National Fenestration Rating Council (NFRC) Fall Membership Meeting

Denver, Colorado  October 3, 2016

Summary, Commercial Modeling Approach (CMA) Program Effectiveness Study
Problem Statement

• Why is market uptake of NFRC’s commercial fenestration products energy performance rating system and the Component Modeling Approach Software Tool (CMAST) so low?
• What can be done to improve NFRC’s commercial program to increase uptake?
Report Methodology

Through **external and internal data analysis and research**,

- Characterizes the existing CMA program market and estimated market size
- Summarizes the current program fee structure and entry points

Through **surveys and interviews**,

- Analyzes the motivations of commercial market stakeholders (manufacturers, permit/code officials, architects, contractors, modelers)
  - Details the CMA value proposition for its various stakeholder audiences
- Documents the reasons for the CMA program’s lack of market uptake and the barriers to its adoption
Report Structure

1. Context and Existing Certification Process
2. Analysis of NFRC Commercial Program Fee Structure and Market Size
3. Analysis of Current NFRC Market Penetration and Demographics
   – Push vs. Pull Approaches for Increasing Market Penetration
4. Findings from Stakeholder Engagement
   – Summary of Market Drivers, Value Proposition, Supply and Demand Barriers, and Structural Barriers
5. Recommendations and Next Steps
FINDINGS
Current CMA Program Fee Structure

- $1000 annual fee for access to the CMAST software, required for most users; ACEs, IAs, code officials, and researchers are exempt.
- Annual participation fee for organizations to maintain components in CMAST -- from $1,500 to $8,500 for frame manufacturers, and $3,500 or $4,500 for spacer manufacturers
- A per-component fee to maintain approved components; $15 per component for NFRC members and $30 per component for non-members. Spacer component fees are $80 for members and $130 for non-members.
- Annual participation fee for Approved Calculation Entities (ACEs), from $1,500 to $5,000.
- Annual maintenance fee for each person ACE within an ACE organization; $150 per person for NFRC member organizations and $200 per person for non-members.
CMAST Market Uptake Data Analysis

• Subject of analysis: database of certificates issued through CMAST 2010 through 2015
  – Context: U.S. commercial buildings data from the Energy Information Administration

• Total number of assemblies in past five years: 9,653
• Total number of projects in past five years: 567 (~113/year)
• Average of tested fenestration assemblies per project: 17
• Total of 70 unique manufacturers acting as specifying authority on a certified building
National Comparison Data – Number of New Buildings

• Total value of new U.S. commercial and multifamily properties in 2015, $554 billion (Census)

• EIA (CBECS) estimates an average of 69,000 new commercial buildings per year from 2003 to 2013

• Census shows that over the same time period an average of 12,000 multifamily residential structures were built per year.

• Average of 81,000 new CMA-eligible buildings per year.
National Data – Manufacturers

• Glass and Glazing contractors total revenue in 2014, $12 billion
• 5,328 glass and glazing contractors, 56 over 100 employees
• 65 flat glass manufacturing companies, 17 over 100 employees
Between 2010 and 2015, 567 certifications vs. 400,000 estimated CMA-eligible buildings
Fenestration Type and Building Size

Non-Residential, 3 Stories or Fewer

- Projected
- Casement
- Fixed

Non-Residential, 10 Stories or More

- Casement

Multifamily, 3 Stories or Fewer

- Glazed Wall System

Multifamily, 10 Stories or More

- Horizontal Slider
- Casement
- Fixed

Glazed Wall System

10/13/16
# Building Type, National vs. CMA Data

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<th>Category</th>
<th>CMA %</th>
<th>National %</th>
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<tbody>
<tr>
<td>Education</td>
<td>38.3%</td>
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<tr>
<td>Other</td>
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</tbody>
</table>

## CMA Certified Buildings by State

- Texas
- Maine
- Washington
- Idaho
- Nevada
- Nebraska
- Michigan
- Missouri
- Illinois
- Colorado
- Oregon
- Utah
- California

[19]
Market Data Analysis Summary

• Smaller commercial buildings more likely to use punched openings, fixed/operable windows, with residential product crossover. Large buildings more likely to use curtain wall or window wall.

• CMA certified buildings have been larger in size than the national average building (CMA uptake skews toward complex buildings)

• Market suppliers -- champion manufacturers and specifying authorities -- driving uptake
  -- EFCO, Window-Tech, Tubelite

• Champion sectors driving uptake
  -- K-12 and Higher Education

• Regulatory demanders -- champion states and cities -- driving uptake
  -- Over half of national market uptake from two states, **Washington and Utah** (commercial building code compliance relies on CMAST)
    • coverage not total, despite rigorous compliance standard

• National uptake still a fraction of the overall market (0.14%)
  -- 2.0% in Washington, 1.6% in Utah
  -- 0.5% of national K-12 and Higher Education
Survey and Roundtables: Identifying Barriers to Market Supply

- **Cost**
  - Participation in the program is costly, and additional labor and testing costs associated with the certification process add up

- **Speed**
  - The process can take 4–9 months (longer than some construction jobs)
  - No economies of scale. Commercial builds are unique and reusability of existing components is low.

- **Ease of Use**
  - CMAST learning curve can be steep..
  - CMAST could use improvement (doesn’t respond well to non-standard sizes, metric to imperial conversion, etc.).

- **Predictability**
  - Design values can end up differing substantially from certified values.
  - Results may vary based on the ACE doing the work and the variation from labs inputting components.
Survey and Roundtables: Identifying Barriers to Regulatory Demand

• **Energy code enforcement for fenestration is lax**
  – Code officials unlikely to stop a job over energy compliance for glass
  – Permit review: underfunded
  – Concerned with life-safety issues first

• **Enforcers accept substitutes or don’t know what to look for**
  – Engineering drawings, CMA design numbers (not final label certificate), thermal test results, manufacturer-provided data, center of glass, etc.
  – CMA label certificate not “visible” to code officials
    • Residential program places label on the product. Highly visible in the field. Commercial program does not.
Stakeholder Consensus on the Value Chain

• Key part of value chain for market uptake:
  – Commercial manufacturers
    • A trusted source of information
    • Often contractually bound to stated performance
    • Design teams / owners and energy modelers look to manufacturers and ACEs for performance numbers
      – Manufacturers/ACEs provide energy performance numbers as part of sales / bidding process

• Not as key a part: permit officials
  – Willing to accept substitutions for the NFRC label certification or bypass energy code requirements
Interviews with Permit Officials

Duane Jonlin, Seattle
- Projects must supply CMAST certificates/reports to pass field inspections
- “No substitutions allowed; no AAMA reports allowed” – “not rigorous” enough

Ellen Eggerton, Fairfax County
- State-wide cost savings sought in public sector
- Ranks of permit officials reduced
- Residential inspectors become “light commercial” inspectors
  - Light commercial = under 10 stories (vast majority of commercial buildings)
- Light commercial inspectors are “combo” inspectors, covering all trades (electrical, plumbing, etc.). Consequences:
  - “Knowledge barriers” – “imagine stacking all code books together and having to master that”
  - Life safety takes priority

Michael Hamilton, Arlington County
- Only dedicated energy specialist in DMV
  - Covers all Arlington construction; heads DMV energy code compliance roundtable
- Familiar with NFRC standards and ComCheck; not familiar with CMAST
  - Had to look up applicable code requirements for commercial building fenestration
Interviews with Manufacturer ACEs/PEs

- **Catherine Best, Benson**
  - On lack of market adoption: “There’s what the rules say. There’s what the specs say. And then there’s what the politics say.”

- **Steve Fronek, Wausau**
  - Implications of trend towards complicated frame assemblies

- **Jesse Winters, Window Tech**
  - Increased business providing drafting and detailing services for glazing contractors

- **Ben West, Oldcastle**
  - Market demand increase in geographies of NW, NE, CA
  - ACE training key

- **Mason Fritz, EFCO**
  - About 55% of his CMAST projects finalized – thus, CMAST market uptake likely more than we can estimate based on finalized projects alone
Structural Barriers

• **Fee structure design** creates a disincentive for manufacturers to use and maintain a large number of components in CMAST.

• **Misuse or abuse of outputs** in CMAST or COMcheck allow for shortcuts to avoid certification.

• There is **market confusion** between residential and commercial programs, especially in the space where commercial buildings (with punched openings) and residential windows overlap.

• The **commercial market is fundamentally different** from the residential market in terms of contractual relationships and the trust gap.
CMA Program Value Proposition

• For Manufacturers:
  – Enhanced consumer trust
  – Enhanced credibility with general contractors
  – Standardization of the code compliance process
    • Commonly accepted performance metrics and values
  – Differentiation
  – Value-added service for architects and engineers
  – Pathway to code compliance
Value Proposition, Continued

• For ACE organizations:
  – Revenue generation

• For permit and code officials:
  – Fair, transparent, and rigorous verification method of energy performance claims
  – Market transformation towards an energy-efficient built environment at a municipal or county scale, resulting in lower carbon emissions
Stakeholder **Top Ten Must-Haves For A Commercial Fenestration Rating System**

1. Focus on the direct customers – product manufacturers. The system must be easy, fast, reliable, and cost-effective.

2. Address the needs of the various levels of the value chain, with a focus also on indirect customers (code officials, glazing contractors, etc.).

3. Cover U-factor, SHGC, and VT as a code minimum and consider condensation.

4. Result in third-party/independently validated outputs.

5. Cover all product types and markets in a single system.

6. Cover standard or actual sizes.

7. Include bid report functionality.

8. Validate code compliance.

9. Accommodate a variety of glass packages, including laminated glass.

10. Be included in or accepted by referenced standards (code).
RECOMMENDATIONS
Recommendation Baskets

1. Market development
2. Program design
3. Improvement process
Recommendations for Market Development

• Focus on increasing value to manufacturers, ACEs, and other CMAST users as the primary stakeholders of the CMA program, rather than enforcement/permit/code officials

• Achieve success on the merits of delivering value to CMAST stakeholders in the form of a program that is:
  – Cost-effective, easy to use, timely, accurate, credible, and consistent, while maintaining sufficient rigor to provide trusted and standardized results for code compliance.
  – Able to meet needs beyond code compliance such as facilitating marketing, modeling, commissioning, etc.
Recommendations For Program Design, 1

• Change the fee structure to charge for certification rather than participation.
  – No annual fees, participation fees, or fees for maintaining components in the database, incentivizing the industry to use the tool and build the database of components, which increases the value of the tool
  – A nominal fee for the generation of a bid report
  – A certification fee
Recommendations For Program Design, 2

- **Eliminate market confusion** by instituting a single NFRC program spanning the residential and commercial markets, differentiating instead by separate “product” or “project” paths.
  
  – A product path that requires all fenestration products on a job to be individually certified (by product)
  
  – A project path, similar to the existing CMA certification, that would allow individual approved components to be used in custom assemblies in a single, project-level certification
Recommendations For Program Design, 3

- **Close loopholes in the verification process.**
  - Remove the ability to generate bid reports without registering in CMAST and look for ways to reduce or call attention to the entry of unverified component values in the tool.
  - Research ways to close loopholes in reporting within COMcheck.
Recommendations For Program Design, 4

- **Streamline the certification process.**
  - Do NOT eliminate the verification and testing process, the foundation of credibility
  - Encourage and incentivize stakeholders to begin the process early and to reuse tested, library-archived components where possible
  - Consider reductions in certification fees for projects that use previously approved components to encourage the market to reuse existing components, resulting in faster certification turnaround times
  - Consider areas where verification could be reduced or accelerated (perhaps a move to selected audits, as opposed to full reviews)
Recommendations For Program Design, 5

• Focus on improving the accuracy, credibility, and consistency of the CMAST outputs.
  – Ensure that CMAST can be used as a marketing tool
  – Work to reduce variability of results design and certification numbers between different ACEs and different simulation labs
  – Work to harmonize CPD and CMAST performance numbers
Recommendations For Program Design, 6

• Make the label certificate visible to enforcers and consumers alike.
  – For certified products, display a label such as the one now affixed to residential windows
  – For certified projects, create a project label to be displayed on the job site
Recommendations for Improvement Process

• Include all members of the value chain.
  – Manufacturers
  – Trade associations, such as AAMA, IGMA, and GANA
  – Government and code bodies representatives and permit officials
  – ACEs
  – Designers (architects and engineers)

• Work in concert with similar programs (AAMA 507) to create a standard with unified industry support.
Quote from DOE’s David Cohan

• “I have no way to get out to 30,000 jurisdictions in a meaningful way, to educate them about code compliance. If it’s not the commercial building permit officials driving it, it has got to be the commercial manufacturers . . . in the end, you’ve got to have a business case for somebody.”
DISCUSSION AND QUESTIONS
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