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Market Driven Residential Energy Codes: Comparing Performance In A Changing Technical Environment, Code Official Survey Results

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Code Official Survey Results

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Market Driven Residential Energy Codes: Comparing Performance in a Changing Technical Environment

FSEC Energy Research Center Code Official Survey Results

Work supported by the U.S. Department of Energy under project EE0008699

September 30, 2020

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EXECUTIVE SUMMARY

An online survey of Energy Code Officials was conducted February 18 to March 20, 2020. The objective of the survey was to determine how Energy Code Officials across the country characterize the differences between prescriptive and performance-based code compliance methods. The intent was to determine how code officials viewed the performance differences, the office and field verification differences and the cost differences in terms of office and field time and effort requirements. The survey also sought to determine the prevalent energy codes that are used in the jurisdictions of the code officials participating in the survey.

There were 907 participants responding to at least some portion of the 48-question survey, though some questions received poor attention. Almost all participating identify as an inspector (391, 39%) and or a plan reviewer (347, 34%). The 2015 International Energy Conservation Code (IECC) was the most selected edition of the energy code in effect, reported by 228 responders. The 2018 IECC was the next most common at 169. Eleven responded they are using the 2006 edition. Almost all of the respondents indicating "Other" indicated a state code.

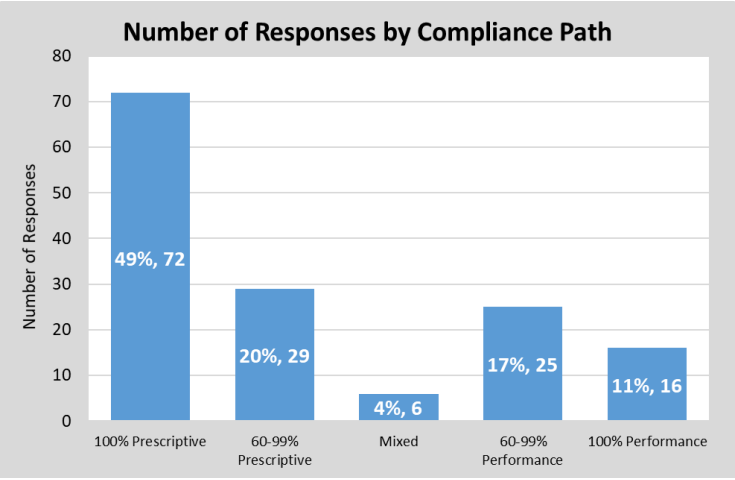

Figure Ex-1. Responses by Compliance Path Used for Projects.

Respondents were asked to estimate the number of projects by compliance method over the last twelve months. This question resulted in just 149 respondents, with almost half indicating 100% prescriptive as shown in Figure Ex-1. Respondents' answers to flexibility of compliance review did not differ significantly between groups. When asked why they thought builders chose the prescriptive path, respondents' number one answer related to prescriptive being easier. The median respondent who indicated the time spent at design, on-site, and follow-up for prescriptive

compliance homes totaled two hours, compared to three hours for performance. When asked subjectively to estimate which took longer to verify the answers were mixed, but the most popular answer was that performance takes longer (44%). Most respondents indicated they had some training available annually or more frequently, but over 10% indicated rare or no training. The report includes insight from respondents to an open-ended question on issues related to energy code compliance. Popular responses were categorized as education, HVAC-related, Envelope-related, cost, policy, blower door and testing, and additions and renovations.

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OVERVIEW

The Code Official Survey conducted for this project was launched on 2/18/2020 and closed 3/20/2020. There were 907 participants responding to at least some portion of the 48-question survey, though some questions received poor attention. Note that the number of responses to each question varies by design and depends on answers to prior questions. Further, multiple answers are sometimes allowed.

Roles of Respondents

Almost all of those participating identify as an inspector (391, 39%) or a plan reviewer (347, 34%). Of those checking "Other," building officials, chief inspector, CBO, and other local government employees saying they performed all tasks were most prevalent (74) and there were 20 respondents that indicated they were a 3rd party inspector, consultant or HERS inspector. There were five Architect/designers and four retired building officials that responded, and a mixture of others.

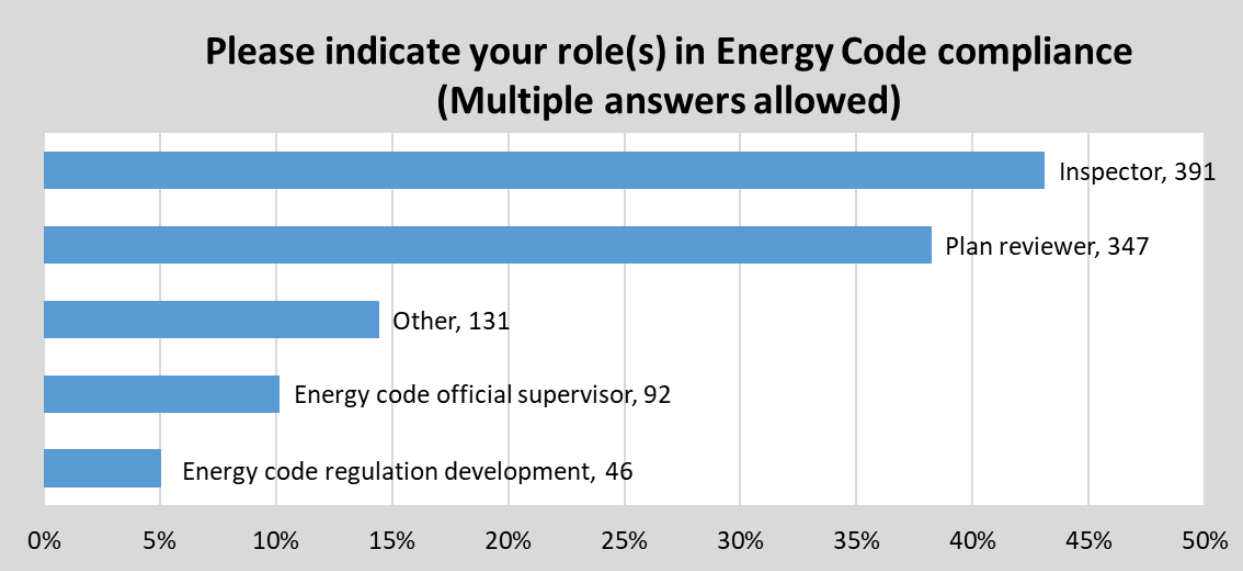

Figure 1. Responses to: Please indicate your role(s) in Energy Code compliance (please select all that apply).

Enforcement of Energy Code

Eighty-five percent of respondents say their juristiction enforces a residential energy code (774 of 907). An unpublished survey conduceted by ICC in 2019 asked respondents if their office conducted residential plan review. Of 401 answers – 29% were negative. This may be due to the use of the word "office" rather than jurisdiction, or it may reflect lack of enforcement. In the same survey, a similar question "Does your office conduct residential field inspection?" 6% of the 269 respondents indicated no.

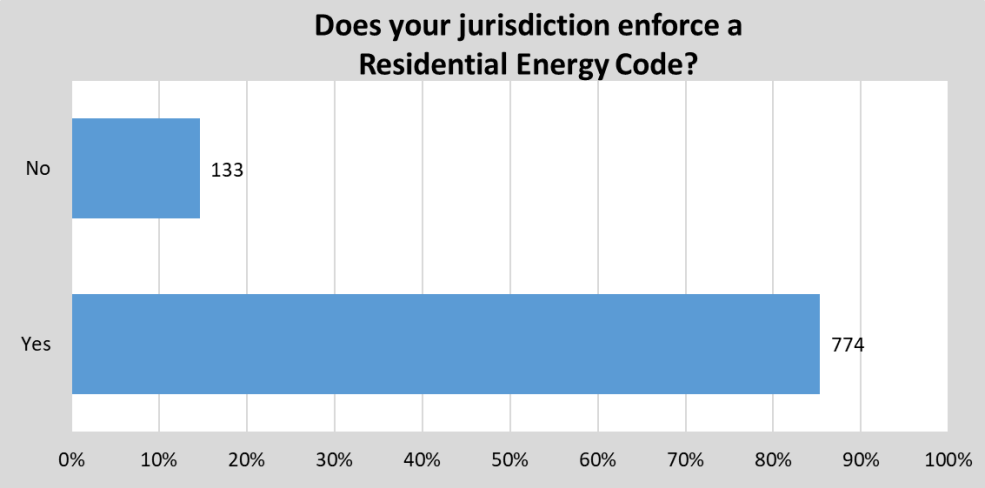

Figure 2. Responses to: Does your jurisdiction enforce a Residential Energy Code?

Energy Code Edition in Use

The 2015 IECC was the most selected edition, selected by 228 responders. The 2018 IECC was the next most common at 169. Eleven respondents selected the 2006 edition. Almost all of the respondents indicating "Other" indicated a state code such as CA(38), WA(10), OR(10), FL(4), PA(4), MN(4), NC(2), NY(1), AR(1), VA(1), MI(1), WI(1), and one unspecified state code. Eleven respondents indicated some mix of IECC codes or exceptions to part of the IECC. Three just provided a note regarding an expected update. Four were unsure. Two indicated "none," which might be referring to the fact that they didn't adopt an IECC version as opposed to not having any code. One indicated they used a different IECC version in their jurisdiction than the state. One respondent indicated "We made our own from the ICC code book." Similarly, the 2019 survey by ICC reported 14% of respondents implementing the 2009 IECC and just over 60% implementing the 2015 IECC. Recent adoptions of the 2018 IECC include New Mexico, Nebraska and Delaware, however some states remain on older code editions, including Arkansas, Kentucky and Louisiana. Although to meet the objective of increased building energy savings the states must update to current codes – older codes retain untapped savings in some markets. DOE Residential Field Studies demonstrated remaining potential energy savings in states on the 2009, 2012 and 2015 IECC[1], and there is still demand for 2009 IECC code books, demonstrating continued and active interest in the 2009 IECC.[2] A multi-prong approach of supporting full

[1] Jeremy Williams, Presentation at the 2019 National Energy Codes Conference, July 2019 https://www.energycodes.gov/sites/default/files/documents/NECC19_D2S1_Williams.pdf

[2] Personal communication with Mark Johnson, International Code Council, October 2020.

implementation of adopted codes, strengthening of the code, and encouraging adoption of the most recently published code is beneficial.

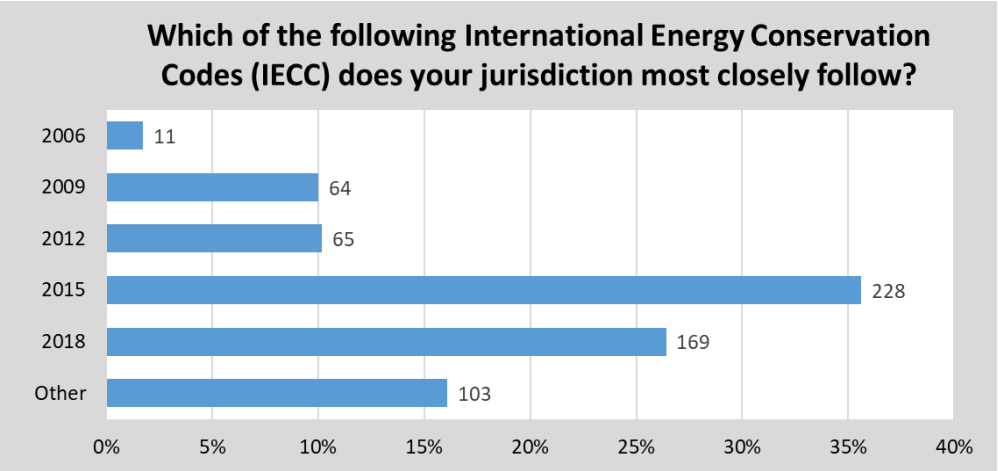

Figure 3. Responses to: Which of the following International Energy Conservation Codes (IECC) does your jurisdiction most closely follow?

Methods and Procedures to Ensure Consistency

Respondents were asked about methods and procedures used to ensure plan review and inspection consistency. Among the 308 who answered, periodic classroom training by professional experts was the most employed method, used by more than 50%. Printed reference materials are also common.

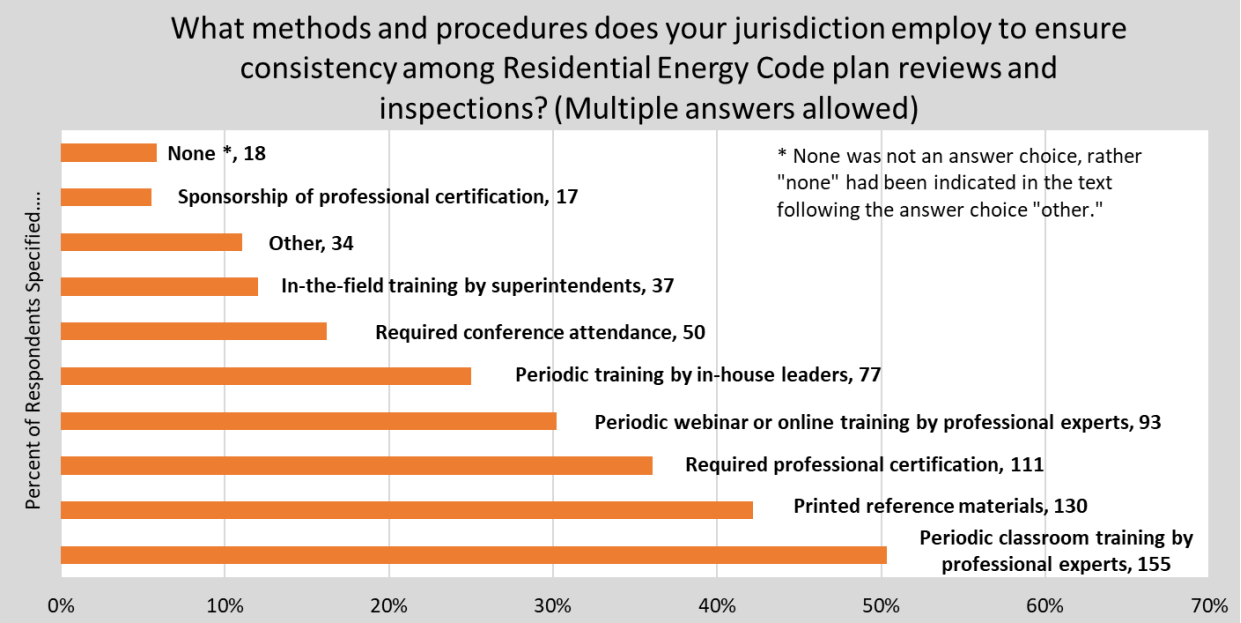

Figure 4. Responses to: What methods and procedures does your jurisdiction employ to ensure consistency among Residential Energy Code plan reviews and inspections?

There were 52 respondents who selected “Other” and wrote in a response, including 18 who indicated “None” or similar, including one who indicated, “Hope for the best.” Seven (7) indicated they did not know or were unsure, two others indicated N/A, and two had no comment.

Five (5) indicated it was part of training, four indicated meetings and peer interaction. Three (3) respondents refer to code books or other written resources, two indicated checklists, one indicated talking to the code body personnel. Two (2) people indicated there was only one reviewer on the staff while one indicated "Reviewer is a licensed professional." Other responses remain unique: "Printed plan review," "Very limited," "State required," "Reviewer is inspector," and "Periodic training by professional experts" disregarding the two similar answer options provided.

Energy Code Training

Respondents were asked about the frequency with which energy code reviewer or field inspector training is provided. Nearly half of the respondents (150 of 308) reported that training is provided annually, and answers ranged from monthly to rarely/never.

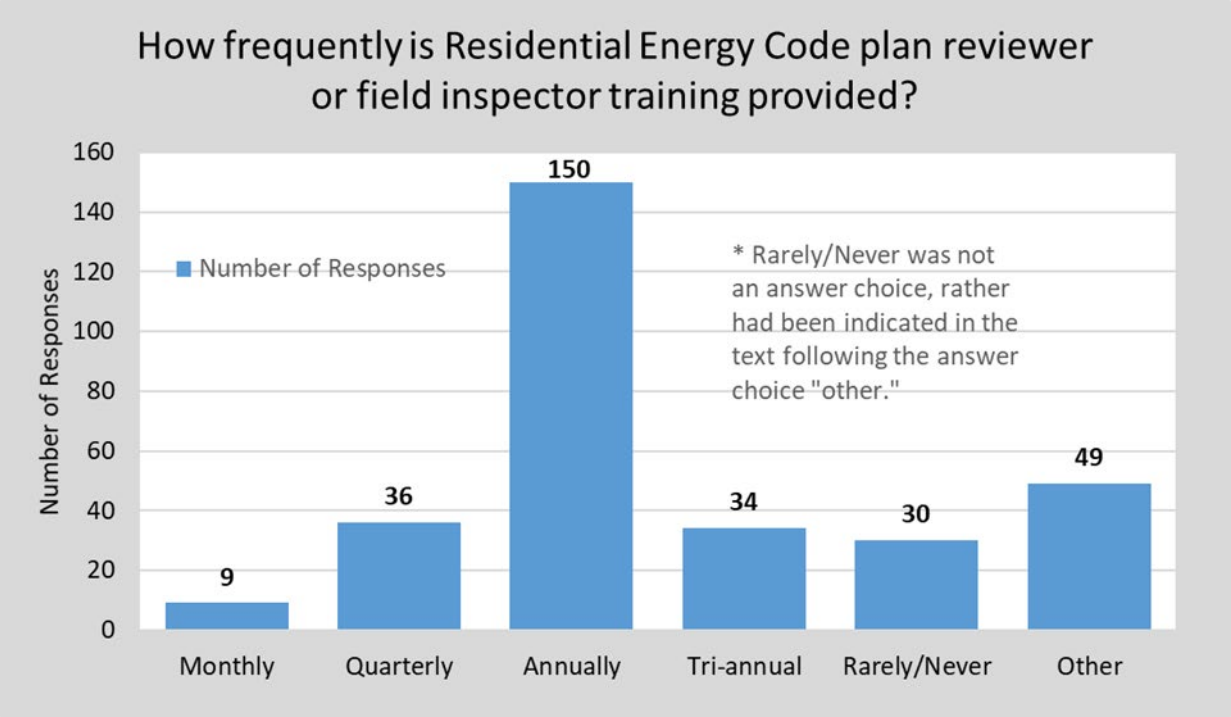

Figure 5. Responses to: How frequently is Residential energy Code plan reviewer or field inspector training provided?

There were 79 respondents who wrote in a time period *other* than the four provided (Monthly, Quarterly, Annually, and Tri-annually). These responses are summarized in the last two bars of the chart above. The Rarely/Never category extracted from those indicating "Other" is comprised of twenty-two (22) who wrote "none" or "Never," some of those indicating they had learned through self-study or on-job training. Another 8 respondents indicated rarely, seldom or occasionally. Nine (9) respondents indicated they take the training when offered, four indicated when code changes and three when license is renewed. One (1) respondents indicated twice a year and another three indicated bi-annually, and one said "as needed." Two (2) respondents indicated it was up to them, oneindicated it was up to inspector's discretion, one that it was

limited, and one that it depends on funding. One (1) person simply responded "3rd party" and one responded "enforcement at state level," – it is unclear whether they were referring to the reason for lack of training or what forces them to take training. There were 8 respondents who said they were "unsure" or "don't know" about frequency of training and another three who indicated N/A. Ten (10) who indicated "Other" had no comment.

Reports of energy code training varied greatly by profession, with "none" or no training being the most common response, representing 38% of responses. Of the 298 respondents who answered this question, 119 said none, however five of these respondents acknowledged training otherwise. Among the professions listed, builders/general contractors receive the most training; energy modelers and design specialists are the professions with the least amount of training.

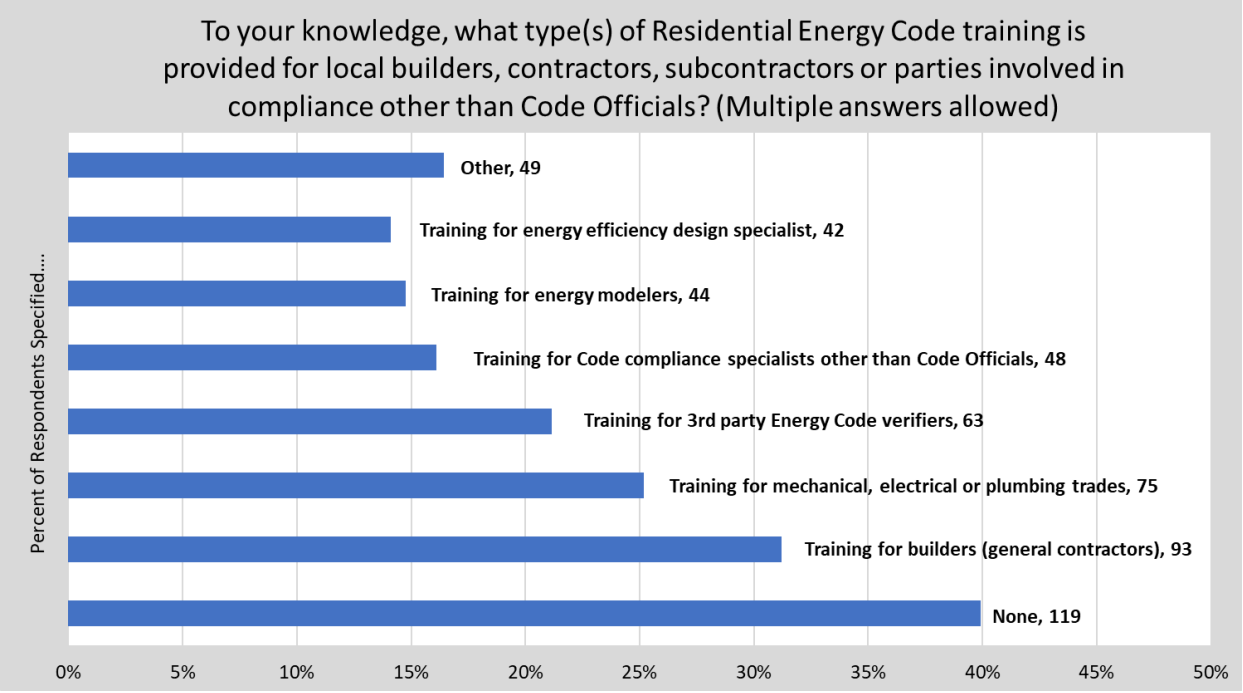

Figure 6. Responses to: To your knowledge, what type(s) of Residential Energy Code training is provided for local builders, contractors, subcontractors or parties involved in compliance other than Code Officials (please select all that apply)?

Of the 49 respondents who selected "Other" for this questions, 20 indicated they didn't know, two said "None," two said N/A, and one had no comment. Seventeen indicated other training with 11 of those indicating training by others, three indicating ICC or code body, two Energy Code Ace and one community College. Two (2) respondents indicated some type of field instruction, three indicated that there was lack of interest among the contractors for such training while one indicated they need classes and one didn't understand the question.

PROJECTS BY PERFORMANCE AND PRESCRIPTIVE

Respondents were provided the following definitions for Performance Compliance and Prescriptive Compliance:

> **Performance Compliance:** Using a computer simulation tool to model the annual energy cost of the proposed design for comparison to a Code-compliant reference building's energy cost as required in Section R405 Simulated Performance Alternative (Performance) including backstops delineated in Section R401-R404; or as required in Section R406 Energy Rating Index Compliance Alternative (ERI) including meeting climate zone-specific ERI targets.
>
> **Prescriptive Compliance:** meeting or exceeding specific Energy Code minimums, such as R-values for walls and roofs and U-factors for windows; equipment controls and efficiencies; and systems installation details as required in Sections R401 through R404 of the International Energy Conservation Code (IECC). This includes compliance per the U-factor Alternative or the UA Tradeoff methods, using REScheck, COMcheck or similar software.

Respondents were asked how many projects and units, by housing type, they had reviewed in the past year and to break their project reviews into prescriptive or performance compliance using the simulated performance alternative (R405) and performance using the energy rating index (R406). Only 148 respondents entered valid information for this question. We suspect that the response rate is low for this question because it asks for detailed numerical values which likely would require some time consuming research to obtain. Nearly half of the 148 respondents to this question selected the prescriptive compliance path 100% of the time in the past year, with another 20% selecting the prescriptive approach for most projects. Below we segment responses into five categories:

1) prescriptive path selected all the time,
2) prescriptive path selected >60% to <100% of the time,
3) performance path selected all the time,
4) performance path selected >60% to <100% of the time, and
5) path was mixed (40 - 60% split between paths).

This frequency of compliance path response is broken down by state in Table 1.

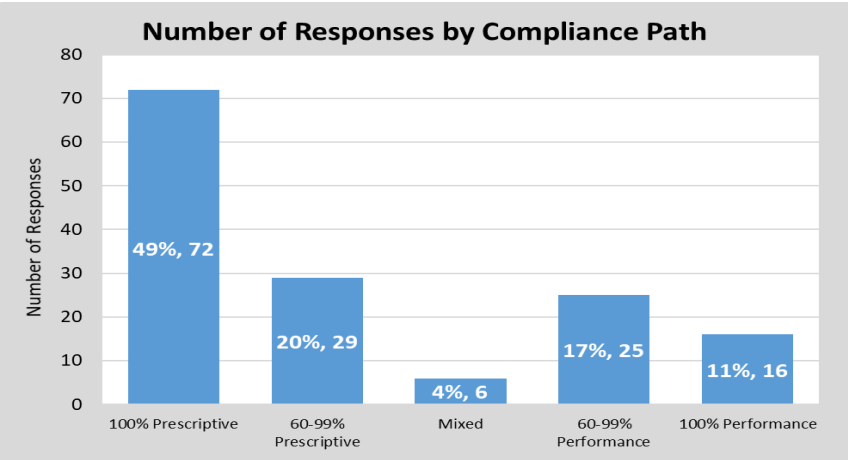

Figure 7. Nearly half the respondents indicated prescriptive path was used 100% of time.

Table 1. Compliance Path Grouping by State

State	100% Prescriptive	60-99% Prescriptive	Mixed	60-99% Performance	100% Performance
AR	3				
AZ	3	2		1	
CA	2	2		4	3
CO	4	3	2	1	
CT			1		
DC		1			
DE				1	
FL	1			1	3
GA	3	1			1
HI		1			
IA	3				1
ID	2				
IL	1	2		3	
KS			1	3	
KY	1	1			
LA		1			
MA					1
MD	1		1	1	
ME		1			
MI	2			1	
MN	4				
MO	4	1		1	
NC		1			
NE	2				
NH	1				
NJ	1				
NM	1				
NV	1				1
NY	1			1	1
OH	1	1	1		
OK	1				
OR	3	2			
PA	2	3		2	2
SC	1			1	
SD	1				
TN	5				
TX	3	2		4	3
VA	6	1			
WA	6	3			
WY	2				
Total	**72**	**29**	**6**	**25**	**16**

Similarly, a 2019 ICC survey indicated a preference for the prescriptive compliance path. Asked which compliance methods are submitted to the jurisdiction: Prescriptive, REScheck, Performance, ERI, or other – nearly 60% of the 261 respondents indicated less than 20% of the submittals used the performance path, and another 17% indicated less than 40% of the submittals used the performance path. Forty percent of the respondents indicated the prescriptive path was used over 60% of the time, and 30% of the respondents indicated REScheck was used over 60% of the time. The ICC survey did not provide correlation between compliance path and code year, or state.

Code Path and Code Edition Relationship

Those who use the performance compliance path all or most of time were almost exclusively selecting more recent IECC codes. Forty-two percent of the respondents who chose 'other' were from California, where performance is heavily favored.

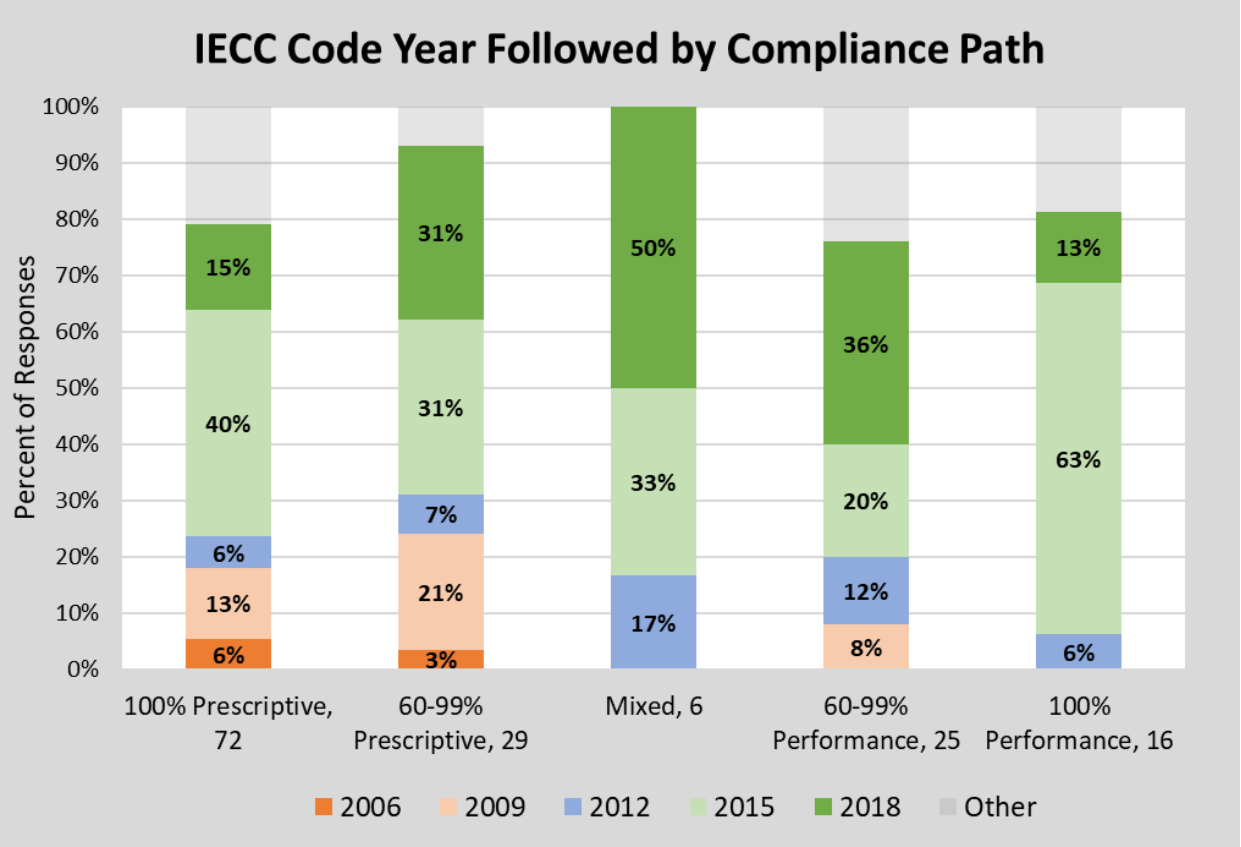

Figure 8. Percentage of respondents selecting IECC code year by compliance path grouping.

For simplicity, in subsequent evaluations we reduce compliance path groupings into three categories:

1. prescriptive path selected at least 60% of the time,
2. performance path selected at least 60% of the time, and
3. path selected was mixed (40 - 60% split between paths).

Flexibility of Enforcement

Respondents were asked to describe the flexibility of their jurisdiction's enforcement. For this question, response options were defined as follows:

> Very strict: all projects must comply with the letter of each Code provision; there is little opportunity for enforcement flexibility or extenuating circumstances
>
> Limited Flexibility: alternate methods of compliance are allowed where approved by the Code Official
>
> Flexible: compliance methods not specified in the Code are sometimes informally allowed, either at plan review or during field inspections
>
> No enforcement of Residential Energy Codes

Among 322 respondents who described the level of jurisdictional enforcement, 80% described enforcement either as very strict (18%) or limited flexibility (61%). Seventeen percent described their jurisdictions enforcement as flexible, and 3% said there was no enforcement.

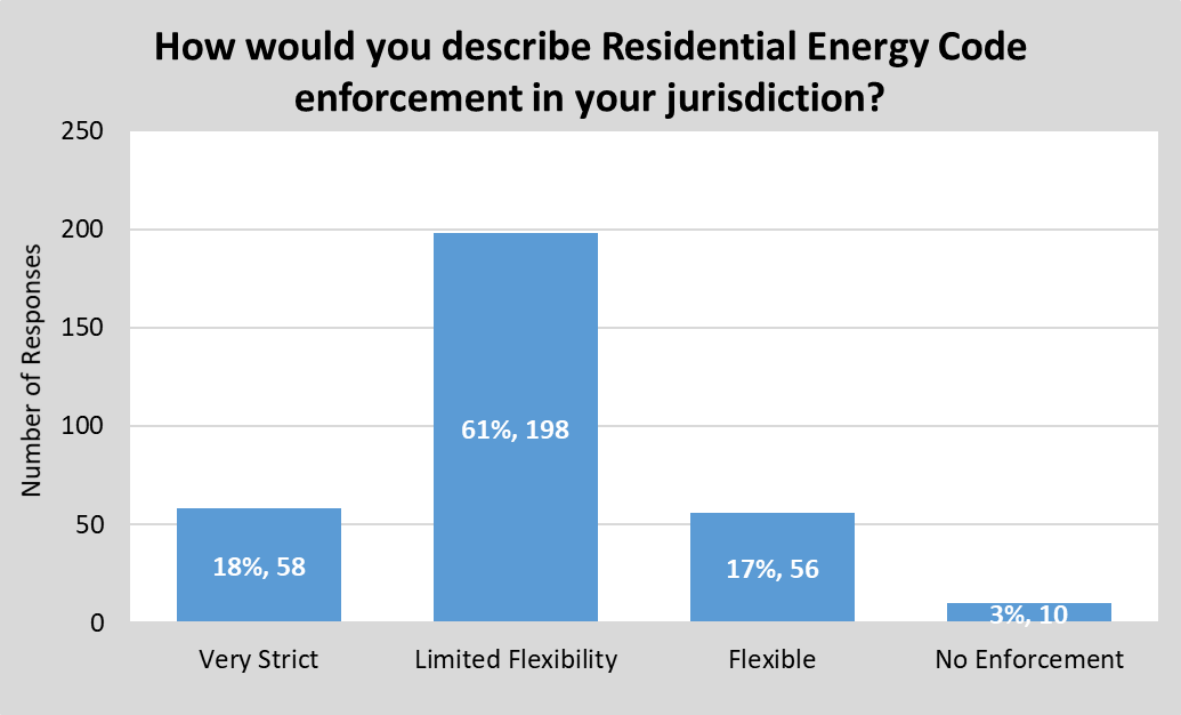

Figure 9. Responses to: How would you describe Residential Energy Code enforcement in your jurisdiction?

Flexibility of Enforcement by Compliance Path

Responses varied somewhat based on typical compliance path. Those selecting the prescriptive path all or most of the time were much more likely than those selecting performance to describe enforcement as flexible (19% versus 10%, respectively), and the prescriptive segment was more likely than performance to describe enforcement as very strict (20% versus 15%, respectively).

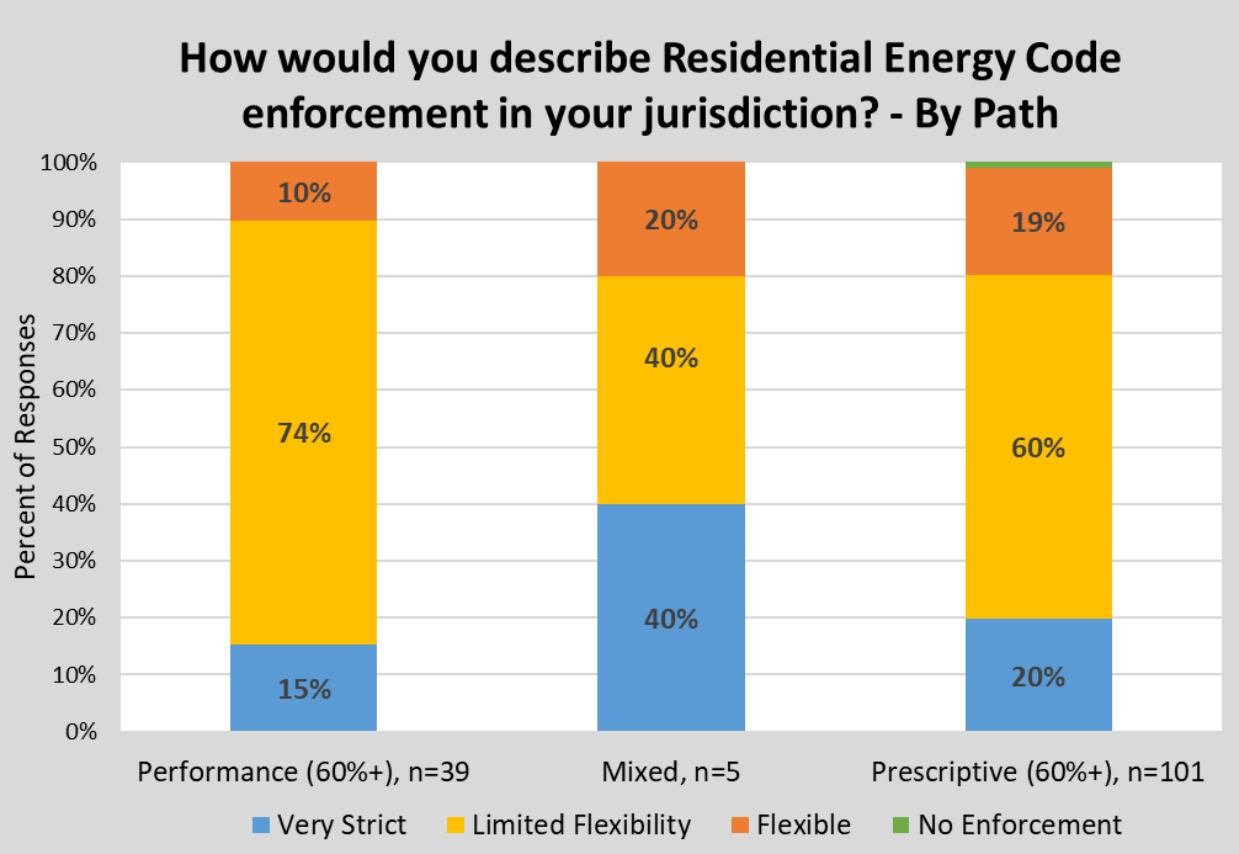

Figure 10. Responses to: How would you describe Residential Energy Code enforcement in your jurisdiction?, by compliance path grouping.

Flexibility of Enforcement by Compliance Code Edition

Responses about the level of enforcement also varied on code year. Those selecting 2006 IECC were much more likely to have either no enforcement (38%) or flexibility in enforcement (50%) than those selecting all other code years. Those selecting any other code year rarely chose no enforcement. For those code years, limited flexibility is most common. Several of the "Other" responses from California (with 42% of responses) identified code more recent than 2018.

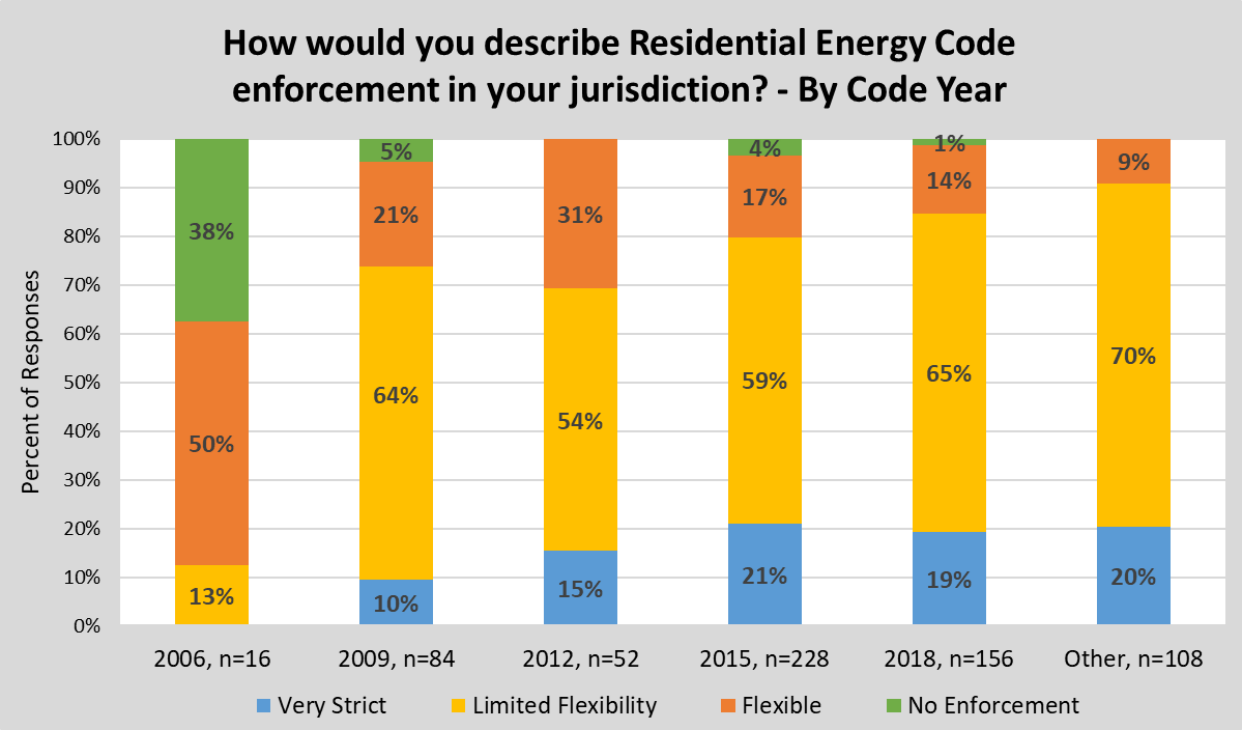

Figure 11. Responses to: How would you describe Residential Energy Code enforcement in your jurisdiction?, by compliance path grouping.

Code Compliance Consistency

Respondents' opinions regarding energy code compliance consistency among their local builders varied greatly. Possible responses were: Good, defined as most builders meet all required targets – there are few errors; Variable, defined as builders are a bit inconsistent – sometimes important items are missed; or Poor, defined as builders' compliance with Energy Code is often incomplete. While most of the 325 respondents who had an opinion reported builders are doing a good job with few errors (145, 45%), nearly as many said builders are a bit inconsistent (139, 43%). Forty-one (13%) respondents offered poor ratings for builder consistency.

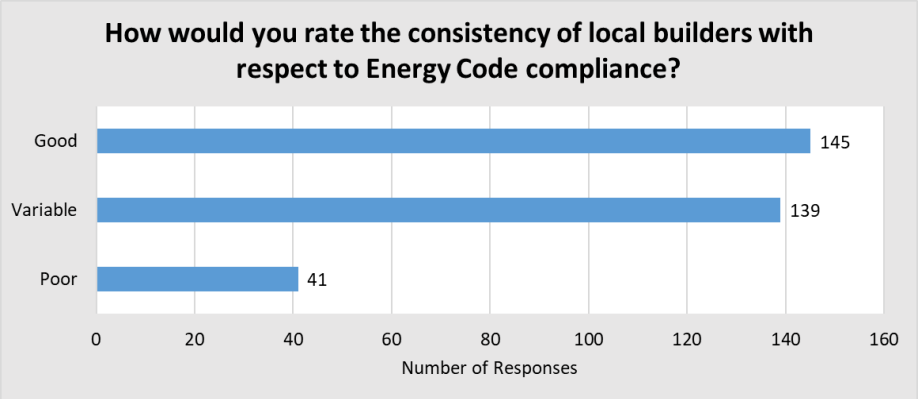

Figure 12. Responses to: How would you rate the consistency of local builders with respect to Energy Code compliance?

Code Compliance Consistency by Compliance Path

Those selecting the prescriptive path all or most of the time were more likely to rate local builder consistency as good (55 of 101, or 54%), whereas those who more typically select performance were more equally split between a rating of good (16 of 36, or 44%) and variable (17 of 36, or 47%).

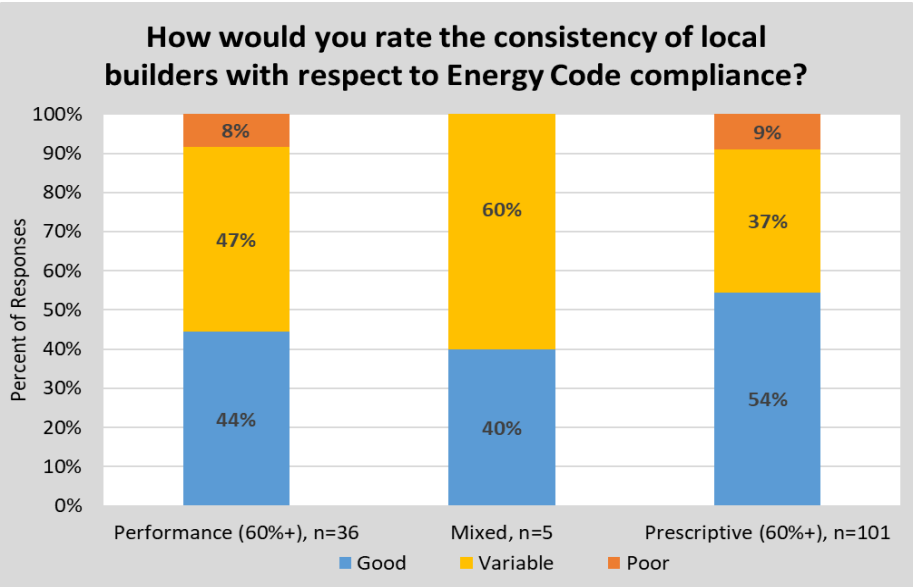

Figure 13. Responses to: How would you rate the consistency of local builders with respect to Energy Code compliance?, by compliance path grouping.

Dedicated Energy Code Plan Reviewer

Having a dedicated energy code plan *reviewer* is not typical. Among the 544 respondents who know whether they have a dedicated energy code plan reviewer, 367 (67%) do not and 177 (33%) do.

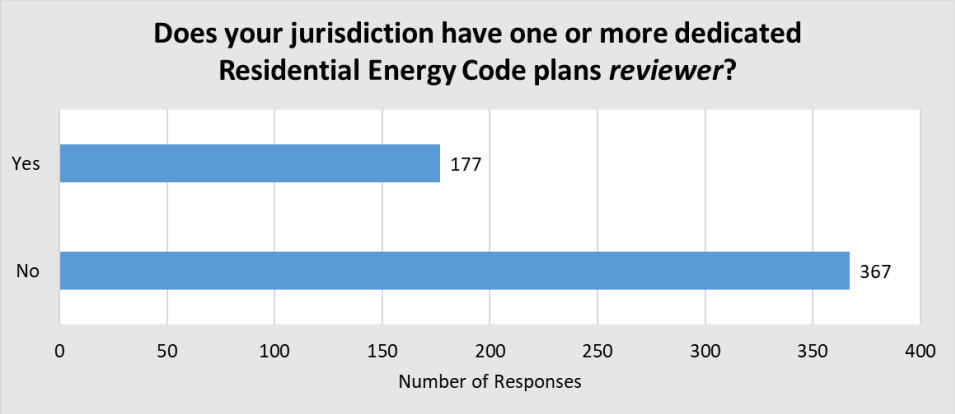

Figure 14. Responses to: Does your jurisdiction have one or more dedicated Residential Energy Code plans reviewer?

Dedicated Energy Code Plan Reviewer by Compliance Path

Those who always or mostly select the performance compliance path are slightly more likely to have a dedicated residential energy code plan reviewer (21 of 39, or 54%) than not (18 of 39, or 46%). Whereas, those who always or mostly select the prescriptive are much less likely to have a dedicated residential energy code plan reviewer (27 of 99, or 27%) than not (72 of 99, or 73%).

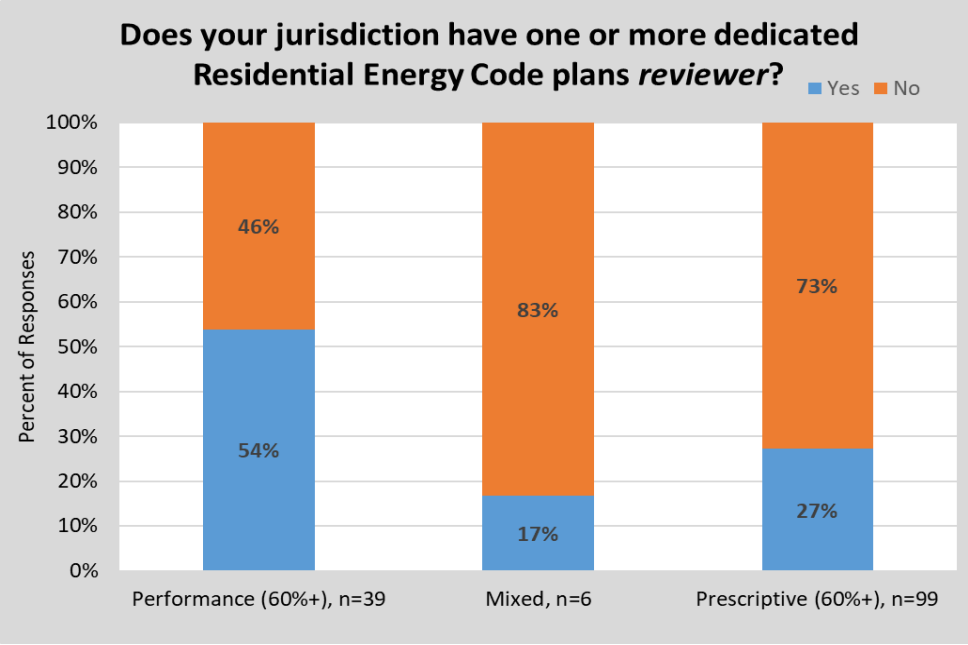

Figure 15. Responses to: Does your jurisdiction have one or more dedicated Residential Energy Code plans reviewer?, by compliance path grouping.

Dedicated Energy Code Inspector

The general pool of responses were similar for dedicated residential energy code *inspectors* as they were for plan reviewers. Among the 544 respondents who know whether they have a dedicated residential energy code inspector, 375 (67%) do not have one and 187 (33%) do.

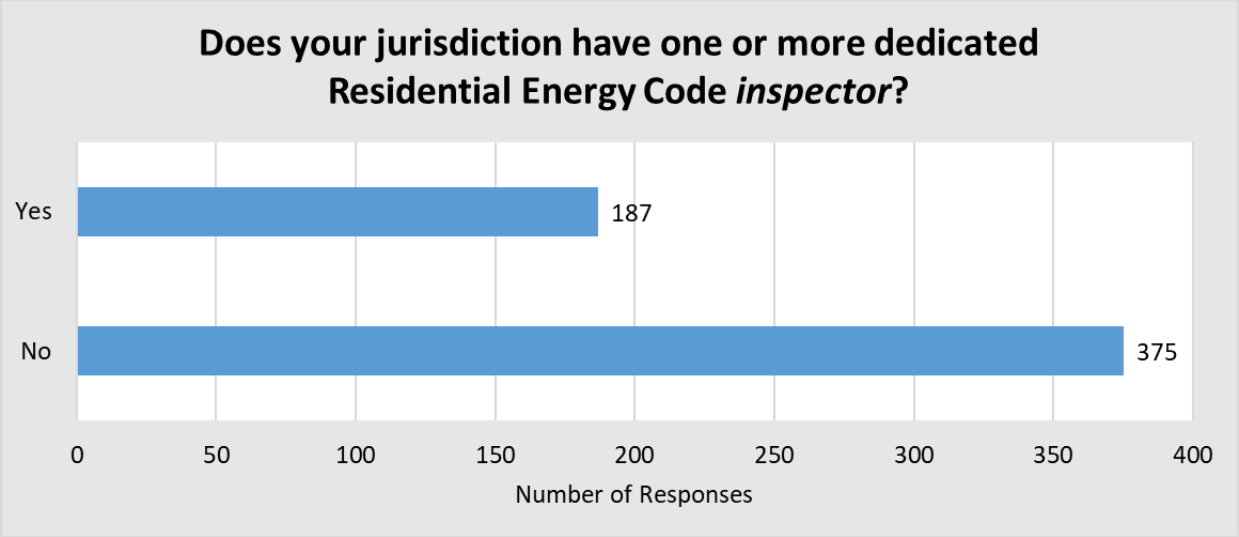

Figure 16. Responses to: Does your jurisdiction have one or more dedicated Residential Energy Code inspectors?

Regardless of the compliance path typically selected, a dedicated residential energy code inspector is not typical. However, as with the response for reviewer, prescriptive path users were much more likely than those using the performance path to report they had no dedicated residential energy code inspector. A dedicated energy code inspector was reported 41% of the time by those who mostly see performance compliance (n=39), and 28% of the time by those who see mostly prescriptive compliance (n=100).

Verification Time

Nearly half of the 54 respondents who had an opinion reported that performance compliance path projects take longer to verify than do prescriptive path projects (24, or 44%). Nineteen (35%) said both paths take about the same time to verify, and 11 (20%) said prescriptive projects take longer than performance projects.

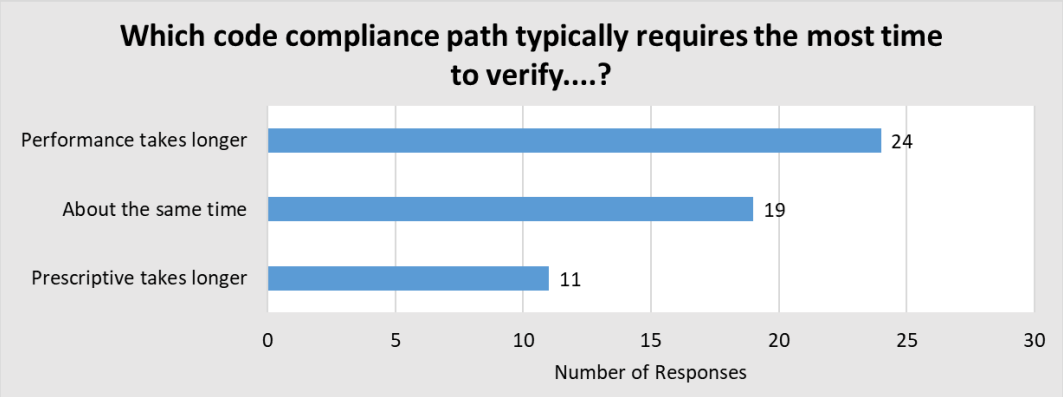

Figure 17. Responses to: Considering newly constructed residential projects (permits) in your jurisdiction during the past year, which code compliance path TYPICALLY requires the most time to verify including time for preparation, plan review, site visits, intern

Verification Time by Compliance Path

The reporting on which compliance path takes longer to verify is related to the compliance path used. The performance path segment was equally split in reporting of which path took longer, whereas the prescriptive group was more likely to say the performance path took longer.

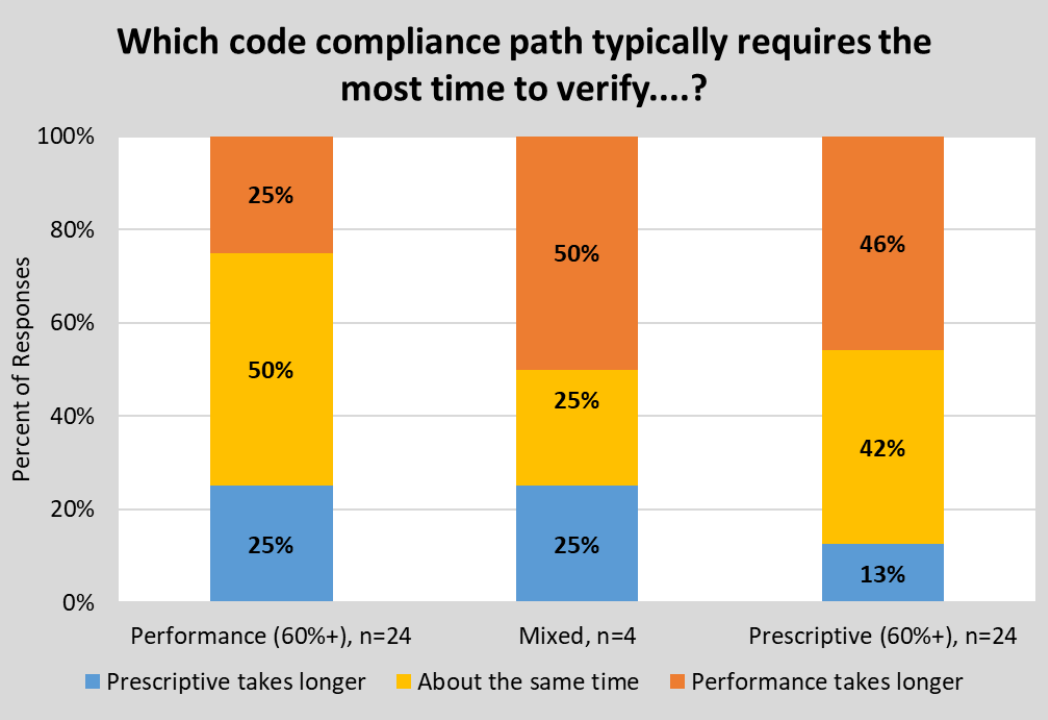

Figure 18. Responses to: Which code compliance path TYPICALLY requires the most time to verify?, by compliance path grouping.

Effectiveness or Reliability by Compliance Path

Overall, respondents who had an opinion on compliance path energy efficiency believe the prescriptive method (18 of 50, or 36%) is slightly more reliable than performance (15 of 50, or 30%). One third reported no difference in compliance path reliability.

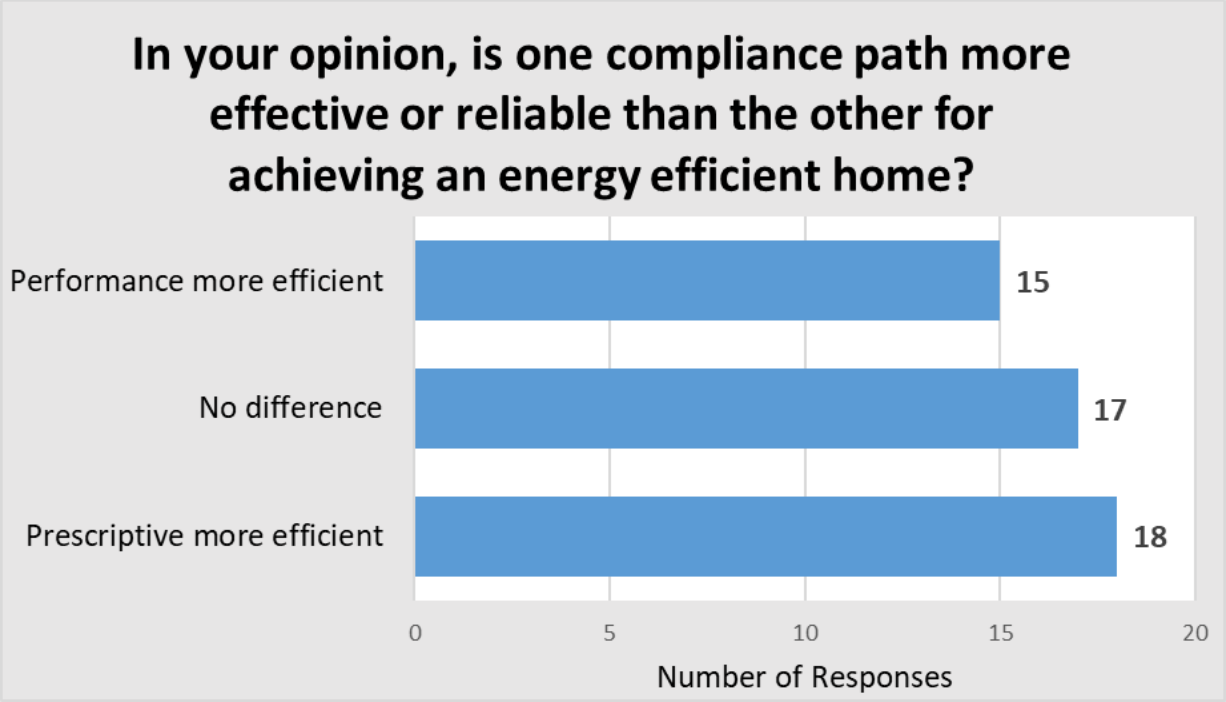

Figure 19. Responses to: In your opinion, is one compliance path more effective or reliable than the other for achieving an energy efficient home?

Effectiveness or Reliability by Compliance Path Generally Selected

Opinions on energy efficiency reliability varied greatly by the compliance path generally selected, however. Fifty percent of those who typically select performance said there is no difference in path reliability, but if there was a difference, performance was more reliable (8 of 22, or 36%). Only twenty-five percent of the segment selecting prescriptive said there is no difference in reliability, and if there is a difference, prescriptive is more reliable (13 of 24, or 54%).

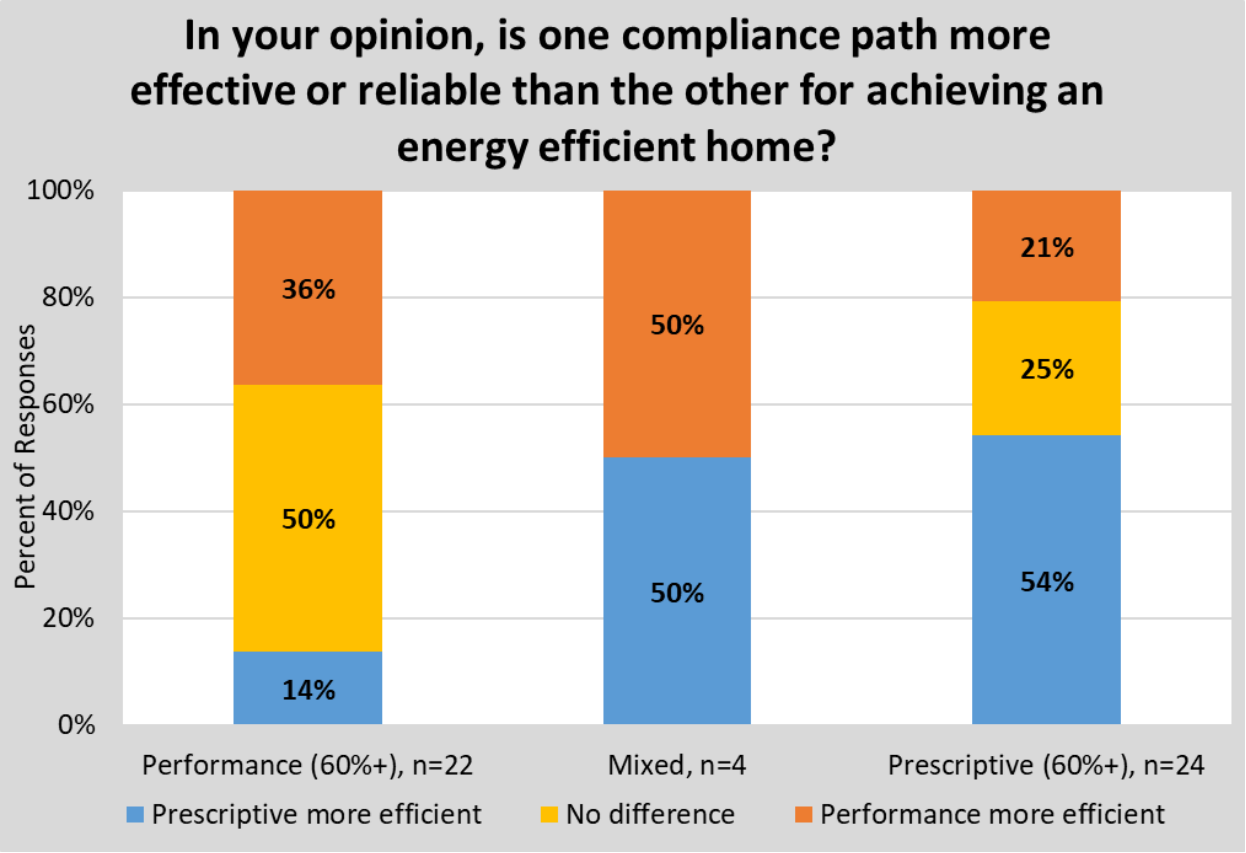

Figure 20. Responses to: In your opinion, is one compliance path more effective or reliable than the other for achieving an energy efficient home?, by compliance path grouping.

PRESCRIPTIVE RELATED QUESTIONS

Those respondents that indicated they had received projects completed with prescriptive compliance were asked several prescriptive path-related questions.

Time Spent to Inspect for Prescriptive Code Compliance

Respondents were asked to *estimate the time spent by inspector and support staff for each prescriptive compliance project, if no problems are found* for each of the selecting tasks: preparation and reporting, plan review, on-site, follow up with builder, subcontractor, and other parties, and all other activates. Responses to these questions (with zeros filtered out) are summarized in Table 2 below. The median response to all of these questions was between 15 and 35 minutes.

Table 2.Time Spent on Prescriptive Compliance Task, Summary Statistics

Task:	Preparation and Reporting	Plan Review	On-site	Follow Up	Other Activities	Total*
Minimum	0:02	0:01	0:05	0:02	0:10	0:01
Median	0:30	0:30	0:35	0:15	0:30	2:00
Mode	1:00	1:00	1:00	1:00	1:00	2:00
Average	0:39	0:49	1:00	0:31	0:39	2:43
Maximum	5:00	4:00	11:00	3:00	1:00	14:00
Sample Size	77	95	99	83	11	103

* Each response was summed to obtain the values in the Total column. The statistics were calculated from these individual totals. Therefore the total is not the sum of the preceding left hand columns. For example the minimum value for the total column is actually the value shown for Plan Review, where the respondent did not include any time spent on the other listed activities.

Responses were evaluated by compliance path group, however respondents were only given this question if they had at least one prescriptive compliance project completed in the past year -- that is, those who reported 100% performance are not part of the >60% performance group.

While the extremes reported for many of these tasks often varied greatly among compliance path groups, the medians were always similar. For example, looking at the responses to time spent on site, one respondent in the 'mostly prescriptive' bin said it takes 11 hours, but the median time spent for those mostly selecting prescriptive for this task was 30 minutes, nearly the same as it was for those mostly selecting performance (35 minutes).

There were nine respondents who selected "other" and wrote a response. Three of these indicated time spent educating builders or inspectors. Two indicated administrative tasks like filing. Two indicated time is spent doing product research, one indicated performing a cross check and one said they spend time "Evaluating alternate materials, methods or systems."

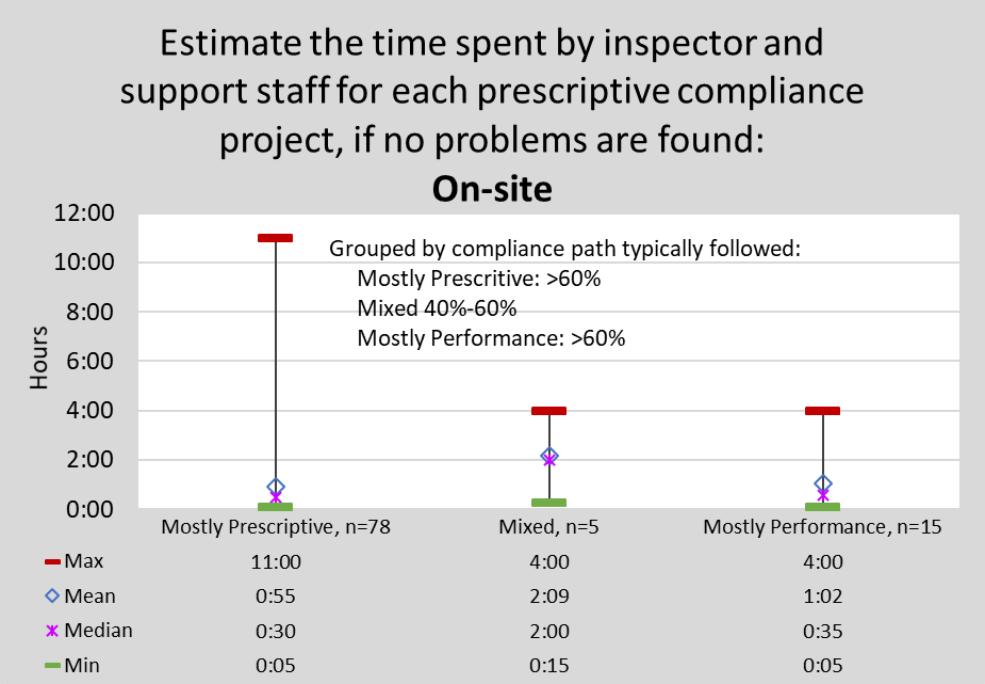

Figure 21. Responses to: Estimate the time spent by inspector and support staff for each prescriptive compliance project, if no problems are found: On site, by compliance path grouping.

Time Spent to Inspect for Prescriptive Code Compliance by Code Edition

Responses to the 'time spent' question were also evaluated by code year selected. Again, we see big differences among groups' maximum observations. However, looking at the code years with substantial sample sizes (2009, 2015, and 2018), we note a shift down in the median time spent on-site for those selecting IECC 2018.

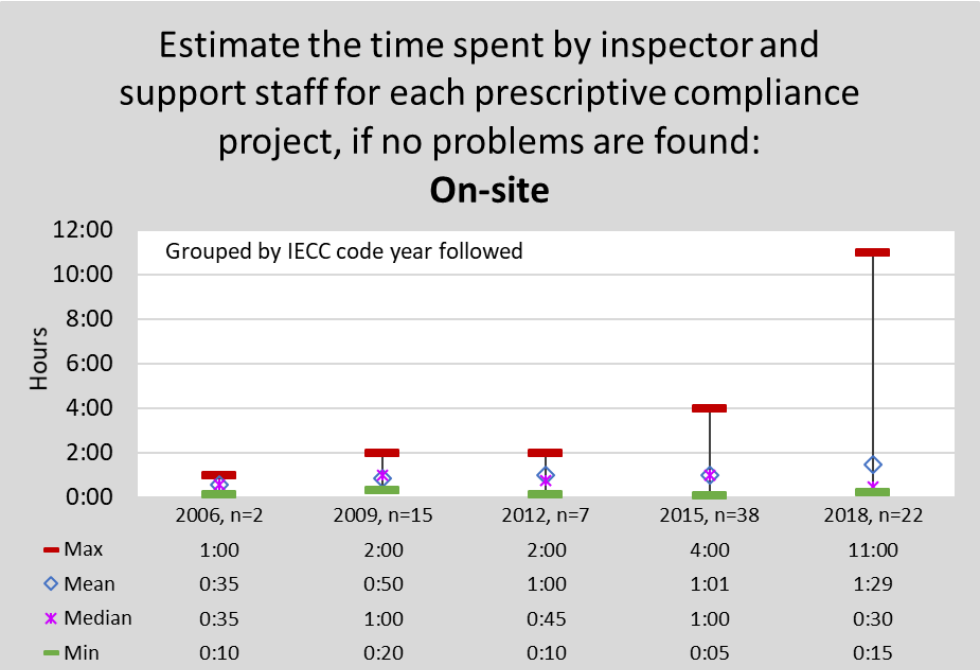

Figure 22. Responses to: Estimate the time spent by inspector and support staff for each prescriptive compliance project, if no problems are found: On site, by IECC year selected.

Frequency of Need to Correct Prescriptive Code Compliance Deficiencies

Respondents were asked questions about how frequently prescriptive compliance projects required corrections. The median response was that 20% required corrections during plan review and 20% required re-inspection, though responses to both questions ranged from 0 to 100% of projects.

Table 3. Corrections Required on Prescriptive Compliance Projects, Summary Statistics

Prescriptive Compliance Permitted Projects: Corrections Required	Min	Median	Max	Count
Estimate the percentage (%) of permit applications achieving Prescriptive Compliance in the past year that required corrections during plan review.	0%	20%	100%	120
Estimate the percentage (%) of permitted projects achieving Prescriptive Compliance in the past year that required re-inspection.	0%	20%	100%	120

Method of Prescriptive Code Compliance

The R-value method is by far the most common prescriptive compliance method used among participants, used by 83 of the 119 (or 70%) who had an opinion. REScheck is a distant second, cited by 26 respondents, or 22%.

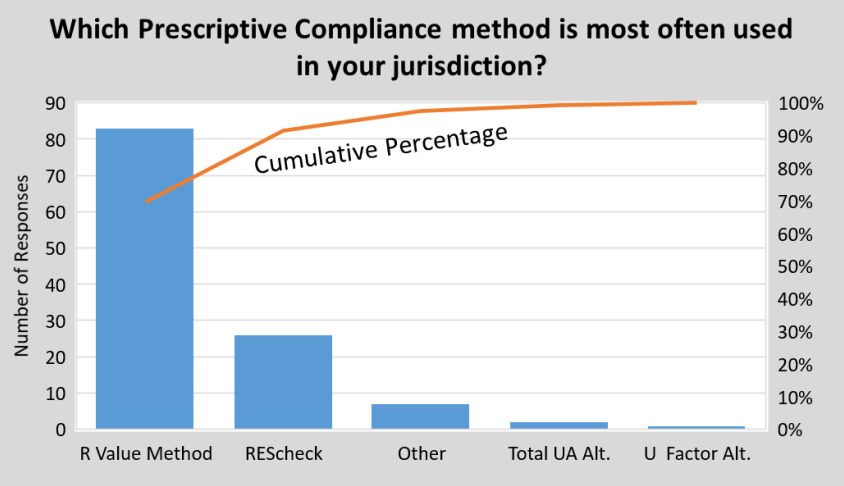

Figure 23. Responses to: Which Prescriptive Compliance method is most often used in your jurisdiction.

Only five respondents selected "Other" and provided text answers to this question. One person indicated "Both R-value and U-factor methods are used." Another added that there are some prescriptive California requirements, "Prescriptive provisions in the CA Energy Code. Provisions given for R value, U factor, Solar Heat Gain Coefficient, maximum west-facing glazing, maximum total glazing." One respondent indicated the "HERS Index score (ERI)" which is unusual to list under prescriptive. One said "IC3" which is a Texas code software program. Someone used this field to indicate "Inspector qualifications not current/active in Residential Energy."

Prescriptive Path Forced Air Distribution Location

Forced air distribution systems are very common. Testing of forced air distribution can receive credit under the performance compliance methods but not using the prescriptive compliance method. However, duct leakage testing is a mandatory requirement in the 2018 IECC for both the prescriptive and performance methods. The median response to the percentage of prescriptive projects containing ducted forced air distribution systems was ninety-two percent. Among those who knew the duct location in a typical single-family home, duplex, or townhouse, the ducts are slightly more likely to be in the conditioned space (61 of 113, 54%) than the unconditioned space (47, or 42%).

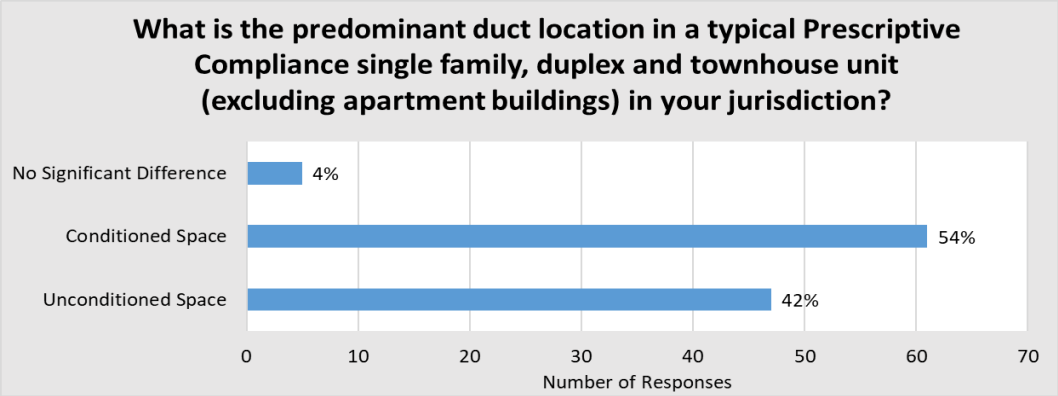

Figure 24. Responses to: What is the most predominant duct location in a typical Prescriptive Compliance single family, duplex and townhouse unit (excluding apartment buildings) in your jurisdiction?

The duct systems in apartment buildings selecting prescriptive compliance were in conditioned space 70% of the time (n=40).

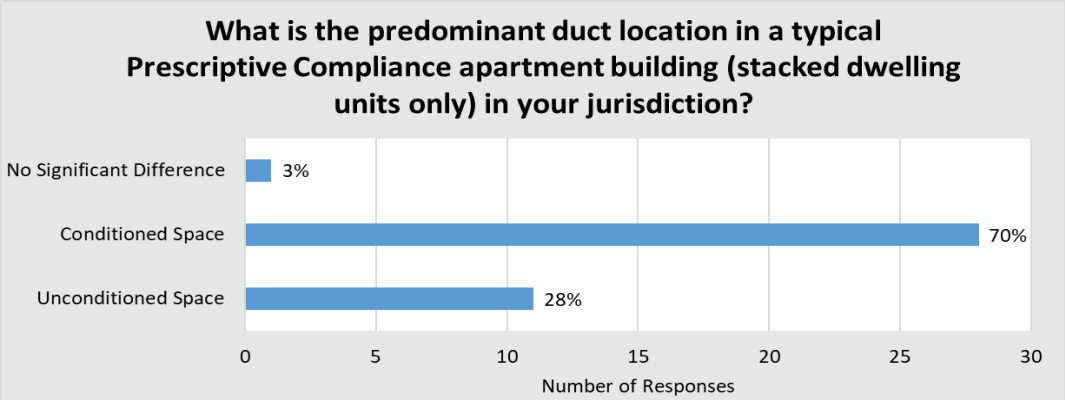

Figure 25. Responses to: What is the most predominant duct location in a typical Prescriptive Compliance apartment building (stacked dwelling units only) in your jurisdiction?

PERFORMANCE RELATED QUESTIONS

Those respondents that indicated they had received projects completed using performance compliance were asked several performance path-related questions.

Time Spent to Inspect for Performance Code Compliance

Respondents were asked to *estimate the time spent by inspector and support staff for each performance compliance project, if no problems are found* for each of the following tasks: preparation and reporting, plan review, on-site, follow up with builder, subcontractor, and other parties, and all other activates. Responses to these questions (with zeros filtered out) are summarized the table below. The median response to each individual task was between 30 minutes and one hour. The overall median time reported for preparation and reporting of performance path projects was one hour.

Table 4.Time Spent on Performance Compliance Task, Summary Statistics

Time Spent Per Performance Compliance Project						
Task:	**Preparation and Reporting**	**Plan Review**	**On-site**	**Follow Up**	**Other Activities**	**Total***
Minimum	0:01	0:05	0:05	0:05	0:05	0:06
Median	1:00	1:00	1:00	0:30	0:30	3:00
Mode	1:00	1:00	1:00	1:00	0:30	5:00
Average	1:11	1:19	1:16	0:54	0:55	4:29
Maximum	8:00	8:00	6:00	8:00	4:00	30:00
Sample Size	40	53	49	49	15	53

* Each response was summed to obtain the values in the Total column. The statistics were calculated from these individual totals. Therefore the total is not the sum of the preceding left hand columns. For example, the minimum value for the total column is actually the value shown for one minute for Preparation and Reporting and five minutes for Plan Review, where the respondent did not include any time spent on the other listed activities.

Responses were also evaluated by compliance path group, however respondents were only given this question if they had at least one performance compliance project completed in the past year -- that is, those who reported 100% prescriptive are not part of the >60% prescriptive group. Time spent on preparation and reporting was higher for those mostly selecting the performance compliance path (median = 1:00) than those mostly selecting prescriptive (median = 0:30).

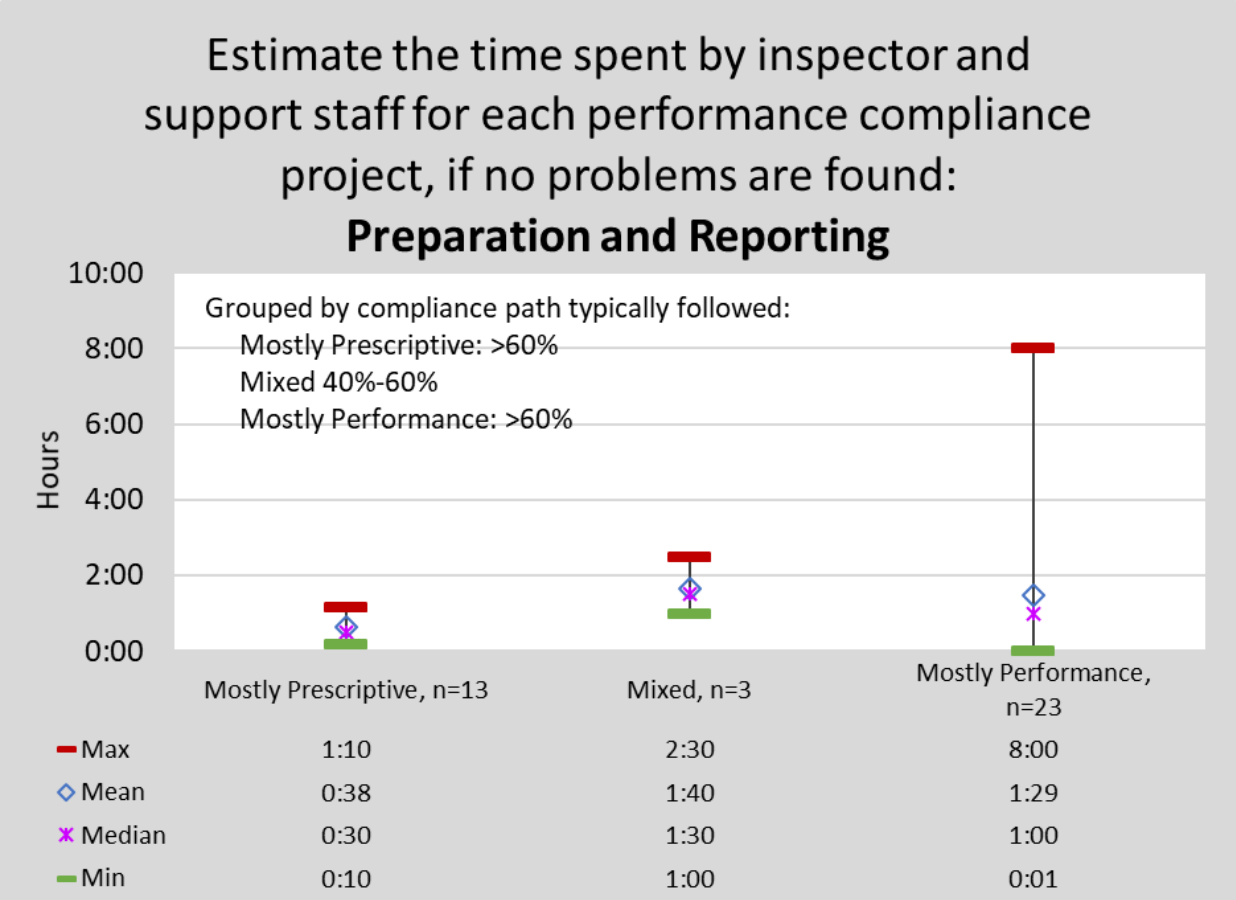

Figure 26. Responses to: Estimate the time spent by inspector and support staff for each performance compliance project, if no problems are found: Preparation and Reporting, by compliance path grouping.

Time Spent to Inspect for Performance Code Compliance by Code Edition

Estimates for time required for plan review and for time on-site varied slightly by code year. The greatest variations were among those applying the more recent codes.

We compared the time estimate results for performance compliance to those for prescriptive compliance, segmented by the code year selected. (Recall that the prescriptive responses are from those who reported at least one prescriptive project in the past year; performance responses are from those who reported at least one performance project in the past year.) Figures 27 and 28 show these comparisons for plan review time and time on-site, respectively.

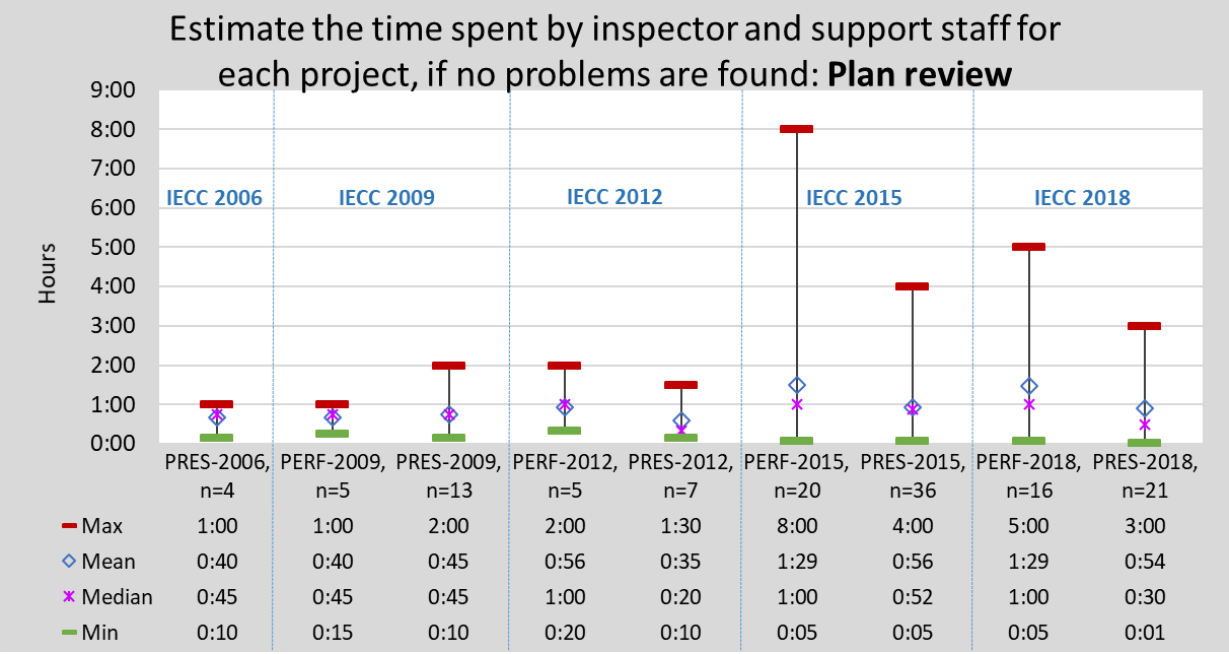

Figure 27. Responses to: Estimate the time spent by inspector and support staff for each performance/prescriptive compliance project, if no problems are found: Plan Review, by code year selected.

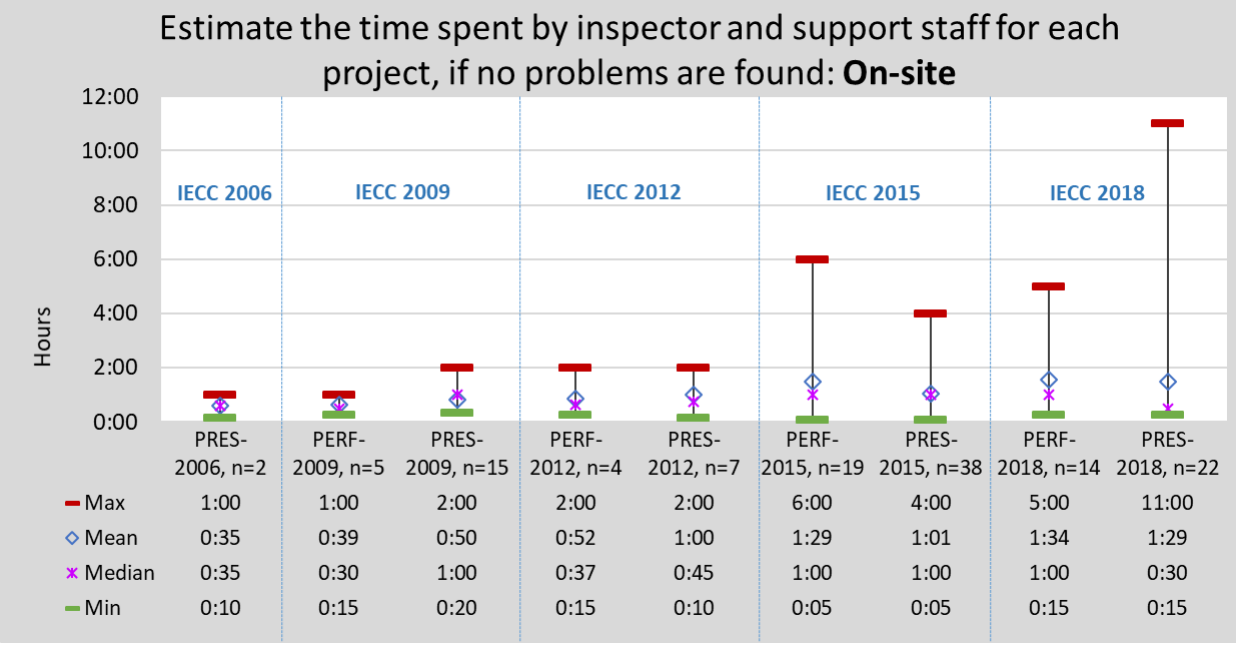

Figure 28. Responses to: Estimate the time spent by inspector and support staff for each performance/prescriptive compliance project, if no problems are found: On-site, by code year selected.

Frequency of Need to Correct Performance Code Compliance Deficiencies

Respondents were asked questions about how frequently performance compliance projects require corrections. Typically, about a quarter of the projects required corrections during plan review, slightly higher than the 20% median found for the prescriptive plan review corrections. Responses for re-inspection were similar to those for prescriptive, with a median of 20% of projects. Responses to both questions also ranged from 0-100% of projects, as it did for prescriptive projects.

Table 5. Corrections Required on Performance Compliance Projects, Summary Statistics

Performance Compliance Permitted Projects: Corrections Required	Min	Median	Max	Count
Estimate the percentage (%) of permit applications achieving Performance Compliance in the past year that required corrections during plan review.	0%	26%	100%	65
Estimate the percentage (%) of permitted projects achieving Performance Compliance in the past year that required re-inspection.	0%	20%	100%	65

Performance Path Forced Air Distribution Leakage

When asked to estimate the percent of projects permitted via Section R405 using tight home air leakage testing as a compliance trade-off, the median response was 30%. Responses ranged from 0 to 100% (n=65), and most homes permitted through performance have a ducted forced air distribution system, as summarized in the table below.

Table 6. Performance Compliance Projects Duct Systems and Leakage, Summary Statistics

Performance Compliance Permitted Projects: Ducted Systems and Leakage	Min	Median	Max	Count
Estimate the percentage (%) of projects permitted via the Section R405 Performance Compliance path using tight home air leakage testing (blower door ACH50) less than the mandatory requirement as a trade-off to achieve compliance during the past year?	0%	30%	100%	65
For permitted projects where the Performance Compliance path is used, estimate the percentage (%) that contain a ducted forced air distribution system.	0%	91%	100%	62

Performance Path Forced Air Distribution Location

The duct location in a typical single-family home, duplex, or townhouse selecting performance compliance is just as likely to be in unconditioned as in conditioned space.

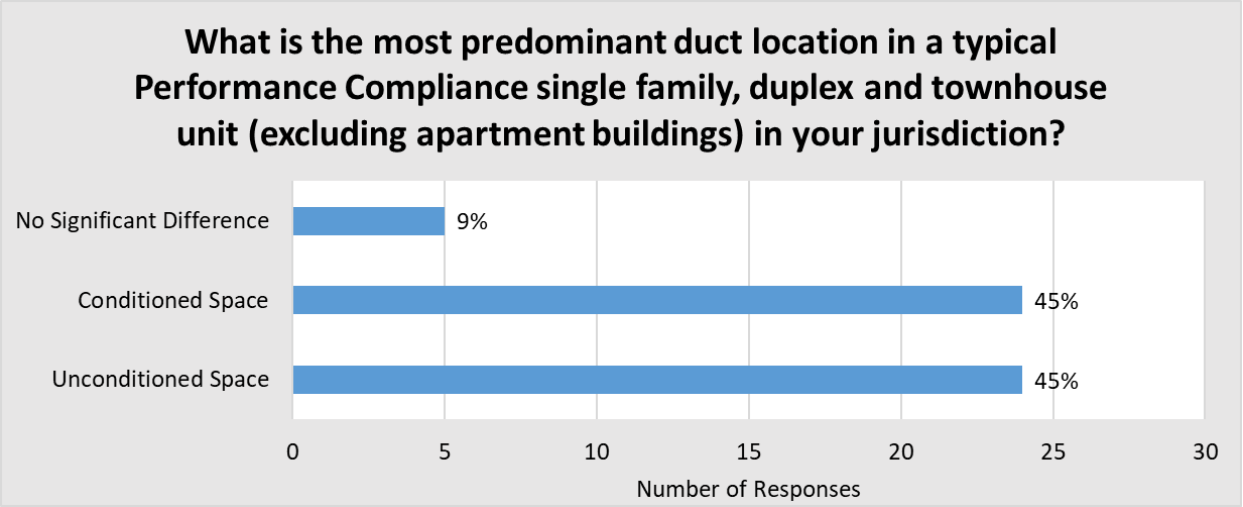

Figure 29. Responses to: What is the predominant duct location in a typical Performance Compliance single family, duplex and townhouse unit (excluding apartment buildings) in your jurisdiction?

However, in apartment buildings, the duct location was in conditioned space 80% of the time (n=20).

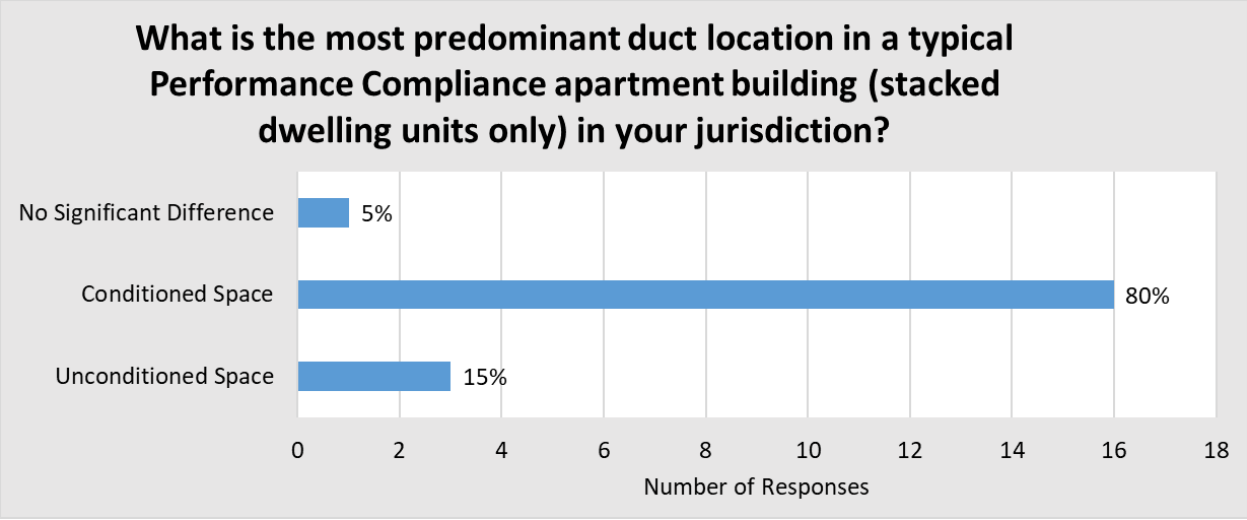

Figure 30. Responses to: What is the predominant duct location in a typical Performance Compliance apartment building (stacked dwelling units only) in your jurisdiction?

OPEN-ENDED QUESTIONS

The survey asked several open-ended questions which are summarized below, with questions in bold. Any grouping of responses in this section are by the authors of this report.

Why Builders Choose Prescriptive

Why do you think residential builders choose the Prescriptive Compliance path?

Responses to this question were generally categorized in the plot below, with specific responses following.

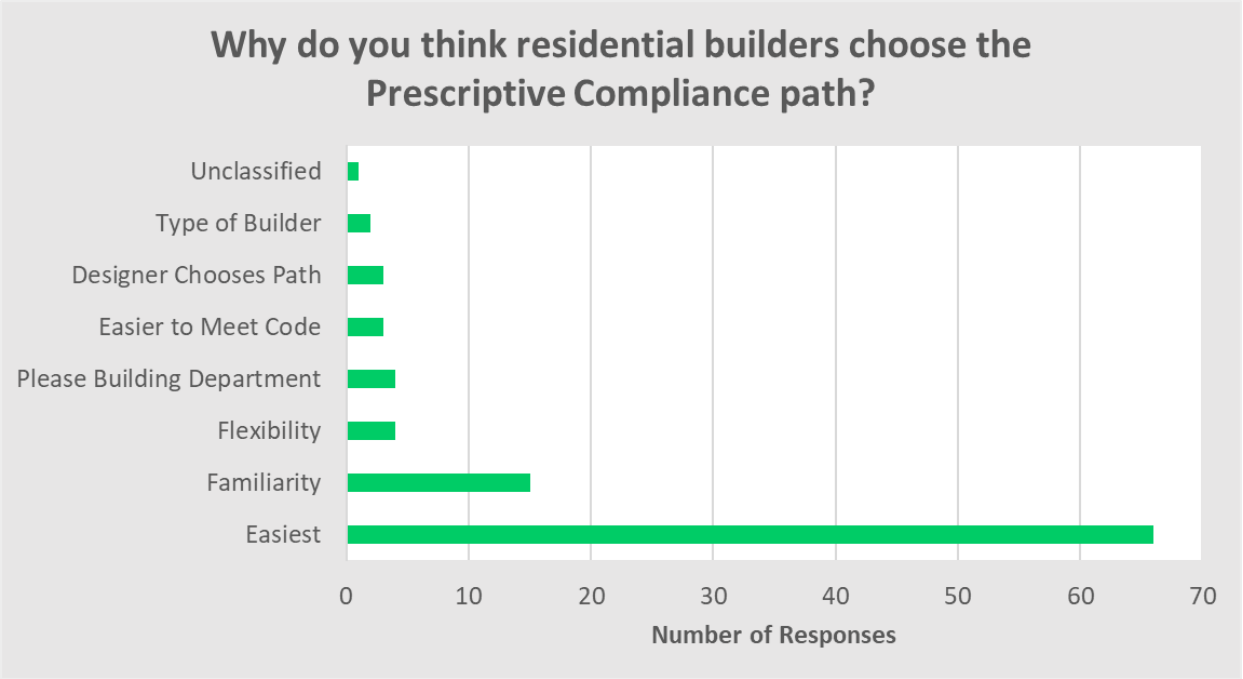

Figure 31. Responses to: Why do you think residential builders choose the Prescriptive Compliance Path?

The most prevalent answer (66 respondents) was that it was **easiest to complete**, saving time and up-front cost. Specific examples of those responses:

"Simpler"

"Easiest and most commonly used."

"No calculations - just look it up in a table and place it on the drawings."

"Most straight forward without professional help."

"It is less costly up front (instead of hiring a consultant to run the model). It also has static values which are easier to remember (e.g. R-13, R-19 etc.)"

"Because it makes it easy to comply, and keeps things consistent from building to building.....fool proof."

"Easiest to comply with. There really aren't any good software systems available to show code compliance."

"Simplest to understand, bid and build to."

“Other options appear to be "too complicated" and require "extra-work".”

“Most get required R-values from local code official; most don't want to take the time or effort to consider performance options.”

“They do not [have to] pay to [obtain a] HERS rater. Also submittal requirements for compliance with [performance] energy code is more time consuming (Preparation and reviewing the documents)”

Fifteen (15) respondents indicated builders used prescriptive as **that was what the path they were familiar with**. One representative answer “Typically it's the only path they are aware of,” another simply stated “Always did it that way.” While another said, “Most builders do not use computer applications.”

Four (4) respondents indicated the **flexibility was the reason**: “Because they can meet the requirements of the code with the REScheck software without having to provide exterior insulation in our climate zone - 6.” Another simply said, “Allows some trade-offs for design”

However, there was one respondent to this question indicating “They really can’t use prescriptive here because it requires exterior insulation.”

Four (4) respondents indicated it was **to please the building department**:

“Just to appease the building department as it is easy this way.”

“We require prescriptive since the only alternative is the moronic ResCheck method.”

Including one respondent, “They [the builders] don't I do.”

Three (3) respondents indicated it was **easiest to meet code**. Sample response:

“Less expensive than designing or testing performance-based compliance.”

Three (3) respondents indicated it wasn’t the builder but the **architect or plan designer who dictated the prescriptive path.** Sample response, “I believe it's the architects not the builders. The builders build per plan. The larger builders have designers on staff.”

While one person indicated “Nonproduction builders find it easier to design directly from IRC,” another indicated the opposite, “we see those that construct tract types homes prefer this.”

An unclassified response, “Easy to understand and energy usage lower when homeowner reports back. Then builders understand and try to improve their homes.”

Open-Ended Catch-all Question

Please note any additional Residential Energy Code compliance verification and Code compliance enforcement issues that have not been specifically addressed in this survey.

This open-ended question was designed to learn things that were not already captured. Comments were categorized by the authors into eight categories with others remaining uncategorized as they didn't directly relate to other comments. Below is a summary of the responses by categorization, selected by each of the received comments for this question.

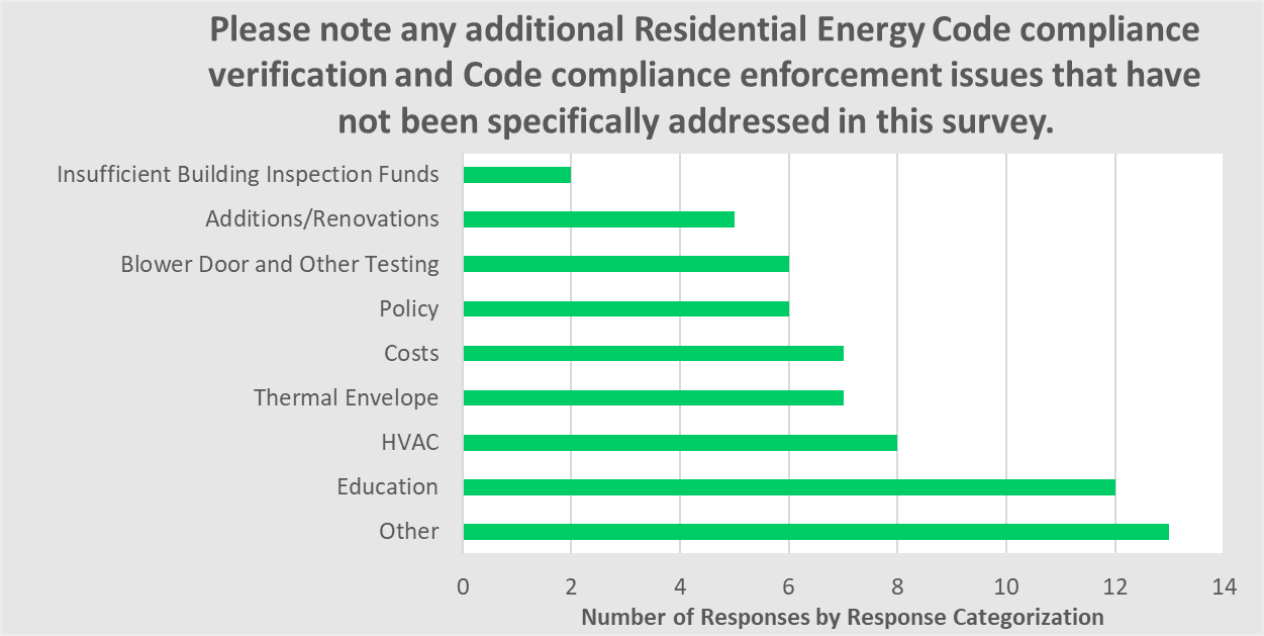

Figure 32. Responses to: Please note any additional Residential Energy Code compliance verification and Code compliance enforcement issues that have not been specifically addressed in this survey.

Education

"No certified or trained inspectors."

"More training and foresight towards implementation of new codes, there is always a learning curve and catch-up time for the general public that requires additional time for enforcement education."

"The energy consultants need to design the building to comply with energy codes and inform the building owners of the requirements. Many times, the consultants provide energy designs solely to pass plan check, and then the builder builds what he wants. It's problematic when that happens, and it happens multiple times per job - the inspector will send them back in when the construction doesn't match the energy design."

"The HERS Rater competency, expertise and knowledge to perform to complete this task for each specific project."

"Poor installation practices."

"The lack of information about why air barriers and proper installation. Lack of interest in inspectors to enforce is not helpful to the industry."

"No one understands the importance of proper installation."

"Understanding the performance path minimum requirements."

"Need guidance on how to ideally verify energy code compliance in the field. Inspection types, how data can be collected, etc."

"This code needs to be simplified for builders and code officials"

"Train the contractors/installers - stop trying to train the local jurisdictions having authority"

"How can third party inspection help with compliance?"

HVAC Related

"Residential energy plan review and inspections includes pipe insulation, hot water circulation system controls, HVAC equipment sizing, duct insulation, duct leakage, local exhaust, whole house ventilation, damper control and high efficacy lighting."

"Mechanical."

"The wide range used in mechanical equipment for the identical structure."

"Proper size hvac systems. Not using energy recovery ventilation systems."

"All house air conditioning condensers should be required to be put on the East or North side of the house. Or have a structure shading the condenser."

"Verification of building leakage & duct leakage reports are quite difficult to get and manual J reports that actually reflect the design characteristics of the building properly. Along with ensuring the building envelope is sealed and insulated properly. These are the major residential concerns at this time."

"Third party testing for lighting and HVAC verifications."

"Mechanical ventilation requirements and construction methods to meet requirements."

Thermal Envelope Related

"Solid wood corner framing at exterior wall corners."

"We have a high percentage of Log Homes here."

"Thermal envelope."

"The difficulties around window/site energy requirement calculations."

"Lack of installation reports for foam insulation."

"What is the R-value equivalent that the code says. Why is there an exemption on the 100% insulated roof. Why can't we be specific?"

"Under Slab & Foundation insulation needs to be enforced."

Costs

"Builders complain to the mayor's office about the excessive costs."

"The State of California has made energy compliance a financial burden on homeowners and the overall real estate market place. Can there be an easier or less cumbersome process?"

"People are limping along and trying to find the path of least resistance to get approval and passed inspections. Some care about a quality product and will try to do a good job as a selling point, but most of those still think the code is excessive. 90% don't understand the energy code and most of those don't seem to care and see it as excessive regulation."

"Energy Code is my least favorite, they are getting too costly and homes too tight. Plan review and inspections on the energy codes take focus away from life safety where the main concern should be."

"Cost."

"Expense to build new structures."

"Cost vs. benefit."

Policy

"There are too many competing standards for residential energy compliance. There are too many "non-profit" liberal think-tanks that are funded by [redacted] [name redacted] to pursue their agenda. The code hearings are full of biased, misleading, paid lobbyists who will never be satisfied with energy conservation, and will continue to push their agenda of energy production."

"Currently we have some state legislators targeting to eliminate the energy code. Not only proposing to eliminate it from state code but also to not allow local jurisdictions to adopt an energy code. Also hearing proposals to cap the energy code where it is adopted at, with no further updates. Unfortunately, the energy code has become very political."

"How is this a fire and life safety issue? Not clear who benefits from energy compliance."

"Energy Codes are too far reaching. Makes compliance a struggle."

"OUR STATE GOVERNMENT IS NOT INTERESTED IN ADOPTING A NEW CODES AND WE ARE UNDER A VERY OLD CODE. 2006 I THINK"

"Incentives for alternative energy systems."

Blower Door and Other Testing

"We need a blower door test to be mandatory. There is no clear list of responsibilities in the code for the building inspector when using ERI path. We created a checklist doing so but it was banned by the [redacted] [name redacted] code council."

"The cost of a blower door was the biggest concern in our area for those not embracing the energy codes. Those that do embrace the codes like to have the testing done and have a third party do that. They then use it as a marketing tool for their benefit."

"Delete requirements for blower door tests, minimum air changes and appliance commissioning"

"Lack of testing firms for blower door examination."

"The energy code with the 2018 version seems to be creating more jobs for home blower testers, rather than focusing on real energy issues."

"Along with performing Blower Door testing, habitable rooms with doors should be pressure tested not to exceed three PA. 1102.4.4 should include all zones, concern is gas furnace in attic with thermal barrier (foam) applied to the underside of roof deck, should be direct vent furnaces."

Additions/Renovations

"At risk of repetitive comments remodel and repair activities are culprits in reducing efficiency due to builders' and craft persons of all trades lack of expertise."

"Requirements for alterations and additions still not well understood and code requirements are all or nothing (building cavities filled with any R value insulation? Fine. Not filled? Bring up to current code requirements!)"

"Special challenges come with alterations. Alteration new work is required to comply with energy code requirements as new. Hot water piping insulation."

"Most aspects of Energy Compliance are difficult to understand and time consuming to fill out documents. Maybe provide specific Prescriptive Compliance documents for each alteration. Not one 8 to 12 page that encompasses all alterations(?)"

"Existing Buildings - how it specifically applies?"

Insufficient building inspection funds

"Giving field inspectors more designated time to conduct and confirm."

"Help and time to do it"

Other

"All paths are code minimum only. There is not code incentive or direction for Passive Home Design other than exceeds code."

"Most were addressed [in the survey]. Would be nice to see some consistency across the board in each climate zone and jurisdiction."

"Moisture"

"Third Party needs oversight. [redacted] only good for Raters, but no good for [redacted] only folks. [redacted] [names redacted] needs to vet an independent method or third party trusted credential for this industry."

"The questions were very poorly written."

"We need to make reporting and testing simple to insure builders will follow. We allow too many choices for meeting requirements and dishonest inspectors in my area sign off on. With no testing or inspections being made or recorded."

"Please stop the use of arch fault breakers."

"Electrical wire size is proven to factor in consumption. Why do all you ignore this fact?"

"Verification that someone is monitoring the third party energy inspectors - who has that responsibility?"

"We receive the energy information with our plans for plan review. They are a part of our codebook (chapter 11). Nothing special. We do not track anything. The inspectors get PTCS reports as necessary through BPA."

"Performance compliance should be eliminated or should require published standards. This will allow future analysis to determine if these guesses/models are being effectively implemented and will allow consideration during repairs and renovations."

"My biggest concerns are on the commercial end."

"I have spent over 10 years in the building energy efficiency world, and over five of those in government compliance of the energy code. When I was a contractor verifying ENERGY STAR, I would be on site for a full half day verifying compliance the way it should be done. I see no solution to incorporate that level of rigor into the enforcement of the energy code relative to the resources available to governments to implement. That is not to say that the natural compliance rate is 0% if the energy code is not enforced, but it is also not 90% or higher if there are no resources to enforce it. I am pessimistic that the increased stringency of the energy code over time will yield increased compliance as a result of these factors. The energy code improvement does not address the WILL of people to comply."