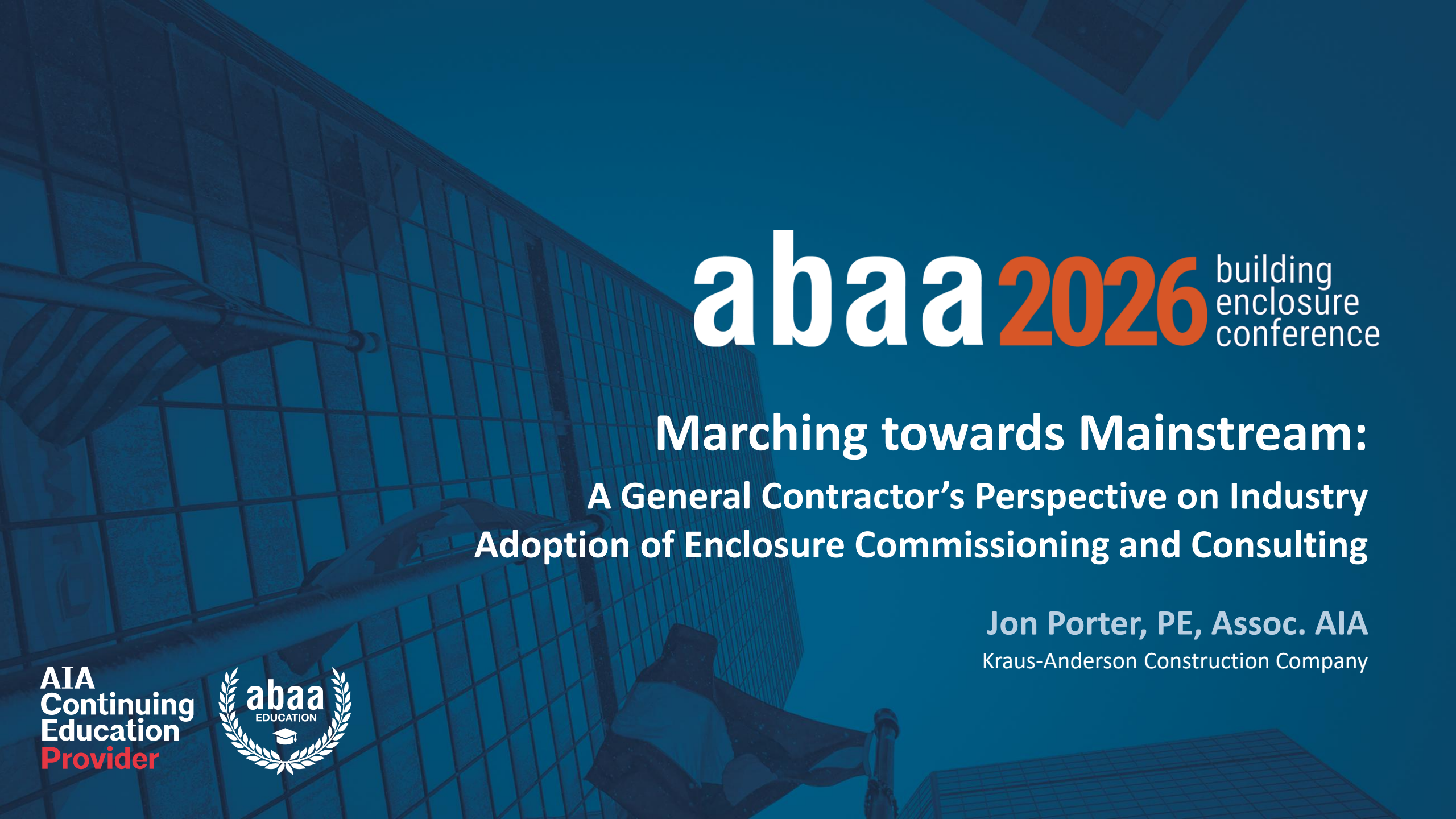

abaa 2026 building enclosure conference

Marching towards Mainstream:

A General Contractor's Perspective on Industry Adoption of Enclosure Commissioning and Consulting

Jon Porter, PE, Assoc. AIA

Kraus-Anderson Construction Company

AIA Continuing Education Provider

abaa EDUCATION

Marching towards Mainstream:

A General Contractor's Perspective on Industry Adoption of Enclosure Commissioning and Consulting

Over time, the adoption of Building Enclosure Consulting and Building Enclosure Commissioning (BECx) continues to push further into the mainstream Architecture, Engineering and Construction (AEC) Industry. As with any changes that occur in the AEC Industry, evolution of practices can at times seem slow or challenging. Future states of practice can turn out different than anticipated for each of the effected stakeholders.

In this presentation, a midstream review of Building Enclosure Consulting and BECx industry adoption will be offered from the perspective of a Commercial General Contractor. Topics such as what is working well and what isn't will be discussed. Potential lessons from the incorporation of Special Inspections & Testing (SI&T), and from Mechanical, Electrical and Plumbing Commissioning (MEPCx) into the industry will be offered as guideposts for the future. With consideration to prevailing AEC project delivery methods, recommendations for maximizing Building Enclosure Consulting's and BECx's future value proposition will be suggested.

abaa building enclosure conference

Learning Objectives

1. Participants will identify parallels between the past adoption of SI&T/MEPCx and the current state of adoption of BECx.
2. Participants will recognize how project delivery methods combined with third party Enclosure Consultants can result in project-level friction points.
3. Participants will be able to compare adoption outcomes between code-driven and client-driven requirements.
4. Participants will assess shortcomings specific to current project delivery methods and how Enclosure Specialists can fill those gaps.

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Marching Towards Mainstream

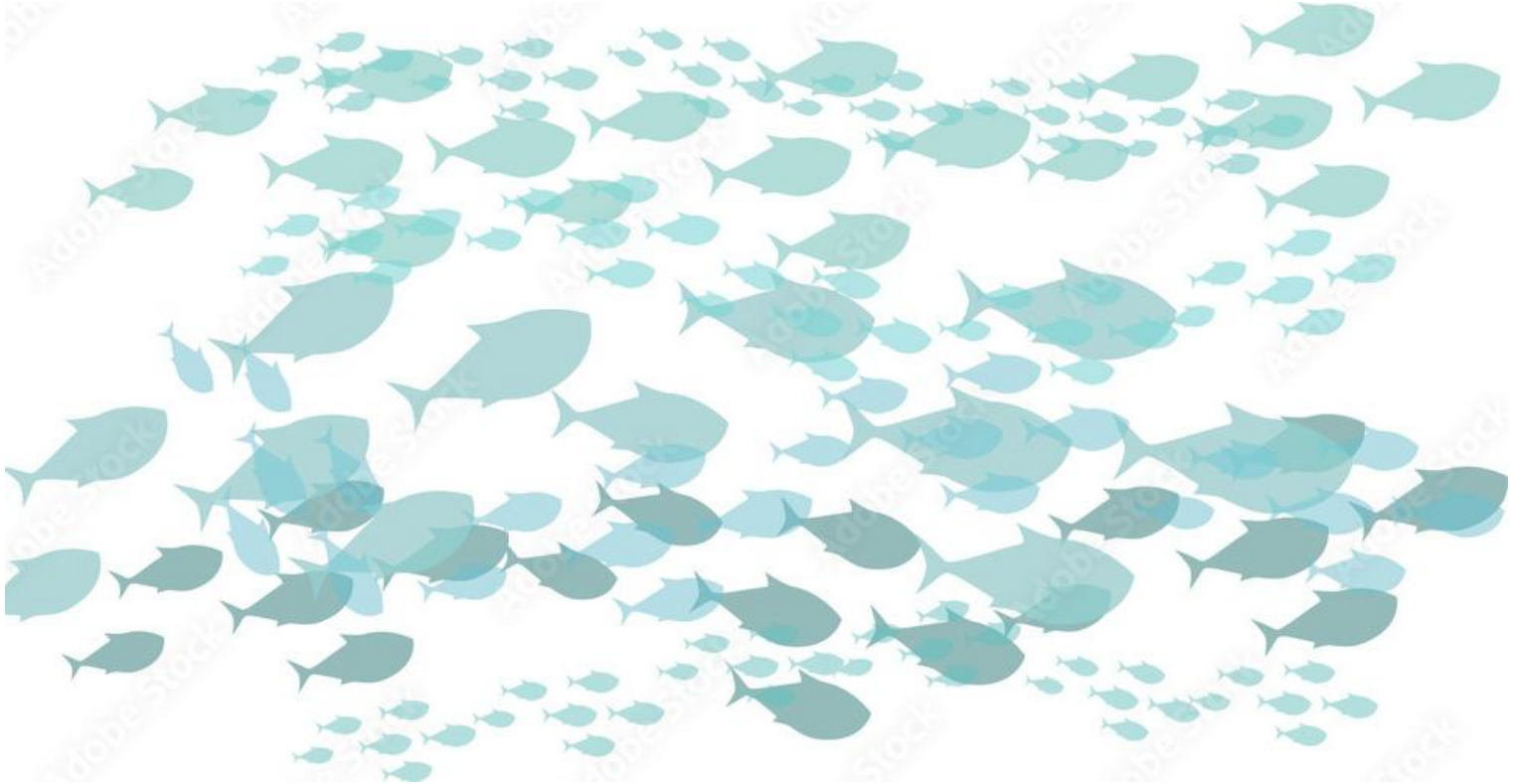
- Agenda
  - Introduction/Topic Overview
  - Current Dynamics of BEC and BECx within AEC
  - What Drives Change in the AEC industry
  - Looking to the Future
  - Conclusion

Marching Towards Mainstream

- Introduction – Acknowledgment and Caveats
  - abaa
  - More Commentary, Less Exposition

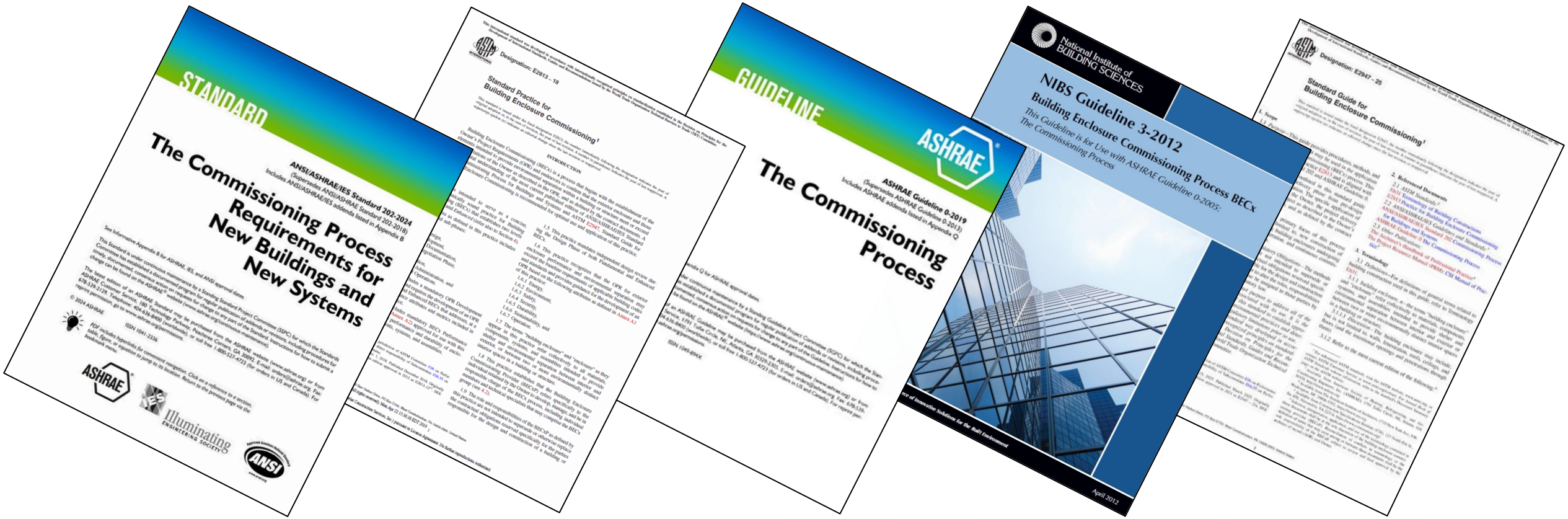
Marching Towards Mainstream

- Introduction – Acknowledgment and Caveats
  - What do I mean by “Mainstream”?



Marching Towards Mainstream

- Introduction – Acknowledgment and Caveats
  - NOT a Commentary on Cx Standards and Guidelines

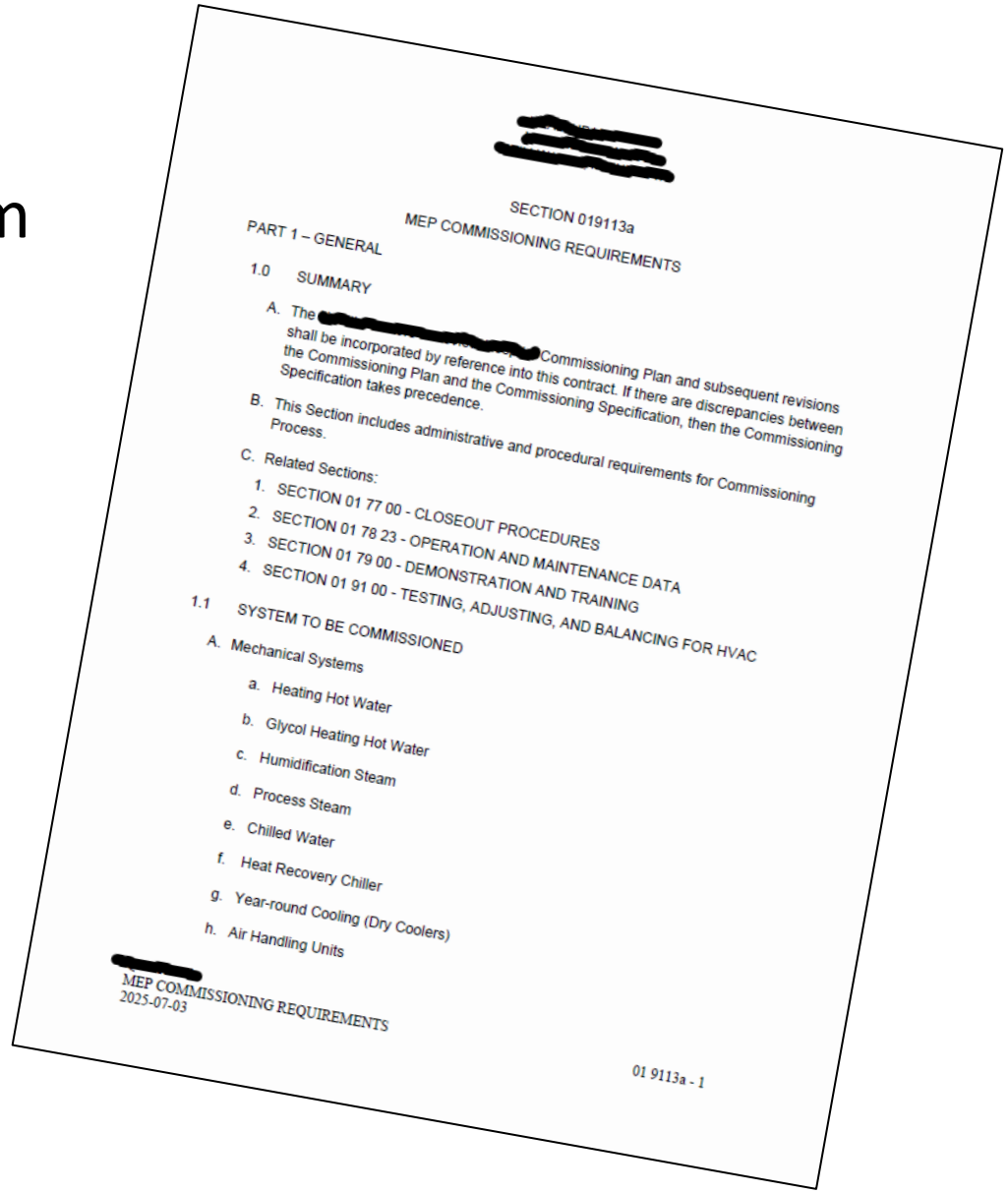


Marching Towards Mainstream

- Introduction – Acknowledgment and Caveats
  - Observations from a General Contractor’s perspective over the past decade
  - Trends, not universal features

Marching Towards Mainstream

- Introduction – Historical Perspective from Mechanical, Electrical, and Plumbing Commissioning (MEPCx)
  - Mainstream MEPCx appears to be about 15 years ahead of Mainstream Building Enclosure Commissioning (BECx)



[redacted]

SECTION 019113a

MEP COMMISSIONING REQUIREMENTS

PART 1 – GENERAL

1.0 SUMMARY

A. The [redacted] Commissioning Plan and subsequent revisions shall be incorporated by reference into this contract. If there are discrepancies between the Commissioning Plan and the Commissioning Specification, then the Commissioning Specification takes precedence.

B. This Section includes administrative and procedural requirements for Commissioning Process.

C. Related Sections:

1. SECTION 01 77 00 - CLOSEOUT PROCEDURES
2. SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA
3. SECTION 01 79 00 - DEMONSTRATION AND TRAINING
4. SECTION 01 91 00 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

1.1 SYSTEM TO BE COMMISSIONED

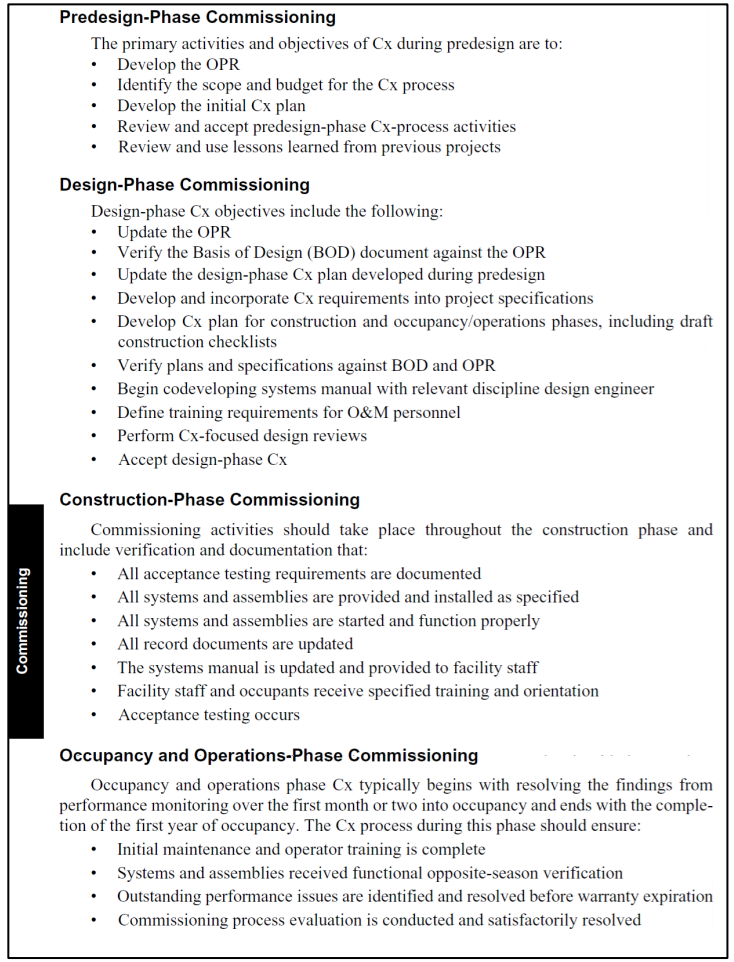
A. Mechanical Systems

a. Heating Hot Water
b. Glycol Heating Hot Water
c. Humidification Steam
d. Process Steam
e. Chilled Water
f. Heat Recovery Chiller
g. Year-round Cooling (Dry Coolers)
h. Air Handling Units

[redacted]

Marching Towards Mainstream

- Introduction – Historical Perspective from MEPCx
  - There is a range in degree of Commissioning (Cx) services rendered
    - Process is variable



Predesign-Phase Commissioning

The primary activities and objectives of Cx during predesign are to:

- Develop the OPR
- Identify the scope and budget for the Cx process
- Develop the initial Cx plan
- Review and accept predesign-phase Cx-process activities
- Review and use lessons learned from previous projects

Design-Phase Commissioning

Design-phase Cx objectives include the following:

- Update the OPR
- Verify the Basis of Design (BOD) document against the OPR
- Update the design-phase Cx plan developed during predesign
- Develop and incorporate Cx requirements into project specifications
- Develop Cx plan for construction and occupancy/operations phases, including draft construction checklists
- Verify plans and specifications against BOD and OPR
- Begin codeveloping systems manual with relevant discipline design engineer
- Define training requirements for O&M personnel
- Perform Cx-focused design reviews
- Accept design-phase Cx

Construction-Phase Commissioning

Commissioning activities should take place throughout the construction phase and include verification and documentation that:

- All acceptance testing requirements are documented
- All systems and assemblies are provided and installed as specified
- All systems and assemblies are started and function properly
- All record documents are updated
- The systems manual is updated and provided to facility staff
- Facility staff and occupants receive specified training and orientation
- Acceptance testing occurs

Occupancy and Operations-Phase Commissioning

Occupancy and operations phase Cx typically begins with resolving the findings from performance monitoring over the first month or two into occupancy and ends with the completion of the first year of occupancy. The Cx process during this phase should ensure:

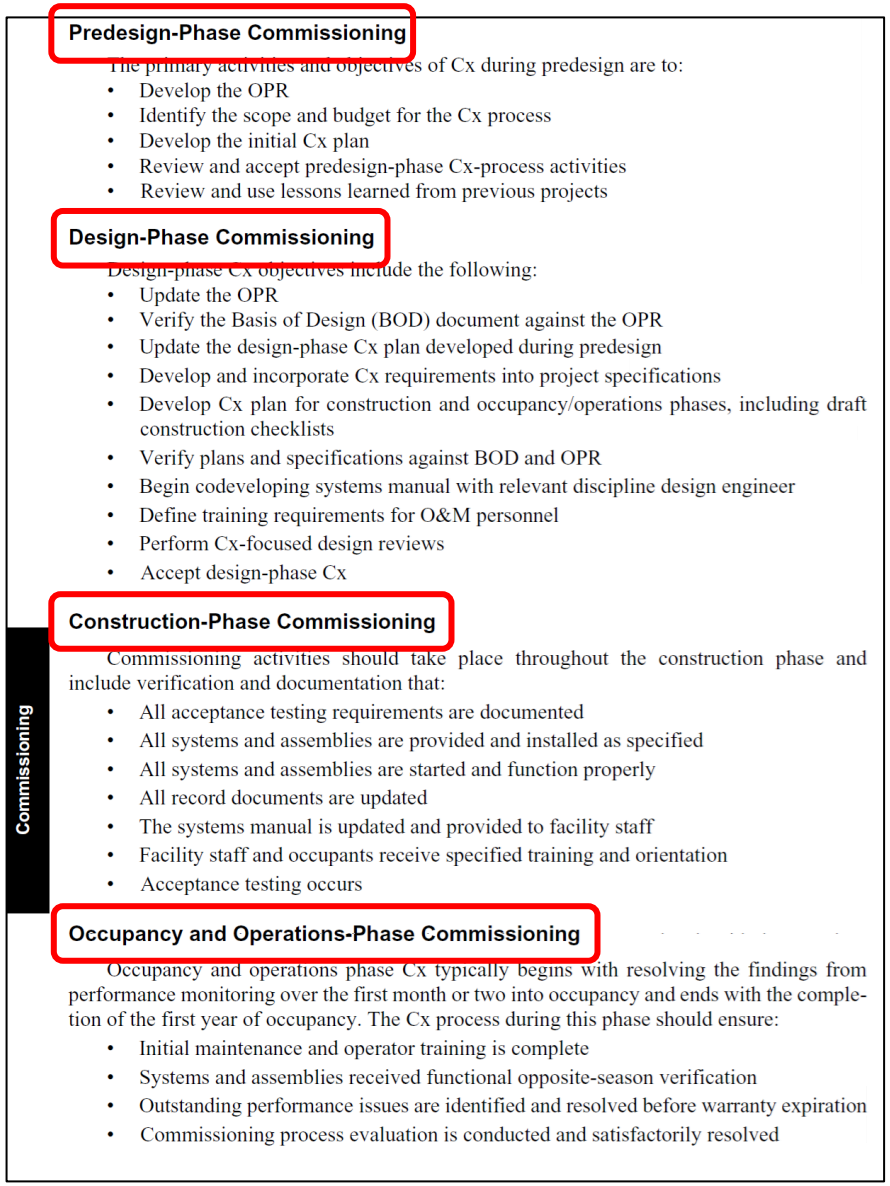
- Initial maintenance and operator training is complete
- Systems and assemblies received functional opposite-season verification
- Outstanding performance issues are identified and resolved before warranty expiration
- Commissioning process evaluation is conducted and satisfactorily resolved

Commissioning

ASHRAE Pocket Guide

Marching Towards Mainstream

- More Comprehensive MEPCx



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Commissioning

Marching Towards Mainstream

- Less Comprehensive MEPCx
  - MEPCx “lite”

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Commissioning

- Develop and incorporate Cx requirements into project specifications
- Perform Cx-focused design reviews
- All systems and assemblies are started and function properly

Marching Towards Mainstream

- Why the Range in Degree of MEPCx Services Rendered?
  - More Comprehensive: Owner has a vested interest regardless of code guidance
    - Organizations with Managed Program/Criteria Documentation
    - Critical Facilities
    - Prominent or Showcase Projects
  - Less Comprehensive: Code requires Cx while the owner is not aware or does not necessarily care

Marching Towards Mainstream

- Impact or Range in Degree of MEPCx Services Rendered
  - Regardless of depth of engagement, less likely to influence material/equipment/systems selections
  - Involvement typically focused on operability of system/control sequences
  - Contrast w/BECx

Marching Towards Mainstream

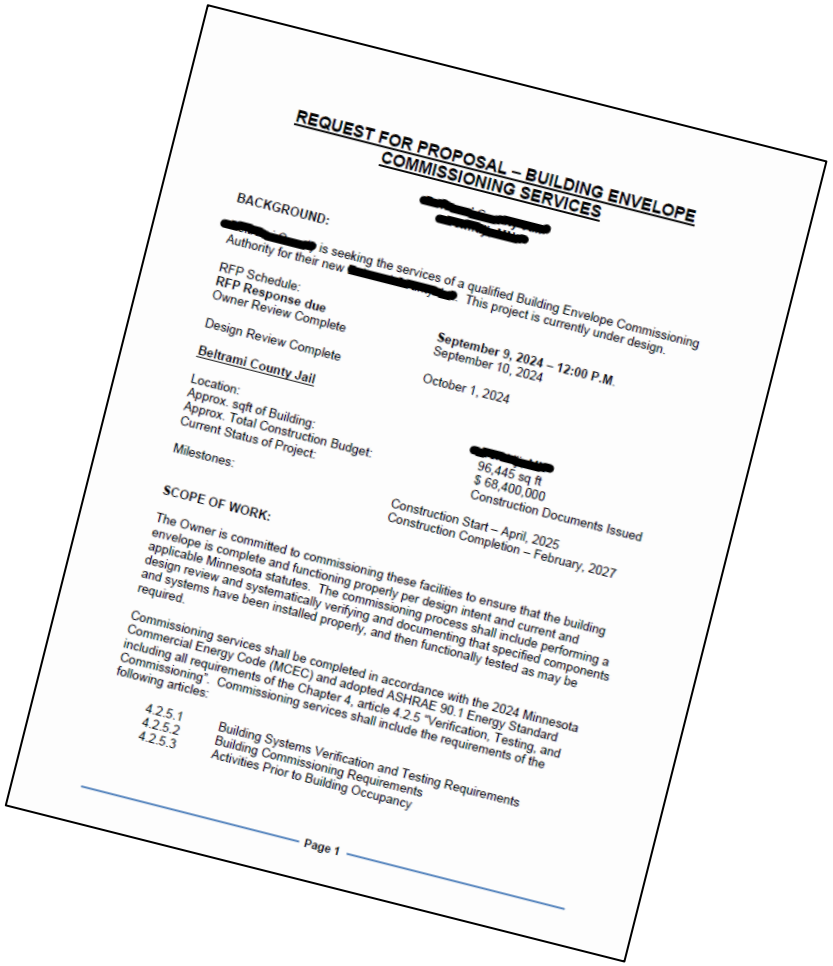
- Current State – Process and Effectiveness of MEPCx
  - Purpose-built Commissioning Management Software
    - Adoption accelerated in 2018 – 2019
    - Real time creation of records on site during verification and documentation activities in construction phase
    - Access/collaboration with all stakeholders in Cx process
  - Similar processes have also occurred in the Special Inspections & Testing (SI & T) space

CxAlloy®

BR BlueRithm

Marching Towards Mainstream

- Current Dynamics of BEC and BECx within the Architecture, Engineering, and Construction (AEC) Industry
  - Who Typically assists the Owner in Soliciting BECx Proposals?
  - Engagement in solicitation assistance is variable
    - Construction Manager
    - Architect
    - MEPCx Agent
    - Owner with established BECx Agent relationships



REQUEST FOR PROPOSAL – BUILDING ENVELOPE COMMISSIONING SERVICES

BACKGROUND:

[redacted] is seeking the services of a qualified Building Envelope Commissioning Authority for their new [redacted]. This project is currently under design.

RFP Schedule:
RFP Response due — September 9, 2024 – 12:00 P.M.
Owner Review Complete — September 10, 2024
Design Review Complete — October 1, 2024

Beltrami County Jail

Location: [redacted]
Approx. sqft of Building: 96,445 sq ft
Approx. Total Construction Budget: $ 68,400,000
Current Status of Project: Construction Documents Issued

Milestones:
Construction Start – April, 2025
Construction Completion – February, 2027

SCOPE OF WORK:

The Owner is committed to commissioning these facilities to ensure that the building envelope is complete and functioning properly per design intent and current and applicable Minnesota statutes. The commissioning process shall include performing a design review and systematically verifying and documenting that specified components and systems have been installed properly, and then functionally tested as may be required.

Commissioning services shall be completed in accordance with the 2024 Minnesota Commercial Energy Code (MCEC) and adopted ASHRAE 90.1 Energy Standard including all requirements of the Chapter 4, article 4.2.5 "Verification, Testing, and Commissioning". Commissioning services shall include the requirements of the following articles:

4.2.5.1 Building Systems Verification and Testing Requirements
4.2.5.2 Building Commissioning Requirements
4.2.5.3 Activities Prior to Building Occupancy

Page 1

Marching Towards Mainstream

- Current Dynamics of BEC and BECx within AEC
- Current Trajectory of Range in Degree of BECx Services Rendered shaping up to be similar to that in MEPCx
  - Variable adherence to BECx Guidelines and Standards
    - More Comprehensive = Owner informed and engaged
    - Less Comprehensive = Owner uninformed or does not care
  - Verification Path for Air Leakage Compliance = the BEC version of MEPCx “lite”?
- Unlike MEPCx Services, all ranges of BECx services more likely to influence material/assembly/system selections

Marching Towards Mainstream

- What is Working Well From the GC perspective

- The value of Third Party Engagement
  - Architect Education (QA)
  - Field Verification (QC)

Marching Towards Mainstream

- What is Working Well From the GC perspective

Preparer of Recipe:
- Combines ingredients
- Bakes recipe
- Presents completed recipe to the diner

Writer of Recipe:
- Defines proportions of ingredients
- Describes what the finished recipe should look like/taste like

Marching Towards Mainstream

- What is Working Well From the GC perspective

No Amount of Skillful Preparation will save the Dish if the Recipe was bad to begin with!

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The most perfect recipe in the world will taste bad if it is prepared wrong!

Marching Towards Mainstream

- What is Working Well From the GC perspective

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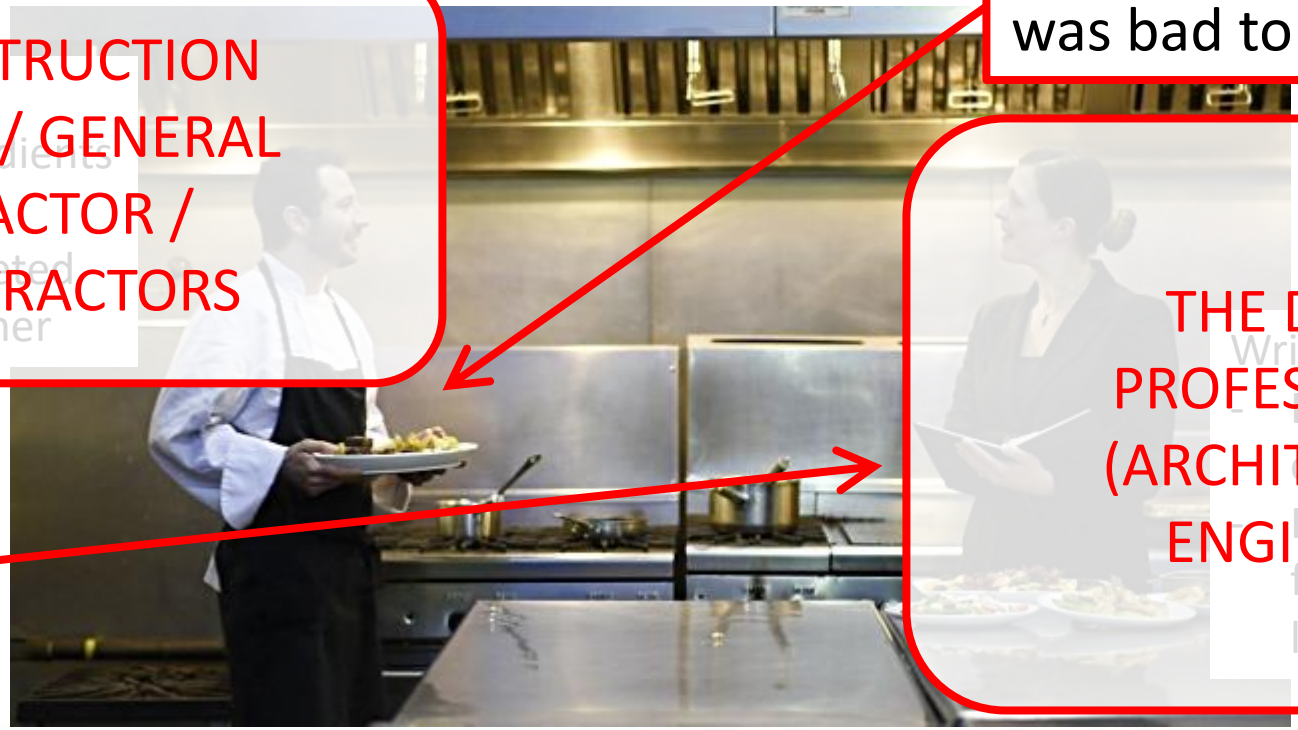
THE CONSTRUCTION MANAGER / GENERAL CONTRACTOR / SUBCONTRACTORS



THE DESIGN PROFESSIONALS (ARCHITECT AND ENGINEERS)

The most perfect recipe in the world will taste bad if it is prepared wrong!

Marching Towards Mainstream

- What is Working Well From the GC perspective

- Project – Specific Anecdotes From Construction PM's
  - "They highlighted common sense approaches and low hanging fruit"
  - "They provided good input into design detailing"
  - "Input and guidance into constructability was very useful"
  - "I had an extremely positive experience with _____"

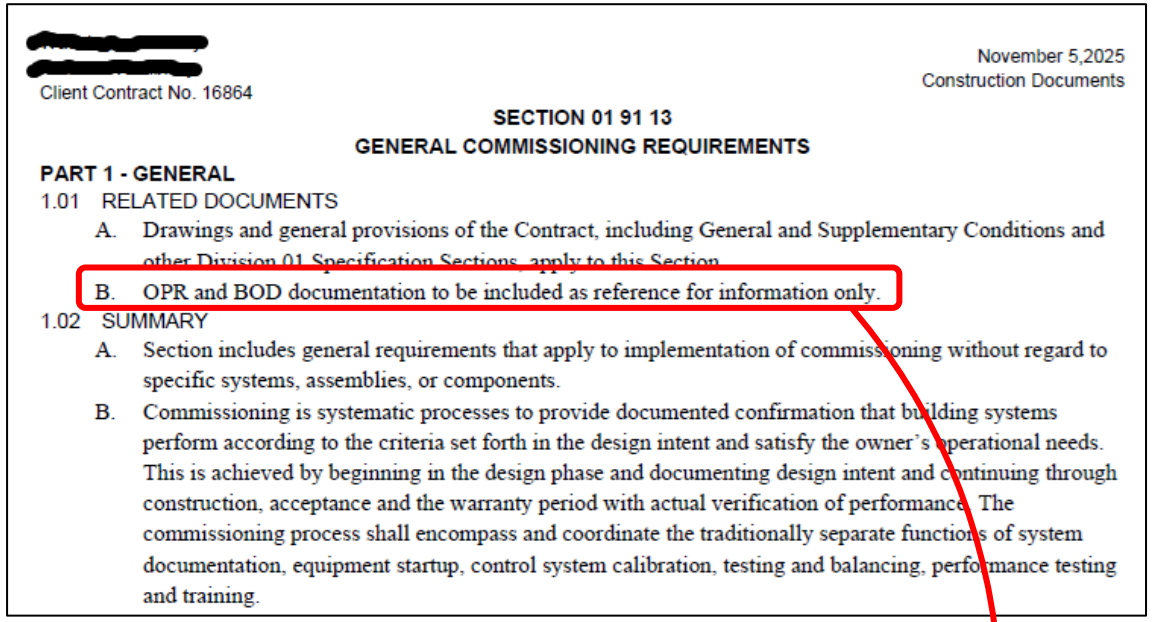
Marching Towards Mainstream

- Current Dynamics of BEC and BECx within AEC

- What are a few Observed Points of Friction?
  - When the BEC or BECx is not integrated well into the larger Project Team
    - Expectations of the consultant/agent not well communicated

Marching Towards Mainstream

- Observed Points of Friction
- Variable Implementation of OPR
- Variable Client Relationships
  - BEC/BECx working directly for Owner
  - BEC/BECx working for MEPCx
- What does the owner's best interests look like if there is no direct interaction with them and there is no OPR?



[redacted]
Client Contract No. 16864

November 5,2025
Construction Documents

SECTION 01 91 13
GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. OPR and BOD documentation to be included as reference for information only.

1.02 SUMMARY

A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.

B. Commissioning is systematic processes to provide documented confirmation that building systems perform according to the criteria set forth in the design intent and satisfy the owner's operational needs. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.

B. OPR and BOD documentation to be included as reference for information only.

Marching Towards Mainstream

- Observed Points of Friction
- BEC/BECx engagement resulting in changes to Contract Documents after bids have been awarded
- Changes as a result of
  - Design reviews after bids are returned
  - Submittal reviews
  - Site observations

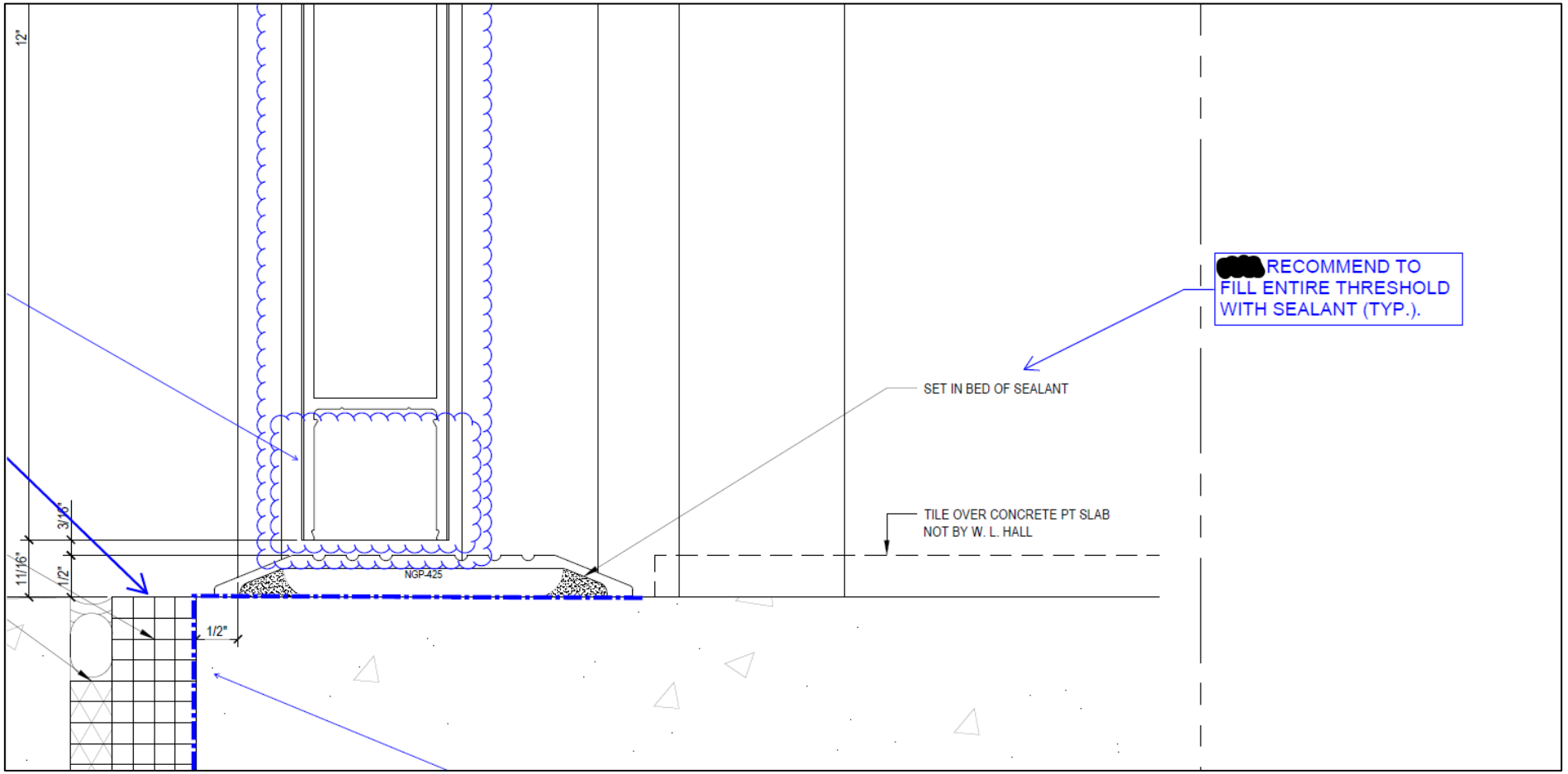
Marching Towards Mainstream

- Observed Points of Friction

- Contractor and Subcontractor confusion surrounding role that has Influence but does not have Authority
  - “Verify but cannot Ensure”
  - “Recommend but cannot Direct”
  - “Suggest but not Mandate”

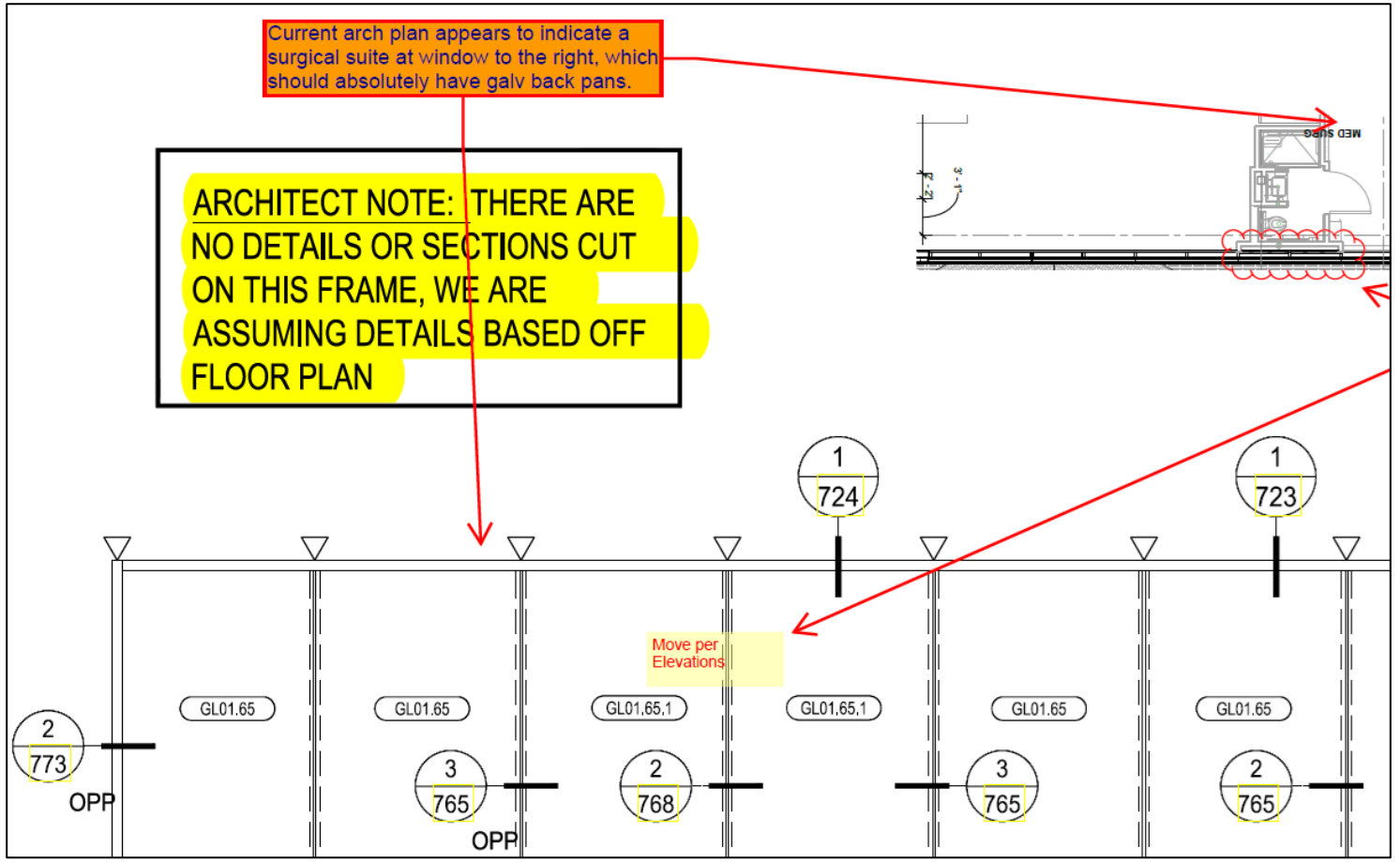
Marching Towards Mainstream

- Influencing without Authority



Marching Towards Mainstream

- Influencing without Authority



Marching Towards Mainstream

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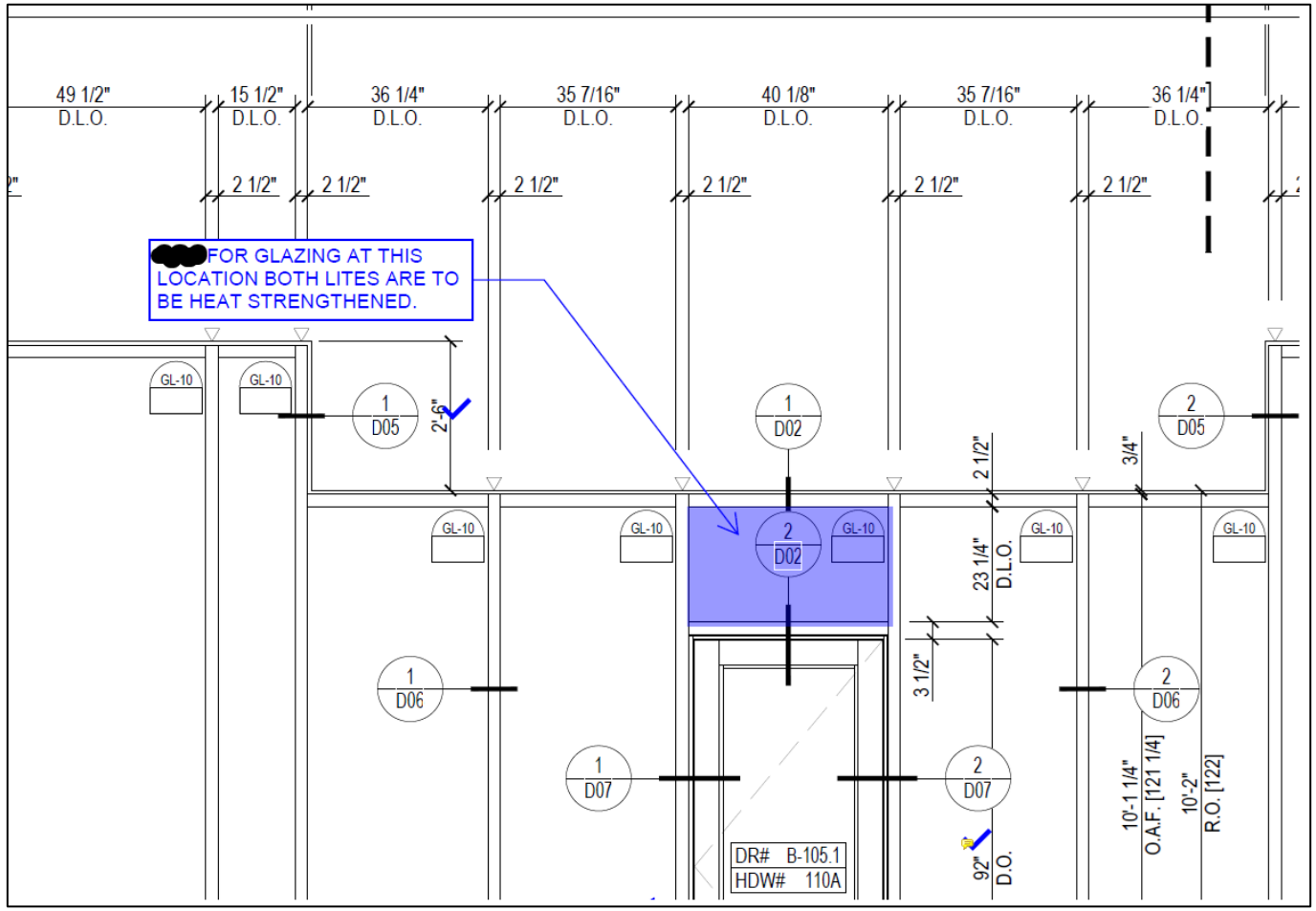

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- Influencing without Authority
- Comments regarding items that are out of compliance with the contract documents
- Suggestions that represent a change to the contract documents

Marching Towards Mainstream

- Influencing without Authority

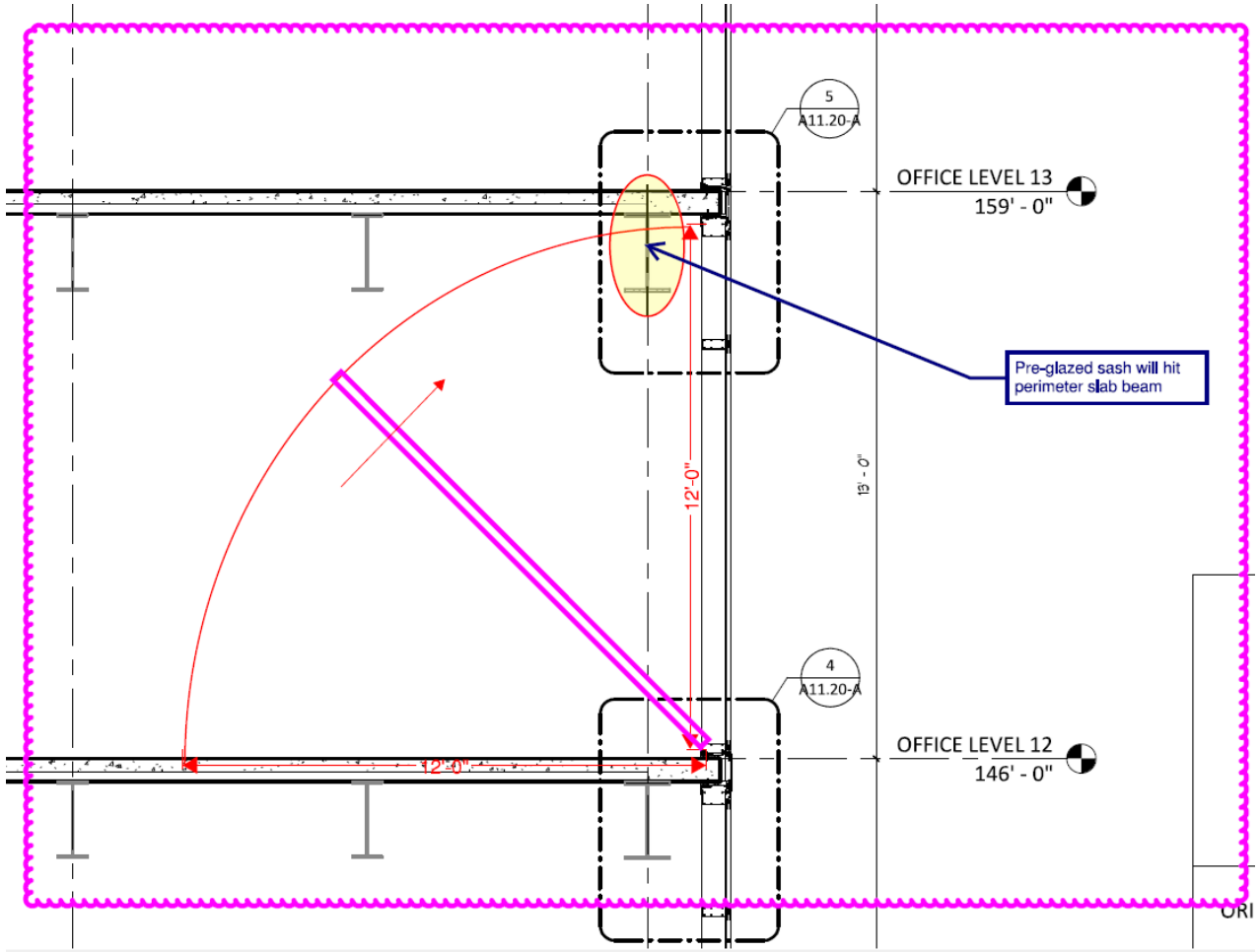
- Submittal reviews and site observations as ineffective vehicles by which to bring visibility to changes that need to be made to the contract documents

Marching Towards Mainstream

- Observed Points of Friction
- When Input/Guidance into Constructability is NOT Provided

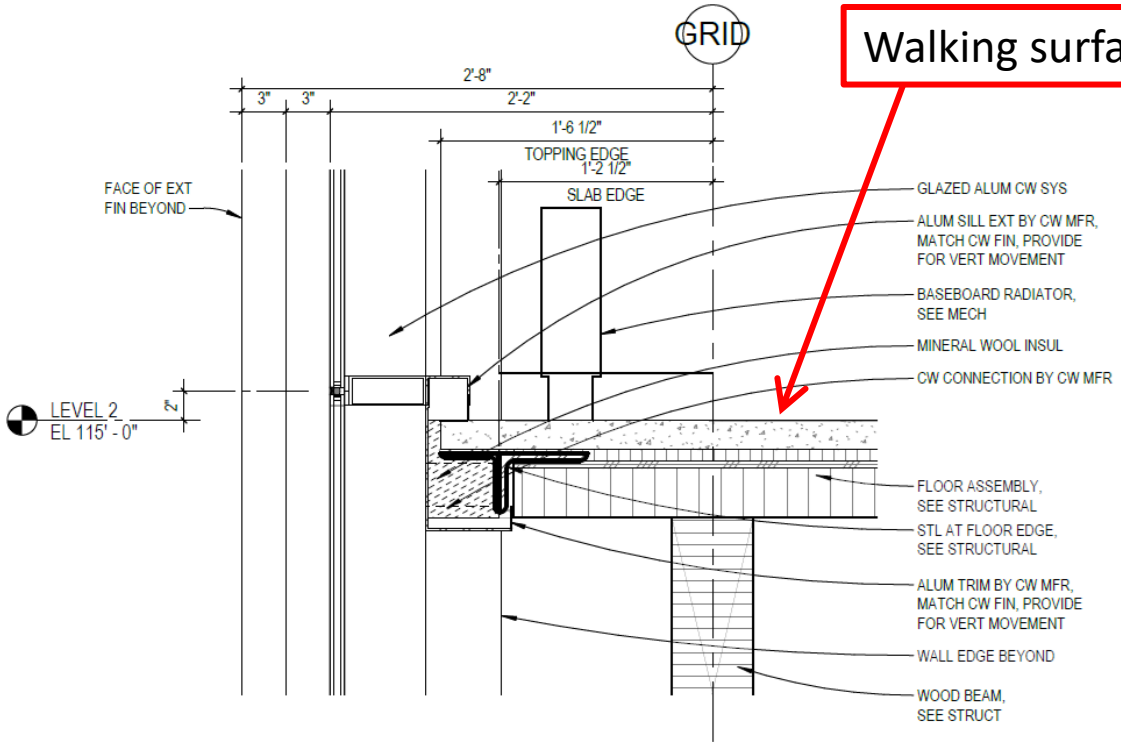
Marching Towards Mainstream

- When Input/Guidance into Constructability is NOT Provided



Marching Towards Mainstream

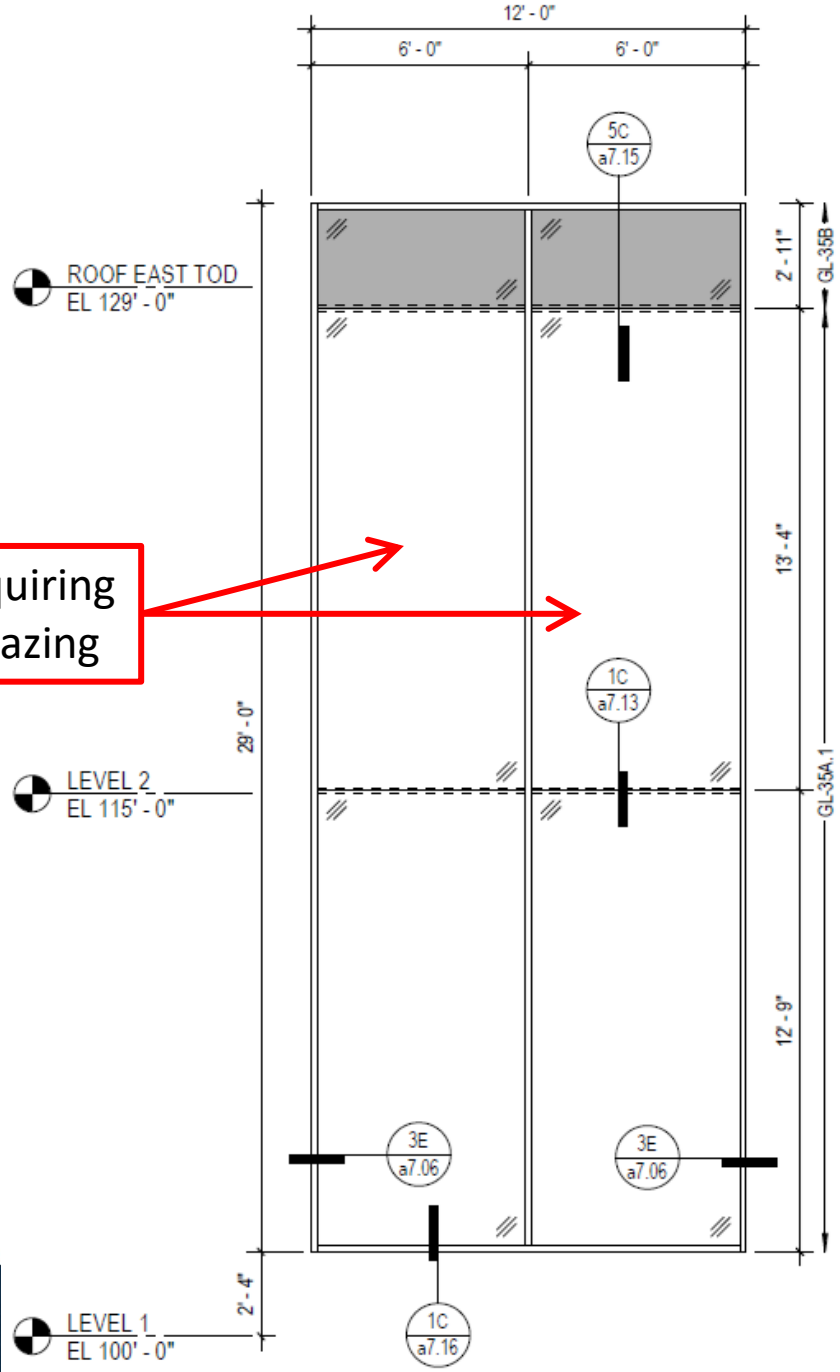
- When Input/Guidance into Constructability is NOT Provided



1C EDGE OF SECOND LEVEL SLAB DETAIL AT CURTAINWALL
1 1/2" = 1'-0"

Walking surface

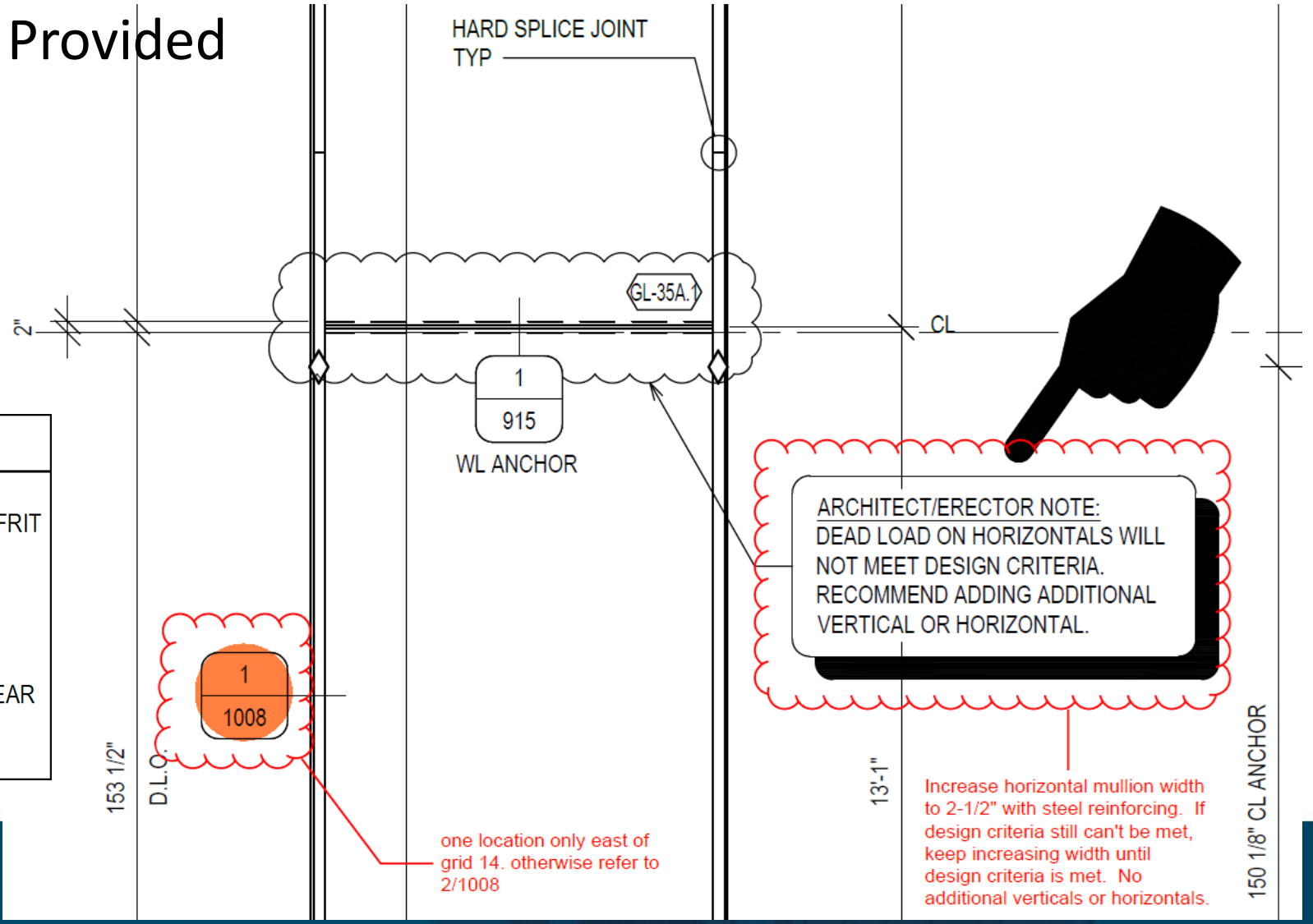
Lites requiring safety glazing



Marching Towards Mainstream

- When Input/Guidance into Constructability is NOT Provided

SYMBOL	DESCRIPTION
GL-35A.1 #3?	1-5/16" INSULATED LAMINATED UNIT EXTERIOR: 1/4" VITRO/PPG STARPHIRE W/ BLACK CERAMIC FRIT SILK-SCREENED #2 CUSTOM 1/8" DOT PATTERN 20% COVERAGE AIR SPACE: 1/2" (90% ARGON FILLED) INTERIOR: 9/16" CUSTOM LAMINATE OUTER PLY: 1/4" GUARDIAN SUNGUARD SN 68 ON ULTRACLEAR LOW-E #, INTERLAYER: 0.060" CLEAR PVB INNER PLY: 1/4" VITRO/PPG STARPHIRE



Marching Towards Mainstream

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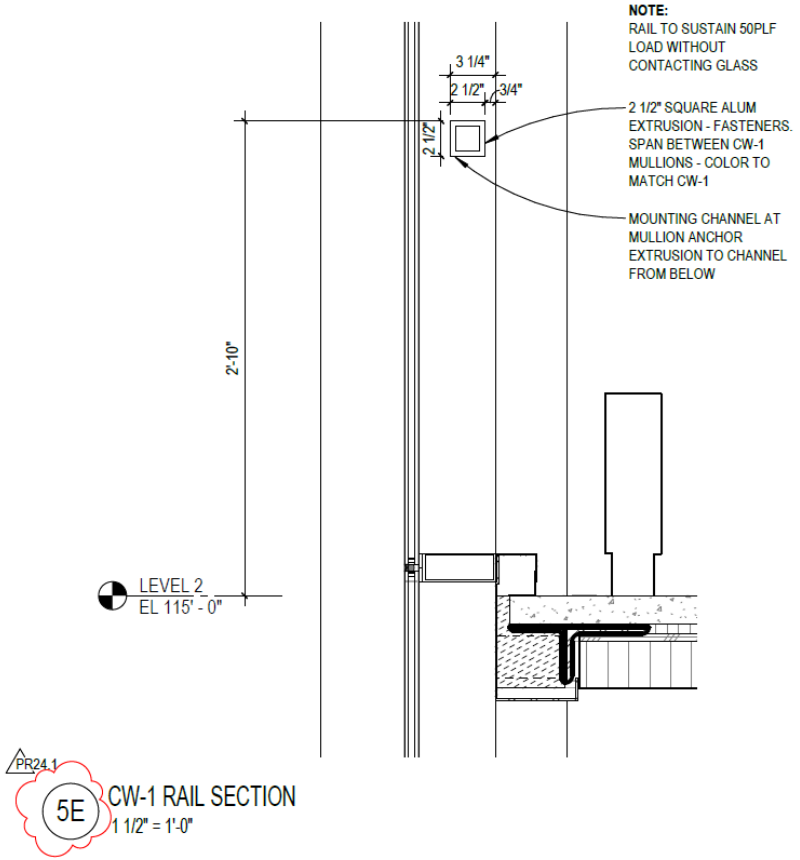
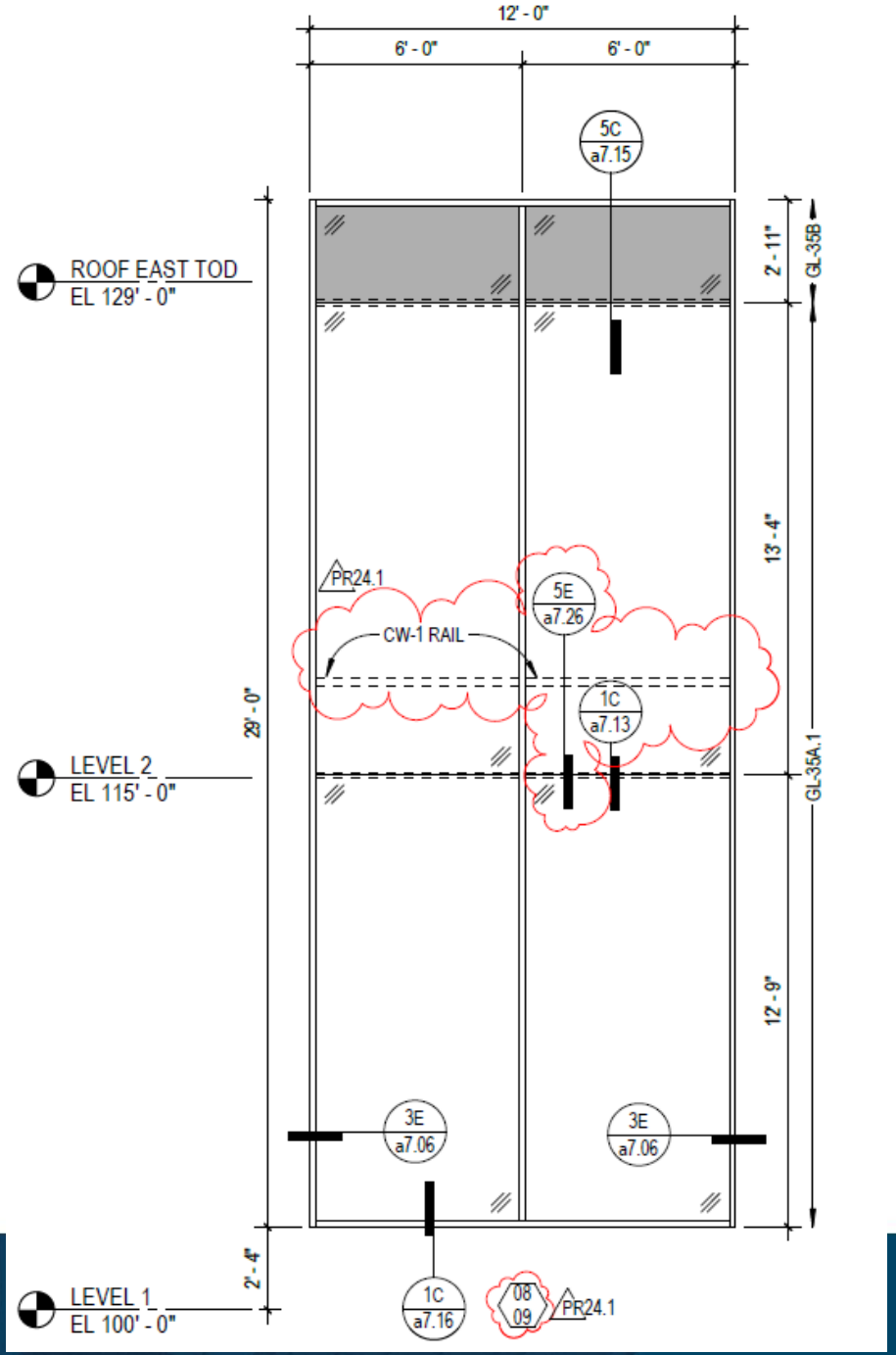




Marching Towards Mainstream

- What Really Drives Change in the AEC Industry?

- Factors Influencing How Effective Code Changes Can Be or Will Be
  - If the Code Change Grinds Processes to a Halt

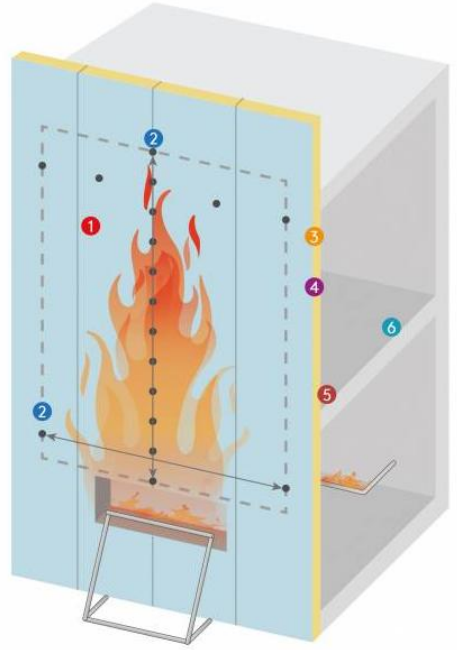
Marching Towards Mainstream

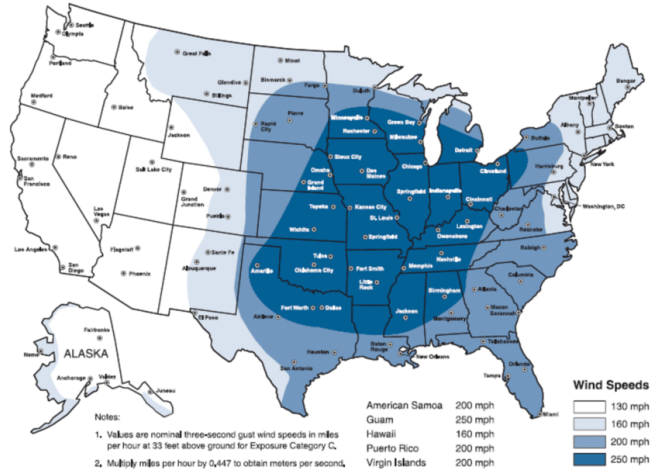
- Factors Influencing How Effective Code Changes Can/Will Be

- If failure to implement the code change prevents the project from
  - Receiving a Building permit
  - Receiving a Certificate of Occupancy (C of O)

Marching Towards Mainstream

- Examples from Code Updates in the Past Decade
- NFPA 285
  - Permit
  - C of O
- Firestopping Special Inspections
  - C of O
- Storm Shelters (Midwest Specific)
  - Permit
  - C of O





Marching Towards Mainstream

- Examples from Code Updates in the Past Decade
- Air Leakage Compliance = ???
- Up through ASHRAE 90.1-2016 and IECC 2018
  - Air Barrier Material Compliance was predominant method selected
- After ASHRAE 90.1-2016 and IECC 2018
  - Compliance Requirements Firming up, but Effectiveness of Code Updates at Driving Change still unclear

Marching Towards Mainstream

- 2+ years after Jurisdiction Adopted ASHRAE 90.1-2019

REGARDING ASHRAE 90.1-2019:
1. WHAT IS THE SELECTED COMPLIANCE PATH?
2. WHAT IS CHOSEN METHOD TO COMPLY WITH SECTION 5.4.3.1.1: EXCEPTION #3, OR WHOLE BUILDING AIR TIGHTNESS TESTING?

PROJECT ELEMENTS / PROGRAM:

This is a summary of the residential mixed use building that includes the following elements:

- (61) 1 Bedroom and (14) 2 Bedroom units for a total of 75 units.
- 4 level of wood frame construction above a 1 level concrete structure with enclosed, partially underground parking accessed via a ramp at the north end of the site.
- Indoor Ammenities include: Main Entry Lobby, Mail/Parcel area, Trash/Recycling Room, Fitness/Yoga Studio, Lounge Areas with fireplace, Club Room/Game Room, Arts and Crafts Room.
- Outdoor Ammenities include: Plaza/Patio Area, Community Gardens, Bike Parking (indoor & outdoor) and Playground.

APPLICABLE CODES

BUILDING CODE:	2020 MSBC (MINNESOTA STATE BUIDING CODE) (2018) IBC (INTERNATIONAL BUILDING CODE) Including draft amendments by the State of MN
ACCESIBILITY CODE:	2020 MN ACCESSIBILTY CODE, ICC A117.1 - Accessibilty Code, MNAC Chapter 1341
MECHANICAL CODE:	2020 MN MECHANICAL AND FUEL GAS CODE - MN Amendments to the 2018 International Mechanical Code and International Fuel Gas Code, MN Amendment Chapter 1346
PLUMBING CODE:	2020 MN STATE PLUMBING CODE
FIRE CODE:	2020 MSFC (MINNESOTA FIRE CODE), Chapter 7511
ELECTRICAL CODE:	2020 NATIONAL ELECTRIC CODE. NFPA 70
ENERGY CODE:	2024 MN ENERGY CODE
ELEVATOR CODE:	2020 MSBC, Chapter 1307

A. OCCUPANCY CLASSIFICATION (CHAPTER 3)

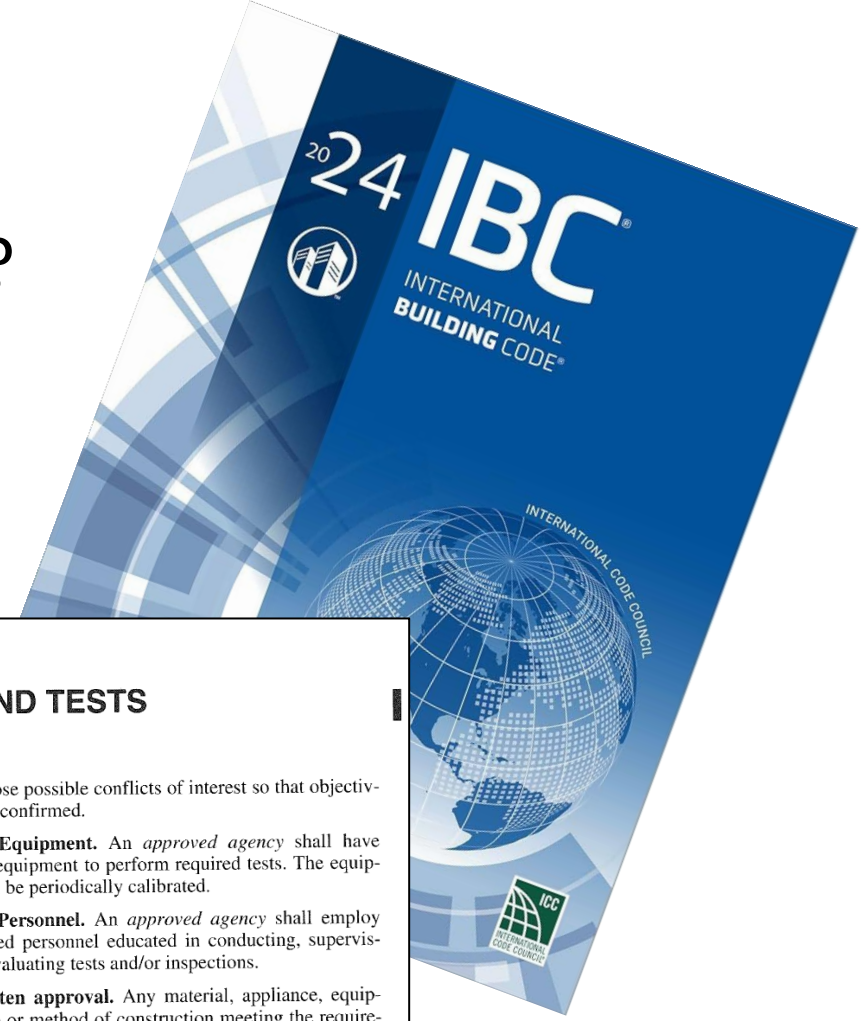
OCCUPANCY	LOCATION	OCCUPANCY CLASSIFICATION
Enclosed Parking Garage	Garage Level P1	S-2
Amenities	Levels 1 - 4	A-3
Apartments	Levels 1-4	R-2
Outdoor Amenities	Level 1	To be assigned by building official

Marching Towards Mainstream

- Air Leakage Compliance Code Updates
- Visibility to Building Officials
  - Gatekeeper of Building Permits and Certificates of Occupancy
- Visibility to Architects
  - Gatekeeper of Standard of Care for
    - Design Documentation
    - Completed Condition of Work implemented by the Trades

Marching Towards Mainstream

- What Really Drives Change in the AEC Industry?
- Historical Perspective From SI & T Adoption



CHAPTER 17

SPECIAL INSPECTIONS AND TESTS

SECTION 1701 GENERAL

1701.1 Scope. The provisions of this chapter shall govern the quality, workmanship and requirements for materials covered. Materials of construction and tests shall conform to the applicable standards listed in this code.

1701.2 New materials. New building materials, equipment, appliances, systems or methods of construction not provided for in this code, and any material of questioned suitability proposed for use in the construction of a building or structure, shall be subjected to the tests prescribed in this chapter and in the *approved* rules to determine character, quality and limitations of use.

1701.3 Used materials. The use of second-hand materials that meet the minimum requirements of this code for new materials shall be permitted.

SECTION 1702 DEFINITIONS

also disclose possible conflicts of interest so that objectivity can be confirmed.

1703.1.2 Equipment. An *approved agency* shall have adequate equipment to perform required tests. The equipment shall be periodically calibrated.

1703.1.3 Personnel. An *approved agency* shall employ experienced personnel educated in conducting, supervising and evaluating tests and/or inspections.

1703.2 Written approval. Any material, appliance, equipment, system or method of construction meeting the requirements of this code shall be *approved* in writing after satisfactory completion of the required tests and submission of required test reports.

1703.3 Approved record. For any material, appliance, equipment, system or method of construction that has been *approved*, a record of such approval, including the conditions and limitations of the approval, shall be kept on file in the *building official's* office and shall be open to public inspection at appropriate times.

Marching Towards Mainstream

- What Really Drives Change in the AEC Industry?

- Historical Perspective From Special Inspections & Testing (SI & T) Adoption
  - Significant Effort of Definition and Standardization Occurred in the early 1990's
  - Council of American Structural Engineers (CASE)

Marching Towards Mainstream

- Historical Perspective From SI & T Adoption
  - Prominent Structural Failures in the 1980's
    - Hyatt Regency Walkway Collapse
    - Kemper Arena Roof Collapse
    - L'Ambiance Plaza Collapse
  - Response Included Code Updates
    - Clear Delineation of Responsibilities
    - Specific Nature and Frequencies of Tests AND Inspections

Marching Towards Mainstream

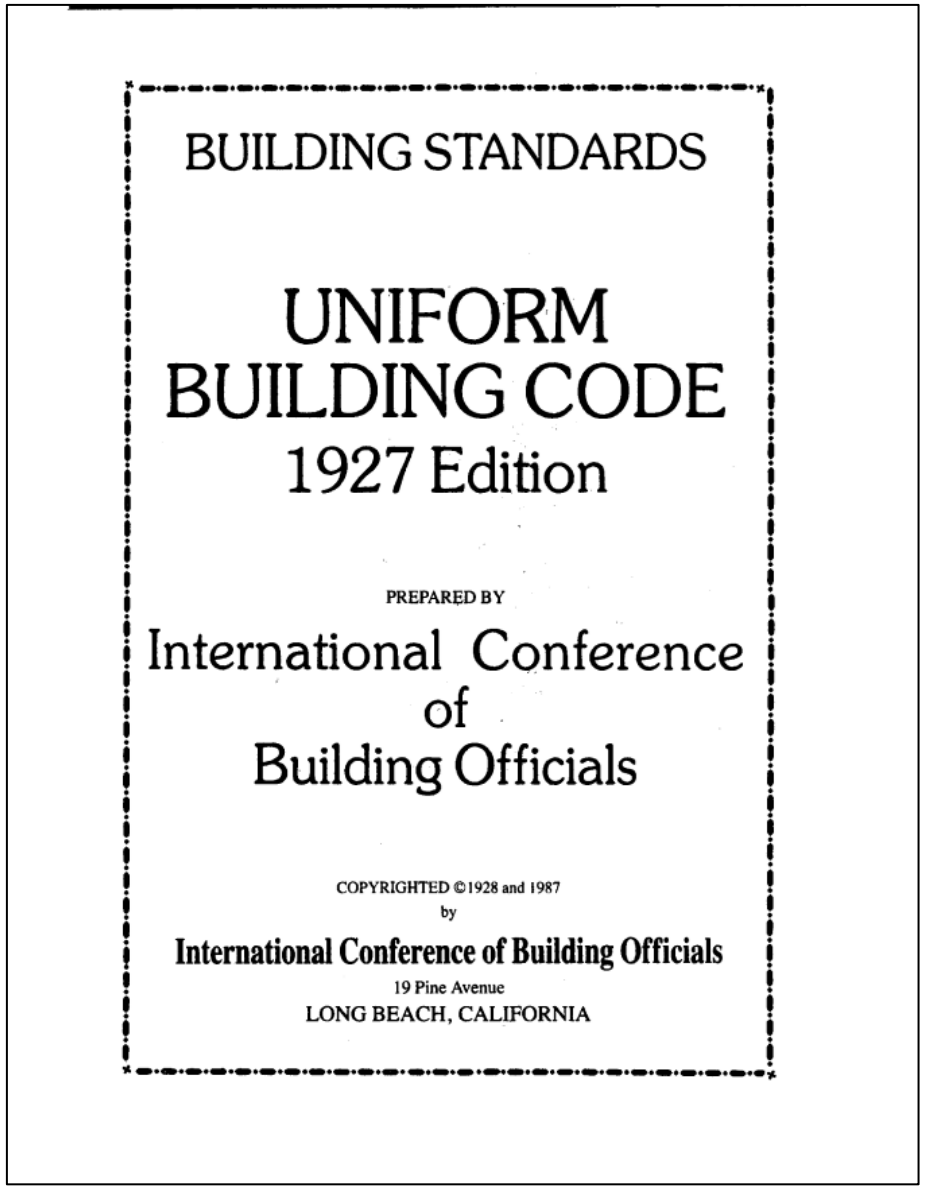
- Historical Perspective From SI & T Adoption
  - Licensed Design Professional (During Design)
    - Interprets Code
    - Uses interpretation to define requirements of Construction Documents
  - SI & T Agency (During Construction)
    - Delivers a Pass/Fail result based on requirements of Construction Documents
  - Licensed Design Professional (During Construction)
    - Confirms SI & T results

  - For past 20± years in most jurisdictions
    - A project will not be granted a Permit if SI & T requirements are not clearly defined on Construction Documents
    - A project will not be granted a C of O if any SI & T results are not listed as a Pass

Marching Towards Mainstream

- Historical Perspective From Code Evolution
- Uniform Building Code, 1927 Edition

Each such "registered inspector" shall carefully inspect all materials entering into the construction of the structure and be responsible for obtaining full information regarding the strength of materials where new or untried materials are intended for any use involving structural safety. He shall have full authority to inspect and pass upon the sufficiency of all work involving the construction of forms, bracing, shoring, needling, underpinning, mixing of concrete, protection of same, depositing of material, placing of reinforcing steel, removal of forms, the erection of structural steel, trusses and bracing, the placing of structural timbering, the erection of masonry, tile and terra cotta, and each and every item of material used in the engineering assembly or erection of the building or structure. He shall


BUILDING STANDARDS

UNIFORM BUILDING CODE

1927 Edition

PREPARED BY

International Conference of Building Officials

Marching Towards Mainstream

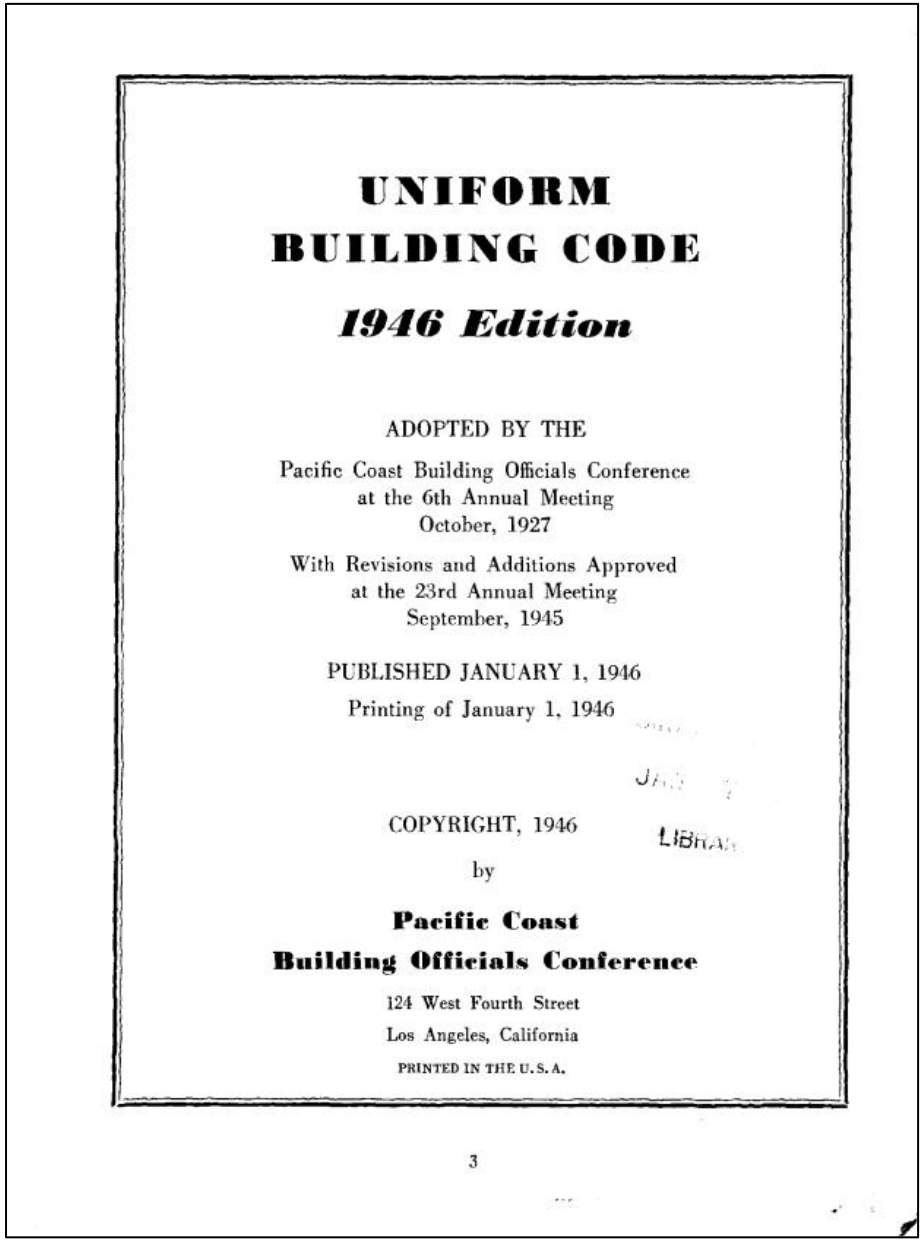
- Uniform Building Code, 1927 Edition
- Defined the Role of “Registered Inspector”
- Incredibly Broad Spectrum of Power and Responsibility
  - “…Carefully Inspect All Materials…”
  - “…Have Full Authority…”
  - “…Shall be Held Directly Responsible…”

Marching Towards Mainstream

- 5 Editions Later, 1946 Edition
- Renames Position to “Special Inspector”
- Removes Broad Powers and Responsibility

(b) Special Inspector. The special inspector shall be a qualified person approved by the Building Official.

The special inspector shall furnish continuous inspection on the construction and work requiring his employment. He shall report to the Building Official in writing, noting all Code violations and other information as required.



UNIFORM
BUILDING CODE

1946 Edition

ADOPTED BY THE

Pacific Coast Building Officials Conference
at the 6th Annual Meeting
October, 1927

With Revisions and Additions Approved
at the 23rd Annual Meeting
September, 1945

PUBLISHED JANUARY 1, 1946

Printing of January 1, 1946

Pacific Coast
Building Officials Conference

124 West Fourth Street
Los Angeles, California

PRINTED IN THE U. S. A.

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Marching Towards Mainstream

- Effective Code Evolution moves toward
  - Increased clarity
  - Reduced variability in interpretation of power and duties of specific parties

"Codes have to be written in a form that allows easy enforcement,

They have to be tailored to the precise problem you are dealing with

and they have to be handed to enforcers with adequate training and authority."

-Vincent Brannigan

Marching Towards Mainstream

- Currently, with IECC and ASHRAE 90.1
  - How well do they allow easy enforcement
  - How well are they tailored to address precise problems
  - How effectively are they handed to enforcers with adequate training and authority

"Codes have to be written in a form that allows easy enforcement,

They have to be tailored to the precise problem you are dealing with

and they have to be handed to enforcers with adequate training and authority."

-Vincent Brannigan

Marching Towards Mainstream

- Looking to the Future
- Variable Processes do not speed up adoption as well as consistency does
- Special Inspection example:
  - Any welds other than single pass fillet welds require continuous special inspection, regardless of project size, type or complexity
  - Universal understanding/expectation

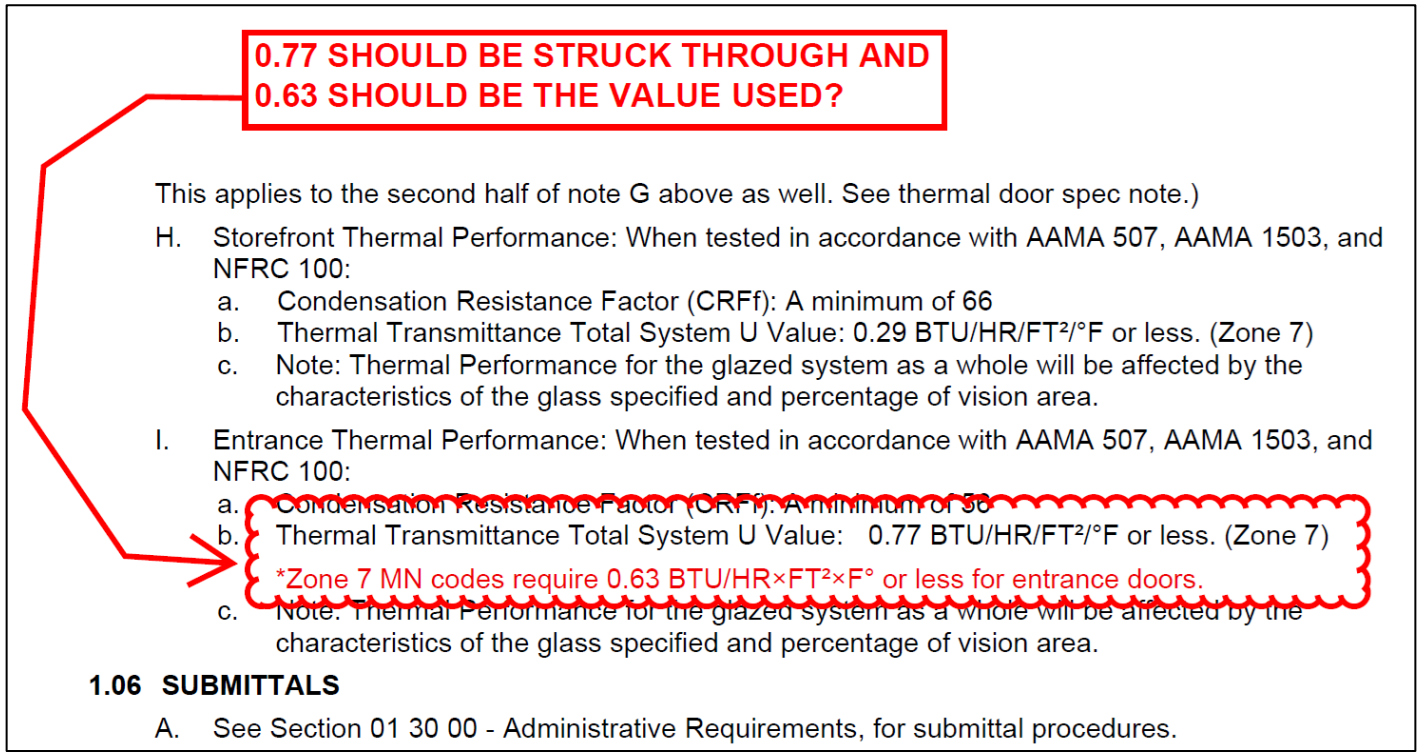
Marching Towards Mainstream

- Looking to the Future

- How to Maximize Effectiveness of BEC/BECx engagement
  - More consistent onboarding of Consultant/Agent earlier in design phase

Marching Towards Mainstream

- How to Maximize Effectiveness of BEC/BECx engagement
  - Back-checking of design review comments



Marching Towards Mainstream

- How to Maximize Effectiveness of BEC/BECx engagement
  - Consistent delineation of submittal review comments and site observation comments
    - Is item noted
      a) out of compliance with contract documents or
      b) a suggestion to modify the current contract documents?
    - Any suggestion to modify the current contract documents needs to be directly communicated to the Owner, the Architect and the General Contractor

Marching Towards Mainstream

- How to Maximize Effectiveness of BEC/BECx engagement
  - Confirm current status of project progress before starting each phase of BEC/BECx services
  - Coordinate timing/duration/turnaround of BEC/BECx tasks

Marching Towards Mainstream

- How to Maximize Effectiveness of BEC/BECx engagement
  - Move beyond framing Verification and WBAT as equivalent options for validating air leakage compliance
  - This pits two independent activities against each other, when in reality both are needed

5.4.3.1 Whole-Building Air Leakage

5.4.3.1.1 New *buildings* less than 10,000 ft^2 of *gross conditioned floor area* shall comply with measured *air leakage* requirements in Section 5.4.3.1.4.

5.4.3.1.2 New *buildings* not less than 10,000 ft^2 of *gross conditioned floor area* shall comply with one of the following:

a. Measured *air leakage* requirements in Section 5.4.3.1.4
b. A *continuous air barrier* design and installation verification program performed in accordance with Section 5.9.1.2

5.4.3.1.3 In *alterations* and *additions* to an *existing building* where portions of the *continuous air barrier* are impacted, those portions shall be installed or reinstalled and comply with one of the following:

a. Measured *air leakage* requirements in Section 5.4.3.1.4
b. A *continuous air barrier* design and installation verification program performed in accordance with Section 5.9.1.2

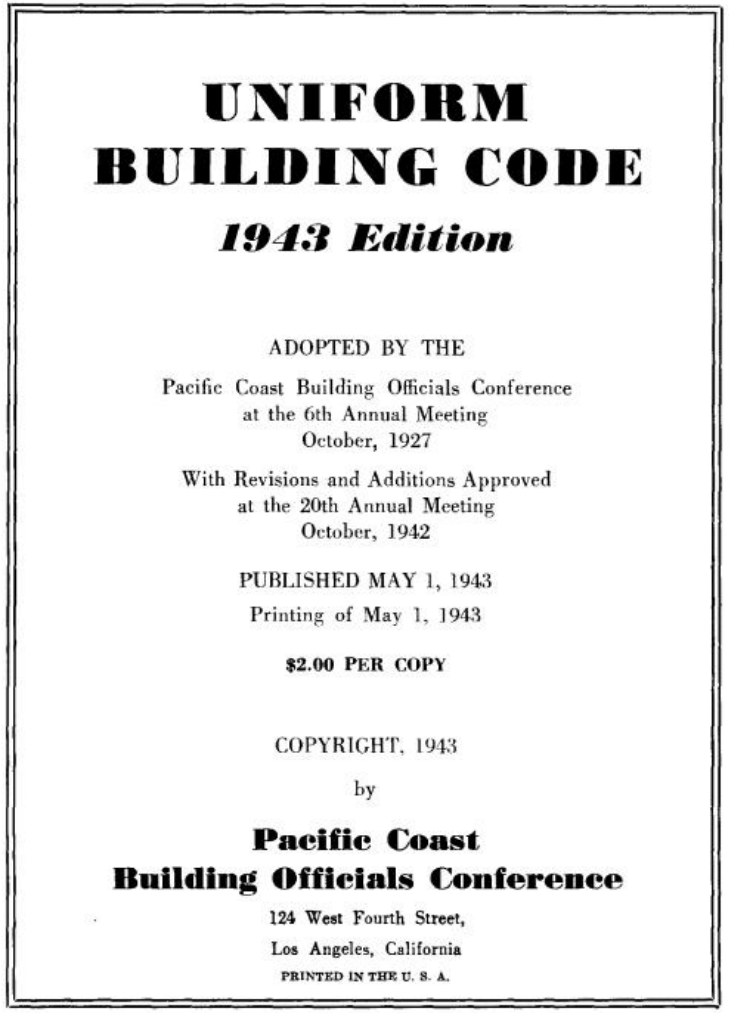
Marching Towards Mainstream

- Verification or WBAT, a Perspective from Code Evolution
- In 1943, UBC first introduced inspections of concrete placement

Registered Inspectors

(b) **Registered Inspector Required.** In addition to the inspections to be made by the Building Inspector as specified in this Section, the owner or his agent shall employ a registered inspector for full-time inspection on the following types of work:

1. **Reinforced Concrete.** On reinforced concrete work when the design is based on an f'_c in excess of 2,000 pounds.
2. **Masonry.** On masonry when the design is based on unit stresses in excess of 50 per cent of those allowed in Chapter 24.
3. **Welding.** On all structural welding.



UNIFORM BUILDING CODE

1943 Edition

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Pacific Coast Building Officials Conference
at the 6th Annual Meeting
October, 1927

With Revisions and Additions Approved
at the 20th Annual Meeting
October, 1942

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Printing of May 1, 1943

$2.00 PER COPY

Pacific Coast Building Officials Conference

124 West Fourth Street,
Los Angeles, California

PRINTED IN THE U. S. A.

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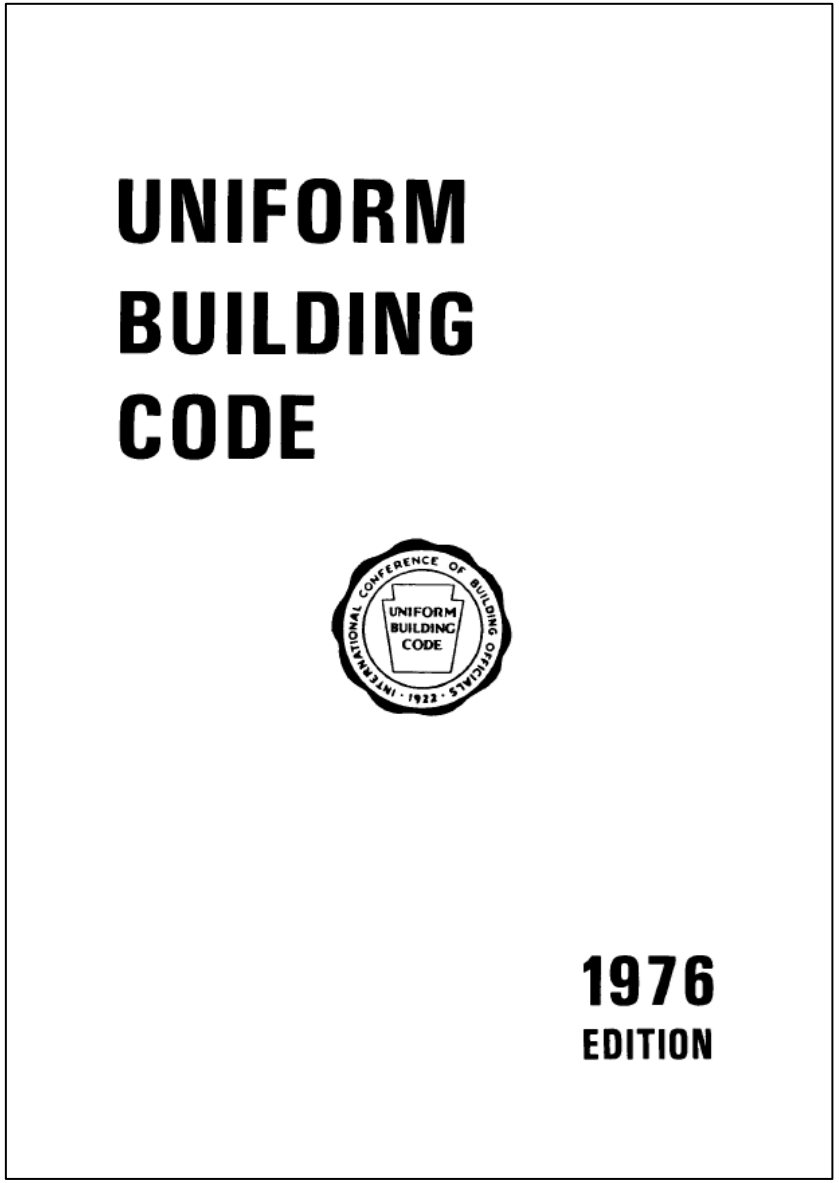
- 7 editions later, the 1976 UBC made testing of concrete mandatory for all projects (concrete cylinders)



TESTS AND QUALITY CONTROL

Making and Curing Specimens—in the Laboratory	26-10
Making and Curing Specimens—in the Field	26-10
Compressive Strength Test for Cylindrical Specimens	26-10
Evaluation of Compression Test Results of Field Concrete	26-11
Obtaining and Testing Drilled Cores and Sawed Beams	26-10
Test for Splitting Tensile Strength	26-12
READY-MIXED CONCRETE	26-13

Marching Towards Mainstream

- Verification or WBAT
- UBC: Inspections of concrete placement (verification) was not validating the in-place strength of the concrete (testing)
- Confirming factors that influence performance level is not the same as confirming performance level
- Both activities are necessary

Marching Towards Mainstream

- How to Maximize Effectiveness of BEC/BECx engagement

- Project-specific Anecdotes, technical related
  - “Architects need help cleaning up specs with acceptable products and manufacturers”
  - “I wished they would have helped out more on _____” (aggressive design using incapable basis of design information or requiring delegated design for true proof-of-concept)
  - “If you make a big deal out of something, please be clear in explaining why it is important”

Marching Towards Mainstream

- Final Thoughts on the Future
  - The preferred future state is one where BECx does more than simply follow in the path of MEPCx “lite”
  - Creation and adoption of purpose-built Cx software for BEC would improve the process for all stakeholders

Marching Towards Mainstream

- Final Thoughts on the Future

- Pathways to increasing BEC/BECx utilization on ALL projects:
  - If through owners,
    more owner education
    is essential

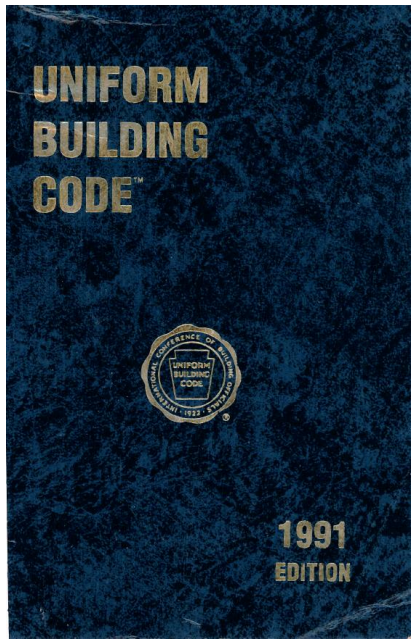
  - If through code changes,
    clear and conspicuous code language
    AND activated code enforcement
    is essential

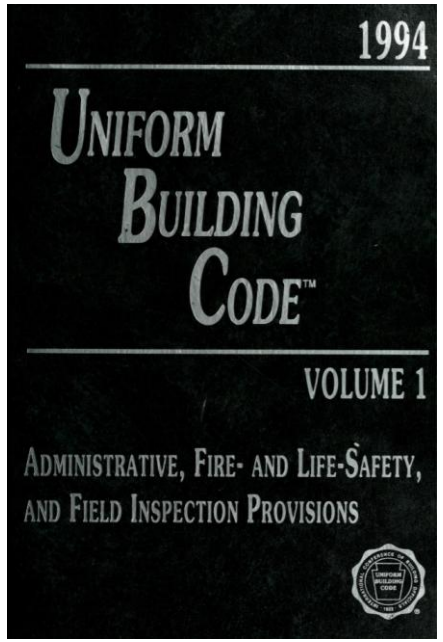
Marching Towards Mainstream

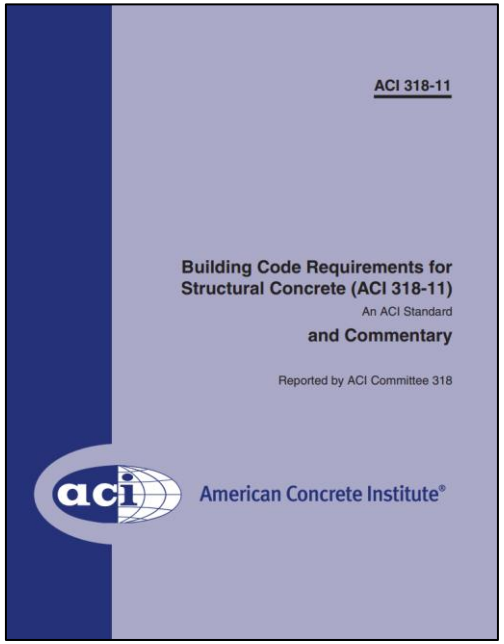
- Final Thoughts on the Future
  - Do enclosure-related code items (in both IBC and Energy codes) need a re-organizing makeover?
    - Streamlining usability and clarity
    - Concise language
    - Reduced cross-referencing

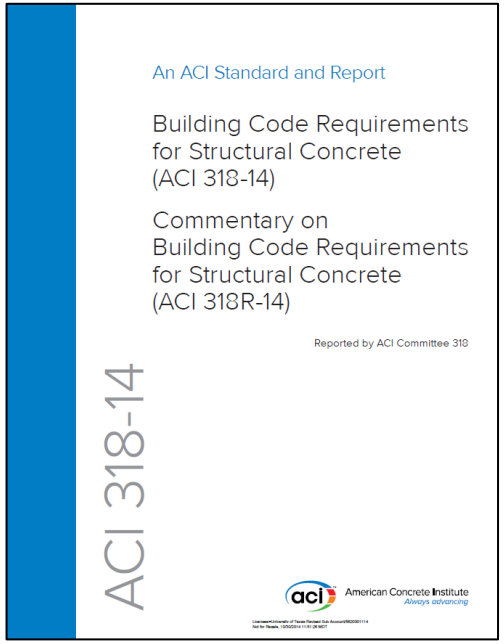
Marching Towards Mainstream

- Final Thoughts on the Future
  - Do enclosure-related code items (in both IBC and Energy codes) need a re-organizing makeover?



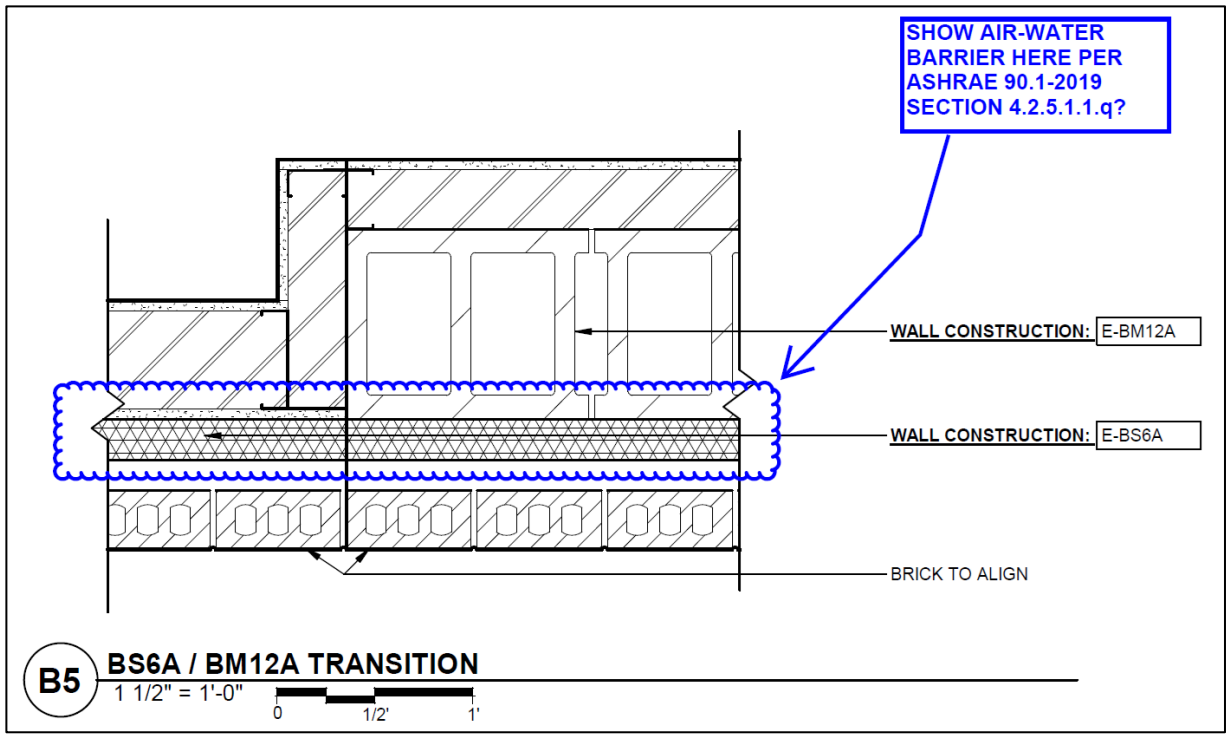






Marching Towards Mainstream

- Final Thoughts on the Future
  - Architect education is critical



,000	23,000	75%	69,000	184,000	0.09
,000	17,500	75%	52,500	140,000	0.16
4,000	26,000	75%	78,000	208,000	0.25
,000	9,500	75%	28,500	76,000	0.02
			Allowable Area Sum of Ratio's:		0.51

as 1-story

THESE VALUES DO NOT APPEAR TO BE CONSISTENT WITH PRESCRIPTIVE ENERGY CODE REQUIREMENTS?

	Code Requirements	Design Criteria
ZONE	7	7
THERMAL ENVELOPE		
ROOFS: INSULATION ABOVE DECK	R-35 c.i.	R-35 c.i.
WALLS ABOVE GRADE:MASS	R-15.2 c.i.	R-15.2 c.i.
WALLS ABOVE GRADE:STEEL FRAME	R-13 + 12.5 c.i.	R-13 + 12.5 c.i.
WALLS BELOW GRADE	R-15 c.i.	R-15 c.i.
NONHEATED / HEATED SLAB	NH: R-20 for 24" H: R-25 for 48"	NH: R-20 for 24" H: R-25 for 48"
OPAQUE DOORS: NONSWINGING	R - 4.75	R - 4.75
FENESTRATION		
ENTRANCE DOORS	U-0.77; SHGC 0.45	U-0.77
FIXED WINDOWS	U-0.29; SHGC 0.45	U-0.29
AIR BARRIER	<0.004 cfm/ft^2 ASTM E2178	<0.004 cfm/ft^2 ASTM E2178

Marching Towards Mainstream

- Final Thoughts on the Future
  - Architect education is critical
  - "Give a man a fish and you feed him for a day;
    teach a man to fish and you feed him for a lifetime“
  - Are we feeding Architects for a day or for a lifetime?

Marching Towards Mainstream

- Final Thoughts on the Future
  - Building Official education is critical
  - Getting enclosure-related code items to become tollgates for permitting and for C of O

Marching Towards Mainstream

- Conclusion

- BEC/BECx involvement is essential to improved project outcomes, both during design and construction. Optimizing that engagement will ultimately serve to increase BEC/BECx utilization and will expedite the transformation of project delivery for higher performing buildings.

Thank You!

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Jon Porter


abaa 2026
building
enclosure
conference