BUILDING ENCLOSURE COMMISSIONING

OPPORTUNITY FOR CONSENSUS AND COLLABORATION

MAUREEN GUTTMAN, AIA
ON BEHALF OF

DANIEL J. "DAN" LEMIEUX, AIA
PRINCIPAL AND UNIT MANAGER
WISS, JANNEY, ELSTNER ASSOCIATES, INC.
WASHINGTON, D.C.

CHAIRMAN
ASTM SUBCOMMITTEE E06.55
PERFORMANCE OF BUILDING ENCLOSURES

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What Is BECx?

ASTM E2813, Standard Practice for Building Enclosure Commissioning

- ✓ ***"Building Enclosure Commissioning (BECx) is a holistic process that begins with the establishment of the Owner's Project Requirements (OPR) and endeavors to ensure that the exterior enclosure… meets or exceeds the expectations of the Owner as defined in the OPR…"***
- ✓ **E2813 includes an OPR Development Guideline**
  Energy·Environment·Safety·Security·Durability·
  Sustainability Operation & Maintenance
- ✓ **E2813 requires quantifiable performance testing**
  Air·Water·Structural·Acoustic·Thermal·Durability·Solar
  Optical·Moisture Content·Safety·Security
- ✓ **E2813 requires independent, third-party design peer review**

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What Is BECx?

ASTM E2813, Standard Practice for Building Enclosure Commissioning

- ✓ **E2813 Includes Minimum Required Core Competencies of the Service Provider**
  - **Building and Materials Science**
  - **Procurement and Project Delivery**
  - **Contract Documents and Construction Administration**
  - **Performance Test Standards and Methodology**
- ✓ **E2813 Core Competencies will Form the Basis of the ASTM/NIBS/ISO Personnel Certification and Training Program**
  - **Scopes, JTAs, and KSAs complete**
  - **Exam Writing in Progress**
  - **Alpha and Beta Testing Scheduled for Q1 2015**
  - **Outreach to Industry and Profession**
    - **AIA, ASHRAE, CSI, ICC, RCI, BCA, Univ of Wisconsin, Others…**

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Why Is It Important?

A Few Statistics

- ✓ **Uncontrolled rainwater penetration and condensation potential are two of the most common threats to building enclosure performance…**
- ✓ **Together, they represent up to 80% of all construction-related claims in the United States…**
- ✓ **90% of all water intrusion problems occur within 1% of the total building area (interfaces)**
- ✓ **Built environment accounts for 30%-40% of energy use worldwide and, by some estimates, 60%-70% of the materials extracted, processed, and consumed by our society today…**

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How Did We Get Here?

Failure in the Project Delivery Process

- ✓ **Compartmentalization of the Design Profession**
- ✓ **Declining Skill Levels in the Construction Trades**
- ✓ **Rising Incidence and Cost of Litigation**
- ✓ **Failure to Deliver…**

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Death of the Architect as "Master Builder"

Substituting "Observation" for "Supervision" During the Construction Phase…

- **Day v. National U.S. Radiator, 241 La.288, 128 So.2d 660 (1958)**
- **Miller v. DeWitt, 37 Ill.2d 272, 226 N.E.2d 630 (1967)**

"Some viewed [this] substitution… as a retreat from the architect's traditional role, tending to weaken the architect's services during this crucial project phase…"

- AIA Architect's Handbook of Professional Practice

CHALLENGES AND OPPORTUNITIES

What Can We Do?

Develop Enforceable Consensus Standards

- ✓ ASTM E2813, Standard Practice for Building Enclosure Commissioning
- ✓ ASTM E2947, Standard Guide for Building Enclosure Commissioning

Embrace a Holistic Approach

- ✓ Predesign
- ✓ Design
- ✓ Preconstruction
- ✓ Construction
- ✓ Occupancy and Operations

Demand *Quantifiable* Performance

- ✓ Energy
- ✓ Environment
- ✓ Safety
- ✓ Security
- ✓ Durability
- ✓ Sustainability
- ✓ Operation and Maintenance

ASTM E2813 STANDARD PRACTICE FOR BECx

Enforceable Levels of BECx

"Fundamental"

- ✓ **BECxA Engagement During the Design Phase**
- ✓ **Minimum of One (1) Independent, Third-Party Design Review (CD Phase)…**
- ✓ **Minimum Level of Performance Testing (Annex A.2)**

"Enhanced"

- ✓ **BECxA Engagement During the Pre-Design Phase**
- ✓ **Minimum of Three (3) Independent, Third-Party Design Review (SD/DD/CD Phases)**
- ✓ **Minimum Level of Performance Testing (Annex A.2)**

Precedent…?

- ✓ ***1998: Public Works Canada Originates "Basic" and "Enhanced" Levels of Cx***
- ✓ ***2001: USGBC Adopts "Fundamental" and "Enhanced" Levels of LEED***

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Minimum Requirements for Performance Testing

E2813 – 12

TABLE A2.1 *Continued*

Property	Standard Designation	Title	Lab System Testing	Enhanced		Fundamental	
				Field Mockup Testing[A]	In-Situ Field Testing	Field Mockup Testing	In-Situ Testing
	ANSI S12.8	Methods for Determination of Insertion Loss of Outdoor Noise Barriers	...	(OF)	(OF)	(OF)	(OF)
	ANSI S12.60	Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools	OL	...	...	...	...
		Air Infiltration					
Air flow	ASTM E2319	Test Method for Determining Air Flow Through the Face and Sides of Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen	OL	...	...	...	
Air leakage	ASTM E283	Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen	L (M)	...	...	...	
	ASTM E779	Test Method for Determining Air Leakage Rate by Fan Pressurization	...	...	✓ (1X)	...	
	ASTM E1827	Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door	...	...	✓ (1X)	...	
	ASTM E783[B] *Opaque Walls*	Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors	...	✓ (1X)	✓ (1X)	✓ (1X)	
	ASTM E783 *Windows*	Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors	...	✓ (1X)	✓ (2X)	✓ (1X)	

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Minimum Required Core Competencies of the Service-Provider

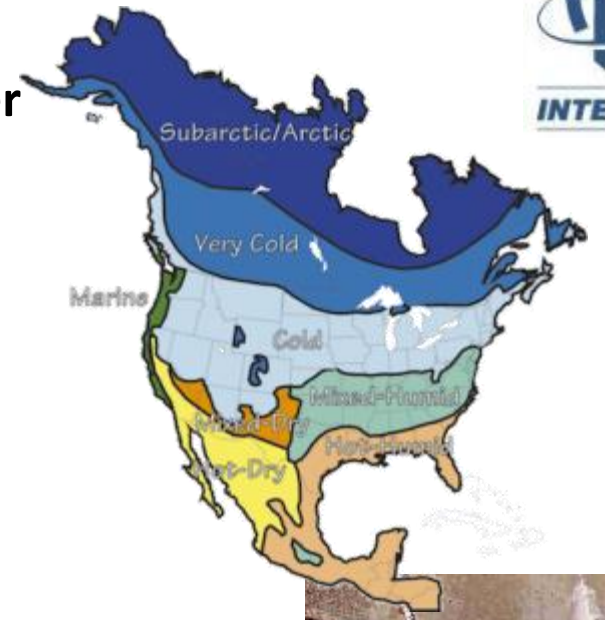
- ✓ **Building and Materials Science**
- ✓ **Procurement and Project Delivery**
- ✓ **Contract Documents and Construction Administration**
- ✓ **Performance Test Standards and Methodology**

ASTM E2813 STANDARD PRACTICE FOR BECx

Minimum Required Core Competencies of the Service-Provider

Building and Materials Science

- ✓ **Principles associated with heat transfer via conduction, convection, radiation, and air infiltration/exfiltration**
- ✓ **Principles associated with moisture storage and transport via gravity, diffusion, convection, capillary action, absorbed flow, and osmosis…**
- ✓ **Characteristics and behavior of materials, components, systems, and assemblies when specified for a given application, geographic region, location, exposure, or climate…**



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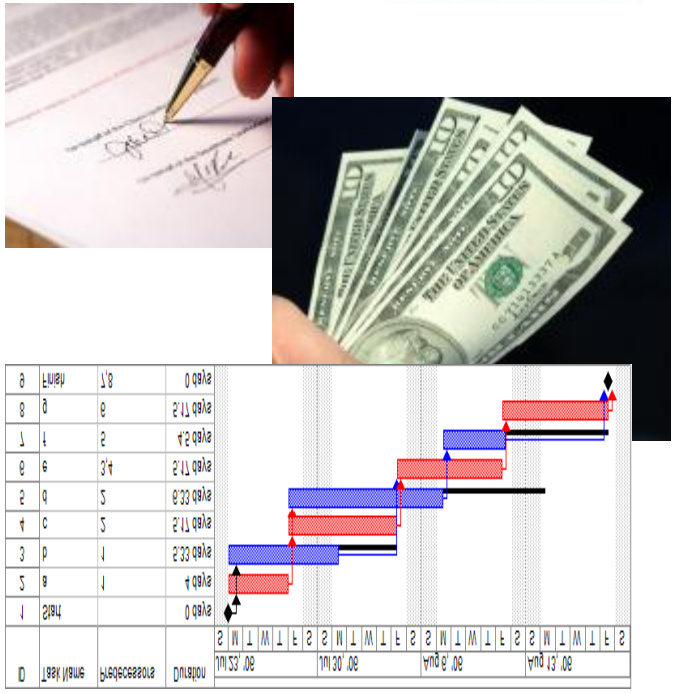
Minimum Required Core Competencies of the Service-Provider

Procurement and Project Delivery

- ✓ **Influence of the project delivery method on the scope and cost of the BECx process**
- ✓ **Influence of the number and type of contracts between the Owner and the project team on the role and responsibilities of the BECxP**
- ✓ **Influence of design scheduling, phasing, and sequencing of the work on the BECx process**
- ✓ **Influence of the experience, qualifications, technical depth, and commitment of the design and construction teams on the successful integration and delivery of the BECx process**



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Minimum Required Core Competencies of the Service-Provider

Contract Documents and Construction Administration

- ✓ **Interpretation and enforcement of the Contract Documents in the context of the BECx process…**
- ✓ **Importance of shop drawing review and design refinement at interfaces to fully integrated building enclosure performance…**
- ✓ **Influence of allowable construction tolerances on interface detailing and construction…**
- ✓ **Material compatibility and continuity of primary heat, air, and moisture control layers on fully integrated building enclosure performance…**
- ✓ ***Timely preparation and delivery of BECx work product…***

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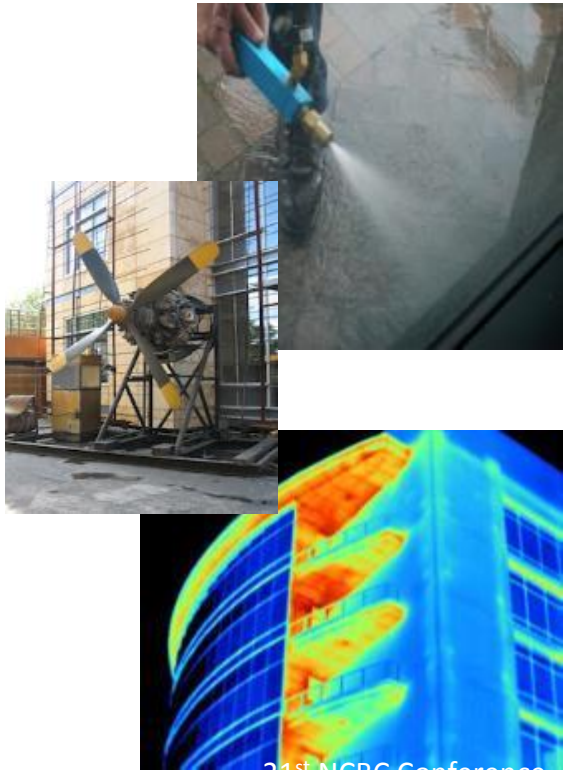
Minimum Required Core Competencies of the Service-Provider

Performance Test Standards and Methodology

- ✓ **Quantifiable thresholds of performance…**
- ✓ **Clear and unambiguous definitions of failure…**
- ✓ **Appropriate interpretation of test results…**
- ✓ **Documentation of all modifications to the design arising from pre-construction mock-up testing and translation into the field…**
- ✓ **Distinction between errors and omissions in architectural design vs. product design**
- ✓ **Conflicts between industry standards and open, consensus-based standards and impact on the enforcement of the Contract Documents…**



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Why Spend the Money?

Regardless of the Scale and Complexity of the Project, Preliminary Data Suggests that the Cost of BECx will typically be…

- ✓ **3%-4% of Design Fee**
- ✓ **Less than 1% of Total Construction Cost**

and will yield…

- ✓ **A 4-to-5 Year Return on Investment in New Construction through Energy Savings alone…**