RESIDENTIAL BUILDING CODE EDUCATION
CURRENT STATUS AND BEST PRACTICES

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SCOPE OF THIS REPORT

This report covers the work performed under Department of Homeland Security funding opportunity DHS-11-MT-082-000-02. FEMA, FLASH and Clemson University partnered to identify what, if any, building code curriculum exists in post-secondary education today. The discovery process included designing and implementing a survey to university administrators, professors and graduate students and industry professionals such as Building Code Officials, Engineers and Architects. The survey was designed to:

- Identify barriers that keep colleges and universities from teaching building codes.
- Assess if there is a need to teach building codes at the college or university level.
- Identify benefits that would motivate universities and colleges to develop courses on building codes.
- Identify methods that will assist universities and colleges in the development of courses on building codes.
- Identify useful themes that building code courses should contain.

This report describes survey results on the current level of teaching activity, identified barriers/opportunities, and resources needed to incorporate building codes into college and university level curricula.

The period of performance for this research was 1/01/2012 through 12/31/2012 and recommendations from the report will be completed during subsequent years.

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TABLE OF CONTENTS

Scope of this Report 2

Overview 4

Study Significance 4

Background Research 6

Research Summary 7

Conclusions 7

References 8

Appendix A: Research Methods & Procedures 9

Appendix B: Results & Analysis 13

Appendix C: Interview Coding 19

Appendix D: Summary 20

Overview

Residential design, material and construction are governed by codes ensuring life, property, and health for all citizens are protected (Dunham, 1998). When International Residential Codes (IRCs) are not enforced, industry professionals apply their own discretion. Based on this research, it is the belief that professionals who appreciate IRC importance and acquire knowledge for implementation are more likely to apply IRCs into their work even when not required or enforced by law. Understanding current status and best practice for teaching IRCs to architecture, civil engineering, and construction science management majors (here in after known as "construction students") provides the first step to understanding how to protect communities in the future (Gerber, 2009).

Municipalities lacking International Residential Code (IRC) adoption or inadequate enforcement risk greater chance of community destruction during the event of a natural disaster. For example, the investigation by the California Seismic Safety Commission into the Northridge southern California earthquake found far less destruction would have occurred if building codes had been rigorously enforced (Burby & May, 1999). However, most municipalities lacking enforcement cite deficient funds and resources as the cause. A report by Heather Way, at the University of Texas School of Law states, "Code enforcement takes time, people, and money, and there is not enough of these resources dedicated to code enforcement in Dallas" (Way, McCarthy, & Scott, 2007). The current economic environment (especially at the local government level) limits the amount of adequate funding available to improve building code enforcement. The future safety of communities will require a different solution.

Educating the next generation of building professionals regarding building codes, specifically residential, is one potential solution for safer communities. As future design professionals, construction students will be responsible for applying building code regulations, "they must perform professionally and accept responsibility and potential liabilities associated with their services" (Dunham, 1998).

ABET is the national accreditation board for civil engineering programs. ABET's "Code of Ethics for Engineers" states that "engineers shall hold paramount the safety, health, and welfare of the public in the performance of their professional duties" (ABET, 1997). Increased community destruction due to lack of residential code implementation and how it affects the safety, health, and welfare of the public seems to still be in question. Understanding the teaching process of IRCs is the first step towards increasing community safety. University construction programs follow national accreditation guidelines. Each guideline provides brief, subjective teaching topics measured through a review process; yet, none of the review topics specifically mention building codes as a direct accreditation requirement. Edward Allen, an architect and author from South Natick, Massachusetts states, "To me the (National Architectural Accreditation Board) NAAB has really fallen short on that issue (of building science detailing and building technology) and so have the schools. There needs to be more taught on the subject" (Energy Design Update, 2005).

Study Significance

The purpose of the research conducted was to identify what is needed, if anything, to improve IRC education of future engineers, contractors, and architects. Better education in this area will lead to greater adoption of codes and a more resilient infrastructure (See Figure 1).

The research process included three components:

(1) assess the current status of residential building code education in accredited architectural, civil engineering, and construction science management programs;

(2) identify importance level of residential building code education from academic and industry perspectives; and

(3) identify "best practice" residential building code teaching strategies.

To address the three areas, five research questions were investigated (See Figure 2). The responses from these questions led to the recommendation to increase the teaching of IRC in construction programs curricula based on the identified best practices.

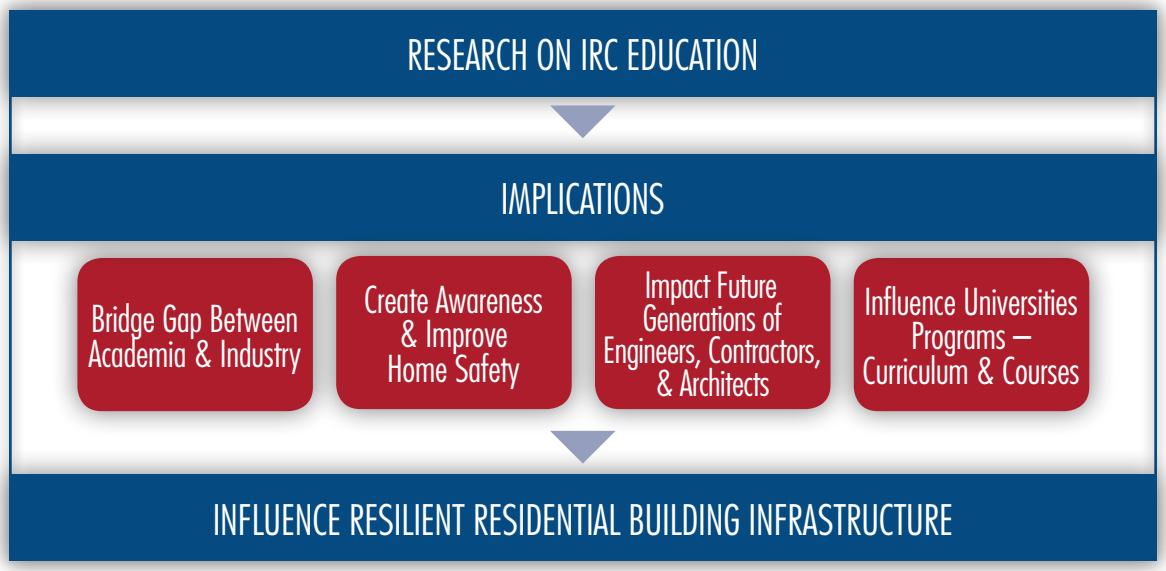

Figure 1: Research Impact

RESEARCH QUESTIONS INVESTIGATED

1. Is IRC knowledge frequently used within industry careers?

a. Courses including IRC education
b. Academic importance rating
c. Industry importance rating
d. Frequency of industry use in career

2. Using the following variables, should IRC be included within accredited construction programs' curricula? If so, when should IRC be taught?

a. Courses including IRC education
b. Academic importance rating
c. Industry importance rating
d. Frequency of industry use in career

3. Using the following variables, do differences exist between industry and academic perception of IRC importance and proper instructional methods?

a. Course time (number of hours) IRC should cover
b. Teaching methods
c. Depth of knowledge

4. What are motivations to include IRC in course work?

5. Are there certain learning objectives IRC courses should contain?

Figure 2: Research Questions

BACKGROUND RESEARCH

The first step was to identify past research related to building code education and evaluate the current status of building code education within university curriculums. The findings indicate a gap in International Residential Code (IRC) education research as well as a lack of importance placed on residential building code in curricula.

Peer reviewed articles from academic and professional journals were evaluated to identify any precedent research on the topic of IRC education. There has been no published research since the early 2000's when the International Code Council (ICC) was formed and states began adopting the International Residential Code (IRC). Previous research, prior to ICC and IRC formation and adoption, emphasize the difficulty in code integration to the curricula due to numerous code agencies, state policies, and conflicting codes. Much of the publications speculate IRC education would improve, becoming inherently easier to teach, when the IRC became recognized as the only code (Dunham, 1998).

The decade long deficiency in IRC education research and lack of IRC teaching method information presents the question, "Why is there a gap in literature that began when the IRC commenced?" One theory is that construction programs believe IRC is now taught properly because there is only one code and requires no additional research. Another theory is that they believe IRC now holds little importance in curricula, therefore research is not a priority. A 2005 report from the *Journal of Energy Design Update* presents a conflicting argument suggesting: schools are not providing sufficient education regarding building science (Energy Design Update, 2005). Richard Keleher in his "Paper of Concern" to the National Architectural Accrediting Board (NAAB) states, "schools are not providing sufficient education in the areas of the building envelope/ enclosure and the relevant building science" (Energy Design Update, 2005). Recognizing building codes as a subset of the larger category building science and envelopes highlights the failure in current education programs (Dunham, 1998). Andre Desjarlais, an engineer and program manager for building envelope research at Oak Ridge National Laboratory, stated, "Part of the problem is that… we don't have university-level programs in building science. We just don't teach it" (Energy Design Update, 2005). These concerns, not addressed in the current literature, create the backdrop for which this research provides insight; essentially restarting the IRC education conversation.

Need for Residential Building Code Education

A presentation in 2011 by University of New Orleans faculty members explains, "an area of the country [New Orleans] so much at risk of coastal storms requires an educated populous to whom risk resilience comes naturally (Kiefer, Peterson, Nance, & Laska, 2011). Communities affected by Katrina are encouraged to rebuild on their own terms and in the same areas in which flooding occurred (Flynn, 2007). The goal from the Chief Planning Architect, Steven Bingler, is "to empower people to make decisions for themselves and their communities" effectively leaving future community resiliency in the hands of the construction professionals performing the work (Flynn, 2007). Building back stronger will not occur unless these construction professionals understand how to do so. A portion of learning to build back stronger includes educating to the IRC. Coastal regions continue to be the fastest growing regions and Stephen Flynn, author of *The Edge of Disaster*, reports, "nearly 90 percent of Americans are currently living in locations that place them at a moderate-to-high risk for earthquakes, volcanoes, wildfires, hurricanes, flooding, or high wind damage" (Flynn, 2007). Given the potential widespread destruction of communities across the country affecting nearly 90% of the population there is a strong need for societal resilience in the context of natural hazard risk beginning with systemic integration of resilience education in curriculums (Kiefer, Peterson, Nance, & Laska, 2011).

See Appendix for detailed information on survey procedures, population samples, participants, and detailed results.

Research Summary

Analysis of our research found IRC is not included in most construction programs. Industry professionals cite "on-the-job" training as the way in which they learned IRCs. However, over 90% of these professionals agreed IRC should be taught within degree programs prior to industry experience. At minimum, students should understand the "bigger-picture" of why IRCs are important and display proficiency in recognition.

Deeper knowledge and technical skills are applicable for trade career programs and should be included in curriculum development. The most appropriate time to integrate IRC education is after a student learns design principles. Typically design principles are taught in the first or second year of most programs, indicating IRC education should begin in year three of four-year programs or in year two of two-year programs. Additionally, faculty indicated an increased motivation to teach IRC if free course modules were available. They specified that course modules would be most useful as student aids and resources during design practice. Varying levels of module detail would provide versatile and diverse applications for different degree types.

CONCLUSIONS

This research restarts the building code education conversation from the late 1990's and early 2000's. Specifically, it addresses the current status of International Residential Code education in accredited construction programs, it identifies the importance level of IRC education from the academic and industry perspectives; and it provides a construct for "best practice" IRC teaching strategies. Based on the statistical and descriptive findings IRC is not included in university programs; yet, those industry and academic research participants believe it should be. Depth of knowledge, teaching strategies, and appropriate year level were identified. (See Appendix).

Faculty response suggests willingness to include IRC into course work and they ensure this can be done through integrating IRC over multiple courses. Availability of free modules for teachers and resources for students was a concern that emerged through faculty interview discussions. Researchers believe IRC curriculum development would be within industry and education communities.

Recommendations for Curriculum Development

Course development was identified in our study as a worthwhile investment to increase IRC education for construction students. Both faculty and industry believe this topic should be addressed during the second half of technical or undergraduate programs. Depth of knowledge varies between program types and industries expectations of students. The course modules should include a basic understanding, importance and depth of knowledge regarding code implementation. The best teaching practices varied as did student-learning styles. Multiple techniques should be incorporated: case studies, photos, online resources, technical illustrations and descriptive installation procedures. Both, academic and industry methodological teaching frameworks should try to be included. Teacher lecture material and student design material are resources that would provide multiple uses for the course modules and increase the likelihood to impact education.

Recommendations for Future Research

Prior to curriculum development, teacher pedagogy and student learning frameworks should be researched allowing curriculums to align with previously developed constructs. Additionally, distribution and marketing methods related to course publication is important for acceptance within the education community. A developed course should be available online and easily accessible. Additional research related to format, ease of use and course settings, based on existing online courses, would increase the likelihood of education community acceptance. Based on our research findings we conclude that proper course development can lead to acceptance and practice from the education community.

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Appendix A: Research Methods & Procedures

The question and issues surrounding IRC education presented by the *Journal of Energy Design Update* and Hensley's predication of easier IRC teaching practices with IRC adoption provides the background this research addresses. (Energy Design Update, 2005; Dunham, 1998). Grounded in theory, allowing actual and current education practices to emerge, previous theoretical teaching frameworks were intentionally ignored. The methods we used were exploratory in nature using a sequential quantitative then a qualitative approach. At each research phase, responses became richer in context, providing both statistical analyses of data followed by open coded response categorization. This mix methods approach increased research internal validity through triangulating initial, statistical responses with follow-up interviews. Survey questions were checked through face validity ensuring responses accurately answered the research questions.

Research Procedure

The mix method approach included three research phases illustrated in Figure A.1. Starting with Phase 1, every curriculum of every program with a student chapter of American Society of Civil Engineers (ASCE), Construction Science Association (CSA), and American Institute of Architects (AIA) was analyzed. This list included approximately 950 different programs, throughout the country, ranging in degree types from associate degrees to PhD programs. Combined, these degree programs represent 460 university departments. Curriculums were accessed through online department websites, course outlines and course descriptions. Analysis was done through reviewing each course description; and highlighting and recording courses related to building codes, specifically residential. Faculty members within each department from Phase 1 were asked to participate in Phase 2, an online survey. Additionally, members of the American Institute of Architects (AIA) residential sector and the International Code Council (ICC) members were also asked to participate in an online survey. Participants were informed that the survey would take less than ten minutes and responses would remain anonymous unless they agreed to participate in Phase 3, the follow-up interviews. Survey responses filtered comparison groups: (1) those agreeing IRC is an important topic and those disagreeing IRC is an important topic; (2) those with suggestive IRC teaching methods.

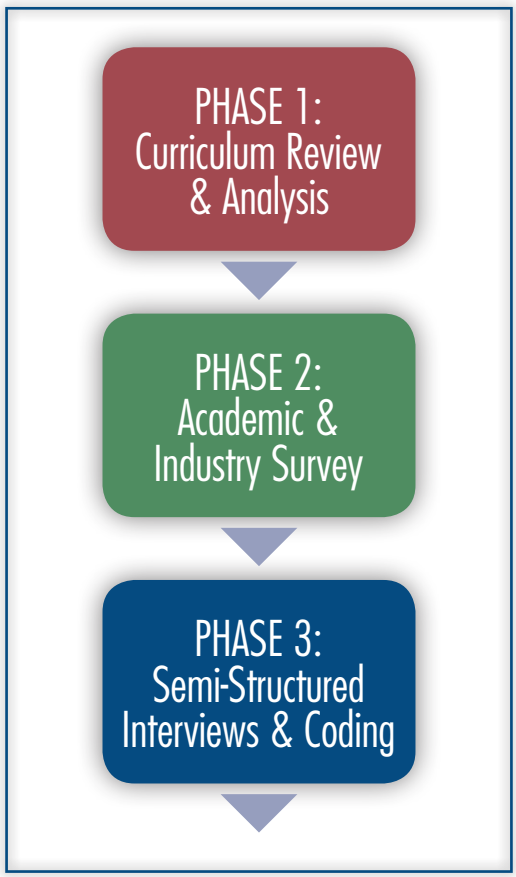

Figure A.1: Research Process

Survey Populations and Samples

The sample size for both academia and industry surveys are the entire populations. The academia population is every university with a current student chapter within ASCE, AIA, and CSA. Figure A.2 illustrates the regional percentages across the country. The academic response rate was 14.78% (68 participants) with a completion rate of 79.41% (54 participants completed).

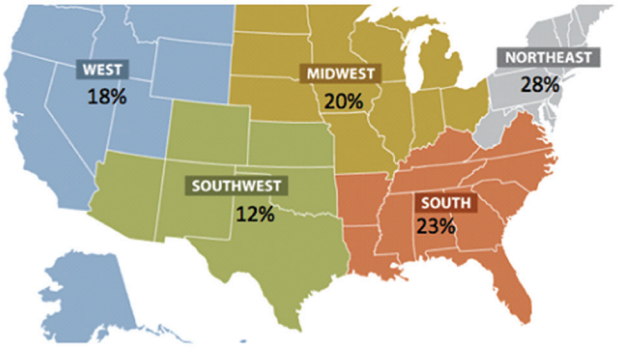

Figure A.2: Regional Demographic of Universities

Classifications by program types (Civil Engineering, Architecture, Construction Science) and academic response rate are provided in Table A.1. Civil Engineering faculty represent the majority of university programs across the country and were the largest survey respondents.

Table A.1: Academic Response Rate

UNIVERSITY DEPARTMENTS		
Department Type	**Number of Departments**	**Response Rate**
Civil Engineering	266	13.9%
Architecture	157	6.37%
Construction Science	37	18.92%
Total	**460**	**11.74%**

The entire ICC residential division and AIA residential members received survey invitations; however the ICC and AIA did not report population sizes. In total, 90 ICC and AIA members started the survey with a completion rate of 85.6% (77 completed surveys). Regional distribution of both groups is illustrated in Figure A.3.

Figure A.3: Regional Response Distribution; Red: Academic, Blue: Industry

Industry respondents by profession are highlighted in Table A.2. Distributing the survey to only ICC and AIA members, the largest subgroups – Architects and Code Officials was expected. Experiences within these two subgroups vary greatly as identified during Phase 3. Many code officials previously worked as contractors or tradesmen and architects interned within the construction field prior to starting their architecture design careers.

Table A.2: Industry Response Rate

INDUSTRY RESPONSE RATE		
Profession	**Response Number**	**%**
Code Official	35	45.45%
Architecture	31	40.26%
Construction Profession	3	3.90%
Engineer	2	2.60%
Other	6	7.79%
Total	**77**	

Interview Participants

Academic and industry cohorts, alike, strongly indicate through survey results (Phase 2) that IRC education in university curriculums is an important topic; the statistical analysis and findings are reported in Appendix B. Survey findings affected Phase 3 interview participant types. Purposeful sampling, only those pro-IRC education, were selected to provide descriptive explanation (Matusovich, Streveler, & Miller, 2009). Those participants against IRC education provided additional comments on the survey comment sections, explaining reasons against IRC education.

Pro-IRC education participants were selected if they (1) thought IRC should be taught within university course work and (2) were willing to participate in follow up interviews, providing contact information. Academia survey results produced 19 potential participants; 5 were chosen for phone interviews and the remaining received email responses.

Industry responses indicated 27 potential follow-up participants; 7 were chosen for semi-structured phone interviews and the remaining were sent questions through email. Phone interviews followed a semi-structured approach with exact questions asked as to the structured email follow-up. Table A.3 provides itemized responses for each program and professional group. Each academic and industry group provided written and/or verbal feedback influencing final coded results.

Table A.3: Follow-Up Interview Response

PHASE 3: ACADEMIA FOLLOW-UP INTERVIEWS		
Program Type	**Requested**	**Respondents**
Architecture	5	3
Construction Science	2	1
Civil Engineer	11	1
Total	**18**	**5**
PHASE 3: INDUSTRY FOLLOW-UP INTERVIEWS		
Profession	**Requested**	**Respondents**
Architecture	12	2
Engineer	1	1
Code Official	11	5
Contractor	3	1
Total	**27**	**9**
		TOTAL INTERVIEWS: 14

Interview Assessment Technique

Interview questions followed a semi-structured, open-ended response strategy. There was no set question order and additional time and/or comment space was provided to all interviewees allowing for elaborate, detailed responses. The idea was to encourage faculty and industry to reflect and report on their teaching beliefs and practices (Matusovich, Streveler, & Miller, 2009). Interview questions reflected key variables identified on page 5, including: IRC importance in curricula, necessary depth of knowledge, teaching motivations, current status and best practice teaching methods. The structured interview question set is provided in Table A.4. Interviews were transcribed and read numerous times before an open-coding strategy was applied to responses. Information patterns, or codes, emerged from the data itself; refining and cataloging codes by combining similarities until a remaining code set was clearly defined (Matusovich, Streveler, & Miller, 2009). High-level coding, depicted in Figure A.4, illustrates categorization relevant to questions asked. Subset coding and results are provided in Appendix C.

Table A.4: Follow-Up Interview Response

INDUSTRY
1) Can you elaborate with personal or professional experience on why (or why not) there is a need to teach International Residential Code?
2) In some counties throughout the country International Residential Code are suggested and not necessarily the law. Can you provide a statement for why a new designer, contractor, or engineer should be motivated to include International Residential Code when not required by law?
3) If field visits are not possible to students interested in learning International Residential Code what would you suggest for them to gain a better understanding of what International Residential Code entail?
4) How did you personally learn International Residential Code and why were you motivated to do so?

ACADEMIC
1) Can you elaborate on how (or how not) current students within your departmental programs gain an understanding of general building codes? Do you feel this is the most effective?
2) Can you elaborate on your personal experience with styles or methods used to teach subjects often considered tedious, detailed, or less engaging for students.
3) Do you feel educators should be cautious about teaching building codes in general? Is there a level of detail or emphasis that should not be over done?
4) Would you or your department find course modules related to International Residential Code useful if provided to you for free?

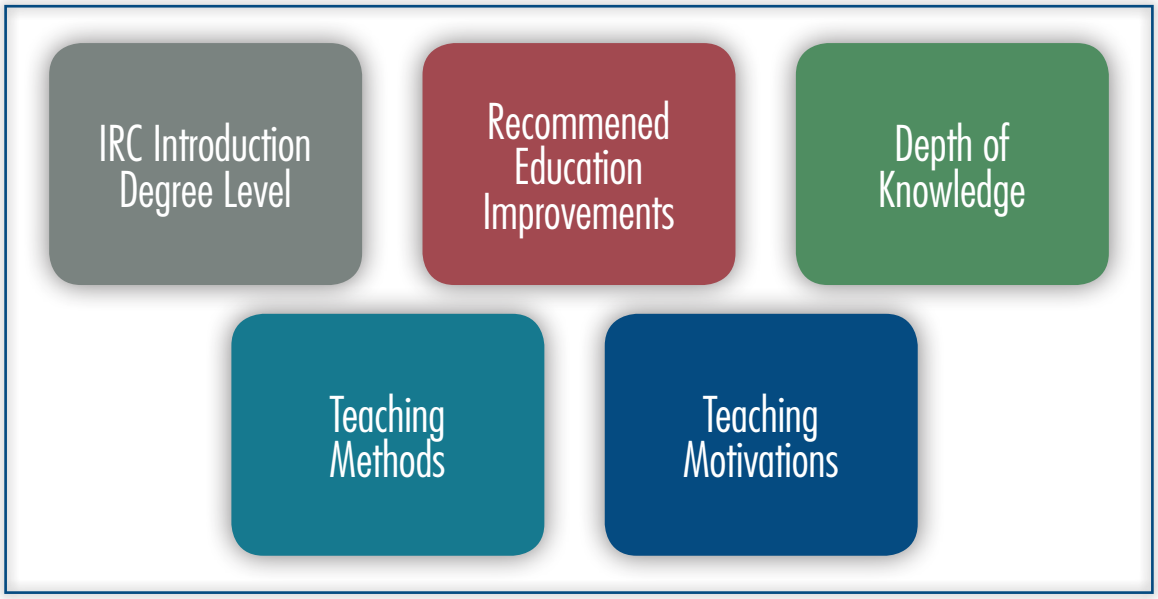

Figure A.4: Code categories based on response

Appendix B: Results & Analysis

Curriculum Review

Understanding IRC education in construction university curricula could not be explained nor justified through Phase 1: online curricula reviews, alone. As the literature review led to a gap in knowledge and development of this study, Phase 1 provided supportive findings suggesting IRCs are not sufficiently included in secondary education programs across the country. Researchers read and reviewed course descriptions from each university construction program (462 universities); documenting IRC inclusions in course titles or course descriptions. Results indicate 6.9% of construction programs include IRCs or non-structural, dwelling codes. The depth and level of IRC knowledge varies; however IRCs occupied enough course work - time or material - to warrant identification in course title or description. Curriculum review findings support continued research towards Phase 2 and 3 – identifying IRC curricula inclusion and clarifying practices.

Analysis of Research Questions

Statistical results and qualitative coding strategies provide an interpretive understanding of IRCs importance, place, and methods within university construction program curricula. The mix method results strengthen the depth of understanding by providing descriptive responses and validating the survey analysis. Six research questions were specifically addressed in this study.

Question 1: *Are IRC important within industry careers?*

The online survey established a basis for the importance of IRC professionally: 92% of industry professionals surveyed indicated, "they use IRC in their careers at least monthly". Figure B.1 illustrates the significance. The large architect and code official survey response groups were factored into analysis to ensure accuracy of results. No significant difference occurred with removal of either group. Filtering both code officials and architects from the survey, indicate 89.9% of contractors, engineers, or other related industry professionals use IRC on a monthly basis.

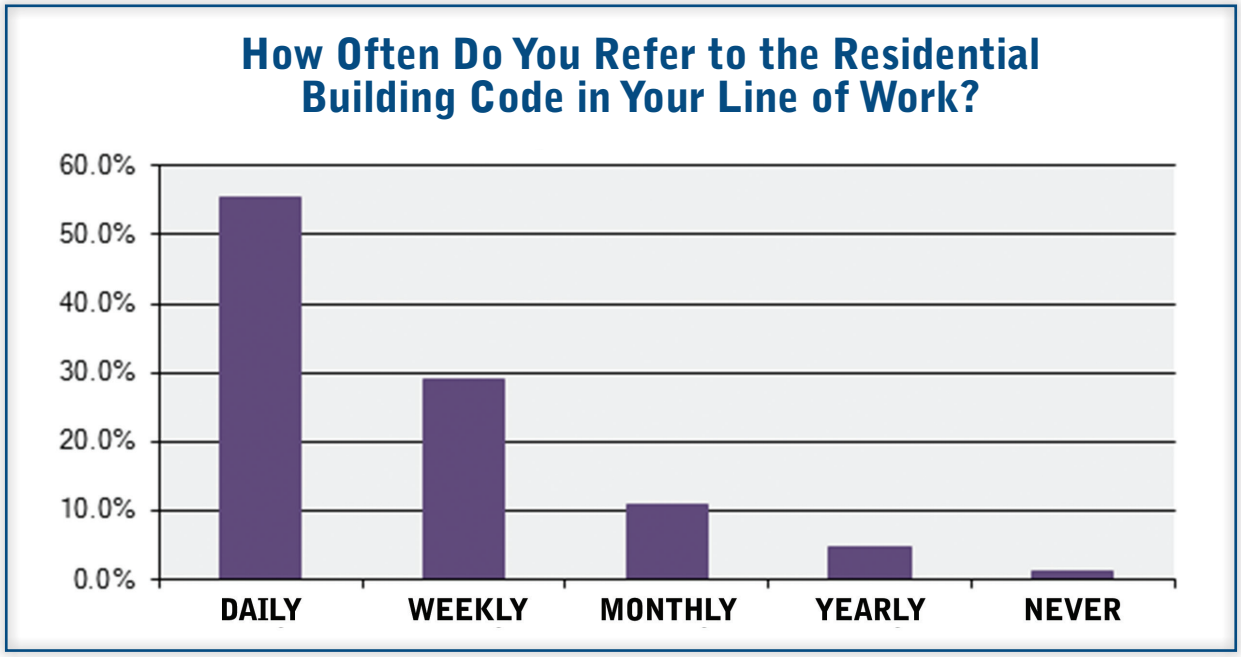

Figure B.1: IRC use within industry careers

Interview questions directed responses to why IRC is an important factor in their careers and also the depiction of experiences influencing their understanding and degree in which IRC is important. Interview responses indicate industry professionals trying to gain or keep creditability amongst professions (or with clients), continually read and stay updated with IRC. An interview quote supports the claim, "I have found that as a relatively young architect, I found that to gain credibility amongst the construction world it was absolutely imperative to do my homework and be articulate about the issues that were relevant to my clients. The building codes guide and shape everything we build regardless of one's opinion of them".

Question 1A: *Should IRC be included within accredited construction programs' curricula? If so, when should IRC be taught?*

Both groups believe IRC should be taught at the university level. Figure B.2 illustrates these results and highlights the difference – degree level in which IRC should be taught. Industry response suggests the technical degree is the most appropriate while academic response suggest undergraduate. Both degree types are preparation for entering the workforce suggesting: IRCs are an important, fundamental concept, prior to starting an industry career. Current professionals indicated they learned IRC from work experience, yet 91% of respondents expressed IRC should be taught to students prior to starting their own professional careers. The high "pro-IRC" education response suggests that professionals believe their experience learning IRC was not appropriate and that the focus should be placed within school course work.

Difference between academic and industry cohorts led to further interview probing. Two constructs emerged through interviews: 1.) Students at the associate degree level will be implementing/installing technical skills and therefore should be the most educated regarding IRCs; 2) Students' graduating from four-year programs will be designing and/or managing construction workers, therefore they must understand the importance of IRC; include IRC in their design and enforce IRC on jobsites. This understanding influences our recommendations for curriculum development; including both constructs. Varying degree levels and program types require either a broader understanding or a deeper understanding and course development must be versatile in application to meet both needs. The interview quotes below provide additional support.

Real World **RESPONSE**

"The construction managers have to check it [IRC] and unless they have prior knowledge or some sort of code education they might not even know what to look for."

"It would be best at trade schools first and for most. Those are the guys putting the work in place."

"By this answer, I don't mean that code aspects should not be taught. However, we should not be teaching to the code, but rather the basis for code provisions."

"…The understanding of risk and potential risks can be taught without getting into specifics of residential codes. "

"I feel we should make the students aware of how codes impact design, where to find them, how to use them and how to simply respond to them."

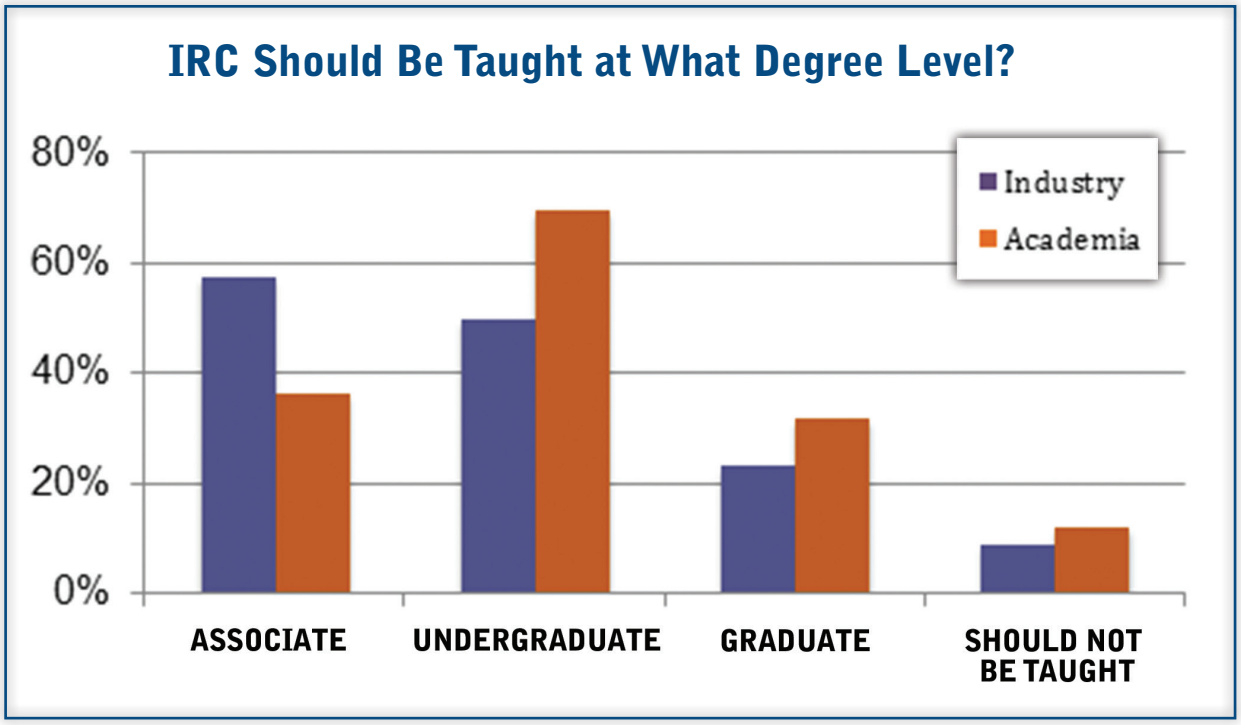

Figure B.2: Difference in degree emphasis

Over 50% of those surveyed stated IRC should be taught to all construction majors. Architecture programs were thought to be the most important programs to receive IRC education. 90% of those surveyed stated IRC should be taught to Architecture students, illustrated in Figure B.3.

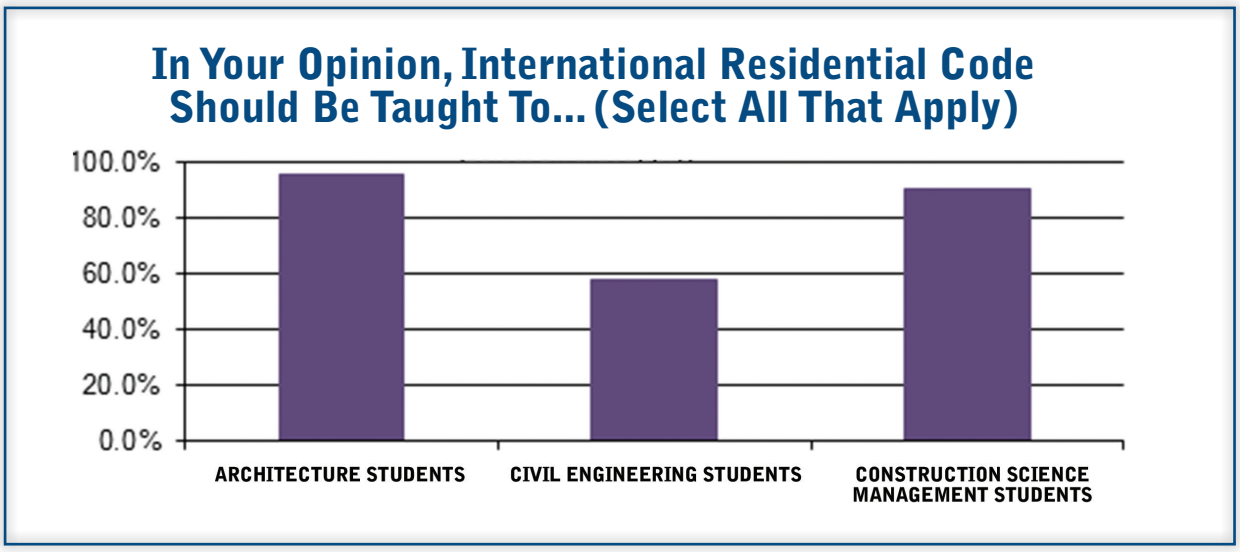

Figure B.3: IRC importance to varying construction programs

Identifying the program year or semester level in which IRC should be included varies based on program type; however, the overall themes are the same. IRC should be taught/integrated only when students show basic understanding of building system principles.

Meaning, IRC is not appropriate within introductory course work. Students should first learn building stages, systems, process, and components. Including IRC prior to students' basic understanding would have limited impact. The interview responses below explain.

Real World **Response**

"If you teach a code class to a young design student the effect is minimal to the student because they don't understand the bigger picture of how the building goes together at that point."

"I think it [third year] is a great year. Been successful for our school. The first few years are tough with lots of information. It is like the marines. It is boot camp. You are breaking them down."

"Education at the 4 year university setting [in] my opinion is that it [code] has to be later in the curriculum."

"IRC is required in third year studio."

Question 2: *Do differences exist between industry and academic perception of IRC importance and proper instructional methods?*

The amount of time and level of detail construction students should dedicate to IRC varies by group (industry or academic). Figure B.4 illustrates the gap between academia and industry.

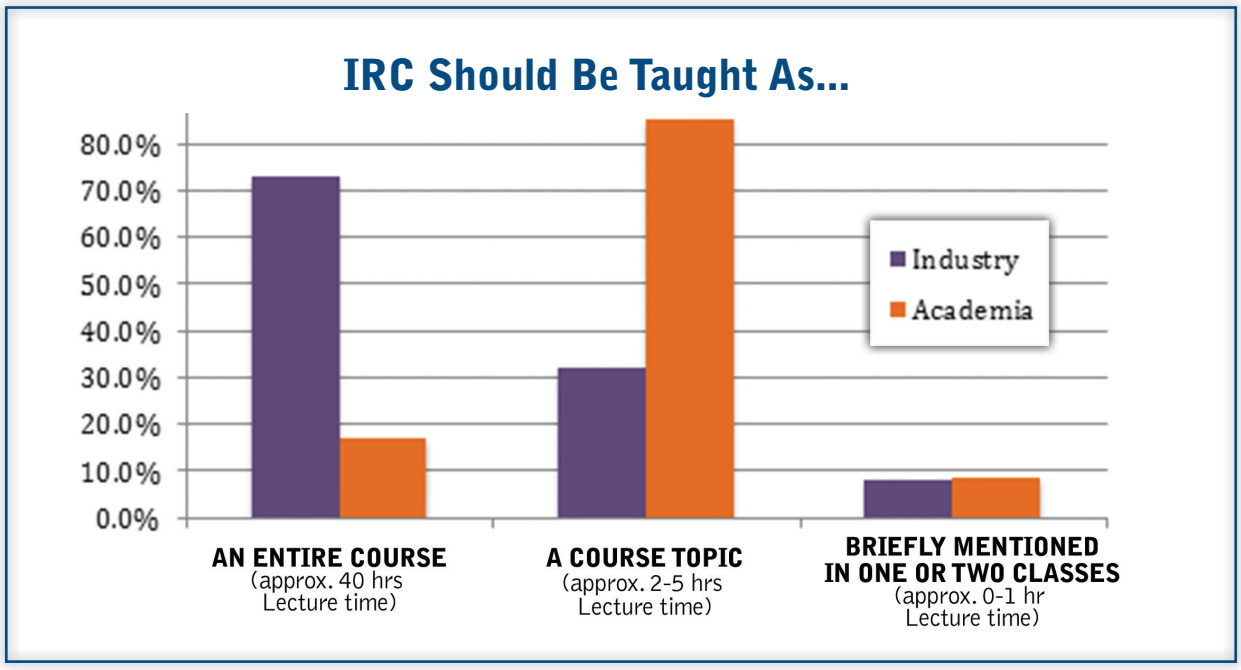

Figure B.4: Importance of lecture time regarding IRC

However, further interview questioning shows importance level is not different, only teaching methods. Academics believe IRC should be taught as a course topic (approx. 2-5 hours of study) and then integrated into all design course work – spanning the length of the program. Industry professionals survey response indicates: IRC should include more course time - approx. 40 hours of study. Survey responses alone, would suggest, industry places a higher importance of IRC education than academics. However, importance level is fairly similar. Implementing IRC in multiple courses, lecture time decreases, however IRC knowledge education does not. Additionally, faculty members suggest integration into course work is best because the amount of lecture time available is limited within a short two- or four-year program. Faculty members explain that reducing lecture time on IRC and integrating into several courses over final year(s) of the program is also easier to do. Interview response substantiates these claims, "[Code] is introduced in a technical course as a topic and then integrated in the design studios".

Teaching methodology varied between cohorts. Working professionals highly recommend teaching IRC through case studies and real world examples. University faculty members suggest teaching through student implementation in design, estimates and final capstone projects. Figure B.5. Recommendations for Curriculum Development, suggests both methods are important to include. Students' development of their own IRC understanding may require both or either forms of learning styles. Interview responses supporting each claim: case study and design integration are supported in the quotes below.

Real World RESPONSE

"A case study of where codes have mattered."

"Short cased studies. To give people an idea."

"Talking about real life we talk about code ethics and current events."

"Should be integrated into various courses and coursework"

"An outline…that included photos of some mistakes. Although they might not remember the specific part, [architecture] ours is a visual field and there's a good chance they will remember the photo."

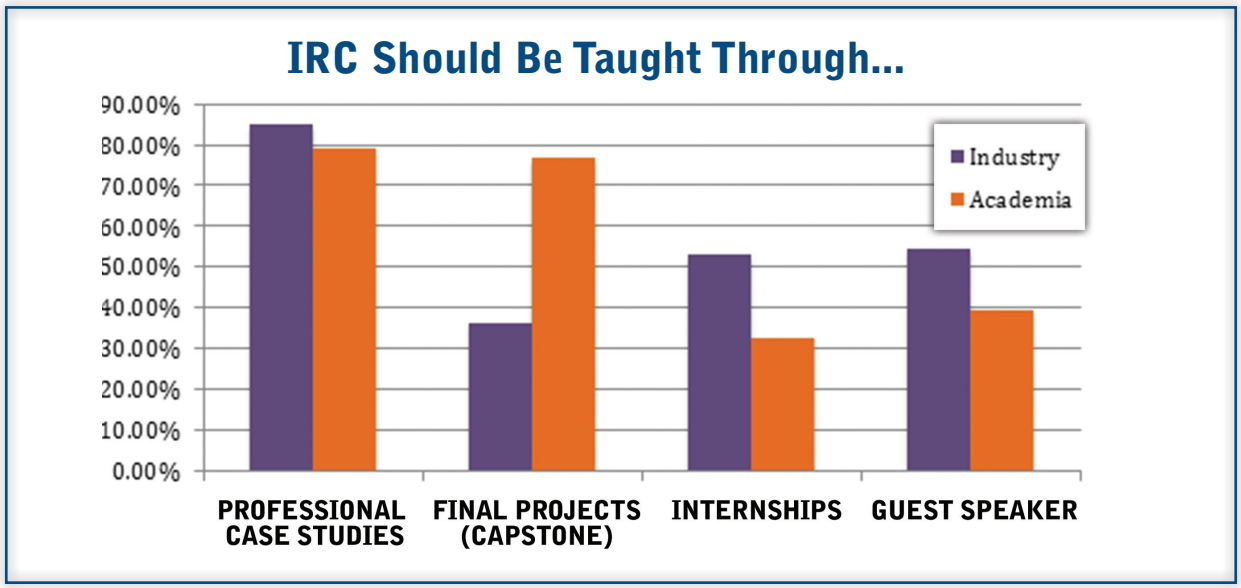

Figure B.5: Teaching practices

Question 3: *What are teacher motivations to include IRC in course work?*

Academic response highlighted that professors' are motivated to teach what the students want to learn. This motivational finding indicates: Students first must be motivated to learn IRC because they realize the significance it will play in their professions. The role of the teacher is to help students see this significance (explained in Question 1.) Additionally, university faculty believes IRC education will impact the future safety of buildings and their community. In the context of curriculum development and teacher motivation, reminding faculty how IRC education influences awareness to their community and safety, faculty belief in safety can become a motivation. Over 60% of faculty agreed that free, available course modules regarding IRC would increase the likelihood of teaching the topic. This is illustrated in Figure B.6 and discussed during curriculum development, on page 4.

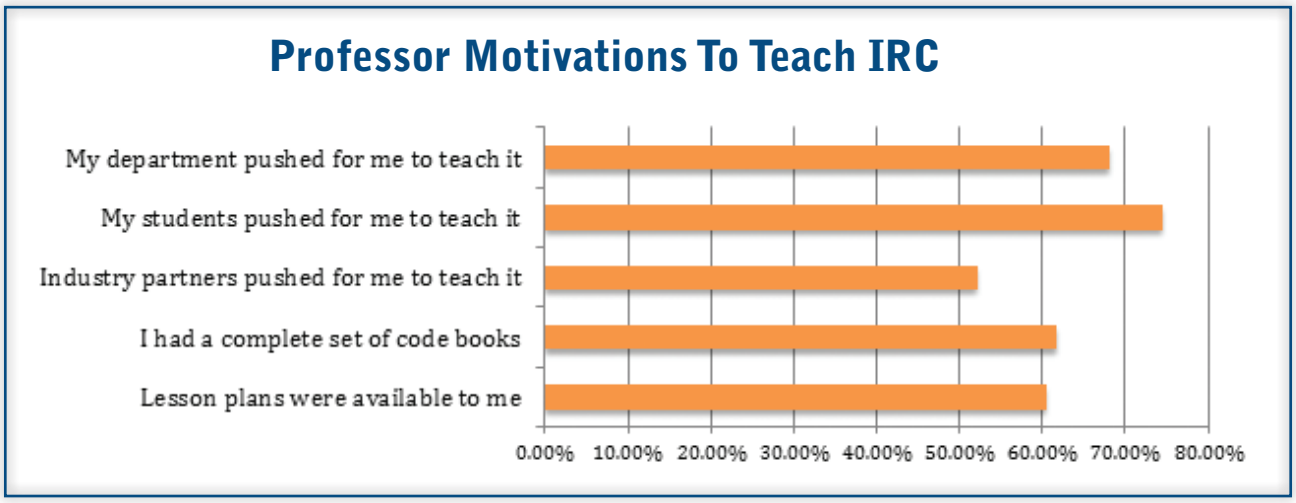

Figure B.6: Teacher IRC motivation

Question 4: *Are there certain learning objectives IRC courses should contain?*

Learning objectives should be integrated into design course work. Schools identified as current "best-practice" during curriculum review and interviewed in Phase 3 emphasized IRC integration rather than a dedicated semester course. Schools highlighted IRC knowledge is not significantly weighted into grading. IRC is described as building blocks students should use during the design process, rather than material students must memorize. In this scenario, learning objectives would be: proper student knowledge, and impacting design to include code. Interview response provides supportive claim, *"I make my student make a poster that shows [IRC inclusion]… I don't put a lot of emphasis on it or much of a grade on it."*

Appendix C: Interview Coding

Transcribed interview text was categorized based on connections between responses.

Degree level to introduce IRC

Pre-design course. Typically design begins third year of four year program or second year of technical program.

Depth of IRC education

Broadly: Why code is important. How to use code books. How code impacts design. Professional awareness and ethics regarding home safety.

Specifically: What to look for on jobsites. Associated terminology. Types of codes. Application during building process and career.

IRC teacing methods

Application to real life

Case studies

Student resources for design

Teacher Motivations

Students and department push for IRC inclusion

Course modules avaliability

Recommened education improvments

Integration during third year of four year program or secondyear of two year program

Figure B.7: Coded themes from interviews

Appendix D: Summary

The safety, health and welfare of our communities are the priority and responsibility of the home building industry. Research illustrates that homes built to code are more resilient than those not built to code. However, cases of increased destruction to communities and loss of life due to code violations are still present. Increasing IRC enforcement requires additional resources – a request not possible for most communities due to current economic conditions. Teaching IRC to the next generation of construction professionals may result in greater code compliance impacting community resilience.

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