THE EVALUATION OF THE 2004-5 BUILDER ENERGY CODE TRAINING

CALMAC Study No. BII001

Submitted To:

The Building Industry Institute

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January 20, 2006

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Executive Summary

The Building Energy Code Training Program was established by the Building Industry Institute (BII) to train production builders and local governments (building departments) in the proper implementation of the California Residential Energy Efficiency Standards (Title 24), methods and programs to exceed these Standards, and upcoming changes to the residential 2005 Title 24 Standards, proposed for implementation in October 2005. This process evaluation was designed to assess the effectiveness of the BECT training. The evaluation performed the following activities:

- Observed five separate workshops
- Reviewed course material
- Conducted interviews with course instructors
- In-depth interviews with 10 code official attendees
- In-depth interviews with 10 builder attendees
- Analyzed pretest of 62 attendees
- Email survey of 81 participants
- Interim Evaluation Memo summarized four areas where the BECT training could be modified to be a more effective forum for attendees
- Review of Evaluation findings with implementation team

Findings

- **Builders and code officials think they are familiar with codes, but pre-test shows otherwise.** ' Most attendees (83%) say they are at least somewhat familiar with the existing code. However, of the 62 attendees taking the pre-test quiz, the average score was 2.3 correct out of 5 questions. No one was able to answer all five questions correctly.

- **BECT Course is helpful** –satisfaction with the training courses is high. Seventy-eight percent of the attendees felt that the course had provided what they had hoped it would.

- **Additional training is desired** –Topics of special interest include: More information related to the code changes, Lighting requirements, Zero energy, Multifamily energy code requirements, and On-site training

- **Code changes are being incorporated** – The majority of builders is either beginning to incorporate the changes for October or is already building homes that are in compliance. However, few builders indicate they know how they will build homes that exceed the new code by at least 15 percent.

- **Additional assistance is desired** – Even given the existing work to meet code changes, interest is very high for assistance in meeting and exceeding code after the October changes take effect.

- **Large number were building EnergyStar homes under old code, but do not plan to yet under new code** – A surprisingly high number of builders indicate that they are building the majority of homes at least 15 percent above code. In fact, the average of their responses indicates that 50 percent of the homes being built are at this level. However, almost none of these builders plan to build 15% above the new code. Many do not know how they would accomplish this. There is a need and an interest in helping builders design and build at the new plus 15% level.

- **Awareness of the Community Energy Efficiency Partnership (CEEP) is very low**. Very few of the attendees had a clear understanding of CEEP and only 2 out of 81 had previously participated. Given that all BECT courses include a small segment on CEEP, this low awareness is surprising.

- **The BECT Courses created some changes in energy efficiency practices.** Twenty-four of the 51 builders made changes. These included changes in lighting, (16), HVAC (16), insulation (14), duct work (13), air infiltration (8), windows and doors (5), and water heating (5).

Recommendations

Over the last several years BECT has been one of the few sources of information on energy-efficiency building code for the building industry in California. The California Utilities offer some courses in Title 24 compliance, though most of these are targeted at the HVAC community. Our survey and interview show that BECT is well received and the vast majority of attendees report to be satisfied with the training sessions.

Our own observations of the training sessions suggest that there are areas in need of improvement. The course, as it is designed, provides intensive discussion of all aspects of the residential code. We found the course instructors to be extremely knowledgeable regarding the Title 24 codes, and both instructors do an effective job of keeping attendees' attention for the 3-4 hours the course runs.

However, a concern with BECT centers on the fact that the presentation of material to attendees is not the ultimate objective for the BECT courses. The real objective is to change the behavior of attendees so that builders can build to code and above and code officials can enforce the code. The recommendations we make below concentrate on changing the training so that it is more effective in *changing the behavior* of the attendees. This requires training experiences that focus on the specific needs of the individual participants, involves the audience in the learning experience, reinforces the important messages using a variety of

instructional approaches, and provides the necessary support for participants after the course has been completed.

We know that ConSol appreciates these attributes because they are embodied in the on-site field training that is part of BECT. The hands-on, experiential learning that takes place at the on-site training is absent from the classroom. There is a sharp contrast in the delivery of these two training events, and an equally sharp contrast in their effectiveness in making lasting changes in participants' behavior.

With this in mind, we provide suggestions that should make the classroom lecture more effective in getting attendees to a) build better buildings or b) enforce the code more strictly.

Redesign Courses to Reflect Adult Learning Needs & Train the Trainers

The world of adult education is full of smart people that have mastery of subject material and a willingness to teach. This does not, however, make them effective educators. There is a growing body of research on how adult learners absorb material, how they retain information, and what motivates changes in behavior. According to the practices discussed in some of these recent studies, there are six elements that BECT courses should embrace. These include:

- Identify clear learning objectives (what the attendee will get out of the course) that match the course goals with the needs of attendees
- Know your audience! Each instructor is advised to inventory the specific needs and interests of each audience early on in the workshop. This process develops intimacy and allows the instructor to provide specific and anecdotal information helpful to that specific group.
- Limit course content (do not try to do too much within a single class), and prioritize materials so that the most important material is related first, last and reinforced throughout the course. Learner retention is highest when the adult learner has three different things to do in a one hour timeframe. Talking head lectures, while commonplace, are ineffective when compared to more interactive courses. (There is a reason they call it "death-by-PowerPoint.)
- Design and facilitate an interactive workshop that *requires* participation by attendees. This participation can be hands-on, but it can also involve role playing, design development, and other ways of developing class participation.
- Design course work that focuses specifically on changing behavior. Ideally, each attendee should leave the workshop with an action plan as to how to proceed with the material that was just learned. Some courses build the creation of the action plan into the workshop. Alternatively, ConSol/BII could ask each participant near the end of the lecture to write down specifically what they intend to do (differently) based on their learning and experience. Some of these might be shared with the class.

This provides ConSol/BII, the instructors and evaluators with an invaluable means of understanding a) how attendees benefited from the training and b) what the attendees intend to do with these new found benefits.

- Consider follow-up opportunities that lead to reinforcement of material. One-time workshops do not have the means to reinforce important course material in different ways to ensure that material is understood and personalized. Furthermore, questions on how to put concepts into practice usually arise after the workshop is completed and attendees are back at work.. Attendees need access to resources that can their answer questions, and sometimes friendly encouragement to push forward with changes in behavior when the normal work load crush may be overwhelming. ConSol/BII should consider Web resources, redesign of the handouts, follow-up courses, post-attendance tracking, and even call-in and/or web-chat times for attendees where the instructor can answer questions.

The recommendations provided below focus on designing and implementing workshops that are directly centered on getting attendees to increase the energy savings in the buildings they build. Among the changes we strongly recommend are the following:

- Consider different audiences and different needs,
- Shorten courses by concentrating on specific areas
- Focus beginning segment on most important content
- Query attendees about their individual needs early in the session
- Add interactive components
- Redo PowerPoint approach
- Redo manual to be more useful
- Add web based support
- Place greater emphasis on on-site training

Consider Different Audiences and Different Needs,

The current courses are designed to provide value to all varieties of builders, designers, suppliers, and jurisdictions. The course introduces both existing code and the proposed changes for October 2005. The format of information transfer and discussion is designed to serve all attendees yet we question, given the disparate needs of each region and organization, if real tangible needs are being met.

While the majority of the respondents of the survey stated that they came to the BECT training to find out about the changes made in the 2005 code, the course dealt mostly with the existing 2004 code and only at the end discussed the new changes. In this case, the course never promoted itself as a 2005 Code Change course, but it was clear that the increased interest seen in the months leading up to the code change date was a good clue of the attendees' interests. Right now, there is a lot of interest in the BECT workshops because people and

organizations are becoming aware of the October changes in code and looking for specific guidance on how to deal with changing code requirements. Since that is a primary motivation for many people's interest in attending, the course could focus specifically on new codes changes and strategies on construction and/or enforcement. While BECT does not need help right now in attracting attendees, changing the course title to "Helping Builders Deal with Changes to the Title 24 Code" and focusing specifically on the opportunities and obstacles in reaching the new code could be more effective in providing specific benefits to attendees. The workshops, which currently end with a short discussion of the changes in the 2005 code, could start by introducing the code changes and focus much more on the issues that the attendees identify as being problems or obstacles and make sure that, by the end of the workshop, these problems and obstacles have been addressed.

Furthermore, there is an opportunity to develop more specialized course offerings to meet the various needs of stakeholders. The survey revealed interest in the following courses:

- Meeting 2005 Title 24 in different climate zones
- How to specify/design buildings that meet the 2005 Standards
- How to specify/design buildings that exceed the 2005 Standards
- The use of Home Energy Rating System
- Lighting requirements/lighting opportunities in 2005 Title 24

Shorten Courses by Concentrating on Specific Areas

There is an enormous amount of information presented in the BECT classroom course. For many of the attendees, four hours of class time is often spent waiting for a few minutes that address their specific interests or concerns. And then, when their interest is addressed, it is only covered in a cursory fashion. The issue arises that it is expensive to offer short courses. We therefore recommend that BECT piggyback two courses each day at a single location. The courses should be related so someone can attend both if they are interested in both topics.

Query Attendees about Their Needs Early in the Session

Marketing efforts that are clear about the course material, the benefits attendees will receive, and the target audience, should provide a group of attendees with relatively common interests. However, the most successful workshops will, after introducing the course objectives, query the audience to see what their individual desires and needs are. This provides the instructor and attendees a chance to introduce themselves and to express their expectations. The query at this time can help the instructor know if background material needs to be supplemented or omitted, and what specific topics will warrant what degree of attention. A good instructor can get the sense of the group and find ways to keep the course on track, while still satisfying the particular needs of an attendee.

Focus Beginning Segment on Most Important Content Areas

The attention span of the average tired adult does not last four hours; therefore it is important to use the first twenty minutes to present the three most important aspects of the session when everyone is most alert. It is then important that these key concepts are revisited throughout the session.

Add Interactive Components Such as Developing Plans

Assessments of adult education programs make clear that lecture-centric modes are the least effective means of gaining information retention. Hands-on activities such as those conducted at on-site trainings are a far more effective means of gaining information retention.

There are many other ways to gain this type of active learning in a classroom setting. For example, development of new building plans, or brainstorming exercises are good ways to involve the attendees in active learning. Creating small groups that focus on problem solving activities are most likely to impact adult learning.

Revise PowerPoint Approach

The BECT PowerPoint presentation could be reworked to incorporate the content suggestions provided above. As importantly, the actual content of the slides needs attention.

The presentation could benefit by being divided into specific subjects with a summary slide introducing each topic. The slides need to state the important concepts in writing. The presenter gives a lot of key information verbally, but it needs to be in writing to focus attendees' attention on important concepts. For example, the section on the 2005 code changes never shows collectively what changes are required. It would be better to include a list of 2005 changes, starting with a summary of areas changed, followed by details in each area.

Revise Manual

The current manual is a large accumulation of the PowerPoint presentation that is given by the lecturer. Some versions handed out to attendees include the speaker notes. If the manual is intended to serve as a resource for attendees, it is of minimal use in its current form. The support materials (those sections other than the PowerPoint presentation) will be more useful if they were better if integrated into one well-indexed reference source.

Add Web Based Support

If ConSol/BII decides to provide more tailored workshops, the breadth of material currently covered will no longer be covered in each class. There are two significant implications here. One is that the existing hand-outs, slides and notebooks will need to be redesigned appropriately for each workshop. The other is that it will be important to make the existing information easily accessible

for anyone who needs it. The web is the logical medium for this resource. It is easy to imagine both new and existing code information presented by "chapter" and including detailed FAQ sections that relate to different audience questions and climate zones.

Place Greater Emphasis on On-Site Training

The on-site training is a valuable training tool. There are opportunities to expand on-site trainings and more aggressively recruit stakeholders to participate. Because it is so expensive to run the on-site course, BECT should look to bring some of the on-site experience into classrooms or use web-casts to enrich workshop learning and broaden stakeholder access.

Chapter One: Introduction

1.1 Description of the Building Energy Code Training Program

The Building Energy Code Training Program was established by the Building Industry Institute (BII) to train production builders and local governments (building departments) in the proper implementation of the California Residential Energy Efficiency Standards (Title 24), methods and programs to exceed these Standards, and upcoming changes to the residential 2005 Title 24 Standards, proposed for implementation in October 2005. The BECT is an information only program. Recent California Energy Commission and CPUC funded studies on residential construction quality have shown that up to 80% of new homes typically do not meet the complicated Title 24 Energy Standards,[1] and that the BII training program has significantly improved code compliance.[2] As documented by third party studies[3] this program improved compliance with energy regulations by builders and local building departments to the benefit of the consumer (through lower utility bills) and the state of California (through lower energy consumption).

BECT has several elements that make it a unique builder training program. These include:

- PEER–to-PEER training: BECT is a builder training program provided by the building industry to its members. Builders trust and appreciate that the training is provided by a member of the industry. They are more comfortable with the trainer who comes from within the industry and are willing to open their homes under construction to the trainers because they know that any information gleaned from the training is not going to be used against the builder in any way.
- On-site training: A critical component of BECT is on-site training – most training programs only train in classroom. BECT focuses on production builders[4] and trains them on their own job sites using their homes as the teaching labs. This approach allows the trainers to show the builders the code compliance problems and/or challenges that they have in their own homes making the training instantly germane. This is carefully done so that it is strictly informational, non-confrontational, and confidential to the builder. It has been shown to produce the desired results of changing the builder's construction practices and improve code compliance.
- Integrated classroom and on-site training: The classroom component is critical to the program and integrates with the on-site. The

[1] CEC Residential Construction Quality Assessment project, 2002

[2] Builder Energy Code Training Final Reports; 1996-2002

[3] Block Energy Design Evaluation of Builder Energy Code Training, 1997

[4] Production builders are defined as those who build more than 150 homes per year based on a small number of plans.

superintendents attend the on-site and purchasing and contracting staff attend the classroom. The classroom stresses proper subcontracting practices that will support the superintendent who is going to tell the subcontractors to improve their work.

- Coordinated builder and building department training: The same basic information is provided to both the builders and the building department staff, improving coordination and communication between the builders and their regulators.

1.1.1 BECT Objectives

The objectives for the BECT program were stated in the program plan as follows.

- Train staff of production builders: 864 staff from 108 companies.
- Train municipal building department staff: 36 building departments.
- As a direct result of builder and building department training, improve compliance with Title 24, capturing at least a 6% improvement in heating, cooling, and water heating as measured by Title 24 for the average participating builder's homes.
- Train builders and municipal building department staff in the 2005 Title 24 improvements and encourage builders to use early adoption of the quality-construction and lighting portions of the 2005 Standards.
- Inform builders of the IOU Statewide programs for EnergyStar Homes and encourage participation.

1.1.2 Components of BECT Operation

- Course Development—The BECT training course has been offered in California prior to this project, though funding had been mostly supplied by US DOE. The instructors begin the classroom training with a general overview of the energy code, including: summary of problems, required documentation, mandatory measures, and the advantages and disadvantages of compliance methods, focusing on the performance method which production builders use almost exclusively. Following the overview, the training focuses on the specifics of building according to the energy code. The emphasis is placed on compliance and quality construction for each component of the house including: insulation, windows, space conditioning, plumbing, and lighting. The trainers discuss appropriate contract language for subcontractors' material and equipment specifications to ensure compliance with the energy code is properly enforced in the contracts between builders and energy-related subcontractors and suppliers. The need for quality field-inspection procedures to ensure correct installation of features and to eliminate mistakes in the field is also stressed. The course then discusses building above code levels. The final section of the course discusses the October 2005 changes in Title 24.
- Training Manual-- Participants are given an extensive BECT course manual to support classroom training. Included in the manual are

checklists that have been developed specifically for this program. Checklists, such as the Field Inspection Checklist are introduced in the classroom training as tools that can expedite quality control. Checklists and installation protocols are also made available on CD and are available on the Building Industry Institute's website.

- Builder Classroom Presentation--The program plan describes the ideal course attendees as being the vice president of construction, the head purchasing agent, and the general superintendent of production builders. (The courses attended by the evaluators had as many as 70 attendees, the likely influence of the Title 24 changes that were soon to come into effect). The course is scheduled to take three hours, though in all observed cases, more time was needed to complete the material.
- Jurisdiction Classroom Presentation-- The training for building departments covers all of the same main issues covered by the builders' training. However, some of the emphasis is different. For instance, the building departments are instructed in quick, simple, repeatable methods for Title 24 documentation review and analysis, whereas the builders are instructed in how to read the documents.
- Builder On-Site Training-- On-site training sessions follow the classroom training, and are usually attended by three to twelve field superintendents and subcontractors who participate at the invitation of the builder and the encouragement of the instructor. On-site training sessions last two to four hours and are individually provided to each interested builder company. The builder chooses from their available subdivisions, ideally making two homes available, one "at rough", and one at final inspection. The instructor begins the session at the home that is "at rough". Using the field set of plans for that subdivision, which include Title 24 documentation, the instructor and the field superintendents complete the field inspection checklist provided by BECT. Use of the builder's own documentation makes the training appropriate to their own work experience by teaching the field supervisors how to critique their projects for compliance with the Title 24 documentation. At the final-inspection house the instructor and participants discuss correct installation and use of the required Title 24 energy efficiency features visible in a completed home.
- Marketing-- A key element of this program is getting builders to attend the training sessions. This is achieved through a carefully timed and orchestrated plan that gets the information on training sessions to builders in sufficient time for them to schedule to attend, but not so far ahead that they forget. The process includes providing class descriptions and schedules on both BII and ConSol websites, announcements of upcoming training at regular CBIA and BIA membership meetings, and direct-mail to builders with phone and fax follow-up.

1.2 Overview of Evaluation Objectives

Programs operated in 2004-2005 are guided by the CPUC Energy Efficiency Policy Manual, Version 2. The Policy Manual states that "Information only programs require an evaluation plan, but will not require monitoring and verification components." Each information-only program must develop an evaluation plan that addresses the following components:

- Providing up-front market assessments and baseline analysis, especially for new programs—(not applicable)
- Providing ongoing feedback, and corrective and constructive guidance regarding the implementation of programs
- Measuring indicators of the effectiveness of specific programs, including testing of the assumptions that underlie the program theory and approach
- Assessing the overall levels of performance and success of programs
- Informing decisions regarding compensation and final payments
- Helping to assess whether there is a continuing need for the program"

1.2.1 Revised Evaluation Strategy

The project logic is that compliance with Title 24 is low because many builders do not fully understand what is required under Title 24, or they do not have the training and hands-on experience with the new building performance techniques to incorporate these techniques in their building practices. Simultaneously, poor understanding of the code and the new building performance techniques by building inspectors prevents them from full enforcement of the Title 24 provisions. Because builders and building inspectors have limited time, money, and interest in energy efficiency, courses that are designed to improve code understanding must be tailored to their needs, convenient to attend, and free. Furthermore, the complexity of the techniques requires that coursework include hands-on training at the building site.

Based on the program logic and objectives, we can use the evaluation components to determine the effectiveness of this program.

Providing up-front market assessments and baseline analysis, especially for new programs

The prime research question is, do builders and building inspectors have a poor understanding of the Title 24 requirements, and/or a poor understanding of the techniques available to meet code requirements? Additionally, it would help the justification of this program to have current figures on overall Title 24 compliance measured by what is built in the field, not by what is filed with permitting.

The previous BECT program established a baseline value for actual compliance by field testing conditions in the homes built by attendee builders, prior to their

attendance at the seminar. For this evaluation, we developed a short questionnaire that is given at the beginning of the course to all attendees of the training to measure their understanding and self-reported compliance with the code. Results of that testing, shown in Chapter Five, confirm a low comprehension of the Title 24 provisions

This market assessment only measures the behavior of program attendees and says nothing about the behavior of those not attending the seminars. It is likely that these builders behave differently. It would be useful to know the behavior of non-attendees, because it is their behavior that training building inspector training is most likely to affect. However, this was considered a low priority in the evaluation objectives, and consequently not included in the evaluation plan.

Providing ongoing feedback, and corrective and constructive guidance regarding the implementation of programs

There are two methods that are used to collective information on the ways to improve the program. The first is process related activities performed by the Wirtshafter Associates team. These include review of program materials, interviews with BII personnel and course trainers, observation of the courses, in-depth interviews with builders and building code officials. The second method is a quantitative survey of attendees to gauge, among other information, their satisfaction and suggestions for course improvement.

Measuring indicators of the effectiveness of specific programs, including testing of the assumptions that underlie the program theory and approach

The key measure of effectiveness is how well the information is conveyed to the attendees and whether that translates into changes in building practices.

We answer this question by directly asking builder attendees to describe elements of their construction practice that have changed as a result of the training. Our proposal queried 81 builders and building inspectors. This is nearly half of the program's two-year goal. The evaluation used a web-based survey.

Assessing the overall levels of performance and success of programs. Helping to assess whether there is a continuing need for the program.

The reported and measured changes in building practice are the primary measure of the program's success. Additionally, we use the surveys to determine additional program benefits such as greater awareness and use of other energy efficiency/renewable programs and measures.

An important component of this training is whether it serves as an important communication network for builders and building officials to stay informed about codes and efficiency measures. Both codes and measures change over time

and it is important to keep builders current. For some builders, especially those with high turnover, it is likely to be beneficial to train and retrain staff.

The changes in Title 24 likely coming just at the end of the study period suggest that the program will be needed at least through 2006. To fully answer this last research question, however, it would be necessary to query non-participant builders, however, there was insufficient budget to perform such a study.

1.3 BECT Program Accomplishments

Table 1.1 shows the program goals and accomplishments for 2004 to November 15, 2005.

Table 1.1: BECT Goals and Accomplishments

	Number of Sessions		Number of Attendees		Number of Firms/Jurisdictions	
	Goal	Actual	Goal	Actual	Goal	Actual
Builder Classroom	72	125	1718	1732	216	349
Jurisdiction Classroom	72	86	No goal	1149	72	249
Builder Onsite	No goal	21	No goal	223	No goal	21

1.4 Study Methodology

The evaluation performed the following activities:

- Observed five separate workshops
- Reviewed course material
- Conducted interviews with course instructors
- In-depth interviews with 10 code official attendees
- In-depth interviews with 10 builder attendees
- Analyzed pretest of 62 attendees
- Email survey of 81 participants
- Interim Evaluation Memo summarized four areas where the BECT training could be modified to be a more effective forum for attendees
- Review of Evaluation findings with implementation team

Chapter Two: Interviews with Code Officials Attendees

This chapter summarizes our research related to the various public servants involved with code enforcement that attended one of the Building Energy Code Training (BECT) Courses offered as part of the California energy efficiency programs. These courses took place over a two-year period in 2004 and 2005. The courses were designed to assist code officials gain a better understanding of existing code and code changes that take place in October 2005.

Ten code officials that participated in a course were interviewed. The feedback provided by this group and presented in this document is organized as follows:

- Code Status
- Barriers and Code Enforcement
- Satisfaction with Training
- Interest in Additional Courses
- Market Information
- Additional Suggestions or Comments

The first section describes the methodology for the interview process and information related to the people interviewed. The subsequent sections present the data by the headers shown in the bullet points above.

The original sample of code officials comprised approximately 80 individuals that had taken the course over the past two years. The data originated from the database maintained by ConSol. From this group, 40 people were selected randomly, the other 40 were used for the survey sample.

The interview began with an introduction and one screening question to ensure that the people had actually attended the BECT course.

People were then asked what role they played in relation to code enforcement. These results are shown in Table 2.1. After reviewing the responses, it became clear that clarification is needed on how people are referred to within the rest of this document:

- **Code Official** – generic term used for any of the categories of people responding during the interview.
- **Building Code Official** – specific title of a manager that typically oversees the building inspectors and plan examiners. Variations on the title include Chief Building Official, Building Official and others.
- **Others**—including inspectors, plan checkers, and others.

Table 2.1: Job Role

Title	#	%
Building Inspector	2	20%
Senior Mgt (e.g., Chief Building Official, Deputy Director)	3	30%
Plan Examiner	3	30%
Electrical Inspector	1	10%
Construction Mgt Specialist	1	10%
Total	10	100%

2.1 Market Information

Understanding the market is important to designing course material that is most useful to the attended audience. Code officials were asked a series of market-related questions to gain a better understanding of current market activity and building practices.

First, code officials were asked what they were currently doing in relation to the new codes that will be effective October 2005. Their responses were reviewed and grouped into similar categories. The results are illustrated in Table 2.2. All of the code officials indicate some activity in relation to the code changes. The one jurisdiction already enforcing codes decided to adopt the standards early beginning in August 2005. The majority of the interviews were conducted in August 2005 so these results are not surprising.

Table 2.2: Activity Related to Code Changes

Response	#	%
We're doing nothing as of yet	-	0%
Currently planning, but no changes yet	4	40%
Beginning to incorporate code changes	5	50%
Homes are now compliant with new code	1	10%
Homes are now compliant and will be above code	-	0%
Total	10	100%

To ascertain current market conditions, code officials were asked to provide information related to the status of the new home market in their jurisdictions. All of the code officials indicate that residential new construction is currently very

active. A quote illustrative of this fact is as follows: "It is very active—there is lots of building going on… [the market is] booming right now." As a first indicator of future activity, one code official said that while it was active the market is slowing down.

To further explore market activity related to new home starts, code officials were asked to provide an estimate of 2004 to 2006 home starts. Their individual responses with expected changes in 2005 and 2006 are shown in Table 2.3. Overall, the data indicate an expected steady pace to slow down in activity through the end of 2006. However, jurisdictional differences are also evident.

Table 2.3: 2004 to 2006 Home Starts

Respondent	2004	2005	2006
	Estimate	***Change from 2004***	***Change from 2005***
Code Official 1	2,000	Same	Increase
Code Official 2	5,000	Same	Same
Code Official 3	100	Decrease	Increase
Code Official 4	Not sure	Not sure	Decrease
Code Official 5	8,000	Decrease	Decrease
Code Official 6	2,000	Decrease	Same
Code Official 7	25	Increase	Decrease
Code Official 8	1,500	Decrease	Same
Code Official 9	Not sure	Not sure	Not sure
Code Official 10	2,000	Increase	Same

In addition, code officials were asked what types of homes were being built in their jurisdictions. The question was open-ended so the responses vary significantly. However, there are a few points that stand out including that jurisdictions are seeing a mix of tract and custom homes. The minimum average size home is 1,300 sq. ft. and the maximum average size is 5,000 sq. ft. Overall, there are more high-end homes with the average size in the neighborhood of approximately 3,000 sq. ft. Two stories or more are also more often being built. Code officials also consider the homes to be energy efficient. To illustrate, a typical response to this question would be:

- "Homes are 2,500 sq. ft. and larger. There are lots of tract and custom homes (custom homes are 4,000 to 5,000 sq. ft.). The homes are at least two stories."

Code officials were also asked to provide an estimate of the average cost of homes. These results are illustrated in Table 2.4. The home prices vary extensively as shown by the wide range in prices given.

Table 2.4: Price of New Homes

Statistic	Price
Average	$685,000
Standard Deviation	$259,000
Mode	$600,000
Maximum	$1,200,000
Minimum	$350,000

To gain a better understanding of current standard practice, respondents were asked how many homes were built at least 15 percent above code and then asked to split the remaining percentage between homes built right at code and slightly above code (0 to 15 percent). These results are illustrated in Table 2.5. Not surprisingly, code officials indicate that the majority of homes are built right at code.

Table 2.5: Homes Built in Relation to Code

Response	Avg	Std Dev	Mode	# @ 100%
At Code	64%	29%	90%	-
0 to 15% Above Code	23%	27%	5%	-
At least 15% above code?	16%	27%	0%	-

2.2 Barriers and Code Enforcement

An important issue for the evaluation is to determine what barriers might exist to energy code enforcement and what code officials need as assistance to enforce codes. Related to this issue, code officials were first asked how they would describe their existing working relationship with builders. All of the respondents indicate they have at least a good working relationship with builders in their jurisdiction. One code official commented that: “I have a good relationship with good builders, but also have speculators that aren't as scrupulous that don't have the skills to do quality work.”

When asked what barriers exist, code officials indicate a lack of education and/or information for various groups of professionals. In general, builders or architects are mentioned most often. A closer look at the responses illustrates a few subgroups that officials believe should be targets of course work:

- "Education of the design community is important…sell to design community to buy into code benefits…also have CEC help with financing community—lending agencies can help promote energy saving features by providing better loan terms for these developments."
- "Barriers are mostly related to lack of knowledge on the trades' people part regarding the code changes. I don't think that the people actually building the homes attend the courses or understand what the code does."
- "Only barrier is lack of knowledge on the code itself by the contractors—the people that are actually installing and building the homes—the laborers."

Following up on the barriers, code officials were asked what assistance they could use to improve code compliance. Not surprisingly, all of the officials that indicate a barrier (seven respondents) also indicate that more information, including educational courses, is needed. Two quotes illustrate this point nicely:

- "Get more information out to the developers including a brochure of upcoming changes—something to hand out to developers would be best."
- "Educating the workers on how to install [measures] properly so that the measures actually meet code—do it right the first time to avoid call backs."

Another important topic is what additional support is needed and which groups should be reached in order to maximize compliance with 2005 code. When asked to provide suggestions for additional support, code official responses are similar to what is already provided in relation to addressing barriers. Their suggestions included:

- Brochures or other hand outs for building industry (three responses)
- Education—more courses (two responses)
- Information hotline[5] (two responses)
- Informational campaigns aimed at building community (two responses)

Code officials were next asked what groups of people would be most advantageous to target with these additional resources. The results are illustrated in Table 2.6. As evident from the table, the two groups indicated most often are the inspectors and building code officials. Others include senior mechanical engineers, city planners, and construction planning supervisors.

[5] One code official indicated that this already existed and to make sure it continues to exist.

Table 2.6: People to Reach to Maximize Code Compliance

Title	#	%
Building Inspectors	5	31%
Building Code Official	4	25%
Plan Examiners	2	13%
Senior Mgt (e.g., Chief of Operations)	2	13%
Other	3	19%
Total	16	100%

2.3 Satisfaction with Training

Understanding the code officials' familiarity with codes prior to taking the course is important to understanding the effectiveness of the training. On a scale from one to five with one being very familiar, code officials rated their familiarity as shown in Table 2.7. The majority of code officials say they are at least somewhat familiar. The other three respondents are on the fence and did not commit either way on their familiarity.

Table 2.7: Familiarity with Codes

Rating	#	%
Very Familiar	1	10%
Somewhat Familiar	6	60%
Neutral	3	30%
Not Very Familiar	-	0%
Not at All Familiar	-	0%
Total	**10**	**100%**

Given their level of familiarity, code officials were then asked what they hoped to receive when they decided to attend a course. Overwhelmingly, the October code changes were given as the reason for attending (eight of ten respondents). Two respondents added that they were looking for general energy code knowledge with one respondent adding they wanted to take this knowledge back to colleagues.

One indicator of training effectiveness is whether the attendees received what they had hoped for from the course. Only one code official gives a response other than yes. This person finds that his goal of learning more about the code

changes was only partly achieved primarily because too much time was spent on the ***existing*** code in his session.

To explore potential areas for improvement, code officials were asked if they had any issues with the course or with the way it was presented. Only one code official says yes and it was the same person in which his needs were only partially met. His comment as to why he responded yes is as follows:

- "The two day course compacted information into such a short time…many topics were given in a short period of time and not all had to do with energy…presentations in the past were very valuable and easier to bring back to staff."

The most important indicator of training success is whether the attendees found the material useful once they had a chance to take the knowledge back to their workplace. Code officials were asked to rate the usefulness of the information they received on a scale of one to five with one being extremely valuable. A summary of their responses is shown in Table 2.8. As evident in the table, nine of the respondents find the course was at least somewhat valuable to them.

Table 2.8: Usefulness of Course

Rating	**#**	**%**
Extremely Useful	1	10%
Somewhat Useful	6	60%
Neutral	3	30%
Not Very Useful	-	0%
Not at All Useful	-	0%
Total	**10**	**100%**

2.4 Interest in Additional Courses

BECT program staff needs to know what types of courses are of interest in the future for their perspective audiences. Code officials were asked to rate their interest (on a scale of one to five) in additional courses offered next year. The results are shown in Table 2.9 below. Code officials show less interest in courses that would play less of a role in helping them enforce code (i.e., specifying buildings above code and HERS). Many of the respondents reinforce the importance of continuing education and show a high level of interest in additional courses related to Title 24 changes.

Table 2.9: Interest in Additional Courses

Course	Likely				Unlikely	Avg
	1	2	3	4	5	
Changes to the Title 24 Code	7	2	1	-	-	1.4
How to specify buildings that meet the new code?	4	2	2	2	-	2.2
How to specify buildings that are above the new code?	3	-	5	2	-	2.6
Lighting requirements in Title 24?	5	3	1	1	-	1.8
Use of home energy ratings systems?	2	3	2	3	-	2.6

In addition, code officials were asked to provide suggestions related to training services and topics. One code official suggests that offering the courses locally was a big help for his office. Besides changes to Title 24, two other course suggestions are:

- Non-residential energy code changes
- Daylighting

2.5 Additional Suggestions or Comments

The opportunity to provide any feedback related to the training or any other energy efficiency-related issues was given to code officials to close the interview. Four of the respondents provided the following information:

- "Work with Chambers of Commerce, Builders Associations and Trade Associations to assist in getting the word out to the industry."
- "Developers are still not aware of changes."
- "Class was very helpful—all three [people] attending liked the course."
- "Enjoyed the class and would attend again."
- "Seminar was a half day and covered too much—break up the topics so they can be covered more in depth."

2.6 Summary of Significant Findings

The following significant findings are evident from the research conducted with code officials:

- **Familiar with existing code** – Code officials say they are familiar with existing codes since seven of the 10 respondents indicate at least being somewhat familiar and the other three respondents are on the border rating their familiarity as neutral.

- **High level of satisfaction with BECT course –** All but one code official finds the course they attended at least somewhat useful. The other code official rates it neutral primarily because the course he attended did not include enough material related to the code changes.

- **Continuing education important** – Code officials indicate throughout the interview process the importance of continuing education, especially related to the code changes. An example from one code official that illustrates this importance is: "Our building official is adamant about education." Another opinion expressed is: "We sent staff to training for the changes already and we are hosting an additional training September 22." Additional courses related to the changes in Title 24 and lighting requirements are rated exceptionally high by code officials.

- **Good relationship with builders –** Code officials indicate that they have good relationships with builders and they attempt to work with them to produce energy efficient homes. From their perspective, they do not see the relationship with builders as adversarial.

- **Lack of education a barrier –** All of the code officials find that education is a barrier to greater energy efficiency. In particular, educating the people that actually build the homes (i.e., trade laborers) is important because they don't understand energy codes and, hence, do not always install measures in a manner that meets code.

- **Handout for builders suggested –** Three respondents suggest that handouts be developed for builders. For example, one respondent notes: "Cheat sheets—a small pocketsize handbook with the major things to look for on an energy inspection related to the code changes [would be helpful]."

- **Small number of EnergyStar homes –** Code officials indicate an average of 16 percent of homes are currently built at 15 percent or more above code in their jurisdictions. In contrast, when the same question is posed to builders who participated in a BECT course, the builders say that 50 percent of the homes they build are at the 15 percent above code or higher level.

- **Slowdown in market occurring –** A number of code officials predict that 2005 will be slower than 2004 and that 2006 will be the same as or slower than 2006 (70 percent).

Chapter Three: Interviews with Builders Attendees

This chapter summarizes our research related to residential home construction professionals that attended one of the Building Energy Code Training (BECT) Courses offered as part of the California energy efficiency programs. These courses took place over a two-year period in 2004 and 2005. The courses are designed to assist industry professionals gain a better understanding of existing code and code changes that take place in October 2005.

Ten builders who participated in the BECT course were interviewed. The feedback provided by builders and presented in this document is organized as follows:

- Code Status
- Satisfaction with Training
- Interest in Additional Courses
- Market Information
- On-site Training
- Energy Efficiency Practices
- Additional Suggestions or Comments

The first section of this chapter describes the methodology for the interview process and information related to the people interviewed. The subsequent sections present the data by the headers shown in the bullet points above.

The data originated from the ConSol tracking system. The original sample of building industry professionals comprises approximately 1,300 individuals who had taken the BECT course over the past two years. From this list, the number of potential candidates was reduced to 536 where phone numbers were readily available. From this group, 50 people were selected to be part of the in-depth interview sample.

The interview began with an introduction and one screening question to ensure that the people had actually attended the BECT course.

People were next asked to describe their role at their particular company. The categories for each job role were included as part of the interview. Respondents were asked to clarify which category fit best, when their initial response did not conform to the provided choices. Their roles at their companies are illustrated in Table 3.1 below. As evident in the table, the builders interviewed represent a diverse group of professionals with the largest group (40 percent) comprised of managers involved with the construction phase of the project. Throughout the rest of this document, the term builder is used to represent the various types of industry professionals that were interviewed.

Table 3.1: Job Role

Title	#	%
Design	-	0%
Purchasing	2	20%
Land Acquisition and Development	2	20%
Plan Development and Code Approval	1	10%
Finance	-	0%
Construction	4	40%
Sales	-	0%
Owner or President	1	10%
Other	-	0%
Total	**10**	**100%**

3.1 Market Information

An understanding of builders' current practices and perceptions regarding market activity are crucial to the program design in general and to the marketing plan more specifically. In addition, this information can feed into the design of future course material.

Similar to code officials, builders were asked what they are currently doing in relation to the code changes that take affect in October 2005. Their responses were recorded and then compared to the statements as shown in Table 3.2. If there was an uncertainty during the interview, builders were asked to clarify what they meant in relation to the statements. At the time of the interviews, all of the builders were doing something related to the code changes. None of the builders had the capacity to build homes that were compliant and above the existing code levels.

Table 3.2: Activity Related to Code Changes

Response	#	%
We're doing nothing as of yet	-	0%
Currently planning, but no changes yet	2	20%
Beginning to incorporate code changes	5	50%
Homes are now compliant with new code	3	30%
Homes are now compliant and will be above code	-	0%
Total	**10**	**100%**

More important to the BECT program is how are configuring homes to meet code. All of the builders indicate they have at least figured some things out related to how they will build homes given the new code. In fact, forty percent of the builders indicate that they have figured out all they need to configure the homes to meet code. Even with this high response rate, 80 percent of the builders are at least somewhat interested in additional assistance in how to configure the homes to be in compliance with the new codes.

The response rate decreases dramatically when builders are asked if they have figured out how to build homes that exceed the new code by at least 15 percent. Only one company indicates that they have figured out all they need in relation to this question. The builder responded: "This is all that a division of our company does—figure out what is next as far as energy efficiency and meeting code." This particularly company happens to be a large builder that can dedicate staff to this venture.

Seventy percent of respondents indicate that they will not be building homes 15 percent above code. For example, one builder noted: "our company is not going to do this [build 15 percent above code] so we wouldn't be interested."

Even so, 80 percent indicate that it would be at least somewhat valuable to them to receive assistance in how to build homes that exceed code by 15 percent. However, only 30 percent of respondents think that assistance on how to build at 15 percent above code would be extremely valuable, while 60 percent of respondents think that assistance on how to meet code would be extremely valuable.

Next, builders were asked how many homes they built in 2004 in order to better understand the size of the companies operating in the marketplace. Their responses are summarized in Table 3.3. Companies of all different sizes are represented; with the vast majority of builders (80 percent) constructing 1,000 homes or less.

Table 3.3: Homes Built in 2004

Range	**#**	**%**
100 or Less	4	40%
101 to 1,000	4	40%
1,001 to 10,000	1	10%
Greater than 10,000	1	10%
Total	**10**	**100%**

Builders were then asked how many homes they expect to build in 2005. Some builders were not sure on a number so they expressed their answer in comparison to how many they built in 2004. The results are shown in Table 3.4. As evident from the table, all of the builders are constructing either the same or more homes than in they constructed in 2004.

Table 3.4: Homes Built in 2005 Compared to 2004

Response Indicated:	#	%
More than last year	6	60%
Same as last year	4	40%
Less than last year	-	0%
Total	**10**	**100%**

An important evaluation topic is to estimate how many homes are built above code. Builders were first asked how many of their homes are built at least 15 percent above code and then asked to specify how many of the remaining homes are above code versus right at code. The results are illustrated in Table 3.5.

The second column shows the average of the ten builder responses. A surprising number of builders indicate that they are building a large number of homes at 15 percent or more above code. As shown in the last column of Table 3.5, four builders indicate that all the homes they build are currently at this level.

Table 3.5: Homes Built in Relation to Code

Percent at:	Avg	Std Dev	Mode	# @ 100%
Right at code	30%	44%	0%	2
1 to 14% above code	20%	33%	0%	1
15% or greater above code	50%	47%	0%	4

3.2 Satisfaction with Training

A baseline of knowledge prior to attending a course is essential in understanding the impact of the training courses. First, builders were asked, on a scale from one to five with one being very familiar, how familiar they were with the existing energy code ***prior*** to attending the course. A summary of their responses is shown in Table 3.6. Familiarity is minimal since only two builders indicate they were very familiar with the codes. An additional three builders were somewhat familiar ahead of attending the course. The remaining five builders were neutral to not at all familiar with the codes.

Table 3.6: Familiarity with Codes

Rating	#	%
Very Familiar	2	20%
Somewhat Familiar	3	30%
Neutral	3	30%
Not Very Familiar	1	10%
Not at All Familiar	1	10%
Total	**10**	**100%**

All the builders indicate that the BECT course met their expectations in full. Builders that hesitated or sounded unsure were asked whether it only partly met their expectations and none of them changed their response to the course only partly meeting their needs. Builders were also asked whether they had any issues with the course material or in how it was presented to them. All of the attendees indicated there were no issues. In fact, many of the attendees expressed how satisfied they were or added that it was a "good course" after being asked this question.

Builders were asked their reasons for originally attending the course. There were a number of reasons given. Allowing for multiple responses, grouping builder responses into similar categories produce the following summary:

- Learn about the code changes (six responses)
- Determine compliance with the new code (three responses)
- Understand the costs involved with compliance (three responses)
- Obtain general knowledge (one response)

Finally, builders were asked to rate the usefulness of the course in relation to understanding existing Title 24 Code and the changes taking place in October 2005.

Table 3.7 shown below includes a summary of the builder ratings. All of the builders consider the course at least somewhat useful in relation to the code changes.

Table 3.7: Usefulness of Course

Rating	#	%
Extremely Useful	3	30%
Somewhat Useful	7	70%
Neutral	-	0%
Not Very Useful	-	0%
Not at All Useful	-	0%
Total	**10**	**100%**

3.3 Interest in Additional Courses

Given their attendance at one of the BECT courses, the builders were asked their interest in taking additional courses next year. The results are shown in Table 3.8 below. The information in the table clearly indicates a high level of interest in all courses.

Table 3.8: Interest in Additional Courses

Course	Likely				Unlikely	
	1	2	3	4	5	Avg
Changes to the Title 24 Code	8	2	-	-	-	1.2
Lighting requirements in Title 24	7	2	-	1	-	1.5
How to specify buildings that meet the new code	6	2	-	1	1	1.9
Use of home energy ratings systems	5	3	-	1	1	2.0

In addition to the information shown on Table 3.8, builders were asked if there were other courses that they would like to see taught by the Building Industry Institute. Three builders' added ideas for topics including a course geared towards electricians, a zero energy course including information on solar panels, and anything related multi-family fire code or energy code.

3.4 On-site Training

An option for builders is to take a course in which the action takes place at the construction site. The Building Industry Institute on-site training is done on two different homes. The first home must be in the framing stage so that proper installation can be demonstrated. The second home must be in the finishing stage with electricity available so that diagnostic testing can be conducted.

Builders were first asked whether they had attended one of these courses. Four builders responded yes and all four of the builders rate the training as extremely valuable. One builder added: "Very thorough training and the trainer was well spoken." Another builder who had not participated said: "I can see with a pertinent trade that the training could be valuable."

Builders were then asked whether they would be interested in this type of training for their company. Interest in on-site training is evident in that eight of the ten interviewees responded that they would be interested. The two builders responding no were asked why and they said:

- "when we start in zero energy projects in 2006 we might be interested"
- "we are already doing this with another company"

3.5 Energy Efficiency Practices

To gain a better understanding of possible long-term impacts of the training courses, builders were asked whether their firm implemented any energy efficiency practices as a result of attending. There was an even split on this issue with 50 percent responding yes and 50 percent responding no. Comments include:

Responding Yes

- Changed HVAC practices (two builders)
- Changed lighting practices (one builder)
- Incorporated new information on plans (one builder)
- Not sure of the specifics (one builder)

Responding No

- Already building at least 15 percent above code (two builders)
- More informational gathering (one builder)
- Incorporated new information on plans, but no changes to construction practices (one builder)
- Helped confirm the scope of work for projects (one builder)

Training course material is generally designed to meet the general audience in the building community. To explore the possibility of targeting material at particular sub-groups within the building community, builders were asked who the most important people at their companies are in relation to energy efficiency and

the design/build process for new homes. Architects and Owners/Executive Level Management are indicated most often (four builders). Other responses include:

- Project Management (three builders)
- Marketing (two builders)
- Planning (one builder)
- Special division focusing on this issue (one builder)
- Anyone in the company has equal say (one builder)

3.6 Additional Suggestions or Comments

When presented with an opportunity to provide any additional comments they would like, only one builder took advantage of this opportunity. His comment was: "Pressurizing HVAC lines and insulation problems covered in the on-site is good. I was concerned with the new lighting requirements—we build custom homes and using fluorescent lighting in kitchens isn't very appealing."

3.7 Significant Findings

Significant findings that were evident from the research with builders include:

- **BECT Course is helpful** – Prior to the course, code familiarity was minimal for at least half of the builders. Only two builders indicate they were very familiar with the energy code prior to taking the course. However, satisfaction with the training course is very high. All of the respondents indicate that the course fully meets their expectations. Everyone also found the course at least somewhat useful for performing their jobs.

- **Additional training is desired** – There is a very high interest in all sorts of additional training. Topics of special interest include:
  - More information related to the code changes
  - Lighting requirements
  - Zero energy
  - Multifamily energy code requirements
  - On-site training

- **Code changes are being incorporated** – The majority of builders (80 percent) is either beginning to incorporate the changes for October or is already building homes that are in compliance. However, only one builder indicates he knew how he would build homes that exceed the new code by at least 15 percent.

- **Additional assistance is desired** – Even given the existing work to meet code changes, interest is very high for assistance in meeting and exceeding code after the October changes take effect. Eighty percent of

the respondents indicate that it would be at least somewhat valuable to receive assistance on how to meet code after October.

- **Market maintaining momentum** – All of the builders indicate that they will build either more or the same number of homes as in 2004.

- **Large number were building EnergyStar homes under old code, but do not plan to yet under new code** – A surprisingly high number of builders indicate that they are building the majority of homes at least 15 percent above code. In fact, the average of their responses indicates that 50 percent of the homes being built are at this level. However, almost none of these builders plan to build 15% above the new code. Many do not know how they would accomplish this. There is a need and an interest in helping builders design and build at the new plus 15% level.

- **Minimal changes in energy efficiency practices** – Changes in energy efficiency practices resulting from the course attendance are minimal according to the builders interviewed. Only three builders indicate specific changes in building practices involving HVAC or lighting. An additional builder says they are changing how they specify their plans in relation to energy efficiency measures.

Chapter Four: Results of the Attendee Survey

The methodology included a survey of past attendees to determine their satisfaction with the survey, issues they had encountered, and actions taken as a result of attending the survey. Though originally proposed as a telephone survey of attendees, the actual survey was implemented as a web survey. Given the complexity of the survey questions, it was decided that the enumerators could not be expected to understand many of the specific building measures that would be given as responses to the questions. The web survey allowed the respondents to choose the correct answers without interpretation by the enumerators.

4.1 Characteristics of Attendees

The survey started with 667 email addresses of attendees to both the builder and jurisdiction sessions. When the invitation was broadcast to these addresses 90 were returned as undeliverable shrinking the sample to 577. From this sample we received 81 completed surveys; a response rate of 14 percent.

The composition of the 81 respondents is shown in Table 4.1.

Table 4.1: Composition of Respondents

	Number of Respondents	Percentage of Respondents
Builder/Developer	51	63.0%
Subcontractor	3	3.7%
Supplier	2	2.5%
Architect/Designer	8	9.9%
Local government planner or code official	17	21.0%
Total	81	

We then asked the builders to designate which aspects of the building trade they were involved in. Many of the respondents were involved in multiple responsibilities. The results are shown in Table 4.2.

Table 4.2: Responsibilities of Attendee Builders and Developers

	Number of Respondents
Design	18
Purchasing	32
Land acquisition and development	36
Plan development and code approval	22
Finance and fund acquisition	19
Construction	42
Sales	28

We then asked them to specify which building components they were involved in. Most of the respondents (41 out of 51) were involved in all aspects or all but one of the aspects from the list that includes: framing, insulation, windows and doors, infiltration and air sealing, heating, ventilation and air-conditioning, drywall, ducts, lighting and electrical, and plumbing. There were two respondents that did only HVAC, two that did only framing and windows, two that did only insulation, one that did framing and HVAC and one that did framing, plumbing, and electrical. Somewhat surprisingly, thirteen respondents said they also did solar.

We asked the code officials to specify which type of activities they were responsible for, and those responses are shown in Table 4.3.

Table 4.3: Responsibilities of Attendees from Local Governments

	Number of Respondents
Plan checking and/or approval only	6
Residential inspections only	2
Plan checking and/or approval and Residential inspections	8
Plan checking and/or approval and Residential inspections, and Local planning/area development	1
Total	17

4.2 Familiarity with Codes

We asked all respondents to gauge how familiar they were with the existing (2001) code before they attended the seminar. Table 4.4 shows the results

broken down by respondent type. Most attendees (83%) were at least somewhat familiar with the existing code. Subcontractors and architects/designers were the least familiar.

Table 4.4: Familiarity with the Existing Code

	Builder	Subs	Suppliers	Architects	Code Officials	Grand Total
Very familiar	16		1	3	7	27
Somewhat familiar	29		1	1	9	40
Not very familiar	5	2		4	1	12
Not at all familiar	1	1				2
Grand Total	51	3	2	8	17	81

4.3 Course Expectations and Satisfaction

We then asked respondents to state what they hoped to learn from the BECT training session. The responses given as open ended responses have been categorized into eight topics. These results are shown in Table 4.5. As can be seen, most stated that they wanted general information about the new code, and most of the rest wanted specific information about how the new code would affect costs, specs, or a specific building component. Only five respondents said they wanted information on the existing code.

Respondents were asked if the course met their expectations. Seventy-eight percent felt that the course had provided what they had hoped it would.

Table 4.5: Subjects Respondents Hoped Course Would Address.

	Builder	Subs	Suppliers	Architects	Code Officials	Grand Total
New Code	35	1		4	14	54
Existing Code/ General Code Info.	2	1	1	1		5
Lighting	5				2	7
Costs	5					5
Bidding Specs	1			2		3
Electrical	1				1	2
Inspections	1					1
HVAC		1				1
Grand Total	50	3	1	7	17	78

As can be seen, the respondents generally felt that the course did give them what they had hoped to learn in attending.

Table 4.6: Did Respondents Learn What They Hoped To?

	Builder	Subs	Suppliers	Architects	Code Officials	Grand Total
Yes	41	2	2	5	13	63
No					1	1
Partly	10	1		3	3	17
Grand Total	51	3	2	8	17	81

There were a quarter of the respondents who were only partly satisfied. Those whose expectations were only partly met gave the following explanations:

- There were a few examples shown from a very basic PowerPoint presentation. The handouts were just copies of the PowerPoint. Understanding codes and requirements is one thing but learning about more alternatives to standard fluorescent lighting would have been an upgrade to the presentation.
- I learned general concepts, not specific changes.
- It was a lot of info in a short time so it was great but difficult to retain.
- New T-24 changes for 2005.
- Learned about new products and how they compare to their competitors.

- Most of the information was related to single family housing. We do not build single family houses. We build multi-family housing (Condo's & Apartments). Therefore, most of the information did not apply for multi-family housing.
- I had hoped to learn some specific requirements RE: the third party hers inspections and how the local building department will interpret and enforce the new code, also what new materials and applications would be employed to achieve the new requirements.
- We were told at the training that the code would take place on any new building permits that were pulled after Oct 1st. In the county of Riverside, this was only partially true in that if your plans are approved you don't need to update. We updated our plans for nothing, and it cost us quite a bit.
- Not all methods, costs, and time changes could be explained (As I found out not all of these areas are as finite as I had hoped).
- Residential LEED.
- An easy to remember set of standards for complying with current code.
- I did receive knowledge from the class, but we did have materials in front of us (books were not delivered in time), and I was hoping to have more history as to what the Title 24 was, and were it was going. I just had the WAS missing.
- I was looking for more in-depth info on the changes.
- Commercial standards.
- It wasn't as detailed. Mostly covered lighting & insulations.
- Expected more practical training.
- In electrical, I felt we did not cover enough on bonding and grounding principles.

In Table 4.7, respondents marked how useful the course was in meeting existing Title 24 needs. Approximately half of the respondents found it extremely useful and most of the rest found it somewhat useful.

Table 4.7: How Useful Was the Course in Meeting Your Needs Regarding the Existing Title 24?

	Builder	Subs	Suppliers	Architects	Code Officials	Grand Total
Extremely useful	27	2		2	8	39
Somewhat useful	23	1	1	5	7	37
Not very useful	1		1		1	3
Not at all useful				1	1	2
Grand Total	51	3	2	8	17	81

In Table 4.8, respondents were asked how useful the course was in meeting the new 2005 code needs. The course was generally found to be more useful in meeting the new code needs than it had been in meeting existing code needs.

Table 4.8: How Useful Was the Course in Meeting Your Needs Regarding the New Title 24?

	Builder	Subs	Suppliers	Architects	Code Officials	Grand Total
Extremely useful	33	1	1	4	8	47
Somewhat useful	17	2	1	3	8	31
Not very useful	1					1
Not at all useful				1	1	2
Grand Total	51	3	2	8	17	81

4.4 Future Course Attendance

Respondents were asked the likelihood that they would attend BII courses if they were held in 2006. The responses, shown in Table 4.9, indicate a lukewarm desire for additional course attendance by these respondents. Courses that provide specific instruction on meeting the 2005 code requirements were the most likely to be attended in the future.

Table 4.9: Likelihood That Respondents Would Attend an Additional BII Course in 2006

	Extremely likely	Somewhat likely	Somewhat unlikely	Extremely unlikely
2005 changes to Title 24	6	7	28	36
How to specify/design buildings that meet the 2005 Standards	15	7	25	28
How to specify/design buildings that exceed the 2005 Standards	12	10	22	28
Lighting requirements/lighting opportunities in 2005 Title 24	5	5	26	43
The use of Home Energy Rating System	7	11	37	19
Meeting 2005 Title 24 in different climate zones	14	21	22	17

Respondents were asked to suggest other courses they would be interested in attending. Four courses, electrical codes, alternative financing, safety and fire codes, and dealing with moisture intrusion were mention twice. All other suggestions were only mentioned once.

As part of BECT, the Building Industry Institute offers builders on-site diagnostic testing and inspections at their construction sites. We asked attendees if they had taken advantage of this on-site training. Of the 51 builders, 17 said they had taken the on-site course and 32 said they had not.

We then asked the 17 that had taken the class to rate the value of the course. Table 4.10 gives the responses.

Table 4.10: How Would You Rate the Value of the On-Site Training That You Received?

Extremely Valuable n=8
• They present information and equipment that we do not have access to on a normal basis.
• Informative
• All superintendents were there hearing it at the same time and understand what is coming at them in the months to come with the changes
• It was interesting to find where houses leak air (infiltration)
• Had never seen it performed before. Showed many locations that I didn't realize would leak when tested. Very informative.
• It is important that the field staff know what is expected of them
Somewhat valuable n=8
• I had the same trainer at the on-site training as in the class room for the new energy code and I found that they were more about sales than education
• Because some of the issues being recommended are for housing not multi-family structures.
• Because it was too short!
• Have not been to on-site training in some time.
• Did not receive written report results back. Do not know how we tested and what are recommendations for improvement.
Not at all valuable n=1
• I have not received the results as was promised when signing up for the training, as represented to me by ConSol.

We asked the respondents to provide additional detail about what they liked about the on-site class; what they like and what they wanted to see improved. These answers are given in Table 4.11.

Table 4.11 What Respondents Liked about the On-site Session and What They Would Like to See Improved

What Respondents Liked
• visual aids
• hands on situation
• There was some good practical practices that can be implemented
• the familiarization of testing process's
• We tested our own product
• Testing process. Would like to learn more.
• Hands on, this is how its done and what to expect if there are failures.
• Review of construction methods and installation.
• It brought the training out to the field
• It gave you a visual of what typical issues were in the field.
• detail
• The ability to visualize the requirements as they apply to field conditions. The convenience of assembling the various trades in one place so that they can see the need and the importance of complying with the code requirements and how their field applications need to be addressed or improved so as to be in compliance
What, if anything, would you like to see improved?
• More written detail
• Better training of field personnel by subcontractors and improved quality control to insure proper application/installation practices
• More time spent on various aspects of the classes you have.
• Follow-up on diagnostic testing results/report.
• More often
• Not be so technical when people in the class have little or no knowledge.
• Stick to training
• getting my results would be very useful to determine how far we have to improve.
• Once again, address multi-family housing.
• Some classroom testing

We asked those builders who had not yet participated in an on-site session to gauge their interest in attending one. Table 4.12 shows the interest level.

Table 4.12: Interested in On-sites for Those that Have Not Participated

	Number
Yes	9
No	7
Don't know	14

We then asked them if they had the necessary conditions for hosting an on-site session. These requirements are two homes under construction where one is in the rough stage, before drywall is installed, and a second near completion. Table 4.13 shows whether attendees who have not attended on-sites have the conditions needed to host an on-site.

Table 4.13: In the near future, will you have two homes available, one with insulation installed, and a second in the finished state with electricity available?

	Number
Yes	12
No	2
Don't know	6

4.5 Awareness of CEEP

We asked the respondents if they had ever heard of the Community Energy Efficiency Partnership (CEEP). CEEP is a companion program also run by the Building Industry Institute that recruits local jurisdictions to support energy efficient new home construction by rewarding builders for building homes 15% above Title 24 standards. As Table 4.14 indicates, very few of the attendees had a clear understanding of CEEP and only 2 out of 81 had previously participated. Given that all BECT courses include a small segment on CEEP, this low awareness is surprising.

Table 4.14: Awareness of CEEP Program

	Builder	Subs	Suppliers	Architects	Code Officials	Grand Total
Yes, I have been involved with projects that have qualified for CEEP	2					2
Yes, I am aware of the program, but I have never participated	16		1	1	5	23
Yes, I have only heard of the program, but I have never participated	10				7	17
No, I am not aware of the program	23	3	1	7	5	39
Grand Total	51	3	2	8	17	81

4.6 Builders Current Activity and Efficiency Level

We asked each builder to provide the number of homes they build each year. These results are summarized in Table 4.15. Most of those attending are the larger production builders. Only three of the 37 respondents built 20 or less homes in 2004.

Table 4.15: Attendee Builders Activity in 2004 and 2005

	2004	Projected 2005
Mean	444	492
Standard Deviation	456	498
N	37	36
Minimum	0	0
Maximum	2400	3000
Median	198	250

We then asked the builders to classify what percentage of their homes were built to code, built above code or built to 15% or more above code. The results are:

- 14 builders build to code only 100% of the time
- 3 builders build to above code 100% of the time
- 19 builders build to ES or above 100% of the time.
- 5 builders sometimes build to code and sometimes build to above code
- 2 builders sometimes build to code and sometimes build to 15% above code
- 3 builders sometimes build to above code and sometimes build to 15% above code
- 3 builds build at all three levels

When we weight the categories by the number of homes built we find the results shown in Table 4.16.

Table 4.16: The percentage of homes built by efficiency level, weighted by total homes constructed by respondents

	Percent
Homes built at code	28%
Homes built above code	25%
Homes built at 15% above code	47%

We then asked the respondents to classify how they were responding to the new code requirements. The survey was performed in late September early, October just as the new code was coming into effect. Table 4.17 shows the results. We also asked those respondents, who were not already meeting the new code requirements whether their firms had figured out how they will meet the code requirements. These results are shown in Table 4.18.

Table 4.17: How Are Respondents Dealing with New Code Requirements?

	Build 100% at code	Build some at code and some above code	Build 100% above code but not at Energy Star	Build some (<10%) at Energy Star	Build 100% at Energy Star or above	Grand Total
We are doing nothing as of yet		1				1
We are planning how to comply with the new standard, but we have not yet made any changes to the building specifications			1		1	2
We are beginning to incorporate the requirements of the new standard into the homes we are now designing/building	10	2	1	2	5	20
The homes we are designing/building now are compliant with the new standard, and they will continue to be so after October	3	3	1	4	3	14
The homes we are designing/building now are exceeding the new standard, and come October we will be building homes that are above the new standard	1			1	8	10
Don't know					2	2
Grand Total	14	6	3	7	19	49

Table 4.18: Has Your Company Figured Out How to Build Homes at the New Code?

	Build 100% at code	Build some at code and some above code	Build 100% above code but not at Energy Star	Build some (<10%)at EnergyStar	Build 100% at Energy Star or above	Grand Total
Yes, we have figured it out	5	1	2	1	4	12
We have figured some things out, but still have some areas to work out	2	1		1	2	6
No, we have not figured out how we will build homes after October	1					1
Don't know	2	1				3
Grand Total	10	3	2	2	6	23

We asked an open ended question of builder respondents who are not yet meeting new code to give us a list of their biggest challenges in meeting the new code. The answers have been classified into categories in Table 4.19. We also asked this group if assistance would be useful in helping them configure their houses to meet the new code. These responses are summarized in Table 4.20. It appears as though these builders would find design assistance helpful.

Table 4.19: Biggest Challenge in Meeting New Code for Builders Not Yet Building to New Code

	Number
Lighting	12
HERS	4
HVAC	1
Don't Know	4

Table 4.20: Would Assistance Be Helpful--Asked of Builders Not Yet Building to New Code

	Number
Yes, extremely valuable	5
Yes, somewhat valuable	7
No, it would not be something we would use	3
Don't know	5

We asked those builders who had previously built some or all of their homes at the EnergyStar level of 15% above code, whether they had defined procedures to build homes 15% or better above the new code. These results are shown in Table 4.21. Most of these builders have yet not figured out how to build at this level.

Table 4.21: Has Your Company Figured Out How to Build Homes at the 15% above the New Code?

	Build some (<10%)at EnergyStar	Build 100% at EnergyStar or above	Grand Total
Yes, we have figured it out	3	5	8
We have figured some things out, but still have some areas to work out	3	6	9
No, we have not figured out how we will build homes after October		5	5
Don't know	1	3	4
Grand Total	7	19	26

We also asked these builders, who had previously built some or all their homes at the EnergyStar level, to name the biggest challenges facing them in building to 15% above code. Their responses are categorized in Table 4.22

Table 4.22: Biggest Challenge in Meeting 15% Above New Code

	Number
Lighting	5
Costs	7
Not Knowing What Measures Will Be Needed to Reach +15%, Not Know What EnergyStar Will Look Like	6
Getting Information to Trades	4
Getting Code Approval	2
Cool Roofs	1
Don't Know	4

We also asked these builders, who had previously built some or all their homes at the EnergyStar level, if design assistance would be useful in helping them build houses 15% above the new code. Table 4.23 shows that 15 respondents would find that a useful service.

Table 4.23 Would Assistance Be Helpful--Asked of Builders Not Yet Building to New Code

	Number
Yes, extremely valuable	5
Yes, somewhat valuable	10
No, it would not be something we would use	7
Don't know	5

4.7 Challenges for Trade Allies

We asked the suppliers, subcontractors, and architects to provide the biggest challenges for them in meeting the new code. Their responses include:

- Architect: Lighting - Making comfortably lit spaces with fluorescent lighting and not breaking the budget by using an over abundance of dimmer switches or fluorescent tinting.
- Architect: I didn't learn enough to know how to answer.
- Architect: Educating the builders
- Architect: Cost
- Architect: Fluorescent lighting capabilities... or, actually, lack of.
- Architect: Not yet known

- Architect: Finding reasonable exterior title 24 fixtures, the ones that look nice are to expensive for the builder who does 15 houses at a time.
- Architect: The electrical requirements: the cost of three-way and dimmer switches restricts the lighting choices we use to have under the 2001 code, and oftentimes leaves fluorescents as the only choice, which could provide undesirable lighting if installed at the cheapest level.
- Subcontractor: Finding the right style of light fixture for the customer that meets the 2005 building code
- Supplier: Education of clients
- Supplier: Informing the builders as to how the changes will affect them in terms of cost.

4.8 Jurisdiction Responses

We asked the jurisdictional attendees if they used the CF-R6 forms. Table 4.24 indicates that have of the respondents do use the CF-R6.

Table 4.24: Do You Now Provide CF-6R Forms?

	Number
Yes	8
No	8
Don't know	1

We then asked the jurisdictional attendees what are of the new code will be hardest to enforce. Their answers, shown in Table 4.25, indicate a large concern about lighting code requirements.

Table 4.25: Which Areas of the New Code Will Be The Hardest to Enforce?

	Total
Lighting efficacy	8
Lighting controls	9
HVAC sizing	5
HVAC EER	7
Insulation quality	4
Duct sealing	7
Third party testing	1
Don't Know	1

Jurisdiction respondents were asked if they had made any changes in the way they approved plans or inspect buildings as a result of attending the workshop. Table 4.26 shows that the majority have made changes as a result of the workshops. Table 4.27 lists those changes.

Table 4.26: Have You Made Any Changes in the Way You Approve Building Plans or Inspect Buildings as a Result of Attending a Workshop?

	Number
Yes	14
No	1
Don't know	2

Table 4.27: Which of the Following Specific Measures Do You Now Require and/or Inspect that You Did Not Require and/or Inspect Before Attending the Workshop?

	Total
Lighting efficacy	7
Lighting controls	5
HVAC sizing	5
TXV	2
HVAC EER	3
Insulation quality	6
Duct sealing	5

4.9 Energy Saving by Builders Resulting From BECT

Builders were asked if they implemented any of the measures that they learn at the BECT training sessions. As Table 4.28 indicates, 24 of the 51 builders made changes. Table 4.29 shows the areas where these savings occurred.

Table 4.28: Did Your Firm Implement any Energy Efficiency Practices as a Result of Your Attending the BECT Training?

	Number
Yes	24
No	12
Don't know	9
No Response	6

Table 4.29: In What Areas of the Houses You Build Did You Make Energy Saving Changes Resulting from Your Attendance at the BECT Seminar?

	Total
Insulation	14
Air infiltration	8
Windows and doors	5
Lighting	16
HVAC	16
Duct work	13
Water heating	5

The builders who stated that they had not made changes were asked to choose the reasons they had not made any changes. Their responses are shown in Table 4.30.

Table 4.30: What Are the Reasons Your Firm Did Not Adopt Anything Presented at the BECT Seminar? Check All that Apply.

	Number
My firm already does everything possible in a house	3
My firm already meets code in the houses we build	4
My firm already builds to EnergyStar	2
The seminar did not present anything new	4
I am not in a position to make changes in the houses we build	1

4.9.1 Insulation

Of the 14 respondents that claimed they changed their insulation practices,

- nine now reduce voids,
- eight reduce compression,
- five add more insulation—three add more to attic, three add more to walls, one adds more to knee walls, and one adds more to rim joists,
- five do more sealing of penetrations, and

- three install insulation in areas they where before they did not install insulation—one now insulates walls to R19, one now insulates knee walls, and one now insulates rim joists to R13.

The builders who changed their insulation practices added the following specific comments:

- Buried ducts
- Adding more and tighter along edges and corners.
- Not just due to the training but because the code is now in effect we have made all the code required changes according to our energy calculations.
- Better ratings and strict scope of work with inspections to determine proper installation
- More critical of installations
- Not allowing any voids. Reduce compression of insulation.
- Better quality of work to cover voids and less compression
- Making sure the insulation is not compressed within the wall, no voids in the insulation and making sure the insulation is in contact with drywall

4.9.2 Air infiltration

The builders who changed their air infiltration practices added the following specific comments:

- Changed standard spec to include points of inspection
- Making sure there is fresh air intake within the house
- More sealing of electrical boxes, windows, registers, and at green plate of home and any light showing thru framing
- Better caulking @ framing/windows/door openings
- Upsize units
- Sealing of penetrations

4.9.3 Windows and Doors

The builders who changed their windows and doors practices made the following changes:

- Specifying increased specs for manufacturer
- We were already pro-active in regards to window installations
- Just by sealing better
- I'm more observant on installation and hold the sub-contractors to a higher standard

4.9.4 Lighting

Table 4.31 shows the changes builders made in their lighting practices as a result of attending the BECT training sessions.

Table 4.31: Builders' Changes Made to Lighting Practices as a Result of BECT Attendance

	Total
Reduced the amount of light fixtures in the house	1
Specified more high efficacy lamps	14
Specified switched junction boxes in lieu of light fixtures	4
Specified switched receptacles in place of light fixtures	3
Specified occupancy sensors to control non-high efficacy lights	8
Specified motion/photo sensors to control exterior lighting	10
None of the above	2

4.9.5 HVAC

The builders who changed their HVAC practices made the following changes:

- We are in the process of incorporating (trying out) a few changes due to the course and are going to evaluate the difficulty and importance/necessity/benefit of them.
- Using higher seer and third party inspections
- Duct testing and rough inspections
- Updated to 13 SEER
- Upgrading the units
- Increased SEER rating, duct testing
- Better sealing, higher efficiency
- Do duct testing randomly
- Higher SEER
- Increased SEER rating on condensers, R6 duct
- Upsize units
- Checking for better positive connections and relocating of registers.

4.9.6 Ducts

The builders who changed their duct practices made the following changes:

- Tight duct testing
- Duct testing for selected projects, to conform with new energy codes
- Duct testing
- Duct sealing, tight duct
- Better duct and stricter installation requirements
- R6 foil wrapped duct
- Not sure of anything more than the R-6
- Having the HVAC contractor perform to the new standards

4.9.7 Water Heating

The builders who changed their water heating practices made the following changes:

- Better efficiency
- On demand systems
- Increased efficiency water heaters, but only as specified in our energy calculations

Chapter Five: Pre-test Results

To test the knowledge of the attendees coming into the training, a five-question pre-test was given before the training started. The test was administered to attendees of the builder classroom session in eight locations. A total of 62 attendees answered the questions.

The five questions were as shown in Table 5.1.

Table 5.1: BECT Training Pre-Course Assessment

Course Location:_____, Date: _____
What is your occupation? _____

Q-1: How much incandescent lighting can a builder install in a 2001 compliant kitchen?

A 100% of general lighting,
B 100% of task lighting,
C 50% of task lighting,
D 50% of general lighting,
E 50% of all lighting,
F none.

Q-2: What percentage of kitchen lights can be incandescent under the 2005 Code?

A 100% of general lighting,
B 100% of task lighting,
C 50% of task lighting,
D 50% of general lighting,
E 50% of all lighting,
F none.

Q-3: In 2001 Code, how much of the water piping entering and leaving the water heater must be insulated?

A All of the piping,
B 20 feet,
C 10 feet,
D 5 feet,
E none.

Q-4: What is the difference between storage and large type water heaters?

A Storage type water heaters are less than 40,000 BTUs and large type water heaters are more than 40,000 BTUs.
B Storage type water heaters are less than 75,000 BTUs and large type water heaters are more than 75,000 BTUs.
C Storage type water heaters are less than 100,000 BTUs and large type water heaters are more than 100,000 BTUs.
D Storage type water heaters are less than 120,000 BTUs and large type water heaters are more than 120,000 BTUs.

Q-5: Are INSTALLATION CERTIFICATES (CF-6R's) required under the 2001 version of Title 24?

A Yes, always,
B Only when a HERS rater is used,
C No.

The results show a low understanding of the code by attendees, especially the lighting questions. Only 13% of the respondents knew that the current code allows 100% of the kitchen task lighting to be incandescent, and 24% knew that the new code allows 50% of all kitchen lighting to be incandescent. More than 30% of the respondents answered the other three questions incorrectly. Figure 5.1 shows the percentage of respondents getting each of the questions correct.

Figure 5.1: Percentage of Correct Answers

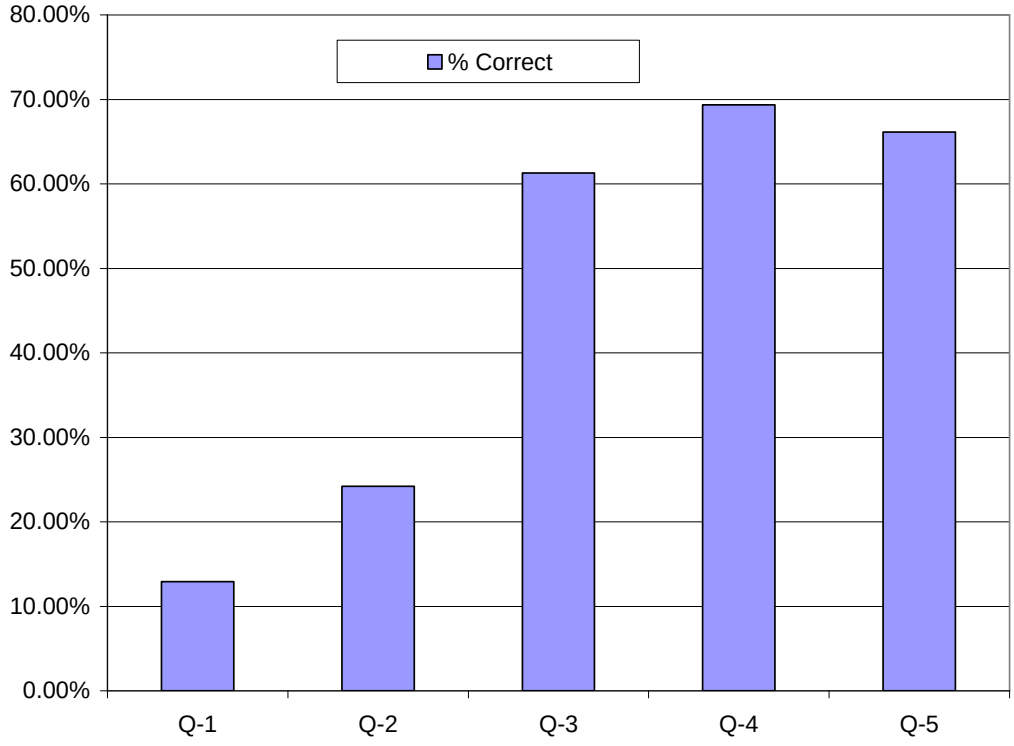
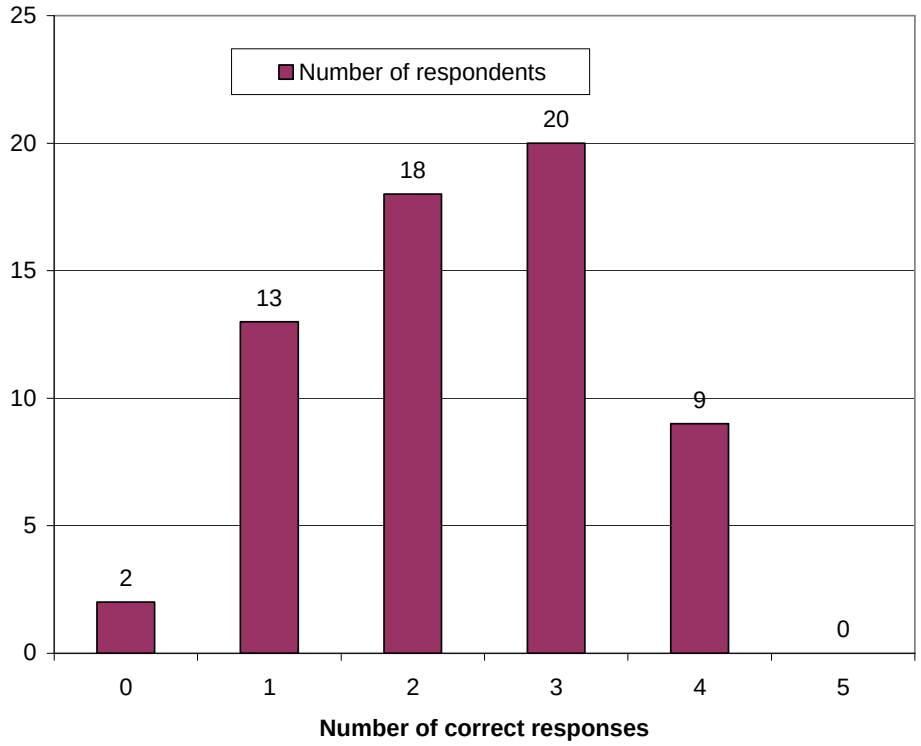


Figure 5.2 shows the resulting scores for each individual respondent. Not one of the 62 respondents was able to answer all five questions correctly. More than half the respondents answered two or less of the five questions correctly. The average score on the test was 2.3 correct answers.

Figure 5.2: Respondent Tabulation of Pretest Questions



No examines were given after test was completed. It is recommended that at some future courses, the exam be given at the end of the course.

Chapter Six: Policy Recommendations

Over the last several years BECT has been one of the few sources of information on energy-efficiency building code for the building industry in California. The California Utilities offer some courses in Title 24 compliance, though most of these are targeted at the HVAC community. Our survey and interview show that BECT is well received and the vast majority of attendees report to be satisfied with the training sessions.

Our own observations of the training sessions suggest that there are areas in need of improvement. We base our critique on the observation of five separate workshops, review of the course material and informal interviews with course instructors and participants. We also held a debriefing meeting with the BECT Program Manager to review the key elements of our findings, which are summarized below.

The course, as it is designed, provides intensive discussion of all aspects of the residential code. We found the course instructors to be extremely knowledgeable regarding the Title 24 codes, and both instructors do an effective job of keeping attendees' attention for the 3-4 hours the course runs.

However, a concern with BECT centers on the fact that the presentation of material to attendees is not the ultimate objective for the BECT courses. The real objective is to change the behavior of attendees so that builders can build to code and above and code officials can enforce the code. Because these courses are financed with Public Goods Charges (PGC) funds, there is also an implied need to deliver improvements in the energy-efficiency of new residential homes. This suggests that success is measured by how many attendees make improvements in the buildings they build or inspect (whether these improvements bring the buildings into code compliance or to levels of efficiency above what the code requires) based on their participation in the BECT course.

The recommendations we make below concentrate on changing the training so that it is more effective in *changing the behavior* of the attendees. This requires training experiences that focus on the specific needs of the individual participants, involves the audience in the learning experience, reinforces the important messages using a variety of instructional approaches, and provides the necessary support for participants after the course has been completed.

We know that ConSol appreciates these attributes because they are embodied in the on-site field training that is part of BECT. The hands-on, experiential learning that takes place at the on-site training is absent from the classroom. There is a sharp contrast in the delivery of these two training events, and an equally sharp contrast in their effectiveness in making lasting changes in participants' behavior.

With this in mind, we provide suggestions that should make the classroom lecture more effective in getting attendees to a) build better buildings or b) enforce the code more strictly.

6.1 Define Specific Outcome-based Learning Objectives for Each Training

The existing course materials (e.g., binder, PowerPoint presentation, misc. hand-outs) are clean, professional, and appropriate by adult education standards. The instructors are extremely knowledgeable and they do a good job presenting the material. The materials and instructors have, based on a top-level review of course evaluations and our survey results, been rated quite high by course attendees. Almost all of the attendees are satisfied with the seminars. It should also be noted that ConSol/BII has had no problem with scheduling trainings or recruiting attendees.

As mentioned, the true measure of the success of these workshops should be whether they move attendees to change their behavior. It is one thing to design a workshop that provides thorough and concise transfer of information, it is quite another to design a workshop that intends to have its attendees *do something* specific. We think it is important that the BECT team understand and embrace this outcome-based training as the real objective of each workshop. Doing so will require significant changes in the course content, the marketing of courses, and the instructional practices used.

In formulating our recommendations, we have relied heavily on the literature on adult education. This literature notes that adult learning experiences are different from school education. The key differences relate to the fact that adult training is short in duration and focused on a specific subject; and directed at older attendees who have busy lives and established working behavior. To be successful the training must be fully understood and accepted as worthwhile by the attendees, and encompassed into the work strategy. Introducing new ideas in a lecture series, no matter how important the material, only fulfils the first of these requirements. It is generally left for the attendee to work out on his or her own how to incorporate these facts into an action plan. Given the busy schedules and pressing deadlines of many workers, a situation exacerbated by the time taken to attend the course, it is not surprisingly that course attendance does not always lead to concrete or measurable changes in behaviors or business practices.

6.2 Redesign Courses to Reflect Adult Learning Needs & Train the Trainers

The world of adult education is full of smart people that have mastery of subject material and a willingness to teach. This does not, however, make them effective educators. There is a growing body of research on how adult learners absorb material, how they retain information, and what motivates changes in behavior. There is a wealth of information and resources available that can provide

ConSol/BII and its instructors with guidance on how to design and implement more effective adult trainings. According to the practices discussed in some of these recent studies, there are six elements that BECT courses should embrace. These include:

- Identify clear learning objectives (what the attendee will get out of the course) that match the course goals with the needs of attendees
- Know your audience! Each instructor is advised to inventory the specific needs and interests of each audience early on in the workshop. This process develops intimacy and allows the instructor to provide specific and anecdotal information helpful to that specific group.
- Limit course content (do not try to do too much within a single class), and prioritize materials so that the most important material is related first, last and reinforced throughout the course. Learner retention is highest when the adult learner has three different things to do in a one hour timeframe. Talking head lectures, while commonplace, are ineffective when compared to more interactive courses. (There is a reason they call it "death-by-PowerPoint.)
- Design and facilitate an interactive workshop that *requires* participation by attendees. This participation can be hands-on, but it can also involve role playing, design development, and other ways of developing class participation.
- Design course work that focuses specifically on changing behavior. Ideally, each attendee should leave the workshop with an action plan as to how to proceed with the material that was just learned. Some courses build the creation of the action plan into the workshop. Alternatively, ConSol/BII could ask each participant near the end of the lecture to write down specifically what they intend to do (differently) based on their learning and experience. Some of these might be shared with the class. This provides ConSol/BII, the instructors and evaluators with an invaluable means of understanding a) how attendees benefited from the training and b) what the attendees intend to do with these new found benefits.
- Consider follow-up opportunities that lead to reinforcement of material. One-time workshops do not have the means to reinforce important course material in different ways to ensure that material is understood and personalized. Furthermore, questions on how to put concepts into practice usually arise after the workshop is completed and attendees are back at work.. Attendees need access to resources that can their answer questions, and sometimes friendly encouragement to push forward with changes in behavior when the normal work load crush may be overwhelming. ConSol/BII should consider Web resources, redesign of the handouts, follow-up courses, post-attendance tracking, and even call-in and/or web-chat times for attendees where the instructor can answer questions.

6.3 Specific Recommendations for BECT Courses

The recommendations provided below focus on designing and implementing workshops that are directly centered on getting attendees to increase the energy savings in the buildings they build. Among the changes we strongly recommend are the following:

- Consider different audiences and different needs,
- Shorten courses by concentrating on specific areas
- Focus beginning segment on most important content
- Query attendees about their individual needs early in the session
- Add interactive components
- Redo PowerPoint approach
- Redo manual to be more useful
- Add web based support
- Place greater emphasis on on-site training

6.3.1 Consider Different Audiences and Different Needs,

The current courses are designed to provide value to all varieties of builders, designers, suppliers, and jurisdictions. The course introduces both existing code and the proposed changes for October 2005. The format of information transfer and discussion is designed to serve all attendees yet we question, given the disparate needs of each region and organization, if real tangible needs are being met.

Courses could be geared to the better meet the needs of each audience. In Wirtshafter Associates' review of the California Statewide Education and Training Services Program[6], it was shown that a course on energy efficient lighting design failed because it tried simultaneously to satisfy the needs of architects, interior designers, engineers, and lighting designers. Interviews revealed that each of these groups needed a specific focus for their training and that efforts to include them all met no one's interests.

While the majority of the respondents of the survey stated that they came to the BECT training to find out about the changes made in the 2005 code, the course dealt mostly with the existing 2004 code and only at the end discussed the new changes. In this case, the course never promoted itself as a 2005 Code Change course, but it was clear that the increased interest seen in the months leading up to the code change date was a good clue of the attendees' interests. Right now, there is a lot of interest in the BECT workshops because people and organizations are becoming aware of the October changes in code and looking for specific guidance on how to deal with changing code requirements. Since

[6] Wirtshafter Associates, Inc. "Evaluation of The 2003 Statewide Education and Training Services Program, for Southern California Edison, June 3, 2005

that is a primary motivation for many people's interest in attending, the course could focus specifically on new codes changes and strategies on construction and/or enforcement. While BECT does not need help right now in attracting attendees, changing the course title to "Helping Builders Deal with Changes to the Title 24 Code" and focusing specifically on the opportunities and obstacles in reaching the new code could be more effective in providing specific benefits to attendees. The workshops, which currently end with a short discussion of the changes in the 2005 code, could start by introducing the code changes and focus much more on the issues that the attendees identify as being problems or obstacles and make sure that, by the end of the workshop, these problems and obstacles have been addressed.

Furthermore, there is an opportunity to develop more specialized course offerings to meet the various needs of stakeholders. The survey revealed interest in the following courses:

- Meeting 2005 Title 24 in different climate zones
- How to specify/design buildings that meet the 2005 Standards
- How to specify/design buildings that exceed the 2005 Standards
- The use of Home Energy Rating System
- Lighting requirements/lighting opportunities in 2005 Title 24

6.3.2 Shorten Courses by Concentrating on Specific Areas

There is an enormous amount of information presented in the BECT classroom course. For many of the attendees, four hours of class time is often spent waiting for a few minutes that address their specific interests or concerns. And then, when their interest is addressed, it is only covered in a cursory fashion.

It may be that, even for generalists who have interest in all aspects of the code, trying to cover the entire code in one session is too much. Lots of information presented does not translate into information retained. In fact, it is commonly recognized that adult training courses should be designed to teach no more than three items at a course. If there is a demonstrable need to impart more than the three objectives, then it might be best to create separate, thematic sessions. It is also possible to string several of theses shortened courses together, so that interested parties from a builder can attend the specific session that are relevant to their individual responsibilities.

The issue arises that it is expensive to offer short courses. We therefore recommend that BECT piggyback two courses each day at a single location. The courses should be related so someone can attend both if they are interested in both topics.

6.3.3 Query Attendees about Their Needs Early in the Session

Marketing efforts that are clear about the course material, the benefits attendees will receive, and the target audience, should provide a group of attendees with

relatively common interests. However, the most successful workshops will, after introducing the course objectives, query the audience to see what their individual desires and needs are. This provides the instructor and attendees a chance to introduce themselves and to express their expectations. The query at this time can help the instructor know if background material needs to be supplemented or omitted, and what specific topics will warrant what degree of attention. A good instructor can get the sense of the group and find ways to keep the course on track, while still satisfying the particular needs of an attendee.

6.3.4 Focus Beginning Segment on Most Important Content Areas

The attention span of the average tired adult does not last four hours; therefore it is important to use the first twenty minutes to present the three most important aspects of the session when everyone is most alert. It is then important that these key concepts are revisited throughout the session.

6.3.5 Add Interactive Components Such as Developing Plans

Assessments of adult education programs make clear that lecture-centric modes are the least effective means of gaining information retention. Hands-on activities such as those conducted at on-site trainings are a far more effective means of gaining information retention.

There are many other ways to gain this type of active learning in a classroom setting. For example, development of new building plans, or brainstorming exercises are good ways to involve the attendees in active learning. Creating small groups that focus on problem solving activities are most likely to impact adult learning.

6.3.6 Revise PowerPoint Approach

The BECT PowerPoint presentation could be reworked to incorporate the content suggestions provided above. As importantly, the actual content of the slides needs attention.

Some slide titles do not give the audience an idea of the topic to be covered. For example, one slide says simply “Walls.” A title of “Methods for Improving Efficiency in Walls” would be more appropriate and meaningful to the audience.

The presentation could benefit by being divided into specific subjects with a summary slide introducing each topic. The slides need to state the important concepts in writing. The presenter gives a lot of key information verbally, but it needs to be in writing to focus attendees’ attention on important concepts. For example, the section on the 2005 code changes never shows collectively what changes are required. It would be better to include a list of 2005 changes, starting with a summary of areas changed, followed by details in each area.

6.3.7 Revise Manual

The current manual is a large accumulation of the PowerPoint presentation that is given by the lecturer. Some versions handed out to attendees include the speaker notes. If the manual is intended to serve as a resource for attendees, it is of minimal use in its current form. The support materials (those sections other than the PowerPoint presentation) will be more useful if they were better if integrated into one well-indexed reference source.

6.3.8 Add Web Based Support

If ConSol/BII decides to provide more tailored workshops, the breadth of material currently covered will no longer be covered in each class. There are two significant implications here. One is that the existing hand-outs, slides and notebooks will need to be redesigned appropriately for each workshop. The other is that it will be important to make the existing information easily accessible for anyone who needs it. The web is the logical medium for this resource. It is easy to imagine both new and existing code information presented by "chapter" and including detailed FAQ sections that relate to different audience questions and climate zones.

6.3.9 Place Greater Emphasis on On-Site Training

The on-site training is a valuable training tool. There are opportunities to expand on-site trainings and more aggressively recruit stakeholders to participate. Because it is so expensive to run the on-site course, BECT should look to bring some of the on-site experience into classrooms or use web-casts to enrich workshop learning and broaden stakeholder access.