Performance Testing for Quality Assurance and Commissioning

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Principal
The most benefit to a project is obtained during the Design Phase

- architectural program
- Owner’s Project Requirements
  - design meet expectations
  - details that perform
- details that are constructible
  - cost vs. performance
ENVELOPE. Most insurance claims have to do with the integrity of the building envelope—wall and roof leaks, says David R. Reid, senior vice president and construction industry practice leader in the Phoenix office of insurer Marsh USA Inc.
Consequences

• Cost to repair
• Time to repair
• Loss of use
• Lost reputation
“Architecture should speak of its time and place, but yearn for timelessness”

Frank Gehry
Pritzker Architecture Prize, 1989

Stata Center, MIT Campus, Cambridge, MA 2004
Risk Factors

- Cost of Loss / square meter (square foot)
- Building Use or Function
- Area - square meter (square foot)
- Building Enclosure Design Complexity
- Environment / Climate
- Level of Innovation and/or Performance
- Level of owner’s experience
- Level of Contractor experience

= Owner Risk Tolerance
Tolerance of risk, influences approach to QA & verification
Verifying performance?

Quality Process, such as:
Building Enclosure Commissioning (BECx)
or a
BUILDING ENCLOSURE
PERFORMANCE & QUALITY ASSURANCE
(COMMISSIONING PROGRAM)

Specified Performance Testing in
Part 3 of enclosure related
sections

Code Minimum or GC
initiated QC Program
Testing

- When
- Where
- What
- How
- Cost / budget
Testing

• Types of tests
  – Test per standard?
    - Water
    - Air
    - Thermal (CI)
    - Structural
    - Test Pressures?
  - Sound
  - Infra-Red
  - Pull testing for anchors
  - Peel Adhesion
  - Seismic/Inter-story drift

• Are there tests not defined by standards?

• Project specific tests
Relevant testing is the best testing!
Field Air Tests – Glazed assemblies & Interfaces

ASTM E783  Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
Field Water Tests – Glazed assemblies & Interfaces

Field Water Tests – Glazed assemblies & Interfaces

**AAMA 501.02** Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors by Uniform or Cyclic Static Air Pressure Differential.
Field Water Tests – Glazed assemblies & Interfaces

AAMA 501.1-05 Standard Test Method for Exterior Windows, Curtain Walls, and Doors for Water Penetration Using Dynamic Pressure – Modified for Field Use
Field Air Tests – Air Barrier

Field Thermal Tests – Glazed Assemblies/Transition to Air barrier

Field High Voltage
Electronic Leak detection –
Roofing and Planter
waterproofing
• **Approach to testing?**
  - What’s the risk?
    - watertightness
    - air tightness
    - thermal continuity

• **Be project specific**
  - Define a pass / fail

• **Be prescriptive**
  - Isolate window from wall

• **Be prepared**
  - What fails/leaks and why?
  - Is it systemic?
  - How much more to test in event of failure
discussion
The performance requirements shall be coordinated for the building enclosure as an integrated whole, inclusive of air barrier requirement for continuity between the various facade, roof and below grade assemblies.
Prevent Loss by Verifying Performance

Meeting the Owner Project Requirements (OPR) and the design intent through a quality oriented process

“The Commissioning Process is a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meets defined objectives and criteria. The Commissioning Process assumes that owners, programmers, designers, contractors, and operations and maintenance entities are fully accountable for the quality of their work. The Commissioning Team uses methods and tools to verify that the project is achieving the Owner’s Project Requirements throughout the delivery of the project.

The Commissioning Process begins at project inception (during the Pre-Design Phase) and continues for the life of the facility (through the Occupancy and Operations Phase). The Commissioning Process includes specific tasks to be conducted during each phase in order to verify that design, construction, and training meet the Owner’s Project Requirements.”

The building enclosure provides the layer by which the exterior environment is filtered from the interior.