 |
| Energy modeling | 22 | 18% | 36% | 14% | 18% | 9% | 5% | 2 |
| Efficiency package options | 25 | 16% | 36% | 24% | 16% | 8% | 0% | 1 |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

**Table 48. Usefulness Ratings for HVAC and Air Quality Training Components**

(Mean)

| Training Component | Mean Ratings | | | |
|---|---|---|---|---|
| | | Cumulative (February 2015) | | |
| | February 2015 | All* | Code Officials | Builders/ Others |
| Technical assistance options | 4.8 | NA | 5.2 | 4.4 |
| Circuit rider service | 4.8 | NA | 5.1 | 4.6 |
| HVAC efficiency | 4.7 | NA | 5.1 | 4.5 |
| Mechanical system code provisions | 4.7 | NA | 5.1 | 4.5 |
| Compliance methods | 4.6 | NA | 4.8 | 4.4 |
| COMcheck software | 4.6 | NA | 4.8 | 4.3 |
| HVAC systems | 4.6 | NA | 4.8 | 4.3 |
| ASHRAE 90.1 performance path | 4.6 | NA | 4.7 | 4.5 |
| Compliance issues | 4.5 | NA | 4.8 | 4.2 |
| Documentation | 4.4 | NA | 5.0 | 4.0 |
| Efficiency package options | 4.4 | NA | 4.5 | 4.3 |
| Mass Save new construction incentives | 4.4 | NA | 4.3 | 4.6 |
| Energy modeling | 4.2 | NA | 4.8 | 3.9 |
| Stretch code | 4.2 | NA | 4.0 | 4.3 |

*No previous HVAC training data.

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

**Table 49. Were the HVAC and Air Quality Components New?**

(Percentage)

| Component | January through April* | | | | | |
|---|---|---|---|---|---|---|
| | All | | Code Officials | | Builders and Others | |
| | n | Yes | n | Yes | n | Yes |
| Technical assistance options | 17 | 59% | 11 | 73% | 6 | 33% |
| ASHRAE 90.1 performance path | 17 | 59% | 11 | 55% | 6 | 67% |
| Compliance issues | 16 | 56% | 10 | 50% | 6 | 67% |
| Circuit rider service | 13 | 54% | 7 | 43% | 6 | 67% |
| Energy modeling | 16 | 50% | 10 | 60% | 6 | 33% |
| COMcheck software | 16 | 50% | 10 | 50% | 6 | 50% |
| Efficiency package options | 17 | 47% | 10 | 70% | 7 | 14% |
| Mechanical system code provisions | 17 | 41% | 11 | 45% | 6 | 33% |
| HVAC systems | 18 | 33% | 11 | 36% | 7 | 29% |
| HVAC efficiency | 18 | 33% | 11 | 36% | 7 | 29% |
| Mass Save new construction incentives | 17 | 29% | 11 | 36% | 6 | 17% |
| Documentation | 17 | 29% | 10 | 30% | 7 | 29% |
| Stretch code | 18 | 28% | 11 | 18% | 7 | 43% |
| Compliance methods | 16 | 25% | 9 | 22% | 7 | 29% |

* HVAC training was not available before January 2015

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

Respondents generally gave high ratings to the quality of the training sessions, as shown in Table 50, with average ratings ranging from 3.7 to 5.6 on a 1-to-6 scale in which 6 is excellent and 1 is poor. The lowest rating was provided for the quality of the LLC handout information. Ninety-two percent of respondents would recommend the LLC and EBS trainings to others, compared with 79 percent for the HVAC training, consistent with the fact that the HVAC training received lower ratings in most categories. Overall, the 2015 trainings received slightly lower ratings when compared with the total trainings. However, trainees' willingness to recommend the trainings to others remains consistent.

**Table 50. Quality of Training Sessions**

(Mean ratings on a 1 to 6 scale)

| General Category | 2/11 LLC | 2/12 EBS | 2/24 HVAC | 3/5 EBS | Jan thru Apr | Nov thru Apr |
|---|---|---|---|---|---|---|
| n | 12 | 26 | 30 | 39 | 107 | 223 |
| Handling of participant questions | 5.3 | 5.5 | 4.5 | 5.3 | 5.1 | 5.2 |
| Presenter's skills | 5.6 | 5.6 | 4.3 | 5.3 | 5.1 | 5.2 |
| Quality of slide information | 5.0 | 5.3 | 4.6 | 4.9 | 4.9 | 5.0 |
| Quality of handout information | 3.7 | 4.4 | 3.9 | 4.1 | 4.0 | 3.9 |
| n | 12 | 26 | 29 | 38 | 105 | 218 |
| Percent recommending training to others | 92% | 92% | 79% | 92% | 89% | 89% |

The training attendees also provided feedback on the training quality through an ARS. Table 51 summarizes the three trainer qualities that were assessed using a different 1-to-6 scale than described previously, with 1 as strongly agree and 6 as strongly disagree. For the current evaluation period, the highest mean rating (closest to 1) was for trainers' organization and preparedness and the lowest mean rating (closest to 6) was for the trainer encouragement of participation. This is in contrast to the cumulative ratings, where the highest rating was for the trainer keeping an appropriate pace, and the lowest was for organization and preparedness.

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

**Table 51. ARS Ratings of Training Quality**

| Statement | Agreement with Statement** (Percent) | | | | | | | Mean | |
|---|---|---|---|---|---|---|---|---|---|
| | n* | 1 - Strongly Agree | 2 | 3 | 4 | 5 | 6 - Strongly Disagree | Jan thru Apr | Nov thru Apr |
| The trainer was organized and prepared | 59 | 76% | 8% | 7% | 2% | 3% | 3% | 1.58 | 1.71 |
| The trainer kept an appropriate pace | 57 | 65% | 12% | 9% | 5% | 5% | 4% | 1.84 | 1.67 |
| The trainer encouraged participation | 58 | 57% | 19% | 12% | 7% | 3% | 2% | 1.86 | 1.69 |

*Count of responses for January through April
**Not all statements were assessed at each training

## Use of Training

The immediate surveys asked respondents to estimate when they would be conducting final inspections of building units permitted under the 2012 IECC (building code officials) or have the units they were working on undergo final inspections (builders and others). However, enrollment records indicated a majority of survey respondents (70 percent of 134 total) worked in cities and towns where 2012 IECC is not applicable because there is a stretch code in place. As such, only twenty-nine attendees indicated that they had at least some building units currently permitted under the 2012 IECC. Table 7 shows the numbers of permitted units and inspections reported by the attendees who responded to this question.

**Table 52. Building Units Permitted and Inspected under 2012 IECC**

| Number of Buildings | Currently permitted | | Final inspections to date | Final inspections expected within one year | |
|---|---|---|---|---|---|
| | Code officials | Builders and others | Code officials | Code officials | Builders and others |
| n | 13 | 16 | 11 | 9 | 18 |
| Less than five | 5 | 8 | 4 | 1 | 10 |
| Five to ten | 0 | 6 | 0 | 1 | 4 |
| Eleven to 100 | 5 | 2 | 5 | 4 | 4 |
| More than 100 | 3 | 0 | 2 | 3 | 0 |

The surveys asked code officials who had not yet inspected buildings under the 2012 IECC to estimate when they expect to conduct a final inspection based on the 2012 IECC. As shown in Table 9, of the 13 code officials who were able to answer, 31 percent said they expect a final inspection in the next three months, the next four to six months, as well as in the next seven to twelve months. This question was not applicable to code officials in a stretch code community.

**Table 53. Expected Final Inspections on 2012 IECC Buildings**

(Percent)

| Expected Final Inspection | January through April | November through April |
|---|---|---|
| n | 13 | 36 |
| In the next three months | 31% | 33% |
| In the next four to six months | 31% | 25% |
| In the next seven to twelve months | 31% | 33% |
| More than a year from now | 8% | 8% |

The surveys also asked respondents when they first expected to use something learned at the training. As shown in Table 10, 45 percent of all January through April respondents said they

expected to use the training immediately, while 29 percent said they expected to use it within the next three months. These results were very comparable to those for respondents who took the training from November through April.

**Table 54. When Expect to First Use Training Information**

(Percent)

| Timeframe | January through April | | | November through April | | |
|---|---|---|---|---|---|---|
| | Code Officials | Builders and Others | Total | Code Officials | Builders and Others | Total |
| n | 28 | 77 | 105 | 83 | 134 | 217 |
| As soon as I walk out the door | 54% | 42% | 45% | 47% | 47% | 47% |
| Sometime in the next three months | 18% | 32% | 29% | 22% | 31% | 27% |
| In the next four to six months | 21% | 12% | 14% | 22% | 13% | 16% |
| In the next seven to twelve months | 0% | 8% | 6% | 1% | 4% | 3% |
| More than a year from now | 0% | 4% | 3% | 2% | 3% | 3% |
| Not likely to ever use it | 7% | 3% | 4% | 6% | 2% | 4% |

## Most Important Information and Other Qualitative Data

Respondents from all training sessions were asked to identify the most important new information learned during the training sessions. Respondents from EBS trainings most frequently identified the most important new information as code changes and updates, whereas LLC participants identified efficient options, and HVAC participants identified code compliance, exemptions, and requirements most frequently (Table 11). Not all categories identified by respondents were relevant to respondents from all trainings.

**Table 55. Most Important New Information from Training Sessions**

(percentage, multiple responses)

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

| General Category | EBS | HVAC | LLC |
|---|---|---|---|
| n | 45 | 22 | 7 |
| Updated codes / Code changes | 31% | 9% | 14% |
| Air leakage / Air and vapor barriers | 22% | 0% | 0% |
| IECC vs. ASHRAE vs. Stretch codes | 18% | 0% | 0% |
| Insulation | 9% | 0% | 0% |
| Code compliance/exemptions/requirements | 7% | 14% | 14% |
| Envelope design / provisions / options | 7% | 0% | 0% |
| U-values | 7% | 0% | 0% |
| Technical support/ resources | 7% | 0% | 0% |
| Most all of what was presented | 4% | 5% | 0% |
| Inspections | 2% | 0% | 0% |
| Efficient options/assessment | 2% | 0% | 43% |
| Awareness | 2% | 0% | 0% |
| Plan review | 2% | 0% | 0% |
| Interior zoning | 2% | 0% | 0% |
| Thermal bridging | 2% | 0% | 0% |
| R-values | 2% | 0% | 0% |
| Clarification of existing codes | 2% | 0% | 0% |
| Energy modeling | 2% | 0% | 0% |
| Daylighting | 0% | 0% | 14% |
| Lighting controls | 0% | 0% | 14% |
| Incentive information | 0% | 0% | 14% |
| Efficiency package options | 0% | 14% | 0% |
| HVAC systems | 0% | 9% | 0% |
| Technical assistance options | 0% | 9% | 0% |
| System commissioning | 0% | 9% | 0% |
| Documentation | 0% | 5% | 0% |
| Compliance issues | 0% | 5% | 0% |
| Energy modeling | 0% | 5% | 0% |

| | | | |
|---|---|---|---|
| Other | 0% | 14% | 0% |

When asked how they would use the information provided in the training, code officials most often mentioned that they will use it in the plan review or inspection process. Builders, equipment suppliers, and others who attended the January through April trainings most commonly indicated that the information would be used to improve communication or for code compliance (see Table 12). Not all categories identified by respondents were relevant to respondents from all trainings.

When asked to provide additional comments and suggestions for improving the training sessions, suggestions were consistent with the previous trainings, with attendees most often requesting presentation handouts and presentation improvements (see Table 57). This was consistent with the relatively low rating of the quality of handouts shown in Table 50.

**Table 56. How Training Information Will Be Used**

(Percentage, multiple responses)

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

| General Category | January through April | | November through April | |
|---|---|---|---|---|
| | Builders/ Equipment Suppliers / Others | Code Officials | Builders/ Equipment Suppliers/ Others | Code Officials |
| n | 54 | 18 | 116 | 74 |
| Code compliance | 20% | 0% | 10% | 4% |
| In current job | 17% | 0% | 9% | 4% |
| Future design / New construction | 15% | 11% | 8% | 9% |
| Improve communicating/sharing information | 15% | 17% | 13% | 5% |
| Energy efficiency improvements/analysis | 15% | 6% | 11% | 1% |
| Educate designers, engineer, owners, and/or contractors about code requirements | 7% | 11% | 5% | 7% |
| Plan, application, permit, or document review / Inspections | 6% | 50% | 6% | 34% |
| Construction or building control or oversight | 6% | 11% | 3% | 4% |
| Identifying utility incentive eligibility / Evaluating projects for utility incentives | 6% | 0% | 5% | 1% |
| Quality control | 4% | 6% | 2% | 1% |
| Renovation applications | 4% | 6% | 4% | 1% |
| Not applicable | 4% | 6% | 3% | 3% |
| Open to new kinds of work | 4% | 0% | 2% | 0% |
| Multifamily residential applications | 4% | 0% | 3% | 0% |
| Better detailing and better materials | 2% | 0% | 2% | 0% |
| Apply to permit applications to obtain compliance | 2% | 0% | 1% | 1% |
| All of it | 0% | 6% | 1% | 1% |
| Planning and implementing new purchase | 0% | 0% | 0% | 1% |
| Program administration | 0% | 0% | 1% | 0% |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

| | | | | |
|---|---|---|---|---|
| Improve lighting in common areas | 0% | 0% | 1% | 0% |
| Lighting control specifications | 0% | 0% | 1% | 0% |
| Will blog about event | 0% | 0% | 1% | 0% |
| Immediate use | 0% | 0% | 1% | 1% |
| LEED requirements | 0% | 0% | 1% | 1% |
| Other | 2% | 6% | 1% | 1% |

**Table 57. Additional Comments and Suggestions to Improve Training Sessions**
(percentage, multiple responses)*

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

| General Category | January through April Trainings | | | | November through April |
|---|---|---|---|---|---|
| | EBS | HVAC | LLC | Total | |
| n | 29 | 15 | 7 | 51 | 94 |
| Provide printout of presentation so participants can take notes | 21% | 20% | 13% | 18% | 13% |
| Presenter / materials need improvement | 21% | 40% | 13% | 24% | 13% |
| Training good or great / Presenter did a great job | 14% | 7% | 16% | 14% | 16% |
| More discussion of examples/ issues | 14% | 7% | 6% | 12% | 6% |
| Good information | 7% | 7% | 6% | 8% | 6% |
| Not enough focus on code | 7% | 7% | 6% | 8% | 6% |
| Too much/detailed information | 3% | 7% | 4% | 4% | 4% |
| More or better handouts with details and / or summaries of information presented | 3% | 7% | 18% | 6% | 18% |
| Building/location issues | 3% | 0% | 2% | 2% | 2% |
| Highly recommended | 3% | 0% | 2% | 2% | 2% |
| Enjoyed class discussion | 3% | 0% | 2% | 2% | 2% |
| Wrong audience for material / target to audience | 0% | 13% | 5% | 4% | 5% |
| Instructor allowed people to dominate discussion | 0% | 7% | 2% | 2% | 2% |
| Provide checklists | 0% | 7% | 3% | 4% | 3% |
| Provide water | 0% | 0% | 2% | 0% | 2% |
| Good location/setting | 0% | 0% | 2% | 0% | 2% |
| Very helpful in understanding energy codes | 0% | 0% | 1% | 0% | 1% |
| Train the builders / workmen in the field | 0% | 0% | 1% | 0% | 1% |
| Class long | 0% | 0% | 1% | 0% | 1% |
| Table on stretch codes was confusing | 0% | 0% | 1% | 0% | 1% |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

| | | | | | |
|---|---|---|---|---|---|
| Reference code sections on every slide | 0% | 0% | 1% | 0% | 1% |
| Tie training to IEBC/IBC code | 0% | 0% | 2% | 0% | 2% |
| Need more specifics on daylighting / skylight requirements | 0% | 0% | 2% | 0% | 2% |
| Slides disjointed/didn't match 2012 IECC | 0% | 0% | 1% | 0% | 1% |
| Other | 14% | 0% | 6% | 10% | 6% |

* Not all categories identified by respondents were relevant for both training types

The training sessions used ARS to develop estimates of the percentage of all building permits that are for retrofit projects. As shown in Table 58, respondents indicated an average of almost three-fifths of the permits they drew or were drawn in their jurisdictions are for retrofit projects and at least one-half of those retrofits are energy-related. Building code officials provided similar responses.

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

**Table 58. Proportion of Retrofit Building Permits (ARS Data—November through April)**

(Percentage)

| Percent of Retrofit Permits | All Trainees | | Building Code Officials Only | |
|---|---|---|---|---|
| | Portion of Building Permits that Are Retrofits | Portion of Retrofit Permits that Are Energy-Related | Portion of Building Permits that Are Retrofits | Portion of Energy-Related Retrofit Permits |
| n | 88 | 80 | 39 | 39 |
| None | 1% | 1% | 0% | 3% |
| 20% | 20% | 26% | 21% | 26% |
| 40% | 10% | 23% | 13% | 26% |
| 60% | 22% | 19% | 18% | 23% |
| 80% | 43% | 19% | 46% | 18% |
| 100% | 3% | 13% | 3% | 5% |
| Mean | 59% | 53% | 59% | 49% |

Survey respondents work in or cover many cities and towns throughout the region. When asked to identify the cities that they cover or work in the most, Boston was identified most frequently, followed by Cambridge, as shown in Table 59.

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

**Table 59. Cities and Towns Represented in 2015 Training Sessions**

(Percentage, multiple responses)

| City or Town | Code Officials | Builders and Others | Total | City or Town | Code Officials | Builders and Others | Total |
|---|---|---|---|---|---|---|---|
| n | 26 | 64 | 90 | n | 26 | 64 | 90 |
| Boston | 4% | 66% | 48% | Chelmsford | 4% | 0% | 1% |
| Cambridge | 0% | 28% | 20% | Cohasset | 0% | 2% | 1% |
| Brookline | 19% | 9% | 12% | Dartmouth | 0% | 2% | 1% |
| Worcester | 8% | 9% | 9% | Fitchburg | 0% | 2% | 1% |
| Somerville | 0% | 9% | 7% | Gloucester | 0% | 2% | 1% |
| Wellesley | 0% | 8% | 6% | Greenfield | 0% | 2% | 1% |
| Needham | 0% | 8% | 6% | Hamilton | 0% | 2% | 1% |
| Newton | 0% | 8% | 6% | Hingham | 0% | 2% | 1% |
| Westwood | 8% | 3% | 4% | Hyde Park | 0% | 2% | 1% |
| Andover | 0% | 5% | 3% | Jamaica Plain | 0% | 2% | 1% |
| Framingham | 0% | 5% | 3% | Lunenburg | 4% | 0% | 1% |
| Lowell | 0% | 5% | 3% | Marblehead | 4% | 0% | 1% |
| Walpole | 8% | 2% | 3% | Medway | 4% | 0% | 1% |
| Waltham | 4% | 3% | 3% | Methuen | 4% | 0% | 1% |
| Chelsea | 8% | 0% | 2% | Middleton | 0% | 2% | 1% |
| Dover | 8% | 0% | 2% | Natick | 0% | 2% | 1% |
| Lexington | 0% | 3% | 2% | Northampton | 0% | 2% | 1% |
| Lynn | 0% | 3% | 2% | Northborough | 0% | 2% | 1% |
| Malden | 0% | 3% | 2% | Oakham | 4% | 0% | 1% |
| Medfield | 8% | 0% | 2% | Plymouth | 0% | 2% | 1% |
| Norwood | 0% | 3% | 2% | Reading | 0% | 2% | 1% |
| Quincy | 0% | 3% | 2% | Revere | 0% | 2% | 1% |
| Salem | 0% | 3% | 2% | Roxbury | 0% | 2% | 1% |
| Springfield | 0% | 3% | 2% | Scituate | 0% | 2% | 1% |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (January – April 2015 Trainings)…*

| City or Town | Code Officials | Builders and Others | Total | City or Town | Code Officials | Builders and Others | Total |
|---|---|---|---|---|---|---|---|
| Stoughton | 8% | 0% | 2% | Sherborn | 4% | 0% | 1% |
| Amherst | 0% | 2% | 1% | Southborough | 0% | 2% | 1% |
| Ashburnham | 0% | 2% | 1% | Swampscott | 0% | 2% | 1% |
| Avon | 4% | 0% | 1% | Townsend | 0% | 2% | 1% |
| Bedford | 0% | 2% | 1% | Watertown | 0% | 2% | 1% |
| Belmont | 0% | 2% | 1% | Westfield | 0% | 2% | 1% |
| Billerica | 0% | 2% | 1% | Westminster | 0% | 2% | 1% |
| Braintree | 0% | 2% | 1% | Weston | 0% | 2% | 1% |
| Burlington | 0% | 2% | 1% | Wilmington | 0% | 2% | 1% |
| Canton | 4% | 0% | 1% | Winchester | 0% | 2% | 1% |

## FEEDBACK SUMMARY

Overall, the training sessions appeared to have been effective and received favorable feedback from attendees. Feedback on the trainers was consistent with the previous round of trainings and training usefulness scores remain relatively high. The HVAC training, which was provided for the first time, received slightly lower training quality scores, indicating that attention should be paid to the trainers' presentation, handouts, and handling of questions.

# IMMEDIATE COMMERCIAL CODE COMPLIANCE SUPPORT INITIATIVE TRAINING FEEDBACK (JULY 2015)

**TO:** Massachusetts Program Administrators (PAs), Massachusetts Energy Efficiency Advisory Council (EEAC) Consultants, and Conservation Services Group (CSG)

**FROM:** Allen Lee, Sara Wist, Althea Koburger, Cadmus

**SUBJECT:** Immediate Commercial Code Compliance Support Initiative Training Feedback

**CC:** Pam Rathbun, Tetra Tech; Betty Tolkin, Joanne O'Donnell, and Lynn Hoefgen, NMR Group

**DATE:** July 31, 2015

The Code Compliance Support Initiative (CCSI) seeks to improve compliance with residential and commercial building codes in Massachusetts over the long term. To support this goal, CCSI has made training sessions available for builders, subcontractors, architects, code officials, and other relevant audiences, addressing topics such as IECC compliance, Stretch Code compliance, Advanced Buildings criteria, and Massachusetts PA incentives.

This memo provides analysis and feedback on the three CCSI commercial training sessions that occurred from mid-April through June 2015. It also contains selected statistics on cumulative responses from all 12 commercial trainings held from November 2014 through June 2015 (shown in Table 37).

**Table 60. Training Sessions—November–June**

(Number of trainings)

| Training | Nov–Dec 2014 | Jan–Apr* 2015 | Apr**–Jun 2015 |
|---|---|---|---|
| Envelope and Building Science (EBS) | 2 | 2 | 2 |
| Lighting, Lighting Controls, and Electric Provisions (LLC) | 3 | 1 | 0 |
| HVAC and Indoor Air Quality (HVAC) | 0 | 1 | 1 |
| Total | 5 | 4 | 3 |

*Through April 2nd
**Beginning April 14th

Feedback is based on data collected during the registration process, through an Audience Response System (ARS) and from immediate surveys completed by participants.

As outlined in the amended work plan dated May 5, 2015, Cadmus summarizes the findings from the commercial training immediate surveys to the PAs and EEAC after every three to six trainings. 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. This memo represents the third commercial training immediate survey summary, with the first memo

*Immediate Commercial Code Compliance Support Initiative Training Feedback (July 2015)…* summarizing five trainings completed in late 2014 and the second memo summarizing the four trainings completed in early 2015.

## TRAINING ATTENDEE DATA

CSG, the CCSI contractor, held two EBS commercial training sessions (one on June 11 and one on June 17, 2015) and one HVAC training session (April 14, 2015).

### Unique Attendees—All Trainings

The team calculated the number of unique trainees for all trainings (residential and commercial) from September 23, 2014, through June 17, 2015, by using trainee enrollment data and completed immediate surveys. As shown in Table 38, residential trainings had 870 unique attendees and commercial trainings had 427 unique attendees; 144 individuals have attended both residential and commercial trainings. More than four out of 10 unique attendees were code officials; the trainings also had sizable numbers of architects/design engineers in attendance. Trainees listed as "other" most often described themselves as engineers or consultants to the PAs. Table 2 will be updated for each of the residential and commercial immediate training survey memos.

**Table 61. Numbers of Unique Training Attendees**

(Number of attendees)

| Position | All Residential Trainings | All Commercial Trainings | All Trainings—Both Res and Com |
|---|---|---|---|
| Building code official | 443 | 162 | 493 |
| Builder (oversees the entire construction of a home or building) | 117 | 8 | 124 |
| Architect or design engineer | 89 | 88 | 162 |
| Building contractor | 53 | 13 | 64 |
| HERS rater or energy efficiency consultant | 37 | 28 | 64 |
| Equipment supplier | 18 | 18 | 31 |
| Other | 58 | 54 | 106 |
| Position not known* | 55 | 56 | 109 |
| Total unique training attendees | 870 | 427 | 1153 |

*Includes individuals who did not indicate their positions 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.

### Commercial Training Attendee Data

In total, 160 individuals enrolled in one or more of the April 14, 2015, through June 2015 training sessions, for a total of 169 commercial training enrollment records. Based on information provided at the time of enrollment in commercial trainings, the largest group of training attendees during the current evaluation period identified themselves as code officials, whereas

the largest group in the previous period (January through April 2) identified themselves as architects or design engineers. Attendees in the more recent training, however, proved comparable to November and December 2014 trainings, where attendees most often identified themselves as building code officials.

Table 39 presents more detailed self-descriptions of commercial training attendees for both the current evaluation period and cumulative numbers from all commercial trainings offered from November 2014 through June 2015.

**Table 62. Training Attendees**

(Percentage)

| Position | April Through June Trainings | | | All Trainings Nov. Through June |
|---|---|---|---|---|
| | EBS | HVAC | Total | |
| N | 115 | 54 | 169 | 454 |
| Building code official | 81% | - | 55% | 44% |
| Architect or design engineer | 3% | 50% | 18% | 23% |
| Program manager | 3% | 2% | 2% | 5% |
| HERS rater or energy efficiency consultant | 1% | 9% | 4% | 8% |
| Equipment supplier for new homes | 2% | 7% | 4% | 3% |
| Building contractor | 3% | 9% | 5% | 3% |
| Builder (oversees entire construction) | 3% | 2% | 3% | 2% |
| Other | 4% | 20% | 9% | 11% |

Just under one-half (49%) of enrolled attendees have been in their present positions for over 10 years (Table 63). Approximately one-quarter of building code officials and about one-half of architects or design engineers have more than 15 years of experience in their current positions.

**Table 63. Years in Present Position***

(Percentage)

| Position | n | < 1 year | 1-5 years | 6-10 years | 11-15 years | 16-20 years | > 20 years |
|---|---|---|---|---|---|---|---|
| Building code official | 93 | 4% | 23% | 22% | 27% | 9% | 16% |
| Architect or design engineer | 31 | - | 16% | 32% | 3% | 6% | 42% |
| Building contractor | 8 | - | 5 | - | - | - | 3 |
| HERS rater or energy efficiency consultant | 6 | - | 2 | 1 | 1 | 1 | 1 |
| Equipment supplier for new homes | 6 | 1 | 1 | - | 1 | - | 3 |
| Builder (oversees entire construction) | 5 | - | 1 | 1 | - | - | 3 |
| Program manager | 4 | - | 2 | - | - | - | 2 |
| Other | 16 | 4 | 5 | 3 | - | 1 | 3 |

* The table shows the number of responses where the total respondent sample (n) size is less than 20.

## ATTENDEE SURVEY DATA

Surveys designed to collect information on attendees and feedback regarding training were provided to attendees at the end of each training.[4] In total, training participants returned 90 surveys. Of those 90 surveys:

- 55 were from building code officials
- 35 fell into the other categories: builders, architects, contractors, and others

Nineteen trainees not found in the enrollment data returned surveys. Of these, only seven entered a first name, and three returned surveys with the name line blank. Since actual attendance is not tracked at the trainings and because not all surveys were traceable to enrollment records, Cadmus could not calculate an accurate survey return rate.

## IMMEDIATE SURVEY FEEDBACK

### Usefulness and Quality

The surveys asked respondents to rate the EBS and HVAC training components' usefulness on a 1-to-6 scale, in which 6 is *very useful* and 1 is *not at all useful*. As with prior trainings, the majority of survey respondents rated all training components as a 4, 5, or 6 in terms of usefulness (shown in Table 64 and

Table 47), while some indicated components were not covered during the training. The most highly rated components were thermal bridging and the circuit rider service for the EBS and HVAC trainings, respectively.

[4] Some participants who attended multiple training sessions returned surveys for more than one training.

**As shown in Table 65, average ratings for EBS training components ranged from 4.0 to 4.7—a rate slightly lower than the previous round of EBS trainings. Average ratings for HVAC training components, as shown in**

Table 68, varied more than for EBS trainings, ranging from 3.7 to 4.9. In general, ratings from the April HVAC training were slightly lower than ratings for all HVAC trainings from November through April. However, as both the number of attendees and the sizes of samples responding to the surveys are small, comparisons between immediate survey findings across trainings are not necessarily statistically significant.

Surveys also asked attendees whether the trainings provided new material, with results shown in Table 43 and Table 49. As with earlier trainings, fewer respondents answered this question than provided ratings of usefulness. For EBS trainings, the energy modeling options and the technical assistance option components were most likely to contain new information for attendees. HVAC training attendees most often identified information on circuit rider services and technical assistance options as new.

**Table 64. Usefulness Ratings for Envelope Building Science Training Components**

(percentage)

| Training Component | n | Rating of Usefulness (percentage) | | | | | | Not Covered |
|---|---|---|---|---|---|---|---|---|
| | | 6 - Very Useful | 5 | 4 | 3 | 2 | 1 - Not at all Useful | |
| Thermal bridging | 55 | 31% | 27% | 24% | 16% | 2% | 0% | 0 |
| Slabs | 54 | 28% | 35% | 22% | 11% | 2% | 2% | 0 |
| Air barriers | 55 | 27% | 31% | 22% | 15% | 5% | 0% | 0 |
| Insulation | 55 | 27% | 33% | 20% | 16% | 2% | 2% | 0 |
| Air leakage | 55 | 27% | 31% | 18% | 16% | 5% | 2% | 0 |
| Fenestration | 55 | 27% | 27% | 29% | 9% | 4% | 4% | 0 |
| Code changes | 55 | 22% | 33% | 27% | 15% | 4% | 0% | 0 |
| Energy compliance options | 54 | 20% | 33% | 19% | 20% | 4% | 4% | 0 |
| Technical assistance options | 51 | 20% | 37% | 27% | 16% | 0% | 0% | 1 |
| Compliance options | 54 | 19% | 35% | 28% | 11% | 7% | 0% | 0 |
| Res. and Com. offers | 53 | 19% | 36% | 23% | 13% | 6% | 4% | 1 |
| Envelope provisions | 55 | 18% | 38% | 27% | 15% | 2% | 0% | 0 |
| Energy modeling options | 54 | 15% | 31% | 13% | 28% | 7% | 6% | 1 |
| Dampers | 53 | 15% | 36% | 15% | 19% | 9% | 6% | 1 |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (July 2015)…*

| Training Component | n | Rating of Usefulness (percentage) | | | | | | Not Covered |
|---|---|---|---|---|---|---|---|---|
| | | 6 - Very Useful | 5 | 4 | 3 | 2 | 1 - Not at all Useful | |
| Vestibules | 54 | 15% | 30% | 20% | 20% | 7% | 7% | 1 |
| Case studies | 47 | 11% | 26% | 21% | 23% | 13% | 6% | 4 |

**Table 65. Usefulness Ratings for Envelope Building Science Training Components**

(Mean)

| Training Component | Mean Ratings | | | |
|---|---|---|---|---|
| | June 2015 | Cumulative (Nov 2014-Jun 2015) | | |
| | | All | Code Officials | Builders/Others |
| Code changes | 4.5 | 4.9 | 4.5 | 5.3 |
| Air barriers | 4.6 | 5.0 | 4.7 | 5.4 |
| Air leakage | 4.5 | 5.0 | 4.7 | 5.4 |
| Envelope provisions | 4.6 | 5.0 | 4.8 | 5.2 |
| Insulation | 4.6 | 5.0 | 4.7 | 5.2 |
| Fenestration | 4.5 | 4.9 | 4.7 | 5.1 |
| Thermal bridging | 4.7 | 5.0 | 4.8 | 5.2 |
| Slabs | 4.7 | 5.0 | 4.8 | 5.1 |
| Energy compliance options | 4.4 | 4.8 | 4.5 | 5.1 |
| Compliance options | 4.5 | 4.8 | 4.5 | 5.1 |
| Technical assistance options | 4.7 | 4.8 | 4.7 | 4.8 |
| Res. and Com. offers | 4.4 | 4.6 | 4.5 | 4.8 |
| Energy modeling options | 4.1 | 4.6 | 4.3 | 4.9 |
| Dampers | 4.2 | 4.5 | 4.2 | 4.8 |
| Vestibules | 4.1 | 4.5 | 4.3 | 4.7 |
| Case studies | 4.0 | 4.3 | 4.3 | 4.3 |

**Table 66. Were the Envelope Building Science Components New?**

(Percentage)

| Component | June 2015 | | November 2014 through June 2015 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | All | | Code Officials | | Builders and Others | |
| | n | Yes | n | Yes | n | Yes | n | Yes |
| Energy modeling options | 34 | 47% | 86 | 47% | 47 | 40% | 39 | 54% |
| Technical assistance options | 32 | 44% | 86 | 53% | 45 | 42% | 41 | 66% |
| Code changes | 36 | 42% | 97 | 53% | 50 | 42% | 47 | 64% |
| Case studies | 29 | 38% | 81 | 52% | 41 | 39% | 40 | 65% |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (July 2015)…*

| Component | June 2015 | | November 2014 through June 2015 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | All | | Code Officials | | Builders and Others | |
| | n | Yes | n | Yes | n | Yes | n | Yes |
| Energy compliance options | 33 | 27% | 87 | 36% | 46 | 22% | 41 | 51% |
| Compliance options | 33 | 27% | 94 | 36% | 47 | 28% | 47 | 45% |
| Fenestration | 34 | 29% | 95 | 38% | 48 | 25% | 47 | 51% |
| Vestibules | 34 | 35% | 89 | 43% | 47 | 32% | 42 | 55% |
| Res. and Com. offers | 32 | 28% | 85 | 32% | 45 | 24% | 40 | 40% |
| Dampers | 33 | 39% | 88 | 39% | 46 | 33% | 42 | 45% |
| Envelope provisions | 34 | 29% | 95 | 33% | 48 | 27% | 47 | 38% |
| Thermal bridging | 35 | 29% | 97 | 30% | 49 | 29% | 48 | 31% |
| Air leakage | 35 | 26% | 95 | 31% | 49 | 22% | 46 | 39% |
| Insulation | 33 | 24% | 95 | 25% | 47 | 19% | 48 | 31% |
| Air barriers | 35 | 26% | 95 | 28% | 49 | 20% | 46 | 37% |
| Slabs | 35 | 26% | 97 | 25% | 49 | 22% | 48 | 27% |

**Table 67. Usefulness Ratings for HVAC and Air Quality Training Components**

(Percentage)

| Training Component | n | Rating of Usefulness (percentage) | | | | | | Not Covered |
|---|---|---|---|---|---|---|---|---|
| | | 6 - Very Useful | 5 | 4 | 3 | 2 | 1 - Not at all Useful | |
| Circuit rider service | 11 | 36% | 0% | 27% | 27% | 9% | 0% | 14 |
| Compliance issues | 29 | 31% | 28% | 31% | 10% | 0% | 0% | 0 |
| Stretch code | 29 | 31% | 21% | 24% | 10% | 14% | 0% | 1 |
| Mechanical system code provisions | 29 | 28% | 41% | 21% | 7% | 3% | 0% | 0 |
| HVAC efficiency | 30 | 27% | 47% | 17% | 10% | 0% | 0% | 0 |
| Technical assistance options | 18 | 22% | 33% | 28% | 11% | 6% | 0% | 9 |
| HVAC systems | 29 | 21% | 52% | 14% | 3% | 10% | 0% | 1 |
| Efficiency package options | 27 | 19% | 48% | 19% | 15% | 0% | 0% | 1 |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (July 2015)…*

| Training Component | n | Rating of Usefulness (percentage) | | | | | | Not Covered |
|---|---|---|---|---|---|---|---|---|
| | | 6 - Very Useful | 5 | 4 | 3 | 2 | 1 - Not at all Useful | |
| ASHRAE 90.1 performance path | 23 | 17% | 30% | 43% | 9% | 0% | 0% | 6 |
| Compliance methods | 27 | 15% | 44% | 26% | 15% | 0% | 0% | 1 |
| COMcheck software | 14 | 14% | 21% | 14% | 21% | 29% | 0% | 13 |
| Mass Save incentives | 19 | 11% | 32% | 42% | 5% | 11% | 0% | 8 |
| Energy modeling | 18 | 11% | 11% | 56% | 11% | 11% | 0% | 9 |
| Documentation | 26 | 8% | 19% | 27% | 31% | 12% | 4% | 3 |

**Table 68. Usefulness Ratings for HVAC and Air Quality Training Components**

(Mean)

| Training Component | Mean Ratings | | | |
|---|---|---|---|---|
| | April 2015 | Cumulative (Nov 2014-Apr 2015) | | |
| | | All | Code Officials | Builders/Others |
| HVAC efficiency | 4.9 | 4.8 | 5.1 | 4.8 |
| Mechanical system code provisions | 4.8 | 4.8 | 5.1 | 4.7 |
| Efficiency package options | 4.7 | 4.5 | 4.5 | 4.6 |
| HVAC systems | 4.7 | 4.6 | 4.8 | 4.6 |
| Compliance methods | 4.6 | 4.6 | 4.8 | 4.5 |
| ASHRAE 90.1 performance path | 4.6 | 4.6 | 4.7 | 4.5 |
| Compliance issues | 4.6 | 4.6 | 4.8 | 4.5 |
| Technical assistance options | 4.6 | 4.7 | 5.2 | 4.5 |
| Stretch code | 4.4 | 4.3 | 4.0 | 4.4 |
| Circuit rider service | 4.3 | 4.6 | 5.1 | 4.4 |
| Mass Save new construction incentives | 4.3 | 4.4 | 4.3 | 4.4 |
| Energy modeling | 4.0 | 4.1 | 4.8 | 3.9 |
| COMcheck software | 3.7 | 4.2 | 4.8 | 4.0 |
| Documentation | 3.7 | 4.0 | 5.0 | 3.8 |

**Table 69. Were the HVAC and Air Quality Components New?**

(Percentage)

| Component | April 2015 | | January through April 2015 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | All | | Code Officials | | Builders and Others | |
| | n | Yes | n | Yes | n | Yes | n | Yes |
| Circuit rider service | 5 | 80% | 18 | 61% | 7 | 43% | 11 | 73% |
| Technical assistance options | 9 | 67% | 26 | 62% | 11 | 73% | 15 | 53% |
| Efficiency package options | 13 | 54% | 30 | 50% | 10 | 70% | 20 | 40% |
| Compliance methods | 13 | 38% | 29 | 31% | 9 | 22% | 20 | 35% |
| Mechanical system code provisions | 13 | 38% | 30 | 40% | 11 | 45% | 19 | 37% |
| Documentation | 13 | 38% | 30 | 33% | 10 | 30% | 20 | 35% |
| ASHRAE 90.1 performance path | 11 | 36% | 28 | 50% | 11 | 55% | 17 | 47% |
| Compliance issues | 14 | 36% | 30 | 47% | 10 | 50% | 20 | 45% |
| Stretch code | 14 | 36% | 32 | 31% | 11 | 18% | 21 | 38% |
| COMcheck software | 7 | 29% | 23 | 43% | 10 | 50% | 13 | 38% |
| Mass Save new construction incentives | 11 | 27% | 28 | 29% | 11 | 36% | 17 | 24% |
| HVAC efficiency | 14 | 21% | 32 | 28% | 11 | 36% | 21 | 24% |
| Energy modeling | 7 | 14% | 23 | 39% | 10 | 60% | 13 | 23% |
| HVAC systems | 14 | 7% | 32 | 22% | 11 | 36% | 21 | 14% |

Respondents generally awarded the quality of the training sessions high ratings, as shown in Table 50, with average ratings ranging from 3.2 to 5.3 on a 6-to1 scale, with 6 as excellent and 1 as poor. As in the previous trainings evaluation, respondents gave the lowest ratings for the quality of handout information (rating of 3.8). Eighty percent of respondents would recommend the April 14 HVAC trainings to others, compared with 100% for the June 11 EBS training and 75% for the June 17 EBS training. Overall, the April through June trainings received slightly lower ratings when compared with total trainings (November 2014 through June 2015).

**Table 70. Quality of Training Sessions**

(Mean ratings on a 6 to 1 scale)

| General Category | 4/14 HVAC | 6/11 EBS | 6/17 EBS | Apr Through Jun 2015 | Nov 2014 Through Jun 2015 |
|---|---|---|---|---|---|
| N | 32 | 16 | 41 | 89 | 312 |
| Handling of participant questions | 5.2 | 5.3 | 5.0 | 5.1 | 5.2 |
| Presenter's skills | 5.1 | 5.3 | 5.0 | 5.1 | 5.2 |
| Quality of slide information | 4.6 | 4.9 | 4.1 | 4.4 | 4.8 |
| Quality of handout information | 4.0 | 4.4 | 3.2 | 3.7 | 3.8 |
| n | 30 | 16 | 40 | 86 | 304 |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (July 2015)…*

| General Category | 4/14 HVAC | 6/11 EBS | 6/17 EBS | Apr Through Jun 2015 | Nov 2014 Through Jun 2015 |
|---|---|---|---|---|---|
| Percent recommending training to others | 80% | 100% | 75% | 81% | 87% |

Training attendees also provided feedback on the training quality through an ARS. Table 51 summarizes the three trainer qualities assessed using a different 1-to-6 scale than described previously, with 1 as strongly agree and 6 as strongly disagree. For the current evaluation period, respondents awarded the best mean rating (closest to 1) for trainers' encouragement of participation and the worst mean rating (closest to 6) for the trainer keeping an appropriate pace, although average ratings did not differ very much. Each training quality measure received higher ratings when averaged over all trainings than ratings received for just the most recent trainings.

**Table 71. ARS Ratings of Training Quality**

| | Agreement with Statement** (Percent) | | | | | | | Mean | |
|---|---|---|---|---|---|---|---|---|---|
| | n* | 1 - Strongly Agree | 2 | 3 | 4 | 5 | 6 - Strongly Disagree | June 2015 | Nov 2014 thru Jun 2015 |
| The trainer was organized and prepared | 59 | 66% | 15% | 4% | 2% | 6% | 7% | 2.3 | 1.9 |
| The trainer kept an appropriate pace | 35 | 34% | 31% | 9% | 11% | 6% | 9% | 2.5 | 1.8 |
| The trainer encouraged participation | 36 | 50% | 33% | 0% | 0% | 11% | 6% | 2.1 | 1.9 |

*Count of responses for June 2015; no data for the HVAC training April 14.
**Not all statements were assessed at each training

## Use of Training

The immediate surveys asked respondents to estimate when they would be conducting final inspections of building units permitted under the 2012 IECC (building code officials) or would have the units they were working on undergo final inspections (builders and others). Enrollment records, however, indicated a majority of survey respondents (68% of 80 respondents to the question) worked in at least one city or town where the 2012 IECC did not apply as a stretch code was in place. As such, only 20 attendees indicated they had at least some building units currently permitted under the 2012 IECC. Table 7 shows the number of permitted units and inspections reported by attendees who responded to this question.

**Table 72. Building Units Permitted and Inspected Under 2012 IECC***

| Number of Buildings | Currently Permitted | | Final Inspections to Date | Final Inspections Expected Within One Year | |
|---|---|---|---|---|---|
| | Code Officials | Builders and Others | Code Officials | Code Officials | Builders and Others |
| N | 16 | 4 | 9 | 12 | 4 |
| Less than five | 6 | 3 | 2 | 5 | 2 |
| Five to ten | 1 | 0 | 0 | 2 | 0 |
| Eleven to 100 | 4 | 1 | 4 | 2 | 1 |
| More than 100 | 5 | 0 | 3 | 3 | 1 |

* May include residential construction in addition to commercial construction

The surveys asked commercial code officials who had not yet inspected buildings under the 2012 IECC to estimate when they expected to conduct a final inspection, based on the 2012 IECC. As shown in Table 73, of 23 code officials able to answer, 48% said they expected a final inspection within the next three months, and 26% expected to do so within the next four to six months. This question did not apply to code officials in a stretch code community.

**Table 73. Expected Final Inspections on 2012 IECC Buildings***

(Percent)

| Expected Final Inspection | April Through June 2015 | November 2014 Through June 2015 |
|---|---|---|
| N | 23 | 58 |
| In the next three months | 48% | 40% |
| In the next four to six months | 26% | 24% |
| In the next seven to twelve months | 17% | 28% |
| More than a year from now | 9% | 9% |

* May include residential construction in addition to commercial construction

The surveys also asked respondents when they first expected to use something learned at the training. As shown in Table 10, 59% of all April through June 2015 respondents said they expected to use the training immediately, while 25% said they expected to use it within the next three months. The results for this period showed a higher percentage of people planning to use the information immediately compared to the cumulative results and considerably higher compared to the previous period (45%, not shown).

**Table 74. When Expect to First Use Training Information**

(Percent)

| Timeframe | April Through June 2015 | | | November 2014 Through June 2015 | | |
|---|---|---|---|---|---|---|
| | Code Officials | Builders and Others | Total | Code Officials | Builders and Others | Total |
| N | 53 | 34 | 87 | 81 | 111 | 192 |
| As soon as I walk out the door | 60% | 56% | 59% | 58% | 46% | 51% |
| Sometime in the next three months | 21% | 32% | 25% | 20% | 32% | 27% |
| In the next four to six months | 13% | 6% | 10% | 16% | 10% | 13% |
| In the next seven to twelve months | 4% | 6% | 5% | 2% | 7% | 5% |
| More than a year from now | 0% | 0% | 0% | 0% | 3% | 2% |
| Not likely to ever use it | 2% | 0% | 1% | 4% | 2% | 3% |

## Most Important Information and Other Qualitative Data

Surveys asked respondents from all training sessions to identify the most important new information learned during the training sessions. Respondents from EBS trainings most frequently identified information on insulation as most important, whereas HVAC participants most frequently identified updated codes and code changes as most important (Table 11). Not all categories respondents identified were relevant to respondents from both trainings.

**Table 75. Most Important New Information from Training Sessions**

(percentage, multiple responses)

| General Category | EBS | HVAC |
|---|---|---|
| n | 31 | 22 |
| Insulation | 29% | 0% |
| Slab insulation/information | 19% | 0% |
| Updated codes/Code changes | 16% | 36% |
| Code compliance/exemptions/requirements | 13% | 27% |
| Thermal bridging | 10% | 0% |
| Roofing/reroofing | 10% | 0% |
| IECC vs. ASHRAE vs. Stretch codes | 6% | 0% |
| Envelope design/provisions/options | 6% | 0% |
| Most all of what was presented | 3% | 0% |
| Inspections | 3% | 0% |
| Plan review | 3% | 0% |
| Correct reference of sections of IECC | 3% | 0% |
| R-values | 3% | 0% |
| Lighting controls | 3% | 0% |
| Air leakage/Air and vapor barriers | 3% | 0% |
| System commissioning information | 0% | 5% |
| Stretch code | 0% | 9% |
| Compliance methods | 0% | 9% |
| Energy modeling | 0% | 9% |
| Efficiency package options | 0% | 5% |
| Other | 10% | 14% |

When asked how they would use the information provided in the training, code officials most often cited plans to use the information in the plan review or inspection process. Builders, equipment suppliers, and others attending the April through June trainings most commonly indicated information would be used for future designs and new construction (Table 12). Not all categories respondents identified were relevant to respondents from all trainings.

When asked to provide additional comments and suggestions for improving the training sessions, respondents offered suggestions consistent with the previous trainings, most often requesting presentation handouts and presentation improvements (Table 77). This result is consistent with the relatively low ratings on the quality of handouts, as shown in Table 50.

**Table 76. How Training Information Will Be Used**

(Percentage, multiple responses)

| General Category | April Through June 2015 | | November 2014 Through April 2015 | |
|---|---|---|---|---|
| | Code Officials | Builders/ Equipment Suppliers/ Others | Code Officials | Builders/ Equipment Suppliers/ Others |
| N | 32 | 23 | 106 | 139 |
| Plan, application, permit, or document review/Inspections | 44% | 0% | 37% | 5% |
| Future design/New construction | 9% | 16% | 9% | 10% |
| Improve communicating/sharing information | 9% | 13% | 7% | 14% |
| Code compliance | 9% | 13% | 6% | 12% |
| In current job | 9% | 9% | 6% | 10% |
| Construction or building control or oversight | 9% | 0% | 6% | 3% |
| Not applicable | 6% | 0% | 4% | 2% |
| Educate designers, engineer, owners, and/or contractors about code requirements | 6% | 9% | 7% | 6% |
| Personal knowledge | 6% | 0% | 2% | 1% |
| Apply to permit applications to obtain compliance | 3% | 0% | 2% | 1% |
| Energy efficiency improvements/analysis | 0% | 13% | 1% | 12% |
| Planning and implementing new purchase | 3% | 6% | 1% | 1% |
| Identifying utility incentive eligibility/Evaluating projects for utility incentives | 0% | 3% | 1% | 5% |
| LEED requirements | 0% | 3% | 1% | 1% |
| Open to new kinds of work | 0% | 3% | 0% | 2% |
| Better detailing and better materials | 0% | 3% | 0% | 2% |
| Multifamily residential applications | 0% | 0% | 0% | 2% |
| Renovation applications | 0% | 0% | 1% | 4% |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (July 2015)…*

| General Category | April Through June 2015 | | November 2014 Through April 2015 | |
|---|---|---|---|---|
| | Code Officials | Builders/ Equipment Suppliers/ Others | Code Officials | Builders/ Equipment Suppliers/ Others |
| Program administration | 0% | 0% | 0% | 1% |
| Improve lighting in common areas | 0% | 0% | 0% | 1% |
| Lighting control specifications | 0% | 0% | 0% | 1% |
| Immediate use | 0% | 0% | 1% | 1% |
| In the field | 3% | 0% | 1% | 0% |
| Quality control | 0% | 0% | 1% | 1% |
| All Of it | 0% | 0% | 1% | 1% |
| Other | 0% | 0% | 1% | 2% |

*Immediate Commercial Code Compliance Support Initiative Training Feedback (July 2015)…*

**Table 77. Additional Comments and Suggestions to Improve Training Sessions**

(percentage, multiple responses)*

| General Category | April Through June 2015 Trainings | | | November 2014 Through June 2015 |
|---|---|---|---|---|
| | EBS | HVAC | Total | |
| N | 22 | 6 | 28 | 122 |
| More or better handouts with details and/or summaries of information presented | 36% | 0% | 29% | 20% |
| Presenter/materials need improvement | 18% | 0% | 14% | 13% |
| Provide printout of presentation so participants can take notes | 9% | 17% | 11% | 12% |
| Good information | 9% | 17% | 11% | 7% |
| Not enough focus on code | 14% | 0% | 11% | 7% |
| Good information | 9% | 17% | 11% | 7% |
| Train the builders/workmen in the field | 14% | 0% | 11% | 3% |
| More discussion of examples/issues | 5% | 17% | 7% | 7% |
| Training good or great/Presenter did a great job | 9% | 0% | 7% | 14% |
| More discussion of examples/issues | 5% | 17% | 7% | 7% |
| Class not long enough | 9% | 0% | 7% | 2% |
| Too much/detailed information | 5% | 17% | 7% | 5% |
| Building/location issues | 5% | 17% | 7% | 3% |
| Enjoyed class discussion | 5% | 0% | 4% | 2% |
| Wrong audience for material/target to audience | 5% | 0% | 4% | 5% |
| Instructor allowed people to dominate discussion | 0% | 17% | 4% | 2% |
| Provide checklists | 0% | 0% | 0% | 2% |
| Provide water | 0% | 0% | 0% | 2% |
| Good location/setting | 0% | 0% | 0% | 2% |
| Tie training to IEBC/IBC code | 0% | 0% | 0% | 2% |
| Highly recommended | 0% | 0% | 0% | 2% |
| Need more specifics on daylighting/skylight requirements | 0% | 0% | 0% | 2% |
| Very helpful in understanding energy codes | 0% | 0% | 0% | 1% |
| Table on stretch codes was confusing | 0% | 0% | 0% | 1% |
| Reference code sections on every slide | 0% | 0% | 0% | 1% |
| Slides disjointed/didn't match 2012 IECC | 0% | 0% | 0% | 1% |
| Other | 9% | 0% | 7% | 7% |

Training sessions used ARS to develop estimates of the percentage of all building permits provided for retrofit projects. As shown in Table 58, respondents indicated an average of about 60% of the permits they drew (or were drawn in their jurisdictions) were for retrofit projects and

about 60% of those retrofits were energy related. Responses by building code officials were similar to those from all trainees.

**Table 78. Proportion of Retrofit Building Permits (ARS Data—November through June)**

(Percentage)

| Percentage of Retrofit Permits | All Trainees | | Building Code Officials Only | |
|---|---|---|---|---|
| | Portion of Building Permits that are Retrofits | Portion of Retrofit Permits that are Energy-Related | Portion of Building Permits that are Retrofits | Portion of Retrofit Permits that are Energy-Related |
| N | 158 | 164 | 62 | 67 |
| None | 3% | 2% | 0% | 1% |
| 20% | 17% | 20% | 15% | 19% |
| 40% | 12% | 17% | 11% | 15% |
| 60% | 20% | 21% | 18% | 30% |
| 80% | 45% | 26% | 55% | 28% |
| 100% | 4% | 14% | 2% | 6% |
| Mean % of retrofits | 60% | 58% | 64% | 56% |

Survey respondents worked in or covered many cities and towns throughout the region. When asked to identify cities they covered or worked in the most, builders most frequently cited Boston, followed by Cambridge, as shown in Table 59.

**Table 79. Cities and Towns Represented in Training Sessions**

(Percentage, multiple responses)

| City or Town | Code Officials | Builders and Others | Total | City or Town | Code Officials | Builders and Others | Total |
|---|---|---|---|---|---|---|---|
| n | 48 | 32 | 80 | | | | |
| Boston | 0% | 29.9% | 15.5% | Brewster | 1.4% | 0% | 0.7% |
| Cambridge | 0% | 14.3% | 7.4% | Cheshire | 1.4% | 0% | 0.7% |
| Worcester | 0% | 10.4% | 5.4% | Colrain | 1.4% | 0% | 0.7% |
| Waltham | 0% | 5.2% | 2.7% | Cummington | 1.4% | 0% | 0.7% |
| Springfield | 2.8% | 1.3% | 2.0% | Deerfield | 1.4% | 0% | 0.7% |
| Amherst | 4.2% | 0% | 2.0% | Dudley | 1.4% | 0% | 0.7% |
| Bedford | 0% | 2.6% | 1.4% | East Longmeadow | 1.4% | 0% | 0.7% |
| Foxborough | 0% | 2.6% | 1.4% | Eastham | 1.4% | 0% | 0.7% |
| Framingham | 0% | 2.6% | 1.4% | Fall River | 1.4% | 0% | 0.7% |
| Newton | 0% | 2.6% | 1.4% | Franklin | 1.4% | 0% | 0.7% |
| Westborough | 0% | 2.6% | 1.4% | Freetown | 1.4% | 0% | 0.7% |
| Chicopee | 2.8% | 0% | 1.4% | Gardner | 1.4% | 0% | 0.7% |
| Holyoke | 2.8% | 0% | 1.4% | Goshen | 1.4% | 0% | 0.7% |
| Lenox | 2.8% | 0% | 1.4% | Greenfield | 1.4% | 0% | 0.7% |
| Pittsfield | 2.8% | 0% | 1.4% | Groton | 1.4% | 0% | 0.7% |
| Plymouth | 2.8% | 0% | 1.4% | Hadley | 1.4% | 0% | 0.7% |
| Provincetown | 2.8% | 0% | 1.4% | Hampden | 1.4% | 0% | 0.7% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Walpole | 2.8% | 0% | 1.4% | Lee | 1.4% | 0% | 0.7% |
| Ayer | 0% | 1.3% | 0.7% | Longmeadow | 1.4% | 0% | 0.7% |
| Barnstable | 0% | 1.3% | 0.7% | Medfield | 1.4% | 0% | 0.7% |
| Blackstone | 0% | 1.3% | 0.7% | Medway | 1.4% | 0% | 0.7% |
| Brockton | 0% | 1.3% | 0.7% | Monterey | 1.4% | 0% | 0.7% |
| Fitchburg | 0% | 1.3% | 0.7% | Needham | 1.4% | 0% | 0.7% |
| Gratton | 0% | 1.3% | 0.7% | New Ashford | 1.4% | 0% | 0.7% |
| Lawrence | 0% | 1.3% | 0.7% | Northampton | 1.4% | 0% | 0.7% |
| Leominster | 0% | 1.3% | 0.7% | Orleans | 1.4% | 0% | 0.7% |
| Lowell | 0% | 1.3% | 0.7% | Pelham | 1.4% | 0% | 0.7% |
| Marlboro | 0% | 1.3% | 0.7% | Phillipston | 1.4% | 0% | 0.7% |
| Milford | 0% | 1.3% | 0.7% | Quincy | 1.4% | 0% | 0.7% |
| Millbury | 0% | 1.3% | 0.7% | Royalston | 1.4% | 0% | 0.7% |
| Natick | 0% | 1.3% | 0.7% | Sheffield | 1.4% | 0% | 0.7% |
| North Andover | 0% | 1.3% | 0.7% | Shelburne | 1.4% | 0% | 0.7% |
| Northborough | 0% | 1.3% | 0.7% | Somerset | 1.4% | 0% | 0.7% |
| Scituate | 0% | 1.3% | 0.7% | South Hadley | 1.4% | 0% | 0.7% |
| Sharon | 0% | 1.3% | 0.7% | Southwick | 1.4% | 0% | 0.7% |
| Shrewsbury | 0% | 1.3% | 0.7% | Sturbridge | 1.4% | 0% | 0.7% |
| Wakefield | 0% | 1.3% | 0.7% | Templeton | 1.4% | 0% | 0.7% |
| Woburn | 0% | 1.3% | 0.7% | Townsend | 1.4% | 0% | 0.7% |
| Acushnet | 1.4% | 0% | 0.7% | Uxbridge | 1.4% | 0% | 0.7% |
| Adams | 1.4% | 0% | 0.7% | Westwood | 1.4% | 0% | 0.7% |
| Agawam | 1.4% | 0% | 0.7% | Whately | 1.4% | 0% | 0.7% |
| Alford | 1.4% | 0% | 0.7% | Wilbraham | 1.4% | 0% | 0.7% |
| Avon | 1.4% | 0% | 0.7% | Williamsburg | 1.4% | 0% | 0.7% |
| Belchertown | 1.4% | 0% | 0.7% | Williamstown | 1.4% | 0% | 0.7% |
| Berkley | 1.4% | 0% | 0.7% | Worthington | 1.4% | 0% | 0.7% |

## FEEDBACK SUMMARY

Overall, the training sessions appeared to have been effective and received favorable feedback from attendees. Feedback on trainers was consistent with previous training rounds, with training usefulness scores remaining relatively high. Trainees continued to identify opportunities for improvements regarding presentation handouts, indicating changes to materials provided during trainings could be improved. The number of HVAC trainees who cited the circuit rider service as new information indicate opportunities may exist for increased outreach in this sector. Some information should be gathered addressing why code officials did not attend the HVAC training, as this may indicate they will have difficulty enforcing the HVAC requirements.

# IMMEDIATE COMMERCIAL CODE COMPLIANCE SUPPORT INITIATIVE TRAINING FEEDBACK (DECEMBER 2015)

**TO:** Massachusetts Program Administrators (PAs), Massachusetts Energy Efficiency Advisory Council (EEAC) Consultants, and Conservation Services Group (CSG)

**FROM:** Allen Lee, Althea Koburger, Cadmus

**SUBJECT:** Immediate Commercial Code Compliance Support Initiative Training Feedback

**CC:** Pam Rathbun, Tetra Tech; Betty Tolkin, Joanne O'Donnell, and Lynn Hoefgen, NMR Group

**DATE:** December 30, 2015

The Code Compliance Support Initiative (CCSI) seeks to improve compliance with residential and commercial building codes in Massachusetts over the long term. To support this goal, CCSI has made training sessions available for builders, subcontractors, architects, code officials, and other relevant audiences, addressing topics such as IECC compliance, Stretch Code compliance, Advanced Buildings criteria, and Massachusetts PA incentives.

This memo provides analysis and feedback from immediate survey responses on the five CCSI commercial training sessions that occurred since the last memo (October through December 2015) was completed, as well as selected statistics based on cumulative responses from all 17 (12 in 2015 and 5 in 2014) commercial trainings held from November 2014 through December 2015 (shown in Table 37). Note that all results reported throughout this memorandum for the period October through December 2015 cover only the December 4, 2015, MP training and not the two subsequent trainings in that month.

**Table 80. Training Sessions—November 2014–December 2015**

(Number of trainings)

| Training | Nov–Dec 2014 | Jan–Apr* 2015 | Apr**–Jun 2015 | Oct-Dec 2015*** | Total Nov 2014-Dec 2015 |
|---|---|---|---|---|---|
| Envelope and Building Science (EBS) | 2 | 2 | 2 | 1 | 7 |
| Lighting, Lighting Controls, and Electric Provisions (LLC) | 3 | 1 | - | 2 | 6 |
| Mechanical Provisions (MP) (formerly HVAC) | 0 | 1 | 1 | 2 | 4 |
| Total | 5 | 4 | 3 | 5 | 17 |

*Through April 2nd
**Beginning April 14th
***The analysis included the MP training on December 4, 2015, but not two subsequent trainings in December.

Feedback is based on data collected during the registration process, through an Audience Response System (ARS), and from immediate surveys completed by participants.

*Immediate Commercial Code Compliance Support Initiative Training Feedback (December 2015)…*

As outlined in the amended work plan dated May 5, 2015, Cadmus summarizes the findings from the commercial training immediate surveys to the PAs and EEAC after every three to six trainings. 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. This memo presents the fourth commercial training immediate survey summary, with the first memo summarizing five trainings completed in late 2014, the second memo summarizing the four trainings completed in early 2015, and the third summarizing three trainings in mid-2015.

## TRAINING ATTENDEE DATA

CLEAResult (formerly CSG), the CCSI contractor, held two LLC training sessions on October 9th and November 13th, one EBS commercial training session on October 14th, and two MP training sessions on October 22nd and December 4th.

### Unique Attendees—All Trainings

The team calculated the number of unique trainees for all trainings from September 23, 2014, through December 10, 2015, by using trainee enrollment data and completed immediate surveys. As shown in Table 38, residential trainings had 1,002 unique attendees and the commercial trainings had 505 unique attendees; 183 individuals have attended both residential and commercial trainings. More than four out of ten unique attendees have been code officials; the trainings have also had sizable numbers of architects/designers in attendance. Builders, described as those overseeing the entire construction of a home or building, and building contractors responsible for specific aspects of construction, as would be expected, 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. This table is updated for each memo, residential and commercial, provided on the immediate training surveys.

**Table 81. Numbers of Unique Training Attendees**

(Number of attendees)

| Position | All Residential Trainings | All Commercial Trainings | All Trainings—Both Res and Com |
|---|---|---|---|
| Building code official | 486 | 206 | 544 |
| Builder (oversees the entire construction of a home or building) | 135 | 8 | 142 |
| Architect or design engineer | 103 | 93 | 181 |
| Building contractor | 78 | 15 | 91 |
| HERS rater or energy efficiency consultant | 46 | 32 | 77 |
| Equipment supplier | 19 | 23 | 37 |
| Other | 78 | 72 | 143 |
| Position not known* | 57 | 56 | 109 |
| Total unique training attendees | 1002 | 505 | 1324 |

*Includes individuals who did not indicate their positions 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.

## Commercial Training Attendee Data

In total, 132 individuals enrolled in one or more of the October through December 2015 training sessions, for a total of 137 commercial training enrollment records. Based on information provided at the time of enrollment in commercial trainings, the largest group of training attendees during the current evaluation period identified themselves as code officials. Attendees over the entire evaluation period also most often identified themselves as building code officials.

Table 39 presents more detailed self-descriptions of commercial training attendees for both the current evaluation period and cumulative numbers from all commercial trainings offered from November 2014 through December 2015.

**Table 82. Commercial Code Training Attendees**

(Percentage)

| Position | October to December 2015 Trainings | | | | Nov 2014 to Dec 2015 |
|---|---|---|---|---|---|
| | LLC | EBS | MP | Total | |
| n | 44 | 45 | 48 | 137 | 586 |
| Building code official | 25% | 67% | 52% | 48% | 46% |
| Architect or design engineer | 16% | 11% | 17% | 15% | 21% |
| HERS rater / energy efficiency consultant | 9% | 7% | 6% | 7% | 8% |
| Equipment supplier for new homes | 9% | 4% | 4% | 6% | 4% |
| Building contractor | - | 2% | 10% | 4% | 3% |
| Builder (oversees entire construction) | - | - | 2% | 1% | 2% |
| Program manager | 7% | - | - | - | 4% |
| Other | 34% | 9% | 8% | 17% | 12% |

Over a quarter (26%) of enrolled attendees had been in their present positions for over 20 years; over a third (37%) had been in their position for 5 years or less. Nearly 30% of building code officials and 40% of architects or design engineers had more than 20 years of experience in their current positions (see Table 63).

**Table 83. Years in Present Position***

(Percentage)

| Position | n | < 1 year | 1-5 years | 6-10 years | 11-15 years | 16-20 years | > 20 years |
|---|---|---|---|---|---|---|---|
| Building code official | 66 | 5% | 24% | 17% | 12% | 14% | 29% |
| Architect or design engineer | 20 | 10% | 30% | 10% | 0% | 10% | 40% |
| Equipment supplier for new homes | 8 | 1 | 1 | 4 | 0 | 1 | 1 |
| HERS rater or energy efficiency consultant | 10 | 4 | 3 | 1 | 0 | 0 | 2 |
| Building contractor | 6 | 0 | 1 | 1 | 0 | 0 | 4 |
| Builder (oversees entire construction) | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| Program manager | 3 | 0 | 0 | 3 | 0 | 0 | 0 |
| Other | 21 | 10% | 52% | 5% | 19% | 5% | 10% |

* The table shows the number of responses where the total respondent sample (n) size is less than 20.

## ATTENDEE SURVEY DATA

Surveys designed to collect information on attendees and feedback regarding training were provided to attendees at the end of each training.[5] In total, training participants returned 102 surveys. Of those 102 surveys:

- 61 were from building code officials
- 41 fell into the other categories: builders, architects, contractors, and others.

Twenty-two trainees from the paper surveys entered names not found in the enrollment data. An additional five returned surveys with the name line blank. Since actual attendance is not tracked at the trainings and because not all surveys were traceable to enrollment records, Cadmus could not calculate an accurate survey return rate.

## IMMEDIATE SURVEY FEEDBACK

### Usefulness and Quality

The surveys asked respondents to rate the LLC, EBS and MP training components' usefulness on a 1-to-6 scale, in which 6 is *very useful* and 1 is *not at all useful*. As with prior trainings, the majority of survey respondents rated all training components as a 4, 5, or 6 in terms of usefulness (shown in Table 84, Table 64, and

[5] Some participants who attended multiple training sessions returned surveys for more than one training.

Table 47), while some indicated components were not covered during the training. The most highly rated components were interior lighting requirements, slabs, and the compliance methods for the LLC, EBS and MP trainings, respectively.

As shown in Table 85, average ratings for LLC training components ranged from 4.6 to 5.5. Average ratings for EBS ranged from 4.2 to 4.9 as shown in Table 65 —a range slightly higher than the previous round of EBS trainings. Average ratings for MP training components, as shown in

Table 68, ranged from 4.4 to 5.0. In general, ratings from the October through December MP training were slightly higher than ratings for all MP trainings from November 2014 through December 2015. However, as both the number of attendees and the sizes of samples responding to the surveys are small, comparisons between immediate survey findings across trainings are not necessarily statistically significant.

Surveys also asked attendees whether the trainings provided new material, with results shown in Table 46, Table 43, and Table 49. As with earlier trainings, fewer respondents answered this question than provided ratings of usefulness. LLC trainings showed that whole building incentives and compliance issues and resources were most likely to be new information for training attendees. For EBS trainings, dampers and the case study components were most likely to contain new information for attendees. MP training attendees most often identified information on circuit rider services and HVAC system options as new; although this finding for the October through December training period was based on only four responses, it was consistent with findings across the entire period.

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**Table 84. Usefulness Ratings for Lighting and Lighting Control Training Components**

(Percentage)

| Training Component | n | Rating of Usefulness (percentage) | | | | | | Not Covered |
|---|---|---|---|---|---|---|---|---|
| | | 6 - Very Useful | 5 | 4 | 3 | 2 | 1 - Not at all Useful | |
| Interior lighting requirements | 31 | 55% | 42% | 3% | 0% | 0% | 0% | 0 |
| Efficient lighting sources & techniques | 30 | 50% | 37% | 13% | 0% | 0% | 0% | 0 |
| Compliance issues & resources | 30 | 50% | 37% | 10% | 3% | 0% | 0% | 0 |
| Mass Save whole building incentives | 30 | 47% | 33% | 13% | 7% | 0% | 0% | 0 |
| 2012 IECC overview | 28 | 46% | 46% | 4% | 4% | 0% | 0% | 0 |
| Lighting zones | 31 | 45% | 42% | 13% | 0% | 0% | 0% | 0 |
| Lighting controls | 30 | 43% | 50% | 7% | 0% | 0% | 0% | 0 |
| Exterior lighting requirements | 31 | 42% | 48% | 3% | 3% | 3% | 0% | 0 |
| Mass Save system incentives | 29 | 38% | 34% | 24% | 3% | 0% | 0% | 0 |
| Electrical provisions | 28 | 36% | 29% | 32% | 4% | 0% | 0% | 0 |
| Stretch code | 26 | 19% | 42% | 19% | 19% | 0% | 0% | 2 |

**Table 85. Usefulness Ratings for Lighting and Lighting Control Training Components**

(Mean)

| Training Component | Mean Ratings | | | |
|---|---|---|---|---|
| | Oct-Dec 2015 | Cumulative (Nov-Dec) | | |
| | | All | Code Officials | Builders/ Others |
| Interior lighting requirements | 5.5 | 5.3 | 5.3 | 5.3 |
| Efficient lighting sources & techniques | 5.4 | 5.2 | 5.3 | 5.2 |

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| | | | | |
|---|---|---|---|---|
| Lighting controls | 5.4 | 5.2 | 5.2 | 5.2 |
| 2012 IECC overview | 5.4 | 5.1 | 4.9 | 5.2 |
| Lighting zones | 5.3 | 5.1 | 5.2 | 5.1 |
| Compliance issues & resources | 5.3 | 5.1 | 5.0 | 5.1 |
| Exterior lighting requirements | 5.2 | 5.1 | 5.0 | 5.1 |
| Mass Save whole building incentives | 5.2 | 5.0 | 4.9 | 5.1 |
| Mass Save system incentives | 5.1 | 5.0 | 4.8 | 5.0 |
| Electrical provisions | 5.0 | 4.9 | 4.9 | 4.8 |
| Stretch code | 4.6 | 4.5 | 4.6 | 4.5 |

**Table 86. Were the Lighting and Lighting Control Components New?**

(Percentage)

| Component | Oct-Dec 2015 | | November through December | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | All | | Code Officials | | Builders and Others | |
| | n | Yes | n | Yes | n | Yes | n | Yes |
| Mass Save whole building incentives | 16 | 69% | 66 | 59% | 25 | 68% | 41 | 54% |
| Compliance issues & resources | 17 | 59% | 66 | 59% | 25 | 60% | 41 | 59% |
| Electrical provisions | 16 | 56% | 63 | 60% | 23 | 65% | 40 | 58% |
| Mass Save system incentives | 16 | 56% | 66 | 55% | 25 | 64% | 41 | 49% |
| Lighting controls | 17 | 53% | 67 | 49% | 26 | 54% | 41 | 46% |
| Exterior lighting requirements | 17 | 53% | 68 | 53% | 25 | 64% | 43 | 47% |
| Lighting zones | 17 | 53% | 68 | 44% | 26 | 50% | 42 | 40% |
| Stretch code | 16 | 50% | 66 | 36% | 25 | 20% | 41 | 46% |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Efficient lighting sources & techniques | 17 | 47% | 66 | 53% | 25 | 72% | 41 | 41% |
| 2012 IECC overview | 16 | 44% | 67 | 42% | 25 | 40% | 42 | 43% |
| Interior lighting requirements | 17 | 41% | 68 | 47% | 25 | 48% | 43 | 47% |

**Table 87. Usefulness Ratings for Envelope Building Science Training Components**

(percentage)

| Training Component | n | Rating of Usefulness (percentage) | | | | | | Not Covered |
|---|---|---|---|---|---|---|---|---|
| | | 6 - Very Useful | 5 | 4 | 3 | 2 | 1 - Not at all Useful | |
| Slabs | 36 | 33% | 33% | 28% | 6% | 0% | 0% | 0 |
| Air leakage | 36 | 31% | 36% | 28% | 11% | 0% | 0% | 0 |
| Envelope provisions | 35 | 29% | 40% | 23% | 9% | 0% | 0% | 1 |
| Technical assistance options | 34 | 29% | 32% | 24% | 9% | 0% | 6% | 0 |
| Insulation | 36 | 28% | 39% | 31% | 3% | 0% | 0% | 0 |
| Thermal bridging | 36 | 28% | 36% | 31% | 6% | 0% | 0% | 0 |
| Fenestration | 36 | 28% | 33% | 31% | 8% | 0% | 0% | 0 |
| Air barriers | 36 | 28% | 33% | 28% | 11% | 0% | 0% | 0 |
| Energy compliance options | 35 | 26% | 29% | 29% | 9% | 6% | 3% | 0 |
| Code changes | 34 | 24% | 35% | 26% | 15% | 0% | 0% | 1 |
| Vestibules | 34 | 24% | 35% | 24% | 12% | 6% | 0% | 0 |
| Res. and Com. offers | 31 | 23% | 35% | 23% | 16% | 3% | 0% | 4 |
| Energy modeling options | 35 | 23% | 17% | 31% | 14% | 11% | 3% | 0 |
| Compliance options | 35 | 20% | 46% | 20% | 14% | 0% | 0% | 1 |
| Dampers | 33 | 18% | 33% | 33% | 12% | 3% | 0% | 1 |
| Case studies | 35 | 14% | 31% | 29% | 17% | 6% | 3% | 0 |

**Table 88. Usefulness Ratings for Envelope Building Science Training Components**

(Mean)

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| Training Component | Mean Ratings | | | |
|---|---|---|---|---|
| | Oct-Dec 2015 | Cumulative (Nov 2014-Dec 2015) | | |
| | | All | Code Officials | Builders/ Others |
| Envelope provisions | 4.9 | 5.0 | 4.8 | 5.2 |
| Insulation | 4.9 | 5.0 | 4.7 | 5.2 |
| Air leakage | 4.9 | 5.0 | 4.7 | 5.1 |
| Thermal bridging | 4.9 | 5.0 | 4.8 | 5.2 |
| Slabs | 4.9 | 5.0 | 4.8 | 5.1 |
| Air barriers | 4.8 | 5.0 | 4.7 | 5.4 |
| Fenestration | 4.8 | 4.9 | 4.7 | 5.1 |
| Code changes | 4.7 | 4.9 | 4.5 | 5.3 |
| Compliance options | 4.7 | 4.8 | 4.5 | 5.1 |
| Technical assistance options | 4.6 | 4.8 | 4.7 | 4.8 |
| Res. and Com. offers | 4.6 | 4.6 | 4.5 | 4.8 |
| Energy compliance options | 4.5 | 4.7 | 4.5 | 5.1 |
| Energy modeling options | 4.2 | 4.5 | 4.3 | 4.9 |
| Dampers | 4.5 | 4.5 | 4.2 | 4.8 |
| Vestibules | 4.6 | 4.5 | 4.3 | 4.7 |
| Case studies | 4.2 | 4.3 | 4.3 | 4.3 |

**Table 89. Were the Envelope Building Science Components New?**

(Percentage)

| Component | Oct-Dec 2015 | | November 2014 through December 2015 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | All | | Code Officials | | Builders and Others | |
| | n | Yes | n | Yes | n | Yes | n | Yes |
| Dampers | 25 | 68% | 113 | 45% | 68 | 43% | 45 | 49% |
| Case studies | 24 | 63% | 105 | 54% | 62 | 47% | 43 | 65% |
| Code changes | 27 | 59% | 124 | 54% | 73 | 47% | 51 | 65% |
| Envelope provisions | 27 | 56% | 122 | 38% | 71 | 35% | 51 | 41% |
| Thermal bridging | 28 | 54% | 125 | 35% | 73 | 37% | 52 | 33% |
| Air barriers | 28 | 54% | 123 | 34% | 73 | 30% | 50 | 40% |
| Technical assistance options | 23 | 52% | 109 | 53% | 65 | 45% | 44 | 66% |
| Energy compliance options | 25 | 52% | 112 | 39% | 68 | 32% | 44 | 50% |
| Slabs | 28 | 50% | 125 | 30% | 73 | 32% | 52 | 29% |
| Vestibules | 25 | 48% | 114 | 44% | 69 | 36% | 45 | 56% |
| Energy modeling options | 25 | 48% | 111 | 47% | 69 | 43% | 42 | 52% |
| Res. and Com. offers | 24 | 46% | 109 | 35% | 67 | 33% | 42 | 38% |
| Compliance options | 27 | 44% | 121 | 38% | 70 | 36% | 51 | 41% |
| Fenestration | 28 | 43% | 123 | 39% | 72 | 31% | 51 | 51% |
| Insulation | 28 | 36% | 123 | 28% | 71 | 24% | 52 | 33% |
| Air leakage | 27 | 33% | 122 | 31% | 72 | 25% | 50 | 40% |

**Table 90. Usefulness Ratings for Mechanical Provisions Training Components**

(Percentage)

| Training Component | n | Rating of Usefulness (percentage) | | | | | | Not Covered |
|---|---|---|---|---|---|---|---|---|
| | | 6 - Very Useful | 5 | 4 | 3 | 2 | 1 - Not at all Useful | |
| Compliance methods | 28 | 43% | 25% | 21% | 11% | 0% | 0% | 0 |
| Technical assistance options | 26 | 38% | 27% | 15% | 19% | 0% | 0% | 2 |

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| Training Component | n | Rating of Usefulness (percentage) | | | | | | Not Covered |
|---|---|---|---|---|---|---|---|---|
| | | 6 - Very Useful | 5 | 4 | 3 | 2 | 1 - Not at all Useful | |
| Mechanical system code provisions | 26 | 35% | 38% | 12% | 15% | 0% | 0% | 0 |
| HVAC efficiency | 26 | 35% | 38% | 12% | 15% | 0% | 0% | 0 |
| Stretch code | 26 | 35% | 27% | 19% | 12% | 0% | 8% | 0 |
| HVAC systems | 25 | 32% | 32% | 24% | 12% | 0% | 0% | 0 |
| Compliance issues | 27 | 30% | 37% | 19% | 15% | 0% | 0% | 0 |
| ASHRAE 90.1 performance path | 25 | 28% | 28% | 24% | 20% | 0% | 05 | 0 |
| COMcheck software | 23 | 26% | 30% | 9% | 35% | 0% | 0% | 3 |
| Efficiency package options | 29 | 24% | 38% | 21% | 17% | 0% | 0% | 0 |
| Energy modeling | 23 | 22% | 48% | 9% | 17% | 4% | 0% | 3 |
| Documentation | 24 | 21% | 38% | 8% | 29% | 4% | 0% | 0 |
| Circuit rider service | 16 | 19% | 50% | 19% | 13% | 0% | 0% | 5 |
| Mass Save incentives | 23 | 17% | 35% | 35% | 13% | 0% | 0% | 3 |

**Table 91. Usefulness Ratings for Mechanical Provisions Training Components**

(Mean)

| Training Component | Mean Ratings | | | |
|---|---|---|---|---|
| | Oct-Dec 2015 | Cumulative (Nov 2014-Dec 2015) | | |
| | | All | Code Officials | Builders/ Others |
| Compliance methods | 5.0 | 4.7 | 4.6 | 4.8 |
| HVAC efficiency | 4.9 | 4.9 | 4.7 | 4.9 |
| Mechanical system code provisions | 4.9 | 4.8 | 4.6 | 4.9 |
| Technical assistance options | 4.8 | 4.7 | 4.7 | 4.8 |
| Circuit rider service | 4.8 | 4.7 | 4.7 | 4.6 |
| HVAC systems | 4.8 | 4.7 | 4.6 | 4.7 |
| Compliance issues | 4.8 | 4.7 | 4.5 | 4.8 |
| Efficiency package options | 4.7 | 4.6 | 4.3 | 4.8 |
| Energy modeling | 4.7 | 4.3 | 4.4 | 4.3 |

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| | | | | |
|---|---|---|---|---|
| ASHRAE 90.1 performance path | 4.6 | 4.6 | 4.5 | 4.7 |
| Mass Save incentives | 4.6 | 4.4 | 4.4 | 4.5 |
| Stretch code | 4.6 | 4.4 | 3.9 | 4.7 |
| COMcheck software | 4.5 | 4.3 | 4.4 | 4.2 |
| Documentation | 4.4 | 4.2 | 4.3 | 4.1 |

**Table 92. Were the Mechanical Provisions Components New?**

**(**Percentage**)**

| Component | Oct-Dec 2015 | | January through December 2015 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | All | | Code Officials | | Builders and Others | |
| | n | Yes | n | Yes | n | Yes | n | Yes |
| Circuit rider service | 4 | 50% | 22 | 59% | 9 | 44% | 13 | 69% |
| HVAC systems | 6 | 33% | 38 | 24% | 14 | 43% | 24 | 13% |
| Technical assistance options | 7 | 29% | 33 | 55% | 15 | 53% | 18 | 56% |
| Compliance issues | 7 | 29% | 37 | 43% | 14 | 43% | 23 | 43% |
| COMcheck software | 7 | 29% | 30 | 40% | 14 | 36% | 16 | 44% |
| Mechanical system code provisions | 7 | 29% | 37 | 38% | 15 | 47% | 22 | 32% |
| Energy modeling | 7 | 29% | 30 | 37% | 14 | 57% | 16 | 19% |
| HVAC efficiency | 7 | 29% | 39 | 28% | 15 | 40% | 24 | 21% |
| Documentation | 6 | 17% | 36 | 31% | 13 | 31% | 23 | 30% |
| ASHRAE 90.1 performance path | 7 | 14% | 35 | 43% | 15 | 47% | 20 | 40% |
| Stretch code | 7 | 14% | 39 | 28% | 15 | 13% | 24 | 38% |
| Efficiency package options | 7 | 0% | 37 | 41% | 14 | 50% | 26 | 35% |
| Compliance methods | 7 | 0% | 36 | 25% | 13 | 15% | 23 | 30% |
| Mass Save incentives | 11 | 0% | 39 | 21% | 17 | 24% | 22 | 18% |

Respondents generally gave the quality of the training sessions high ratings, as shown in Table 50, with average ratings ranging from 4.3 to 5.8 on a 6-to-1 scale, with 6 as excellent and 1 as poor. As in the previous trainings evaluation, respondents gave the lowest ratings for the quality of handout information. However, the handout information quality ratings have increased substantially, with the average rating of 4.6 for all the October through December 2015 trainings compared to an average of 3.8 for all the prior trainings. This improvement might have been due to changes made in response to prior findings, but implementers and trainers were not interviewed as part of this study to confirm that. Seventy-five percent of respondents would recommend the MP trainings to others, compared with 89% for the EBS training and 97% for the LLC trainings. Overall, the October through December trainings received very similar ratings when compared with total trainings (November 2014 through December 2015).

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**Table 93. Quality of Training Sessions**

(Mean ratings on a 6 to 1 scale)

| General Category | 10/9 & 11/13 LLC | 10/14 EBS | 10/22 & 12/4 MP | Oct –Dec 2015 | Nov 2014 Through Dec 2015 |
|---|---|---|---|---|---|
| n | 31 | 38 | 33 | 102 | 414 |
| Presenter's skills | 5.8 | 5.2 | 4.8 | 5.3 | 5.2 |
| Handling of participant questions | 5.7 | 5.1 | 4.9 | 5.2 | 5.2 |
| Quality of slide information | 5.5 | 5.0 | 4.6 | 5.0 | 4.9 |
| Quality of handout information | 5.1 | 4.4 | 4.3 | 4.6 | 4.0 |
| n | 31 | 36 | 32 | 99 | 403 |
| Percent recommending training to others | 97% | 89% | 75% | 87% | 87% |

Training attendees also provided feedback on the training quality through an ARS. Table 51 summarizes the three trainer qualities assessed using a different 1-to-6 scale, with 1 as strongly agree and 6 as strongly disagree. For the current evaluation period, respondents gave the best mean rating (closest to 1) for trainers keeping an appropriate pace during the session and the worst mean rating (closest to 6) for the trainer's preparedness, though average ratings did not differ very much. Mean scores for the current evaluation period were very similar to cumulative scores.

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**Table 94. ARS Ratings of Training Quality**

| | Agreement with Statement* (Percent) | | | | | | | Mean | |
|---|---|---|---|---|---|---|---|---|---|
| | n | 1 - Strongly Agree | 2 | 3 | 4 | 5 | 6 - Strongly Disagree | Oct to Dec 2015 | Nov 2014 to Dec 2015 |
| The trainer was organized and prepared | 102 | 58% | 13% | 11% | 5% | 6% | 8% | 2.1 | 2.0 |
| The trainer kept an appropriate pace | 83 | 59% | 19% | 5% | 10% | 4% | 4% | 1.9 | 1.9 |
| The trainer encouraged participation | 88 | 58% | 20% | 6% | 7% | 3% | 6% | 1.9 | 1.9 |

*Not all statements were assessed at each training.

## Use of Training

The immediate surveys asked respondents to estimate when they would be conducting final inspections of building units permitted under the 2012 IECC (building code officials) or would have the units they were working on undergo final inspections (builders and others). Enrollment records, however, indicated a majority of survey respondents (61% of 84 respondents who answered the question) worked in at least one city or town where the 2012 IECC did not apply because a stretch code was in place. As such, only 17 attendees indicated they had at least some building units currently permitted under the 2012 IECC. Table 7 shows the number of permitted units and inspections reported by attendees who responded to this question.

**Table 95. Building Units Permitted and Inspected Under 2012 IECC***

| Number of Buildings | Currently Permitted | | Final Inspections to Date | Final Inspections Expected Within One Year | |
|---|---|---|---|---|---|
| | Code Officials | Builders and Others | Code Officials | Code Officials | Builders and Others |
| n | 13 | 4 | 10 | 9 | 3 |
| Less than five | 3 | 0 | 1 | 2 | 3 |
| Five to ten | 0 | 4 | 1 | 2 | 0 |
| Eleven to 100 | 6 | 0 | 5 | 3 | 0 |
| More than 100 | 4 | 0 | 3 | 2 | 0 |

* May include residential construction in addition to commercial construction; numbers provided rather than percentages for n<20

The surveys asked commercial building code officials who had not yet inspected buildings under the 2012 IECC to estimate when they expected to conduct a final inspection, based on the 2012

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IECC. As shown in Table 73, of 23 code officials able to answer, 65% said they expected a final inspection within the next three months, and 13% expected to do so within the next four to six months. This question did not apply to code officials in a stretch code community.

**Table 96. Expected Final Inspections on 2012 IECC Buildings***

(Percent)

| Expected Final Inspection | Oct Through Dec 2015 | Nov 2014 Through Dec 2015 |
|---|---|---|
| In the next three months | 65% | 44% |
| In the next four to six months | 13% | 22% |
| In the next seven to twelve months | 22% | 27% |
| More than a year from now | 0% | 6% |

* May include residential construction in addition to commercial construction

The surveys also asked respondents when they first expected to use something learned at the training. As shown in Table 10, 52% of all October through December 2015 training respondents said they expected to use the training immediately, while 31% said they expected to use it within the next three months. The results for this period showed a similar percentage of people planning to use the information immediately compared to the cumulative results, but were lower compared to the previous period (59%, not shown).

**Table 97. When Expect to First Use Training Information**

(Percent)

| Timeframe | Oct Through Dec 2015 | | | Nov 2014 Through Dec 2015 | | |
|---|---|---|---|---|---|---|
| | Code Officials | Builders and Others | Total | Code Officials | Builders and Others | Total |
| n | 61 | 40 | 101 | 197 | 208 | 405 |
| As soon as I walk out the door | 46% | 63% | 52% | 50% | 51% | 51% |
| Sometime in the next three months | 33% | 28% | 31% | 25% | 30% | 28% |
| In the next four to six months | 15% | 10% | 13% | 17% | 11% | 14% |
| In the next seven to twelve months | 3% | 0% | 2% | 3% | 4% | 3% |
| More than a year from now | 2% | 0% | 1% | 2% | 2% | 2% |
| Not likely to ever use it | 2% | 0% | 1% | 4% | 1% | 2% |

## Most Important Information and Other Qualitative Data

Surveys asked respondents from the five training sessions to identify the most important new information learned during the training sessions. Respondents from MP and EBS trainings most frequently identified information on code compliance as most important, whereas LLC participants most frequently identified daylighting and lighting controls as most important (Table 11). Not all categories respondents identified were relevant to respondents from all trainings.

**Table 98. Most Important New Information from Training Sessions**
(percentage, multiple responses)

| General Category | MP | EBS | LLC |
|---|---|---|---|
| n | 24 | 28 | 27 |
| Code compliance/exemptions/requirements | 50% | 29% | 19% |
| Updated codes/Code changes | 25% | 11% | 11% |
| Efficiency package options | 25% | 0% | 7% |
| HVAC systems / Efficiency | 12% | 0% | 0% |
| Most all of what was presented | 8% | 7% | 7% |
| IECC vs. ASHRAE vs. stretch codes | 4% | 21% | 7% |
| Compliance methods | 4% | 0% | 0% |
| Daylighting | 0% | 7% | 22% |
| Lighting controls / Lighting | 0% | 4% | 21% |
| Insulation | 0% | 21% | 0% |
| Thermal bridging | 0% | 14% | 0% |
| Air leakage/Air and vapor barriers | 0% | 14% | 0% |
| Envelope design/provisions/options | 0% | 7% | 0% |
| Technical support / resources | 0% | 0% | 7% |
| Clarification of existing code | 0% | 0% | 4% |
| Slab insulation/information | 0% | 4% | 0% |
| Other | 17% | 0% | 4% |

When asked how they would use the information provided in the training, code officials most often said they would use it in the plan application and review or inspection process. Builders, equipment suppliers, and others attending the October through December trainings most commonly indicated information would be used for future designs and new construction (Table 12). These findings were the same top choices for code officials and builders/others as in the previous group of responses (April through June). Not all categories that respondents identified were relevant to respondents from all trainings and the differences between the results for the October through December 2015 period and the results for all trainings are due, in part, to the mix of training courses during these periods.

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**Table 99. How Training Information Will Be Used**

(Percentage, multiple responses)

| General Category | Oct to Dec 2015 | | Nov 2014 to Dec 2015 | |
|---|---|---|---|---|
| | Builders/ Equipment Suppliers/ Others | Code Officials | Builders/ Equipment Suppliers/ Others | Code Officials |
| n | 29 | 39 | 168 | 145 |
| Plan, application, permit, or document review / Inspections | 17% | 44% | 7% | 39% |
| Future design / New construction | 45% | 8% | 16% | 9% |
| Code compliance | 10% | 15% | 11% | 8% |
| Educate designers, engineer, owners, and/or contractors about code requirements | 14% | 10% | 8% | 8% |
| Energy efficiency improvements/analysis | 14% | 5% | 13% | 2% |
| Improve communicating/sharing information | 10% | 8% | 14% | 7% |
| Apply to permit applications to obtain compliance | 3% | 8% | 1% | 3% |
| Identifying utility incentive eligibility / Evaluating projects for utility incentives | 3% | 5% | 5% | 2% |
| In current job | 3% | 5% | 9% | 6% |
| Construction or building control or oversight | 3% | 5% | 3% | 6% |
| All of it | 3% | 5% | 1% | 2% |
| Not applicable | 0% | 8% | 2% | 5% |
| Quality control | 3% | 3% | 2% | 1% |
| Immediate use | 0% | 5% | 1% | 2% |
| Renovation applications | 3% | 0% | 4% | 1% |
| Open to new kinds of work | 0% | 3% | 2% | 1% |
| LEED requirements | 0% | 0% | 1% | 1% |
| Program administration | 0% | 0% | 1% | 0% |
| Improve lighting in common areas | 0% | 0% | 1% | 0% |
| Lighting control specifications | 0% | 0% | 1% | 0% |
| Will blog about event | 0% | 0% | 1% | 0% |
| Multifamily residential applications | 0% | 0% | 2% | 0% |
| Better detailing and better materials | 0% | 0% | 2% | 0% |
| Planning and implementing new purchase | 0% | 0% | 1% | 1% |
| Other | 3% | 0% | 1% | 1% |

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When asked to provide additional comments and suggestions for improving the training sessions, respondents offered suggestions consistent with the previous trainings, most often requesting improvement of the presenter and/or materials (see Table 77). This result is consistent with the relatively low ratings on the quality of handouts, as shown in Table 50. Common recommendations included the instructor keeping on track time-wise and not running over (included in the "other" category), providing more examples, and being sure to provide handouts so attendees can follow along. Other comments included in the "other" category included providing a link to the PowerPoint, and a request for more training sessions. However, attendees overall reported that the presenters did a good job.

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**Table 100. Additional Comments and Suggestions to Improve Training Sessions**
(percentage, multiple responses)*

| General Category | Oct Through Dec 2015 Trainings | | | | Nov 2014 Through Dec 2015 |
|---|---|---|---|---|---|
| | MP | EBS | LLC | Total | |
| n | 16 | 15 | 3 | 34 | 156 |
| Presenter/materials need improvement | 47% | 27% | 0% | 32% | 17% |
| More or better handouts with details and/or summaries of information presented | 0% | 13% | 0% | 6% | 17% |
| Training good or great/Presenter did a great job | 13% | 13% | 100% | 21% | 15% |
| Provide printout of presentation so participants can take notes | 0% | 27% | 0% | 12% | 12% |
| Good information | 13% | 13% | 0% | 12% | 8% |
| More discussion of examples/issues | 13% | 7% | 0% | 9% | 7% |
| Too much/detailed information | 27% | 0% | 0% | 12% | 6% |
| Not enough focus on code | 0% | 0% | 0% | 0% | 6% |
| Wrong audience for material/target to audience | 7% | 0% | 0% | 3% | 4% |
| Highly recommended | 0% | 13% | 0% | 6% | 3% |
| Train the builders/workmen in the field | 0% | 0% | 0% | 0% | 3% |
| Building/location issues | 0% | 0% | 0% | 0% | 3% |
| Class length not appropriate | 7% | 0% | 0% | 3% | 2% |
| Enjoyed class discussion | 0% | 0% | 0% | 0% | 2% |
| Instructor allowed people to dominate discussion | 0% | 0% | 0% | 0% | 2% |
| Provide checklists | 0% | 0% | 0% | 0% | 2% |
| Provide water | 0% | 0% | 0% | 0% | 1% |
| Good location/setting | 0% | 0% | 0% | 0% | 1% |
| Tie training to IEBC/IBC code | 0% | 0% | 0% | 0% | 1% |
| Very helpful in understanding energy codes | 0% | 0% | 0% | 0% | 1% |
| Table on stretch codes was confusing | 0% | 0% | 0% | 0% | 1% |
| Reference code sections on every slide | 0% | 0% | 0% | 0% | 1% |
| Slides disjointed/didn't match 2012 IECC | 0% | 0% | 0% | 0% | 1% |
| Other | 27% | 7% | 0% | 15% | 10% |

Training sessions used ARS to develop estimates of the percentage of all building permits that were for retrofit projects. As shown in Table 58, respondents indicated an average of about 58% of the permits they drew (or were drawn in their jurisdictions) were for retrofit projects and about 61% of those retrofits were energy related. Responses by building code officials were similar to

those from all trainees, although representing a slightly lower percentage of retrofits that were energy-related.

*Immediate Commercial Code Compliance Support Initiative Training Feedback (December 2015)…*

**Table 101. Proportion of Retrofit Building Permits (ARS Data—November 2014 through December 2015)**

(Percentage)

| Percentage of Retrofit Permits | All Trainees | | Building Code Officials Only | |
|---|---|---|---|---|
| | Portion of Building Permits that Are for Retrofits | Portion of Retrofit Permits that Are Energy-Related | Portion of Building Permits that are Retrofits | Portion of Energy-Related Retrofit Permits |
| n | 286 | 279 | 106 | 104 |
| None | 2% | 2% | 0% | 1% |
| 20% | 18% | 17% | 5% | 8% |
| 40% | 13% | 16% | 5% | 6% |
| 60% | 27% | 24% | 10% | 10% |
| 80% | 37% | 24% | 16% | 9% |
| 100% | 3% | 17% | 0% | 3% |
| Mean % | 58% | 61% | 61% | 55% |

Survey respondents worked in or covered many cities and towns throughout the region. When asked to identify cities they covered or worked in the most, builders most frequently cited Boston, followed by Cambridge, as shown in Table 59 (on next page). Code officials were more widely distributed. However, builders and others made up the most common responses overall.

## FEEDBACK SUMMARY

Overall, the training sessions appeared to have been effective and received favorable feedback from attendees. Feedback on trainers was consistent with previous training rounds, with training usefulness scores remaining relatively high. Trainees continued to identify opportunities for improvements regarding presentation materials and handouts, indicating changes to materials provided during trainings could be improved. However, the results show that the ratings for these materials have improved substantially compared to ratings from prior trainings. This may have resulted from changes to the materials in response to findings in our prior memos, but we have no information to confirm this given that interviewing the training implementers was not in the scope of this study. Interviews of the trainers or implementers in 2016 to assess their responses to these findings could provide useful information.

Other recommendations to consider involve ensuring session presenters are engaged with the class and aware of the pace, and providing more examples and case studies to attendees during sessions. The persistence of high numbers of MP trainees who cite the circuit rider service as new information over the entire evaluation period indicates that opportunities may exist for increased outreach with this service. This evaluation period also saw an uptick in the number of code officials who attended the MP trainings, which was a positive sign over the previous period, where no code officials attended the MP training. Low registration and turnout for November and December commercial training sessions (9 and 11 registered attendees,

respectively) compared to other training sessions suggest that holding sessions during holiday periods may limit the number of attendees, and be a less efficient use of training resources.

**Table 102. Cities and Towns Represented in Training Sessions—November 2014–December 2015**

(Percentage, multiple responses)

| City or Town | Code Officials | Builders and Others | Total | City or Town | Code Officials | Builders and Others | Total |
|---|---|---|---|---|---|---|---|
| n | 56 | 76 | 132 | | | | |
| Boston | 7% | 26% | 18% | Easton | 2% | 0% | 1% |
| Cambridge | 2% | 20% | 12% | Essex Co Correctional | 0% | 1% | 1% |
| Worcester | 11% | 9% | 10% | Fairhaven | 0% | 1% | 1% |
| Waltham | 4% | 3% | 3% | Fall River | 0% | 1% | 1% |
| Fitchburg | 5% | 0% | 2% | Franklin | 2% | 0% | 1% |
| Taunton | 5% | 0% | 2% | Grafton | 2% | 0% | 1% |
| Andover | 0% | 3% | 2% | Great Barrington | 0% | 1% | 1% |
| Burlington | 0% | 3% | 2% | Hopedale | 2% | 0% | 1% |
| Framingham | 4% | 0% | 2% | Lancaster | 2% | 0% | 1% |
| Hopkinton | 2% | 1% | 2% | Lawrence | 0% | 1% | 1% |
| Leominster | 4% | 0% | 2% | Lexington | 0% | 1% | 1% |
| Millbury | 4% | 0% | 2% | Lowell | 0% | 1% | 1% |
| Northborough | 4% | 0% | 2% | Lynn | 0% | 1% | 1% |
| Providence | 0% | 3% | 2% | Mansfield | 2% | 0% | 1% |
| Upton | 4% | 0% | 2% | Merrimac | 2% | 0% | 1% |
| Walpole | 2% | 1% | 2% | Natick | 0% | 1% | 1% |
| Wayland | 4% | 0% | 2% | New Bedford | 0% | 1% | 1% |
| Acousnet | 0% | 1% | 1% | Newton | 2% | 0% | 1% |
| Amesbury | 2% | 0% | 1% | Oakham | 2% | 0% | 1% |
| Ashby | 2% | 0% | 1% | Palmer | 0% | 1% | 1% |
| Attleboro | 0% | 1% | 1% | Pembroke | 0% | 1% | 1% |
| Bridgewater | 0% | 1% | 1% | Plymouth | 0% | 1% | 1% |
| Brimfield | 2% | 0% | 1% | Princeton | 2% | 0% | 1% |
| Brockton | 0% | 1% | 1% | Salem | 2% | 0% | 1% |
| Brookline | 2% | 0% | 1% | Salisbury | 2% | 0% | 1% |
| Cambridge | 0% | 1% | 1% | Somerville | 2% | 0% | 1% |
| Dedham | 0% | 1% | 1% | South Shore | 0% | 1% | 1% |
| Canton | 2% | 0% | 1% | Southbridge | 0% | 1% | 1% |
| Concord | 0% | 1% | 1% | Sturbridge | 2% | 0% | 1% |
| Dartmouth | 0% | 1% | 1% | Uxbridge | 2% | 0% | 1% |
| Dedham | 0% | 1% | 1% | Wellesley | 2% | 0% | 1% |
| Dudley | 2% | 0% | 1% | Westborough | 2% | 0% | 1% |

# FOLLOW-UP INTERVIEWS WITH CCSI RESIDENTIAL TRAINING ATTENDEES—FINAL (JANUARY 11, 2016)

## EXECUTIVE SUMMARY

As part of the ongoing evaluation of the Massachusetts Code Compliance Support Initiative (CCSI), NMR conducted follow-up in-depth interviews (IDIs) with 60 individuals who had attended one or more residential classroom trainings approximately six months earlier. Thirty respondents work as municipal building code employees and 30 work as builders, architects, equipment suppliers, or energy efficiency professionals (referred to as 'builders and others'). The overall goal of the follow-up interviews is to determine if and how the subjects are using what they learned at the trainings in the field; the interviews also explored how information from the trainings is shared, the changing environment for code compliance and enforcement, and suggestions for improving the trainings.

### Use of Training Information in the Field

Nearly two out of three respondents (63 percent) said they had made some changes in their work as a result of the training(s) they attended. Municipal building code employees were more likely to say they had made changes due to the trainings (73 percent for inspections and 53 percent for building permit review) than builders and others (53 percent for all work). The areas most affected by changes were insulation, particularly checking depths and around electric boxes for municipal building code employees, and insulation and air sealing for builders and others.

Close to one-half of the municipal building code employees (13 out of 30, or 43 percent) said that the most useful part of the trainings were related to insulation and envelope areas. Air barriers and vapor barriers were also mentioned by close to one-fifth (5 out of 30, or 17 percent) of municipal building code employees as the most useful topic areas that were discussed during the trainings. Many builders and others (10 out of 30, or 33 percent) reported that discussions about insulation and envelope issues were the most useful part of the trainings to them.

The most common reasons for not making any changes to fieldwork after attending the trainings were already knowing the information and working in a stretch code community. While municipal building code employees often cited the latter as a reason for not making any changes, a sizable number who work in stretch code communities (9 out of 16) also noted that they had made changes to their work in the field. Respondents also praised the trainings, noting the benefits of bringing together a diverse group of market actors to discuss code compliance.

### Sharing Information from the Trainings

Nearly three-fourths of respondents (43 out of 60, or 72 percent) had shared some of the information from the trainings with other parties. Builders and others were more likely to share the information (83 percent) than municipal building code employees (60 percent). Among, those who did share information, nearly all of the municipal building code employees (94

percent) shared information from the trainings with builders and contractors, and 39 percent said they shared information with other code official colleagues. Nearly all of the builders and others (96 percent) who shared information from the trainings did so with other builders and contractors and 17 percent said they shared information with code officials. The majority of respondents (35 out of 43, or 81 percent) said that most of the various parties that they shared information with were using it.

Just over one-half (32 out of 60, or 53 percent) of the respondents said they had attended one or more trainings or gatherings discussing building codes since attended the CCSI training. These trainings and gatherings included seminars, webinars, presentations, conferences, industry association meetings, classroom seminars, and online classes. Municipal building code employees were more likely than builders and others to report having attended a training or gathering discussing building codes since the CCSI training: 19 building code employees compared to 13 builders and others.

## Code Compliance and Enforcement Environment

Most builders and others reported increased interest in energy efficiency among both code officials (67 percent) and their customers (80 percent) during the past year. Most municipal building code employees (27 out of 28, or 96 percent) placed either a medium, medium-to-high, or high priority on energy efficiency, with about one-half of respondents (15 out of 28, or 54 percent) reporting that checking for energy efficiency is a high priority. Over one-half of municipal building code employees (16 out of 28, or 57 percent) said the priority for checking energy efficiency will continue to increase in the future, with most reporting that it will increase as the code continues to increase.

## Considerations for Improving the CCSI Trainings

The most frequent suggestion offered by all respondents was for the CCSI to try to get more people to attend the trainings, especially builders (from municipal building code employees) and contractors (from builders and others). The respondents offered a few specific suggestions for increasing attendance by these groups. These include offering different trainings for attendees with different levels of knowledge and experience, partnering with lumber yards or other suppliers, and coordinating with supervisor license training classes. Other common suggestions from municipal building code employees were to provide different kinds of checklists (5 out of 25, or 20 percent), to adjust the types and duration of the trainings (5 out of 25, or 20 percent), and to focus more on particular areas, especially ventilation (four out of 25, or 16 percent). Builders and others also suggested more focus on areas such as HVAC and types and applications of insulation.

More general suggestions for improving code compliance include offering field assistance at construction sites and educating homeowners about the new code through information accessible by the public. While not all the suggestions provided by the respondents may be practical or cost-effective to implement, they should be considered as some respondents have made good cases for increasing training flexibility to serve more difficult to reach populations.

Finally, all but two of the 60 respondents reported that they would encourage their colleagues to attend the CCSI trainings. Respondents expressed their appreciation for the trainings giving them a good introduction to the energy code and bringing together code officials, builders, and others to discuss situations encountered in the field.

## INTRODUCTION

NMR, as part of the cross-cutting team, conducted follow-up in-depth interviews (IDIs) with 60 individuals who had attended one or more residential classroom trainings. Thirty respondents work as municipal building code employees and 30 work as builders, architects, equipment suppliers, or energy efficiency professionals. The overall goal of the follow-up interviews is to determine if and how the subjects are using what they learned at the trainings in the field; thus, the team allowed for at least six months between the trainings and the follow-up IDIs. The subjects attended the trainings from September 2014 through February 2015; the team interviewed them from June through September 2015.

### Residential Classroom Trainings

The Code Compliance Support Initiative (CCSI) sponsored thirty residential classroom trainings, lasting between three and three-and-one-half hours each, between September 23, 2014 and June 5, 2015.[6] Eighteen trainings concentrated on envelope and building science, twelve on HVAC and indoor air quality, and three on a more general overview of moving from 2009 IECC to 2012 IECC. NMR estimated the residential trainings had 870 unique attendees from the enrollment data and completed immediate surveys available at the trainings. The follow-up IDIs drew from attendees of the 23 trainings held from September 2014 through February 2015 in order to allow for at least six months after attendance.

### Follow-up Interview Design

The follow-up interview guides are designed to assess how the trainings have influenced activities in Massachusetts in the past several months.[7] They address the following areas related to the trainings:

- Activities since attending training(s) depending on the type of trainee—home inspections, building permit review, projects under design, projects under construction, and completed projects
- How and if the work done since the training(s) has made use of the information provided
- Most useful part of the training(s) and suggestions for improvement
- Whether the respondents have shared what they learned with others and how this information is being used
- Whether the respondents have recommended the trainings to others.

[6] After a summer hiatus, residential classroom trainings restarted on September 18, 2015. Nine additional residential trainings were offered through the end of 2015.

[7] The CCSI evaluation also uses immediate paper surveys that attendees fill out at the end of each training. The immediate surveys focus more on the quality of the trainings and how much material was new to the respondents. NMR provides summaries of the immediate training survey responses at the end of every five to six residential trainings.

The interview guides also address perceived changes in code enforcement and the market for energy efficiency in the following areas:

- Type of information filed with building departments to document energy code compliance
- Other trainings the respondents have attended and sources of information used
- For builders and others, whether customers have become more interested in energy efficiency and are more willing to pay more for it in the last year or so
- For builders and others, whether interactions with code officials have changed over the past year
- For municipal building code employees, serious issues related to energy efficiency encountered over the past year or so and how they were addressed
- For municipal building code employees, what factors influence the effort spent on checking for the energy-efficiency aspects of code compliance, including time constraints and the availability of trained personnel.

0 contains copies of the interview guides for municipal building code employees and builders and others.

## Sampling and Respondents

The 60 respondents work in various fields that make use of the trainings provided by the CCSI. One-half of the respondents work for municipalities enforcing the building code; occupations for this group of respondents include building commissioner, deputy building commissioner, and code official. The other one-half of respondents work as builders, architects, subcontractors, equipment suppliers, and energy efficiency professionals, mostly HERS raters; they are referred to as ‘builders and others’ in this report.

The follow-up IDI sample drew from attendees of the residential trainings held from September 2014 through February 2015 in order to allow for at least six months after attendence. The sample consisted of unique attendees who had registered for the trainings and filled out the immediate survey forms distributed at the end of the sessions. The sample was cleaned to remove attendees who were employed by the Program Administrators or the implementation contractors. This left a sample of 448 individuals, consisting of 275 municipal building code employees and 173 individuals in the builders and others category.

The interviewers sent emails to the entire sample explaining the purpose of the study and the participation process. The study offered $100 as compensation for the interviewees’ time which could be paid to them, their employers, or a charity. Individuals who responded to the emails expressing interest were then contacted by the interviewers to complete the interviews.

Eighteen of the 30 IDIs with municipal building code employees and 27 of the 30 IDIs with builders and others were completed with individuals who had respoonded to the emails. The interviewers then selected individuals who had not responded to the emails using a random

sample identifier function and contacted them for participation in the study. The interviewers contacted 138 individuals in total, 71 municipal building code employees and 67 builders and others, to complete the 60 IDIs. Table 1 summarizes the sample disposition.

**Table 1. Sample Disposition**

| Sample | Total | Municipal Building Code Employees | Builders and Others |
|---|---|---|---|
| Initial sample receiving emails | 448 | 275 | 173 |
| Total sample contacted by telephone | 138 | 71 | 67 |
| IDIs completed with individuals expressing interest to emails | 45 | 18 | 27 |
| IDIs completed through random telephone calls | 15 | 12 | 3 |
| Total IDIs | 60 | 30 | 30 |

The respondents also listed up to three Massachusetts municipalities where they do most of their work. Table 2 lists the occupations of the 60 follow-up interview respondents[8] and the numbers who work in municipalities under 2012 IECC building code, the stretch code, or both.[9] More than one-half of the municipal building code employees attending the residential trainings work only in cities and towns that are under the stretch code, while two-thirds of the builders and others work in at least some 2012 IECC municipalities.

**Table 2. Follow-Up Interview Respondents**
(number of respondents)

| Position | Total Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| All municipal building code employees | 30 | 12 | 16 | 2 |
| Building commissioners | 5 | 2 | 3 | 0 |
| Deputy building commissioners | 1 | 0 | 1 | 0 |
| Other code officials | 24 | 10 | 12 | 2 |
| All builders and others | 30 | 12 | 10 | 8 |

[8] Subcategories are listed, with indentations, under the main categories for all tables in this report.
[9] The stretch code, based on 2009 IECC, has been adopted by close to one-half of Massachusetts cities and towns. These municipalities do not use the new building code based on 2012 IECC since the stretch code is considered roughly equivalent to it. A small number of code officials cover more than one town and work under both codes.

| Position | Total Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| Builders | 11 | 6 | 3 | 2 |
| Architects | 5 | 2 | 2 | 1 |
| HERS raters | 5 | 0 | 3 | 2 |
| Other energy efficiency specialists | 3 | 1 | 0 | 2 |
| Equipment suppliers | 2 | 2 | 0 | 0 |
| Engineer | 2 | 0 | 1 | 1 |
| Housing rehab specialist | 1 | 0 | 1 | 0 |
| HVAC subcontractor | 1 | 1 | 0 | 0 |
| All respondents | 60 | 24 | 26 | 10 |

Two out of five respondents attended the Envelope and Building Science (EBS) but not the HVAC and Indoor Air Quality (HVAC-IAQ) trainings while less than one-quarter attended the HVAC-IAQ but not the EBS trainings and one-third attended both (Table 3).

**Table 3. Trainings Attended by Follow-Up Interview Respondents**
(number of respondents)

| Type of Training Attended | Total Number of Respondents | Type of Respondent | |
|---|---|---|---|
| | | Municipal Building Code Employees | Builders and Others |
| EBS only* | 24 | 11 | 13 |
| HVAC-IAQ only* | 14 | 4 | 10 |
| Both EBS and HVAC-IAQ | 20 | 13 | 7 |
| 2009 to 2012 IECC | 2 | 2 | 0 |
| Total | 60 | 30 | 30 |

*Some of these respondents also attended the 2009 to 2012 IECC training or various commercial trainings

## USE OF TRAINING INFORMATION IN THE FIELD

A key goal of the follow-up interviews is to assess how the training attendees are using what they have learned in their everyday jobs. The question posed to them was:

> "Have you changed how you conduct inspections for the energy code (code officials)/ made any changes in your work on these projects to better comply with the energy code (builders and others) as a result of the training(s) you attended?"

Nearly two out of three respondents (63 percent) said they had made some changes in their work as a result of the training(s) they attended. Municipal building code employees were more likely to say they had made changes due to the trainings (73 percent for inspections and 53 percent for building permit review) than builders and others (53 percent for all work). This section first examines the opportunities trainees had to use what they had learned—that is, how many housing units they built or how many building inspections they conducted. The respondents also estimated the number of inspections for units permitted under 2012 IECC and, for municipal building code employees, how many building permits they had reviewed. This section then examines what changes the respondents believe they made due to the trainings and why a sizeable minority did not make any changes.

## Building Units Inspected and Housing Construction

Most respondents (88 percent) have either conducted building inspections or been involved in residential unit construction since attending the trainings. Seven respondents have not been involved in inspections or residential construction; one is a municipal building code employee who only reviews permits and two are equipment suppliers. Of the remaining four, one works mainly on commercial projects, one works mainly outside Massachusetts, and two have not had their projects reach an inspection stage.

As shown in Table 4, 14 of the 29 municipal building code employees who have participated in home inspections since attending the trainings have examined homes permitted under 2012 IECC. The respondents estimated the total number of housing units involved per inspection; this includes housing units in multifamily projects. We also note that some inspections involve rehabs and additions; others involve specific areas such as HVAC systems rather than entire new construction projects. Municipal building code employees estimated close to 5,000 inspections on a housing unit basis, including nearly 1,600, or about one-third, permitted under 2012 IECC.

**Table 4. Inspections by Follow-Up Interview Respondents (Municipal Building Code Employees)**

| Types of Inspections | Number of Respondents | Number of Housing Units |
|---|---|---|
| All inspections | 29 | 4,889 |
| All inspections of 2012 IECC homes | 14 | 1,591 |
| Final inspections | 29 | 1,698 |
| Final Inspections of 2012 IECC homes | 14 | 844 |

As shown in Table 5, 14 out of the 24 builders and others who have worked on residential construction projects since attending the trainings have worked on homes permitted under 2012 IECC. Their work involved 832 housing units with, again, one-third or 275 of them permitted under 2012 IECC.

**Table 5. Construction by Follow-Up Interview Respondents (Builders and Others)**
(multiple response for number of respondents)

| Types of Projects | Number of Respondents | Number of Housing Units |
|---|---|---|
| All projects | 24 | 832 |
| Projects in the planning stage | 9 | 123 |
| Projects under construction | 17 | 403 |
| Projects with final inspections | 18 | 306 |
| All 2012 IECC projects | 14 | 275 |
| 2012 IECC projects in the planning stage | 6 | 56 |
| 2012 IECC projects under construction | 8 | 122 |
| 2012 IECC projects with final inspections | 8 | 97 |

The follow-up IDIs also asked municipal building code employees to estimate how many building permit applications they had reviewed since attending the trainings. Twenty-eight of the 30 code officials said they are responsible for permit review; they estimated they had reviewed permits involving over 12,000 housing units since attending the trainings. Again, many of the permits involved multifamily projects as well as rehabs and additions to existing homes.

## Changes Made to Work after Attending Trainings

The interviewers asked all respondents who said they made any changes to their work after attending the trainings to explain how they had changed what they do in the field. To the extent possible, the interviewers tried to get the respondents to describe the areas affected by these changes. The resulting descriptions, as detailed in this section, varied from focusing on specific areas to more general changes.

### Municipal building code employees

Most (22 or 73 percent of 30) municipal building code employees said they made some changes to conducting inspections after attending the trainings. As shown in Table 6, respondents who attended both the EBS and HVAC-IAQ trainings were more likely to make changes to conducting inspections. This may be due to respondents with less knowledge in this field attending more trainings.

**Table 6. Trainings Attended by Follow-Up Interview Respondents**
(number of municipal building code respondents)

| Whether made changes to conducting inspections | Number of Respondents | Type of training attended | | | |
|---|---|---|---|---|---|
| | | EBS Only | HVAC-IAQ Only | EBS and HVAC-IAQ | 2009 to 2012 IECC |
| Yes | 22 | 7 | 2 | 11 | 2 |
| No | 8 | 4 | 2 | 2 | 0 |

As already noted, all respondents had filled out immediate survey forms after their trainings. Table 7 compares the responses to the immediate survey question of when they expected to first use what they had learned in the training session with whether the respondents reported changing how they conduct inspections in the follow-up interviews. While one respondent correctly noted in the immediate survey that he would not use information for more than one year, most respondents, even those who did not change the way they conduct inspections, had said they would be using the training information immediately.

**Table 7. When Expected to First Use Training Information and Changes Made**
(number of municipal building code respondents)

| Expected to first use training in immediate survey | Whether made changes to conducting inspections | |
|---|---|---|
| | Yes | No |
| As soon as I walk out the door | 18 | 6 |
| Sometime in the next three months | 3 | 1 |
| In the next four to six months | 1 | 0 |
| More than a year from now | 0 | 1 |

As shown in Table 8, the most frequently mentioned area affected by changes to inspection was insulation; some respondents gave more specific answers, noted below the general areas.

**Table 8. Areas Affected by Municipal Building Code Employee Changes to Inspections**

(number of respondents; multiple response)

| Areas | Number of Respondents | Type of training attended | | | |
|---|---|---|---|---|---|
| | | EBS Only | HVAC-IAQ Only | EBS and HVAC-IAQ | 2009 to 2012 IECC |
| All building code employees who made changes | 22 | 7 | 2 | 11 | 2 |
| All insulation and envelope areas | 10 | 4 | 1 | 4 | 1 |
| Insulation around electric boxes | 2 | 1 | 0 | 1 | 0 |
| Checking insulation depth using the guides provided | 2 | 2 | 0 | 0 | 0 |
| Attic insulation | 1 | 0 | 1 | 0 | 0 |
| Verifying proper application of spray foam insulation | 1 | 1 | 0 | 0 | 0 |
| Verifying insulation of ductwork in unconditioned areas | 1 | 0 | 0 | 1 | 0 |
| Verifying sheetrock installation | 1 | 0 | 0 | 1 | 0 |
| Air/vapor barriers | 4 | 2 | 0 | 2 | 0 |
| All ventilation | 4 | 0 | 2 | 1 | 1 |
| Bathroom fans | 2 | 0 | 1 | 1 | 0 |
| Paying attention to air exchanges | 1 | 0 | 1 | 0 | 0 |
| Air sealing | 5 | 2 | 2 | 1 | 0 |
| Ductwork | 3 | 0 | 0 | 3 | 0 |
| Educating builders and contractors | 2 | 1 | 0 | 1 | 0 |
| Reviewing HERS reports | 1 | 0 | 0 | 1 | 0 |
| Asking for the Manual J calculations performed | 1 | 0 | 0 | 1 | 0 |
| Did not provide specific areas | 3 | 1 | 0 | 1 | 1 |

The follow-up IDIs also asked municipal building code employees if they were spending more time on inspections after the trainings and, if so, to estimate how much more. Only five of the municipal building code employees said their time had increased. In all cases, the increases were small; two said the time spent on inspections had increased by five minutes; one said it had increased by two to three minutes; and two said it took “a little while longer”.

Fewer municipal building code employees (16 out of 30, or 53 percent) said they had changed how they review building permit applications after the trainings. Most mentioned the same areas covered in the changes to how they conduct inspections (Table 9). All of the building code employees who said they made changes to permit review after the trainings had also said they made changes to how they conduct inspections.

**Table 9. Areas Affected by Municipal Building Code Employee Changes to Permit Review**
(number of respondents; multiple response)

| Areas | Number of Respondents | Type of training attended | | | |
|---|---|---|---|---|---|
| | | EBS Only | HVAC-IAQ Only | EBS and HVAC-IAQ | 2009 to 2012 IECC |
| All building code employees who made changes | 16 | 5 | 2 | 8 | 1 |
| Checking insulation requirements | 8 | 2 | 1 | 4 | 1 |
| Ventilation | 2 | 0 | 1 | 0 | 1 |
| Checking HERS reports | 2 | 0 | 1 | 1 | 0 |
| Air/vapor barriers | 1 | 1 | 0 | 0 | 0 |
| Air sealing | 1 | 1 | 0 | 0 | 0 |
| Ductwork | 1 | 0 | 0 | 1 | 0 |
| Verifying compliance path is in the plans | 1 | 0 | 0 | 1 | 0 |
| Understanding prescriptive requirements | 1 | 0 | 0 | 1 | 0 |
| Asking for the Manual J calculations performed | 1 | 0 | 0 | 1 | 0 |
| Did not provide specific areas | 2 | 1 | 0 | 1 | 0 |

Again, the follow-up IDIs also asked municipal building code employees if they were spending more time on plan review after the trainings and, if so, to estimate how much more. Only three municipal building code employees said their time had increased. Again, the increases were small; one estimated ten minutes per plan, one estimated two minutes, and one could not give an estimate.

Some respondents elaborated on the subtle ways they are using what they learned at the trainings in the field. Regarding inspections, one deputy building commissioner that attended an EBS training noted:

> *I'm just more aware and in tune of some of the finer details and ensuring that things are being done properly. Making sure there's no voids in the insulation. … I pay a little bit closer attention to some of the finer details such as making sure behind electrical boxes and things like that to ensure that's been properly completed.*

Regarding permit review, another code official that attended an HVAC-IAQ training noted:

> *Those two things that I remember off the top of my head [ceiling & knee wall insulation], we are certainly looking for them and people are generally not putting them in plans, but we point it out with our red pencil so they have to do it. [Do you pay more attention to certain areas and, if so, which ones?] The HERS rating. We're looking at that now, but we never used to look at it because it really wasn't presented. So not just the insulation in isolation, but the whole building – we're looking at that a lot more than we used to.*

**Builders and others**

Slightly more than one-half (16 or 53 percent of 30) of the builders and others interviewed said they made some changes to their work after attending the trainings. As shown in Table 10, respondents who attended the EBS training were more likely to make changes to their work.

**Table 10. Trainings Attended by Follow-Up Interview Respondents**
(number of builder and other respondents)

| Whether made changes to work | Total Number of Respondents | Type of training attended | | |
|---|---|---|---|---|
| | | EBS Only | HVAC-IAQ Only | EBS and HVAC-IAQ |
| Yes | 16 | 8 | 5 | 3 |
| No | 14 | 5 | 5 | 4 |

As already noted, all respondents had filled out immediate survey forms after their trainings. Table 11 compares the responses to the immediate survey question of when they expected to first use what they had learned in the training session with whether the respondents reported changing anything in their work. Note that some respondents provided different responses for the different trainings they attended. Interestingly, respondents who said they did not change anything in their work following the trainings were actually more likely to say that they would use what they had learned as soon as they walked out the door in the immediate surveys, but this is based on a small sample size.

**Table 11. When Expected to First Use Training Information and Changes Made**
(number of builder and other respondents; multiple response)

| Expected to first use training in immediate survey | Whether made changes to work | |
|---|---|---|
| | Yes | No |
| As soon as I walk out the door | 10 | 11 |
| Sometime in the next three months | 6 | 3 |
| In the next four to six months | 1 | 1 |
| In the next seven to twelve months | 1 | 0 |
| More than a year from now | 1 | 0 |

As in the case of the municipal building code employees, most of the builders and others who said they made some changes to their work after the trainings, with some prodding by the interviewers, specified areas they addressed after the trainings. As shown in Table 12, insulation, air sealing, HVAC requirements, and ventilation were mentioned most frequently; some respondents gave more specific answers, noted below the general areas.

**Table 12. Areas Affected by Builder and Other Trainee Changes**
(number of respondents; multiple response)

| Areas | Number of Respondents | Type of training attended | | |
|---|---|---|---|---|
| | | EBS Only | HVAC-IAQ Only | EBS and HVAC-IAQ |
| All builders and others who made changes | 16 | 8 | 5 | 3 |
| All insulation and envelope areas | 10 | 5 | 2 | 3 |
| Floor insulation | 2 | 1 | 0 | 1 |
| Allocate funds to areas that require better insulation | 2 | 0 | 1 | 1 |
| Sheeting | 1 | 1 | 0 | 0 |
| All air sealing | 7 | 3 | 2 | 2 |
| Improved caulking techniques | 1 | 0 | 0 | 1 |
| Changed products used for air sealing | 1 | 1 | 0 | 0 |
| HVAC requirements | 4 | 0 | 2 | 2 |
| Better review of subcontractor work | 1 | 0 | 1 | 0 |
| Ventilation | 3 | 2 | 1 | 0 |

| | | | | |
|---|---|---|---|---|
| Relayed information to employees or subcontractors | 2 | 0 | 1 | 1 |
| Understand need to call in HERS rater early | 2 | 0 | 2 | 0 |
| Air/vapor barriers | 2 | 1 | 1 | 0 |
| Duct sealing | 2 | 1 | 1 | 0 |
| Ductwork | 1 | 1 | 0 | 0 |
| Did not provide specific areas | 1 | 1 | 0 | 0 |

Respondents in this group were more likely than the municipal building code employees to elaborate on the specifics of how their work had changed. One builder that attended the EBS and HVAC-IAQ trainings said,

> *Probably the biggest difference is that one of our installers of insulation – a guy that sprays an open cell product - changed his product because the stuff that he used was having problems adhering, which was never visible or noticeable, but it was something that was talked about in the class, making sure that its sticking to the substrate properly then checking it, which we have done and realized this one product was not working well...[Do you pay more attention to certain areas and, if so, which ones?] All the little stuff, like seams in termination points and getting around fenestrations; things that are easy to skip over that need to be addressed better. And the separation between first floor and basement is done a little bit differently since then. It's a matter of where does the insulated envelope start and stop. In the basement that has been something that's not fully understood or left open to interpretation, whereas now it's very clear…The big picture stuff we're all very aware of, it's more ancillary details that have been refined in the class.*

Another builder was quite happy he attended the HVAC-IAQ training,

> *That one [2012 IECC] project we completed, I should have called the HERS rater sooner than I did, because I didn't know I had to call him because the town it was done in didn't necessarily say I needed a HERS rater. From now on I'm going to call a HERS rater right from the start. I'm paying a lot more attention to energy, insulation, caulking, and sealing. I thought I paid a lot of attention to it before, but that is nothing compared to what I pay to it now. It's just a requirement for doing business. If I had not attended the trainings, I probably would have failed the inspection on the one [2012 IECC] unit that was completed that required a lot of attention to insulation. I would have likely failed; I wouldn't have gotten an occupancy permit.*

### Why No Changes were Made after Attending Trainings

Twenty-seven percent of municipal building code employees and 47 percent of builders and others said they made no changes to their work in the field after attending the trainings. The

main reasons were already being familiar with the information presented at the trainings and working in communities under the stretch code.

### Municipal building code employees

As shown in Table 13, municipal building code employees were slightly more likely to say they had not made any changes to how they conducted inspections since they already knew the information presented. However, they were more likely to say they did not make any changes to building permit application review because they work in stretch code communities.

**Table 13. Why Municipal Building Code Employees Made No Changes**
(numbers of respondents; multiple response)

| Reasons | Inspections | Building Permit Application Review |
|---|---|---|
| All building code employees who did not make changes | 8 | 14 |
| Already knew the information covered | 4 | 5 |
| Work in a stretch code community | 3 | 7 |
| Did not give a reason | 0 | 1 |
| Do not do inspections/permit review | 1 | 3 |

### Builders and others

As shown in Table 14, HERS raters and other energy efficiency specialists were the most likely to say they had not made any changes to their work because they already knew the material covered by the trainings. All but one of the five HERS raters interviewed said they had made no changes to their work and all three of the other energy efficiency specialists interviewed said they had made no changes to their work after the trainings. However, only two of the 11 builders and one of the five architects interviewed said they had made no changes to their work in the field, again, because they believe they are already working on very efficient homes.

**Table 14. Why Builders and Others Made No Changes**
(numbers of respondents; n=14)

| Type of Respondent | Reason | Number of Respondents |
|---|---|---|
| HERS Rater | Already knew the information covered | 4 |
| Other energy efficiency specialist | Already knew the information covered | 2 |
| Other energy efficiency specialist | Does not apply to work | 1 |

| | | |
|---|---|---|
| Equipment supplier | Does not apply to work | 2 |
| Builder | Already building energy efficient homes | 1 |
| Builder | Too late for current projects but can use in the future | 1 |
| Architect | Already designing energy efficient homes | 1 |
| HVAC subcontractor | Already working to code | 1 |
| Engineer | Working in stretch code community | 1 |

### Stretch code effect

As noted above, municipal building code employees often said they made no changes after the trainings because they work in stretch code communities. Table 15 gives an overall perspective on the stretch code effect; while most (7 out of 8) of the municipal building code employees who did not change anything were in stretch code communities, 9 out of the 22 municipal building code employees who made changes work exclusively in stretch code communities. Working in stretch code communities appears not to have had much effect on whether builders and others changed their practices after the trainings.

**Table 15. Changes to Work Practices by Community**
(numbers of respondents; n=60)

| Respondents | Total | 2012 IECC Community | Stretch Code Community | Both |
|---|---|---|---|---|
| Municipal building code employees who changed some practices | 22 | 11 | 9 | 2 |
| Municipal building code employees who did not change anything | 8 | 1 | 7 | 0 |
| Builders and others who changed some practices | 16 | 5 | 6 | 5 |
| Builders and others who did not change anything | 14 | 7 | 4 | 3 |
| All respondents | 60 | 24 | 26 | 10 |

## Benefits of the Trainings Cited by Respondents

After discussing the changes that they had made to their work or why they had made no changes, the respondents talked about other areas where the trainings had provided benefits.

An equipment supplier who attended an EBS training and had earlier said the trainings did not affect his work, noted:

> *We have a lot of retrofit customers…but knowing the building codes on new construction gave me more confidence in talking to those guys doing new construction….knowing…the proper installs and products, having that knowledge from the training has been good interacting with these new customers*.

The other equipment supplier who also attended an EBS training and had not made changes to his work also commented:

> *The R-values increasing; that [requires] more insulation, which increases volume for me as a distributor selling insulation products. It shed some light into how the program, how the state of Massachusetts is helping inspectors, builders, and contractors really know what the new changes are going to be; whether it's insulation or windows.*

Some municipal building code employees also noted that the trainings had influenced their work beyond doing inspections and reviewing building permit applications. One code official who attended both EBS and HVAC-IAQ trainings noted that his interactions with the public are changing:

> *Yes. I would say we're more proactive in trying to get people to do more than just the code. We get the question, "how much insulation should I put in?" And I will tell them, "the code requires this level, but as much as you can afford, you're better off putting it in." We try to push them to spend a little more money to make the houses more efficient. We try to steer people in the direction of spray foam insulation. We've had a lot of questions this spring in regards to ice damns. I tell people, "the only thing I can tell you that cures ice damns is spray foam insulation in the roof."*

A builder who had attended the EBS, HVAC-IAQ, and 2009 to 2012 IECC trainings commented on the benefits of bringing together a diverse group of market actors to discuss compliance:

> *I find the seminar is good because you bring together a whole bunch of not just builders, but also inspectors. And when you have a good open discussion in the classroom environment, some good ideas get exchanged: what the inspectors are looking for in particular, different ways of applying new products or new ways of doing things that get the job done better. I find that discussion to be as helpful as what you actually learn from the seminar itself.*

## MOST USEFUL INFORMATION FROM TRAININGS

A key goal of the follow-up interviews is to identify what areas the attendees found most useful about the trainings and why. The question posed to them was:

> "To the best of your recollection, can you tell me which part or parts of the training(s) you found most useful and why?"

The resulting descriptions, as detailed in the following subsections, varied from focusing on specific topics that respondents found useful to more general feedback about the usefulness of the trainings.

### Municipal Building Code Employees

Table 16 shows the feedback received from municipal building code employees about which part or parts of the trainings they found most useful. Close to one-half of the municipal building code employees (13 out of 30, or 43 percent) said that the most useful part of the trainings were related to insulation and envelope areas. Air barriers and vapor barriers were also mentioned by close to one-fifth (5 out of 30, or 17 percent) of municipal building code employees as the most useful topic areas that were discussed during the trainings.

**Table 16. Most Useful Information from Trainings—Municipal Building Code Employees**
(multiple response; n=30)

| Most Useful Part of Training | Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| All insulation and envelope areas | 13 | 6 | 7 | 0 |
| Blower door test | 3 | 3 | 0 | 0 |
| Draft stopping | 1 | 1 | 0 | 0 |
| Thermal imaging photographs | 1 | 0 | 1 | 0 |
| Air/vapor barriers | 5 | 2 | 3 | 0 |
| Good overview of code changes | 5 | 1 | 3 | 1 |
| Duct work/testing | 2 | 0 | 1 | 1 |
| All HVAC | 2 | 1 | 1 | 0 |
| Manual J | 1 | 1 | 0 | 0 |
| All Ventilation | 2 | 0 | 2 | 0 |
| Ventilation formulas | 1 | 0 | 1 | 0 |

| Most Useful Part of Training | Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| Exhaust fans | 1 | 0 | 1 | 0 |
| Examples of proper and improper installations | 2 | 1 | 1 | 0 |
| Prescriptive requirements | 2 | 1 | 1 | 0 |
| Acceptable materials | 1 | 0 | 1 | 0 |
| Air sealing | 1 | 1 | 0 | 0 |
| Classroom demonstration | 1 | 0 | 1 | 0 |
| Future code requirements | 1 | 0 | 1 | 0 |
| Good presenters | 1 | 1 | 0 | 0 |
| Open dialogue | 1 | 0 | 1 | 0 |
| Photographs from inspections | 1 | 1 | 0 | 0 |
| Training followed the code well | 1 | 1 | 0 | 0 |
| General | 4 | 0 | 4 | 0 |
| Don't remember | 1 | 0 | 1 | 0 |

Regarding insulation and air barriers, one code official who attended an EBS training noted:

> *Knee wall insulation and other issues like that are difficult to understand for many contractors. The trainings are helpful for them in terms of issues related to air barriers and what materials are acceptable and won't break the bank. Contractors need to talk about acceptable solutions for materials and the training did that well.*

Another code official who also attended an EBS training described how seeing thermal imaging photographs was useful:

> *The thermal imaging photographs were very helpful. It gives you a gauge of how much heat is actually being lost. Especially comparative photographs where they're showing a set of exterior concrete steps, one that had been properly insulated away from the house and one that was not. You could see the one that was not was glowing red. There were more photographs similar to that, and I found that to be very helpful in seeing how much heat is being lost with some of the improper construction techniques.*

One Building Commissioner provided more general feedback about how useful the EBS training he attended was to himself and others in attendance:

*The classes try to put everyone on the same page, which is helpful. As a Building Commissioner, I already knew the information, but I like to attend to see what others are asking about and to answer any questions or provide context from my perspective. We do a lot of existing building work [in our town], and I thought it was very helpful for the audience to talk about the renovation side of things.*

Another Building Commissioner in a stretch code community who attended both the EBS and HVAC-IAQ trainings noted the following about the usefulness of the trainings, despite the trainings' focus on topics more relevant to the 2012 IECC code:

*[Our city] is a stretch community so a lot of the training topics were not yet applicable to us because they were talking about the 2012 [IECC] code or future codes, but it's still helpful for us to get a sense of what is going on with these other codes. Also, it's helpful to hear what others experience going through the inspection process.*

## Builders and Others

Table 17 shows the feedback received from builders and others about which part or parts of the trainings they found most useful. As in the case of the municipal building code employees, many builders and others (10 out of 30, or 33 percent) reported that discussions about insulation and envelope issues were the most useful part of the trainings to them. Builders and others tended to give more general answers with close to one-half (13 out of 30, or 43 percent) reporting that the most useful part of the training to them was being provided with a good overview of the code.

**Table 17. Most Useful Information from Trainings – Builders and Others**
(multiple response; n=30)

| Most Useful Part of Training | Total Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| Good overview of code changes | 13 | 6 | 3 | 4 |
| All insulation and envelope areas | 10 | 3 | 2 | 5 |
| Housing tightness | 1 | 1 | 0 | 0 |
| Infiltration | 1 | 0 | 0 | 1 |
| Molding | 1 | 0 | 1 | 0 |
| Thermal bridge | 1 | 0 | 0 | 1 |
| Air/vapor barriers | 4 | 1 | 2 | 1 |
| Duct work/testing | 3 | 2 | 1 | 0 |
| HVAC | 3 | 3 | 0 | 0 |
| Prescriptive vs. Performance paths | 3 | 0 | 1 | 2 |
| Good presenters | 2 | 2 | 0 | 0 |

| Most Useful Part of Training | Total Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| Showing examples and referring to specific sections in code | 2 | 0 | 1 | 1 |
| Social opportunity with other stakeholders | 3 | 1 | 1 | 1 |
| Acceptable materials | 1 | 1 | 0 | 0 |
| Air sealing | 1 | 0 | 0 | 1 |
| Context behind code | 1 | 1 | 0 | 0 |
| Correction of misinformation | 1 | 0 | 1 | 0 |
| Different techniques | 1 | 0 | 0 | 1 |
| Examples of proper and improper installations | 1 | 0 | 1 | 0 |
| Graphs, charts on energy usage | 1 | 0 | 1 | 0 |
| Photographs from inspections | 1 | 0 | 1 | 0 |
| Renovations | 1 | 1 | 0 | 0 |
| Ventilation | 1 | 1 | 0 | 0 |
| Don't remember | 1 | 0 | 1 | 0 |

One builder who attended both the EBS and HVAC-IAQ trainings described the usefulness of learning about insulation code changes as well as less disruptive installation techniques:

> *Part of the changes to the code have to do with increased insulation levels so less energy is used. I found all of those to be helpful because the discussions that ensued talked about different insulation techniques so that you could be least disruptive in the traditional way of building… finding the techniques that are the least disruptive in the way they've been doing things is always good to know, so you can work with your trades and point things out to make things easier for them.*

Another builder who attended the HVAC training commented on the usefulness of having been provided with the context behind why the insulation code is written as it is:

> *I found the information on insulation requirements the most helpful. Just getting up to speed… and having a broader understanding of what they need to accomplish is from an insulation standpoint very helpful to me to advocate with the people that are designing our stuff that we try and put as much of the ductwork as we can within the envelope.*

Another builder who attended both the EBS and HVAC-IAQ trainings commented on the usefulness of the HVAC discussion as well as envelope, air sealing, and infiltration topics:

*When I took the trainings last November, I was somewhat new to residential. I had done more work on the commercial side, so it was a good intro to standard building practices on the residential side. I specifically remember the HVAC section being interesting: learning about the different HVAC systems and things to look for in code compliance as well as the specifics of the building envelope, air sealing, and infiltration parts of the code were really valuable to learn because they are somewhat different from the commercial code.*

One architect who attended the EBS training commented on the usefulness of images to show installation techniques:

*The most useful part was the fact that they used slides and photos and showed the "forensic" side of doing inspections. There were useful images shown of proper and improper installations.*

A HERS rater who attended the EBS training commented on the usefulness of having many stakeholders in the same place to discuss the code:

*What was nicest was the fact that everybody was in the room: raters, building code officials, architects, builders. I was more interested in what people were being told, because code is getting interpreted differently everywhere.*

## SHARING OF INFORMATION AND RECOMMENDING TRAININGS

The follow-up interviewers also probed into whom the training attendees have shared information from the trainings with, what information was shared, how the information is being used, and whether the training attendees have recommended the trainings to their colleagues. The questions posed to them were:

> "Please think of different parties you interact with such as people in your building department, colleagues from other jurisdictions, builders, contractors, and others (municipal building code employees)/ as people working on your project, colleagues, code officials, and others (builders/others). Have you shared information from the training(s) with others?
>
> Can you tell me what information you shared and with whom?
>
> Do you believe the party/parties is/are making use of the information you have shared? How are they using this information?
>
> Would you recommend that your colleagues attend the Energy Code Technical Support Initiative trainings? Why or why not?"

The resulting feedback, as detailed in the following subsections, shows that a variety of information was shared from the trainings with a diverse group of stakeholders. Nearly all training attendees would recommend the trainings to their colleagues; some respondents noted that they had already done so and that these other parties had attended a training.

### Parties that Information has been Shared With

The interviewers asked respondents if they had shared information from the trainings with other parties that they typically interact with. As shown in Table 18, close to three-fourths of respondents (43 out of 60, or 72 percent) had shared some of the information from the trainings with other parties. Builders and others were more likely to share the information than municipal building code employees. Note that one respondent did not provide a response to this question, and 16 others said they had not shared any information from the trainings with anyone else as of yet.

**Table 18. Training Information Shared with Other Parties**

| Training Info Shared with Others? | Number of Respondents | Type of Respondent | |
|---|---|---|---|
| | | Munic. Bldg. Code Empl. | Builder/Other |
| Yes | 43 | 18 | 25 |
| No | 16 | 11 | 5 |
| No response | 1 | 1 | 0 |

The interviewers then asked the respondents who said they had shared information (n=43) which parties they had shared the information with. As shown in Table 19, almost all of the municipal building code employees (94 percent) shared information from the trainings with

builders and contractors, and seven of eighteen municipal building code employees (39 percent) said they shared information with other code official colleagues.

**Table 19. Parties that Municipal Building Code Employees Shared Training Information With** (multiple response; n=18)

| Party Information was Shared with | Total Number of Respondents |
|---|---|
| Builders/contractors | 17 |
| Code officials | 7 |
| Architects | 3 |
| Homeowners | 3 |
| HERS raters | 1 |
| Municipal committees and trusts | 1 |
| Tradespeople | 1 |

As shown in Table 20, almost all of the builders and others (96 percent) shared information from the trainings with other builders and contractors.

**Table 20. Parties that Builders and Others Shared Training Information With** (multiple response; n=25)

| Party Information was Shared with | Total Number of Respondents |
|---|---|
| Builders/contractors | 24 |
| Code officials | 4 |
| HERS raters | 4 |
| Homeowners | 4 |
| Municipal committees and trusts | 4 |
| Architects | 3 |
| Tradespeople | 2 |
| Engineers | 1 |

The majority of respondents (35 out of 43, or 81 percent) believe that most of the various parties that they shared information with are using it. Five respondents said that only some of the other parties are using the information, or that they can only assume the information is being used. Finally, five other respondents said they were not sure if the parties were using the information, or did not know if it was being used in a tangible way (Table 21).

**Table 21. Whether Information Shared with Others Is Being Used**
(multiple response; n=43)

| Parties Receiving Information from the Trainings | Yes | Some are | Assume so | Not sure | Not in a tangible way |
|---|---|---|---|---|---|
| *n* | *35* | *2* | *3* | *4* | *1* |
| Architects | 6 | 0 | 0 | 0 | 0 |
| Builders/contractors | 33 | 2 | 2 | 4 | 0 |
| Code officials | 8 | 0 | 3 | 0 | 0 |
| Engineers | 1 | 0 | 0 | 0 | 0 |
| HERS raters | 5 | 0 | 0 | 0 | 0 |
| Homeowners | 6 | 0 | 0 | 1 | 0 |
| Municipal committees and trusts | 4 | 0 | 0 | 0 | 1 |
| Tradespeople | 3 | 0 | 0 | 0 | 0 |

## Information Shared with Other Parties and Use

The interviewers also asked respondents to describe the information that they shared with other parties. Table 22 shows the information from the training that attendees shared with code officials. Most of the code officials that attendees shared information with were provided information about insulation and envelope training topics.

**Table 22. Information Shared with Code Officials**
(multiple response; n=11)

| Information Shared | Total Number of Respondents |
|---|---|
| All insulation and envelope areas | 7 |
| Insulation | 4 |
| Envelope | 2 |
| Infrared photography | 1 |
| Code information/changes | 5 |
| Air sealing | 2 |
| Ductwork | 2 |
| HVAC | 1 |

Table 23 shows the information from the trainings that respondents shared with builders and contractors. Similar to code officials, close to two-thirds (25 out of 38, or 66 percent) of the builders and contractors that respondents shared information with were provided information about insulation and envelope training topics.

**Table 23. Information Shared with Builders and Contractors**
(multiple response; n=38)

| Information Shared | Total Number of Respondents |
|---|---|
| All insulation and envelope areas | 25 |
| Make up air | 3 |
| Thermal barriers | 2 |
| Blower door testing | 1 |
| Housing tightness | 1 |
| Infiltration | 1 |
| Infrared photography | 1 |
| Moisture issues | 1 |
| Air sealing | 8 |
| Code information/changes | 8 |
| All HVAC | 4 |
| Mechanical ventilation | 2 |
| Sizing of heating systems | 1 |
| Ductwork | 4 |
| Air/vapor barriers | 2 |
| Ventilation | 1 |
| Don't remember/didn't say exactly what was shared | 8 |

Table 24 shows the information from the trainings that respondents shared with all other parties. Respondents most often shared information with architects about insulation and envelope training topics, and with HERS raters and homeowners about code information/changes.

**Table 24 Information Shared with All Other Parties**
(multiple response; n=18)

| Information Shared | Party Receiving Information | | | | | |
|---|---|---|---|---|---|---|
| | Architects | Engineers | HERS Raters | Home owners | Municipal committees and trusts | Trades people |
| *n* | *6* | *1* | *5* | *7* | *4* | *3* |
| Code information/changes | 3 | 1 | 4 | 6 | 2 | 0 |
| All insulation and envelope areas | 4 | 0 | 1 | 0 | 2 | 3 |
| Housing tightness | 0 | 0 | 0 | 0 | 1 | 0 |
| Infiltration | 0 | 0 | 0 | 0 | 0 | 1 |
| Infrared photography | 1 | 0 | 0 | 0 | 0 | 0 |
| Air sealing | 1 | 0 | 0 | 0 | 0 | 0 |
| Ductwork | 0 | 0 | 0 | 0 | 0 | 1 |
| Ventilation | 0 | 0 | 1 | 0 | 0 | 0 |
| Don't remember/didn't say exactly what was shared | 0 | 0 | 0 | 1 | 2 | 1 |

Feedback on the use of training information passed on to various parties is broken out into broad categories in Table 25, Table 26, and Table 27 by the type of party using the *information (not by respondent type).*

Table 25 shows how the information that respondents shared with code officials is being used. Code officials are using the information for code enforcement in general, as well as specifically to help them enforce air sealing, ductwork, envelope, HVAC, and insulation requirements.

**Table 25. How Information Is Being Used by Others: Code Officials**
(multiple response; n=11)

| How Information is Being Used | Total Number of Respondents |
|---|---|
| To enforce code - general | 6 |
| To enforce insulation requirements | 3 |
| To enforce air sealing requirements | 2 |
| To enforce ductwork requirements | 2 |
| To enforce envelope requirements | 2 |
| To enforce HVAC requirements | 1 |

Table 26 shows how the information that respondents shared with builders and contractors is being used. Builders and contractors are using the information to help them meet the code in general (8 out of 38, or 21 percent), as well as specifically to help them meet insulation and envelope requirements (23 out of 38, or 61 percent), and air sealing requirements (8 out of 38, or 21 percent). Close to one-fourth (9 out of 38, or 24 percent) of respondents said they shared information from the trainings with this group, but did not know how the information was used.

**Table 26. How Information Is Being Used by Others: Builders and Contractors**
(multiple response; n=38)

| How Information is Being Used | Total Number of Respondents |
|---|---|
| All insulation and envelope areas | 23 |
| To meet insulation requirements | 10 |
| To meet envelope requirements | 3 |
| To meet make-up air requirements | 3 |
| To meet thermal barrier requirements | 2 |
| To meet blower door testing requirements | 1 |
| To meet housing tightness requirements | 1 |
| To meet infiltration requirements | 1 |
| To price insulation work correctly | 1 |
| To troubleshoot moisture issues | 1 |
| All air sealing | 8 |
| To meet air sealing requirements | 7 |
| To price air sealing work correctly | 1 |
| To meet code - general | 8 |
| To meet ductwork requirements | 4 |
| To meet HVAC requirements | 2 |
| To meet mechanical ventilation requirements | 2 |
| To meet air barrier requirements | 1 |
| To meet vapor barrier requirements | 1 |
| Don't know how information was used | 9 |

Table 27 summarizes how the information that respondents shared with all the other parties that were mentioned is being used. Most often these other parties are using the information they received to include in their architectural plans (architects), meet the code (engineers, HERS raters, tradespeople), or to understand the code better (homeowners, town or city committees, and trusts).

**Table 27. How Information Is Being Used by Others: All Other Parties**
(multiple response; n=18)

| How Information is Being Used | Architects | Engineers | HERS Raters | Home owners | Municipal committees and trusts | Trades people |
|---|---|---|---|---|---|---|
| *n* | *6* | *1* | *5* | *7* | *4* | *3* |
| Incorporate into architectural plans | 5 | 0 | 0 | 0 | 0 | 0 |
| To meet code | 0 | 1 | 5 | 0 | 0 | 5 |
| To meet ductwork requirements | 0 | 0 | 0 | 0 | 0 | 1 |
| To meet envelope requirements | 0 | 0 | 0 | 0 | 0 | 1 |
| To meet HVAC requirements | 0 | 0 | 0 | 0 | 0 | 1 |
| To meet infiltration requirements | 0 | 0 | 0 | 0 | 0 | 1 |
| To meet insulation requirements | 0 | 0 | 1 | 0 | 0 | 1 |
| To meet ventilation requirements | 0 | 0 | 1 | 0 | 0 | 0 |
| To understand code | 1 | 0 | 1 | 6 | 4 | 0 |
| To understand envelope requirements | 1 | 0 | 0 | 0 | 1 | 0 |
| To understand housing tightness best practices | 0 | 0 | 0 | 0 | 1 | 0 |
| Don’t know how information was used | 0 | 0 | 0 | 1 | 2 | 1 |

The following quotes provide more context about what information was shared, and how that information was used.

An HVAC subcontractor who attended the EBS and HVAC-IAQ trainings noted discussing the training topics in a more general way with his colleagues and with local inspectors:

*After we take these courses we all kind of discuss with the inspector and among ourselves the things that have changed and the things we need to look for and things that we're going to start doing better. We talk about the whole class and what's changed and what we like and what we don't like and stuff like that.*

A code official who attended both the EBS and HVAC-IAQ trainings noted what he had shared with his colleagues as well as builders and contractors and why he believes it is important to share that information:

*With other building inspectors, we've talked about R-values and envelope, the upcoming new requirements for makeup air, the requirement for insulating exhaust duct work. I've shared all that same information with builders and contractors; it's just a little different conversation. I take the approach that I'd much rather spend 5 minutes with someone who doesn't know and teach them what's required, knowing that the next time they will do it the right way and I won't have to make 2 trips to pass an inspection, just one…Especially because all the contractors and builders talk to each other.*

An equipment supplier who attended the EBS training noted sharing insulation-related information with his customers:

*The guys I deal with on a daily basis (insulation contractors) are always asking about the new changes. They have questions. The inspectors are going back to the insulation contractors and are making sure they are doing everything up to code. They come back to me as the distributor who should know this information and explain to them the correct way to go about the individual jobs they need to do. There's just been a lot of questions on what the correct R-values are. What type of R-value they need to achieve, I bring it back from the information I learned in that class.*

A builder who attended both the EBS and HVAC-IAQ trainings noted that he passes on different techniques that he has learned to the various subcontractors and tradespeople that he works with:

*I pass on different techniques on how to do different things as part of what they're doing, whether it's the heating people or the insulation people, even plumbers and electricians. We are trying to make everybody more aware of the envelope of the structure so we can cut down on air infiltration.*

## Recommending Trainings to Other Parties

The interviewers asked respondents if they would recommend that their colleagues attend the Energy Code Technical Support Initiative trainings. All but two of the 60 respondents reported that they would encourage their colleagues to attend the trainings. One municipal building code employee thought the trainings were mandatory for colleagues and so did not see the purpose of recommending them to anyone. One HERS rater said she worked alone and did not interact with colleagues.

One HVAC contractor who attended both the EBS and HVAC-IAQ trainings provided the following additional context about why he would recommend the trainings to his colleagues:

*I think it's necessary, I think it should be required. It kind of is required for us to maintain our licenses; we need a certain amount of continuing education credits. I think this is a great way to get it because you're learning what you need to do. It saves you money, it saves the contractor money, it saves everyone money if people walk onto the job site knowing what they're job is and what they need to get done to make it right. I think everyone should take it.*

An equipment supplier who attended the EBS training provided some insight about why he thought it was important for those new to the industry to be encouraged to attend the trainings:

*I was new to the industry a year and a half ago. I was always ears open, willing to learn. I was able to take a lot of that info and continue to develop my knowledge of the industry, products, and codes. I thought it was great. For new people, you can learn a lot from that.*

A builder who attended both the EBS and HVAC-IAQ trainings said that he would recommend the trainings to others for the following reason:

*It's very helpful to do the trainings because it keeps you up to date with code changes which in turn is needed for inspectors to sign off on your work and to get your renewal of your license. So much money is at stake if a mistake is made that it's important to keep up with code.*

An architect who attended the EBS training and would recommend the trainings to her colleagues believes Mass Save should try to encourage more architects to attend in the future:

*Yes, I would advertise it more with architects because I think it's very helpful for architects as well…The target audience is contractors, building inspectors, and architects or building professionals, but in reality I have the feeling that mostly contractors and building officials are going to the Mass Save seminars. They are well priced and I think many architects would benefit from going there.*

Seventeen respondents volunteered that the parties that they had recommended the trainings to had attended one or more of the trainings. The interviewers did not directly ask if the respondents had actually recommended the trainings or if the other parties had attended. It is possible that more respondents have recommended the trainings and know of colleagues who have attended.

## SOURCES OF INFORMATION IN ADDITION TO CCSI

The follow-up interviews presented an opportunity to identify the primary sources of information that municipal building code employees, builders, and others consult regarding building code requirements. The questions posed to them were:

"Since [DATE(S) of CCSI TRAINING(S)], have you attended any other trainings, webinars, or gatherings discussing building codes? If yes, what was the focus of these events?

Other than the [CCSI TRAINING(S)] and [any other trainings, webinars, or gatherings discussing building codes attended since DATE(S) of CCSI TRAINING(S)], what are your main sources of information on building code requirements?"

## Trainings Attended Since CCSI Trainings

Just over one-half (32) of the 60 respondents said they had attended one or more trainings or gatherings discussing building codes since attending the CCSI training. These trainings and gatherings took a variety of forms, including seminars, webinars, presentations, conferences, industry association meetings, classroom seminars, and online classes. Municipal building code employees were more likely to report having attended a training or gathering discussing building codes since the CCSI training: 19 building code employees compared to 13 builders and others. The 13 builders and others consisted of four builders, three HERS raters, two architects, two engineers, and two other energy efficiency specialists.

When asked to describe the type of training or gathering they attended, respondents generally recalled the sponsor, the topic, or both. The IDIs did not specifically ask if the trainings or gatherings attended focused on the energy aspects of the building code; nor did the interviewers probe into this area.[10] However, some interviewees did volunteer information about their sources of information on energy codes. As noted in the appropriate sections, some of the trainings or presentations cited by the respondents may well have been sponsored by MassSave.

There appear to be few classroom trainings or presentations on the energy code in Massachusetts outside of the CCSI. Some of the PAs partnered with the University of Massachusetts in Amherst to offer some trainings on energy-efficient technologies (Massachusetts Energy Efficiency Partnership). The International Code Council also offers presentations on the energy code, though these may be held outside Massachusetts.

Since attending the CCSI training, most of the 19 municipal building code employees had attended a training or gathering sponsored by a building inspector association. Meanwhile, within the group of 13 builders and others who had attended a training or gathering, most non-builders had attended one sponsored by an industry/professional association, while most builders had attended one sponsored by a building materials supplier. Fifteen municipal building code employees reported attending a training or gathering focused on building code, compared to only two builders and others. The specific types of building code on which the trainings and gatherings attended by municipal building code employees focused reflect the numerous types of building codes these individuals are responsible for enforcing, including residential, commercial, energy, fire, and other building codes.

### Municipal building code employees

Table 28 displays the sponsors of trainings and gatherings municipal building code employees attended since attending the CCSI training. All but two of the 19 municipal building code employees attended a training or gathering sponsored by a building inspector association. Additional sponsors of trainings and gatherings attended by numerous municipal

[10] Future follow-up IDIs may probe more into the information sources used by the respondents, in addition to the CCSI, specifically on the energy aspects of the building code.

building code employees include the International Code Council, MassSave, various state agencies, and other industry/professional associations. Several of the organizations mentioned, such as the Massachusetts Building Commissioners and Inspectors Association (MBCIA) , the Board of Building Regulations and Standards, the International Code Council, the Boston Society of Architects, and MassSave (most often mentioned by respondents attending the commercial CCSI trainings) do offer some trainings or discussions on the energy code. Some of the discussions and presentations mentioned by the respondents, such as the ones at MBCIS and the Boston Society of Architects, may well have been sponsored by MassSave.

**Table 28. Sponsors of Trainings Attended by Municipal Building Code Employee**
(number of respondents; multiple response)

| Training Sponsors | Number of Respondents |
|---|---|
| All municipal building code employees who attended trainings since CCSI trainings | 19 |
| Building inspector association | 17 |
| MA Building Commissioners and Inspectors Association | 4 |
| Southeastern Massachusetts Building Officials | 4 |
| Building Officials of Western Massachusetts | 3 |
| International Code Council | 3 |
| MassSave | 3 |
| Massachusetts State Agency | 3 |
| Board of Building Regulations and Standards | 1 |
| Department of Public Safety | 1 |
| Department of Finance Services | 1 |
| Other industry/professional association | 3 |
| Local builders association | 1 |
| Electrical Inspectors Association of MA and RI | 1 |
| Boston Society of Architects | 1 |
| National Fire Protection Association | 1 |
| American Wood Council | 1 |
| Not specified | 5 |

Table 29 displays the topics on which trainings and gatherings municipal building code employees attended focused. Building code was the most frequently mentioned topic. Many respondents specified the type of building code, including commercial code, energy code, fire code, residential energy code, code enforcement, code for existing homes, and property maintenance code. Additional topics of trainings and gatherings attended by numerous municipal building code employees include make-up air exchanges, HERS reports, and Manual J calculations. Fourteen of the 19 respondents who had attended trainings or

gatherings discussing building codes since attending the CCSI training mentioned some coverage of energy code issues.

**Table 29. Topics at Trainings Attended by Municipal Building Code Employees**
(number of respondents; multiple response)

| Training or Gathering Topics | Number of Respondents |
|---|---|
| All municipal building code employees who attended trainings since CCSI trainings | 19 |
| All building code | 15 |
| Commercial code | 3 |
| Energy code | 2 |
| Fire code | 2 |
| Residential energy code | 2 |
| Code enforcement | 2 |
| Code for existing homes | 1 |
| Property maintenance | 1 |
| Make-up air exchanges | 2 |
| HERS reports | 2 |
| Manual J | 2 |
| Building case studies | 1 |
| Geothermal | 1 |
| Hazardous materials | 1 |
| Insulation | 1 |
| Did not provide specific topics for a particular training | 14 |

### Builders and others

Table 30 displays the sponsors of trainings and gatherings builders and others said they attended since attending the CCSI training. These respondents most frequently mentioned an industry or professional association as the type of sponsor; respondents attending these events include two HERS raters, an architect, an engineer, and two other energy efficiency specialists. Respondents most commonly mentioned the Northeast Sustainable Energy Association with events attended by almost one-quarter of the 13 builders and others, followed by building materials suppliers, with three builders attending a training sponsored by building materials suppliers such as a lumberyard or an electrical contractor. Several of the organizations mentioned, such as the Northeast Sustainable Energy Association (NSEA), Affordable Comfort, Inc., and MassSave (most often mentioned by respondents attending the commercial CCSI trainings) typically sponsor trainings or discussions on the energy code. As in the case of municipal building code employees, some of the discussions and presentations

mentioned by the respondents, such as the ones at NSEA, may well have been sponsored by MassSave.

**Table 30. Sponsors of Training Attended by Builders and Others**
(number of respondents; multiple response)

| Training Sponsors | Number of Respondents |
|---|---|
| All builders and others who attended trainings since CCSI trainings | 13 |
| Industry/professional association | 6 |
| Northeast Sustainable Energy Association | 3 |
| Home Performance Coalition/Affordable Comfort Inc. | 2 |
| Association of Energy Engineers | 1 |
| Building materials supplier | 3 |
| Builders association | 2 |
| MassSave | 1 |
| Not specified | 4 |

Table 31 displays the topics of trainings and gatherings builders and others said they attended since attending the CCSI training. Though the respondents were asked specifically about building code trainings, some mentioned more general areas. Two respondents reported attending trainings on building code; however, one of those two said the focus was on building code for a state other than MA. Additional topics mentioned by numerous builders and others include building energy, home performance, and insulation. Seven of the 13 respondents who had attended trainings or gatherings discussing since attending the CCSI training mentioned some coverage of energy issues.

**Table 31. Training Topics Attended by Builders and Others**
(number of respondents; multiple response)

| Training Topics | Number of Respondents |
|---|---|
| All builders and others who attended trainings since CCSI trainings | 13 |
| All building code | 2 |
| Energy code | 1 |
| Code in other state | 1 |
| Building energy | 2 |
| Home performance | 2 |
| Insulation | 2 |
| Blower door testing methods | 1 |
| Electronic control systems | 1 |

| | |
|---|---|
| Historic preservation | 1 |
| Water and mold damage | 1 |
| Did not provide specific topics | 4 |

## Other Sources of Information on Building Codes

When asked to name their main sources of information on building code requirements, respondents named the individual or organization supplying the information, the information medium, or both. The most commonly mentioned information source among all respondents was trade magazines, and the most commonly mentioned trade magazine was the Journal of Light Construction. Respondents also mentioned the Internet, telephone, newsletters, memos, seminars, webinars, conferences, and trade shows. Municipal building code employees and builders and others consult many of the same information sources, including the code itself or the code book, peers and colleagues, professional/industry associations, the International Code Council, the MA Board of Building Regulations and Standards, Building Science Corp, and MassSave. Builders and others were more likely than municipal building code employees to cite the code itself/code book as a primary source of information, while municipal building code employees were more likely than builders and others to cite peers and colleagues as a primary source of information.

### Municipal building code employees

Twenty-eight of the 30 municipal building code employees named at least one source of information on building code requirements that they use. As shown in Table 32, trade magazines were the most frequently mentioned information source on building code requirements, especially the Journal of Light Construction and Fine Home Buildings. The next most commonly mentioned information sources were peers and colleagues, International Code Council (ICC), the MA Board of Building Regulations and Standards (BBRS), and building inspector associations. Five municipal building code employees identified the energy code itself or the code book as a key source of information, four mentioned MassSave resources including handouts and a hotline, and three indicated they simply search the web when questions arise.

**Table 32. Main Building Code Information Sources for Municipal Building Code Employee**
(number of respondents; multiple response)

| Information Sources | Number of Respondents |
|---|---|
| All municipal building code employees who utilize information sources other than trainings | 28 |
| Trade Magazines | 16 |
| Journal of Light Construction | 7 |
| Fine Home Buildings | 5 |
| Handyman | 1 |
| Coastal Connections | 1 |

| Information Sources | Number of Respondents |
|---|---|
| Remodeler's Digest | 1 |
| Peers and colleagues | 7 |
| International Code Council | 7 |
| Website | 4 |
| Telephone | 3 |
| Newsletter | 1 |
| MA Board of Building Regulations and Standards | 6 |
| Bulletins | 4 |
| Telephone | 2 |
| Building inspector associations | 6 |
| Websites | 3 |
| Seminars | 2 |
| Publications | 1 |
| The code itself/code book | 5 |
| MassSave | 4 |
| Handouts | 3 |
| Hotline | 1 |
| Internet/web search | 3 |
| Building Science Corp newsletter | 2 |
| MA Department of Public Safety website | 2 |
| Product manufacturers | 2 |
| National Fire Protection Association website | 1 |
| National Fire Academy white papers | 1 |
| Buildingcodeforum.com | 1 |
| Association of General Contractors publications | 1 |

**Builders and others**

Twenty-six of the 30 builders and others named at least one source of information on building code requirements that they use.[11] As shown in Table 33, trade magazines were the most

[11] Two of the four builders and others who did not name any information sources indicated that the CCSI trainings were their only source of information on building code requirements.

frequently mentioned information source on building code requirements, especially the Journal of Light Construction. The next most commonly mentioned sources of information were the code itself or the code book, followed by industry/professional associations. Builders and others also identified peers and colleagues, building inspectors, the Building Science Corp newsletter, local builders associations, ENERGY STAR and MassSave resources as information sources on building code requirements.

**Table 33. Main Building Code Information Sources for Builders and Others (number of respondents; multiple response)**

| Information Sources | Number of Respondents |
|---|---|
| All builders and others who utilize information sources other than trainings | 26 |
| Trade Magazines | 15 |
| Journal of Light Construction | 5 |
| Custom Builder | 1 |
| Home Power | 1 |
| Green Building Advisor | 1 |
| Remodeler's Digest | 1 |
| Professional Builder | 1 |
| Fine Home Buildings | 1 |
| Builder | 1 |
| The code itself/code book | 10 |
| Industry/professional associations | 8 |
| Boston Society of Architects | 2 |
| American Institute of Architects | 1 |
| ASHRAE | 1 |
| Green Builders Association | 1 |
| Home Performance Coalition/Affordable Comfort Inc. | 1 |
| RESNET | 1 |
| Peers and colleagues | 3 |
| Building inspectors | 3 |
| Building Science Corp newsletter | 3 |
| Local builders association | 2 |
| ENERGY STAR | 2 |
| Checklists | 1 |
| MassSave | 2 |
| Hotline | 1 |
| Greentech Media | 1 |
| International Code Council newsletter | 1 |
| MA Board of Building Regulations and Standards website | 1 |

| Information Sources | Number of Respondents |
|---|---|
| Northeast HERS reference manual | 1 |

## CODE COMPLIANCE AND ENFORCEMENT ENVIRONMENT

A key goal of the follow-up interviews is to identify perceived changes in code enforcement and the market for energy efficiency. This section first examines builders and others' perceptions of their interactions with code officials and their customers' interest in energy efficiency. The majority of the builders and others reported increased interest in energy efficiency among both code officials and their customers during the past year or so. Next, this section explores municipal building code employees' and builders' and others' perceptions of the priority given to checking energy efficiency during inspections. Almost all respondents consider energy efficiency to be a medium or high priority relative to the other components of building inspections. This section then looks at energy efficiency issues municipal building code employees encounter in the field, revealing that insulation issues are relatively common. Finally, it explores the factors impacting the amount of time municipal building code employees spend checking for the energy-efficiency aspects of code compliance, and ends with a summary of information filed at local building departments to document energy code compliance for residential construction.

### Builders and Others' Interaction with Code Officials

Interviewers asked builders and others if their interactions with code officials and code enforcement regarding energy efficiency changed in the last year or so. As shown in Table 34, over one-half (17 out of 30) of the builders and others said that their interactions with code officials regarding energy efficiency had changed in the last year or so.

**Table 34. Changes in Interactions with Code Officials**
(number of respondents; n=30)

| Have your interactions with code officials regarding energy efficiency changed? | Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| Yes | 17 | 7 | 6 | 4 |
| No | 10 | 4 | 4 | 2 |
| No interaction with code officials | 3 | 1 | 0 | 2 |

As shown in Table 35, builders and others enumerated a variety of changes they had noticed, including increased awareness of the energy code among code officials, increased enforcement of the energy code by code officials, and increased discussion of energy efficiency with code officials (three respondents for each category). Two respondents thought that code officials had become more knowledgeable about energy efficiency issues and two others pointed out that their interactions with code officials have changed insomuch as the code itself has changed.

**Table 35. Types of Changes in Interactions with Code Officials**
(multiple response; n=17)

| Types of Changes | Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| Increased awareness of energy code | 3 | 1 | | 2 |
| Increased enforcement of energy code | 3 | 2 | 1 | 0 |
| Talk about energy efficiency more | 3 | 1 | 1 | 1 |
| Increased knowledge of energy efficiency issues | 2 | 0 | 1 | 1 |
| Just as it applies to the new code requirements | 2 | 2 | 0 | 0 |
| Improved relationship | 1 | 0 | 1 | 0 |
| Increased anxiety over inspections | 1 | 1 | 0 | 0 |
| Increased frequency of communication | 1 | 0 | 1 | 0 |
| More helpful/able to provide guidance | 1 | 0 | 0 | 1 |
| Increased interest in energy efficiency | 1 | 0 | 0 | 1 |
| Request more documentation | 1 | 0 | 1 | 0 |

One respondent who attended the HVAC-IAQ training thought that his relationship with code officials had improved, stating:

> *My relationship has gotten better because I'm more aware of what they're doing. Not just what they're doing, but why they're doing it.*

However, another respondent who attended both the EBS and HVAC-IAQ trainings noticed "increased anxiety between builders and code officials":

> *The builders want their inspections to go smoothly so that they can feel proud of the projects they work on after putting a lot of time and effort into them, and code officials want inspections to go well so that they're signing off on work that they feel confident in.*

Other changes that respondents noticed included increased frequency in communication with code officials, increased helpfulness on the part of code officials, increased interest in energy efficiency, and increased requests for documentation.

## Customer Interest in Energy Efficiency

Most (24 out of 30, or 80 percent) of builders and others said that their customers had become more interested in energy efficiency in the last year or so (Table 36). However, just under one-half (11 out of 24, or 46 percent) of these respondents said their customers were willing to pay more for energy efficiency without qualifying their answers. An additional eight

respondents said some of their customers are willing to pay more, but it depends on the customer and/or circumstances, such as the length of the payback period and whether rebates are available. Two respondents said that their customers were not willing to pay more for energy efficiency; both work in stretch code communities.

**Table 36. Changes in Customer Interest in Energy Efficiency**
(number of respondents; n=30)

| Have your customers become more interested in energy efficiency? | Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| Yes | 24 | 8 | 9 | 7 |
| No | 6 | 4 | 1 | 1 |
| **If yes, are customers willing to pay more for energy efficiency?** | 24 | 8 | 9 | 7 |
| Yes | 11 | 6 | 1 | 4 |
| Some are/it depends | 8 | 2 | 4 | 2 |
| No | 2 | 0 | 2 | 0 |
| Does not apply | 3 | 0 | 2 | 1 |

## Prioritization of Energy Efficiency

The follow-up interviewers asked respondents how checking for energy efficiency during inspections is prioritized relative to other areas, whether that priority has changed after attending the training (municipal building code officials), or whether that priority has changed in the last year (builders and others). The interviewers asked both groups if they thought that priority would increase in the future.

Specifically, the interviewers asked municipal building code employees the following questions:

> "Would you say checking the energy efficiency of a project is a low, medium, or high priority in building inspections, relative to the other things you and other members of your building department have to look for? Why? Has this priority changed since you attended [TRAINING(S)]? Do you anticipate the priority given to checking energy efficiency will increase in the future? [IF YES] Why is that?"

The interviewers asked builders and others a similar set of questions:

> "Would you say checking the energy efficiency of a project is a low, medium, or high priority in building inspections, relative to the other things you or the building department has to check? Why? Has this changed over the past year or so? If yes, how has it changed? Do you anticipate the priority given to checking energy efficiency will increase in the future? [IF YES] Why is that?"

**Municipal building code employees**

Table 37 shows how municipal building code employees prioritize checking for energy efficiency relative to other areas and their reasonings behind those prioritizations. Note that two of the thirty municipal building code employees did not respond to this question.

**Table 37. Energy Efficiency Prioritization - Municipal Building Code Employees**
(number of respondents; n=28)

| Reasons for Energy Efficiency Prioritization | How Energy Efficiency is Prioritized | | | |
|---|---|---|---|---|
| | High | Med-High* | Medium | Low |
| *n* | *15* | *2* | *10* | *1* |
| Checked equally with other requirements | 5 | | 1 | |
| To save money and energy | 3 | | | |
| Code increases have led to higher prioritization | 2 | | 1 | |
| Goal to ensure code is enforced in city/town | 2 | | | |
| Required by code | 2 | | | |
| Health/safety/structural come first | 1 | 1 | 8 | 1 |
| Green Community | | 1 | | |

*While the interviewer offered the categories low, medium, and high, a number of respondents answered 'medium to high'.

All but one municipal building code employee (27 out of 28, or 96 percent) places either a medium, medium-to-high, or high priority on energy efficiency, with about one-half of respondents (15 out of 28, or 54 percent) reporting that checking for energy efficiency was a high priority. The most common reason provided was that they check it equally with all other requirements, with one code official who attended the EBS training noting:

> *We do a thorough job and all inspections are high quality. We make sure everything meets code, including the energy efficiency aspects of the project.*

Three respondents reported that they believe it is a high priority to help save energy and money, with another code official who attended both the EBS and HVAC-IAQ trainings noting:

*I consider it high. I would say most people consider it at least medium if not high. I'm born and bred from an old Yankee who is cost conscious and I know the more energy you can save, the less money you'll spend on heat, AC, and electricity.*

Two municipal building code employees reported that they highly prioritize energy efficiency because it is a key goal in their town, with one building commissioner who attended both the EBS and HVAC-IAQ trainings noting:

*We take the code requirements very seriously, it's a very high priority in our town. We work with a lot of builders, engineers, and architects who don't submit the correct paperwork, or don't properly design the project to meet code, or who haven't followed the code closely enough during construction. We are sticklers, and often have to ask people to go back and do things again, or make changes.*

Over one-third of municipal building code employees (10 out of 28, or 36 percent) said that checking for energy efficiency was a medium priority, with health, safety, and structural elements coming first (n=8). One respondent mentioned that it was a low priority, also stating that they believe health, safety, and structural elements are higher priorities.

The interviewers then asked the municipal building code employees if their prioritization of energy efficiency has changed since they attended the trainings (Table 38). Note that three municipal building code employees did not respond to the question.

**Table 38. Influence of Training on Prioritization of Energy Efficiency**

| Influence of Training on Prioritization of Energy Efficiency | Total Number of Respondents |
|---|---|
| *n* | *27* |
| Has not influenced prioritization of checking for energy efficiency | 24 |
| Has somewhat influenced prioritization of checking for energy efficiency | 3 |

Most respondents (24 out of 27, or 89 percent) said their prioritization has not changed since they attended the training. Note that all but one of the 24 respondents who said their prioritization has not changed since attending the training ranked energy efficiency as a high (n=14), medium-to-high (n=2), or medium (n=7) priority, and only one ranked it as a low priority.

The interviewers then asked the municipal building code employees if they anticipate that the priority given to checking energy efficiency will increase in the future (Table 39). Note that two municipal building code employees did not respond to this question.

**Table 39. Whether Priority for Checking Energy Efficiency will Change in Future**
(number of respondents; n=28)

| Why Priority Will or Will Not Change | Will Priority Change in Future? | | |
|---|---|---|---|
| | Yes | No | Hope not |
| *n* | *16* | *11* | *1* |
| Will continue to increase in importance as code increases | 15 | | |
| Will continue to increase in importance as awareness grows | 1 | | |
| Will continue to be a high priority | | *6* | |
| Health/safety/structural will continue to be higher priorities | | *4* | |
| Important to meet all aspects of code and not prioritize one over another | | *1* | *1* |

Over one-half of respondents (16 out of 28, or 57 percent) think the priority for checking energy efficiency will continue to increase in the future, with most reporting that it will increase as the code continues to increase. One code official who attended both the EBS and HVAC-IAQ trainings noted,

> *As more people figure this out, it's going to have to be dealt with. I think as the energy codes work harder to make houses more efficient, you'll have no choice but to pay more attention and make sure what's supposed to be done is being done.*

Close to two-fifths of respondents (11 out of 28, or 39 percent) said that they did not think the priority for checking energy efficiency will change in the future, with one code official who attended the HVAC-IAQ training noting

> *It's at a reasonable level now, so it's probably going to stay the same.*

Another code official who attended the EBS training said it's important to meet all aspects of the code and not prioritize one over another noting,

> *Everything is important, but structural comes first; energy code is also very important because it is crucial that all the details are done correctly so that the house functions correctly and so you don't get damage in terms of mold or air infiltration, and tighter houses mean ventilation is a bigger issue.*

Finally, one code official who attended both the EBS and HVAC-IAQ trainings said that he hoped the priority given to checking for energy efficiency would not increase in the future, noting:

> *I hope not, honestly because we don't want to make it to be such a priority that you lose focus on other things. You want to keep equal focus on all parts of the building, in particular fire safety, life safety, and thermal energy compliance.*

### Builders and others

The interviewers asked the builders and others about the prioritization they or their building department gives to checking the energy efficiency of a project relative to other areas. They also asked the respondents to describe the reasoning behind those prioritizations (Table 40).

**Table 40. Reasons for Energy Efficiency Prioritization by Builders and Others**
(number of respondents; n=30)

| Reasons for Energy Efficiency Prioritizations | How Energy Efficiency is Prioritized | | |
|---|---|---|---|
| | High | Med-High | Medium |
| *n* | *27* | *1* | *2* |
| Energy efficiency is central to their business practices | 11 | | |
| Code increases have led to higher prioritization | 8 | | |
| Required by code | 3 | | |
| To build better, more comfortable buildings | 3 | | |
| Checked equally with other requirements | 1 | | |
| Customers more aware of monetary savings | 1 | | |
| Health/safety/structural come first | | 1 | 2 |

All respondents say they place a medium, medium-to-high, or high amount of priority on energy efficiency, with almost all (27 out of 30, or 90 percent) reporting that checking for energy efficiency was a high priority. The most common reason mentioned was that it is central to their business practices, with one builder who attended the HVAC-IAQ training noting:

> *It's a very high priority, and that high priority is somewhat self-directed because the clientele that we have are low- and very-low-moderate income folks who are first time homeowners. When we build something we want to make it as efficient as possible from an economic perspective because of the economic circumstances of our homeowners. We want to give our homeowners every opportunity to succeed in home ownership…The success of the homeowner…affects a whole bunch of things other than just the homeowners in that home: it affects the neighborhood, the community, and the city.*

A HERS rater who attended the HVAC-IAQ training discussed the importance of customer satisfaction, comfort, and energy efficiency:

> *It's high for me. The same things you're checking for energy efficiency are going to make it a more durable project, more comfortable. They all go hand in hand. You could say, sure I don't care about energy efficiency, but I do care about not having to be called back because a client is complaining that the building is poor, or window is*

*drafty, those are much higher priorities than energy, but the irony is there's not a real easy way to say, lets codify comfort…Everybody wants to make their customers happy and worrying about energy, making that a high priority is an easy way to keep customers happy.*

Over one-fourth of respondents reported that code increases have led to higher prioritization of energy efficiency (8 out of 30, or 27 percent), with one architect who attended the EBS training commenting:

*Means and methods are more common. So now when I talk to people (builders) about insulating their basement a certain way they all have the vocabulary, they understand.*

The interviewers also asked the builders and others to comment on the prioritization that they believe *the building departments that they work with* give to energy efficiency during inspections (Table 41). Note that two interviewees said they could not comment on this question and did not respond.

**Table 41. Reasons for Energy Efficiency Prioritization by Building Departments**
(number of respondents [builders and others]; n=28)

| Reasons for Energy Efficiency Prioritizations | How Energy Efficiency is Prioritized | | | |
|---|---|---|---|---|
| | High | Medium | Low | Depends on building dept./official |
| *n* | *16* | *3* | *4* | *5* |
| Code increases have led to higher prioritization | 8 | 1 | | |
| Required by code | 5 | | | |
| Has been a high priority for many years | 1 | | | |
| Health/safety/structural come first | 1 | 1 | 1 | |
| Important as they are a Green Community | 1 | | | |
| Don't think they check for energy efficiency enough | | | 1 | |
| Some are more interested/aware than others | | | | 5 |
| Still trying to get up to date with the new code | | 1 | 1 | |
| Think code officials need more HVAC training/experience | | | 1 | |

Over three-fifths of respondents (19 out of 28, or 68 percent) said they think building departments they work with place a medium or high amount of priority on energy efficiency. Close to one-third of respondents (8 out of 28, or 29 percent) mentioned that increases in the code in recent years have led to building departments highly prioritizing efficiency. An architect who attended the EBS training noted:

*It's a very high priority, since even before this 2012 adoption. They've gone so far as to even put the R-values of assemblies on the building permit card, which I had never really seen 10 to 12 years prior. Obviously spray foam has been out for a while… But since then people have been doing a lot more sort of alternative insulation products…So the building department is getting more comfortable with seeing more specifications and allowing those to be used. I would say energy is much higher than it's ever been in terms of being on their radar.*

Four respondents believed that building departments that they work with place a low priority on energy efficiency, with another architect who attended the EBS training commenting:

*It's a low priority [for building departments], unfortunately. They are still looking more for safety issues, fire code and such. Maybe they aren't educated enough to look in detail about that? It's very spotty what they check. Since it involves the entire building enclosure, it's hard to check sometimes: it's hidden somewhere, they aren't there at the moment when the work is done and then it's all closed up and invisible.*

One HVAC contractor who attended both the EBS and HVAC-IAQ trainings thought that inspectors were not familiar enough with how to make sure HVAC equipment is rightsized:

*I think they don't check energy efficiency enough. I think they need to go deeper because there's a lot of companies out here that do it wrong, even with the new codes. I see a lot of oversized equipment, buildings that are way over engineered too much tonnage as far as AC goes and they put in dehumidifiers because the house is getting moldy… So I wish the inspectors knew more about what they're inspecting …I think they [building inspectors] should be licensed contractors that… want to move on to something else so that they know what they're looking at.*

Five respondents said that the type of prioritization depends on the building department or the individual official that they are working with, noting that some are more aware or interested in energy efficiency than others. A builder who attended both the EBS and HVAC-IAQ trainings commented:

*Every town or city inspector does things their own way, so they have their own focus on what's important to them. So every different thing they are checking has a different level of priority depending on which inspector you're dealing with. They're generally more aware of air infiltration and insulation requirements, but one of them may emphasize looking at the insulation more than the air infiltration, and another one might be the opposite.*

The interviewers then asked the builders and others if the prioritization of energy efficiency has changed in the last year (Table 42). Note that three of the builders and others said they could not comment on this question and did not respond.

**Table 42. Whether Priority for Checking Energy Efficiency has Changed in Last Year**
(number of respondents; n=27)

| Reasons for Why Priority has/has not Changed in Last Year | Priority Changed? | |
|---|---|---|
| | Yes | No |
| *n* | *18* | *9* |
| Priority has increased as code has increased | 9 | |
| Priority has increased as awareness has increased | 9 | |
| Has been a high priority since new code was adopted | | 4 |
| Don't think industry checks energy efficiency enough | | 2 |
| Has been a high priority for many years | | 2 |
| Has been a high priority since becoming a Green Community | | 1 |

Two-thirds of respondents (18 out of 27, or 67 percent) said that the priority for checking energy efficiency has increased in the last year. Nine respondents mentioned that they thought it has increased as the code has increased, with one builder who attended the HVAC-IAQ training saying:

> *Yes. With the code changes the inspectors have become more particular about certain aspects of weather sealing and HVAC installations.*

One-third of respondents (9 out of 27, or 33 percent) mentioned that the priority has increased over the last year due to increased awareness of energy efficiency issues, with one builder who attended both the EBS and HVAC-IAQ trainings saying:

> *Yes. It's become on the forefront of the enforcement officers' perspectives, and in turn now, all the contractors are very savvy to it.*

Another one-third of respondents (9 out of 27, or 33 percent) said that they did not think there were increases to the priority given to checking energy efficiency in the last year, with four respondents noting that it has been a high priority since the new code was adopted. Two believe it's been a high priority for many years, and one engineer said it has been a high priority since the town he works in most often became a Green Community. Two respondents thought the priority has not changed because they don't think the industry as a whole is checking energy efficiency enough during inspections.

The interviewers then asked respondents if they anticipate that the priority given to checking energy efficiency will increase in the future (Table 43). Note that two of the builders and others said they could not comment on this question and did not respond.

**Table 43. Whether Priority for Checking Energy Efficiency will Change in Future**
(number of respondents; n=28)

| Why Priority Will or Will Not Change | Will Priority Change in Future? | | |
|---|---|---|---|
| | Yes | No | Hope so |
| *N* | *18* | *7* | *3* |
| Will continue to increase in importance as code increases | 11 | | |
| Will continue to increase in importance as awareness grows | 4 | | |
| Direction in which both code and industry is headed | 2 | | |
| Will continue to be a high priority as long as it's in the code | *1* | | |
| Will continue to be a high priority | | *3* | |
| Code officials don't want to be bothered | | *2* | |
| Not sure how it could be prioritized more than it already has been | | *1* | |
| Will stay even with whatever the code requires | | *1* | |
| If code is better enforced, prioritization will hopefully increase | | | *1* |
| If HVAC requirements are better understand, it will be easier to enforce code | | | *1* |
| May increase in importance as code increases | | | 1 |

The majority of respondents (18 out of 28, or 64 percent) think the priority for checking energy efficiency will continue to increase in the future, with most of these respondents (11 out of 28, or 39 percent) believing that it will increase as the code continues to increase. One equipment supplier who attended the EBS training agreed:

> *I anticipate it will increase more in the future; with everyone being energy conscious in the retrofit market as well as the new construction market, they're all doing their due diligences to get up to speed on current code as well as being more efficient in building as well as remodeling. It's a growing trend. We see it with energy efficient products that we sell: the high, expensive types of insulation are growing more so than less expensive, less efficient type of products.*

A builder who attended the HVAC-IAQ training also agreed:

> *Because there is a movement under foot within the country and within the code department to tighten up energy code so we all use less energy. It's clearly going to go up, no doubt in my mind.*

Four respondents said they believe prioritization for energy efficiency will increase in the future as awareness about the code and about energy issues grow, with another equipment supplier who attended the EBS training saying:

*I'm sure it will. As costs go up, people will become more and more aware of it.*

A HERS rater who attended the EBS training added:

> *Yes [it will increase] because it has nowhere to go but up. It's a slow process. It's been changing quickly. It's been changing drastically, whereas prior to the last code iterations, each code update changed relatively little. Now it's on a steeper changing curve. It takes time for people to grasp and understand. It's at least a 2 to 3 year lull after the requirement comes out before it's uniformly enforced. Which is surprising to me: I was always a builder and I thought that the building officials were always up to date with the latest of everything and now that I'm on the other side of the counter I can see that they're not.*

Three other respondents say they hope the prioritization placed on energy efficiency will increase in the future, and seven do not believe it will increase more than it already has. Note that most of these respondents who do not think it will increase already think it is a high priority and will continue to be, don't think it could be prioritized more than it already is, or believe it will stay even with whatever the code requires.

Interviewers also asked those who were neither builders nor municipal building code employees if they thought that builders were more concerned about complying with code. Nine respondents, including four HERS raters, two equipment suppliers, two architects, and an HVAC subcontractor thought that builders were more concerned about complying with code. Three respondents, including a HERS rater, an architect, and an energy efficiency specialist said that some builders are, but it depends on the builder. Two respondents, including an architect and an energy efficiency specialist, indicated that some builders are becoming more aware of the code requirements, but most builders need a lot of training and education in order to comply with code. Both of these respondents work in municipalities in which 2012 IECC is in force (Table 44).

**Table 44. Others' Perceptions of Builders Concern Regarding Code**
(number of other respondents; n=14)

| Are builders more concerned about complying with code? | Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| Yes | 9 | 3 | 4 | 2 |
| Some are/it depends | 3 | 0 | 1 | 2 |
| Builders need training | 2 | 2 | 0 | 0 |

## Situations Code Officials Encounter in the Field

Interviewers asked municipal building code employees to recall any serious issues related to energy efficiency they encountered during inspections over the past year or so. Twenty-four of the 30 municipal building code employees recalled at least one issue related to energy efficiency they had encountered in the field, although over one-half (14) of these 24 respondents said the issues were not very serious. The most common type of issue municipal

building code employees encountered during inspections had to do with insulation: thirteen municipal building code employees recalled encountering issues with insulation. Seven respondents said they had observed insulation that had not been installed in accordance with code requirements. Other insulation issues respondents mentioned included failing to document insulation R-values and potential fire safety issues resulting from the use of paper-based insulation or improper installation of spray foam around sprinkler heads. The second most commonly mentioned issue was a general lack of knowledge regarding code requirements. Respondents mentioned that it was difficult for builders and contractors to keep up with changing code requirements, and two respondents commented that this was particularly the case with out-of-state engineers, architects, and contractors. The third most commonly encountered issue pertained to indoor air quality, including exhaust venting issues and concerns that new buildings did not have proper air exchange. Three municipal building code employees encountered air sealing issues (Table 45).

**Table 45. Issues Encountered During Inspections**
(multiple response; n=24)

| Issue | Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| All insulation issues | 13 | 5 | 8 | |
| Insulation requirements not met | 7 | 2 | 5 | |
| R-values not properly documented | 1 | | 1 | |
| Fire safety issues | 1 | | 1 | |
| General lack of code knowledge | 7 | 3 | 4 | |
| Out-of-state contractors | 2 | | 2 | |
| Indoor air quality | 6 | 2 | 4 | |
| Exhaust venting issues | 2 | 1 | 1 | |
| Proper air exchange | 2 | 1 | 1 | |
| Air sealing | 3 | 1 | | 2 |
| Window/door installation | 1 | | 1 | |
| Unsealed ducts | 1 | | 1 | |

## Time Spent on Enforcement of Energy Code

Interviewers asked municipal building code employees to describe the factors that determine the amount of time they spend checking for the energy-efficiency aspects of code compliance. As shown in Table 46, the most commonly mentioned factor was the quality of work with respect to how well it meets code: the more problems there were, the longer it took to point them out to the builder, architect, or engineer for correction. As one interviewee who attended both the EBS and HVAC-IAQ trainings explained:

*Whether or not they do the job right the first time. Usually you can tell when you look at the job the type of work they do and if you walk in and it looks crappy then you have to spend more time because there's probably more mistakes to find. The poorer quality jobs take more time because you have to point out all the inefficiencies.*

The second most commonly mentioned factor was the complexity of the project, with more complex projects requiring more time. The third most commonly mentioned factor was time and/or the availability of personnel was a factor. As one interviewee who attended both the EBS and HVAC-IAQ trainings explained:

*The number one enemy of any building inspector is not the willful disregard of compliance with code, but the simple lack of time.*

Two interviewees said that their experience with a particular builder or contractor was a factor. For instance, some builders were simply more careful with respect to building to code than others, and the ones who were more careful required less time. In addition, an interviewee explained that if he knew a contractor had not previously worked in a stretch code town, he paid extra attention inspecting the work. Other factors mentioned by interviewees included the level of energy efficiency the builder was trying to achieve and the presence of architectural drawings. One interviewee commented that the new code requirements required more time than the previous code, and another interviewee recalled having to spend more time inspecting insulation installed by homeowners.

**Table 46. Factors Impacting Time Spent Enforcing Energy Code**
(multiple response; n=22)

| Factors | Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| Quality of the work/how well it meets code | 11 | 6 | 4 | 1 |
| Complexity of the job | 8 | 6 | 2 | |
| Time/availability of personnel | 3 | 1 | 2 | |
| Experience with the builder/contractor | 2 | 1 | 1 | |
| Level of energy efficiency the builder is trying achieve | 1 | | 1 | |
| Presence of architectural drawings | 1 | | 1 | |
| Homeowner DIY insulation | 1 | | 1 | |
| New code requirements | 1 | | 1 | |

## Code Compliance Documentation Filed

Interviewers asked municipal building code employees to briefly describe the type of information filed at their building department to document energy code compliance for residential construction. If necessary, the interviewers probed further, asking:

"What percent of the projects you review submit the following:

- REScheck files with supplemental checklists for mandatory requirements
- REScheck files with no supplemental information
- Prescriptive checklists
- Documentation that ducts are tested and/or that a blower door test is conducted."

Interviewers asked builders and others if they were involved in filing information to document energy code compliance for residential construction with the local building department, and if so, to briefly describe the type of information filed and whether it has changed since attending the training(s). If necessary, the interviewers probed further, asking:

"For what percent of the projects do you submit the following:

- REScheck files with supplemental checklists for mandatory requirements
- REScheck files with no supplemental information
- Prescriptive checklists
- Documentation that ducts are tested and/or that a blower door test is conducted."

**Municipal building code employees**

Municipal building code employees mentioned anywhere from one to six types of information or documents filed at their building departments. Nearly four-fifths (23) of the municipal building code employees said that documentation that ducts were tested and/or a blower door test was conducted is filed at their building department; 18 of these 23 indicated that it took the form of a HERS rating. Almost two-thirds (19) of the municipal building code employees said that REScheck files were filed at their building departments, and about one-half (nine) of those 19 said the REScheck files were accompanied by supplemental checklists for mandatory requirements. Only three municipal building code employees said that Manual J documents were filed at their departments, and only one stretch code municipal building code employee said that thermal bypass checklists were filed (Table 47).

**Table 47. Information Filed at Municipal Building Code Employees' Building Departments**
(multiple response; n=29)

| Type of Information Filed | Number of Responses | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| HERS or other documentation of duct blaster and/or blower door test | 23 | 9 | 12 | 2 |

| Type of Information Filed | Number of Responses | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| REScheck | 19 | 9 | 8 | 2 |
| Prescriptive checklist | 7 | 2 | 3 | 2 |
| Energy code compliance path | 4 | 2 | 2 | |
| Plans/drawings showing insulation values | 3 | 1 | 2 | |
| Manual J | 3 | | 2 | 1 |
| Documentation of insulation inspection | 2 | | 1 | 1 |
| Thermal bypass checklist | 1 | | 1 | |
| Other | 11 | 4 | 7 | |

**Builders and others**

Fourteen builders and others – including three architects, four HERS raters, and seven builders – said they were involved in filing information to document energy code compliance for residential construction with the local building department. Twelve of the 14 builders and others said they submitted REScheck files, and one-half of those 12 said they submitted supplemental checklists for mandatory requirements along with the REScheck files. Over three-fifths (nine) of the 14 builders and others said the submitted documentation that ducts were tested and/or a blower door test was conducted; six of those nine (including four HERS raters) specified that it took the form of a HERS rating. Only one respondent working in stretch code communities - a HERS rater – reported submitting thermal bypass checklists. In addition, only one respondent - an architect working in 2012 IECC communities - reported submitting Manual J documents (Table 48).

**Table 48. Information Builders and Others File at Building Departments**
(multiple response; n=14)

| Type of Information Filed | Number of Responses | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC Code | Stretch Code | Both Codes |
| REScheck | 12 | 5 | 5 | 2 |
| HERS or other documentation of duct blaster and/or blower door test | 9 | 3 | 4 | 2 |
| Prescriptive checklist | 4 | 2 | 2 | |
| Thermal bypass checklist | 1 | | 1 | |
| Documentation of insulation inspection | 1 | | | 1 |
| Manual J | 1 | 1 | | |
| Other | 2 | 1 | 1 | |

Two of these 14 builders and others said the type of information they file to document energy code compliance at local building departments had changed since attending the training, including one builder and one architect. The builder explained that prior to the training, he was not aware that 2012 IECC required a blower door test. The architect stated that he was more diligent about including actual figures in specifications following the training.

## SUGGESTIONS FOR IMPROVING THE CCSI TRAININGS AND OTHER COMMENTS

Most respondents offered specific suggestions for improving the CCSI trainings as well as more general comments for promoting code enforcement and energy efficiency. These suggestions and comments came up throughout the interviews. The interviewers also posed two questions before concluding each interview.

> "Is there anything that you would want added to the [TRAINING(S)] that was not already covered?
>
> Is there anything we have not covered that you would like to add; in particular do you have any suggestions for how the Energy Code Technical Support Initiative can help you to enforce (municipal building code employees)/comply with (builders and others) the energy code?"

The most frequent suggestion was to get more people to attend the trainings, especially builders and contractors.

## Municipal Building Code Employees

Eleven of the 25 (44 percent) municipal building code employees who offered training suggestions wanted to get more people, especially builders, to attend them. As shown in Table 49, other common suggestions were to provide different kinds of checklists (7 out of 25, or 28 percent), to adjust the types and duration of the trainings (5 out of 25, or 20 percent), and  to focus more on particular areas, especially ventilation (5 out of 25, or 20 percent).

**Table 49. Municipal Building Code Employee Suggestions for Improving the CCSI Trainings**
(number of respondents; multiple response)

| How to Improve the CCSI Trainings | Number of Respondents | Type of training attended | | | |
|---|---|---|---|---|---|
| | | EBS Only | HVAC-IAQ Only | EBS and HVAC-IAQ | 2009 to 2012 IECC |
| All municipal building code employees who offered suggestions for improvement | 25 | 10 | 4 | 9 | 2 |
| All suggestions about getting more people to attend | 11 | 4 | 2 | 3 | 2 |
| Get more builders to attend | 7 | 2 | 2 | 2 | 1 |
| Get more contractors to attend | 5 | 3 | 0 | 1 | 1 |
| Get more architects to attend | 2 | 0 | 1 | 1 | 0 |
| Make trainings shorter and more high-level to get builders to attend | 2 | 1 | 0 | 1 | 0 |
| Get more HERS raters to attend | 1 | 1 | 0 | 0 | 0 |
| Make trainings mandatory for builders | 1 | 0 | 1 | 0 | 0 |
| Make training mandatory for code officials | 1 | 0 | 0 | 1 | 0 |
| More focus on specific areas | 8 | 4 | 0 | 4 | 0 |
| Ventilation | 5 | 3 | 0 | 2 | 0 |
| Air sealing | 2 | 1 | 0 | 1 | 0 |
| HVAC | 1 | 0 | 0 | 1 | 0 |
| Thermal barriers | 1 | 0 | 0 | 1 | 0 |
| All suggestions for checklists | 7 | 3 | 0 | 3 | 1 |
| Create permitting and inspection checklists | 2 | 0 | 0 | 2 | 0 |

| How to Improve the CCSI Trainings | Number of Respondents | Type of training attended | | | |
|---|---|---|---|---|---|
| | | EBS Only | HVAC-IAQ Only | EBS and HVAC-IAQ | 2009 to 2012 IECC |
| Create inspection checklist for performance and prescriptive paths | 1 | 0 | 0 | 1 | 0 |
| All suggestions for adjusting types and duration of trainings | 6 | 2 | 1 | 2 | 1 |
| Trainings too fast-paced and high level | 2 | 1 | 0 | 1 | 0 |
| Do different trainings for beginners and those wanting more in-depth information | 3 | 0 | 0 | 2 | 1 |
| Do longer trainings | 1 | 1 | 0 | 0 | 0 |
| Include geothermal and solar options | 2 | 0 | 0 | 2 | 0 |
| Offer more information on retrofits and renovations | 2 | 1 | 1 | 0 | 0 |
| Train on use of infrared cameras to detect heat loss | 1 | 0 | 0 | 1 | 0 |
| Put slides and handouts on the MassSave website | 1 | 0 | 0 | 1 | 0 |
| More training for code officials on HERS forms | 1 | 0 | 0 | 0 | 1 |
| Have separate sections on the 2012 IECC and the stretch code | 1 | 0 | 0 | 0 | 1 |
| Hold trainings on-site for large departments such as Boston | 1 | 0 | 0 | 1 | 0 |
| Provide hand-outs for in-field use by contractors | 1 | 1 | 0 | 0 | 0 |
| Better advertise the trainings on-line | 1 | 0 | 1 | 0 | 0 |

Table 49 presents a wish list from the respondents; not all suggestions may be practical. The aim of the CCSI trainings is to increase code compliance; thus, adding sections on solar and geothermal options may not make much sense. It may also not be practical to offer different trainings for attendees with different levels of knowledge and experience. However, the respondents who proposed doing so made some good points, such as the following:

*The training [was] too fast paced with not enough info for beginners; [it was] in my town so I put a lot of effort into getting as many builders to come as I could…A lot of builders couldn't follow and asked [the instructor] to further explain things after the session. Builders are not at same caliber as the building officials. The trainings should be two part. I think there could be a whole class on thermal barriers alone. That's what is driving blower door tests – or some other specific topic. Start out very basic by explaining key elements before getting into the specifics about the code. (Code official who attended the EBS training)*

*[Offer] more trainings that are specific to builders because they are not showing up at the general trainings in very large numbers; maybe make it shorter and more high level for them (Code official who attended the EBS training)*

Municipal building code employees also offered more general suggestions for increasing code compliance. These include:

- Offer field assistance at construction sites (two respondents)
- Educate homeowners about the new code with information accessible by the public (two respondents)
- Issue technical bulletins about the new code
- Email newsletters or use similar means to reach targeted audiences.

One municipal building code employee made a strong case for facilitating more discussions among the attendees:

*The trainings should be longer and more round table style stuff where people should feel comfortable asking questions and troubleshooting challenges…in-depth, longer trainings with more back and forth dialogue where people can talk about anecdotal learning rather than just being lectured to…It is nice to have a rundown of what is in the old and new codes but they didn't go into it in enough depth; should bring the energy code book and slow down. [It is] difficult to see which code they are talking about…too much in too little time for most people. (Code official who attended the EBS training)*

## Builders and Others

Eight of the 23, or 35 percent builders and others who offered training suggestions wanted to get more people, especially subcontractors, to attend them; as in the case of municipal building code employees, this was the most popular suggestion (Table 50).

**Table 50. Suggestions from Builders and Others for Improving the CCSI Trainings**
(number of respondents; multiple response)

| How to Improve the CCSI Trainings | Number of Respondents | Type of training attended | | |
|---|---|---|---|---|
| | | EBS Only | HVAC-IAQ Only | EBS and HVAC-IAQ |
| All builders and others who offered suggestions for improvement | 23 | 11 | 7 | 6 |
| All suggestions about getting more people to attend | 8 | 4 | 1 | 3 |
| Get more subcontractors to attend | 5 | 3 | 1 | 1 |
| Get more builders to attend | 4 | 1 | 1 | 2 |
| Get more insulation contractors to attend | 2 | 1 | 0 | 1 |
| Get more code officials to attend | 2 | 1 | 0 | 1 |
| Partner with lumber yards or other suppliers to get more attendees | 2 | 1 | 0 | 1 |
| Coordinate with supervisor license training classes to get more contractors to attend | 2 | 1 | 0 | 1 |
| Offer evening trainings to get more attendees | 1 | 1 | 0 | 0 |
| More focus on specific areas | 4 | 2 | 1 | 1 |
| HVAC | 2 | 1 | 1 | 0 |
| Types and application of insulation | 2 | 1 | 0 | 1 |
| Air leakage | 1 | 1 | 0 | 0 |
| Air sealing | 1 | 1 | 0 | 0 |
| Ventilation | 1 | 0 | 0 | 1 |
| More information on the science of efficient building techniques | 2 | 2 | 0 | 0 |
| Offer more real life examples of homes failing inspection, tightness, and other details | 2 | 1 | 1 | 0 |

| How to Improve the CCSI Trainings | Number of Respondents | Type of training attended | | |
|---|---|---|---|---|
| | | EBS Only | HVAC-IAQ Only | EBS and HVAC-IAQ |
| Continue the trainings | 2 | 0 | 2 | 0 |
| Pictures of installations done right and wrong are very helpful | 1 | 0 | 0 | 1 |
| Have trainings in more western Mass. Locations | 1 | 0 | 0 | 1 |
| Put more resources on-line, especially the presentations | 1 | 0 | 1 | 0 |

Again, Table 50 presents a wish list from the respondents and not all suggestions offered may be practical. However, one architect who attended the EBS training offered some good points for reaching more subcontractors:

> *It's hard for contractors to take a day off to do an in person training; residential contractors are small businesses and very busy so they don't have the same opportunities that someone working in a code official capacity might have. Maybe that means requiring trainings or an evening training with food. A lot of contractors don't do so much on-line and the MassSave model is focused on email. Contractors are more phone based…could have information available for them at the counter where they pick up building permit applications. [It is] important to have a phone number to make [the training] more accessible.*

The respondents also commented on the importance of the trainings for builders. One engineer who attended the HVAC-IAQ training noted:

> *Builders are not necessarily interested in energy efficiency; [I] have seen builders discourage homeowners from making changes due to risk and cost…[It is] important to show the average builder how these can be pulled into everyday construction and not be burdensome.*

Meanwhile, a builder who attended both the EBS and HVAC-IAQ trainings stressed the importance of interactions with code officials, which the trainings help bring about:

> *Create stronger relationships and information sharing between builders and code officials—having the building community in an organized relationship with the code officials needs to be fostered. More frequent meetings could help alert [the parties] of changes and increase communication about problems and how to solve them within the local community.*

Two builders also offered more general suggestions, similar to those from the municipal building department employees, for increasing code compliance; one wanted field assistance and one wanted more education for homeowners. Finally, one builder who attended the HVAC-IAQ training expressed his appreciation for the training instructors.

*There's some really top notch people…They have a hands on experience, and when those of us that actually do the building ask questions, they don't scratch their heads and say, 'I don't know what that means.' They have a lot of practical experience and understanding of how things happen. They talk the talk and they walk the walk. That makes answering questions a lot easier when they understand the questions that are being asked.*

**FOLLOW-UP IN-DEPTH INTERVIEW GUIDE FOR RESIDENTIAL TRAINING ATTENDEES—MUNICIPAL BUILDING CODE EMPLOYEES—FINAL**

Name: _____ Title: _____

Company or City/Town: _____ Telephone: _____

Email: _____

Name for Incentive Check: _____ No Incentive Accepted: _____

Address for Incentive Check: _____

_____

Interview date: _____ Time: _____

**Introduction**: Hello, may I speak to [_____]? My name is _____, and I'm calling from NMR Group on behalf of the sponsors of the Mass Save® Energy Code Technical Support Initiative. We are conducting follow-up interviews with those who have attended the trainings offered by this Initiative in the last few months to understand how the information from the trainings is being used in the field. We offer compensation of $100 for your time in responding to this interview which should take about 30 to 45 minutes; the check could be made payable to you, your employer, or a charity; you do not have to accept compensation for this interview. Your responses will be kept confidential; we will combine them with those of other respondents for the findings and analyses we present to the sponsors of this Initiative. We can do this interview now or schedule for a more convenient time. [If need to confirm legitimacy, refer to William Blake of National Grid at 781-907-1583 or William.Blake@nationalgrid.com.]

[VERIFY OCCUPATION, JURISDICTION, TITLE, AND EMAIL; IF RESPONDENT IS A BULDING CODE OFFICIAL AND SAYS S/HE HAS ANOTHER OCCUPATION AS WELL, INSTRUCT HIM/HER TO ANSWER QUESTIONS IN CAPACITY AS A BUILDING CODE OFFICIAL]

**Intro 1.** I have an attendance list that indicates you attended [TRAINING(S)] on [DATE(S)]. Is that correct?

a. Yes

b. No [THANK AND TERMINATE]

**Intro 1a.** [USE ONLY IF RESPONDENT HAS ATTENDED BOTH RESIDENTIAL AND COMMERCIAL TRAININGS] For this interview I would like to cover just the [RESIDENTIAL TRAININGS] you attended on [DATE(S)].

**Intro 2.** I would also like to confirm that your jurisdiction [CITY/TOWN(S)] is using the building code based on 2012 IECC/is using the stretch code/is using both the building code based on 2012 IECC and the stretch code.

a. Yes

b. No; explain which code they are using _____

**Use of Training**

1. To the best of your recollection, can you tell me which part or parts of the TRAINING(S) you found most useful and why?

2. Since you attended [TRAINING(S)] on [DATE(S)], can you give me an estimate of how many residential on-site inspections you have conducted or participated in? [RECORD]

    a. How many housing units were involved?

    b. And can you estimate how many of these were final inspections?

    c. [ASK IF IN 2012 IECC JURISDICTION] And, how many involved construction permitted under 2012 IECC.

| | All inspections | Construction permitted under 2012 IECC, if applicable |
|---|---|---|
| Total inspections | | |
| Total housing units | | |
| Final inspections | | |
| Housing units in final inspections | | |

    d. [IF HAVE ZEROS FOR ALL THE SQUARES IN QUESTION 2] Do you normally conduct residential inspections in your position?

        i. [IF YES] When would you expect to next conduct an inspection?

3. [IF DONE ANY INSPECTIONS SINCE COMPLETED TRAINING(S)] Have you changed how you conduct inspections for the energy code as a result of the training(s) you attended?

a. [IF YES] Can you please tell me how your inspection process has changed? [PROBE, IF NECESSARY:]

    i. Do you pay more attention to certain areas and, if so, which ones?

    ii. Has the time spent on inspections changed and, if so, by how much?

    iii. Do you verify the insulation levels or other values reported differently than before the training? If so, how has this changed?

b. [IF NO] Why would you say the training has not affected how you conduct inspections? [PROBE, IF NECESSARY:]

    i. Was the training relevant to how you do inspections?

    ii. Do you feel you already did everything you should to enforce the code?

    iii. Has there not been enough time to incorporate what you have learned?

c. [IF HAVE NOT CHANGED ANYTHING DUE TO TRAINING(S) OR IF HAD ZEROS FOR ALL THE SQUARES IN QUESTION 2 BUT EXPECTED TO DO INSPECTIONS IN THE FUTURE] Do you expect what you have learned at the TRAINING(S) will influence your inspections in the future?

    i. [IF YES] How and when do you expect TRAINING(S) to influence your inspections?

4. Since you attended [TRAINING(S)] on [DATE(S)], can you give me an estimate of how many residential building permit applications you have reviewed or participated in reviewing and how many [HOUSING UNITS/BUILDINGS] in total were involved?

    a. [IF HAVE NOT REVIEWED ANY PERMIT APPLICATIONS IN QUESTION 4] Do you normally review building permit applications in your position?

        i. [IF YES] When would you expect to next review an application?

5. [IF REVIEWED ANY BUILDING PERMIT APPLICATIONS SINCE COMPLETED TRAINING] Have you changed how you review building permit applications as a result of the training(s) you attended?

    a. [IF YES] Can you please tell me how your review process has changed? [PROBE, IF NECESSARY:]

        i. Do you pay more attention to certain areas and, if so, which ones?

        ii. Has the time spent on permit review changed and, if so, by how much?

iii. Do you verify the insulation levels or other values reported differently than before the training? If so, how has this changed?

b. [IF NO] Why would you say the training has not affected how you review permit applications? [PROBE, IF NECESSARY:]

i. Was the training not relevant to how you do inspections?

ii. Do you feel you already did everything you should to enforce the code?

iii. Has there not been enough time to incorporate what you have learned?

c. [IF HAVE NOT CHANGED ANYTHING DUE TO TRAINING(S) OR IF HAD NOT REVIEWED ANY BUILDING PERMIT APPLICATIONS BUT EXPECTED TO DO SO IN THE FUTURE] Do you expect what you have learned at the TRAINING(S) will influence your building permit application reviews in the future?

i. [IF YES] How and when do you expect TRAINING(S) to influence your reviews?

6. Are there areas other than inspections and permit review where the training(s) has/have influenced your work?

a. [IF YES] Can you describe those tasks and how the training(s) has/have influenced your work?

7. Can you briefly describe the type of information filed at your building department to document energy code compliance for residential construction?

a. What percent of the projects you review submit the following:

i. REScheck files with supplemental checklists for mandatory requirements ____%

ii. REScheck files with no supplemental information ____%

iii. Prescriptive checklists ____%

iv. Documentation that ducts are tested and/or that a blower door test is conducted _____%

**Sharing Information**

8. Please think of different parties you interact with such as people in your building department, colleagues from other jurisdictions, builders, contractors, and others. Have you shared information from the [TRAINING(S)] with others?

a. [IF 8 = YES] Can you tell me what information you shared and with whom?

b. [IF 8a = YES] Do you believe [PARTY] is making use of the information you have shared? [PROBE: How are they using this information?]

**Other Sources of Information**

9. Since [DATE], have you attended any other trainings, webinars, or gatherings discussing building codes?

    a. [IF YES] Please tell me the names and approximate dates of these events.

    b. What was the particular focus of these events?

10. Other than the [TRAINING(S)] and [EVENTS IN QUESTION 9], what are your main sources of information on the building codes and methods of enforcement?

**General**

11. Would you say checking the energy efficiency of a project is a low, medium, or high priority in building inspections, relative to the other things you and other members of your building department have to look for?

    a. Why?

    b. Has this priority changed since you attended [TRAINING(S)]?

    c. Do you anticipate the priority given to checking energy efficiency will increase in the future?

        i. [IF YES] Why is that?

12. What, if any, serious issues related to energy efficiency have you encountered during inspections over the past year or so, that needed to be fixed?

    a. [IF MENTIONED IN QUESTION 12] Please describe what happened and how it was addressed?

    b. [IF MENTIONED IN QUESTION 12] How often do these issues occur?

13. In general, what factors determine the amount of time you spend checking for the energy-efficiency aspects of code compliance?

    a. [PROBE, IF NECESSARY:] Is time and/or the availability of personnel an issue?

**Closing**

14. Is there anything that you would want added to the [TRAINING(S)] that was not already covered?

    a. What would you add and why?

15. Would you recommend that your colleagues attend the Energy Code Technical Support Initiative trainings?

    a. Why or why not?

16. Is there anything we have not covered that you would like to add; in particular do you have any suggestions for how the Energy Code Technical Support Initiative can help you to enforce the energy code?

Thank you so much for your time!

**FOLLOW-UP IN-DEPTH INTERVIEW GUIDE FOR RESIDENTIAL TRAINING ATTENDEES—BUILDERS AND OTHERS—FINAL**

Name: _____ Title: _____

Company or City/Town: _____ Telephone: _____

Email: _____

Name for Incentive Check: _____ No Incentive Accepted: _____

Address for Incentive Check: _____

_____

Interview date: _____ Time: _____

**Introduction**: Hello, may I speak to [_____]? My name is _____, and I'm calling from NMR Group on behalf of the sponsors of the Mass Save® Energy Code Technical Support Initiative. We are conducting follow-up interviews with those who have attended the trainings offered by this Initiative in the last few months to understand how the information from the trainings is being used in the field. We offer compensation of $100 for your time in responding to this interview which should take about 30 to 45 minutes; the check could be made payable to you, your employer, or a charity; you do not have to accept compensation for this interview. Your responses will be kept confidential; we will combine them with those of other respondents for the findings and analyses we present to the sponsors of this Initiative. We can do this interview now or schedule for a more convenient time. [If need to confirm legitimacy, refer to William Blake of National Grid at 781-907-1583 or William.Blake@nationalgrid.com.]

[VERIFY OCCUPATION, TITLE, EMAIL, AND ADDRESS FOR SENDING CHECK]

**Intro 1.** I have an attendance list that indicates you attended [TRAINING(S)] on [DATE(S)]. Is that correct?

c. Yes

d. No [THANK AND TERMINATE]

**Intro 1a.** [USE ONLY IF RESPONDENT HAS ATTENDED BOTH RESIDENTIAL AND COMMERCIAL TRAININGS] For this interview I would like to cover just the [RESIDENTIAL TRAININGS] you attended on [DATE(S)].

**Intro 2.** I would also like to confirm that you work in [CITY/TOWN(S)], which are using the building code based on 2012 IECC/are using the stretch code/are using both the building code based on 2012 IECC and the stretch code.

c. Yes

d. No; explain which code they are using _____

For subcontractors and equipment suppliers, note the type of work done/equipment supplied.

_____

**Use of Training**

1. To the best of your recollection, can you tell me which part or parts of the TRAINING(S) you found most useful and why?

2. Since you attended [TRAINING(S)] on [DATE(S)], can you give me an estimate of how many residential projects you have conducted? [RECORD]

    a. How many housing units were involved?

    b. What stage are these projects currently in (e.g., planning, under construction, final inspection completed)?

    c. How many of these projects involved construction permitted under 2012 IECC?

| | All projects | Construction permitted under 2012 IECC, if applicable |
|---|---|---|
| Total projects | | |
| Total housing units | | |
| Planning stage projects | | |
| Planning stage housing units | | |
| Under construction projects | | |
| Under construction housing units | | |
| Final inspections | | |
| Housing units in final inspections | | |

d. [IF HAVE ZEROS FOR ALL THE SQUARES IN QUESTION 2] Do you expect to work on a residential structure within the next year?

i. [IF YES] When would you expect to start?

ii. How many housing units would be involved and at what stage would they be at?

3. [IF HAVE WORKED ON ANY PROJECTS SINCE COMPLETED TRAINING(S)] Have you made any changes in your work on these projects to better comply with the energy code as a result of the training(s) you attended?

a. [IF YES] Can you please tell me how your work has changed? [PROBE, IF NECESSARY:]

i. Do you pay more attention to certain areas and, if so, which ones?

ii. What, if anything, would you have done differently if you had not attended the [TRAINING(S)?]

iii. [IF YES AND MORE THAN ONE PROJECT LISTED IN QUESTION 1] Do these changes apply to any particular projects or all the work you have done since the training(s)?

1. Which projects in particular have been affected by you attending the [TRAINING(S)]?

b. [IF NO] Why would you say the training has not affected your work?

[PROBE, IF NECESSARY:]

i. Was the training relevant to your work?

ii. Do you feel you already did everything properly to code?

iii. Has there not been enough time to incorporate what they you learned?

4. [IF HAVE NOT CHANGED ANYTHING DUE TO TRAINING(S) *OR* IF HAD ZEROS FOR ALL THE SQUARES IN QUESTION 2] Do you expect what you have learned at the TRAINING(S) will influence your work in the future?

a. [IF YES] How and when do you expect [TRAINING(S)] to influence your work?

5. Are there areas we have not covered where the training(s) has/have influenced your work?

a. [IF YES] Can you describe these areas and how the training(s) has/have influenced your work?

6. Are you involved in filing information to document energy code compliance for residential construction with the local building department?

    a. [IF YES] Please briefly describe the type of information filed and whether it has changed since you attended TRAINING(S). For what percent of the projects do you submit the following:

        i. REScheck files with supplemental checklists for mandatory requirements ____%

        ii. REScheck files with no supplemental information ____%

        iii. Prescriptive checklists ____%

        iv. Documentation that ducts are tested and/or that a blower door test is conducted _____%

**Sharing Information**

7. Please think of different parties you interact with such as people working on your project, colleagues, code officials, and others. Have you shared information from the [TRAINING(S)] with others?

    a. [IF YES] Can you tell me what information you shared and the party involved?

    b. [IF YES] Do you believe [PARTY] is making use of the information you have shared?

    c. How are they using this information?

**Other Sources of Information**

8. Since [DATE], have you attended any other trainings, webinars, or gatherings discussing building codes?

    a. [IF YES] Please tell me the names and approximate dates of these events.

    b. [IF YES] Was there a particular focus at these events you can remember? If so, describe.

9. Other than the [TRAINING(S)] and [EVENTS IN QUESTION 8], what are your main sources of information on building code requirements?

**General**

10. Would you say checking the energy efficiency of a project is a low, medium, or high priority in building inspections, relative to the other things you or the building department has to check? Why?

    a. Has this changed over the past year or so? If yes, how has it changed?

    b. Do you anticipate the priority given to checking energy efficiency will increase in the future?

        i. [IF YES] Why is that?

11. Have your interactions with code officials and code enforcement regarding energy efficiency changed in the last year or so?

    a. [IF YES] What changes have you experienced?

12. Do you put in more effort and/or spend more time in complying with the energy code in the past year or so?

    a. [IF YES] Please explain where you put in more effort/spend more time.

13. Have your customers become more interested in energy efficiency in the last year or so? Why or why not?

    a. [IF YES] Are customers willing to pay more for energy efficiency?

    b. [FOR RESPONDENTS OTHER THAN BUILDERS = YES] Are builders more concerned about complying with code?

**Closing**

14. Is there anything that you would want added to the [TRAINING(S)] that was not already covered?

    a. [IF YES] What would you add and why?

15. Would you recommend that your colleagues attend the Energy Code Technical Support Initiative trainings? Why or why not?

    a. Why or why not?

16. Is there anything we have not covered that you would like to add; in particular do you have any suggestions for how the Energy Code Technical Support Initiative can help you to comply with the energy code?

Thank you so much for your time!

# FOLLOW-UP INTERVIEWS WITH CCSI COMMERCIAL TRAINING ATTENDEES—REVISED DRAFT (JANUARY 29, 2016)

## EXECUTIVE SUMMARY

As part of the ongoing evaluation of the Massachusetts Code Compliance Support Initiative (CCSI), Cadmus conducted follow-up in-depth interviews (IDIs) with 21 individuals who had attended one or more commercial classroom training sessions approximately six months earlier. Four respondents are municipal building code employees and 17 are builders, architects, equipment suppliers, or energy efficiency professionals (referred to as "builders and others"). The interviews were intended primarily to determine if and how the subjects are applying in the field what they learned in the training. The interviews also explored how the information from the training is shared, what changes are occurring for code compliance and enforcement, and any suggestions for improving the training.

### Use of Training Information in the Field

On average, since attending the training, municipal building code employees reported they have used the information in 34 percent of the work they have completed; builders and others reported using the information in 35 percent of their work. Respondents are using the training in a variety of ways, some of which include design practices, inspections, compliance of different building systems and components, and making recommendations to peers, customers, and end users.

Over half of the respondents (12 out of 21, or 57 percent) said they had made some changes in their work as a result of attending the training. Municipal building code employees were more likely to say they had made changes as a result of the training (67 percent for inspections and 75 percent for building permit review) than builders and others (53 percent for all work). Areas identified as most affected by these changes included new construction, project management, and providing code-related assistance to others.

Municipal building code employees identified the code overview and the discussion on compliance options as the two most useful parts of the training. For the builders and others group, a little over one-third of the 16 that answered the question (6 out of 16, or 38 percent) said the information about lighting provisions—particularly day-lighting, occupancy sensors for exterior lighting, plug-load controls, and LED lighting—was the most useful; 31 percent (5 out of 16) remarked that the overview of code provisions was the most useful; and another 31 percent (5 out of 16) said building envelope topics, particularly air sealing requirements, glazing, and discussion on moisture control were the most useful.

The most common reasons respondents gave for not making any changes to their work after attending the training were that they already knew the information and that the training did not directly apply to their job positions.

### Sharing Information from the Training

Nearly four-fifths of respondents (17 out of 21, or 81 percent) had shared some of the information from the trainings with other parties. Municipal building code employees were more likely to share the information (four out of four) than were builders and others (13 out of

17, or 76 percent). Among those who did share information, all of the municipal building code employees shared information with builders, contractors, and design professionals. Over one-half (7 out of 13, or 54 percent) of the builders and others who shared information from the training did so with design professionals and 46 percent (6 out of 13) with builders and contractors. The majority of both municipal building code officials and builders and others respondents (10 out of 17, or 59 percent) said that of the various parties with whom they shared information, most were using it.

One-third (7 out of 21) of the respondents said that since attending the initial CCSI training they had attended one or more training sessions or gatherings, including conferences and industry association meetings, to discuss building codes. Respondents also identified their two main sources of information on building code requirements; these were peers and colleagues (12 out of 21, or 57 percent) and professional/industry associations (also 12 out of 21, or 57 percent). Respondents said other important sources were the code itself, the Internet, industry publications, updates from manufacturers, and continuing education courses.

## Code Compliance and Enforcement Environment

Most builders and others (11 out of 17, or 65 percent) reported increased interest in energy efficiency among their customers during the past year; of these, all but one (10 of the 17, or 59 percent) added that their customers were willing to pay more for energy efficiency. Three of four municipal building code employees (75 percent) reported energy efficiency as a medium-level priority relative to other areas they are responsible for; these three said health, safety, and structural codes come first. All 17 builders and others reported that checking for energy efficiency was a high priority. Over three-fourths (13 out of 17, or 76 percent) said energy efficiency is a high priority because it is central to their business practices. Nearly one-third (5 out of 17, or 29 percent) added that their clients are the driving force in how they prioritize energy efficiency in their business.

All four municipal building code employees said the priority of energy efficiency had not changed since attending the training and would likely not change in the future. One-third of builders and others (6 out of 17, or 35 percent) said that the priority for checking energy efficiency had increased in the last year, while the remaining two-thirds (11 out of 17, or 65 percent) said that it had not. Over half of the respondents who were neither builders nor municipal building code employees (7 out of 12, or 58 percent) said builders had become more concerned with complying with the code in the last year.

## Considerations for Improving the CCSI Training

Half of the respondents that offered suggestions for improving training (8 out of 16, or 50 percent) suggested improving CCSI training and other courses by adding information about specific code sections such as ventilation, air sealing, and window requirements. One-quarter (4 out of 16) suggested including more case studies and real life examples to help participants understand practical applications of the code provisions. Additional suggestions and requests were to clarify when and where each of the different codes and code variations are enforced, explain details of energy savings realized through code changes, and provide more solution-oriented rather than requirement-oriented material, among others.

Fifteen of the 17 builders and others (88 percent) who offered more overarching suggestions recommended ways to improve the duration or the types of training offered. One-third (5 out of 15) recommended that the training be more in depth. An additional one-third (5 out of 15) suggested that training vary for different market actors and another two said there should be a course for beginners.

Finally, all but one of the 21 respondents said they would encourage others to attend the training because it was thorough, informative, and a good experience overall. Respondents expressed their appreciation for the trainings giving them a good introduction to the energy code and bringing together municipal building code employees, builders, and others to discuss situations encountered in the field.

## INTRODUCTION

Cadmus, as part of the cross-cutting team, conducted follow-up in-depth interviews (IDIs) with 21 individuals who had attended one or more commercial classroom training sessions. Four respondents were municipal building code employees and 17 were builders, architects, equipment suppliers, or energy efficiency professionals. The interviews were intended primarily to determine if and how the subjects are applying in the field what they learned in the training. The cross-cutting team allowed at least six months between the training sessions and the follow-up IDIs. The training sessions were conducted from November 2014 through June 2015; the team interviewed the 21 attendees from June through November 2015.

### Commercial Classroom Training

The Code Compliance Support Initiative (CCSI) sponsored ten commercial classroom training sessions, lasting between three and three-and-one-half hours each, between November 20, 2014, and June 17, 2015. Six concentrated on envelope and building science, one on HVAC and indoor air quality, and three on lighting, lighting controls, and other electrical provisions. From the enrollment data and completed immediate surveys, Cadmus estimated the commercial training had 427 unique attendees.

### Follow-up Interview Design

The follow-up interview guides were designed to assess how the training has influenced attendees' activities in Massachusetts in the past several months. They address these areas of the training:

- Activities since attending training session(s) depending on the type of trainee—building inspections, building permit review, projects under design, projects under construction, and completed projects
- How and if the work done since the training had made use of the information provided
- Most useful part of the training and suggestions for improvement
- Whether respondents had shared what they learned with others and how this information was being used
- Whether the respondents recommend the training to others.

The interview guides also addressed perceived changes in code enforcement and the market for energy efficiency in these areas:

- Type of information filed with building departments to document energy code compliance
- Other training the respondents had attended and sources of information used
- For builders and others, whether customers had become more interested in energy efficiency and how willing they were to pay more for it in the last year or so
- For builders and others, whether interactions with code officials had changed over the past year
- For municipal building code employees, serious issues related to energy efficiency encountered over the past year or so and how they have been addressed
- For municipal building code employees, factors that influenced the effort to check for the energy efficiency aspects of code compliance.

Appendix A contains copies of the interview guides for municipal building code employees, builders, and others.

## Sampling

To determine a sample for this study, interviewers selected training attendees at random from a list generated from the immediate surveys completed at the conclusion of each training session. Survey respondents self-identified as builder/other, equipment supplier, or code official. The code officials survey type was targeted first to ensure enough training attendees participated in the follow-up IDIs. Code officials were reached by both phone and e-mail, when provided. Once the list of possible municipal building code employees was exhausted, the equipment supplier and builder/others survey types were targeted. Possible respondents were reached by both phone and e-mail, when provided. All follow-up IDIs were scheduled and conducted over the phone.

The participants who were eligible for the follow-up IDIs participated in training between November 2014 and June 2015. The follow-up IDIs were conducted in June 2015 and again in November 2015, allowing at least six months between the training sessions and the follow-up IDIs. Table 1 shows the distribution of training participants between the commercial training events attended by year for the two trainings.

**Table 1. Year of Commercial Training Attended**

| Year of Commercial Training Attended | Number of Attendees Listed |
|---|---|
| 2014 | 112 |
| 2015 | 109 |
| Total | 221 |

The total population of commercial training attendees available for the interviews consisted of 221 respondents. The first set of IDIs, conducted in June 2015, focused exclusively on training attended in 2014 to ensure at least 6 months had passed between the trainings and

follow-up IDIs. The beginning population of 112 attendees was narrowed down by eliminating duplicate surveys for the same participant, surveys completed anonymously, and surveys without sufficient contact information. The final population from the 2014 training consisted of 80 possible IDI participants.

The population set of 80 possible participants was sorted by the type of respondent, identifying the participant as either a code official or builder and others. Just over half of the respondents (46 out of 80, or 57 percent) were builders and others, while the remaining 34 respondents (43 percent) identified as code officials (Table 2).

**Table 2. Type of Survey Participant from 2014 Training**

| Type of Participant | Number of Attendees Listed |
|---|---|
| Code Officials | 34 |
| Builders/Others | 46 |
| Total | 80 |

Since the sample list consisted of a similar number of code officials and builders and others, the entire list was randomized and the interviewer called each of the respondents. Cadmus also sent an e-mail to each of the possible IDI participants. The interviewer called through the list until 10 interviews were conducted; each respondent was called at least one time. One additional respondent was interviewed as he or she returned the phone call of the interviewer at a later time. The interviewer noted that respondents were often difficult to reach via telephone; code officials were particularly difficult to reach. The June 2015 follow-up IDI respondents consisted of two code officials and nine builder and other respondents (Table 3).

**Table 3. June 2015 Follow-Up Interview Respondents**

| Position | Number of Respondents |
|---|---|
| Code Officials | 2 |
| Builders/Others | 9 |
| Total | 11 |

The second set of IDIs, conducted in November 2015, focused on attendees at commercial training in 2015. The beginning population of 109 attendees, as illustrated in Table 1, was further narrowed down by eliminating duplicate surveys for the same participant, surveys completed anonymously, and surveys without sufficient contact information. The final sample frame consisted of 70 possible IDI participants.

The sample of 70 possible participants was sorted by the type of participant, identifying the participant as either a code official or builder and others. Eighty percent of respondents (56 out of 70) were builders and others, while the remaining 14 respondents (20 percent) identified as code officials (Table 4).

**Table 4. Type of Survey Participant from 2015 Training**

| Type of Participant | Number of Attendees Listed |
|---|---|

| | |
|---|---|
| Code Officials | 14 |
| Builders/Others | 56 |
| Total | 70 |

In an attempt to get a larger number of code official IDI participants, the recruitment for the second set of interviews concentrated first on the 14 code officials. The interviewer began by making contact with each of the code officials via e-mail and following up the e-mail contact with a phone call. Four of the code officials were out of the office during the timeframe in which the IDIs were conducted, five declined the interviews, and the interviewer left two messages for three of code officials. The remaining two respondents elected to participate in the IDIs.

Once the code official sample was exhausted, the interviewer randomized the builder and other respondents and made initial contact via e-mail. The e-mails were followed up by a phone call until eight interviews were completed; 41 builders and others were called in total.

The November 2015 IDIs consisted of two code official respondents and 8 builder and other respondents (Table 5).

**Table 5. November 2015 Follow-Up Interview Respondents**

| Position | Number of Respondents |
|---|---|
| Code Officials | 2 |
| Builders/Others | 8 |
| Total | 10 |

## Respondents

The 21 respondents worked in various fields that make use of the training provided by the CCSI. Four of the 21 of the respondents (19 percent) worked for municipalities enforcing the building code—their occupations included building commissioner, energy manager, and two code officials. The other 17 respondents worked as builders, architects, subcontractors, equipment suppliers, energy modelers, and energy efficiency professionals.

The respondents were asked to list the Massachusetts municipality in which they did most of their work. Table 2 lists the 21 respondents' occupations[12] as well as how many work in municipalities under the 2012 International Energy Conservation Code (IECC), the stretch code, or both.[13]

[12] Subcategories are listed, with indentations, under the main categories for all tables in this report.

[13] The base code for commercial buildings allows them to meet either the 2012 IECC or ASHRAE 90.1-2010. The stretch code has been adopted by close to half of the Massachusetts cities and towns. For large commercial buildings, the stretch code requires performance 20% better than required by ASHRAE 90.1 -2007 and for medium-size commercial buildings, the code requires meeting specific prescriptive requirements or the same requirement as large commercial buildings.

Two of the four municipal building code employees worked in cities and towns that are under the stretch code while the other two worked in cities and towns under the 2012 IECC. Six of the 17 builders and others respondents (35 percent) worked in municipalities that are under both the 2012 IECC and the stretch code. Eight respondents worked in municipalities under just the stretch code and three in the builders and others group worked in municipalities that strictly use the 2012 IECC.

**Table 6. Follow-Up Interview Respondents**

(Number of respondents, n=21)

| Position | Total Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC | Stretch Code | Both Codes |
| All municipal building code employees | 4 | 2 | 2 | 0 |
| Code officials | 2 | 2 | 0 | 0 |
| Building commissioners | 1 | 0 | 1 | 0 |
| Energy managers | 1 | 0 | 1 | 0 |
| All builders and others | 17 | 3 | 8 | 6 |
| Architects | 5 | 0 | 2 | 3 |
| Project manager/planners | 2 | 0 | 1 | 1 |
| Energy efficiency consultants | 2 | 0 | 2 | 0 |
| Energy engineers | 2 | 0 | 2 | 0 |
| Energy planners | 1 | 1 | 0 | 0 |
| Commissioning project managers | 1 | 0 | 0 | 1 |
| Equipment suppliers | 1 | 1 | 0 | 0 |
| Specifications writers | 1 | 0 | 1 | 0 |
| Inspectors | 1 | 1 | 0 | 0 |
| Owners | 1 | 0 | 0 | 1 |
| All respondents | 21 | 5 | 10 | 6 |

The 21 respondents attended one or more of the courses offered by CCSI on envelope and building science, HVAC and indoor air quality, lighting, lighting controls, and other electrical provisions, as noted in Table 7. Thirteen of the 21 respondents (62 percent) attended commercial envelope training, two attended commercial lighting training, and one attended commercial HVAC training. Additionally, five respondents noted that they had attended both the commercial envelope and commercial lighting trainings. Respondents who attended more than one training were asked to answer with respect to the last training they attended at least six months prior.

**Table 7 Types of Training Attended**

| Type of Training Attended | Total Number of Respondents | Type of Respondent | |
|---|---|---|---|
| | | Municipal Building Code Official | Builders and Others |
| Commercial envelope | 13 | 2 | 11 |
| Commercial lighting | 2 | 1 | 1 |
| Commercial HVAC | 1 | 1 | 0 |
| Commercial envelope and commercial lighting | 5 | 0 | 5 |

## USE OF TRAINING INFORMATION IN THE FIELD

A key goal of the follow-up interviews was to assess how the training attendees were using what they had learned in their everyday jobs. To begin, interviewers asked the four municipal building code employees to estimate the percentage of commercial projects they had completed that made use of the information they had learned through the training. Interviewers also asked these employees to describe how they had used the training. Table 8 summarizes this information.

On average, municipal building code employees reported using the lessons learned from the training in 34 percent of the work they have completed. Both of the code officials said they had used the information to provide education in their jurisdiction, by explaining the code to applicants, or by providing education to architects. Respondents had also used the information to conduct field inspections, review plans, and determine code compliance.

**Table 8. Percentage of Work Using Information from Training—Municipal Code Employees (n=4)**

| Type of Respondent | Percentage of Work | How Training is Being Used |
|---|---|---|
| Code official | 50 | Explaining code sections to applicants |
| Code official | 35 | Field inspections; providing education to architects |
| Energy manager | 25 | Reviewing envelope additions |
| Building commissioner | 25 | Determining compliance options; complying with prescriptive requirements |
| Combined average | 34 | -- |

As with municipal building code employees, interviewers asked builders and others to estimate the percentage of work they had completed that made use of the information they learned through the training and to describe how the training has been used. Table 9 summarizes this information.

Among all builders and others, 82% of respondents (14 out of 17) reported that they used the training in some aspect of their work. Note that one of the 17 respondents indicated they were not using the training in any of their work (answered zero percent) and two said that the training had not been applicable to their work.

On average, the training was used in 27 percent of the work completed since attending the training. Respondents were using the training in a variety of ways, such as design practices, inspections, compliance of different building systems and components, and making recommendations to peers, customers, and end users.

**Table 9. Percentage of Work Using Information from Training—Builders and Others**
(Builders and Others, n=17)

| Type of Respondent | Percentage of Work | How Training is Being Used |
|---|---|---|
| Energy engineer | 80 | Energy modeling |
| Equipment supplier | 70 | Making product recommendations to engineers and end-users |
| Architect | 60 | New construction; roof renovations |
| Commissioning project manager | 50 | Plan review |
| Specifications writer | 50 | Material selection; writing performance requirements |
| Architect | 30 | Envelope compliance |
| Architect | 25 | Building design |
| Energy engineer | 20 | HVAC design |
| Project manager | 20 | Making energy related recommendations to customers |
| Sustainable design consultant | 15 | Informing clients of rebates and incentives |
| Energy efficiency consultant | 15 | Implementing occupancy and day-lighting strategies |
| Architect | 10 | New construction |
| Architect | 10 | General energy code work for projects |
| Inspector | 10 | Plan review for inspections and issuing permits |
| Owner | 0 | Not using the training |
| Project manager | 0 | Not applicable |
| Energy planner | 0 | Not applicable |
| Combined average | 27 | -- |

The following subsections examine the work performed by municipal building code employees, how they used the training in inspections and plan reviews, the changes all respondents believe they had made due to the training, and the reasons why some trainees had not made any changes to their work as a result of the training session(s).

## Municipal Building code employees and Building Inspections and Permit Review

Interviewers asked municipal building code employees to identify whether they performed only site inspections, only plan/permit review, or both as part of their work. As shown in Table

10, three of the four municipal building code employees performed both site inspections and permit/plan review. One municipal building code employee, an energy manager, performed only permit/plan review as part of his position.

**Table 10. Type of Work Performed by Follow-Up Interview Respondents**
(Municipal Building Code Employees, n=4)

| Type of Work Performed | Number of Respondents |
|---|---|
| Only site inspections | 0 |
| Only permit/plan review | 1 |
| Both site inspections and permit/plan review | 3 |

### On-site Inspections by Municipal Building Code Employees

The follow-up IDIs asked municipal building code employees to estimate how many commercial on-site inspections they had conducted or participated in since attending the training. The number of inspections varied by respondent, from zero (does not perform inspections) to 20 inspections.

Interviewers then asked respondents to estimate what percentage of those inspections were final inspections, how many total square feet were in all of the inspected buildings, and the percentage of the total square feet inspected that was for final inspections. Table 11 summarizes the answers provided by the three respondents who conducted commercial inspections as part of their positions. None of the respondents could provide the total floor area inspected.

**Table 11. Inspections Performed by Municipal Building Code Employees**
(Municipal Building Code Employees, n=3)

| | Respondent 1 | Respondent 2 | Respondent 3 |
|---|---|---|---|
| Total inspections | 20 | 2 | 15 |
| Percent of total that were final inspections | 5% | 50% | 30% |
| Percent of total sq. ft. for final inspections | 25% | 50% | 50% |

### Permit Application or Plan Reviews by Municipal Building Code Employees

The follow-up IDIs then asked municipal building code employees to estimate how many commercial building permit applications or plans they had reviewed or participated in reviewing since attending the training and the number of buildings involved. Answers varied significantly by respondent and are summarized in Table 12.

**Table 12. Permit Applications or Plans Reviewed by Municipal Building Code Employees**
(Municipal Building Code Employees, n=4)

| | Respondent 1 | Respondent 2 | Respondent 3 | Respondent 4 |
|---|---|---|---|---|
| Total permit/plan reviews | 75 | 4 | Not sure | 8 |
| Number of total buildings | 75 | 4 | Not sure | 8 |

All respondents who provided an estimate of the total number of permit applications and plans reviewed since attending the training said the number of buildings permitted and the number of applications/plans reviewed were the same.

## Builders' and Others' Commercial Projects Worked on Since Training

Builders and others were asked to estimate the number of commercial projects permitted under the energy code they had worked on since attending the training. Fourteen of the 17 respondents stated they had worked on some projects permitted under the energy code. The other three answered that they had not.

As shown in Table 13, an average of 14.8 projects had been permitted under the energy code and worked on since the training, although the number of projects varied greatly from one energy professional to another.

Two project managers and an energy efficiency consultant reported that they had not worked on any projects permitted under the energy code since the training. Interviewers asked these three respondents when they expected to work on a project permitted under the energy code. Two respondents said they expected to work on a project permitted under the energy code in the next three months; the third respondent expected to work on one in the next 7 to 12 months.

**Table 13. Number of Commercial Projects Worked on Since Training**
(Builders and Others, n=14)

| Respondent | Number of Projects |
|---|---|
| Architect | 70 |
| Equipment supplier | 70 |
| Architect | 15 |
| Owner | 12 |
| Sustainable design consultant | 10 |
| Inspector | 10 |
| Commissioning project manager | 6 |
| Architect | 3 |
| Architect | 3 |
| Architect | 2 |
| Specifications writer | 2 |
| Energy engineer | 2 |
| Energy engineer | 1 |
| Energy planner | 1 |

## Changes Made to Work after Attending Training

To get a better idea of how the training had influenced attendees' work, interviewers asked a series of questions focused on changes made as a result of the training. Municipal building code employees were asked two questions:

> *"Have you changed how you conduct inspections for the energy code as a result of the training(s) you attended" and*
>
> *"Have you changed how you review building permit applications/plans as a result of the training (s) you attended."*

Builders and others were asked a similar question:

> *"Have you changed the work that you do to better comply with the energy code as a result of the training(s) you attended?"*

The interviewers asked all respondents who said they had made any changes to their work after attending the training to explain how they had changed what they do in the field. To the extent possible, the interviewers tried to get the respondents to describe the areas affected by these changes. The responses, as described in this section, varied from focusing on specific areas to more general changes.

### Municipal building code employees

*Changes made to inspections*

As already noted, all respondents filled out immediate survey forms after their trainings. Table 14 compares the responses of municipal code employees to the immediate survey question of when they expected to first use what they had learned in the training session with whether the respondents reported changing how they conduct inspections in the follow-up interviews. All four code employees indicated in the immediate survey that they would be using something they learned at the training within the next six months. Two code employees confirmed that they had, in fact, used what they learned in the training in that time period, the other two indicated that they still had not used what they learned in performing their job. The two who reported that they had not made changes said that the topics had not been relevant to their work.

**Table 14. When Expected to First Use Training Information and Changes Made**

| Expected to first use training in immediate survey | Whether made changes to their work | |
|---|---|---|
| | Yes | No |
| Code Officials | | |
| As soon as I walk out the door | 1 | 1 |
| Sometime in the next three months | 0 | 1 |
| In the next four to six months | 1 | 0 |
| In the next seven to twelve months | 0 | 0 |
| More than a year from now | 0 | 0 |

Two of the three municipal building code employees who conducted inspections as part of their job position said they had made some changes as a result of the training. The first respondent said that she has more knowledge, in general, to apply to inspections since attending the building envelope training, particularly in regards to duct sealants and insulation requirements. She said the training had allowed her to "*spend less time looking up the nuances of the code*."

The second respondent also said that the code provided a solid knowledge base to apply when conducting inspections and he found himself spending less time verifying the measures of the code that were focused on during the building envelope training. To further explain how this general knowledge has been applied to his work, the respondent added:

> *"I have more detailed knowledge of the code requirements now, so instead of relying on mechanical engineers for answers, I can solve problems myself. I can also speak with engineers in greater detail about the code provisions."*

Both respondents said that they expect what they learned in the training to influence inspections in the future.

The third municipal building code employee who conducted inspections as part of his job

position said he had not changed how he conducted inspections as a result of the HVAC training he attended because "*not enough new inspections have been needed*."

*Changes made to permit reviews*

Three of the four municipal building code employees who performed permit application or plan reviews as part of their position said they had changed how they perform reviews as a result of the training.

The first respondent, a code official, said the building envelope training had helped her look with more detail at the applications submitted and that she understood the required documentation better. Another respondent remarked that the HVAC training had enabled him to focus more on the code's HVAC requirements and he believed the knowledge from the training will be even more useful as the code becomes more stringent. The third respondent said the building envelope training had allowed him to spend less time reviewing plans since his base knowledge of the code had increased as a result of the training.

One of the four municipal building code employees who performed permit application or plan reviews as part of his position noted that the training had not changed how permits are reviewed because his jurisdiction had not had a great enough need for permit review since then.

*Other changes as a result of training*

Lastly, interviewers asked municipal building code employees if there were areas other than inspections and permit/plan review where the training had influenced their work. Two of the four municipal building code employees said that there were other areas impacted by the training. One respondent, an energy manager that attended the building envelope training, said he was "*better able to answer questions regarding the requirements for additions and usage change of buildings*." The other respondent, a building commissioner that attended the HVAC training, noted that he could now provide greater technical assistance and could "*proactively help with code requirements and building science questions*."

**Builders and others**

As with the code employess, all builders and other respondents had been provided immediate survey forms after their trainings. However, some surveys from these trainings did not include respondent names, or were not filled out. Because of that, we found only 15 responses. Table 15 compares the responses to the immediate survey question of when they expected to first use what they had learned in the training session with whether the respondents reported changing anything in their work. All respondents who filled out the immediate survey indicated that they expected to use something they learned in the training within three months. Nine respondents confirmed that they has already used what they had learned in the training. For the remaining six, they reported that they either had already known the subject matter covered in the training, or that they still intended to apply what they learned, but it had not been necessary yet in their work. As the table shows, those who planned to use the information immediately were more likely to confirm that they had used the information.

**Table 15. When Expected to First Use Training Information and Changes Made**

| Expected to first use training in immediate survey | Whether made changes to work | |
|---|---|---|
| | Yes | No |
| Builders / Others | | |
| As soon as I walk out the door | 8 | 2 |
| Sometime in the next three months | 1 | 4 |
| In the next four to six months | 0 | 0 |
| In the next seven to twelve months | 0 | 0 |
| More than a year from now | 0 | 0 |

Nine of the 17 builders and others respondents (53 percent) indicated that they had changed the work they did to better comply with the energy code as a result of the training, and they specified the areas most affected by these changes. As shown in Table 12, the most notable effect of the training was the improvement in general knowledge, awareness, and familiarity with the code. Five of the nine respondents (56 percent) said the improvement in general knowledge was key to how they were doing business now. An energy engineer that attended the building envelope training said, "*My familiarity with the code has improved and I've seen an increase in how efficient I am in all of my projects. I have to work with several variations of the code and I am able to switch between them much easier and without confusion*."

A project manager that also attended the building envelope training noted that his knowledge and awareness of code requirements had increased and that he was seeing the benefits in his work with others:

> *"I am more aware of energy provisions and the options for compliance now. As someone who works outside of the design, construction, and enforcement industries, knowledge is really important to be able to relate to the people on my projects. I am now an active participant in the discussion of energy efficient features."*

Another respondent, a specifications writer that attended the building envelope training, added that she was using the training to "*double check performance requirements and have conversations with project teams to make sure they are using materials that comply with the code.*"

**Table 16. Areas Affected by Builder and Other Trainee Changes**
(multiple response; n=9)

| Areas | Number of Respondents |
|---|---|
| *n* | 9 |
| Familiarity with code requirements/general awareness | 5 |
| Material and product selection | 2 |
| Efficiency/speed of work | 2 |
| Greater attention to detail | 2 |
| Better participant in discussion of energy features with peers and colleagues | 2 |
| Performance requirement verification | 1 |
| Easier to market improvements to owners | 1 |
| Relayed information to employees or subcontractors | 1 |
| Focus on wireless sensors | 1 |

Interviewers asked the builders and others who identified changes made to their work as a result of the training to also consider what they would be doing differently had they not attended the training and what projects had been most affected by what they learned (see Table 17). One-third of the respondents (three out of nine, or 33 percent) said they would not be doing anything differently. Two respondents stated that their activities would remain the same, but that they could now do them more efficiently.

**Table 17. Activities Builders and Others Would Be Doing Differently without Training**
(multiple response; n=9)

| Activities | Number of Respondents |
|---|---|
| *n* | 9 |
| No activities would be different | 3 |
| Same activities but not as efficiently | 2 |
| Role in design decisions would be smaller | 1 |
| Less time spent on details now aware of | 1 |
| Providing recommendations for non-compliant materials | 1 |
| Using different products | 1 |

Table 18 summarizes the projects that builders and others identified as most affected by what they learned in the training. One-third of respondents (three out of nine, or 33

percent) said new construction projects were most affected by the training. Other projects mentioned included office buildings, multifamily homes, low-budget projects, rehabilitation projects, modeling projects, and project management.

**Table 18. Builders' and Others' Projects Most Affected by Training**
(Number of respondents, n=9)

| Projects | Total Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC | Stretch Code | Both Codes |
| New construction | 3 | 0 | 2 | 1 |
| Project management | 2 | 0 | 1 | 1 |
| Office buildings | 1 | 1 | 0 | 0 |
| Multifamily homes | 1 | 0 | 1 | 0 |
| Modeling projects | 1 | 0 | 1 | 0 |
| Low-budget projects | 1 | 0 | 1 | 0 |
| Rehabilitation projects | 1 | 0 | 1 | 0 |

## Why No Changes were Made after Attending Training—Builders and Others

Eight of the 17 builders and others respondents (47 percent) indicated that they had not changed the work they did to better comply with the energy code as a result of the training. As shown in Table 19, half of these respondents (four out of eight, or 50 percent) who had not made any changes said the training did not apply to their work. These respondents included an energy planner, inspector, energy efficiency consultant, and sustainable design consultant. The other half (four out of eight, or 50 percent) indicated that they had not made any changes because they already knew the information presented. Two of these four went on to say that the work they were currently doing already focused on energy efficiency. One, an architect that attended the building envelope training, elaborated, "*I already design buildings that will achieve energy savings 30% better than code. My clients are very energy efficiency oriented and come to our practice for our expertise in above code design*."

**Table 19. Why Builders and Others Made No Changes**
(numbers of respondents; n=8)

| Respondent | Reason | Number of Respondents |
|---|---|---|
| Energy planner | Does not apply to work | 1 |
| Inspector | Does not apply to work | 1 |
| Energy efficiency consultant | Does not apply to work | 1 |
| Sustainable design consultant | Does not apply to work | 1 |
| Architect | Already knew the information | 1 |
| Owner | Already knew the information | 1 |
| Architect | Already knew the information/ focus already on efficiency | 1 |
| Commissioning project manager | Already knew the information/ focus already on efficiency | 1 |

## MOST USEFUL INFORMATION FROM TRAINING

A key goal of the follow-up interviews was to identify what areas the attendees found most useful in the training and why. The question posed to them was:

> *"To the best of your recollection, can you tell me which part or parts of the training(s) you found most useful and why?"*

The results, as detailed in the following subsections, varied from focusing on specific topics that respondents found useful to more general feedback about the usefulness of the training.

### Municipal Building Code Employees

Table 16 shows which part or parts of the training the four municipal building code employees found most useful. Half (two out of four) said that the training was useful in general and half said the most useful part was the overview of compliance options. Respondents also listed the instructor and his inclusion of real-life experiences, references to the Whole Building Design Guide, and lighting requirements for zoning as the most useful topic areas discussed during the training session(s).

**Table 20. Most Useful Information from Training—Municipal Building Code Employees**
(multiple response; n=4)

| Most Useful Part of Training | Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC | Stretch Code | Both Codes |
| General | 2 | 1 | 1 | 0 |
| Compliance options | 2 | 0 | 2 | 0 |
| Code requirement overview | 1 | 1 | 0 | 0 |
| Lighting (zoning) | 1 | 1 | 0 | 0 |
| Real-life experiences | 1 | 0 | 1 | 0 |
| Outstanding instructor | 1 | 0 | 1 | 0 |
| Reference to Whole Building Design Guide | 1 | 0 | 1 | 0 |

A building commissioner that attended the HVAC training elaborated on compliance options being the most useful part of the training by saying "*compliance alternatives are a significant part of my job and really important to understanding the energy code in general*."

A code official that attended the building envelope training noted the importance of a great instructor and real-life examples, stating:

> *"The training was just really well done. I can't say enough about the instructor. An architect gave the presentation and that is what really made the training successful. He had a lot of real life stories—great ones—things he had seen done correctly and incorrectly. He shared all of that with the class and it put everything into perspective. Great to receive information about the code that goes beyond just code provisions."*

## Builders and Others

Table 17 shows which part or parts of the training builders and others found most useful. Sixteen of the 17 builders and others respondents provided one or more parts of the training that were useful. One owner, however, noted that the lighting training she attended was more of an overview and that she "*didn't find it to be useful*."

A little over one-third of builders and others (6 out of 16, or 38 percent) said the information provided about lighting provisions, particularly day-lighting, occupancy sensors for exterior lighting, plug-load controls, and LED lighting, was the most useful part of the training. Roughly one-third (5 out of 16, or 31 percent) remarked that the overview of code provisions was the most useful part of the training, and another 31 percent (also 5 out of 16) said building envelope topics, particularly air sealing requirements, glazing, and discussion on moisture control were the most useful part . Builders and others tended to give more general answers, with 4 out of 16 (25 percent) reporting that the most useful part of the training to them was the comparison between the codes (IECC versions, stretch code, ASHRAE 90.1). Another four listed compliance options as the most useful part of the training.

Additional answers provided by the respondents were about the quality of the instructor selected to give the course, the opportunity to socialize with other industry professionals, multifamily provisions, energy savings, utility incentives, and the interactive portions of the presentation that encouraged audience participation.

**Table 21. Most Useful Information from Training—Builders and Others**
(multiple response; n=16)

| Most Useful Part of Training | Total Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC | Stretch Code | Both Codes |
| All lighting | 6 | 0 | 0 | 0 |
| Day-lighting | 2 | 1 | 1 | 0 |
| Lighting (general) | 1 | 0 | 1 | 0 |
| Plug-load controls | 1 | 1 | 0 | 0 |
| Occupancy sensors for exterior lighting | 1 | 0 | 1 | 0 |
| LED lighting | 1 | 0 | 1 | 0 |
| All envelope areas | 5 | 0 | 0 | 0 |
| Air sealing | 2 | 0 | 2 | 0 |
| Glazing | 1 | 0 | 0 | 1 |
| Review of envelope assemblies | 1 | 0 | 1 | 0 |
| Moisture control | 1 | 0 | 1 | 0 |
| Overview of code provisions | 5 | 1 | 4 | 0 |
| Compliance options | 4 | 0 | 0 | 4 |
| Comparing different codes v/ identifying differences | 4 | 1 | 1 | 2 |
| Great presenters | 2 | 0 | 2 | 0 |
| Real-life examples / best practices | 2 | 0 | 1 | 1 |
| Social opportunity with other stakeholders | 2 | 0 | 2 | 0 |
| Multifamily provisions | 1 | 0 | 1 | 0 |
| Focus on building as a whole | 1 | 0 | 1 | 0 |
| Graphics, visuals | 1 | 0 | 1 | 0 |
| Energy savings | 1 | 0 | 0 | 1 |
| Incentives for compliance | 1 | 0 | 1 | 0 |
| Future of the energy code | 1 | 0 | 0 | 1 |
| Reinforcement of the importance of energy codes | 1 | 0 | 0 | 1 |

| Most Useful Part of Training | Total Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC | Stretch Code | Both Codes |
| Interactive activities incorporated into training | 1 | 0 | 0 | 1 |

An architect that attended the building envelope training noted the instructor, practical applications, and course graphics as the most useful parts of the training, stating:

> *"The visuals used throughout the training were exceptional. The graphics made it really easy for me to remember things. I felt like I was in college again and receiving the best lecture of my life. It wasn't just some presentation about numbers, it was what a building system needs comprehensively. He talked about how different materials come together and made it really easy to understand. And [the instructor] wasn't reading off anything, he was more like a college professor—using his PowerPoint really effortlessly and clearly. He helped me relate to the code and that was really valuable."*

A specifications writer that also attended the building envelope training commented on the instructor and practical applications as well, noting the usefulness of the comparison of the codes used throughout Massachusetts:

> *"The overview of everything was very good and I really liked how the trainer effortlessly went from an overview to practical applications. [The instructor's] examples helped me understand the stretch code more since I don't use it much. And there were tables which compared the old code and the new code and then clarified where the stretch code fit in—that was really helpful."*

This respondent further explained the value of having industry professionals together in one room:

> *"It was really useful to have code officials, engineers, builders, and architects attend the same training since they all have a unique perspective on the code. It was helpful to get a broad range of responses from the audience. I'm impressed with how many code officials are on board with energy efficiency!"*

Another building envelope training attendee, an architect, remarked that the most useful part of the presentation was the use of interactive tools by the audience. He described a hand-held clicker that was used to ask the audience questions at the end of each section:

> *"I took notes on the session and the thing I wrote down over and over again was about the hand-held clickers. What a great idea! At the end of each section, we would all use these clickers to answer one or two basic multiple-choice questions and could see what the audience was voting in real time. This was really an innovative way to get and keep people engaged. It gave us all a chance to think about what was presented and then decide how to apply it to real life."*

An energy engineer commented on the usefulness of specific topics, such as glazing, covered by the building envelope training:

> *"I really loved that the instructor focused so much on glazing. So many of the buildings I work on are glass and glazing is a critical piece of the puzzle. I definitely have a better understanding of the glazing requirements and have used the information in my analyses and to figure out utility incentives."*

## SHARING OF INFORMATION AND RECOMMENDING TRAINING

The follow-up interviewers also probed with whom the attendees had shared information from the training, what information was shared, how the information was being used, and whether the attendees had recommended the training to their colleagues. The questions were:

> *"Please think of different parties you interact with, such as people in your building department, colleagues from other jurisdictions, builders, contractors, and others (municipal building code employees)/ such as people working on your project, colleagues, code officials, and others (builders/others). Have you shared information from the training(s) with others?*
>
> *"Can you tell me what information you shared and with whom?*
>
> *"Do you believe the party/parties is/are making use of the information you have shared? How are they using this information?*
>
> *"Would you recommend that your colleagues attend the Energy Code Technical Support Initiative training? Why or why not?"*

The resulting feedback, as presented in the following subsections, shows that a variety of information from the training was shared with a diverse group of stakeholders. Nearly all attendees would recommend the training to their colleagues; some respondents said they had already done so and that these other parties had also attended a training.

### Parties with whom Information has been Shared

The interviewers asked respondents if they had shared information from the training with other parties with whom they typically interacted. As shown in Table 18, close to four-fifths of respondents (17 out of 21, or 81 percent) had shared some of the information from the training with other parties. All four of the municipal building code employees stated that they had shared information from the training, while slightly over three-fourths (13 out of 17, or 76 percent) of the builders and others had shared information. Two builders and others had not shared the training at all.

Note that, although two respondents said they had not shared the information by directly referencing the training, one was using skills learned at the training to point out design deficiencies to peers during design review and believed this had led to both a knowledge transfer and increased compliance with the code by the respondent's firm. The other respondent had attended the training with colleagues, all of whom had shared the information.

**Table 22. Training Information Shared with Other Parties**
(All respondents; n=21)

| Training Info Shared with Others? | Number of Respondents | Type of Respondent | |
|---|---|---|---|
| | | Municipal Building Code Employee | Builder/Other |
| Yes | 17 | 4 | 13 |
| No | 2 | 0 | 2 |
| Not directly | 2 | 0 | 2 |

The interviewers then asked the respondents who said they had shared information (n=17) with whom they had shared it. As shown in Table 19, all four municipal building code employees had shared information from the trainings with builders, contractors, and design professionals. One municipal building code employee also shared the information with engineers.

**Table 23. Parties with Whom Municipal Building Code Employees Shared Training Information**
(multiple response; n=4)

| Party Information was Shared with | Total Number of Respondents |
|---|---|
| Builders/contractors | 4 |
| Design Professionals | 4 |
| Engineers | 1 |

As shown in Table 20, roughly half of the builders and others (54 percent) had shared information with design professionals. Other parties builders and others shared training information with include builders and contractors (46 percent), engineers (31 percent), and tradespeople and consultants (23 percent).

**Table 24. Parties with Whom Builders and Others Shared Training Information**
(multiple response; n=13)

| Party Information Was Shared with | Total Number of Respondents |
|---|---|
| Design professionals | 7 |
| Builders/contractors | 6 |
| Engineers | 4 |
| Tradespeople/consultants | 3 |
| Clients/building owners | 2 |
| Energy modelers | 2 |
| Code officials | 1 |
| Specification writers | 1 |
| Project managers | 1 |
| Energy saving companies | 1 |

The majority of respondents (10 out of 17, or 59 percent) believed most of the various parties that they shared information with were using it. Three of the respondents said that only some of the other parties were using the information or that they could only assume the information was being used. Finally, four other respondents said they were not sure if the other parties were using the information or did not know if it was being used in a tangible way (Table 21).

**Table 25. Whether Information Shared with Others Is Being Used**
(multiple response; n=17)

| Parties Receiving Information from the Training | Yes | Some are | Assume so | Not sure | Not in a tangible way |
|---|---|---|---|---|---|
| *n* | *10* | *0* | *3* | *2* | *2* |
| Design professionals | 9 | 0 | 1 | 0 | 0 |
| Builders/contractors | 8 | 0 | 2 | 1 | 0 |
| Engineers | 3 | 0 | 0 | 0 | 1 |
| Tradespeople/consultants | 2 | 0 | 0 | 1 | 0 |
| Energy modelers | 2 | 0 | 0 | 0 | 0 |
| Clients/building owners | 1 | 0 | 0 | 0 | 1 |
| Code officials | 1 | 0 | 0 | 0 | 0 |
| Specification writers | 1 | 0 | 0 | 0 | 0 |
| Project managers | 1 | 0 | 0 | 0 | 0 |
| Energy saving companies | 1 | 0 | 0 | 0 | 0 |

## Information Shared with Other Parties and Use

The interviewers also asked respondents to describe the information they had shared with other parties. Table 22 shows the training information attendees shared with design professionals. Most of the design professionals that attendees shared information with were provided general code knowledge or information regarding code changes and the differences between the codes used throughout Massachusetts.

**Table 26. Information Shared with Design Professionals**
(multiple response; n=11)

| Information Shared | Total Number of Respondents |
|---|---|
| Code information/changes | 10 |
| All Lighting | 3 |
| Daylighting | 2 |
| Controls | 1 |
| All insulation and envelope areas | 2 |
| Insulation requirements | 1 |
| Air barriers | 1 |
| Compliance options | 1 |
| Supporting documentation for permit applications | 1 |
| Multifamily common areas | 1 |

Table 23 shows the information respondents shared with builders and contractors. This information varied from very detailed responses to more general code knowledge. The majority of respondents said they shared information about the building envelope and electrical systems, particularly insulation and lighting controls. They also shared code changes and compliance options.

**Table 27. Information Shared with Builders and Contractors**
(multiple response; n=9)

| Information Shared | Total Number of Respondents |
|---|---|
| All insulation and envelope areas | 3 |
| Insulation | 2 |
| Fenestration requirements | 1 |
| All electrical | 3 |
| Lighting controls/ reduction | 2 |
| Exterior lighting | 1 |
| Code information/changes | 2 |
| Compliance options | 1 |
| All HVAC | 1 |
| Air/vapor barriers | 1 |
| Material selection | 1 |
| Supporting documentation for permit applications | 1 |

Table 24 shows the information from the training that respondents shared with all other parties. Respondents most often shared information with engineers about general code provisions and changes, particularly lighting. The remaining groups received varying information from the respondents.

**Table 28 Information Shared with All Other Parties**
(multiple response; n=16)

| Information Shared | Party Receiving Information | | | | |
|---|---|---|---|---|---|
| | Engineers | Tradespeople/ consultants | Clients/ building owners | Energy modelers | All Others |
| *n* | *5* | *3* | *2* | *2* | *4* |
| All lighting | 2 | 0 | 0 | 0 | 0 |
| Lighting controls | 1 | 1 | 0 | 0 | 0 |
| Exterior lighting | 1 | 0 | 0 | 0 | 0 |
| Code information/changes | 1 | 1 | 0 | 2 | 1 |
| Building positioning | 1 | 0 | 0 | 0 | 0 |
| All insulation and envelope areas | 0 | 1 | 0 | 0 | 0 |
| Fenestration | 0 | 0 | 0 | 1 | 0 |
| Insulation | 0 | 1 | 0 | 0 | 0 |
| HVAC | 0 | 1 | 0 | 0 | 0 |
| Utility incentives | 0 | 0 | 1 | 0 | 1 |
| Compliant product/materials | 0 | 1 | 0 | 0 | 1 |
| Energy savings | 0 | 0 | 1 | 0 | 1 |
| Don't remember/didn't say exactly what was shared | 0 | 0 | 1 | 0 | 0 |

Feedback on how the various parties used the information passed on from training attendees is broken into broad categories in Table 25, Table 26, and Table 27 by the party using the information (not by respondent type).

Table 25 shows how the information respondents shared with design professionals was being used. Design professionals were using the information to design code compliant buildings, including existing buildings, additions, and retrofits. Design professionals were also using the information to provide code knowledge to colleagues, complete permit applications, and review the work of other designers.

**Table 29. How Information Is Being Used by Others: Design Professionals**
(multiple response; n=11)

| How Information is Being Used | Total Number of Respondents |
|---|---|
| To ensure designs are compliant | 6 |
| To provide knowledge to colleagues | 2 |
| To ensure additions and retrofits are compliant | 2 |
| To ensure compliance of building envelopes | 1 |
| To ensure existing buildings are compliant | 1 |
| Clarify when to comply with which code | 1 |
| To provide review of other projects | 1 |
| To complete permit applications | 1 |

Table 26 shows how the information respondents shared with builders and contractors was being used. Builders and contractors were using the information to help them meet the code in general (three out of nine, or 33 percent), as well as specifically to help them meet insulation, HVAC, air barrier, and lighting requirements. Two of the nine respondents said the shared information was being used to determine the best compliance option for a project.

**Table 30. How Information Is Being Used by Others: Builders and Contractors**
(multiple response; n=9)

| How Information is Being Used | Total Number of Respondents |
|---|---|
| To meet code - general | 3 |
| To determine best compliance option | 2 |
| To meet insulation requirements | 1 |
| To meet HVAC requirements | 1 |
| To meet air barrier requirements | 1 |
| To meet lighting requirements | 1 |
| To complete permit applications | 1 |
| Don’t know how information was used | 1 |

Table 27 summarizes how the information that respondents shared with all other parties mentioned was being used. Most often these other parties were using the information to meet

code (engineers, tradespeople/consultants, energy modelers), perform energy or therm model analyses (energy modelers), optimize energy savings (clients/building owners, energy modelers), or provide energy code documentation (engineers, energy modelers).

**Table 31. How Information Is Being Used by Others: All Other Parties**
(multiple response; n=16)

| How Information is Being Used | Engineers | Tradespeople/ consultants | Clients/ building owners | Energy modelers | All Others |
|---|---|---|---|---|---|
| *n* | *5* | *3* | *2* | *2* | *4* |
| To meet code (all) | 2 | 3 | 1 | 2 | 0 |
| To meet HVAC requirements | 0 | 1 | 0 | 0 | 0 |
| To meet insulation requirements | 0 | 1 | 0 | 0 | 0 |
| To meet lighting requirements | 2 | 1 | 0 | 0 | 0 |
| Completing permit applications | 1 | 0 | 0 | 0 | 0 |
| Documentation | 1 | 0 | 0 | 1 | 0 |
| To help end users, clients, facilities save money | 0 | 0 | 0 | 0 | 1 |
| Optimize energy savings | 0 | 0 | 1 | 1 | 0 |
| Energy/therm modeling | 0 | 0 | 0 | 2 | 0 |
| Don't know how information was used | 0 | 2 | 0 | 0 | 2 |

These following quotes provide more context about what information was shared and how it was used.

A code official, an energy manager that attended the building envelope training, noted that he had shared information with many people throughout his department and with design professionals and builders:

> *"There seems to be a lot of confusion in the building community about when to comply with the IECC, the stretch code, 90.1, or a combination of the three. Training has helped me address much of that confusion."*

An architect that also attended the building envelope training noted discussing the training topics in a more general way with his colleagues and how the training had improved his role in the office:

> *"Every time someone from our office attends a training, the office does an internal review of what was learned […] I am probably the most informed in the office in respect to energy codes and the training has helped position me as the technical person that explains code provisions to coworkers."*

An equipment supplier that attended both the lighting and envelope training sessions who shared code updates and the products that pertain to updates with energy service companies (ESCO) noted how the ESCOs were using the information:

> *"The ESCOs, in turn, are using this information to help end users and facilities save more energy and receive more utility incentives. Everyone wins."*

A code official explained his role in sharing the information he received from the lighting training he attended:

> *"Architects, civil engineers, and contractors are all well aware of the work they do for energy conservation, but I don't think wiring contractors are aware of their impact aside from when they are installing LED lights. They aren't really aware of additional lighting controls and lighting reduction techniques inside the building or of the exterior lighting zones. It's my job to make sure they know the ins and outs of the code, including what I trained on, and the fact that they have requirements under this code that are mandatory and have changed since the previous version."*

## Recommending Training to Other Parties

The interviewers asked the 21 respondents if they would recommend the Energy Code Technical Support Initiative trainings to others. All but one reported they would encourage others to attend the training because it was thorough, informative, and overall a good experience. The respondent who would not recommend the training, an owner that attended the lighting training session, explained that it is a "*great concept and a good idea*" and liked that it was supported by utilities, but she believed the course needed to be more focused on "*energy efficiency concepts*" and "*it's just not completely tied together yet.*"

The trainees offered many reasons for recommending the trainings to their colleagues or others in the industry. A senior specifications writer that attended the building envelope session added:

> *"This is a really complex code and it's important for the future that we move forward and do things as well or better than what the code requires. I don't think the code officials will ever be able to monitor every aspect of the code so lots of people need to attend these trainings to be aware of the goals and to help fill in the gaps."*

An energy engineer explained why he would recommend the HVAC training to building owners:

*"[The training] provides a set of concepts and tools that makes it easier to understand the energy conservation measures we are selling. I'd recommend it to anyone… especially owners! An office building of 30 years ago trying to raise itself to contemporary standards knows its operating costs are much higher than that of others, so these owners need to know how to lower operating costs to compete with other buildings."*

A building official that attended a lighting training session also expressed the importance of the entire industry taking the same training:

*"Buildings, architects, and inspectors should all be going to the same training sessions so that we can move towards uniformity of our understanding of what to enforce and how."*

## SOURCES OF INFORMATION IN ADDITION TO CCSI

The follow-up interviews presented an opportunity to identify the primary sources of information that municipal building code employees, builders, and others consult regarding building code requirements. The questions posed to them were:

*"Since [DATE(S) of CCSI TRAINING(S)], have you attended any other trainings, webinars, or gatherings discussing building codes?*

*"Other than the [CCSI TRAINING(S)] and [any other trainings, webinars, or gatherings discussing building codes attended since DATE(S) of CCSI TRAINING(S)], what are your main sources of information on building code requirements?"*

The following subsections detail the responses from training attendees on any training sessions they have attended since the CCSI training and their sources of information on building codes.

### Training Attended Since CCSI Training

One-third (7) of the 21 respondents said they had attended one or more training sessions or gatherings to discuss building codes since attending the CCSI training. These took a variety of forms, including webinars, presentations, conferences, industry association meetings, classroom seminars, and online courses. Builders and others (6 of 17 respondents) were more likely to report having attended a training or gathering discussing building codes since the CCSI training than municipal building code employees (one of four respondents). The six builders and others consisted of an energy modeler, equipment supplier, energy engineer, sustainable design consultant, and two architects.

When asked to describe the type of training or gathering they attended, respondents generally recalled the sponsor, the topic, or both. Since attending the CCSI training, five respondents said they had attended other CCSI training courses with topics such as mechanical provisions, indoor air quality, lighting requirements, and building envelope. The other two respondents said they regularly attend Environmental Business Council, Boston Society of Architects, and code committee meetings throughout the year and that these meetings focused on code updates, new technologies, and other code-related special topics.

## Other Sources of Information on Building Codes

When asked to name their main sources of information on building code requirements, respondents gave the individual or organization supplying the information, the information medium, or both. The two most commonly mentioned information sources among all respondents were peers and colleagues (12 out of 21, or 57 percent) and professional/industry associations (12 out of 21, or 57 percent). Respondents also mentioned the code itself, the Internet, industry publications, updates from manufacturers, and continuing education courses.

Municipal building code employees and builders and others consulted many of the same information sources, including the code itself, peers and colleagues, professional/industry associations, and the Whole Building Design Guide. Builders and others were more likely to cite the code itself or codebook as a primary source of information, while municipal building code employees were more likely to cite peers and colleagues.

### Municipal building code employees

All four municipal building code employees named at least one source for information on the building code requirements that they used. As shown in Table 32, peers and colleagues were the most frequently mentioned information source for building code requirements. Other information sources were the IECC codebook, Internet, Whole Building Design Guide, academic journals, and local building association meetings.

**Table 32. Main Building Code Information Sources for Municipal Building Code Employees**
(multiple response; n=4)

| Information Sources | Number of Respondents |
|---|---|
| All municipal building code employees who utilize information sources other than training | 4 |
| Peers and colleagues | 3 |
| The code itself/code book | 1 |
| Internet/web search | 1 |
| Building Official District Meeting | 1 |
| Builder Association meetings | 1 |
| Whole Building Design Guide | 1 |
| Academia | 1 |
| Academic journals | 1 |

### Builders and others

All 17 of the builders and others also named at least one source of information on building code requirements that they used. As shown in Table 33, Internet/web searches and professional associations were the information sources mentioned most often, followed by the code itself and peers and colleagues. They also identified industry publications, updates from

manufacturers, and continuing education courses as information sources on building code requirements.

**Table 33. Main Building Code Information Sources for Builders and Others (multiple response; n=17)**

| Information Sources | Number of Respondents |
|---|---|
| All builders and others who utilize information sources other than training | 17 |
| All Internet/web search | 10 |
| General | 4 |
| International Code Council online | 2 |
| Oak Ridge website | 1 |
| Building Science Corporation website | 1 |
| Building science bloggers | 1 |
| Greenbuildingadvisor.com | 1 |
| All Industry/professional associations | 10 |
| Boston Society of Architects | 2 |
| ASHRAE | 2 |
| LEED | 2 |
| MA Board of Building Regulations and Standards | 2 |
| USGBC | 1 |
| General | 1 |
| The code itself/code book | 8 |
| Peers and colleagues | 8 |
| All industry publications | 3 |
| General | 1 |
| Building Science Corp newsletter | 1 |
| Whole Building Design Guide | 1 |
| Updates from manufacturers | 1 |
| Continuing education courses (AEC Daily, McGraw Hill) | 1 |

## CODE COMPLIANCE AND ENFORCEMENT ENVIRONMENT

A key goal of the follow-up interviews was to identify perceived changes in code enforcement and the market for energy efficiency. This section examines builders and others' perceptions of their interactions with code officials and of their customers' interest in energy efficiency. The majority of the builders and others reported that interactions with code officials had not

changed in the last year or that they were not directly involved in interactions with code officials (16 out of 17, or 94 percent).

The interviewers also asked municipal building code employees and builders and others about their perceptions of the priority given to checking energy efficiency during inspections. All respondents considered energy efficiency to be a medium or high priority relative to the other components of building inspections, as detailed in the subsections below.

Other subsections look at the energy efficiency issues municipal building code employees encountered in the field; factors influencing the amount of time municipal building code employees spent checking for the energy efficiency aspects of code compliance; information filed at local building departments to document energy code compliance for commercial construction; and the length of time buildings of varying sizes and types take from permitting to receiving a certificate of occupancy.

## Builders and Others' Interaction with Code Officials

Interviewers asked builders and others if their interactions with code officials and code enforcement in regard to energy efficiency had changed in the last year or so. As shown in Table 34, more than one-half of the builders and others (9 out of 17, or 53 percent) said they did not interact directly with code officials. The majority of the remaining respondents (7 out of 8, or 88 percent) said their interactions with code officials regarding energy efficiency had not changed over the last year. One respondent answered that his interactions had changed, adding that "*code officials have stepped up in terms of knowledge and assistance. Everyone is stressed and we turn to code officials for guidance*."

**Table 34. Changes in Interactions with Code Officials**
(number of respondents; n=17)

| Have your interactions with code officials regarding energy efficiency changed? | Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC | Stretch Code | Both Codes |
| Yes | 1 | 0 | 1 | 0 |
| No | 7 | 1 | 2 | 4 |
| No interaction with code officials | 9 | 2 | 5 | 2 |

One architect who answered "no" to interactions with code officials having changed over the last year added that, "*the code officials in Massachusetts seem fairly progressive already so there hasn't been a lot of change in the last year. Definitely in the last five years, but not a lot of change recently*."

Respondents who noted they do not interact with code officials varied by occupation—they included an energy engineer, energy efficiency consultant, sustainable design consultants, and inspectors. Many added that the nature of their projects was what drove their interactions with code officials, noting they worked on renovations rather than new construction or primarily reviewed plans from other designers rather than drafting their own, both of which did not require much, if any, interaction with code officials.

## Customer Interest in Energy Efficiency

The majority (11 out of 17, or 65 percent) of builders and others said that their customers had become more interested in energy efficiency in the last year or so (Table 36). When asked if customers were willing to pay more for energy efficiency in the last year, over half (10 out of 17, or 59 percent) said yes and did not qualify their answers. One additional respondent answered that customers were more willing to pay for more energy efficiency if it was financially beneficial.

**Table 35. Changes in Customer Interest in Energy Efficiency**
(number of respondents; n=17)

| Have your customers become more interested in energy efficiency? | Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC | Stretch Code | Both Codes |
| Yes | 11 | 2 | 6 | 3 |
| No | 5 | 0 | 2 | 3 |
| Does not apply | 1 | 1 | 0 | 0 |
| **Are customers willing to pay more for energy efficiency?** | | | | |
| Yes | 10 | 2 | 6 | 2 |
| Some are/it depends | 1 | 0 | 1 | 0 |
| No | 4 | 0 | 1 | 3 |
| Does not apply | 2 | 1 | 0 | 1 |

The interviewers also asked the builders and others to explain why customers had or had not become more interested in energy efficiency in the last year. The builders and others offered many reasons why interest in energy efficiency had increased in the last year.

One designer said he had seen a greater interest in energy efficiency in the last year but not from his clients. "*The funders of projects are concerned about efficiency now*." Another added that, "*The younger generation seems especially interested in the environment and that continues to grow as universities and occupations continue to educate them on the importance of efficiency*."

An architect said economics was a reason why interest had not been rising, but added that other factors helped offset that:

> *"Economics—low gas and oil prices— have made efficiency not as urgent in the last year. My clients are realizing LEED and high performance buildings are more marketable though, so interest continues to rise."*

An energy engineer explained that interest "*is entirely driven by local costs and, as utility costs rise, interest in energy efficiency rises. Electricity is stable now, and natural gas has dropped, so there haven't been any changes in interest in the last year*."

Others said their customers were not really more interested, but rather were just more aware. Many reported that their customers had always been interested in high efficiency, so it was hard to quantify if they could be more aware.

## Prioritization of Energy Efficiency

The follow-up interviewers asked respondents how checking for energy efficiency during inspections was prioritized relative to other areas, whether that priority had changed after attending the training (municipal building code officials), or whether that priority had changed in the last year (builders and others). The interviewers asked both groups if they thought the priority would increase in the future.

Specifically, the interviewers asked code officials these questions:

> *"Would you say checking the energy efficiency of a project is a low, medium, or high priority in building inspections, relative to the other things you and other members of your building department have to look for? Why? Has this priority changed since you attended [TRAINING(S)]? Do you anticipate the priority given to checking energy efficiency will increase in the future? [IF YES] Why is that?"*

The interviewers asked builders and others a similar set of questions:

> *"Would you say ensuring the energy efficiency of a project is a low, medium, or high priority in your projects, relative to the other things you or the building department has to check? Why? Has this changed over the past year or so? If yes, how has it changed?"*

### Municipal building code employees

Table 37 summarizes how municipal building code employees prioritized checking for energy efficiency relative to other areas and their reasoning behind those prioritizations.

**Table 36. Energy Efficiency Prioritization—Municipal Building Code Employees**
(number of respondents; n=4)

| Reasons for Energy Efficiency Prioritization | Priority of Energy Efficiency | | |
|---|---|---|---|
| | High | Medium | Low |
| *n* | *1* | *3* | *0* |
| Code increases have led to higher prioritization | 1 | 0 | 0 |
| Health/safety/structural come first | 0 | 3 | 0 |

Three of the four municipal building code employees reported that checking for efficiency was a medium priority, and all added that health, safety, and structural codes came first. One official said, "*The department is responsible for so many other aspects of the building process. Energy is a big piece of it, but not our top priority. We focus on life safety first.*" Another respondent who answered that energy efficiency was a medium priority noted:

> *"Energy efficiency is a medium priority when compared to life and safety codes and that is probably being generous. Massachusetts does a better job than most states, but that priority will never be at the same level as safety."*

In explaining energy efficiency as a medium priority, the third respondent stated:

*"It's not a low priority because energy conservation is important; we want to make buildings run more efficiently. But, it's also not a high priority because we need to focus more on structural integrity than energy efficiency."*

The one respondent who answered that energy efficiency was a high priority said it was because the code required it to be.

The interviewers then asked the municipal building code employees if their prioritization of energy efficiency had changed since they attended the training. All four said their prioritization had not changed since they attended the training.

The interviewers then asked the municipal building code employees if they anticipated that the priority given to checking energy efficiency would increase in the future (see Table 39). All four code official respondents reported that the priority of energy efficiency would not change in the future. Three cited health, safety, and structural codes as higher priorities. "*Energy will always take the back seat to safety*," one respondent added. Another code official stated, "*The priority won't increase, but more focus will be put on it as awareness for energy increases*."

**Table 37. Whether Priority for Checking Energy Efficiency Will Increase in Future**

(number of respondents; n=4)

| Why Priority Will or Will Not Change | Will Priority Change in Future? | |
|---|---|---|
| | Yes | No |
| *n* | *0* | *4* |
| Health/safety/structural will continue to be higher priorities | 0 | *3* |
| Important to meet all aspects of code and not prioritize one over another | 0 | *1* |

The remaining respondent who did not cite health, safety, and structural codes as the reason the priority of energy efficiency would not increase added, "*All code requirements should have equal enforcement.*"

**Builders and others**

The interviewers asked the builders and others about the prioritization they or their building department gave to checking the energy efficiency of a project relative to other areas. They also asked the respondents to describe the reasoning for these prioritizations (Table 40).

**Table 38. Reasons for Energy Efficiency Prioritization by Builders and Others**
(number of respondents; n=17)

| Reasons for Energy Efficiency Prioritizations | Priority of Energy Efficiency | | |
|---|---|---|---|
| | High | Medium | Low |
| *n* | *17* | *0* | *0* |
| Energy efficiency is central to their business practices | 13 | *0* | *0* |
| Clients are interested | 5 | *0* | *0* |
| Priority MA gives to energy transfers into business practices | 2 | *0* | *0* |
| High utility rates | 1 | *0* | *0* |
| Increases as awareness increases | 1 | *0* | *0* |
| Required by code | 1 | *0* | *0* |

All 17 of the builders and others respondents said that checking for energy efficiency was a high priority. More than three-fourths (13 out of 17, or 76 percent) stated that it was central to their business practices. Nearly one-third (5 out of 17, or 29 percent) added that clients were the driving force in their prioritization of energy.

Two respondents said energy was a high priority for them because of the importance the Commonwealth of Massachusetts puts on energy. One architect added, "*Energy efficiency seems to be a priority throughout the state so architects have to design with that efficiency in mind*." The other respondent noted, "*Massachusetts prioritizes energy and that has translated into the work that I am doing for my clients*."

Additional reasons respondents gave for making energy efficiency a high priority included high utility rates in the respondent's area, code requirements, and the idea that efficiency increases as awareness increases.

The interviewers then asked the builders and others if the prioritization of energy efficiency had increased in the last year (see Table 42). One-third of respondents (6 out of 17, or 35 percent) said that the priority for checking energy efficiency had increased in the last year. Three of the six thought that it was due to an increase in the stringency of the code and the other three said that the priority has increased because awareness of efficiency had increased. One respondent also said the priority increased with higher utility costs.

**Table 39. Whether Priority for Checking Energy Efficiency Has Increased in Last Year**
(number of respondents; n=17)

| Reasons for Why Priority Has/Has Not Changed in Last Year | Priority Changed? | |
|---|---|---|
| | Yes | No |
| *n* | *6* | *11* |
| Priority has increased as code stringency has increased | 3 | 0 |
| Priority has increased as awareness has increased | 3 | 0 |
| Priority increases with increase in utility costs | 1 | 0 |
| Business practices require priority to be high / always has been high | 0 | 4 |
| No reason given | 0 | 4 |
| Priority has increased in the last 5–10 years | 0 | 2 |
| Priority decreases with decrease in utility costs | 0 | 1 |

Two-thirds of respondents (11 out of 17, or 65 percent) said that the priority for checking energy efficiency had not increased in the last year. Not all of these respondents gave reasons. Of those who did, more than half (four out of seven, or 57 percent) mentioned that their businesses already gave energy efficiency the highest priority. Two of the 11 respondents (18 percent) also said that, although they had not noticed an increase in prioritizing energy efficiency in the last year, they had noticed an increase in the last five to 10 years.

One of the 11 respondents who said the energy efficiency priority had not increased added, "*In fact, energy efficiency has lessened a bit due to moderation in energy costs*."

Interviewers also asked respondents who were neither builders nor code officials if they thought builders had become more concerned about complying with code in the last year (n=12). Over half of those able to answer (7 out of 12, or 58 percent) believed builders had become more concerned with code compliance. These seven respondents included three architects, two project managers, an equipment supplier, and a specifications writer. One of the architects commented:

> *"I am usually brought into a project because builders want to have a really well designed building envelope that is installed well and performs as expected. I've noticed that builders are more interested in having the envelope done correct the first time than having to go back and make corrections during construction. Builders are even bringing me on site to perform inspections to identify problems before they are really problems."*

One of the 12 respondents, an owner, thought that some builders were more concerned with compliance than others and added that this was more due to a lack of understanding of code requirements than a decision not to comply.

The four remaining respondents—two architects, an energy planner, and a project manager—said they did not think builders were more concerned about complying with the code. One architect added, "*Most builders will do whatever you tell them, but don't care one way or another*."

**Table 40. Others' Perceptions of Builders' Concern Regarding Code Compliance**
(number of other respondents; n=12)

| Are builders more concerned about complying with code? | Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC | Stretch Code | Both Codes |
| Yes | 7 | 1 | 3 | 3 |
| Some are/it depends | 1 | 0 | 0 | 1 |
| No | 4 | 1 | 1 | 2 |

## Situations Code Officials Encounter in the Field

Interviewers asked code officials to recall any serious issues related to energy efficiency they had encountered during inspections over the past year or so. One of the four code officials recalled two energy efficiency issues she had encountered in the field—improper installation of vestibules and vestibules not installed where required. She said these issues occurred in roughly 10 percent of the projects in her area and can generally be resolved by the architect on record before a certificate of occupancy is issued. When asked if she felt the issues were more prevalent in certain building types, geographic areas, or for certain builders, she said that the main issue was "*design professionals that aren't current on code requirements*."

Two of the four respondents said they had seen many issues, but none they would consider serious. The remaining respondent noted that he had not seen any serious issues.

## Time Spent on Enforcement of and Compliance with the Energy Code

Interviewers asked code officials to describe the factors that determined the amount of time they spent checking for the energy efficiency aspects of code compliance. As shown in Table 46, the most commonly mentioned factor was the size of the building mentioned by three of the four code officials. Two respondents also noted building use was a leading factor.

Additional factors noted by the respondents included age of the building, type of construction, experience with the contractor, and completeness of documentation.

**Table 41. Factors Impacting Time Spent Enforcing Energy Code**
(multiple response; n=4)

| Factors | Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC | Stretch Code | Both Codes |
| Size of the building | 3 | 2 | 1 | 0 |
| Use of the building | 2 | 1 | 1 | 0 |
| Age of building (new vs. retrofit) | 1 | 0 | 1 | 0 |
| Type of construction | 1 | 0 | 1 | 0 |
| Experience with the builder/contractor | 1 | 0 | 1 | 0 |
| Completeness of documentation | 1 | 0 | 1 | 0 |

Interviewers asked builders and others if they put in more effort and/or spent more time in the last year complying with the energy code than they had previously. Two-thirds of respondents (11 out of 17, or 65 percent) said they had put in more effort and/or spent more time than last year.

The 11 respondents who answered yes were then asked to explain where they put in more time and/or effort. The majority of the respondents (6 out of 11, or 55 percent) spent more time and effort meeting or becoming aware of the code requirements. Many remarked that as the code becomes more stringent, more time is needed to meet the requirements. Other common answers included paying attention to details, determining the appropriate compliance path for a project, designing lighting systems, and achieving the desired efficiency levels of clients. One architect stated that, "*Projects are becoming increasingly complicated and require more effort to achieve clients' desired efficiency levels*." Another architect added that he had "*noticed customers are paying much more attention to and requesting energy features*," and he had spent more time fulfilling those requests in the last year (see Table 42).

**Table 42. Where Additional Time/Effort is Spent in Past Year**
(multiple response; n=11)

| Activities | Number of Respondents | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC | Stretch Code | Both Codes |
| Meeting code requirements/ awareness of code requirements | 6 | 1 | 2 | 3 |
| Attention to detail | 2 | 0 | 2 | 0 |
| Achieving clients' desired efficiency | 2 | 0 | 1 | 1 |
| Compliance path for project | 2 | 1 | 0 | 1 |
| Designing lighting systems | 2 | 1 | 0 | 1 |
| Working with peers/colleagues | 1 | 0 | 0 | 1 |
| Design alternatives | 1 | 0 | 0 | 1 |
| Energy calculations | 1 | 1 | 0 | 0 |
| Alterations | 1 | 0 | 1 | 0 |
| Designing HVAC systems | 1 | 0 | 0 | 1 |
| Designing building envelopes | 1 | 0 | 0 | 1 |

Five of the remaining six respondents simply answered that they had not spent any additional time or effort complying with the code in the last year.

One respondent answered "yes and no," adding:

> *"As I become more familiar with the code, I spend less time on each project. But, building design is getting more innovative all of the time. I have seen many more designs that are complex in the last year and those take more time to verify compliance."*

## Code Compliance Documentation Filed

Interviewers asked code officials to briefly describe the type of information filed at their building department to document energy code compliance for commercial construction. Interviewers also asked:

> *"What percent of the projects you review submit the following:*
>
> - *COMcheck files with supplemental checklists for mandatory requirements*
> - *COMcheck files with no supplemental information*
> - *Prescriptive checklists."*

Interviewers asked builders and others if they were involved in filing information to document energy code compliance for commercial construction with the local building department, and if so, to briefly describe the type of information filed and whether it has changed since attending the training. Additionally, interviewers asked:

> *"For what percent of the projects do you submit the following:*
>
> - *COMcheck files with supplemental checklists for mandatory requirements*
> - *COMcheck files with no supplemental information*
> - *Prescriptive checklists."*

**Municipal building code employees**

When asked to describe the type of information filed at their building departments to document energy code compliance, three of four code officials (75 percent) mentioned COMcheck reports and stamped mechanical drawings. Code officials also noted full design drawings, narratives, and code reviews from licensed architects or engineers as information that is filed at their building departments for energy code compliance (Table 47).

**Table 43. Information Filed at Code Officials' Building Departments**
(multiple response; n=4)

| Type of Information Filed | Number of Responses | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC | Stretch Code | Both Codes |
| COMcheck reports | 3 | 2 | 1 | 0 |
| Stamped mechanical drawings | 3 | 2 | 1 | 0 |
| Full design drawings | 1 | 0 | 1 | 0 |
| Narratives | 1 | 0 | 1 | 0 |
| Code review from licensed architect or engineer | 1 | 1 | 0 | 0 |

When asked what percentage of the projects reviewed included COMcheck files with supplemental checklists for mandatory requirements, COMcheck files with no supplemental information, or prescriptive checklists, the respondents' answers varied as summarized in Table 44.

**Table 44. Percent of Information Filed at Code Official's Building Departments**
(multiple response; n=4)

| Type of information Filed | Percentage Answered by Respondent | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | Average |
| COMcheck files with supplemental checklists | 50 | 100 | 100 | 50 | 75 |

| Type of information Filed | Percentage Answered by Respondent | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | Average |
| COMcheck files with no supplemental information | 50 | 0 | 0 | 50 | 25 |
| Prescriptive checklists | 25 | 0 | 100 | 25 | 38 |

On average, respondents stated that 75 percent of projects reviewed included COMcheck files with supplemental checklists, 25 percent included COMcheck files with no supplemental information, and 38 percent included prescriptive checklists.

### Builders and others

Seven builders and others—four architects, a project manager, an owner, and a sustainable design consultant—said they were involved in filing information to document energy code compliance for commercial construction with the local building department. The type of information filed varied greatly with two of these seven respondents (29 percent) saying they filed design drawings and specifications, energy strategy reports, home energy reports for multifamily units, and COMcheck files (see Table 48).

**Table 45. Information Builders and Others File at Building Departments**
(multiple response; n=7)

| Type of Information Filed | Number of Responses | Building Code in Municipalities Covered | | |
|---|---|---|---|---|
| | | 2012 IECC | Stretch Code | Both Codes |
| Design drawings and specifications | 2 | 0 | 1 | 1 |
| Energy strategy report | 2 | 0 | 1 | 1 |
| HERS report (multifamily) | 2 | 0 | 2 | 0 |
| COMcheck file | 2 | 0 | 0 | 2 |
| Code plans | 1 | 0 | 1 | 0 |
| Summary of egress/accessibility | 1 | 0 | 1 | 0 |
| Existing building evaluation form | 1 | 0 | 0 | 1 |
| Code compliance report | 1 | 0 | 0 | 1 |
| Analysis performed (if necessary) | 1 | 0 | 0 | 1 |
| Contract | 1 | 0 | 0 | 1 |
| Article 37 Green Building report | 1 | 0 | 1 | 0 |
| Historical building exemption report | 1 | 0 | 0 | 1 |

Additional types of information filed include code plans, summaries of egress and accessibility, existing building evaluation forms, code compliance reports, analysis performed (if/when necessary), contracts, Article 37 green building reports, and historical building exemption forms.

An architect elaborated on the historical exemption report, stating:

> *"Much of the work we do involves historical buildings. In many instances, meeting code will harm the building so I have to include a report on why the renovation will cause damage. For example, I just filed an insulation report to show why increasing the insulation and meeting code will degrade the interior of the building."*

The same architect stated that he was responsible for an existing building evaluation form, adding:

> *"[My firm] mostly deals with existing buildings, which always require an Existing Building Evaluation Form. The form has many sections and one of them is dedicated to energy efficiency. We have to fill this out and include with it a statement on how the building will comply with the code."*

Another architect said the type of information the firm filed to document energy code compliance at local building departments had changed since attending the training:

> *"The jurisdiction is just starting to require reports devoted explicitly to describing envelope energy strategies. These reports will be filed with the building department as well as being kept on-site to explain to contractors how to properly install envelope components. The hope is that these reports will cut down on errors in the field."*

Respondents who said they were responsible for filing information to document energy code compliance for commercial construction with the local building department were asked to estimate what percentage of the projects required COMcheck files with supplemental checklists for mandatory requirements, COMcheck files with no supplemental information, or prescriptive checklists to be submitted. Respondents' estimates varied and are summarized in Table 46. (Note that one respondent did not provide an answer to this question.)

**Table 46. Percent of Information Filed at Builders' and Others' Building Departments**
(multiple response; n=6)

| Type of information Filed | Percent Answered by Respondent | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| COMcheck files with supplemental checklists | 0 | 5 | 100 | 80 | 100 | 100 |
| COMcheck files with no supplemental information | 0 | 5 | 0 | 80 | 0 | Not sure |
| Prescriptive checklists | Not sure | 5 | 0 | Not sure | 0 | Not sure |

Based on respondents who were able to answer, on average, 64 percent of the projects required submittal of COMcheck files with supplemental checklists for mandatory

requirements, 21 percent required COMcheck files with no supplemental information, and roughly 2 percent required prescriptive checklists. It is worth noting that these respondents' estimates of the share of projects for which prescriptive checklists were required is much less than the estimates provided by the municipal employees.

### Length of Time from Permitting to Certificate of Occupancy

Interviewers asked all training attendees (n=21), based on their experience, to estimate the number of months it usually took for different sizes and classes of buildings to go from the date permitted to the date it receives a certificate of occupancy. Many respondents chose not to answer if they had not worked on buildings of a certain class or of a certain size range. Table 47 shows the number of respondents for each question, average length of time (in months), and range of time given for each building class and size to go from permitting to certificate of occupancy.

**Table 47. Length of Time from Permitting to Occupancy**
(all training attendees; n=varies)

| Building Type | Office | | | Retail | | | Warehouse | | |
|---|---|---|---|---|---|---|---|---|---|
| Size Range (sq. ft.) | <20,000 | 20,000–50,000 | >50,000 | <20,000 | 20,000–50,000 | >50,000 | <20,000 | 20,000–50,000 | >50,000 |
| Number of Respondents Who Answered | 12 | 10 | 10 | 11 | 9 | 9 | 9 | 9 | 10 |
| Average length of time, months | 9.96 | 15.25 | 25.20 | 10.09 | 16.67 | 21.56 | 6.83 | 9.00 | 13.15 |
| Range of length of time given, months | 0.5–24 | 0.5–24 | 15–48 | 6–24 | 12–36 | 14–36 | 0.5–12 | 1–12 | 1.5–18 |

## SUGGESTIONS FOR IMPROVING THE CCSI TRAINING AND OTHER COMMENTS

Another key goal of the in-depth interviews was to gather improvement suggestions from training participants. Most respondents offered specific suggestions for improving the CCSI training as well as more general comments for promoting code enforcement and energy efficiency. These suggestions and comments came up throughout the interviews. The interviewers also posed three questions before concluding each interview:

> *"Can you think of additional topics you wish the [TRAINING(S)] had included?*

> *"Is there anything we have not covered that you would like to add?*

*"Do you have any suggestions for how the Energy Code Technical Support Initiative can be improved to help you enforce the code (municipal building code employees)/comply with (builders and others) the energy code?"*

Recommendations from the three questions have been divided into two categories—additional training topics and ways to improve the initiative—and are summarized below.

## Additional Training topics

Interviewers encouraged all training attendees to recommend additional topics they wished the sessions had covered. Over three-fourths of the respondents (16 out of 21, or 76 percent) provided one or more recommendations for training topics, as listed in Table 48. In many cases, they offered general ideas to improve the course, such as making the course more design-focused or to include examples of successful design documents, rather than additional course topics. These suggestions are also included in Table 48.

Half (8 out of 16, or 50 percent) of the respondents who offered recommendations for course topics suggested specific code sections, such as ventilation, air barriers, and window requirements. An architect that attended the building envelope training said:

*"The industry is desperately lacking window experts and our knowledge of window performance is incredibly deficient. We need a series of window trainings that are targeted to architects and design professionals as well as manufacturers and suppliers. Window companies and manufacturers are putting out a lot of myths and this initiative should help set the record straight… and we need architects to understand that it is all a matter of using the right windows in the right direction for maximum efficiency."*

One-quarter (4 out of 16) of the respondents suggested including more case studies and real life examples for participants to understand the practical applications of the code provisions. An architect that attended a building envelope training session mentioned the importance of case studies in energy code training:

*"The course materials lacked case studies. The code applies differently to different building types—I would love a future presentation to focus on 3–4 buildings types and to have the instructor comb through the details of each. In general, the formulas discussed at the training do not apply equally to each building type and that can be problematic in the design world and won't achieve the best results."*

Additional suggestions and requests included clarifying when and where each of the different codes and code variations are enforced, detail of energy savings realized through code changes, and more solution-oriented, rather than requirement-oriented, material, among others.

Five of the 21 respondents did not offer a suggestion for additional course topics, including the municipal building code official that attended the HVAC training.

**Table 48. Suggestions for Additional Course Topics**
(multiple response; n=16)

| Additional Course Topics to Cover | Total Number of Respondents | Attended Envelope Training | Attended Lighting Training | Attended Envelope and Lighting Training |
|---|---|---|---|---|
| All training attendees who offered suggestions for additional course topics | 16 | 11 | 2 | 3 |
| All specific areas | 8 | 5 | 1 | 2 |
| Air barriers | 2 | 2 | 0 | 0 |
| Window performance | 2 | 2 | 0 | 0 |
| Ventilation | 1 | 0 | 0 | 1 |
| Exterior lighting requirements | 1 | 0 | 1 | 0 |
| Infiltration | 1 | 1 | 0 | 0 |
| Tenant Lighting | 1 | 0 | 0 | 1 |
| Include more case studies/real life examples/good design documents | 4 | 3 | 0 | 1 |
| Clarity on when/where code is being enforced | 3 | 2 | 1 | 0 |
| Energy savings realized through code changes | 2 | 1 | 1 | 0 |
| Identify main differences between codes (IECC, stretch, ASHRAE 90.1, LEED, etc.) | 2 | 2 | 0 | 0 |
| Solution, rather than requirement, oriented | 2 | 1 | 0 | 1 |
| Design focused | 1 | 0 | 1 | 0 |
| Emphasis on code changes | 1 | 1 | 0 | 0 |
| Passive-house issues | 1 | 1 | 0 | 0 |
| Envelope design for historic masonry rehab | 1 | 1 | 0 | 0 |
| Specialty types of commercial construction | 1 | 0 | 0 | 1 |

| Additional Course Topics to Cover | Total Number of Respondents | Attended Envelope Training | Attended Lighting Training | Attended Envelope and Lighting Training |
|---|---|---|---|---|
| Hands-on activities | 1 | 1 | 0 | 0 |
| Innovation in commercial projects | 1 | 1 | 0 | 0 |
| Add glossary page to handouts with acronyms | 1 | 1 | 0 | 0 |
| Add goals or objectives slide | 1 | 1 | 0 | 0 |

## Suggestions for Improving Energy Code Technical Support Initiative

Seventeen of the 21 respondents (81 percent) offered suggestions for improving the energy code technical support initiative. Fifteen of the 17 respondents (88 percent) who offered training suggestions recommended ways to improve either the duration or the types of training offered. Of the 15 respondents, 5 recommended that the training be more in depth. An architect describing the commercial envelope training commented:

> *"The presentation was too dumbed down in an attempt to reach a wider audience, which made it almost entirely irrelevant to me. When a training is that simplified, it doesn't capture the nuances in the code that would be of use to architects or anyone else with more than a basic knowledge of the code."*

Additionally, 5 of the 15 respondents (33 percent) suggested that different training should be offered to different market actors and another two said there should be a course for beginners. A project manager that attended a building envelope training elaborated from the perspective of someone who needed a beginner course:

> *"As someone with limited knowledge of the code, I thought the course was often geared towards someone with more technical experience and that made it hard for me to always stay engaged. For example, the outline we were given had many acronyms on it that I am not used to, like NFRC. The community likely understands the acronyms, but I don't and I wasted a lot of time trying to write them down to figure out later. Even seeing the list of requirements without any background on what I was looking at was daunting. I found myself wondering if Mass Save expected attendees to have a certain level of knowledge before taking the course. If they do require a certain threshold, does or should Mass Save offer an introductory course for junior architects and people like myself that gives a better background of the code, the basics, a timeline on implementation?"*

As shown in Table 49, other common suggestions were to upload the slides, handouts, and other course material onto the Mass Save website (6 out of 17, or 35 percent), offer online technical assistance, and offer yearly refresher courses.

**Table 49. Suggestions for Improving the CCSI Trainings**

(number of respondents; multiple response)

| How to Improve the CCSI Training | Total Number of Respondents | Attended Envelope Training | Attended Lighting Training | Attended Envelope and Lighting Training |
|---|---|---|---|---|
| Number of respondents who offered suggestions for improvement | 17 | 11 | 3 | 3 |
| All suggestions for adjusting types and duration of trainings | 15 | 10 | 3 | 2 |
| Training too high level, need more detail | 5 | 3 | 1 | 1 |
| Do different trainings for different market actors | 5 | 3 | 1 | 1 |
| Do different training for beginners | 2 | 1 | 1 | 0 |
| Offer refresher courses yearly | 2 | 2 | 0 | 0 |
| Offer shorter training | 1 | 1 | 0 | 0 |
| Put slides and handouts on the Mass Save website | 6 | 5 | 1 | 0 |
| All suggestions about getting more people to attend | 2 | 2 | 0 | 0 |
| Get more licensed contractors to attend | 1 | 1 | 0 | 0 |
| Get more architects to attend | 1 | 1 | 0 | 0 |
| Offer online technical assistance | 2 | 1 | 0 | 1 |
| Add technical resources to the Mass Save website | 1 | 1 | 0 | 0 |
| Partner with industry leaders | 1 | 1 | 0 | 0 |
| Create code comparison document | 1 | 1 | 0 | 0 |
| Record the speaker | 1 | 1 | 0 | 0 |

Four of the 21 respondents did not offer a suggestion for improving the CCSI trainings, including the municipal building code official that attended the HVAC training.

The following quotes from training attendees elaborate on the suggestions and ideas listed in Table 49. Although not all are practical, the respondents were passionate in what they hoped to see in training and in the industry as a whole.

An architect that attended building envelope training suggested that Mass Save partner with industry leaders to explain the benefits of using alternative materials:

> *"I attended an excellent presentation on the code and, specifically, how to deal with curtain walls that was put on by Roxul Insulation. The presentation was really a room full of experts discussing ideas and innovative insulation applications. For example, Roxul makes mineral walls, something few people know. The presentation covered the many applications of mineral walls, densities, thicknesses, and why they should be considered over using foam to avoid VOCs and offgas. Take advantage of the expertise of the industry! The code is moving towards alternatives so let the experts talk about them. This is the information we need and want."*

Another architect that attended a building envelope training session believed the industry would benefit from the creation of a "cheat sheet" for market actors to reference when switching between codes:

> *"There are currently too many places and different codes to draw information from. Ideally, myself and others in Massachusetts would be provided a 'cheat sheet' or other graphic representation that compared the different codes used throughout the state, particularly the prescriptive provisions of the current code, the next code cycle, and the stretch code. I can see this being available online but also as a download to print off and take into the field."*

> *"The problem I see is that courses are being offered for continuing education credits on a code that hasn't been implemented yet. So architects and other people involved in the training get back to their offices and can't remember if the provisions they just learned about are part of the current code, the one in the future, or the stretch code – or fully understand what the difference between them is. This is causing quite a bit of rework in the design world since system components are designed differently between codes and are used to achieve compliance in different ways."*

## FOLLOW-UP IN-DEPTH INTERVIEW GUIDE FOR COMMERCIAL TRAINING ATTENDEES—MUNICIPAL BUILDING CODE EMPLOYEES

Name: _____ Title: _____

Company or City/Town: _____ Telephone: _____

Email: _____

Name for Incentive Check: _____ No Incentive Accepted: _____

Address for Incentive Check: _____

_____

Interview date: _____ Time: _____

**Introduction**: Hello, may I speak to [_____]? My name is _____, and I'm calling from Cadmus on behalf of the sponsors of the Mass Save® Energy Code Technical Support Initiative. We are conducting follow-up interviews with code officials who have attended the commercial building energy code trainings offered by this Initiative to understand how the information from the trainings is being used in the field. We offer compensation of $100 for your time in responding to this interview which should take about 30 to 45 minutes; the check could be made payable to you, your employer, or a charity; you do not have to accept compensation for this interview. Your responses will be kept confidential; we will combine them with those of other respondents for the findings and analyses we present to the sponsors of this Initiative. We can do this interview now or schedule for a more convenient time. [If need to confirm legitimacy, refer to William Blake of National Grid at 781-907-1583 or William.Blake@nationalgrid.com.]

[VERIFY OCCUPATION, JURISDICTION, TITLE, AND EMAIL; IF RESPONDENT SAYS S/HE HAS ANOTHER OCCUPATION AS WELL, INSTRUCT HIM/HER TO ANSWER QUESTIONS IN CAPACITY AS A BUILDING CODE OFFICIAL]

**Intro 1.** I have information from the program sponsors indicating that you attended the [ALL TRAINING(S)] on [DATE(S)]. Is that correct?

e. Yes
f. No [THANK AND TERMINATE]

**Intro 1a.** [USE ONLY IF RESPONDENT HAS ATTENDED BOTH RESIDENTIAL AND COMMERCIAL TRAININGS] For this interview I would like to cover just the [COMMERCIAL TRAININGS] you attended on [DATE(S)].

**Intro 2.** I would also like to confirm that your jurisdiction is using the new Massachusetts commercial building energy code based on IECC 2012-ASHRAE 90.1-2010/is using the energy stretch code/is using both the new Massachusetts commercial building energy code based on IECC 2012-ASHRAE 90.1-2010 and the stretch code.

e. Yes

f. No; [ASK] Please explain which code you are using _____

**Intro 3**. Please tell me whether you perform only plan/permit review, only site inspections, or both as part of your work? [RECORD]

Thank you. For the rest of the interview, I will refer to the [CODE FROM ABOVE] simply as the [new building energy code/stretch code].

## Training Feedback

17. To the best of your recollection, can you tell me which part or parts of the commercial building code TRAINING(S) you found most useful and why? [IF REQUESTED, PROVIDED TRAINING TOPICS]
18. Can you think of additional topics you wish the [TRAINING(S)] had included?
    a. [PROBE] What additional topics would you have liked the training to cover?

## Sharing Information

19. Please think of different parties you interact with such as people in your building department, colleagues from other jurisdictions, builders, contractors, and others. Have you shared information from the [TRAINING(S)] with others?
    a. [IF YES] Can you tell me what information you shared and the party(ies) involved?
    b. [IF YES] Can you tell me how they are using this information?

## Other Sources of Information

20. Since [DATE], have you attended any other trainings, webinars, or gatherings discussing commercial building energy codes?
    a. [IF YES] Please tell me the names and approximate dates of these events.
    b. What was the focus of these events?
21. Other than the [TRAINING(S)] and [EVENTS IN QUESTION 4], what are your main sources of information on the building codes and methods of enforcement?

## Use of Training

22. About what percentage of your commercial [project reviews and/or inspections (from Intro 3)] since attending the [TRAINING(S)] has made use of the information that you learned through the training? [RECORD %]
    a. Don't know/Not applicable
23. [If Q6 >0%] How have you used the training?

a. [Record] _____

24. [ASK IF INTRO 3. INDICATES INSPECTIONS ARE CONDUCTED] Since you attended [TRAINING(S)] on [DATE(S)], can you give me an estimate of how many commercial on-site inspections you have conducted or participated in on buildings permitted under the [new building energy code/stretch code]?
    a. What percent of these inspections would you estimate were final inspections?
    b. And approximately how many total square feet were included in all these inspected buildings permitted under the [new building energy code/stretch code]?
    c. What percent of the total square feet inspected would you estimate was for final inspections?

| | Construction permitted under new building energy code, if applicable | | Construction permitted under new stretch code, if applicable | |
|---|---|---|---|---|
| | # Buildings | Sq. Ft. | # Buildings | Sq. Ft. |
| Total inspections | | | | |
| Final inspections (%) | | | | |

25. [IF 8 = 0] Do you normally conduct commercial inspections in your position?
    a. [IF YES] When would you expect to next conduct an inspection?
        i. In the next three months
        ii. In the next four to six months
        iii. In the next seven to twelve months
        iv. More than a year from now
        v. Never
        vi. Unsure

26. [IF 8>0] Have you changed how you conduct energy code inspections as a result of the training(s) you attended?
    a. [IF YES] Can you please tell me how your inspection process has changed? [PROBE, IF NECESSARY:]
        i. Do you pay more attention to certain areas and, if so, which ones?
        ii. Has the time spent on inspections changed and, if so, by how much (minutes or hours)?
        iii. Do you verify measures that were focused on in the training or other measures differently than before the training? If so, how has this changed?
    b. [IF NO] Why would you say the training has not affected how you conduct inspections? [PROBE, IF NECESSARY:]

i. Was the training relevant to how you do inspections?
ii. Do you feel you already did everything you should to enforce the code?
iii. Has there not been enough time to incorporate what you have learned?

27. [IF 10=NO] Do you expect what you have learned at the TRAINING(S) will influence your inspections in the future?
    a. [IF YES] How and when do you expect TRAINING(S) to influence your inspections?

28. [ASK IF INTRO 3 INDICATES PLAN/PERMIT REVIEWS ARE CONDUCTED] Since you attended [TRAINING(S)] on [DATE(S)], can you give me an estimate of how many commercial building permit applications or plans you have reviewed or participated in reviewing and how many [BUILDINGS] in total were involved?

12a. [IF 12=0] Do you normally review building permit applications/plans in your position?

12b. [IF 12a=YES] When would you expect to next review an application?

a. In the next three months
b. In the next four to six months
c. In the next seven to twelve months
d. More than a year from now
e. Never
f. Unsure

29. [IF 12>0] Have you changed how you review building permit applications/plans as a result of the training(s) you attended?
    d. [IF YES] Can you please tell me how your review process has changed? [PROBE, IF NECESSARY:]
        i. Do you pay more attention to certain areas and, if so, which ones?
        ii. Has the time spent on permit review changed and, if so, by how much?
        iii. Do you verify measures that were focused on in the training or other measures differently than before the training? If so, how has this changed?
    e. [IF NO] Why would you say the training has not affected how you review permit applications? [PROBE, IF NECESSARY:]
        i. Was the training not relevant to how you do inspections?
        ii. Do you feel you already did everything you should to enforce the code?
        iii. Has there not been enough time to incorporate what you have learned?

30. [IF 13=NO] Do you expect what you have learned at the TRAINING(S) will influence your building permit application/plan reviews in the future?
    a. [IF YES] How and when do you expect TRAINING(S) to influence your reviews?

31. Are there areas other than inspections and permit/plan review where the training(s) has/have influenced your work?

a. [IF YES] Can you describe those tasks and how the training(s) has/have influenced your work?

b. [IF YES] And what would you be doing differently had you not attended the training?

32. Can you briefly describe the type of information filed at your building department to document energy code compliance for commercial construction?

    a. [IF YES] Please briefly describe the type of information filed and whether it has changed since you attended [TRAINING(S)].

    b. What percent of the projects you review submit the following:

        i. COMcheck files with supplemental checklists for mandatory requirements ____%

        ii. COMcheck files with no supplemental information ____%

        iii. Prescriptive checklists ____%

33. We would like to know from your experience how long it usually takes from the date a commercial building is permitted to when it receives its certificate of occupancy. Please give me your best estimate for office buildings, retail stores, and warehouses in the following size ranges:

    a. Office _____<20,000 sq. ft. _____20,000 to 50,000 sq.ft. ____>50,000 sq.ft.

    b. Retail _____<20,000 sq. ft. _____20,000 to 50,000 sq.ft. ____>50,000 sq.ft.

    c. Warehouse _____<20,000 sq. ft. _____20,000 to 50,000 sq.ft. ____>50,000 sq.ft.

## General

34. Would you say checking the energy efficiency of a project is a low, medium, or high priority in building inspections, relative to the other things you and other members of your building department have to look for?

    a. Why do you say this?

35. Has this priority changed since you attended [TRAINING(S)]?

    a. [IF YES] How has it changed?

36. Do you anticipate the priority given to checking energy efficiency will increase in the future?

    a. [IF YES] Why do you say this?

37. What, if any, serious issues related to energy efficiency code requirements have you encountered during inspections over the past year or so?

    a. [IF MENTIONED IN QUESTION 21] Please describe what happened and how it was addressed?

    b. [IF MENTIONED IN QUESTION 21] How often do these issues occur?

    c. [IF MENTIONED IN QUESTION 21] Are these issues more prevalent in certain building types, geographies, or for certain builders? How so?

38. In general, what factors determine the amount of time you spend checking for the energy-efficiency aspects of code compliance?
    a. [PROBE] Is time and/or the availability of personnel an issue?

## Closing

39. Would you recommend that your colleagues attend the Energy Code Technical Support Initiative trainings?
    a. Which training(s) in particular?
    b. Why or why not?
40. Do you have any suggestions for how the Energy Code Technical Support Initiative can be improved to help you to enforce the energy code?
41. Is there anything we have not covered that you would like to add?

Thank you so much for your time!

**FOLLOW-UP IN-DEPTH INTERVIEW GUIDE FOR COMMERCIAL TRAINING ATTENDEES— BUILDERS AND OTHERS**

Name: _____ Title: _____

Company or City/Town: _____ Telephone: _____

Email: _____

Name for Incentive Check: _____ No Incentive Accepted: _____

Address for Incentive Check: _____

_____

Interview date: _____ Time: _____

**Introduction**: Hello, may I speak to [_____]? My name is _____, and I'm calling from Cadmus on behalf of the sponsors of the Mass Save® Energy Code Technical Support Initiative. We are conducting follow-up interviews with those professionals who have attended the commercial energy code trainings offered by this Initiative to understand how the information from the trainings is being used in the field. We offer compensation of $100 for your time in responding to this interview which should take about 30 to 45 minutes; the check could be made payable to you, your employer, or a charity; you do not have to accept compensation for this interview. Your responses will be kept confidential; we will combine them with those of other respondents for the findings and analyses we present to the sponsors of this Initiative. We can do this interview now or schedule for a more convenient time. [If need to confirm legitimacy, refer to William Blake of National Grid at 781-907-1583 or William.Blake@nationalgrid.com.]

[VERIFY OCCUPATION, TITLE, EMAIL, AND ADDRESS FOR SENDING CHECK]

**Intro 1.** I have information from the sponsors indicating that you attended the code [TRAINING(S)] on [DATE(S)]. Is that correct?

a. Yes
b. No [THANK AND TERMINATE]

**Intro 1a.** [USE ONLY IF RESPONDENT HAS ATTENDED BOTH RESIDENTIAL AND COMMERCIAL TRAININGS] For this interview I would like to cover just the [COMMERCIAL TRAININGS] you attended on [DATE(S)].

**Intro 2.** I would also like to confirm that you work in [CITY/TOWN(S)], which enforce(s) the new Massachusetts commercial building energy code based on the IECC 2012-ASHRAE 90.1-2010/enforce(s) the energy stretch code/enforce(s) both the new Massachusetts commercial building energy code based on IECC 2012-ASHRAE 90.1-2010 and the stretch code.

a. Yes

b. No; explain which code they are using _____

[For subcontractors and equipment suppliers, note the type of work done/equipment supplied]

---

Thank you. For the rest of the interview, I will refer to the [CODE FROM ABOVE] simply as the [new building energy code/stretch code].

### Training Feedback

c. To the best of your recollection, can you tell me which part or parts of the commercial building code [TRAINING(S)] you found most useful and why? [IF REQUESTED, PROVIDE TRAINING TOPICS]

d. Can you think of additional topics you wish the [TRAINING(S)] had included?

a. [PROBE]What additional topics would you have liked the training to cover?

### Sharing Information

e. Please think of different parties you interact with such as people working on your project, colleagues, code officials, and others. Have you shared information from the [TRAINING(S)] with others?

b. [IF YES] Can you tell me what information you shared and the party(ies) involved?

c. [IF YES] Can you tell me how they are using this information?

### Other Sources of Information

f. Since [DATE], have you attended any other trainings, webinars, or gatherings discussing commercial building energy codes?

d. [IF YES] Please tell me the names and approximate dates of these events.

e. What was the focus of these events?

g. Other than the [TRAINING(S)] and [EVENTS IN QUESTION 4], what are your main sources of information on the building code requirements?

### Use of Training

h. About what percentage of the work you have done since attending the [TRAINING(S)] has made use of the information that you learned through the training? [RECORD %]

f. Don't know/Not applicable

i. [If Q6 >0%] How have you used the training?

g. [Record] _____

j. How many commercial projects permitted under the [new building energy code/stretch code] have you worked on since attending the training? [RECORD]

k. [IF 8=0] When do you expect to work on a commercial project permitted under the [new building energy code/stretch code] provisions?

h. In the next three months
i. In the next four to six months
j. In the next seven to twelve months
k. More than a year from now
l. Never
m. Unsure

l. [IF 8>0; BUILDERS/SUBCONTRACTORS ONLY; ASK QUESTIONS ABOUT [NEW BUILDING ENERGY CODE/ STRETCH CODE] DEPENDING ON ANSWER TO INTRO 2] Since you attended [TRAINING(S)] on [DATE(S)], about how many of the commercial projects you worked on involved construction permitted under the [new building energy code/stretch code]? Approximately what was the total square footage of those projects? Please also let me know what approximate percent of the total floor area is in different stages (planning, under construction, in final inspection)?

| | Construction permitted under new building energy code, if applicable | Construction permitted under stretch code, if applicable |
|---|---|---|
| Number of buildings | | |
| Total square feet | | |
| % of buildings in planning stage? | | |
| % of buildings under construction? | | |
| % of buildings in final inspections? | | |

m. Have you changed the work that you do to better comply with the [new building energy code/stretch code] as a result of the training(s) you attended?
n. [IF YES] Can you please tell me how your work has changed?
o. [IF YES] And what would you be doing differently had you not attended the training?
p. [IF YES] Which projects have been most affected by what you learned from the training(s)?
q. [IF NO TO Q11] Can you tell me why there have been no changes? [PROBE: Was the training not relevant to their work? Do they feel they already did everything properly to code? Is there no time to incorporate what they have learned?]

n. Do you expect what you have learned at the [TRAINING(S)] will influence your work in the future?

r. [IF YES] How and when do you expect [TRAINING(S)] to influence your work?

s. [IF NO] Why do you say this?

o. [BUILDERS/SUBCONTRACTORS/ARCHITECTS ONLY] Are you involved in filing information to document energy code compliance for commercial construction with the local building department?

t. [IF YES] Please briefly describe the type of information filed and whether it has changed since you attended [TRAINING(S)].

u. What percent of the projects you work on require you to submit the following:

   i. COMcheck files with supplemental checklists for mandatory requirements ____%

   ii. COMcheck files with no supplemental information ____%

   iii. Prescriptive checklists ____%

p. We would like to know from your experience how long it usually takes from the date a commercial building is permitted to when it receives its certificate of occupancy. Please give me your best estimate in months for office buildings, retail stores, and warehouses in the following size ranges:

v. Office _____<20,000 sq. ft. _____20,000 to 50,000 sq.ft. ____>50,000 sq.ft.

w. Retail _____<20,000 sq. ft. _____20,000 to 50,000 sq.ft. ____>50,000 sq.ft.

x. Warehouse _____<20,000 sq. ft. _____20,000 to 50,000 sq.ft. ____>50,000 sq.ft.

## General

q. Would you say ensuring the energy efficiency of a project is a low, medium, or high priority in your projects, relative to the other things you have to comply with?

y. Why do you say this?

r. Has this priority changed over the past year or so?

z. [IF YES] How has it changed?

s. [BUILDERS/CONTRACTORS/ARCHITECTS ONLY] Have your interactions with code officials and the code enforcement process regarding energy efficiency changed in the last year or so?

aa. [IF YES] What changes have you experienced?

t. Have you put in more effort and/or spent more time in the last year in complying with the energy code than previously?

bb. [IF YES] Please explain where you put in more effort/spend more time.

u. Have your customers become more interested in energy efficiency in the last year or so?

cc. Why or why not?

v. Would you say customers have been more willing to pay more for energy efficiency in the last year?

dd. Yes

ee. No

w. [EQUIPMENT SUPPLIERS/CONTRACTORS/ARCHITECTS ONLY] Would you say builders have been more concerned about complying with code in the last year?

ff. Yes

gg. No

## Closing

x. Would you recommend the Energy Code Technical Support Initiative trainings to others? Why or why not?

y. Do you have any suggestions for how the Energy Code Technical Support Initiative can be improved to help you comply with the energy code?

z. Is there anything we have not covered that you would like to add?

Thank you so much for your time!

# QUALITATIVE ASSESSMENT OF CCSI COMMERCIAL CLASSROOM TRAINING SESSIONS (FEBRUARY 19, 2016)

| | |
|---|---|
| **TO:** | Massachusetts Program Administrators (PAs), Massachusetts Energy Efficiency Advisory Council (EEAC) Consultants |
| **FROM:** | Holly Farah, Cadmus |
| **SUBJECT:** | Qualitative Assessment of CCSI Commercial Classroom Training Sessions |
| **CC:** | Pam Rathbun, Tetra Tech; Lynn Hoefgen and Betty Tolkin, NMR Group; Allen Lee and Althea Koburger, Cadmus |
| **DATE:** | February 19, 2016 |

## INTRODUCTION

This memorandum presents Cadmus' findings and recommendations from a qualitative assessment of three commercial classroom training sessions sponsored by the Code Compliance Support Initiative (CCSI) in 2015.

## ASSESSMENT APPROACH

To perform the qualitative assessment, in 2015 Cadmus attended the following commercial classroom training sessions sponsored by CCSI and implemented by CLEAResult:

- Building Science and Envelope held in Hyannis on June 11
- Mechanical/HVAC held in Westborough on October 22
- Lighting, Lighting Control, and other Electrical Provisions held in Braintree on December 8.

This qualitative assessment encompassed three focus areas:

- **Instructor.** Cadmus rated the class instructor's level of fluency in the subject, presentation style, skill in communicating and speaking effectively, and ability to incorporate engagement triggers and intersperse lecture with activities in which attendees worked directly with the material, applied what they learned, and contextualized the subject.
- **Presentation material.** We assessed the overall quality, usefulness, comprehensiveness, and level of detail provided in the presentation; the quality of technical materials; and the presentation's structure and pace.
- **Audience.** We assessed the audience composition and whether the training was appropriate given the industry that the audience members came from.

This memo presents our findings for each of the classes and conclusions about all of the training sessions.

## BUILDING SCIENCE AND ENVELOPE TRAINING

**Learning objectives:** To become familiar with the building science and envelope provisions of the 2012 Massachusetts Energy Conservation Code.

**Total number of attendees:** 45 (58 registered[14])

**Training duration:** 3.5 hours

### Instructor's Skill

The class instructor was an expert in the subject and provided the audience with many detailed and helpful insights about applying the code in building construction. The instructor encouraged participation and made an effort to manage the class interactively. The instructor used an audience response device that effectively gauged audience member's reactions and obtained their immediate feedback on questions the instructor posed. The questions were intelligently designed and directly related to topics discussed in the class, and they focused on important aspects of the code.

The instructor used an audience response system (ARS) to gauge audience members' reactions and obtain their immediate feedback on questions posed during the class. ARS questions are also used in the immediate survey memos, and contain several questions that are the same for every commercial training session. They allow the instructor to gain immediate feedback and gauge how well attendees understand a topic. Questions were intelligently designed, directly related to topics discussed in the class, and focused on clarifying aspects of the code applications that could potentially be confusing to the user.

Cadmus assessed the class instructor's skill as follows:

- Class instructor's level of fluency in the subject: Excellent.
- Instructor's presentation style and skill in communicating and speaking effectively: Excellent.
- Did the instructor incorporate engagement triggers and pause the lecture at least once per class so that attendees could participate in an activity in which they worked directly with the material, applied what they learned, or contextualized the subject? Yes, very frequently.

### Presentation Material

Cadmus reviewed the presentation materials to assess the overall quality, usefulness, comprehensiveness, level of detail provided, quality of technical materials, structure, and pace. Training materials were in-depth, comprehensive, and very well-structured. The instructor maintained an appropriate pace and covered the materials without rushing toward the end of the class.

[14] This was the only class that Cadmus observed number of attendees varied from number of registered.

The following energy code topics were covered during this training session:

- Introductions
    - Energy Savings 2006, 2009, 2012, and 2015
    - Code Reference Materials
- Scope and Application
    - Commercial Compliance (Prescriptive: IECC and ASHRAE)
    - 2012 IECC versus ASHRAE 90.1
    - Additional Efficiency Package Options
    - Commercial Compliance Methods
    - Stretch Code: Commercial Compliance
    - Definitions: “Residential and Commercial Buildings”
    - Additions
    - Alterations, Renovations, and Repairs
    - Change in Occupancy, Use, or Space Conditioning
    - Low Energy Buildings
    - Alternate Materials and Methods
    - Key Point Interactive Examples
- Opaque Envelope Requirements
    - Envelope Insulation (including detailed overview of code provisions related to envelope code provisions and table of major changes from 2009 IECC to 2012 IECC and ASHRAE 90.1 2010)
- Fenestration Requirements
- Air Leakage
- Energy Modeling and Compliance
    - Envelope Compliance Issues, All Buildings
    - Energy Modeling Applicability
    - ASHRAE 90.1 Energy Cost Budget Method
    - Overview of COMcheck (16 Slides)
    - Recommended Compliance Procedure
    - Commercial Plan Review: Best Practice
    - Resources
    - Envelope Project Example: Goodyear Elementary School
- Questions

Because the training materials were very detailed, they should have been distributed as manuals or handouts. A print or electronic copy of the slides was not provided in the training, and copies could have been very helpful for attendees to refer to later. This finding is consistent with results from the immediate surveys, where several respondents suggested more or better

handouts be provided to attendees. Slides should have been made accessible online for the attendees (e.g., recorded as a webinar) and emailed to the list of class attendees. Although the training materials were very comprehensive overall, they presented only a summary of stretch code requirements and did not cover how stretch code requirements can be met.

**Technical Review**

Cadmus developed the following set of questions and answered them to assess the technical materials presented during the training class:

- Did the session cover all significant areas and parameters of code within the subject that affect the building's energy consumption in a measurable way? Yes.
- Was the session's duration sufficient to cover all relevant chapters of the particular energy code discussed? Yes.
- Were there any real-life examples to help attendees deeply understand the application of the energy code? Yes.
- Was the depth of detail provided during the session on each code section sufficient to cover the complexity of the subject discussed? Yes.
- Were there any code interpretation or gray areas of the codes discussed that related to the subject? Yes.
- What type of industry key players was this training most appropriate/effective for?
    - Energy code plan checkers
    - Building inspectors
    - Architects
    - Mechanical or electrical engineers
    - Builders/developers
    - General contractors/subcontractors
    - Energy consultants

  All of the above.
- Were the relevant energy code enforcement mechanisms or details on how to perform building inspection discussed? Yes.
- Were any instructions provided in terms of documentation of energy code compliance for the design team? Yes.
- Was any contact information provided at the end of the session so that attendees could ask questions later? Yes.
- Were there any graphics or photos presented to help attendees understand and visualize the subject matter? Yes.

## Audience

The registered audience was a diverse group of 41 building code officials, two architects, seven builders/general contractors, two equipment suppliers, and six others working in miscellaneous sectors of the industry. The training level and material spanned sufficient area, depth, and

details for the entire audience that attended the training session in relation to their positions and industry areas.

### MECHANICAL/HVAC TRAINING

**Learning objectives:** To become familiar with the mechanical and HVAC provisions of the 2012 Massachusetts Energy Conservation Code

**Total number of attendees:** 36

**Training duration:** 3 hours

## Instructor's Skill

The instructor for this training session did not provide the class with a sufficient level of explanation and contextual description to ensure the audience's full understanding of the topic. This might have been because of inadequate HVAC knowledge and expertise or a need for improved communication skills. The presentation was not very effective because on several occasions the instructor asked the audience to read the slides instead of explaining them. Most slides included much more detail than the instructor discussed. Discussions also became prolonged and deviated from the core topic to topics that were less relevant to the objective of the training.

The instructor used an audience response system (ARS) to gauge audience members' reactions and obtain their immediate feedback on questions posed during the class. ARS questions are also used in the immediate survey memos, and contain several questions that are the same for every commercial training session. They allow the instructor to gain immediate feedback and gauge how well attendees understand a topic.

Cadmus assessed the class instructor's skill as follows:

- Class instructor's level of fluency in the subject matter: Slightly lower than moderate. Fluency level has room for improvement.
- Instructor's presentation style and skill in communicating and speaking effectively: Lower than moderate.
- Did the instructor incorporate engagement triggers and pause the lecture at least once per class so that attendees could participate in an activity in which they worked directly with the material, applied what they learned, or contextualized the subject? Sometimes, but not effectively.

## Presentation Material

Cadmus reviewed the presentation materials covered in the 132 PowerPoint slides to assess overall quality, usefulness, comprehensiveness, level of detail provided, quality of technical materials, structure, and pace.

The following energy code topics were discussed during this training session:

- Introductions
    - Energy Savings 2006, 2009, 2012, and 2015
    - Code Reference Materials
    - Resources
    - Compliance Options (IECC 2012, ASHRAE 90.1 2010 Performance Method and Above-Code Program)
- Scope and Application
    - Commercial Compliance (Prescriptive: IECC and ASHAE)
    - On-the-Ground Compliance Issues
    - MA Stretch Code Communities Map
    - Stretch Code Compliance
    - IECC 2012 References
    - Residential vs. Commercial Buildings
    - Building Additions and Code Compliance
    - Change in Occupancy, Use, or Space Conditioning
    - Alternate Materials and Methods
    - Construction Documents
    - Commercial Building Renovations
    - Quiz (Four Questions on Presented Topics)
- 2012 IECC Mechanical Systems Provisions and Major Changes
- Building Mechanical Systems Overview
- System Sizing and Load Calculations
- Cooling Performance Rating
- Heating Performance Terms
- HVAC Options and Controls
- Ventilation Controls
- Economizers (Operations, Requirements, Considerations, Best Practice)
- Air Distribution Systems
- Piping Systems
- Service Water Heating
- Mechanical Systems Commissioning
- Compliance
    - Compliance Issues: All Building Types
    - ASHRAE 90.1 Energy Cost Budget Method
    - Overview of COMcheck, Limitations (5 Slides)
    - Electrical: Key Points
    - Recommended Compliance Procedure

- Commercial Compliance: Best Practice
- HVAC Case Study

Training materials were in-depth, comprehensive, and well-structured. However, the session was too short for the instructor to cover all of the presentation material with an appropriate pace. The training materials were very detailed and should have been distributed as manuals or handouts. A print or electronic copy of the slides was not provided in the training, which could have been helpful for attendees to refer to later. It is useful to make the slides accessible online for the attendees (e.g., recorded as a webinar) and routinely email them to the entire list of class attendees after. CLEAResult did email the slides upon request after the training session.

The training material did not cover topics related to how stretch code requirements can be met. Given that a group of class participants belonged to or worked within jurisdictions that mandate stretch code compliance, this would have been useful and would directly affect compliance with the energy code. We understand the time constraints of the training session, and the topic of compliance with stretch code could require a daylong workshop or even multiple days.

**Technical Review**

Cadmus developed the following questions and used them to assess the presentation materials:

- Did the session cover all significant areas and parameters of code within the subject that affect the building's energy consumption in a measurable way? The presentation material covered a wide range of technical topics, but the training duration and the instructor's presentation skills did not allow for all the material to be communicated effectively to the audience.
- Was the session's duration sufficient to cover all relevant chapters of the particular energy code discussed? No, the session needs to be extended to allow for full coverage of the presentation material.
- Were there any real-life examples to help attendees deeply understand the application of the energy code? There were not sufficient examples.
- Was the depth of detail provided during the session on each code section sufficient to cover the complexity of the subject discussed? No.
- Were there any code interpretation or gray areas of the codes discussed that related to the subject? The discussion was not sufficient.
- What type of industry key players was this training most appropriate/effective for?
  - Energy code plan checkers
  - Building inspectors
  - Architects
  - Mechanical or electrical engineers
  - Builders/developers
  - General contractors/subcontractors
  - Energy consultants

  All of the above.

- Were the relevant energy code enforcement mechanisms or details on how to perform building inspection discussed? The discussion was not sufficient.
- Were any instructions provided in terms of documentation of energy code compliance for the design team? Instructions were not sufficient.
- Was any contact information provided at the end of the session so that attendees could ask questions later? Yes.
- Were there any graphics or photos presented to help attendees understand and visualize the subject matter? Only some. More graphics and photos could be added to help train the audience on various HVAC systems and control types, which could be particularly helpful for building inspectors.

### Audience

The audience was a diverse group of 21 building code officials, seven architects, four builders/general contractors, one HERS rater, one equipment supplier, and one utility representative. The training level and materials were suitable for all the audience members who attended the training session in relation to their positions and industry areas.

## LIGHTING TRAINING

**Learning objectives:** To become familiar with the electric and lighting provisions of the 2012 Massachusetts Energy Conservation Code

**Total number of attendees:** 20

**Training duration:** 3 hours

### Instructor's Skill

The instructor for the lighting training class was very effective and knowledgeable about the industry, products, and technology available in the market and emerging lighting technologies that can save energy if used properly. The instructor communicated that knowledge clearly and effectively, providing a lot of valuable contextual data for the lighting energy code requirements presented during the training session. The instructor drew upon extensive real-life experience and effectively conveyed this knowledge to the class.

The instructor used an audience response system (ARS) to gauge audience members' reactions and obtain their immediate feedback on questions posed during the class. ARS questions are also used in the immediate survey memos, and contain several questions that are the same for every commercial training session. They allow the instructor to gain immediate feedback and gauge how well attendees understand a topic. Questions were intelligently designed, directly related to topics discussed in the class, and focused on important aspects of the code. For example, the instructor asked the audience to calculate the lighting power density of the classroom space they were in.

Cadmus assessed the class instructor's skill as follows:

- Class instructor's level of fluency in the subject matter: Excellent.
- Instructor's presentation style and skill in communicating and speaking effectively: Excellent.
- Did the instructor incorporate engagement triggers and pause the lecture at least once per class so that attendees could participate in an activity in which they worked directly with the material, applied what they learned, or contextualized the subject? Yes, very frequently.

## Presentation Material

Cadmus reviewed the presentation material covered in 119 PowerPoint slides to assess the overall quality, usefulness, comprehensiveness, level of detail provided, quality of technical materials, structure, and pace. CLEAResult provided the audience with a print copy of the slides in the training session, which was very helpful. The presented information was also quite practical, detailed, and specific. In addition, the presented materials and the discussions that arose benefited all attendees, from beginners to advanced practitioners.

The following energy code topics were discussed during this training:

- Introductions
    - Energy Savings 2006, 2009, 2012, and 2015
    - Code Reference Materials
- Scope and Application
    - Commercial Compliance (Prescriptive: IECC and ASHRAE) and Mixed Occupancy
    - 2012 IECC versus ASHRAE 90.1
    - Additional Efficiency Package Options
    - Commercial Compliance Methods
    - Stretch Code: Commercial Compliance
    - Definitions: "Residential and Commercial Buildings"
    - Additions
    - Alterations, Renovations, and Repairs
    - Change in Occupancy, Use, or Space Conditioning
    - Low Energy Buildings
    - Alternate Materials and Methods
- Building Electrical and Lighting Provisions
- Lighting System Impact
- Lighting System Scope
- Intent of Lighting Requirements
- Interior Lighting Power
    - IECC 2012: Lighting Mandates

    - Allowance Tables, Measuring Lighting Power, Case Study and Calculating Lighting Power Density of the Classroom
- Optional Lighting Techniques
    - Efficient Lighting Sources and Techniques (High Performance Super T8, T8/T5?, LED and Its Current Applications, Install Efficient Fixtures)
- Interior Lighting Controls
    - Manual Interior Lighting Controls, Manual or Automatic Lighting Reduction Controls, Exceptions, Occupancy and Vacancy Controls, Network Lighting Controls
- Daylighting and Envelope Requirements
    - Daylight Zone Controls, Multilevel and Daylight Zone Controls (Example: Classroom)
    - Vertical Fenestration Maximum Area with Daylight Controls
    - Skylight (Minimum and Maximum Area, Lighting Controls Under Skylights)
- Exterior Lighting
    - Exterior Lighting Controls, Zone and Power, Exceptions
- System Commissioning
    - Lighting System and Control Commissioning, Example
- Additional Efficiency Package
- Lighting Options Package
- Code Compliance
- Electrical Systems
- Compliance
    - Compliance Issues: All Building Types
    - ASHRAE 90.1 Energy Cost Budget Method
    - Overview of COMcheck, Limitations (5 Slides)
    - Electrical: Key Points
    - Recommended Compliance Procedure
    - Commercial Plan Review: Best Practice
    - Commercial Inspection: Best Practice
    - Lighting Project Example: Middle School
    - Resources

The training materials did not specifically cover topics related to how stretch code requirements can be met. However, the class instructor made an effort to address highly energy-efficient lighting equipment available in the market and installation feasibility.

### Technical Review

Cadmus developed and answered the following questions to conduct a technical review of the presentation material and assess its technical content:

- Did the session cover all significant areas and parameters of code within the subject that affect the building's energy consumption in a measurable way? Yes.
- Was the session's duration sufficient to cover all relevant chapters of the particular energy code discussed? Yes.
- Were there any real-life examples to help attendees deeply understand the application of the energy code? Yes.
- Was the depth of detail provided during the session on each code section sufficient to cover the complexity of the subject discussed? Yes.
- Were there any code interpretation or gray areas of the codes discussed that related to the subject? Yes.
- What type of industry key players was this training most appropriate/effective for?
    - Energy code plan checkers
    - Building inspectors
    - Architects
    - Mechanical or electrical engineers
    - Builders/developers
    - General contractors/subcontractors
    - Energy consultants

  All of the above.
- Were the relevant energy code enforcement mechanisms or details on how to perform building inspection discussed? Yes.
- Were any instructions provided in terms of documentation of energy code compliance for the design team? Yes.
- Was any contact information provided at the end of the session so that attendees could ask questions later? Yes.
- Were there any graphics or photos presented to help attendees understand and visualize the subject matter? Yes.

### Audience

The audience was a diverse group of 17 building code employees, one lighting specialist/interior designer, one builder/general contractor, and one project engineer. The training level and materials were appropriate for all audience members who attended the training in relation to their level of technical expertise, positions, and industry areas.

## CONCLUSIONS

Overall, Cadmus found the quality of all three presentations to be good. However, there was inconsistency in the skills and knowledge of the presenters; the effectiveness of the trainers in presenting the information varied from barely effective to excellent. The most effective presentations were delivered by a trainer who clearly demonstrated subject matter expertise, communicated well, and engaged the audience.

The training material did not specifically cover topics related to how stretch code requirements could be met. However, the class instructor for the lighting training made an effort to address highly energy-efficient lighting equipment available in the market and installation feasibility. This was important because a group of class participants belonged to or worked within jurisdictions that mandate stretch code compliance. Cadmus understands that this topic alone could be a daylong workshop, or even span multiple days, in order to cover construction practices and equipment standards to meet the stretch code by either performing 20% more efficiently than 90.1-2007 or following Section 501.1.4 Prescriptive Path.

The envelope and lighting training sessions were sufficiently detailed and engaging, and both sessions included pragmatic tips and insights about meeting the updated code requirements. The instructors provided an excellent level of context for each discussed topic. The HVAC training was not as successful as the other two training sessions, mainly because of the complexity of HVAC-related discussions and requirements. The three-hour session was simply not long enough to cover all the details that needed to be covered. At times the presenter did not control the flow of the session well enough and discussions deviated from the topic and were not related to the code. As a result, the instructor had to rush through the slides at the end and asked the audience members to read the slides on their own without providing any further explanations, which defeated the purpose of holding an in-person training. Cadmus believes that insufficient time for the session and the instructor's level of fluency with the subject were two significant factors that could be improved in the future training sessions in this category. It is especially important to improve this training because HVAC systems and control types have a significant impact on commercial building energy consumption. Further, commercial noncompliance issues are often associated with HVAC systems and caused by a lack of in-depth understanding and knowledge of related code nuances.

Cadmus offers the following considerations for future energy code training sessions:

- Ensure that all trainers are proficient in the subject matter and have excellent communication and training skills.
- Incorporate real-world examples and class interactive exercises in classes to maintain trainee engagement and enhance their learning experience.
- Make mechanical/HVAC an all-day session or break it into two sessions to allow sufficient time to cover all presentation materials, details, and examples.
- Distribute the training materials as manuals for future reference because they are very detailed and could be a valuable resource for attendees.
- Make slides accessible online for the attendees in a recorded webinar format so that people who could not attend the training in person can complete it independently.

- Consider making training sessions mandatory, rather than voluntary, for energy code officials and building inspectors. During visits to building departments for the data collection task, Cadmus found that some building inspectors reportedly did not have time to attend the energy code training because of their workloads.
- Consider organizing separate trainings, preferably hands-on workshops, customized for stretch code jurisdictions to show how compliance with stretch code can be achievable. This is particularly important for key players in design and construction such as architects, mechanical engineers, and general or mechanical contractors.

# PROCESS ASSESSMENT OF CCSI RESIDENTIAL CLASSROOM TRAININGS (NOVEMBER 18, 2015)

| | |
|---|---|
| **TO:** | Massachusetts Program Administrators (PAs), Massachusetts Energy Efficiency Advisory Council (EEAC) Consultants |
| **FROM:** | Jared Powell and Betty Tolkin, NMR Group |
| **SUBJECT:** | Process Assessment of CCSI Residential Classroom Trainings |
| **CC:** | Pam Rathbun, Tetra Tech; Lynn Hoefgen, NMR Group; Joanne O'Donnell, NMR Group; Lauren Abraham, NMR Group; Allen Lee, Cadmus Group; Holly Farah, Cadmus Group; Sara Wist, Cadmus Group; Althea Koburger, Cadmus Group |
| **DATE:** | November 18, 2015 |

NMR attended three residential classroom trainings sponsored by the Code Compliance Support Initiative (CCSI) in 2015:

- HVAC and Indoor Air Quality held in Waltham on May 29th (5/29 HVAC-IAQ)
- Envelope and Building Science held in Palmer on June 5th (6/5 EBS)
- HVAC and Indoor Air Quality held in Boston on September 29th (9/29 HVAC-IAQ).

CLEAResult conducted the HVAC-IAQ trainings and the Center for EcoTechnology (CET) conducted the EBS training. The 5/29 HVAC-IAQ training had technical difficulties, which delayed its start by about an hour and decreased its duration from three hours to two hours. This was the longest any training had been delayed, and NMR elected to attend the training again on 9/29 to get a more accurate perspective for the process assessment.

The process assessment focused on both the presentations and the audiences. For the presentations, NMR assessed the overall quality, usefulness, comprehensiveness and level of detail provided, quality of materials, structure, and pace. NMR also assessed the composition of the audiences, the types of questions and issues brought up, and how well questions and issues were addressed. The process assessment relied on observation of the three trainings, informed by the expertise of the NMR staff member who attended, a certified HERS rater experienced in the use of various code compliance software.

The process assessment of the CCSI residential classroom trainings is part of the overall evaluation of the CCSI in 2015. The evaluation has several other components including:

- Analyses of immediate surveys collected at the end of the trainings with the attendees' ratings of the areas covered in terms of quality, usefulness, and new material presented
- Analyses of follow-up interviews with the attendees conducted approximately six months after the trainings exploring how they are using what they learned in the field
- Analyses of the types of information collected by various municipalities on energy code compliance.

NMR found all three residential classroom trainings attended to be very good overall. As noted in the body of this report, both presenters did a fine job of conveying the information to the

attendees. Both types of trainings should be very useful for people in the field who need to be brought up to speed on how to meet the new 2012 IECC requirements. Based on the trainings attended, NMR offers the following points for consideration:

- Consider making the slides, or a tailored version of the slides designed for future reference, available to all attendees—preferably, when they sign in at the beginning of the sessions.[15]
- Consider having the trainings focus more on providing reference materials that attendees can use to answer questions in the future, such as websites and support phone numbers.
- Consider continuation of the trainings well into the future—attendees often go into the sessions with limited knowledge of the code requirements. Indeed, current plans call for approximately the same number of trainings in 2016, though the details have not been worked out. The trainings in 2016 will need to be revamped and will become more critical if Massachusetts adopts an energy code based on 2015 IECC in July.

### OVERALL PRESENTATION QUALITY

NMR found the overall quality of all three presentations to be quite good. The CLEAResult presenter for HVAC-IAQ was quiet but engaging, authoritative, knowledgeable, and incorporated humor appropriately. She did a good job of going through the key requirements of the new code, comparing it to the old code, pointing out the differences, and explaining the rationale behind why the changes were made, what kind of impact the changes will have, and the consequences of not incorporating them correctly.

The CET presenter for EBS was clearly a technical expert who was able to describe the code requirements and practical ways to meet them. He facilitated a lively interaction with attendees, at the cost of some time, causing some rushing at the end of the presentation. It was not, however, always clear whether the topics being presented were based on meeting code requirements or just following best practices for energy-efficient construction. The outline presentation categories listed did not always feel like clearly distinct presentation sections, and some of the topics carried across presentation categories.

## Comprehensiveness and Usefulness—HVAC-IAQ Presentations

The HVAC-IAQ presentations should be very useful for people in the field who need to be brought up to speed on how to meet the new requirements. These presentations provided excellent detail, both on the requirements and the consequences of doing things improperly. The presentations used multiple photos of examples of good and bad work while talking through the problems represented (such as insufficient insulation, unsealed ductwork, poorly routed ducts, consequences of abrupt directional changes, and consequences of using flex duct vs. straight duct).

[15] Since this memo was originally issued on October 18, 2015, an enhanced handout package has been provided to training attendees starting on November 9, 2015. The handouts include about two-thirds of the slides used in the trainings (picture slides are excluded) and other information. NMR believes these handouts should address most of the related concerns raised in this process assessment.

The presentations spent the most time covering ducts and ventilation issues. The stretch code was a very minor focus of the presentations, discussed for a couple of minutes while introducing the new code. The stretch code was also discussed at the beginning of these presentations along with descriptions of the IECC 2012 updates, with a brief comparison and explanation of how the stretch code that is in force in some towns is still based on the 2009 IECC code rather than the updated 2012 IECC code. The presenter added that the stretch code can still be quite stringent compared to the 2012 IECC code due to the stricter inspection requirements, even if it does not match 2012 IECC on every measure.[16] Table 1 lists the approximate time durations of each topic for both HVAC-IAQ trainings.

[16] NMR paid particular attention to the handling of the stretch code since many code officials and some builders who attend the trainings work in stretch code communities. More information on how attendees from stretch code communities use what they learn at the trainings will be provided in the analysis of the follow-up interviews.

**Table 50. Topics Covered and Duration for HVAC-IAQ Trainings**

| Topic | May 29th Training | | September 29th Training | |
|---|---|---|---|---|
| | Duration (minutes) | Percent of total training time | Duration (minutes) | Percent of total training time |
| Ventilation | 34 | 28% | 31 | 22% |
| System/duct sizing | 21 | 18% | 21 | 15% |
| Ducts | 19 | 16% | 37 | 26% |
| Indoor air quality | 17 | 14% | 25 | 18% |
| Code updates/stretch code | 9 | 8% | 6 | 4% |
| Introduction | 7 | 6% | 8 | 6% |
| Real world problems | 4 | 3% | 4 | 3% |
| Mechanical systems | 3 | 2% | 2 | 1% |
| Resources/wrap-up | 3 | 2% | 1 | 1% |
| Lighting | 2 | 2% | <1 | <1% |
| Incentives | 1 | 1% | 5 | 4% |

## Materials—HVAC-IAQ Presentations

The slides used in the HVAC-IAQ presentations were quite good, with limited text, encouraging the audience to listen to the presenter rather than focus on trying to read wordy slides. However, there were a large number of slides, and they were not made available to the attendees, limiting their use as a reference source for attendees. The presenter addressed this issue after someone asked for the slides, saying that their organization's policy was to encourage people to attend the trainings and be engaged rather than looking at slides/handouts. She also said they were concerned that people would just rely on PowerPoint slides if they were made available and would not attend trainings, which would result in them missing the richer material that was conveyed verbally. However, NMR believes that having access to the slide deck and the many links that are provided in it is a valuable resource. At a minimum, at least a handout that contains some of the key takeaways would be very useful to the attendees.[17] The handouts provided at the presentations were barely discussed, other than noting that they were there, and participants could look at them for more information. While the

[17] As noted above, the trainings have recently addressed this issue.

agenda and REScheck checklist provided in the handouts are very helpful as a summary of the key things inspectors look for, more attention could have been called to that document.

The minimal materials provided mean that the training itself does not serve as a resource for future reference. It does serve as a good starting point, and the attendees are encouraged to look to other sources, though those sources were only summarily addressed. The HVAC-IAQ presenter did mention early in the session that CLEAResult can do visits to offer help on specific projects, but there was no discussion of what would be involved or how this would be arranged.

### Structure and Pace—HVAC-IAQ Presentations

The HVAC-IAQ presenter (the same individual presented both sessions) was very good overall—she was quite knowledgeable and clearly an expert in this field. She also appeared friendly, calm, and humorous, keeping the audience engaged through what can be a dry topic. She maintained a steady pace throughout the trainings and did not appear rushed, even at the 5/29 HVAC-IAQ, which had a delayed start due to technical difficulties (she did not take a break herself at that training but encouraged the attendees to do so if needed). In order to stay on schedule, she declined to provide detailed answers to attendee questions that were off topic or would be addressed later in the presentation, asking them to either look up the answers in the reference materials provided or wait to see if their question would be addressed later in the relevant section of the presentation. Audience members may not always have appreciated these moments of the presenter exercising control over the pace of the presentation, but they did seem to respect her explanation and the need to stick to the presentation schedule.

The HVAC-IAQ presenter was particularly helpful in explaining the real-world difficulties that may lead to some projects failing to meet certain provisions of the code. She also explained how following code practices is important and leads to better outcomes despite the difficulties some builders and contractors might face—that is, she provided the rationale for compliance. The trainings delved into specific situations, using numerous real-world examples of good and bad practices. The presenter emphasized important issues, such as putting ducts in conditioned space. She also provided the code officials with tips for enforcement—for example, checking Manual J calculations to ensure there is no gaming of the system.

### Comprehensiveness and Usefulness—Envelope and Building Science Presentation

The EBS presentations should also be very useful for people in the field who need to be brought up to speed on how to meet the new 2012 IECC requirements, with a significant focus on issues of building science. The trainings would be less useful to true novices in this field who might benefit from an even more basic introduction to building science. The focus of the presentation included real-world examples of how to follow advanced building science principles as well as the new code requirements. As with the HVAC-IAQ presentations, the EBS presentation provided excellent detail both on the new code requirements and the consequences of not following best practices for energy-efficient construction. The presentation used multiple photos of examples of good and bad work while talking through the problems represented (such as ice dams, water infiltration problems, and poor insulation quality).

The presentation spent the most time on discussions of sealing and testing the building envelope, but topics related to building science generally overlapped, with similar topics covered in the various sections of the presentation. Principles discussed in the general building science section were reinforced in the component-specific sections and discussions of real-world problems. As with the HVAC-IAQ trainings, there was little focus on stretch code. The presenter talked about the stretch code at the beginning of the presentation for less than four minutes, explicitly noting that the presentation was designed to focus on 2012 IECC code because it was the new code, and most attendees would have already been exposed to stretch code requirements.[18] Similar to the HVAC-IAQ presentations, he provided a brief comparison of 2012 IECC to stretch code and talked about how the overall level of energy efficiency is similar, but the stretch code might be stricter at times due to the verification requirements. Table 51 lists the approximate time durations of each topic for the EBS training.

[18] Many towns in central Massachusetts, where this training was held, have not adopted the stretch code and thus come under 2012 IECC. However, the larger cities, such as Springfield and Worcester, are under the stretch code.

**Table 51. Topics Covered and Duration for the EBS Training**

| Topic | Duration (minutes) | Percent of total training time |
|---|---|---|
| Envelope sealing/testing | 29 | 17% |
| Basements/slabs | 22 | 12% |
| General building science | 18 | 10% |
| Ceilings/roofs | 14 | 8% |
| Code updates | 13 | 8% |
| Intro | 13 | 8% |
| Real-world problems | 13 | 8% |
| Windows/walls | 12 | 7% |
| Stretch code | 10 | 6% |
| Insulation | 10 | 6% |
| REScheck | 6 | 3% |
| Resources/wrap-up | 5 | 3% |
| Ducts | 4 | 2% |
| Incentives | 3 | 2% |
| Lighting | 0.5 | <1% |

### Materials—EBS Presentation

Similar to the HVAC-IAQ trainings, the slides were very good, but there were a large number of them and they were not made available to the attendees. One attendee specifically complained about not being given a handout with the slides on it and wanted to have a handout to follow along with the presentation and take notes. He also noted that the insulation requirements that had just been described in the presentation were not listed in the handouts available. The presenter responded that he was just doing what he had been told to do and that they had decided not to provide the slides. Again, this issue appears to have been addressed since NMR attended the trainings.

The presenter briefly listed the contents of the handouts at the beginning of the presentation, and did call some attention to the REScheck checklist provided, but did not rely on or refer to these materials much through the presentation. As in the case of the HVAC-IAQ trainings, NMR believes that having access to the slide deck—or an abbreviated version designed to focus on key takeaways—and the many links that are mentioned in the trainings as resources would be very useful to the attendees.

## Structure and Pace—EBS Presentation

The EBS presenter was very good overall; he spoke clearly and knowledgeably and demonstrated an excellent understanding of the material. He appeared to be an expert in the field with a technical focus and was also humorous with good eye contact. He also responded well when the attendees disagreed with him, making a good case for the material he presented.

The pace of the EBS training was somewhat uneven due to a high level of audience involvement. This caused the presenter to rush at the end to cover the final topics; the training was thus more heavily weighted to the topics at the beginning of the agenda.

The EBS training topics overlapped quite a bit; there was much useful, related, technical information, but the presentation categories were not very distinct from one another. It did seem that the presentation jumped around a bit; for example, slab insulation was discussed for about ten minutes at the beginning of the presentation; then there was a basement/slab section that took another ten minutes later in the presentation. Other topics were also treated this way.

### TRAINING ATTENDEES

The participants at the training sessions NMR attended were mostly code officials and energy efficiency specialists. The 5/29 HVAC-IAQ training had 22 attendees; about one-half were code officials and most of the remainder were energy efficiency specialists including HERS raters, based on a show of hands. There appeared to be only one or two builders at this training. The 9/29 HVAC-IAQ training had 14 attendees; again, about one-half were code officials, and the remainder were mostly HERS raters, with two architects and two HVAC technicians. The 6/5 EBS training had 16 attendees, mostly code officials and energy specialists, with a few architects and developers. Different questions were brought up at the trainings and the presenters' interactions with the attendees also varied.

## Questions and Issues Raised—HVAC-IAQ Trainings

Several attendees asked questions and expressed opinions during the HVAC-IAQ presentations and received responses covering the following topics:

- Belief that homes are built too tight (presenter acknowledged this concern and explained why she disagreed).
- Code official claimed that builders do not know how to use Manual J or even what it is (presenter stressed its importance).
- What are the available rebates for construction or equipment (presenter pointed to MassSave.com).
- Always-on ventilation equipment requires maintenance, and when installed in low-income housing, it does not get maintained, which is harmful to the occupants (presenter acknowledged importance of maintenance, and said that is not just a low-income problem; developers and builders should express these concerns to manufacturers).
- Belief that builders do not know that they are supposed to be insulating foundation walls (presenter addressed this briefly and said that was unfortunate, but she wanted to move on to cover the bigger picture and key topics).
- When HERS ratings are required (presenter clarified).

- Which code is used in Massachusetts (presenter clarified the stretch code based on the 2009 IECC code is used in some cities and towns and the 2012 IECC code is used in the rest of the state).
- Do bathroom fan ducts need to be insulated? (presenter replied yes, to avoid condensation).
- Do any gas dryers provide fresh combustion air? (presenter replied no, and gas dryers are bad for indoor air quality).
- What inputs go into a load calculation? (presenter gave clear, helpful description)
- Multiple comments on code officials' experience in the field with below-code work.

### Overall Handling of Attendee Issues—HVAC-IAQ Trainings

The presenter's handling of questions and other attendee issues was excellent—she acknowledged people who had already spoken and remembered their previous comments. She was very polite in dealing with opinionated questioners—disagreeing with them while acknowledging their concerns and making a good case for her perspective. She also handled a disruptive pair of attendees who were whispering between themselves rather than listening or asking questions by good-naturedly scolding them. In the future, it may be advisable to ask the attendees up front not to have side conversations—they are very distracting in a classroom setting.

There was no formal Q&A at the end of the presentations, but the presenter went up to attendees who wanted to ask questions at the end of the session and talked with them directly; this is a good strategy for getting those not wanting to speak up during the presentation to participate.

The presenter also engaged the trainees by asking several questions on the material presented. The attendees voted anonymously on these quiz questions, both before and after receiving the information (with some attendees still providing the wrong answers). Unfortunately, the Audience Response System (ARS) using hand-held clickers did not work at all at the 5/29 HVAC-IAQ session due to the technical difficulties experienced on that day. At the 9/29 HVAC-IAQ session, the ARS clickers had not been properly calibrated, showing an incorrect number of clickers in use.

The ARS at the 9/29 HVAC-IAQ training did provide some interesting information on how much the attendees knew going in. For example:

- One-half of the attendees incorrectly answered whether or not ventilation was a new requirement under 2012 IECC, prior to the presenter explaining it.
- Two-thirds were incorrect about whether or not code required stoves to be vented outside, prior to presenter explaining the requirement.
- Three-quarters were correct about duct leakage testing not being a new requirement for 2012 IECC code, prior to the presenter explaining it.
- Only slightly more than one-quarter of attendees answered correctly as to what type of bathroom ventilation fans were required by code, even after the presenter had covered the area.

## Questions and Issues Raised—EBS Training

Most attendees (11 out of 16) asked questions and expressed opinions during the EBS presentation and received responses covering the following topics:

- Is the stretch code more flexible or more stringent than IECC 2012 (presenter believes the stretch code is more flexible since it uses the performance path, but probably more stringent in terms of energy efficiency, while he had heard that it is more difficult to comply with the 2012 IECC code due to less flexibility in meeting the code's requirements).
- Does the stretch code checklist have to be verified by someone other than builder; a HERS rater will not sign off on something he has not seen (presenter replied that this varies across jurisdictions; they cannot see everything, so they have to make a call on what they will allow without having seen it).
- What kind of ventilation can be used to meet new requirements? (presenter provided a clear example of different options).
- Does the code require a dedicated fresh air intake channel? (presenter replied "No," but that it is a good idea to use a balanced system if the house is really tight to avoid problematic negative pressures).
- What to do about homeowners (particularly low-income) shutting off ventilation systems to avoid wasting heat, as this practice causes moisture problems and condensation on bathroom walls (presenter replied that this is a challenge and needs to be addressed with consumer education).
- How to insulate and air seal properly when the builder uses ceiling strapping (presenter replied that dead air space is a problem if not sealed really well; attendee and presenter argued a bit, but they accepted that there are different situations; presenter reaffirmed his final point).
- Belief that long-term water condensation issues will arise from the code requirements and the energy code is not taking that into account (presenter replied that they will find out over time what the consequences are; there was a bit of back and forth discussion among the attendees; the issue was not fully resolved).
- How to label blown-in wall insulation and test for its R-value (presenter replied that it is a judgment call and depends on rater or code official).
- What does unconditioned volume mean? (presenter provided official code definition and acknowledged that some code officials look at it differently).
- How to seal fireplaces (presenter provided a clear example).
- Are there fire-rated spray-on insulation materials? (presenter did not know).
- Builders object to some of the new code requirements due to cost (presenter affirmed comment).
- Multiple attendees discussed rotting assemblies due to improper water barriers (presenter provided a technical example; there was some back and forth about assemblies rotting because they cannot dry out; some attendees did not seem totally satisfied with the presenter's response, but eventually agreed that they did not want two vapor barriers).

## Overall Handling of Attendee Issues—EBS Training

The EBS training included much more questioning and discussions about building science and code upgrades than the HVAC-IAQ trainings. The attendees asked a lot of questions about what exactly the code requires and how to meet those requirements. They also spoke at length about the issues they face in the field when builders and contractors do not know the requirements or how to meet them. As noted in the listing of the questions asked, attendees did express their disagreement with code requirements and what they perceived as the negative impacts of these practices.

The presenter encouraged lively audience participation and the attendees seemed to appreciate the discussions. When there where disagreements, the presenter did a good job of acknowledging the attendees' opinions and pointing out where their understanding did not match his. He typically reaffirmed his own point of view after some back and forth, most of the time to close out the issue. The drawback to all the discussions, as noted above, was that they took a fair amount of time, resulting in the presenter rushing at the very end of the presentation and giving less time to the areas at the end of the agenda. Providing copies of the presentation slides to the attendees would have been particularly useful in this case where there was not enough time to cover everything in the classroom.

The ARS worked well at the EBS training; the presenter asked about ten questions, which appeared to engage the attendees.

# CONCLUSIONS

NMR found all three residential classroom trainings attended to be very good overall. Both presenters did a fine job in conveying the information to the attendees and also in dealing with unexpected technical glitches and attendees fostering long discussions on the code and conditions in the field. After attending three presentations, NMR believes the trainers should consider making the slides, or a tailored version designed for future reference, available to all attendees—preferably, when they sign in at the beginning of the sessions. This issue appears to have been addressed recently. Additional focus should be given to the reference materials that attendees can use to answer questions in the future; these (websites, support phone numbers, etc.) were typically mentioned quite briefly, when they should be emphasized to the attendees. While the trainings are quite good, they can only be seen as an entry point to the topics discussed, and the attendees will undoubtedly have questions in the future that need to be answered.

Finally, it is important to continue to offer the trainings. As noted through the ARS use at the 9/29 HVAC-IAQ training, a large number of attendees go into these trainings with limited knowledge of the code requirements. The trainings also provide a venue for code officials, builders, HERS raters, and other market actors to discuss conditions in the field affecting code compliance.