FLORIDA SOLAR ENERGY CENTER®

Creating Energy Independence

Evaluating the Economic Impacts of the Legislatively Delayed Provisions of the 5th Edition (2014) Florida Building Code

FSEC-CR-2009-15

Interim Report

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Submitted to

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Overview

This research provides an assessment of the potential economic impacts of implementing three legislatively delayed requirements of the Florida Building Code, 5th Edition (2014): 1) residential air leakage testing, 2) residential whole-house mechanical ventilation, and 3) two fire service access elevators for applicable buildings (see Exhibit A for code language). This research is based on assessing the costs of implementing the measures without respect to timing. That is, costs of industry not being prepared are not included as the commission and legislature already addressed those concerns. Rather this addresses steady-state direct costs and benefits for measures once implemented on a regular basis.

In order to provide information on such important topics the research team includes industry experts for each measure as well as an economist to ascertain the induced and indirect costs of including such measures in the code. The general process for conducting the research is depicted in Figure 1:

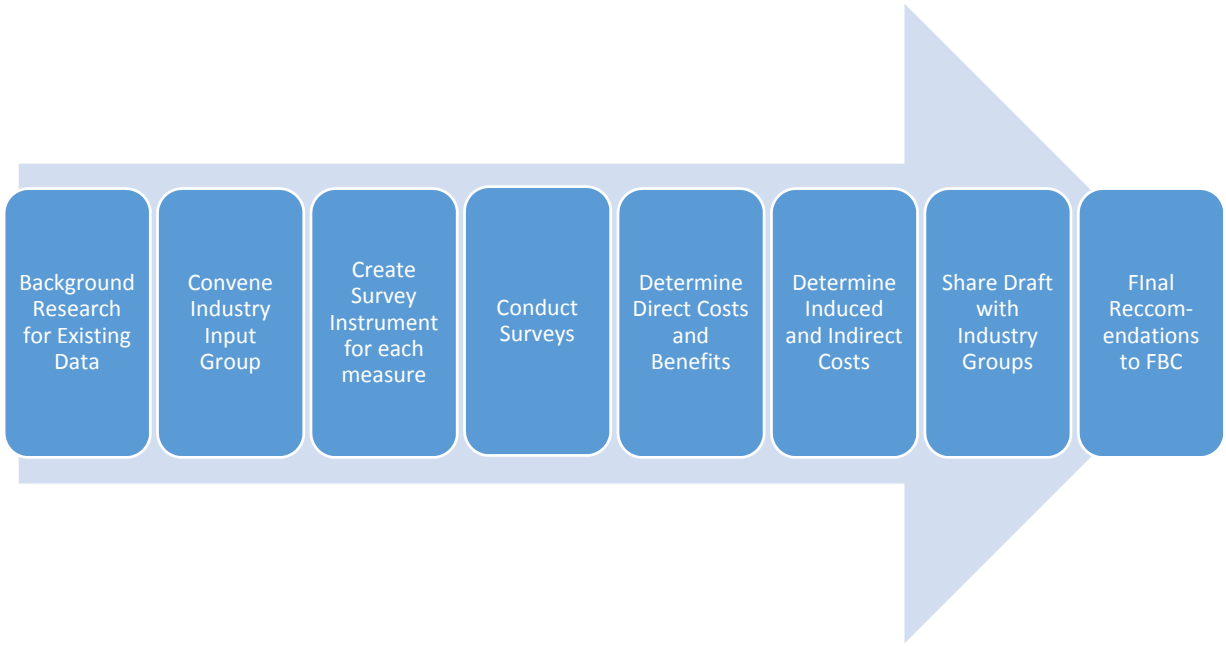


Figure 1. The research plans to study the economic impact of residential air leakage testing, residential mechanical ventilation systems and 2nd fire access elevators will each follow the general process shown.

The resulting economic information gathered for each of the three delayed code requirements will be provided to the Florida Building Commission (FBC) via a draft final report. If any of the information gathered is seen as providing clear direction for one or more code recommendations, the recommendation(s) will also be written up and presented to the Commission. Effort will be made to provide draft recommendations prior to the January 1, 2016 end date for submitting recommendations to the open comment code change cycle.

Work Scope

Each code requirement is a task:

Task 1: Section R402.4.1.2, Energy Conservation volume - the air leakage testing requirement for residential buildings - herein referred to as "Testing",

Task 2: Section R303.4, Residential volume - the whole-house mechanical ventilation requirement for residential buildings – herein referred to as "Ventilation", and

Task 3: Section 403.6.1, Building volume - the requirement for two fire service access elevators - herein referred to as "Elevator".

In Task 4 researchers will present preliminary findings for each requirement at two local industry meetings to obtain stakeholder feedback.

Progress to Date

Work on the project to this point has included fulfilling Institutional Review Board (IRB) requirements, background research, organizing and convening two industry advisory committees, developing and administering two online surveys, sending out surveys, and reviewing initial survey response data. Figure 2 highlights items in the research process that have been worked on at the writing of the interim report.

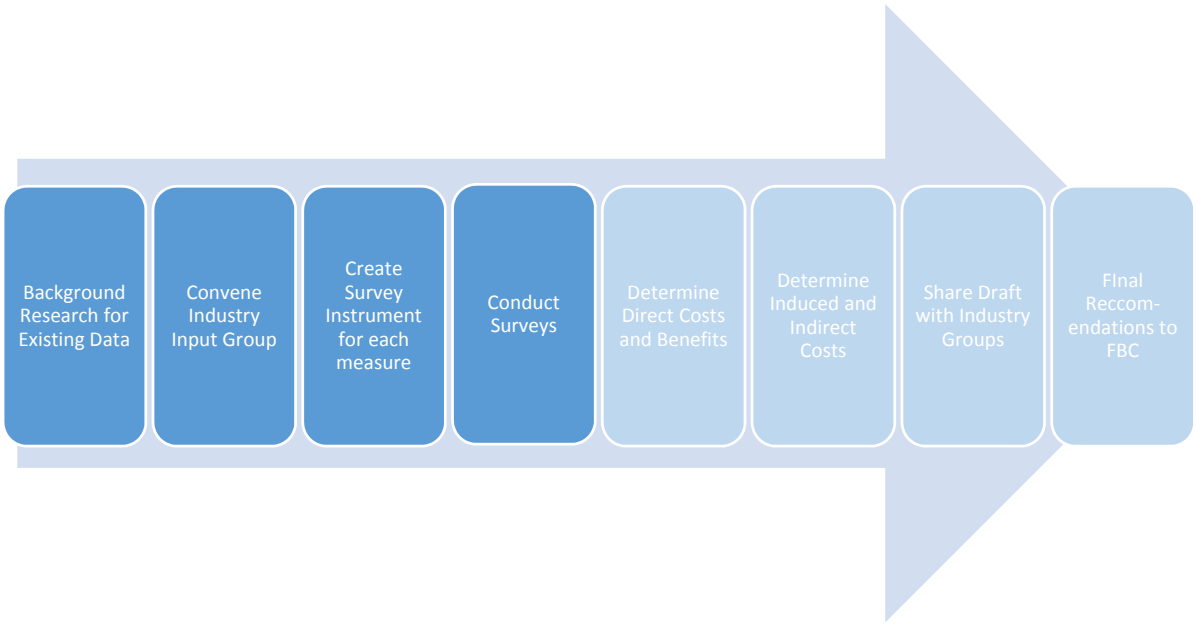


Figure 2. Research process progress to date (first four process steps –background research and surveys still in progress).

Task 1: Testing and Task 2: Ventilation

Based on industry advisory group feedback, it was decided to combine the Task 1 (air leakage / blower door testing requirement) and Task 2 (mechanical ventilation requirement) research activities and survey documents.

Blower Door Testing Background Research

As described in the project proposal, a 2015 Petition for Emergency Rulemaking by the Florida Building Commission[1] included an estimated cost range for blower door testing from the Florida Home Builders Association Green Building Council of $200 to $300 per house. The Florida Solar Energy Center (FSEC) provided a professional opinion letter to the Florida Building Commission,[2] in which, based on professional experience, it estimated that blower door testing for a typical single family homes would involve 35 – 55 minutes on-site to conduct a seven-step test process, not including time for contractor communications and delivering the required test report.

Additional, existing blower door testing data has been collected from two certified home energy rating organizations. One provider has conducted over 11,000 blower door tests since 2009. They indicated a blower door test cost of $150 each for large groups of homes located in close proximity and agreed with the typical prices of $200-300. The other energy rater provided cost data reflecting an average of $350 for blower door testing in about 70 homes. Cost data is anticipated from a third blower door testing provider.

Ventilation Research

A limited amount of whole-house mechanical ventilation cost data has been obtained to date, indicating a range of costs.

- The National Renewable Energy Laboratory (NREL) Residential Efficiency Measures Database[3] indicates an average energy recovery ventilator (ERV) cost of $1,300 to implement
- Referring to runtime ventilation systems with control, a 2013 DOE Building Technologies Program document[4] states that "Building America has refined simple whole-house ventilation systems that cost less than $350 to install."
- A Minnesota Sustainable Housing Initiative article[5] estimates medium-sized (70-120cfm) recovery ventilators to cost between $600 and $1100, with ERVs costing $150 to $200

[1] "Amended Petition for Emergency Rulemaking by the Florida Building Commission." June 9, 2015. Accessed July 29, 2015: http://www.floridabuilding.org/fbc/commission/FBC_0615/Commission/Amended_Petition_for_Emergency_Rulemaking_by_the_FBC.pdf

[2] Vieira, R. Letter to Florida Building Commission Chairman Richard Browdy. June 9, 2015.

[3] http://www.nrel.gov/ap/retrofits/measures.cfm?gId=10&ctId=236

[4] http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/1_3a_ba_innov_lowcostventilation_011713.pdf

[5] http://www.mnshi.umn.edu/kb/scale/hrverv.html

more than comparable HRVs and installation adding $1200 to $1500. High-efficiency models add $250 to the cost of comparably sized average-efficiency units.

Assemble a Testing and Ventilation Industry Advisory Group

The purpose of the residential industry advisory group is to provide expert input and advice during the development of the survey tool, assist with recommending contacts for distribution of the survey, and to provide other relevant blower door testing and mechanical ventilation cost data.

The Residential Industry Advisory Group including representatives from the following organizations and stakeholder groups:

- Florida Refrigeration & Air Conditioning Contractors Association (FRACCA)
- Florida Home Builders Association (FHBA)
- Florida Weatherization Network
- Florida home energy raters (3 companies)
- EPA ENERGY STAR for New Homes program
- Production builders (1 national builder, 2 independent)
- Custom builder (1)

An effort to include mechanical ventilation equipment manufacturers in the advisory group was initially successful but that member dropped out. We could not attract a mechanical ventilation supplier within the window of opportunity to participate. However communication has been established with a national wholesale HVAC distributor. Based on advice from legal counsel no one currently serving on the FBC or TACs was requested to serve.

Testing and Ventilation Survey Instrument

Draft blower door testing and mechanical ventilation surveys were developed and then reviewed by the residential industry advisory group during a combined live on site / teleconference / webinar meeting held October 16, 2015 (meeting agenda provided in the Appendix).

Based on industry advisory group input, survey modifications were made and the separate blower door testing and mechanical ventilation surveys were combined into one survey. The survey was designed to be taken on-line. To minimize time required to take this longer survey, question logic was included; for example, if a respondent indicated they had not performed any blower door tests in the past, they would not see any questions about past blower door testing work (they would however still see questions about anticipated future blower door testing work).

A second meeting of the Residential Advisory Committee convened again on October 30 using a teleconference and webinar interface to review the combined and refined survey. Subsequently, staff used the UCF Qualtrics survey tool to design and organize the survey instrument. The survey was designed and tested by five staff members prior to release. The final survey instrument is provided in the Appendix.

Testing and Ventilation Survey distribution

The initial email announcing the online survey went out on November 6, 2015 to a list of 24,000 general contractors, energy raters, and an FSEC buildings newsletter mailing list. Thousands were returned as undelivered. A much smaller group was returned with a request for sender identification before the email would be delivered; these requests were fulfilled in an effort to maximize survey exposure. The survey was also sent by DBPR to 5,000 people on their code mailing list. The announcement was also sent to certified home energy raters within the EnergyGauge Office database on November 10. Committee members with FRACCA, FHBA, and one of the individual home energy raters indicated intent to distribute the announcement also. FSEC provided distribution partners with boilerplate announcement language to minimize bias. An email will be sent from FSEC on November 16 that will remind professionals to take the survey by the November 20 survey response deadline. The email includes links to both the testing/ventilation and access elevator surveys and will go out to a list of 47,000 people.

Testing and Ventilation Survey Responses

As of November 13, there were 137 testing and ventilation survey responses. Considering the time it takes to complete the survey and the strictly voluntary nature of completing it, the response rate is respectable. Of these 137 respondents, 64 indicate either having performed at least one blower door test or having had at least one blower door test conducted for them over the past two years. Eighty-one respondents indicate having installed at least one whole-house mechanical ventilation system or having had at least one whole-house mechanical ventilation system installed for them over the past two years. Comments to date are largely very constructive. The responses will be tabulated and analysis completed after the survey response period has ended.

Testing and Ventilation Code recommendations

Code recommendations (if any) will be developed after the survey is complete.

Task 3 Access Elevator

Access Elevator Background Research

The literature search to date has included a review of related code modifications from multiple code organizations, including the National Fire Protection Association (NFPA) and the International Code Council (ICC), as well as some local jurisdictions that adopt the ICC family of code. The research also included a review of the history of the requirement, fire related data, and other factors. A summary of that research is provided. Cost data is not very prevalent. Data presented to the FBC had estimates from $770,000 to $1.3 million for structures 12 to 16 stories tall[6].

Overview of Code Requirements

The purpose of having a second fire access elevator in a high-rise building is to facilitate the rapid deployment of firefighters. Firefighters are responsible for assisting in occupant evacuation and fighting the fire. Adding the second fire service access elevator allows them to do both tasks, if needed. Also, if one fire access elevator is out of service, the other one can still be used. Fire access elevator lobbies are required at each level other than the level of exit discharge. The area required for a fire access elevator lobby is 150 sq. ft. One lobby can be used for more than one fire access elevator without having to be enlarged. Fire service elevators (As of the 2015 IBC) need to be able to fit a 24in. by 84in. stretcher. **An additional elevator is not required if the original design contains only one elevator.** Changes that may be necessitated to facilitate the fire service access requirements:

- The building design has to include fire service access elevators that are large enough to accommodate an ambulance stretcher and can hold a minimum of 3,500 pounds
- Emergency lighting along the entire elevator hoistway (lighting may not have to be doubled if it meets the 1 ft.-candle requirement)
- Both elevators must be continuously monitored from the Fire Command Center
- Type 60/Class 2/Level 1 standby source of power for both elevators
- Wiring and cables must be either 2-hr rated CIC or enclosed in 2-hr construction.

IBC Code Changes

Table 1 provides a detail summary of the fire service access elevator (FSAE) requirements per edition of the International Building Code (IBC).

[6] "Amended Petition for Emergency Rulemaking by the Florida Building Commission." June 9, 2015. Accessed July 29, 2015: http://www.floridabuilding.org/fbc/commission/FBC_0615/Commission/Amended_Petition_for_Emergency_Rulemaking_by_the_FBC.pdf

Table 1. Requirements for Fire Service Access Elevators (FSAE) in the IBC

IBC FSAE CODE COMPARISON					
Requirement	**2009 IBC**	**2012 IBC**	**2015 IBC**	**Comments**	**New Cost?**
One Fire Service Access Elevator	**X (403.6.1)**	-	-	Required in buildings with an occupied floor more than 120 ft. above the level of fire department vehicle access.	
Two FSAEs	-	**X (403.6.1)**	**X (403.6.1)**	No fewer than two FSAEs, or all elevators, whichever is less. For example, if you only have one elevator for the building you only need one FSAE. Required in buildings with an occupied floor more than 120 feet above the lowest level of fire department vehicle access.	X
FSAE Accommodation of Ambulance Stretcher	-	-	**X (403.6.1)**	2015: Needs to be both a FSAE and be able to accommodate a stretcher.	X
FSAE Minimum Capacity of 3,500 Pounds	-	**X (403.6.1)**	**X (403.6.1)**		X
Phase I Emergency Recall Operation	**X (3003.2)**	**X (3007.2)**	**X (3003.2)**		
Automatic Sprinkler System		**X (3007.3)**	**X (3007.2)**	The building must be equipped with an automatic sprinkler system. The sprinkler shall have a sprinkler control valve supervisory switch and waterflow-initiating device provided for each floor that is monitored by the buildings fire alarm system. 2012: Prohibited locations consist of elevator machine rooms, elevator machine spaces, and elevator hoistways of FSAEs. 2015: Prohibited locations consist of machine rooms, elevator machinery spaces, control rooms, control spaces, and elevator hoistways of FSAEs.	

IBC FSAE CODE COMPARISON					
Requirement	**2009 IBC**	**2012 IBC**	**2015 IBC**	**Comments**	**New Cost?**
Water Protection	-	**X (3007.4)**	**X (3007.3)**	An approved way to prevent water from entering the hoistway enclosure from the automatic sprinkler system outside the enclosed FSAE lobby.	
Shunt trip	-	**X (3007.5)**	**X (3007.4)**	Means for elevator shut down in accordance with 3006.5 shall not be installed on FSAEs.	
Hoistway Enclosure Protection	**X (3007.2)**	**X (3007.6)**	**X (3007.5)**	Refers to Section 708 for exact requirements.	
Structural Integrity of Hoistway Enclosures	-	**X (3007.6.1)**	**X (3007.5.1)**		
Hoistway lighting	**X (3007.3)**	**X (3007.6.2)**	**X (3007.5.2)**	Minimum of 1 ft.-candle when the firefighters' emergency operation is active.	
FSAE Lobby Rated Enclosure	**X (3007.4.2)**	**X (3007.7.2)**	**X (3007.6.2)**	1-hr smoke barrier. 2009: Required on all floors except the street level. 2012 & 2015: Required on all floors except the levels of exit discharge.	
Lobby Doorways FSAE Lobby Rated Doorways	**X (3007.4.3)**	**X (3007.7.3)**	**X (3007.6.3)**	¾-hour fire door assembly. 2012: Other than the door to the hoistway. 2015: Other than the doors to the hoistway, elevator control room or elevator control space.	
FSAE Lobby Direct Access to Exit Enclosure	**X (3007.4.1)**	**X (3007.7.1)**	**X (3007.6.1)**	2009: Requires direct access to an "exit enclosure". 2012: Requires direct access to an "enclosure for an interior exit stairway". 2015: Requires direct access to an "enclosure for an interior exit stairway or ramp". Exception through a protected path defined.	
FSAE Lobby Minimum Size of 150 sq. ft.	**X (3007.4.4)**	**X (3007.7.4)**	**X (3007.6.4)**	Minimum dimension of 8ft. 2015: Regardless of the number of FSAEs served by the same elevator lobby.	
FSAE Symbol	-	**X (3007.7.5)**	**X (3007.6.5)**		
Class I Standpipe Hose Connection	**X (3007.5)**	**X (3007.10)**	**X (3007.9)**	2009: Required in the "exit enclosure" having direct access from the FSAE lobby. 2012: Required in the "interior exit stairway and ramp" having direct access from the FSAE lobby. The exit enclosure containing the standpipe shall have access to the floor without passing through the FSAE lobby.	

IBC FSAE CODE COMPARISON					
Requirement	**2009 IBC**	**2012 IBC**	**2015 IBC**	**Comments**	**New Cost?**
Elevator System Monitoring	**X (3007.6)**	**X (3007.8)**	**X (3007.7)**	Monitored at the fire command center by a standard emergency service interface system meeting the requirements of NFPA 72.	
Electrical Power Supplied by Normal and Type 60/Class 2/Level 1 standby power	**X (3007.7)**	**X (3007.9)**	**X (3007.8)**	2009 & 2012: Features where this is required consist of elevator equipment, elevator hoistway lighting, elevator machine room ventilation and cooling equipment, and elevator controller equipment. 2015: Features where this is required consist of elevator equipment, elevator hoistway lighting, ventilation and cooling equipment for elevator machine rooms control rooms machine spaces and control spaces, and elevator car lighting.	
Protection of wiring or cables	**X (3007.7.1)**	**X (3007.9.1)**	**X (3007.8.1)**	2009: Wires or cables that interact with the elevator must be protected by construction having 1-hr minimum fire resistance rating or shall be circuit integrity cable having a minimum 1-hr fire resistance rating. 2012: Wires or cables that interact with the elevator must be protected by construction having 2-hr minimum fire resistance rating or shall be circuit integrity cable having a minimum 2-hr fire resistance rating.	

A more detailed discussion including the basis for the code changed follows:

2009 IBC - This edition of the IBC is where the FSAE is introduced and first required in buildings with an occupied floor more than 120 feet above the level of fire department vehicle access (403.6.1). The FSAE is required to have Phase I Emergency Recall Operation (3003.2), hoistway enclosure protection (3007.2), hoistway lighting (3007.3), a rated lobby enclosure (3007.4.2), rated lobby doorways (3007.4.3), lobby direct access to exit enclosure (3007.4.1), minimum lobby size of 150 square feet (3007.4.4), Class I standpipe hose connection (3007.5), elevator monitoring system (3007.6), electrical power supplied by normal and Type 60/Class 2/Level 1 standby power (3007.7), and 1 hour minimum protection of wiring or cables (3007.7.1).

Basis for Change - As a result of the Standards and Technology (NIST) investigation of the collapses of New York City's Word Trade Center towers on September 11, 2001 multiple changes were made to the ICC I-Codes. This is one of the needs identified from the study. The FSAE and the associated requirements of Section 3007 are intended to provide a reasonable

degree of safety for fire fighters operation the FSAE to a location of staging firefighters and equipment. (BBRS) It has been documented that similar requirements for elevators are in the European codes, but the provisions adopted in the ICC codes do not replicate those requirements.

2012 IBC - All 2009 IBC requirements for the FSAE and lobby are also required in the 2012 IBC with some additions. The first addition is a requirement of a total of **two** FSAEs, or **all** elevators, whichever is less for buildings with an occupied floor more than 120 feet above the level of fire department vehicle access (403.6.1). For example, if you have designed your building to have only one elevator than that elevator must be a FSAE and an additional one is not required. This edition also requires all FSAEs to have a minimum capacity of 3,500 pounds (403.6.1). It is required that the building be equipped with an automatic sprinkler system, which shall have a sprinkler control valve supervisory switch and waterflow-initiating device provided for each floor that is monitored by the building fire alarm system (3007).

The locations prohibiting sprinklers consist of elevator machine rooms, elevator machine spaces, and elevator hoistways of FSAEs (3007.3.1). There also needs to be an approved way to prevent water from entering the hoistway enclosure from the automatic sprinkler system outside the enclosed FSAE lobby (3007.4).

Another requirement states that any means for elevator shut down in accordance with 3006.5 shall not be installed on FSAEs (3007.5). Structural integrity of hoistway enclosures also must comply with Sections 403.2.3.1 through 403.2.3.4 (3007.6). This means that the hoistway must match the structural integrity of interior exit stairways and elevator hoistway enclosures. The FSAE symbol was also introduced as a requirement in this edition (3007.7.5). The protection of the wiring and cables was increased from 1 hour to 2 hours in Section 3007.9.1.

Basis for Change - This is the specific requirement being challenged in the State of Florida. There were multiple code proposals submitted in the IBC process and proposals addressing number of FSAE's ranged from a minimum of three FSAE, to a requirement for two FASE with an exception that allows just one with an increased size. There was significant discussion about small footprint buildings and the impact of a second FSAE. **The result was a compromise that allowed only one FSAE if in fact the building was small enough (small footprint building) and only one elevator is provided. Two are only required, where in fact two elevators are provided in the building.** The final provision calling for two FSAE was added to the ICC and the need is based primarily on a survey conducted by the proponents, which includes the National Elevator Industry and the International Association of Fire Fighters. The survey resulted in 35 responses all indicating that the number of elevators used for firefighting operations varies from 2 to 6. Only one respondent, a suburban bedroom community indicated one elevator is sufficient for firefighting. Koffel Associates could not locate the documented results of this study. It is possible the proponents only documented the results in the code proposals.

The proponents also referred to past experience of fires in high-rise buildings that show elevators may not have been available due to maintenance or other reasons. Reliability was indicated as a concern and factor resulting in proposal for additional FSAE. It should be noted that there is a great deal of high-rise fire history available and some where the elevators were not in service at the time of the fire. However, there has been little work to associate the impact of that outage on the outcome of the fire.

2015 IBC - All 2012 IBC requirements for the FSAE and lobby are also required in the 2015 IBC with some changes. The most significant change requires FSAEs to be able to fit a 24 in. by 84 in. stretcher (403.6.1). This change increases the size of all FSAEs instead of just one as previously required.

Basis for Change - The justification is that firefighters use FSAEs to stage and to fight a fire, which means that these elevators will be occupied carrying firefighting equipment and personnel to the fire floor (G53-12). This means that if only one of the FSAEs is able to accommodate a stretcher than it may in use by the firefighters staging the fire and will therefore not be available to evacuate injured persons (G53-12). By having every FSAE large enough to hold a stretcher, you are theoretically able to evacuate disabled occupants regardless of which elevator the firefighters are using to stage the fire. A minor change to the code includes which locations are prohibited to have automatic sprinkler coverage. They consist of machine rooms, elevator machinery spaces, control rooms, control spaces, and elevator hoistways of FSAEs (3007.2).

Local Jurisdiction Impact

New York City and Chicago were two jurisdictions noted to have potentially excluded the requirement for two FSAE. Both cities have their own building codes. New York City's code is based on the ICC but the City has not yet adopted the 2012 Edition of the IBC. As such, the City has not weighed-in yet on whether they believe this requirement is cost effective and if they will adopt it.

The City of Chicago does not yet adopt the ICC family of codes and has their own Building Code. Currently they require only one FSAE and no documentation was found that indicates they have considered providing the second FSAE.

Additional Details on History behind FSAE

September 11, 2001 Tragedy - On September 11, 2001, there were sixteen minutes that passed after the first World Trade Center tower was hit and before the second tower was hit. During these minutes it was estimated that over 3,000 occupants were able to evacuate using the elevators (Lorenz). At this time in history, elevator evacuation during a fire was always advised against, and stair evacuation was seen as ideal even in high rise buildings. This event changed the way the US viewed elevators and emergency evacuation and made it apparent how critical elevators can be in an occupant evacuation. The NIST/GSA investigation/reports from the 911 tragedy resulted in numerous Code changes and changed the way the US saw the use and application of elevators during a fire or other emergency. Changes included adding provisions to "harden" elevators to increase reliability and allow elevators to play a more significant role in

high rise buildings for both emergency evacuation and for fire fighter operations. As a result of this tragedy and the research from the tragedy, increasing elevator reliability and protection for fire fighter operations and occupant evacuation was introduced into the US Codes.

Elevator Reliability

One of the factors used as justification for the additional FSAE is elevator reliability and the need for the second elevator in case one of them is out of service. There was no statistical information found regarding how often elevators are out of service. There are however several reasons as to why an elevator would be down at any given time. Elevators are commonly down for maintenance, operation issues, repair, and modernization (Thornburg). If there is only one FSAE in the building, then there is an increased risk that the one elevator designed to protect the fire fighter could be the one out of service. Elevators in new construction are likely to be using state of the art technology which should make them more reliable and require less maintenance than elevators in the past. However, it needs to be recognized that even these new elevators will age and in time, maintenance will be required, increasing the likelihood that the FSAE will be out of service during an emergency.

Elevator Size

Under the 2015 IBC, the elevators have to be able to accommodate a 24-inch by 84-inch stretcher in the horizontal position. A typical 3500 lb. capacity elevator (2012 IBC requires all FSAEs to be of this capacity) is 80 inches wide and 65 inches deep. Assuming the code intent is to fit the stretcher in the horizontal position in the elevator, this size elevator is a little tight to fit the stretcher diagonally. In practice, the stretcher could fit by tilting slightly non-horizontal or if the stretcher allows the slightest of bending. An elevator of a few inches wider or longer could accommodate the stretcher without any problem. An elevator with an 80 inches by 65 inches interior has a 103 inches diagonal. An elevator with a 105 inches diagonal should fit the stretcher horizontally. An extra factor of safety should be incorporated. Elevator manufacturers may alter their standard 3500 lb. capacity elevators to accommodate the required dimensions.

Assemble an Access Elevator Industry Advisory Group

The purpose of the industry advisory group is to provide expert input and advice during the development of the survey tool to be used to collect cost and other relevant data regarding the inclusion of a second fire service access elevator into high-rise buildings.

The first step was to identify various stakeholder groups who would be affected by the requirement for a second fire service access elevator. The following list was developed:

- Developers
- Architects
- Engineers
- General Contractors
- Cost Estimators
- Fire Marshals

It was anticipated to have each of these groups represented by at least one member of the industry advisory group. Online research was conducted to identify various companies and individuals from each group who had experience with high-rise construction. This research consisted of reviewing state and national databases, newspaper and magazine articles, as well as personal references. Based on advice from legal counsel no one currently serving on the FBC or TACs was requested to serve.

A telephone and email outreach process was used to contact and invite these individuals to volunteer to be a part of the industry advisory group. The following individuals agreed and the industry advisory group consisted of:

- Sheldon Powell, Gables Development - Boca Raton, FL
- Ralph Hippard, Cost Estimator - Tallahassee, FL
- Bruce Faust, Fire Marshal, Orange County, FL
- Stu Cohen, Architect, Cohen, Freedman, Encinosa & Associates - Miami, FL
- Les O'Bryan, Vice President, Coastal Construction Group – Miami, FL

Additional team members who participated with the industry advisory group included:

- Rob Vieira, Director, Buildings Research Division, FSEC, UCF - Cocoa, Fl
- Michael Houston, Architect and Builder - Orlando, FL
- Vernet Lasrado, Ph D, Assistant Director, Office of Research & Commercialization, UCF - Orlando, FL
- Sharon Gilyeat, PE, Principal, Koffel Associates - Columbia, MD
- Lauren Schrumpf, Fire Protection Engineer, Koffel Associates - Columbia, MD

A teleconference was held on Thursday, October 22, 2015 with all industry group representatives present. The agenda for the meeting is included in the Appendix.

A presentation of the project history as well as background on the code changes was provided. And a summary of the preliminary research provided by Koffel Associates regarding fire service access elevator requirements was reviewed.

A robust discussion was held about the addition of a second fire service access elevator and its impacts on the design of high-rise buildings as well as the cost of construction and lost leasable square footage.

These impacts can be summarized as follows:

- In high-rise buildings with multiple passenger elevators a second elevator needs to be equipped to serve as a fire service access elevator.
- If the elevators are remote to each other the second elevator lobby needs to be fire and smoke protected.
- Some high-rise buildings have only one passenger elevator (which is also a fire service access elevator) and one service elevator each with their own lobbies. The design options are to add a second passenger elevator (which is also a fire service access elevator) using

the same lobby or to convert the service elevator and lobby into a fire service access elevator and lobby.
- A fire service access elevator requires a larger footprint, additional electrical and communications requirements, additional waterproofing requirements, and additional fire and smoke barriers around the lobby.
- All of the above involves additional construction costs to some degree and results in a loss of leasable square footage – albeit minor in some instances.

The initial draft survey was reviewed and revisions and additions suggested as a result of the above impacts.

The group then discussed the options for distributing the survey to stakeholder groups and several suggestions were provided.

Additional contact information was provided for several elevator equipment manufacturers and installers as well as for fire protection engineers. These individuals were later contacted and asked to provide additional input regarding the draft survey.

Once a revised draft survey was produced, the industry advisory group reviewed it and in some cases completed the survey to illustrate the types of answers that might be receive.

A final survey was then produced based on the input from the industry advisory group.

Access Elevator Survey Instrument:

The survey was drafted by FSEC and reviewed by the other project team members (Mike Houston, Koffel and Associates, Vernet Lasrado). After editing, the survey was reviewed by the industry advisory group. The advisory group made suggestions. One of the suggestions led to added questions regarding building designs where they felt an additional lobby space may be needed which would significantly drive up costs. Thus the elevator survey contains two examples, one a three elevator passenger high rise building (no extra lobby required) and one a building with one passenger high rise and one service elevator as is sometimes found in some residential towers that have limited units on each floor. The survey went through more edits and project team reviews before being entered into the UCF Qualtrics software for conducting surveys (see Appendix for survey instrument).

Access Elevator Survey Distribution:

The survey was sent to 42,000 architects, general contractors, engineers as provided by DBPR. Thousands of those were returned as undelivered. It is unknown how many ended up in people's spam. Seventy-two were returned with a request for identification before receiving email. Those requests were completed in an effort that the recipient may see the survey. The survey was also sent to 267 registered elevator company representatives, and 23 cost estimators represented as conducting cost estimation in the eastern U.S. It was also sent by DBPR to 5000 people on their code mailing list. A reminder email will be sent to all recipients (from FSEC) on November 16 warning about the approaching November 20 deadline. It is estimated that only a small percentage of all these recipients actually are the stakeholders who work on high rise buildings.

It is similar to sending a survey to everyone working in agriculture in Florida but you only ask those growing guavas to respond.

Research was conducted that led to a small group of names of leading high rise developers and architect firms (some are headquartered out of Florida but had completed high rise structures in Florida). Calls were placed but usually those did not result in a conversation with the key people or receiving email addresses. Instead, a postcard was sent on November 6 to 19 developers and 23 architect firms.

Access Elevator Survey Responses:

As of the morning of November 13, there were 187 responses. Considering the time it takes to complete the survey and the strictly voluntary nature of completing it, the response rate is respectable. Of these respondents, 65 indicate they have helped design, specify or built a fire service access elevator. Comments to date are very constructive. The responses will be tabulated after the survey response period has ended.

Access Elevator Code recommendations:

Code recommendations (if any) will be developed after the survey is complete.

Task 4: Industry Presentations:

This task is planned for early 2016.

Deliverables Update

The project includes interim and final report deliverables.

Deliverable #1 Interim Report

A draft report providing technical information on the problem background and resulting economic information gathered for each of the three delayed code requirements will be submitted by November 15, 2015. The report will be presented to the Commission or Commission's appropriate Technical Advisory Committee at a time agreed to by the Contractor and the Department's Project Manager.

- Interim report deliverable completed with submission of this November 13, 2015 report.

- Presentation to Mechanical, Fire and Energy TACs are scheduled for December.

Deliverable #2 Final Report

A final report providing background data/information, analysis, results, minutes from the stakeholder events and implication by May 15, 2016. The report will be presented to the Commission or Commission's appropriate Technical Advisory Committee at a time agreed to by the Contractor and the Department's Project Manager.

- Final Report due May 15, 2016 with presentations to FBC and TACs.

Project Completion Update

No delays in meeting deliverable due dates are anticipated at this time.

Additional Pertinent Information / Cost Overrun Explanation

No cost overruns are anticipated for this project.

Relevant Work Products

Two online surveys were developed for this reporting period: 1) a blower door testing and mechanical ventilation survey and 2) a two fire service access elevators survey. These surveys together with meeting agendas are provided in the Appendix.

Exhibit A – Relevant Code References

- Excerpt 1 from the Florida Building Code, Energy Conservation, 5th Edition (2014):

> "R402.4.1.2 Testing.
> The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.
>
> "During testing:
> 1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures;
> 2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures;
> 3. Interior doors, if installed at the time of the test, shall be open;
> 4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
> 5. Heating and cooling systems, if installed at the time of the test, shall be turned off; and
> 6. Supply and return registers, if installed at the time of the test, shall be fully open.

- Excerpt 2 from the Florida Building Code, Residential, 5th Edition (2014):

> "R303.4 Mechanical ventilation. Where the air infiltration rate of a dwelling unit is less than 5 air changes per hour when tested with a blower door at a pressure of 0.2 inch w.c (50 Pa) in accordance with Section R402.4.1.2 of the Florida Building Code, Energy Conservation the dwelling unit shall be provided with whole-house mechanical ventilation in accordance with Section M1507.3.

-Excerpt 3 from the Florida Building Code, Building, 5th Edition (2014):

> "Section 403 High Rise Buildings
> "403.6.1 Fire service access elevator. In buildings with an occupied floor more than 120 feet (36 576 mm) above the lowest level of fire department vehicle access, no fewer than two fire service access elevators, or all elevators, whichever is less, shall be provided in accordance with Section 3007. Each fire service access elevator shall have a capacity of not less than 3500 pounds (1588 kg).

Appendix

Residential Industry Advisory Committee Meeting Agenda
October 16, 2015

Fire Service Access Elevator Industry Advisory Group Initial Meeting Agenda
October 22, 2015

Industry Survey Concerning New Florida Residential Construction

Fire Service Access Elevator Impact Survey

FLORIDA SOLAR ENERGY CENTER™
Creating Energy Independence

Agenda

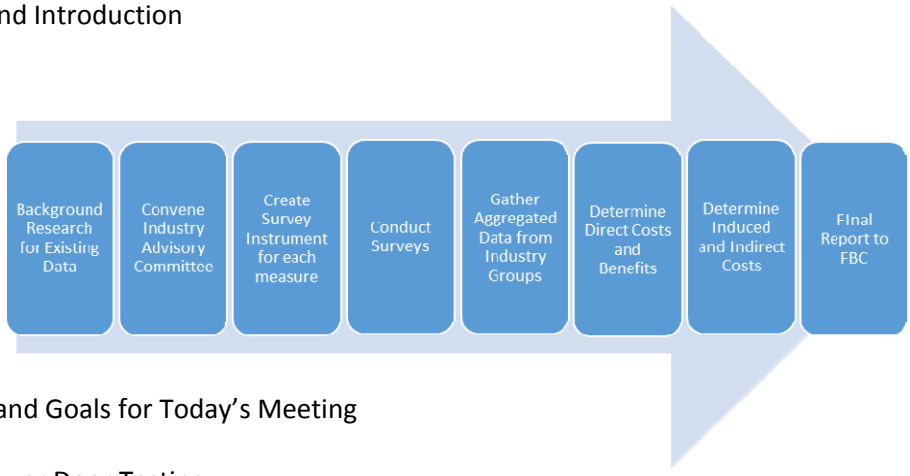
Residential Industry Advisory Committee Meeting

in support of Florida Building Commission research project:

Evaluating the Economic Impacts of the Legislatively Delayed Provisions of the 5th Edition (2014) Florida Building Code

October 16, 2015

Welcome and Introduction



Objectives and Goals for Today's Meeting

Topic 1: Blower Door Testing
- Review delayed code language - Q&A
- Brainstorm stakeholders that will be financially impacted
- Clarify in what way stakeholders are expected to be impacted
- Brainstorm ways to reach each stakeholder & who might have aggregated data

Topic 2: Mechanical Ventilation
- Review delayed code language - Q&A
- Brainstorm stakeholders that will be financially impacted
- Clarify in what way stakeholders are expected to be impacted
- Brainstorm ways to reach each stakeholder & who might have aggregated data

Topic 3: Draft Surveys
- Objective of surveys
- How survey data will be used
- Procedures
- Review of Blower Door Testing Survey
- Review of Mechanical Ventilation Survey

FLORIDA BUILDING COMMISSION

FIRE SERVICE ACCESS ELEVATOR
INDUSTRY ADVISORY GROUP

INITIAL MEETING
OCTOBER 22, 2015 @ 2:30pm

AGENDA

1. Introductions
    a. Rob Vieira Director, Buildings Research Division, FSEC, UCF - Cocoa, Fl
    b. Michael Houston, Architect and Builder - Orlando, FL
    c. Sheldon Powell, Gables Development - Boca Raton, FL
    d. Ralph Hippard, Cost Estimator - Tallahassee, FL
    e. Bruce Faust, Fire Marshal, Orange County, FL
    f. Stu Cohen, Architect, Cohen, Freedman, Encinosa & Associates - Miami, FL
    g. Les O'Bryan, Vice President, Coastal Construction Group – Miami, FL
    h. Vernet Lasrado, Ph D, Assistant Director, Office of Research & Commercialization, UCF - Orlando, FL
    i. Sharon Gilyeat, PE, Principal, Koffel Associates - Columbia, MD
    j. Lauren Schrumpf, Fire Protection Engineer, Koffel Associates - Columbia, MD
2. Project Background and Objectives
3. Review Background Research provided by Koffel Associates
4. Identify Method(s) for Distributing the Survey to the Various Stakeholders
    a. Developers
    b. Architects
    c. Engineers
    d. General Contractors
    e. Cost Estimators
    f. Fire Marshals
    g. Other? _____
5. Review Draft Survey
6. Schedule
    a. Final Survey
    b. Issue Survey
    c. Compile Responses
    d. Next Meeting
7. Other Discussion

Industry Survey Concerning New Florida Residential Construction

[Note: text with blue background below indicates survey logic used to determine which questions respondents see based on previous answers; this text is not visible to respondents.]

This survey concerns ONLY new residential construction (three stories or less) and ONLY in Florida. The University of Central Florida, under the direction and funding of the Florida Building Commission, is collecting input about the cost and other relevant factors related to:

- Whole-house air sealing (excluding duct sealing)
- Whole-house air tightness testing (referred to as blower door testing, which does not include duct testing)
- Residential whole-house mechanical ventilation systems (excluding occupant controlled spot ventilation in kitchens and bathrooms)

Survey results will be used in an assessment of the potential economic impact of two Florida Building Code provisions that the Florida legislature delayed until June 30, 2016:

- Florida Building Code, Energy Conservation, 5th Edition (2014): Section R402.4.1.2 - This provision states that the building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 5 air changes per hour [at 0.2 inches w.g. (50 Pascals) -also known as 5 ACH50]. See Section R402.4.1.2 full text
- Florida Building Code, Residential, 5th Edition (2014), Section R303.4 – This provision requires whole-house mechanical ventilation for houses with ACH50 of less than 5. See Section R303.4 full text
- Additionally, Section R303.4 refers to Section M1507.3 which sets whole-house mechanical ventilation system requirements. See Section M1507.3 full text

Respondents may skip any question; however, skipping key questions may prevent you from seeing more detailed questions. That is, some survey questions will not be displayed depending on answers to preliminary questions. The survey is anonymous.

The survey automatically saves your answers. You can return later (from the same computer) to complete or change your answers for 1 week until the survey closes on November 20.

To report problems or malfunctions in the online survey, please contact Jeff Sonne at Florida Solar Energy Center at 321-638-1406. Thank you.

Part 1 - About Your Business

Have you been involved in the construction of new Florida homes over the PAST TWO YEARS?

- ❍ Yes
- ❍ No

Answer If Have you been involved in the construction of new Florida homes over the past two years? Yes Is Selected

Please list the Florida counties you serve (select all that apply):

- ❑ Alachua
- ❑ Baker
- ❑ Bay
- ❑ Bradford
- ❑ Brevard
- ❑ Broward
- ❑ Calhoun
- ❑ Charlotte
- ❑ Citrus
- ❑ Clay
- ❑ Collier
- ❑ Columbia
- ❑ DeSota
- ❑ Dixie
- ❑ Duval
- ❑ Escambia
- ❑ Flagler
- ❑ Franklin
- ❑ Gadsden
- ❑ Gilchrist
- ❑ Glades
- ❑ Gulf
- ❑ Hamilton
- ❑ Hardee
- ❑ Hendry
- ❑ Hernando
- ❑ Highlands
- ❑ Hillsborough
- ❑ Holmes
- ❑ Indian River
- ❑ Jackson
- ❑ Jefferson
- ❑ Lafayette
- ❑ Lake
- ❑ Lee
- ❑ Leon
- ❑ Levy
- ❑ Liberty
- ❑ Madison
- ❑ Manatee
- ❑ Marion
- ❑ Martin
- ❑ Miami-Dade

- ❑ Monroe
- ❑ Nassau
- ❑ Okaloosa
- ❑ Okeechobee
- ❑ Orange
- ❑ Osceola
- ❑ Palm Beach
- ❑ Pasco
- ❑ Pinellas
- ❑ Polk
- ❑ Putnam
- ❑ Santa Rosa
- ❑ Sarasota
- ❑ Seminole
- ❑ St. Johns
- ❑ St. Lucie
- ❑ Sumter
- ❑ Suwannee
- ❑ Taylor
- ❑ Union
- ❑ Volusia
- ❑ Wakulla
- ❑ Walton
- ❑ Washington

Are you a (an) (select all that apply):

- ❑ Home Builder
- ❑ HVAC Contractor
- ❑ Trade Contractor Other than HVAC, please describe: _____
- ❑ Certified Home Energy Rater
- ❑ Weatherization Industry Professional
- ❑ Other Blower Door Testing Provider
- ❑ Mechanical Engineer
- ❑ Code Official
- ❑ Other, please describe _____

Approximately how many blower door tests have you conducted or had conducted for new Florida homes you built or worked on over the PAST TWO YEARS? (Answer must be a single number e.g. 0, 25, 405):

Approximately how many whole-house mechanical ventilation systems have you installed or had installed over the PAST TWO YEARS in new Florida homes? (Answer must be a single number e.g. 0, 25, 405)

Part 2 - Estimated Cost for a Specific Example House for air sealing, blower door testing, and whole house mechanical ventilation

Questions in Part 2 are based on this PART 2 EXAMPLE HOUSE: A new, Florida Code compliant, single-story, single family detached, concrete block house, all electric (heat pump, water heater, and all appliances), with 2,000 ft2 of conditioned area, 9' ceiling height, 3 bedrooms, and 2 baths.

For reference: ACH50 refers to the air leakage rate measured using a blower door at 0.2 inches w.g. (50 Pascals).

AIR SEALING

Estimate the cost ($) to the builder for typical air sealing measures for the EXAMPLE HOUSE built to the Florida Code's MINIMUM REQUIREMENTS. (See Table R402.4.1.1 Air Barrier And Insulation Installation of the Florida Building Code, Energy Conservation, Chapter 4, full text). (Answer must be a single number e.g. 0, 25, 405)

Would any additional air sealing be necessary to reach the required blower door test result of no greater than 5 ACH50.

- ❍ Yes, in many or all cases.
- ❍ No, unlikely for most homes
- ❍ I don't know

Answer If Would any additional air sealing methods be necessary to reach the required blower door test result of no greater than 5 ACH50. Yes, in many or all cases. Is Selected

If yes, please estimate the additional cost ($). (Answer must be a single number e.g. 0, 25, 405)

Answer If Would any additional air sealing methods be necessary to reach the required blower door test result of no greater than 5 ACH50. Yes, in many or all cases. Is Selected

Please describe the additional air sealing necessary to reach the required blower door test result of no great than 5 ACH50.

PART 2 EXAMPLE HOUSE: A new, Florida Code compliant, single-story, single family detached, concrete block house, all electric (heat pump, water heater, and all appliances), with 2,000 ft2 of conditioned area, 9' ceiling height, 3 bedrooms, and 2 baths.

BLOWER DOOR TESTING

Estimate the cost to builder for conducting a blower door test and all associated reporting and communications for the EXAMPLE HOUSE assuming it is within the tester's normal service area.

	Estimated cost to builder for testing, associated reporting, and all communications ($)	On-site time needed to conduct test (hours)	How long, if at all, would normal site activity need to stop for testing (hours)	Fee for retesting, if necessary ($)
For the EXAMPLE HOUSE (Answer must be a single number e.g. 0, 25, 405)				

Are there any factors that would warrant a substantial increase or decrease in your cost estimate for the EXAMPLE HOUSE?

- ❑ Increase _____
- ❑ Decrease _____

Estimate when the builder could expect to receive the testing results:

- ❍ The same or next business day
- ❍ 2 or 3 business days
- ❍ 4 or 5 business days
- ❍ More than 5 business days
- ❍ I don't know

PART 2 EXAMPLE HOUSE: A new, Florida Code compliant, single-story, single family detached, concrete block house, all electric (heat pump, water heater, and all appliances), with 2,000 ft2 of conditioned area, 9' ceiling height, 3 bedrooms, and 2 baths.

WHOLE HOUSE MECHANICAL VENTILATION SYSTEM

What type of 2014 Florida Code compliant whole-house mechanical ventilation system would you specify for the EXAMPLE HOUSE (select one answer):

- ❍ Exhaust only (excluding occupant controlled kitchen and bathroom fans)
- ❍ HRV (heat recover ventilator) or ERV (energy recovery ventilator)
- ❍ Supply only: runtime with control (ventilation air distributed via AC air handler with ventilation controller)
- ❍ Supply only: ventilation fan delivers outside air into the house (not via the main air handler fan)
- ❍ Other, please describe _____

Estimated cost ($) of this system to the builder including equipment and installation:

Comments on estimate:

Estimated time on-site in hours (Answer must be a single number e.g. 0, 25, 405)

Are there any factors that would likely warrant a substantial increase or decrease in your cost estimate for the EXAMPLE HOUSE?

- ❑ Increase _____
- ❑ Decrease _____

Q22 Would you expect the selection or characteristics of the air conditioning and heating equipment to change with the addition of whole-house mechanical ventilation for the EXAMPLE HOUSE?

- ❍ Yes
- ❍ No
- ❍ I don't know

Answer If Would you expect the selection or characteristics of the air conditioning and heating equipment to change with the addition of whole-house mechanical ventilation for the EXAMPLE HOUSE? Yes Is Selected

If you expect the selection or characteristics of the air conditioning and heating equipment to change with the addition of whole-house mechanical ventilation for the EXAMPLE HOUSE, please estimate the cost and describe the changes needed?

- ❑ Estimate cost ($) (Answer must be a single number e.g. 0, 25, 405) _____
- ❑ Describe the expense _____

Part 3 - Future Work with Blower Door Testing, and Whole-House Mechanical Ventilation

In Part 3, we'd like to ask about your anticipated FUTURE blower door testing and whole-house mechanical ventilation systems, again in new residential code (three stories or less) construction.

If blower door testing is required in the FUTURE, who would you expect to offer blower door testing services (select all that apply)?

- ❑ Home Energy Raters
- ❑ Utilities
- ❑ Weatherization professionals
- ❑ HVAC contractors
- ❑ Insulation contractors
- ❑ Energy Code calculation providers
- ❑ Builders will test their own homes
- ❑ Other, please describe: _____
- ❑ I don't know

If blower door testing is required in the FUTURE, do you or your company intend to conduct or offer blower door testing services?

- ❍ Yes
- ❍ No

Answer If If blower door testing is required in the future, do you or your company intend to conduct blower... Yes Is Selected

Have you or your company already acquired training to conduct blower door testing?

- ❍ Yes
- ❍ No

Answer If Have you or your company already acquired training to conduct blower door testing? Yes Is Selected

Which of the following best describes the type of training you received to conduct blower door testing?

- ❍ Self study
- ❍ Certification program
- ❍ Industry association training
- ❍ Other _____

Answer If If blower door testing is required in the future, do you or your company intend to conduct or offer blower door testing services? Yes Is Selected

If there were no changes in your current capacity and work load, estimate the number of additional blower door tests you could conduct annually within your normal service area. (Answer must be a single number e.g. 0, 25, 405)

Answer If If blower door testing is required in the future, do you or your company intend to conduct or offer blower door testing services? Yes Is Selected

What resources would you need to double the number of blower door tests annually (select all that apply)?

- ❑ Nothing
- ❑ Additional training
- ❑ Additional personnel
- ❑ Additional equipment
- ❑ Other _____
- ❑ I don't know

If whole-house mechanical ventilation is required in the FUTURE, will you or your company be involved in specifying such systems?

- ❍ Yes
- ❍ No

Answer If If whole-house mechanical ventilation is required in the future, will you or your company be involved in specifying such systems? Yes Is Selected

What type(s) of whole-house mechanical ventilation systems do you plan to typically specify to comply with Florida Code requirements if/when the legislative delay ends (select all that apply)?

- ❑ Exhaust only (excluding occupant controlled kitchen and bathroom fans)
- ❑ HRV (heat recovery ventilator) or ERV (energy recovery ventilator)
- ❑ Supply only: runtime with control (ventilation air distributed via AC air handler with ventilation controller)
- ❑ Supply only: ventilation fan delivers outside air into the house (not via the main air handler fan)
- ❑ Other, please describe _____
- ❑ I don't know

Answer If What type(s) of whole-house mechanical ventilation systems do you plan to typically specify to co... Exhaust only Is Selected Or What type(s) of whole-house mechanical ventilation systems do you plan to typically specify to co... Supply only ventilation fan delivers outside air into the house (not via the main air handler fan) Is Selected Or What type(s) of whole-house mechanical ventilation systems do you plan to typically specify to co... Supply only: Runtime with control (ventilation air distributed via AC air handler with ventilation controller) Is Selected Or What type(s) of whole-house mechanical ventilation systems do you plan to typically specify to co... Balanced (supply and exhaust) without HRV or ERV Is Selected Or What type(s) of

whole-house mechanical ventilation systems do you plan to typically specify to co... Balanced (supply and exhaust) with HRV or ERV Is Selected Or What type(s) of whole-house mechanical ventilation systems do you plan to typically specify to co... Unbalanced (supply and exhaust) without HRV or ERV Is Selected Or What type(s) of whole-house mechanical ventilation systems do you plan to typically specify to co... Unbalanced (supply and exhaust) with HRV or ERV Is Selected Or What type(s) of whole-house mechanical ventilation systems do you plan to typically specify to co... Other, please describe Is Selected And What type(s) of whole-house mechanical ventilation systems do you plan to typically specify to co... I don't know Is Not Selected And If whole-house mechanical ventilation is required in the future, will you or your company be invo... Yes Is Selected

Why would you specify this/these types?

Answer If If whole-house mechanical ventilation is required in the future, will you or your company be involved in specifying such systems? If no survey skips to next question. Yes Is Selected

Are there any types of whole-house mechanical ventilation system you would not specify to comply with the Florida Code requirement?

- ❍ Yes, please describe which system(s) you would not specify and why:_____
- ❍ No
- ❍ I don't know

Answer If If whole-house mechanical ventilation is required in the future, will you or your company be involved in specifying such systems? Yes Is Selected

Considering your current capacity and work load, estimate the number of additional whole-house mechanical ventilation systems you could install annually (assuming one system per house) within your normal service area. (Answer must be a single number e.g. 0, 25, 405)

Answer If Approximately how many blower door tests have you conducted or had conducted for new Florida home... Text Response Is Greater Than 0 Or Approximately how many whole-house mechanical ventilation systems have you installed or had insta... Text Response Is Greater Than 0

Part 4 - Overall Experience with Blower Door Testing and Whole House Mechanical Ventilation

In Parts 2 and 3 we asked you about an example house and future plans respectively. Now, in Part 4, we'd like to ask about your EXPERIENCE OVER THE PAST TWO YEARS with blower door testing and whole-house mechanical ventilation systems, again in new residential code (three stories or less) construction.

Answer If Approximately how many blower door tests have you conducted or had conducted for homes you built or worked over the last two years in new Florida homes? (Answer must be a single number e.g. 0,... Enter an approximate number (Answer must be a single number e.g. 0, 25, 405): Is Greater Than 0

Please complete the table below for the blower door tests you have conducted or had conducted for new Florida homes over the PAST TWO YEARS. (Answer must be a single number e.g. 0, 25, 405):

**Note: If the blower door test was part of a larger scope of work, please estimate what it would have cost the builder to have only a blower door test and the associated reporting.*

	% of Total Blower Door Tests Conducted (%)	Approximate Average ACH50?	Approximate Average Cost to Builder for Blower Door Testing* ($)
Tested for ENERGY STAR or other program certification			
Tested for optional Florida Energy Code (performance path credit or envelope tightness demonstration)			
All others			

Answer If Approximately how many blower door tests have you conducted or had conducted for homes you built or worked over the last two years in new Florida homes? Approximate number (Answer must be a single number e.g. 0, 25, 405) Is Greater Than 0

Based on past experience, what would you expect the ACH50 to be in a CODE-MINIMUM new Florida home (three stories or less)?

- ACH50 < 3
- ACH50 between 3.1 and 6
- ACH50 between 6.1 and 9
- ACH50 > 9
- I don't know
- Comments _____

Answer If Approximately how many blower door tests have you conducted or had conducted for homes you built or worked over the last two years in new Florida homes? Enter an approximate number (Answer must be a single number e.g. 0, 25, 405): Is Greater Than 0

In the PAST TWO YEARS, have you ever had a building delay of three or more days due to unavailability of house tightness testing personnel?

- Yes
- No

Answer If Have you ever had a building delay greater than three days due to an unavailable house tightness... Yes Is Selected

What percent (%) of time were delays of three or more days experienced? (Answer must be a single number e.g. 0, 25, 405)

Answer If Have you ever had a building delay greater than three days due to an unavailable house tightness... Yes Is Selected

What cost ($), if any, do you associate with a delay of three days in getting a test completed? (Answer must be a single number e.g. 0, 25, 405)

Answer If Approximately how many whole-house mechanical ventilation systems have you installed or had installed over the last two years in new Florida homes? Approximate number (Answer must be a single number e.g. 0, 25, 405) Is Greater Than 0

Please use the table below to indicate the type(s) of whole-house mechanical ventilation systems you have installed in new Florida homes over the PAST TWO YEARS and estimate the average cost for each type (Answers must be a single number e.g. 0, 25, 405)

	% of Total Installs (%)	Approx. Average Cost to Builder Including Installation ($)
Exhaust only (excluding occupant controlled kitchen and bathroom fans)		
HRV (heat recovery ventilator) or ERV (energy recovery ventilator)		
Supply only: runtime without control (ventilation air distributed via AC air handler, and only when air handler is on)		
Supply only: runtime with control (ventilation air distributed via AC air handler with ventilation controller)		
Supply only: ventilation fan delivers outside air into the house (not via the main air handler fan)		
Other, please describe:		

Answer If Approximately how many whole-house mechanical ventilation systems have you installed or had installed over the last two years in new Florida homes? Approximate number (Answer must be a single number e.g. 0, 25, 405) Is Greater Than 0

In the PAST TWO YEARS, have you ever had a building delay of three days or more related to whole house mechanical ventilation installation?

- ❍ Yes
- ❍ No

Answer If Have you ever had a building delay greater than three days related to mechanical ventilation inst... Yes Is Selected And Approximately how many whole-house mechanical ventilation systems have you installed or had installed over the last two years in new Florida homes? Approximate number (Answer must be a single number e.g. 0, 25, 405) Is Greater Than 0

What percent (%) of time were delays of three or more days experienced?

Answer If Have you ever had a building delay greater than three days related to whole house mechanical ventilation installation? If no, survey skips to the next question. Yes Is Selected And Approximately how many whole-house mechanical ventilation systems have you installed or had installed over the last two years in new Florida homes? Approximate number (Answer must be a single number e.g. 0, 25, 405) Is Greater Than 0

What cost ($), if any, do you associate with a delay of three days in mechanical ventilation installation?

Answer If Approximately how many whole-house mechanical ventilation systems have you installed or had installed over the last two years in new Florida homes? Approximate number (Answer must be a single number e.g. 0, 25, 405) Is Greater Than 0

Why were the whole-house mechanical ventilation systems installed (select all that apply)?

- ❑ ENERGY STAR or other program requires it
- ❑ Builder standard practice
- ❑ Homeowner/buyer request
- ❑ Other, please describe _____

Answer If Approximately how many blower door tests have you conducted or had conducted for homes you built... Enter an approximate number (Answer must be a single number e.g. 0, 25, 405): Is Greater Than 0 Or Approximately how many whole-house mechanical ventilation systems have you installed or had insta... Enter an approximate number (Answer must be a single number e.g. 0, 25, 405) Is Greater Than 0

Part 5 - Most Recent Blower Door Testing or Whole House Mechanical Ventilation Experiences

In Part 4, we asked about experience over the PAST TWO YEARS; now we'd like to ask about YOUR MOST RECENT EXPERIENCE, even if it is not a typical job, with blower door testing and whole-house mechanical ventilation systems, again in new residential code (three stories or less) construction.

Answer If Approximately how many blower door tests have you conducted or had conducted for homes you built or worked over the last two years in new Florida homes? Approximate number (Answer must be a single number e.g. 0, 25, 405) Is Greater Than 0

Considering only YOUR MOST RECENT blower door test in a new Florida home (three stories or less), even if it was not typical of your work, please provide the following. (Answer must be a single number e.g. 0, 25, 405) Note: If the blower door test was part of a larger scope of work, please estimate what it would have cost the builder to have only a blower door test and the associated reporting.

	Month (MM)	Year (YYYY)	Approximate conditioned Area (ft2)	Number of bedrooms	Approximate ACH50 test result	Approximate cost to builder ($)
Most Recent Blower Door Test (Answer must be a single number e.g. 0, 25, 405)						

Answer If Approximately how many blower door tests have you conducted or had conducted for homes you built or worked over the last two years in new Florida homes? Enter an approximate number (Answer must be a single number e.g. 0, 25, 405): Is Greater Than 0

Why was YOUR MOST RECENT blower door test conducted (select all that apply)?

- ❑ ENERGY STAR or other program compliance
- ❑ Florida Code compliance (testing completed for air leakage reduction performance path code credit or for envelope tightness demonstration)
- ❑ Homeowner/buyer request
- ❑ Builder or contractor standard practice
- ❑ Other, please describe _____

Answer If Approximately how many whole-house mechanical ventilation systems have you installed or had installed over the last two years in new Florida homes? Enter an approximate number (Answer must be a single number e.g. 0, 25, 405) Is Greater Than 0

Considering only YOUR MOST RECENT whole-house mechanical ventilation system installation in a new Florida home (three stories or less), even if it was not typical of your work, please provide the following. (Answer must be a single number e.g. 0, 25, 405)

Note: If the whole-house mechanical ventilation system was part of a larger scope of work, please estimate the cost to the builder for only the whole-house mechanical ventilation system.

	Month (MM)	Year (YYYY)	Approximate conditioned area	Number of bedrooms	Approximate outside air flow (cfm)	Approximate cost to builder ($)
Most Recent Whole-House Mechanical Ventilation System Install (Answer must be a single number e.g. 0, 25, 405)						

Answer If Approximately how many whole-house mechanical ventilation systems have you installed or had installed over the last two years in new Florida homes? Enter an approximate number (Answer must be a single number e.g. 0, 25, 405) Is Greater Than 0

What type of system was YOUR MOST RECENT whole-house mechanical ventilation system?

- ❍ Exhaust only (excluding occupant controlled kitchen and bathroom fans)
- ❍ HRV (heat recovery ventilator) or ERV (energy recovery ventilator)
- ❍ Supply only: runtime without control (ventilation air distributed via AC air handler, and only when air handler is on)
- ❍ Supply only: runtime with control (ventilation air distributed via AC air handler with ventilation controller)
- ❍ Supply only: ventilation fan delivers outside air into the house (not via the main air handler fan)
- ❍ Other, please describe: _____

Answer If Approximately how many whole-house mechanical ventilation systems have you installed or had installed over the last two years in new Florida homes? Approximate number (Answer must be a single number e.g. 0, 25, 405) Is Greater Than 0

Why was YOUR MOST RECENT whole-house mechanical ventilation system included in this home (select all that apply)?

- ❑ ENERGY STAR or other program requires it
- ❑ Builder's request
- ❑ HVAC contractor or engineer's recommendation
- ❑ Homeowner/buyer's request
- ❑ Other _____

Answer If Approximately how many whole-house mechanical ventilation systems have you installed or had installed over the last two years in new Florida homes? Approximate number (Answer must be a single number e.g. 0, 25, 405) Is Greater Than 0

Why was this specific whole-house mechanical ventilation system selected (select all that apply)?

- ❑ HVAC contractor's choice
- ❑ Builder's choice
- ❑ Homeowner/buyer's choice
- ❑ Price
- ❑ Other, please describe: _____

Answer If Approximately how many whole-house mechanical ventilation systems have you installed or had installed over the last two years in new Florida homes? Enter an approximate number (Answer must be a single number e.g. 0, 25, 405) Is Greater Than 0

Was there any other additional HVAC cost ($) to the builder resulting from whole-house mechanical ventilation?

- ❍ No
- ❍ Yes

Answer If Was there any other additional HVAC cost to the builder resulting from whole-house mechanical ven... Yes Is Selected And Approximately how many whole-house mechanical ventilation systems have you installed or had insta... Enter an approximate number (Answer must be a single number e.g. 0, 25, 405) Is Greater Than 0

If there was additional HVAC cost to the builder resulting from whole-house mechanical ventilation, please estimate the cost and describe the expense.

- ❑ Estimate cost ($) (Answer must be a single number e.g. 0, 25, 405) _____
- ❑ Describe the expense _____

Answer If Approximately how many whole-house mechanical ventilation systems have you installed or had insta... Text Response Is Greater Than 0

Any additional information or comments on YOUR MOST RECENT whole-house mechanical ventilation system?

Part 6 – General

Do you anticipate that the Florida Code's blower door testing requirement and the associated whole-house air tightness requirement will be beneficial overall?

- ❍ Yes
- ❍ No

Additional blower door test related comments:

Do you anticipate that the Florida Code's whole-house mechanical ventilation requirement will be beneficial overall?

- ❍ Yes
- ❍ No

Additional whole-house mechanical ventilation related comments:

Fire Service Access Elevator Impact

[Note: text with blue background below indicates survey logic used to determine which questions respondents see based on previous answers; this text is not visible to respondents.]

HIGH-RISE BUILDING DEVELOPMENT AND CONSTRUCTION PROFESSIONALS:
As you may be aware, the Florida Building Code (Fifth Edition Building) had language that required a second fire service access elevator in new buildings taller than 120 ft with two or more elevators (Section 403.6.1 Fire Service Access Elevator). Prior to this edition of the code, only one fire service access elevator was required. The Florida legislature delayed this code requirement for one year in order to further study the requirement. The Florida Building Commission is conducting this survey of High-Rise Building Development and Construction Professionals to identify the economic impact of this code provision in order to determine if any changes should be made to the Code in the next code cycle. One of the key variables in determining the potential economic impact is the additional construction costs (if any) of incorporating a second fire service access elevator as well as the potential benefits.

The University of Central Florida, under the direction and funding of the Florida Building Commission is collecting input about the cost and other relevant factors thru this survey. The survey is designed to be anonymous. To report problems or malfunctions in the online survey, please contact Wanda Dutton at UCF's Florida Solar Energy Center at 321-638-1430. The survey will be saved with each question completed. You may return to the survey at a later date on the same computer. The survey will time out one week after you start or at the Nov. 20 deadline for survey completion. Thank you for taking the time to complete this survey and for providing us with your insight and experience.

Part I –About Your Business

I am a (an):
- ❑ Architect
- ❑ Civil/Structural Engineer
- ❑ Cost Estimator
- ❑ Developer
- ❑ Elevator Manufacturer/Installer
- ❑ Fire Protection Engineer
- ❑ General Contractor
- ❑ Local Fire Emergency Professional
- ❑ Mechanical/Electrical Engineer
- ❑ Other _____

Florida counties you typically serve:

The remainder of this survey concerns new commercial Code (120' or above) construction.

Part II – Experience with Fire Access Elevator Installations

Approximately, how may high-rise projects (ten stories or higher) have you been paid to work/consult on?

Have you ever helped design, build or specify a fire service access elevator for a building?
- ❍ Yes
- ❍ No

If No Is Selected, Then Skip To Do you anticipate the Code's 2nd fire...

If yes, approximately how many fire service access elevators have you designed/constructed?

Have any of your projects had more than one fire service access elevator?
- ❍ Yes
- ❍ No

Answer If Have any of your projects had more than one fire service access elevator? Yes Is Selected

If yes, why were they equipped with more than one fire service access elevator?

Part III – Estimated Cost and Comments

Please provide an estimate of additional cost for a new project for which planning is just beginning. The project calls for three elevators for a 12-story office tower with interior lobbies and corridors. Under Florida 2010 code, one elevator would be required to be a fire-service-access elevator and the other two could be non-fire-service-access elevators. Under the 2014 Florida code language (the part delayed by the legislature), there would need to be 2 fire-service-access elevators for this project.

For this project then, what is your best estimate of the additional cost ($) for making a second elevator fire-service access compliant (assume it is being served by the same lobby as the other fire service access elevator)? Enter numbers only - no $ or comma or % signs.

Comments on the above cost:

Are there any other factors that would warrant an increase or decrease in your estimate?

- ❑ Increase _____
- ❑ Decrease _____

What if there was another 12-story project being planned with one passenger elevator (a fire service access elevator) and one service/maintenance elevator serving a different lobby. What would be your estimate of the additional costs to convert the service elevator lobby into a fire service access elevator lobby? Enter numbers only - no $ or comma or % signs.

Comments on the above cost - please list those factors that would provide much of the cost you estimated in the previous question.

Are there any other design situations where the two fire service access elevators would be separated and would therefore require a second fire service access elevator lobby?

If the code already required two fire access elevators at the time a project begins, how often would a second lobby for a fire service access elevator be required for your typical projects (estimated % of projects requiring an additional fire service access lobby)? Enter numbers only - no $ or comma or % signs.

Part IV – Most Recent Experience

We now want to ask about your most recent fire service access elevator installation in new construction (not retrofit). Even if this last job is not typical, please answer about this last job. Please do not provide the job name, address or other identifying information.

What was the approximate additional construction cost ($) to make the elevator(s) fire service access compliant? Include all associated construction costs. Enter numbers only - no $ or comma or % signs.

What was the approximate total building project cost ($)? Enter numbers only - no $ or comma or % signs.

How many stories was the structure?

How many fire service access elevators were installed?

How many total elevators were installed?

How many fire service access elevator (elevators) were in the original design for this structure?

What type of corridors were provided?

- ❍ interior
- ❍ exterior
- ❍ both

What type of expected use was the building?

- ❍ Residential
- ❍ Retail/Office
- ❍ Mixed: Residential and Retail/Office
- ❍ Other _____

What was your role on this project?

- ❑ Architect
- ❑ Civil/Structural Engineer
- ❑ Cost Estimator
- ❑ Developer
- ❑ Elevator Manufacturer/Installer
- ❑ Fire Protection Engineer
- ❑ General Contractor
- ❑ Local Fire Emergency Professional
- ❑ Mechanical/Electrical Engineer
- ❑ Other: _____

What is the status of this project?

- ❍ In design/finance phase
- ❍ Permitted but construction has not begun
- ❍ In construction
- ❍ Occupied

Part V – Future Plans

Now we'd like to ask about your anticipated future fire service access elevator installations.

Based on your experience, what factors have a significant impact on the additional cost of making a second elevator a fire service access elevator assuming it was planned from the design stage (check all that apply)?

- ❑ the increased size of the elevator to accommodate a stretcher (stretcher size 24"x84")
- ❑ adding two way communications connected to the fire command center
- ❑ incorporating additional electrical requirements
- ❑ incorporating the emergency generator requirements
- ❑ incorporating additional structural requirements for the hoist way
- ❑ Other: _____

Do you anticipate the Code's 2nd fire service access elevator will be beneficial overall?

- ❍ Yes
- ❍ No

Do you have any specific concerns about the requirement?

Additional Comments:

Thank you for your help!