Building Commissioning Tactics to Manage IAQ and Mold in New Buildings

Rick Casault, P.E., CCP

Casault Engineering

Seattle, WA

Overview

1. Building Commissioning Process as a Quality Assurance strategy

2. Building Commissioning Process tactics to improve IAQ and prevent mold

Commissioning is the process that encourages and measures Quality.

… but …

Only those who do the work can create Quality.

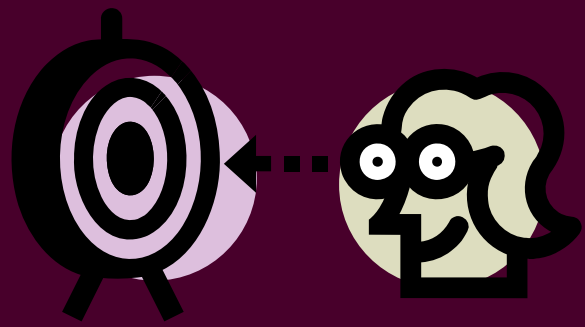
Definition

Commissioning Process:

A quality-focused process for enhancing the delivery of a project (that focuses on) verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's Project Requirements.

ASHRAE Guideline 0-2005, The Commissioning Process

Quality Control



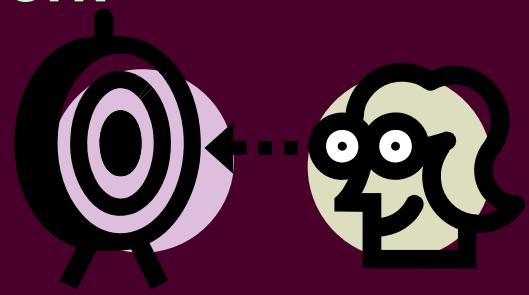
- Commissioning is the owner's quality assurance process
- Goal: Improve the quality of the finished product
- It is proactive
  - Promote understanding of quality expectations
  - Prevent issues from becoming problems
  - Verify achievement of project requirements

Tactics to Manage IAQ and Mold

- **Premise:**
  - Moisture intrusion, diffusion and accumulation lead to mold growth and IAQ problems
- **Next:**
  - Commissioning process tactics to add to your commissioning program to verify achievement of the Owner's Project Requirements for:
    - IAQ improvement
    - Mold and moisture management

Owner’s Project Requirements

- **Predesign:**
  - Define Owner’s Project Requirements (OPR) for
    - Mold and moisture management
    - Indoor air quality
  - Measurable, achievable criteria
  - Include in architect's scope of work



Control & Monitor Moisture & RH

- **Design: Specify contractor controls and acceptance limits**
  - **Maximum acceptable level of moisture in building materials (e.g. concrete, GWB)**
  - **Maximum moisture content & duration**

Control & Monitor Moisture

- **Construction: Material moisture content**
  - **Measure moisture**
    - **Before finish applied**
    - **After finish completion**
    - **Map damaged areas for correction**

Moisture meter

Control & Monitor Relative Humidity

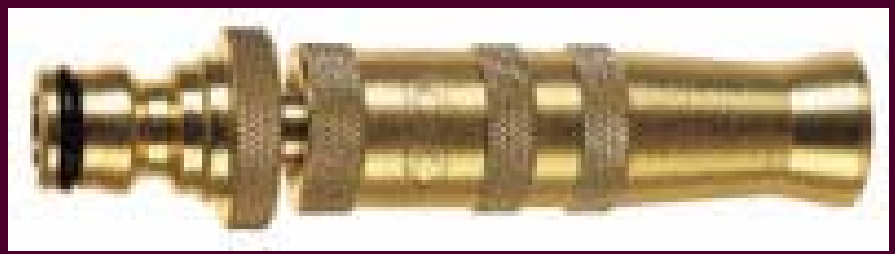
- **Construction: Monitor**
  - **Monitor RH after enclosure**
    - **Multiple locations**
  - **Control RH to acceptable levels**
    - **Fans**
    - **Dehumidifiers**

Building Pressurization

- **Design:**
  - Air balance
  - Pressurization map
  - HVAC Sequence of control
- **Construction: Verify**
  - Balancing (TAB) verification
    - Report +/- 5% of spec?
    - Field verification of report
      - Include space pressurization

Envelope Commissioning

- Below-grade waterproofing, dampproofing, & drainage
  - Soil saturation hose test
- Above-grade masonry sealing, drainage
  - Directed spray hose test



Envelope Commissioning

- Roof leak test, including drains
  - Flood to overflow roof drain level for 24 hours
    - Plug roof drains
- Mechanical room floor leak test
  - Flood to cover entire floor
    - Plug floor drains

Flood Test?

Start-up Commissioning Activities

- **Start-up sequencing of systems**
  1. **Makeup air (pressurization)**
  2. **Air-conditioning (dehumidification)**
  3. **Exhaust (moisture removal)**

HVAC Commissioning Activities

- Dehumidification capacity test
  - Instantaneous condensation capacity
  - Ability to maintain RH under max design load
- Outside air volume and mixing
  - Minimum OSA volume for all VAV modes
  - Mixing effectiveness in occupied spaces

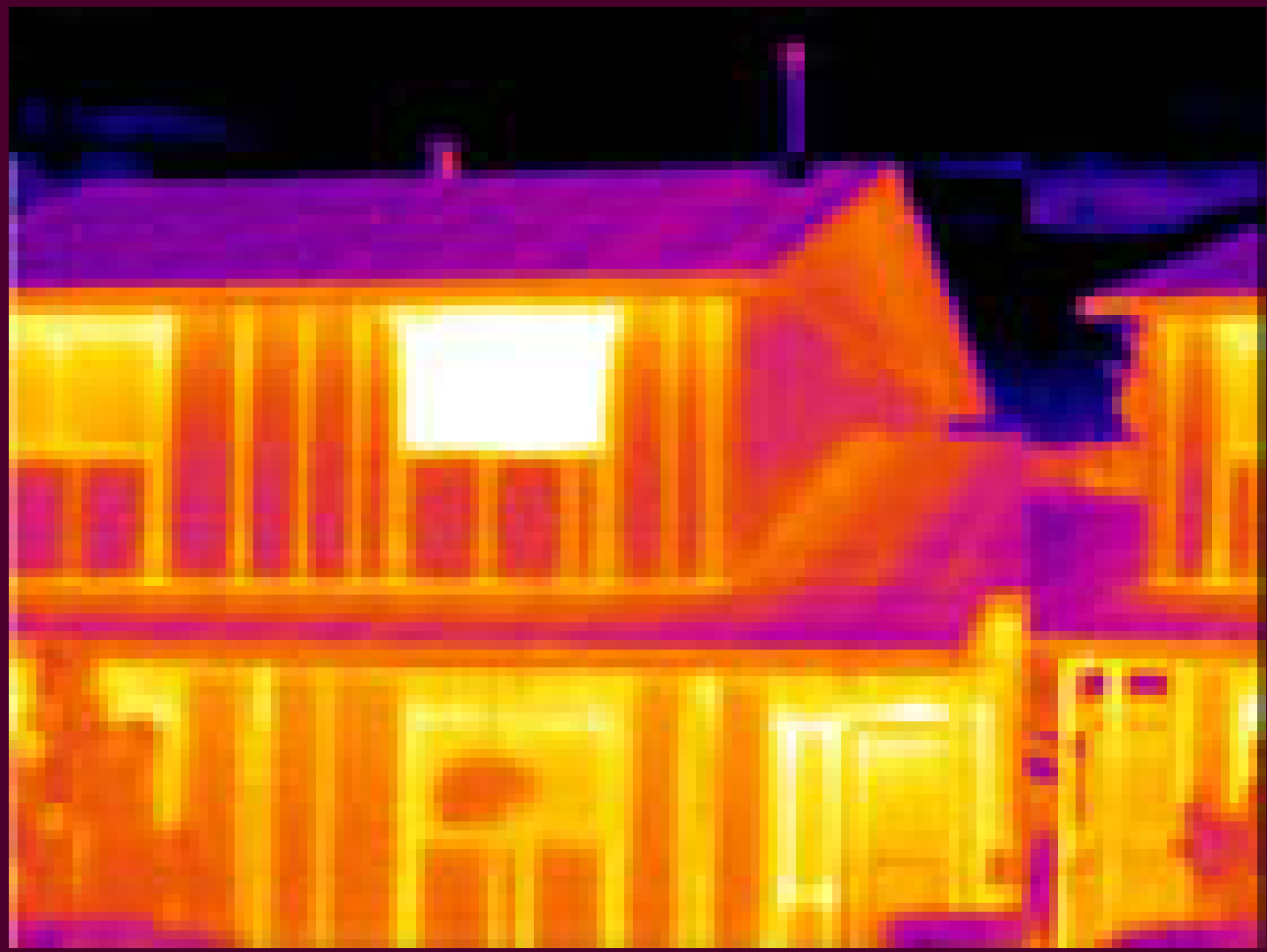
Construction Commissioning Activities

- Measure air pressure differential between spaces
  - (wall cavities, plenums, adjacent spaces, etc.)
- Building air leakage rate
  - Blower door test

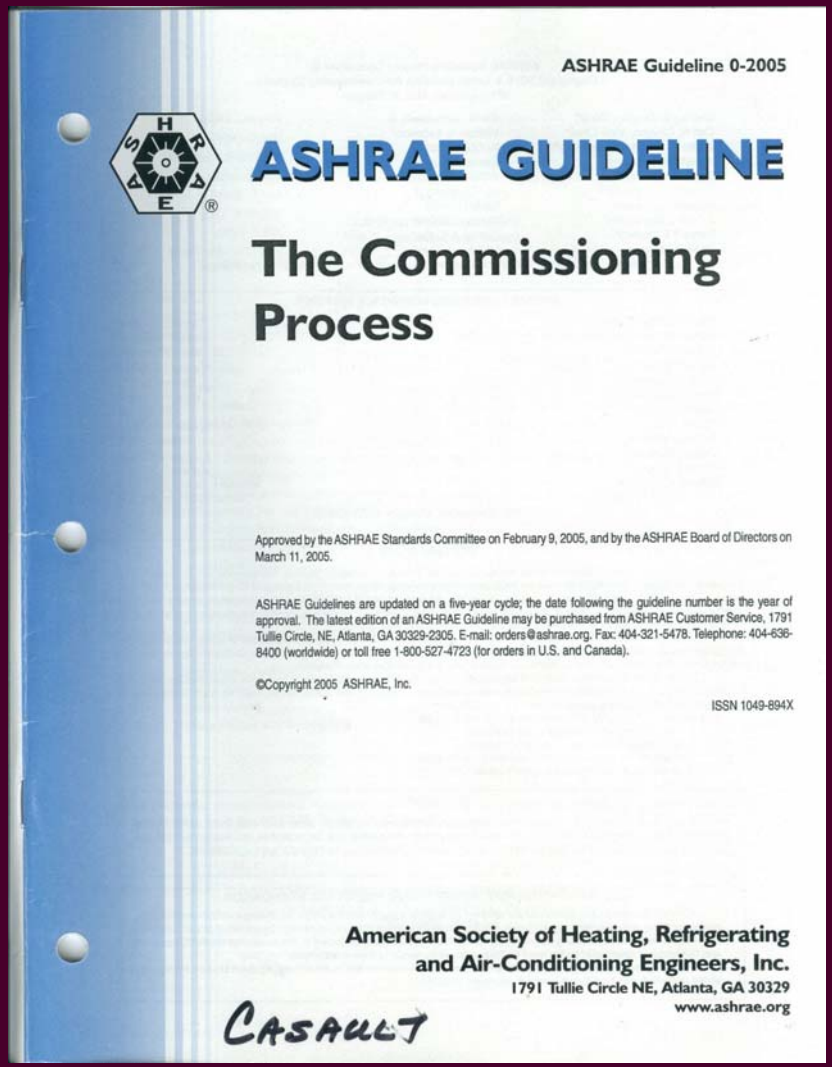
Envelope Commissioning

- **Infrared scan of envelope**
  - **Cold outside air, just before dawn**
    - **30°F air temperature difference indoor to outdoor**
  - **Pressurize and heat interior**
    - **“See” air leaks**

Envelope Infrared Thermograph



ASHRAE Guideline 0-2005



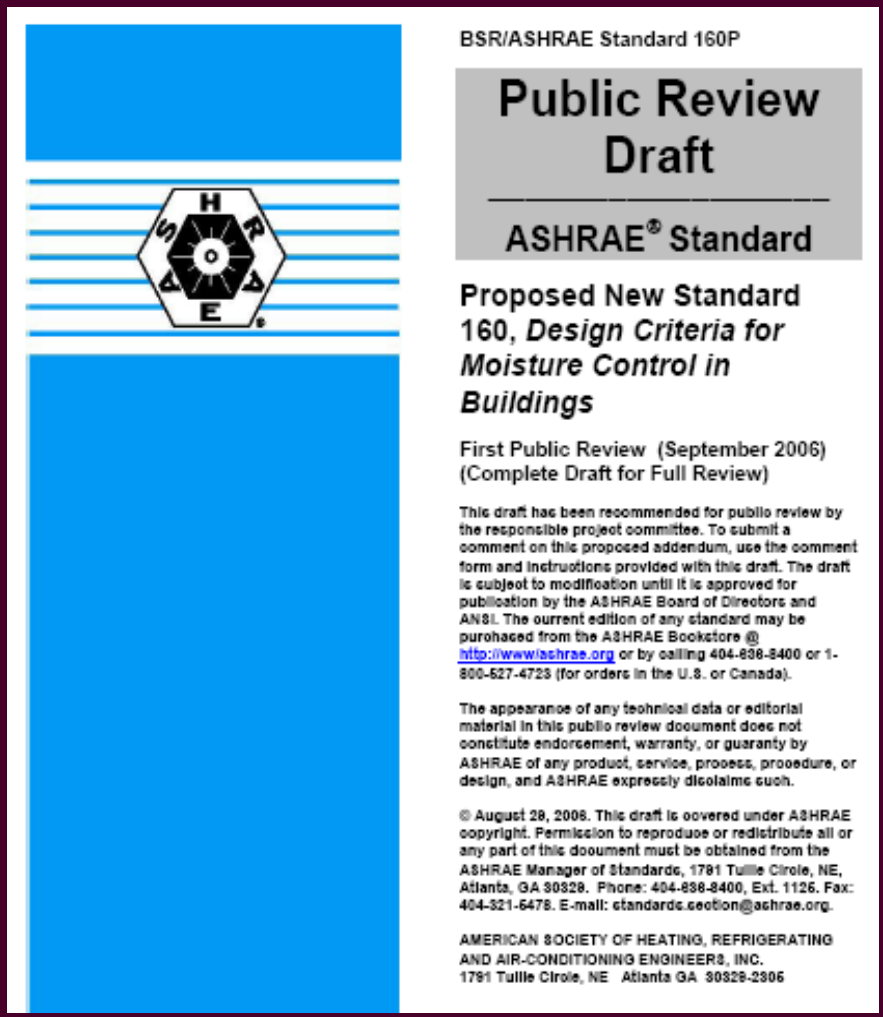
- **Commissioning Process - applicable to all systems**

  http://www.ashrae.org

- **Technical requirements for "Total Building Commissioning Guideline" being developed under NIBS coordination**

  http://www.nibs.org/#

ASHRAE Proposed Standard 160



BSR/ASHRAE Standard 160P

Public Review Draft

ASHRAE® Standard

Proposed New Standard 160, *Design Criteria for Moisture Control in Buildings*

First Public Review (September 2006)
(Complete Draft for Full Review)

This draft has been recommended for public review by the responsible project committee. To submit a comment on this proposed addendum, use the comment form and instructions provided with this draft. The draft is subject to modification until it is approved for publication by the ASHRAE Board of Directors and ANSI. The current edition of any standard may be purchased from the ASHRAE Bookstore @ http://www.ashrae.org or by calling 404-636-8400 or 1-800-527-4723 (for orders in the U.S. or Canada).

The appearance of any technical data or editorial material in this public review document does not constitute endorsement, warranty, or guaranty by ASHRAE of any product, service, process, procedure, or design, and ASHRAE expressly disclaims such.

© August 29, 2006. This draft is covered under ASHRAE copyright. Permission to reproduce or redistribute all or any part of this document must be obtained from the ASHRAE Manager of Standards, 1791 Tullie Circle, NE, Atlanta, GA 30329. Phone: 404-636-8400, Ext. 1126. Fax: 404-321-5478. E-mail: standards.section@ashrae.org.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.
1791 Tullie Circle, NE Atlanta GA 30329-2305

- **Public Review until 6 November 2006 at:**

ashrae.org/technology/page/331

- **"… performance-based design criteria for predicting, mitigating or reducing moisture damage to the building envelope, materials, components, systems and furnishings …"**

QUESTIONS?

Rick Casault, P.E., CCP
Casault Engineering
2705 22nd Avenue South
Seattle, Washington 98144

Phone: **206-660-0410**
E-mail: **rickc@casault.com**

Thank You!