PERFORMANCE SYSTEMS DEVELOPMENT

We Speak Building

Mentor Early, Mentor Often
Integrating Training and QA in Efficiency Programs

Ethan MacCormick - RESNET San Diego 2015

PERFORMANCE SYSTEMS DEVELOPMENT

The PSD Team

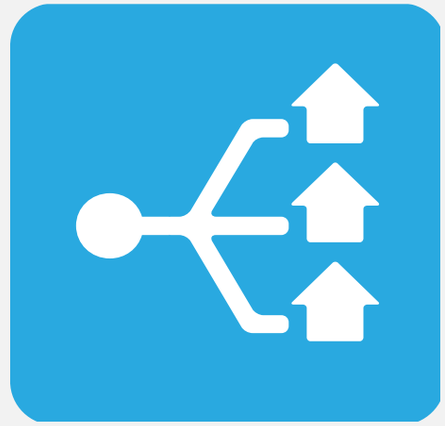
Software

- ✓ Field tools
- ✓ Program Management Applications
- ✓ M&V

Professional Services

- ✓ Technical Consulting
- ✓ Training
- ✓ Energy Engineering
- ✓ Rater Providership

Programs



- ✓ Design
- ✓ Implementation
- ✓ Marketing
- ✓ QA/QC

PERFORMANCE SYSTEMS DEVELOPMENT

The PSD Team

Building Science

Local and National Relationships

Industry Experience

PERFORMANCE SYSTEMS DEVELOPMENT

Topics

- Our History in Mentoring
- The Value of Mentoring
- Mentoring as part of the QA Cycle
- Outcomes
- Expectations

PERFORMANCE SYSTEMS DEVELOPMENT

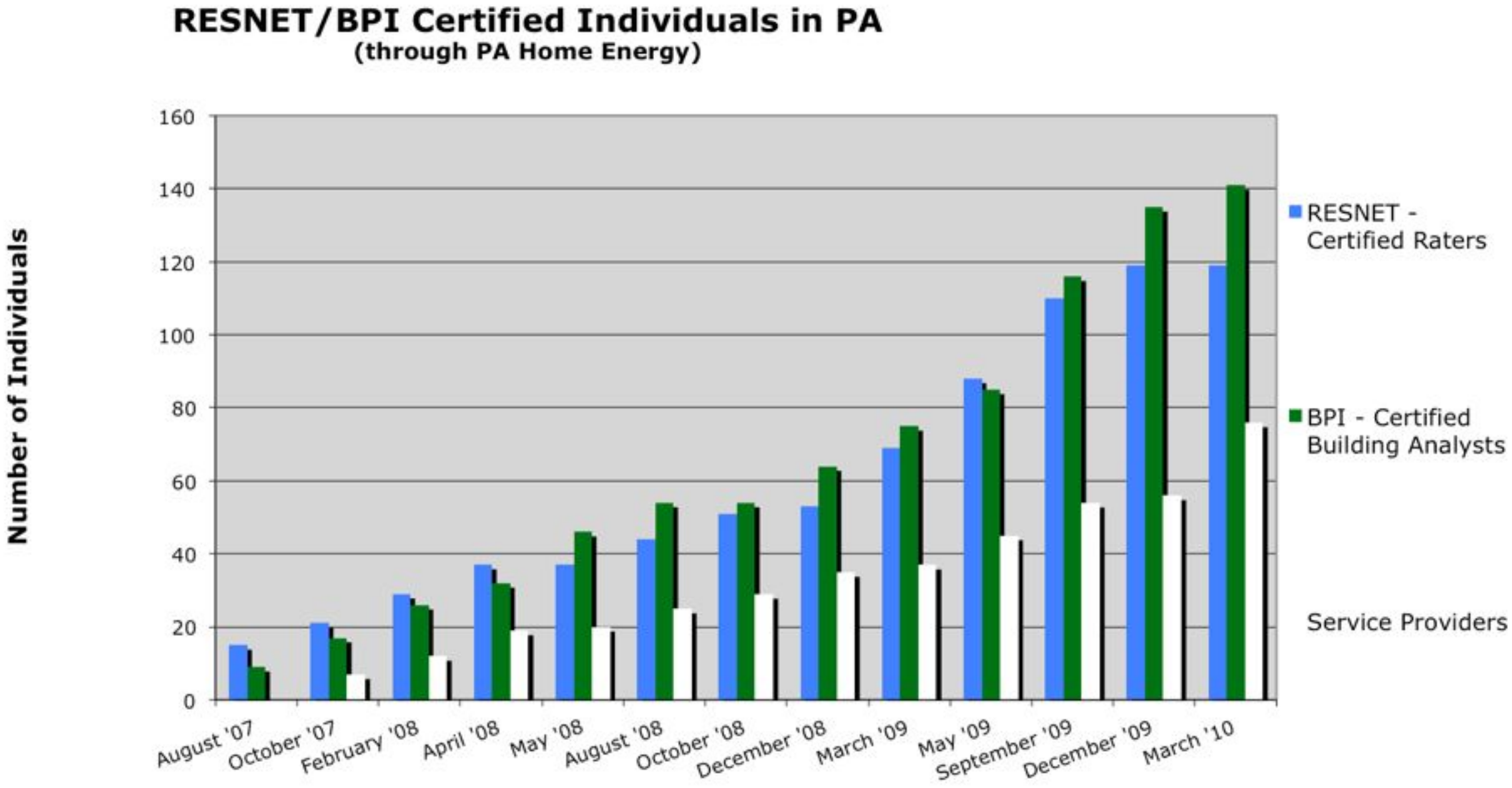
Performance Systems Contracting

Mentoring

- PA Home Energy field mentor evaluates home audits at service provider's sites (free)
- Completes mentoring checklist, evaluating mastery of audit skills
- REQUIRED for all PA Home Energy service providers

PERFORMANCE SYSTEMS DEVELOPMENT

Growth in Green Workforce



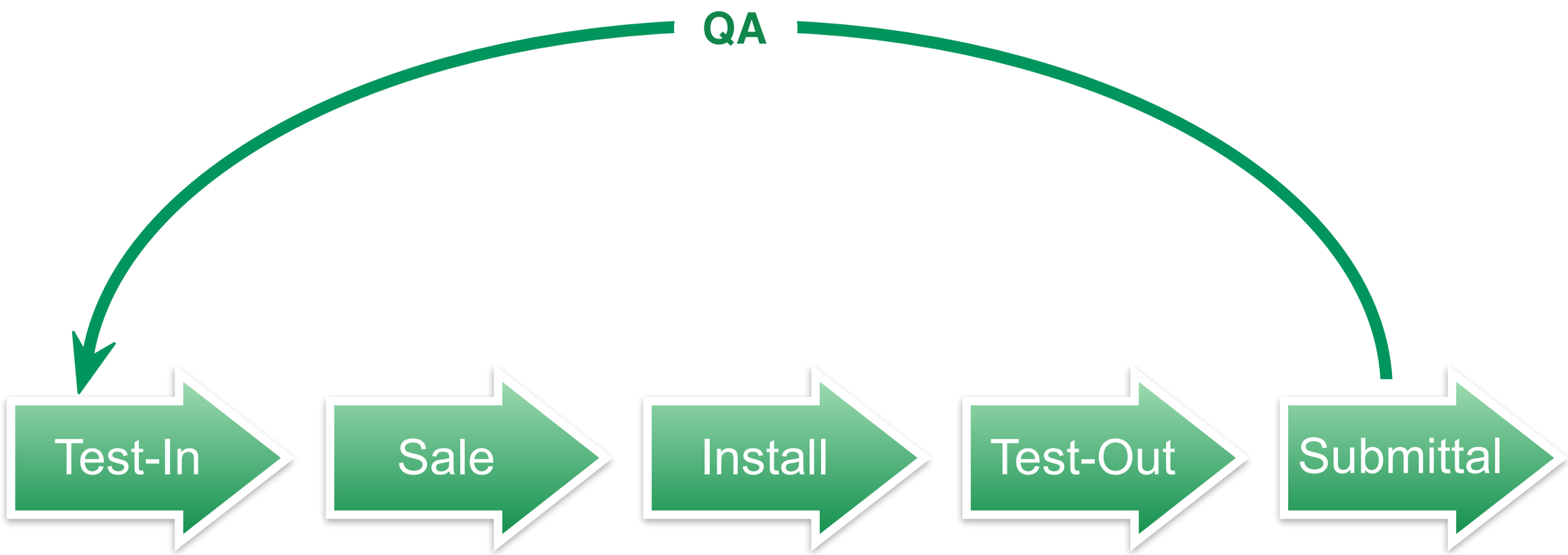
PERFORMANCE SYSTEMS DEVELOPMENT

Growing HP Community

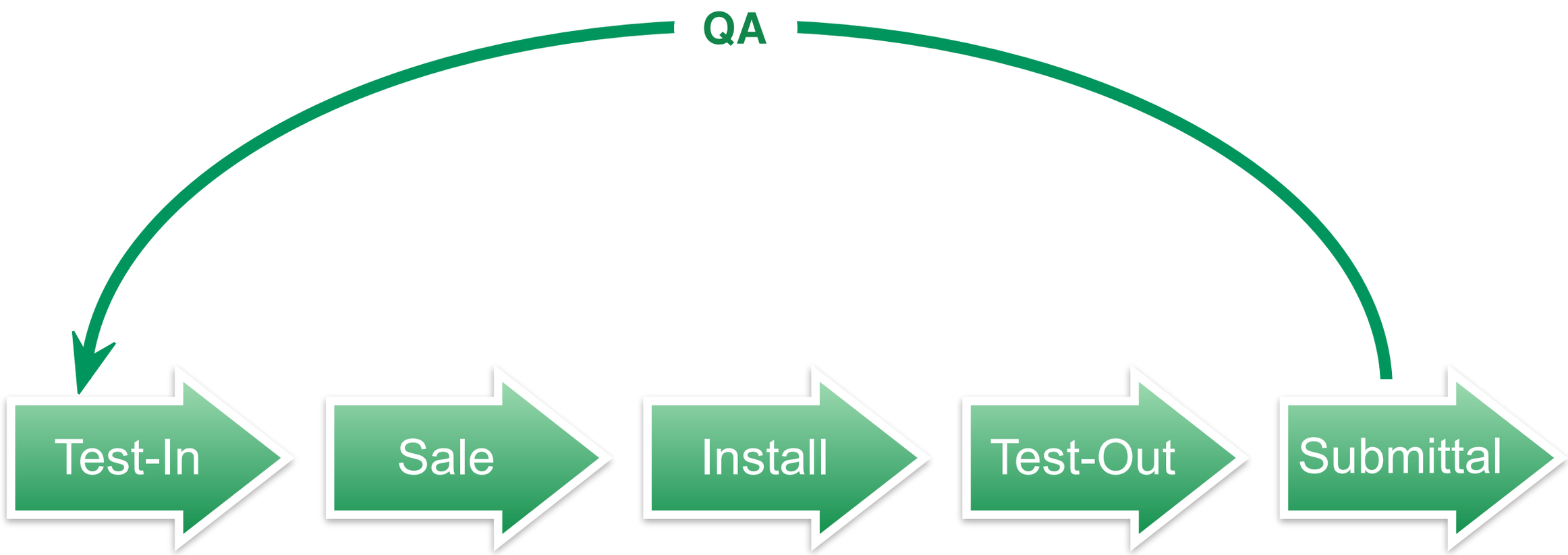
A brief recent history of PSD QA

- In the past ~ 2.5 years, we've conducted over 1500 onsite QA visits in Pennsylvania and Ohio
  - With a team of 3 staff and occasional subcontractors
- In 2013-2014 we did about 35 "Ride-Along" QAs with trained inspectors in a 700 home baseline study, throughout NY
- Plus ~100 HERS QA Provider Field QA throughout the Northeast

Classic Retrofit QA



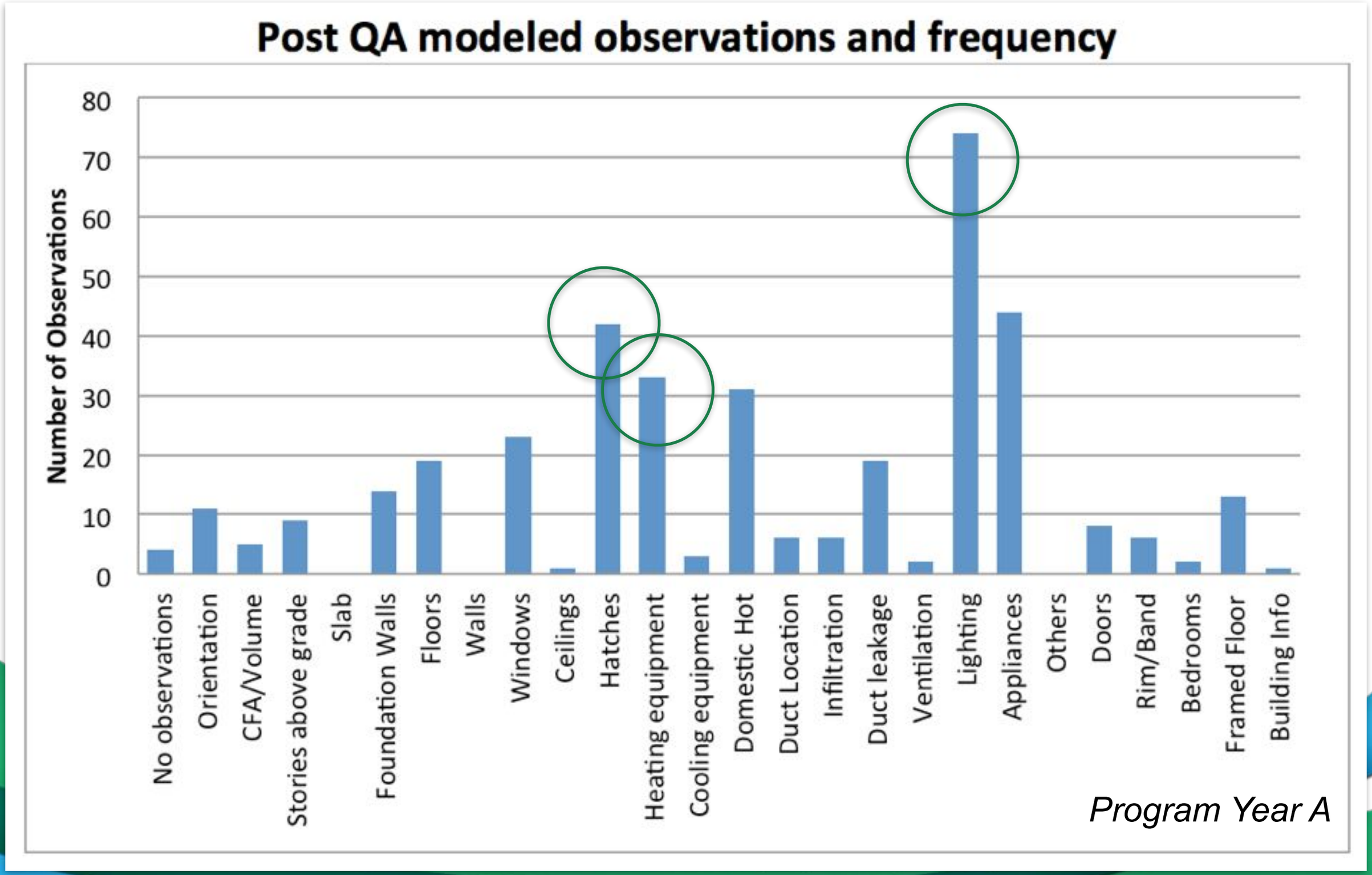
(with big delays in feedback) *Worst case* QA



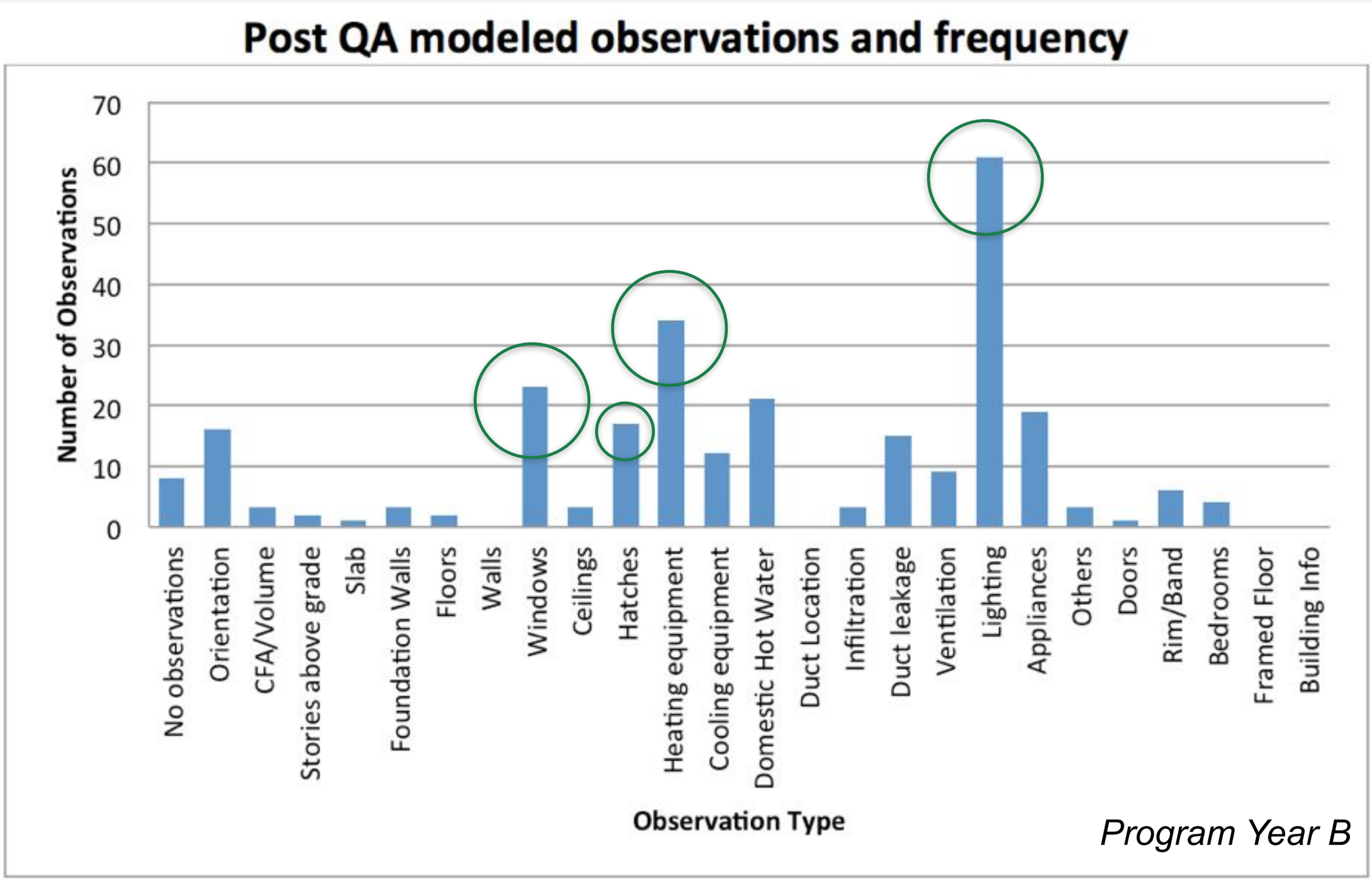
Programs *don't* work this way!

1. Define the Rewards
2. Define the Rules
3. Follow the Rules
4. Success!!!

Field QA Results - New Homes Ratings



Field QA Results - New Homes Ratings



Program Year B

Field Findings

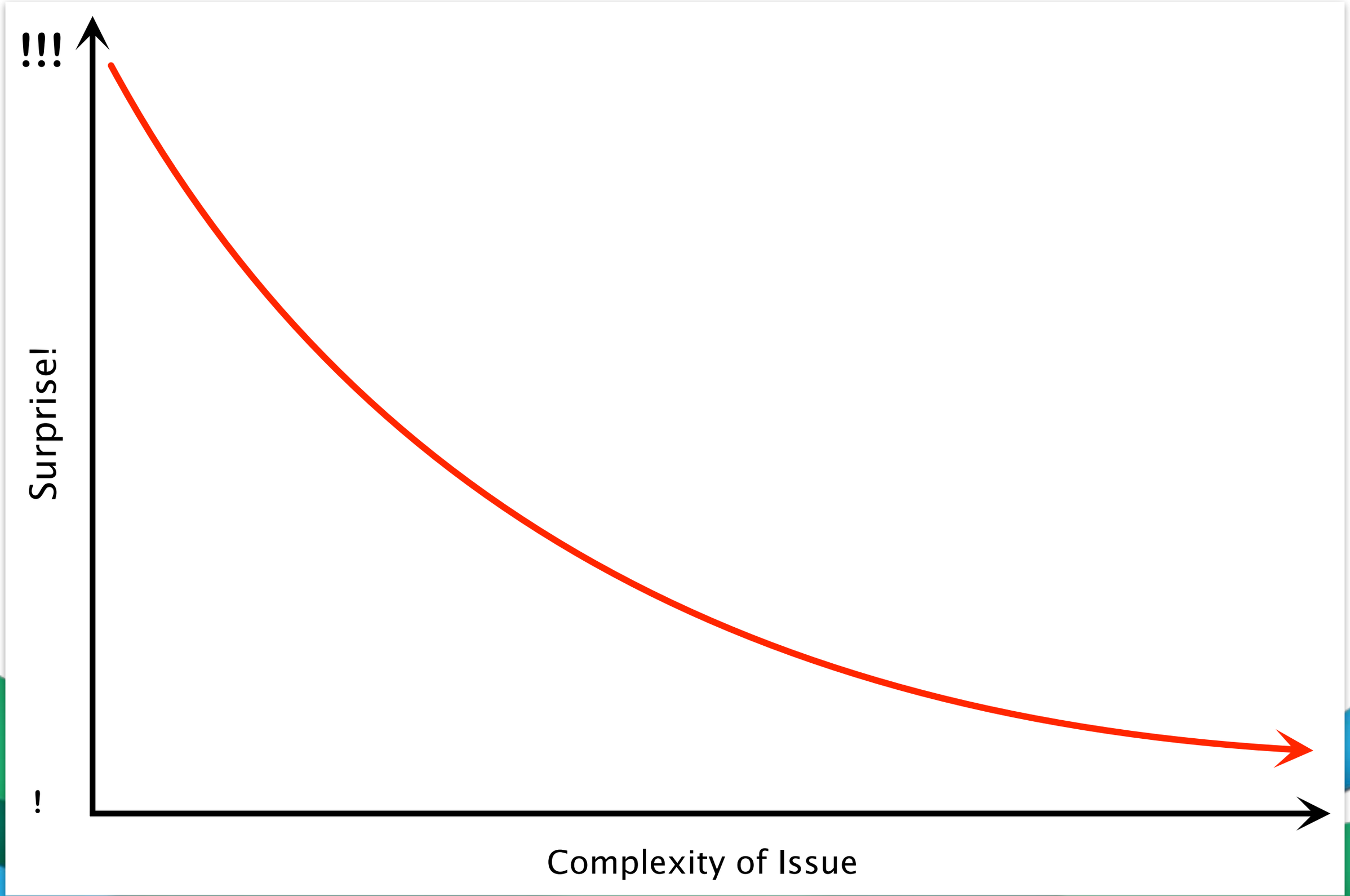
- John Wozniak, Field QA Technician:
  - “We’re always seeing daylight through the rim joists. You just have to stay on top of them.”
  - For raters testing ducts, “it looks like it’s their first time setting it up.”
  - Almost nobody gets auxiliary energy use or lighting counts right.
  - “Hack jobs” on hatches, vertical penetrations not sealed, etc…

Field Findings

- Kevin Rowley, Field QA Technician:
  - "Contractors communication skills with homeowners are *surprisingly lacking.*"
    - how programs work
    - the building science behind what they're doing
  - Any skill contractors don't commonly use, "they forget how to do it when they need it 3 weeks later."
  - The biggest challenge in retrofit seems to be explaining, setting, managing and meeting customer expectations.

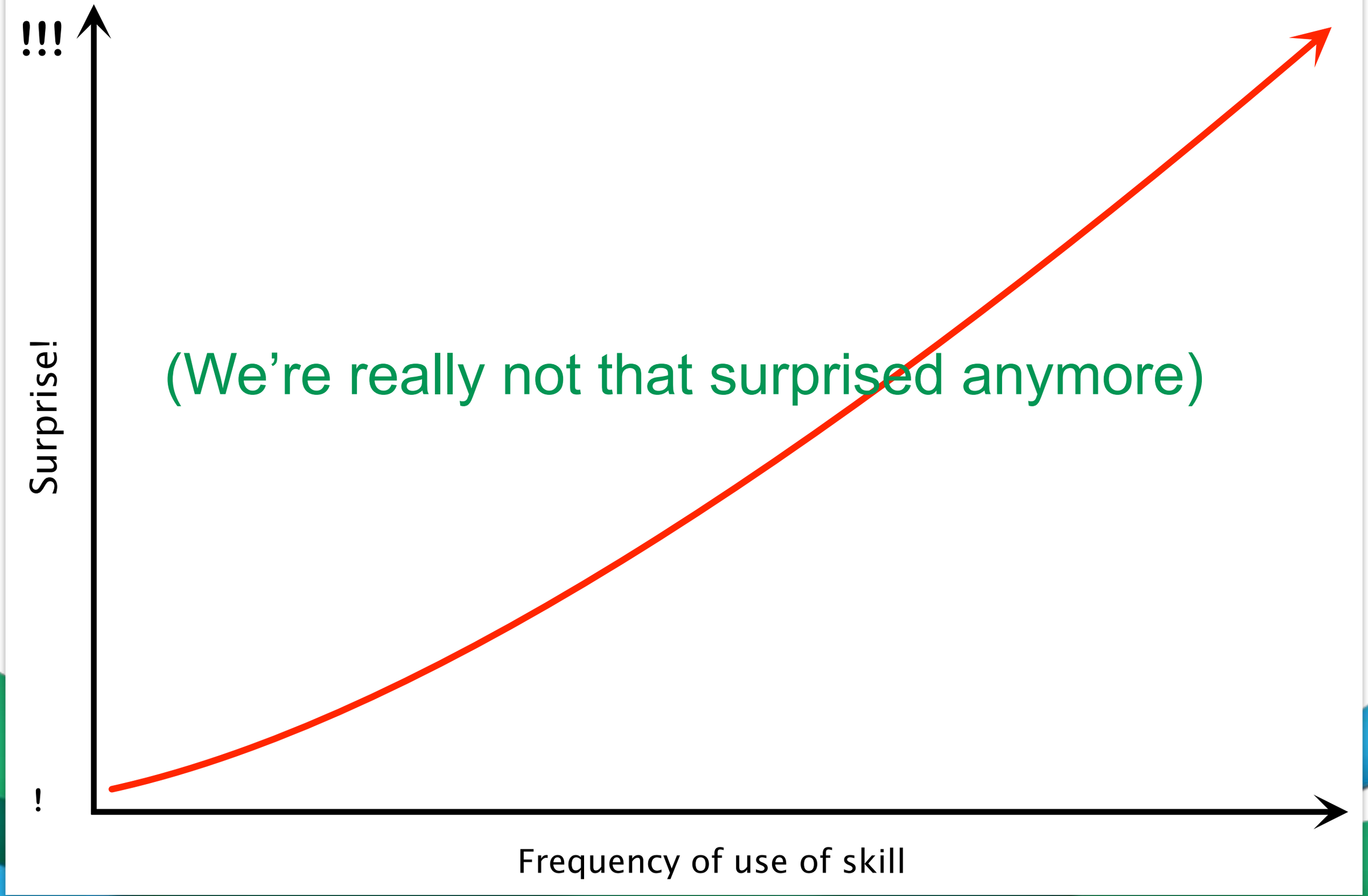
Surprise at misunderstandings

Surprise at misunderstandings



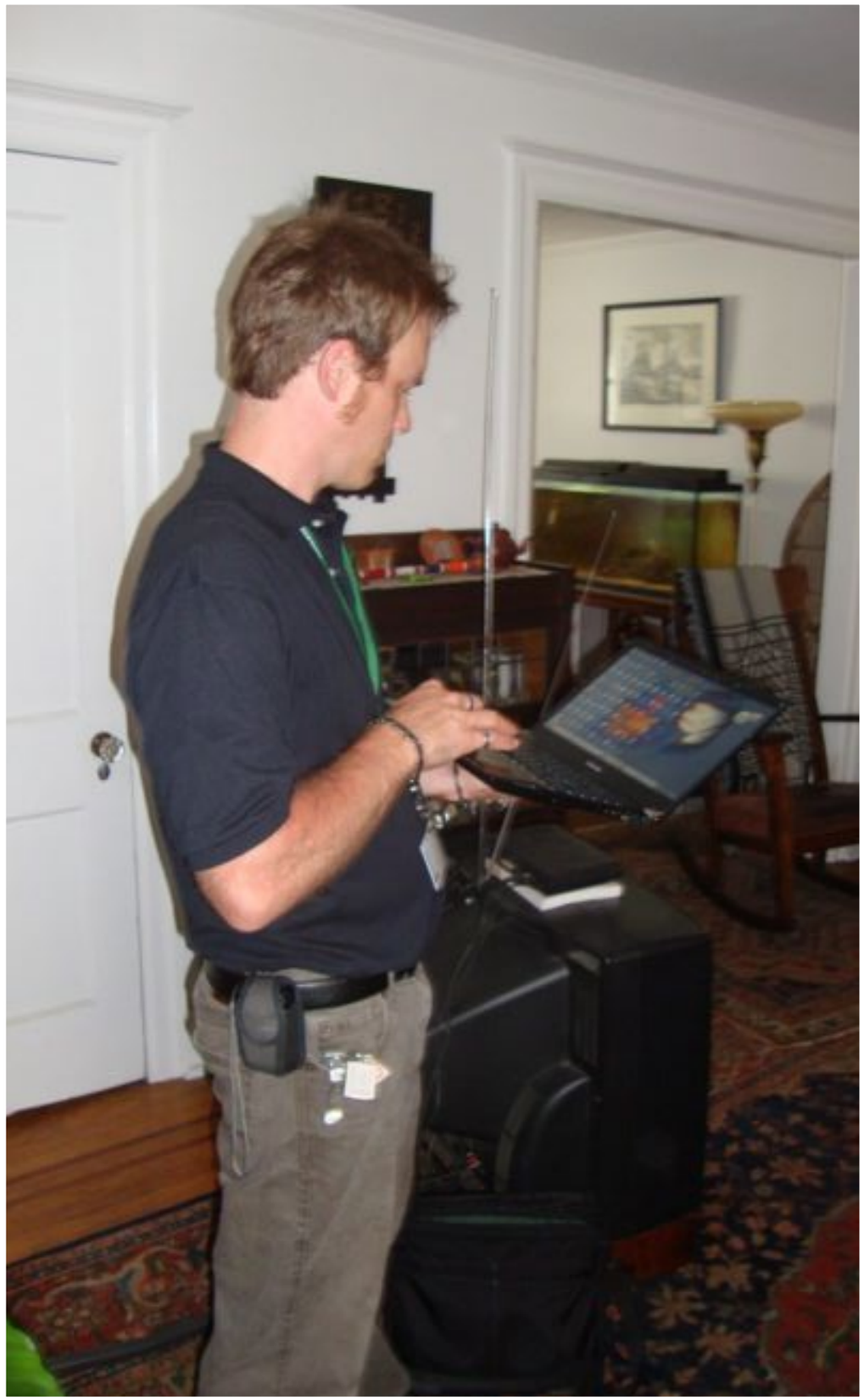
Surprise at misunderstandings

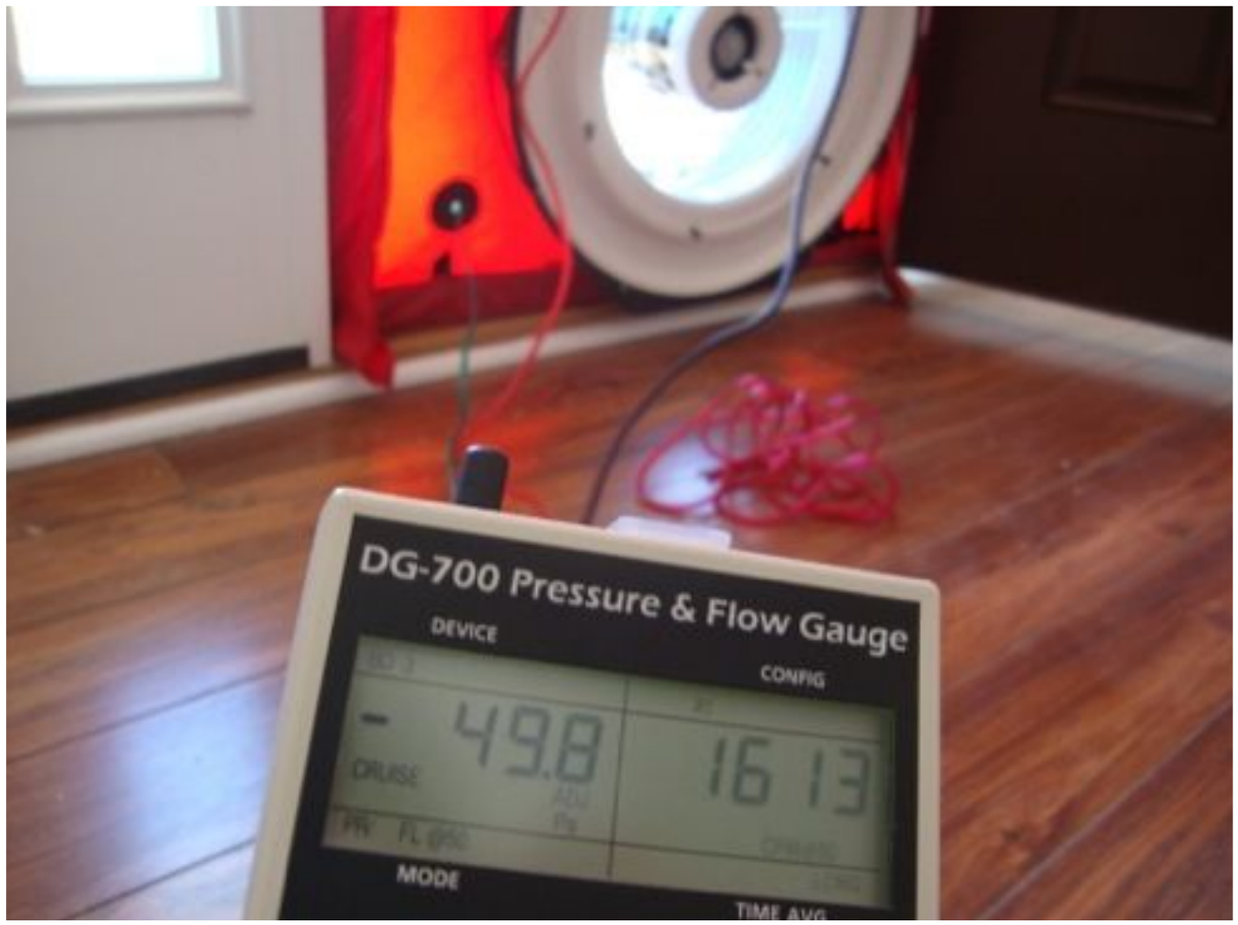
Surprise at misunderstandings



Building Scientists - Contractors - Raters

QA




DG-700 Pressure & Flow Gauge
DEVICE
CONFIG
49.8
16 13
CRUISE
MODE
TIME AVG

PERFORMANCE SYSTEMS DEVELOPMENT

Classic QA and QC will catch problems

…for the next time

…but if we can make it work from the beginning, wouldn’t that be nice?

Example Retrofit Mentoring Requirements

Initial Assessment Shadowing

- 3 out of first 5 assessments by new contractors
- Each new energy auditor participates in a *successful* audit

Initial Scope of Work Review

- Two of the first three projects

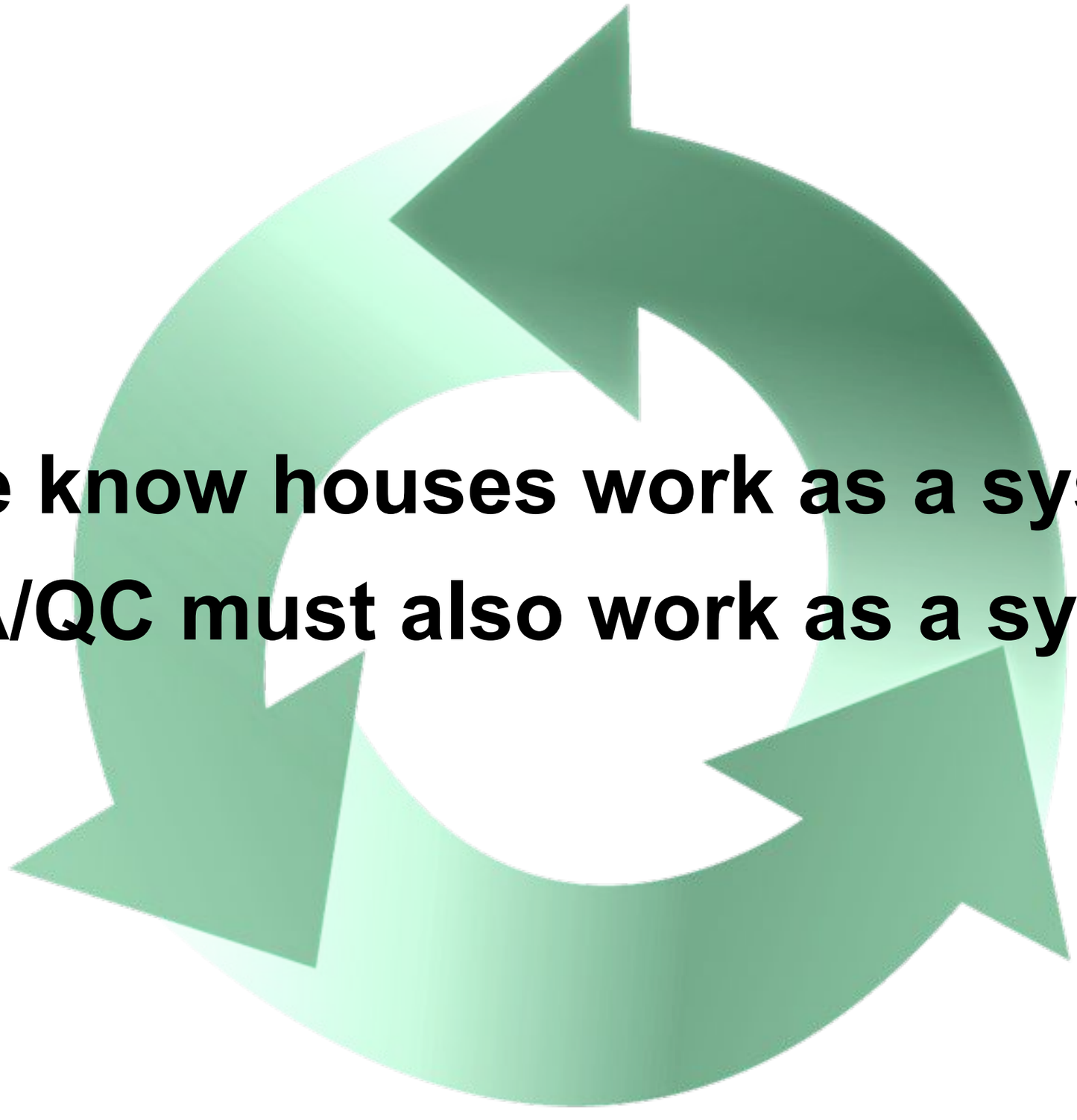
Mid-Point Installation Inspection

- One of the first three projects

Post Installation

- Two out of first three; minimum of 5% thereafter

PERFORMANCE SYSTEMS DEVELOPMENT

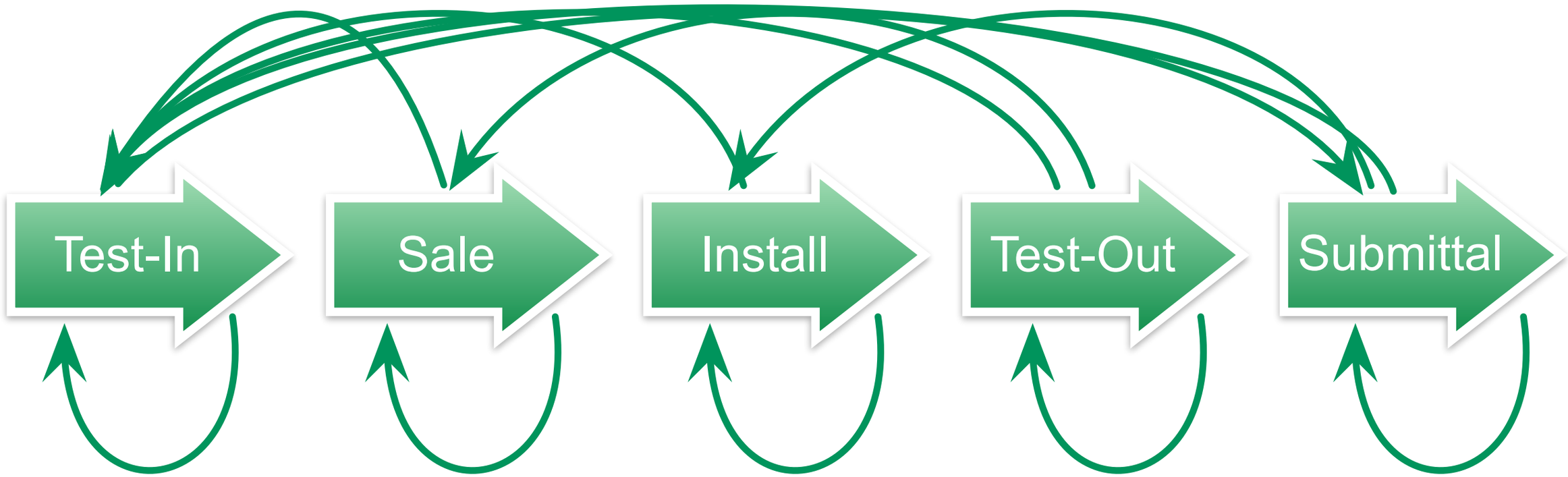


We know houses work as a system

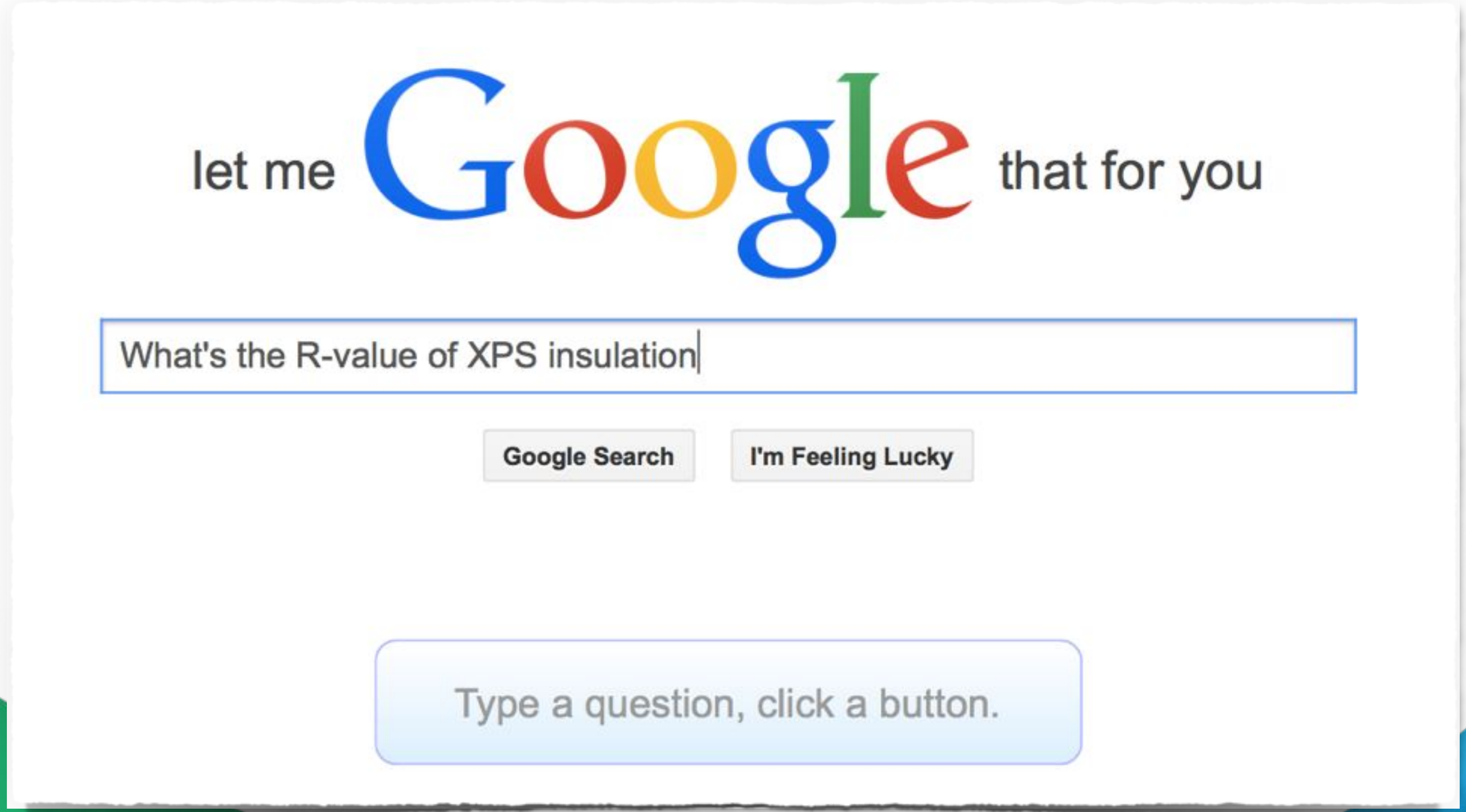
QA/QC must also work as a system

Iterative QA

Interactive QA



Evidence we need mentoring



PERFORMANCE SYSTEMS DEVELOPMENT

QA: Feedback Loop

QA review letters are mailed directly to the CSPs

PERFORMANCE SYSTEMS DEVELOPMENT

Front-Loading the QA

- More feedback, fewer problems
- More feedback at the front end, fewer problems downstream
- Later problems (callbacks) are the most expensive

PERFORMANCE SYSTEMS DEVELOPMENT

Value of Mentoring

- Establish expectations
  - Technical Standards
  - Program Processes
  - Program Goals
- Educating both Contractor/Rater/Builder and Program
- Relationship building
- Common language
- Identifying weaknesses
  - in the program
  - in the contractor
- Increased quality of work

Contractor Feedback

- Provide venues for participants to vent
- Listen but also take action
- Be advocates for contractors
- Turn frustration into satisfaction
- Mentoring is inherently 2-way

PERFORMANCE SYSTEMS DEVELOPMENT

Mentoring is inherently two-way

- One of the best ways to learn something is to teach it.

- “The fastest way to discover what you don’t know, is to try to teach it.”

- Ethan MacCormick

PERFORMANCE SYSTEMS DEVELOPMENT

Multipoint Blower Door Training
A Case Study

- Multi-point blower door testing established as a program requirement
- Contractor reached out to Technical Staff during a QA
  - expressing interested in additional training
- Additional in-field training provided
- Better performance in program as a result

PERFORMANCE SYSTEMS DEVELOPMENT

More than Technical Proficiency

- Mentorship is about overcoming barriers to success
- Sales and marketing is a barrier for many HP companies
- Limited industry standards for proficiency
  - E.G., building analyst equivalent

PERFORMANCE SYSTEMS DEVELOPMENT

Sales/Marketing Mentorship

- Multi-day sales and marketing training
  - Introductory and advanced content
- Action and incentive based webinars
  - Personalized training and strategic plan development
- Lead generation support
  - Including staff development and placement
- Curriculum developed based on needs identified by program participant and feedback

PERFORMANCE SYSTEMS DEVELOPMENT

Value for Services

- Provide training and mentorship as part of program participation
- Recognition of value of services
- Procurement of services in open marketplace
- Another step towards market transformation
- Mentoring/training may be a cost the program bears up front, but
  - Maybe not forever...

Shadowed Audits

Mutual Respect

What the Program brings to the Rater/Builder/Contractor

- Leads
- Technical and Sales Savvy
- Incentives
- Branding
- A Marketplace
- Networking

What the Rater/Builder/Contractor brings to the Program

- A workforce
- Technical and Sales Savvy
- Leads
- Networking
- Program goals will NOT be met without the contractor
- Branding

Mentoring Evaluation

“This is the chattiest shadowed audit I’ve ever been a part of.”

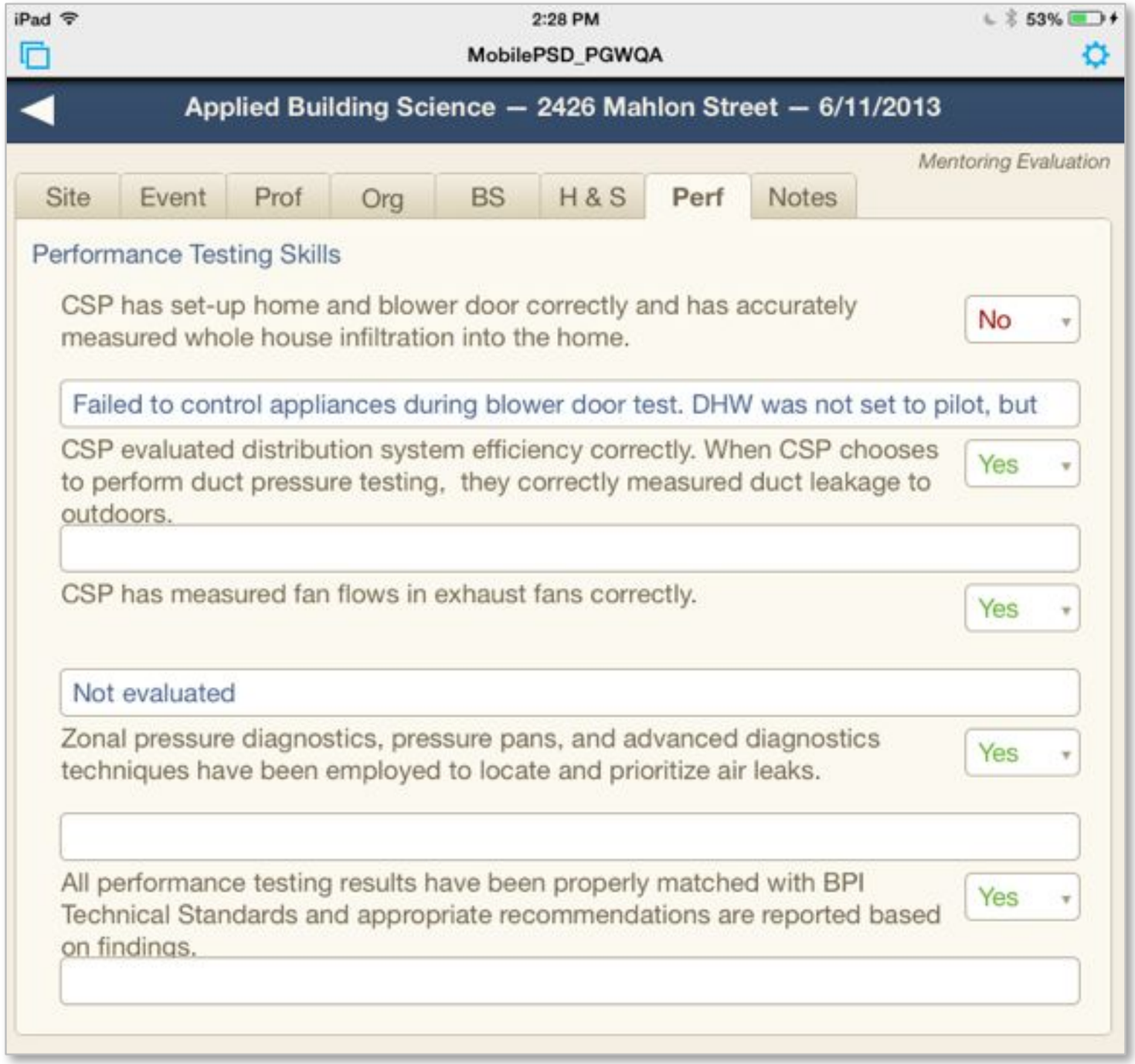
-Melissa Mason, Energy Savings Plus, LLC

Typical Mentoring Evaluation

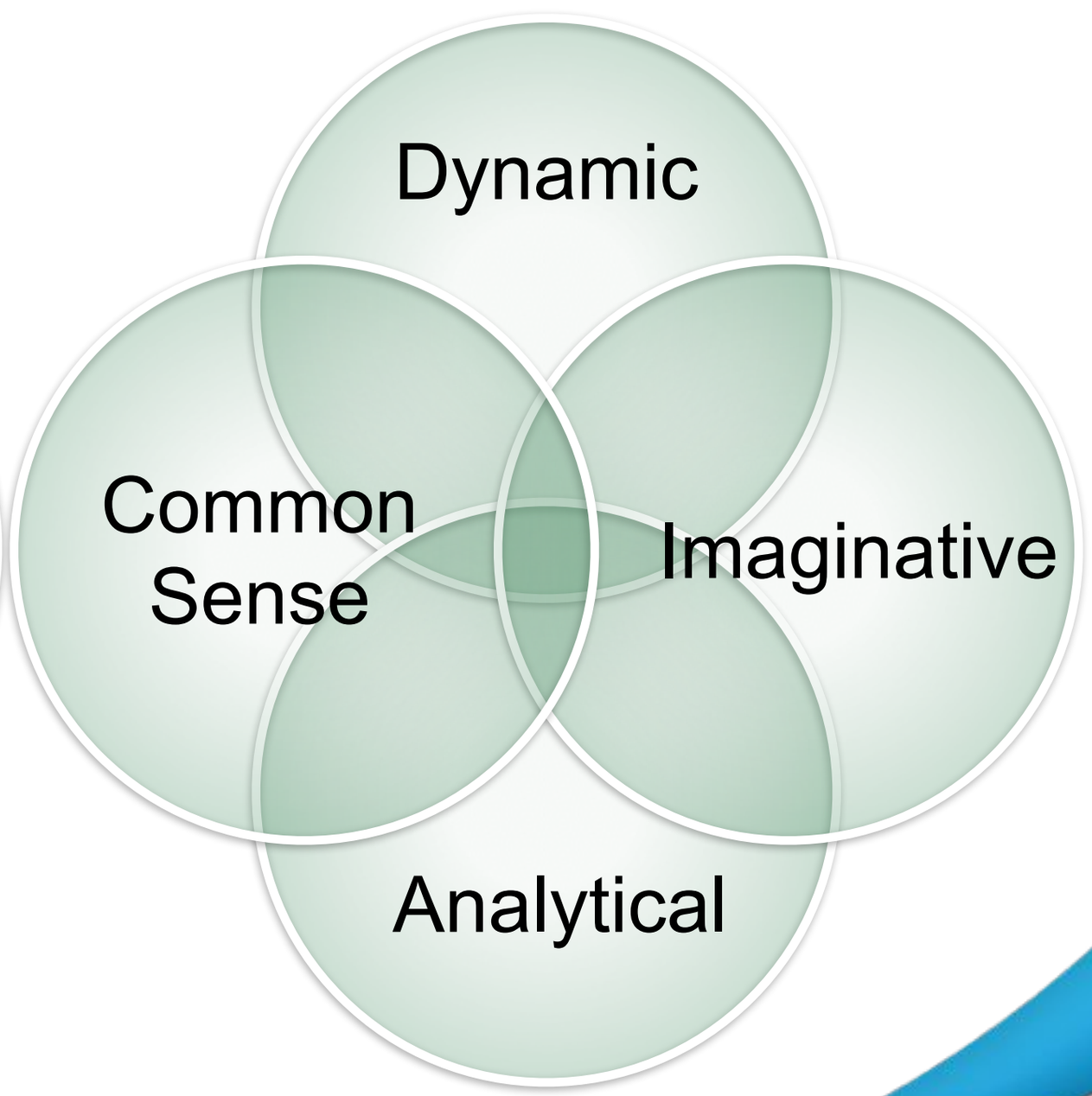
- Professionalism and Communication
- Programmatic and Organizational
- Buildings Science and Prioritization of Improvements
- Gas Leakage and Combustion Safety Testing
- Performance Testing

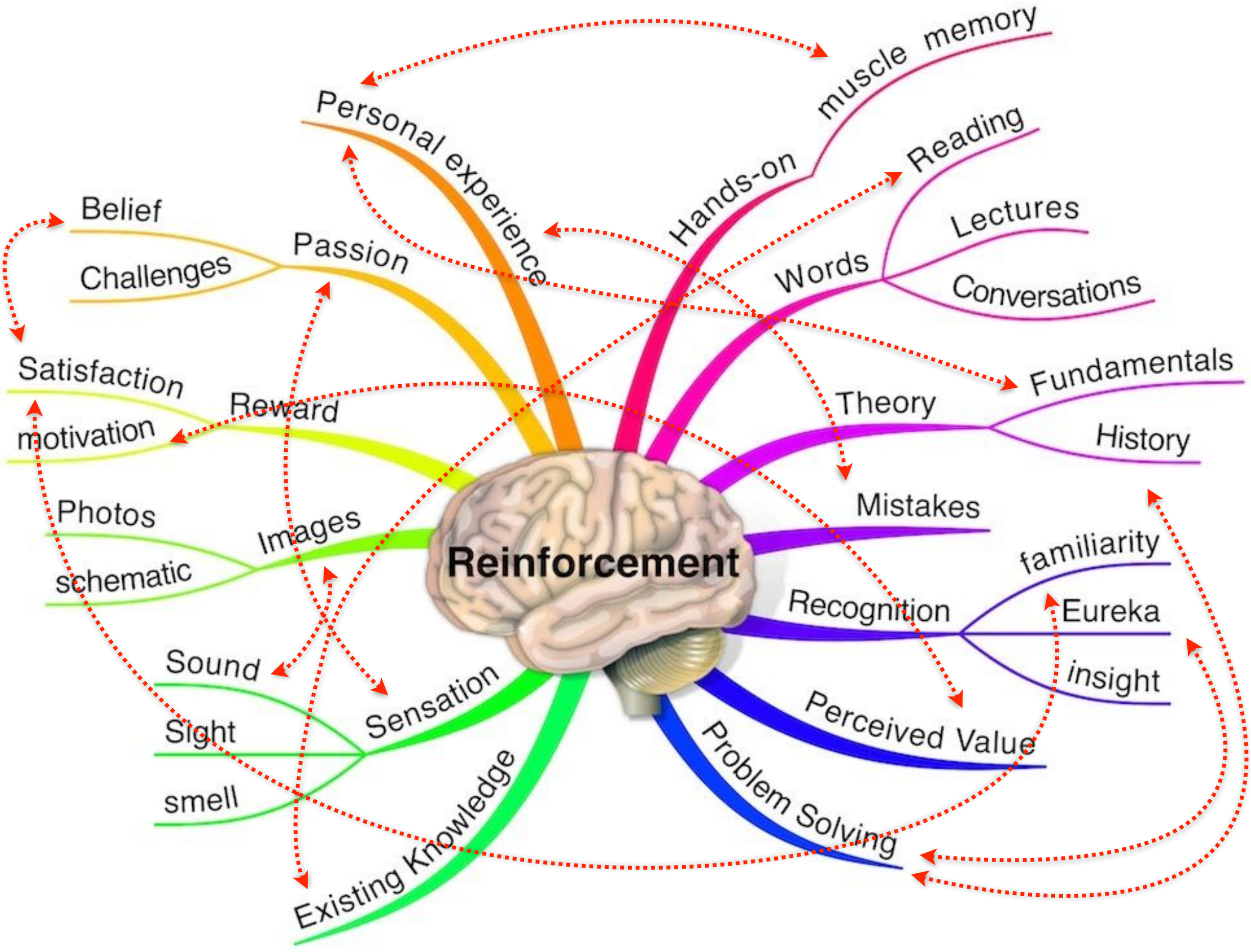
PERFORMANCE SYSTEMS DEVELOPMENT

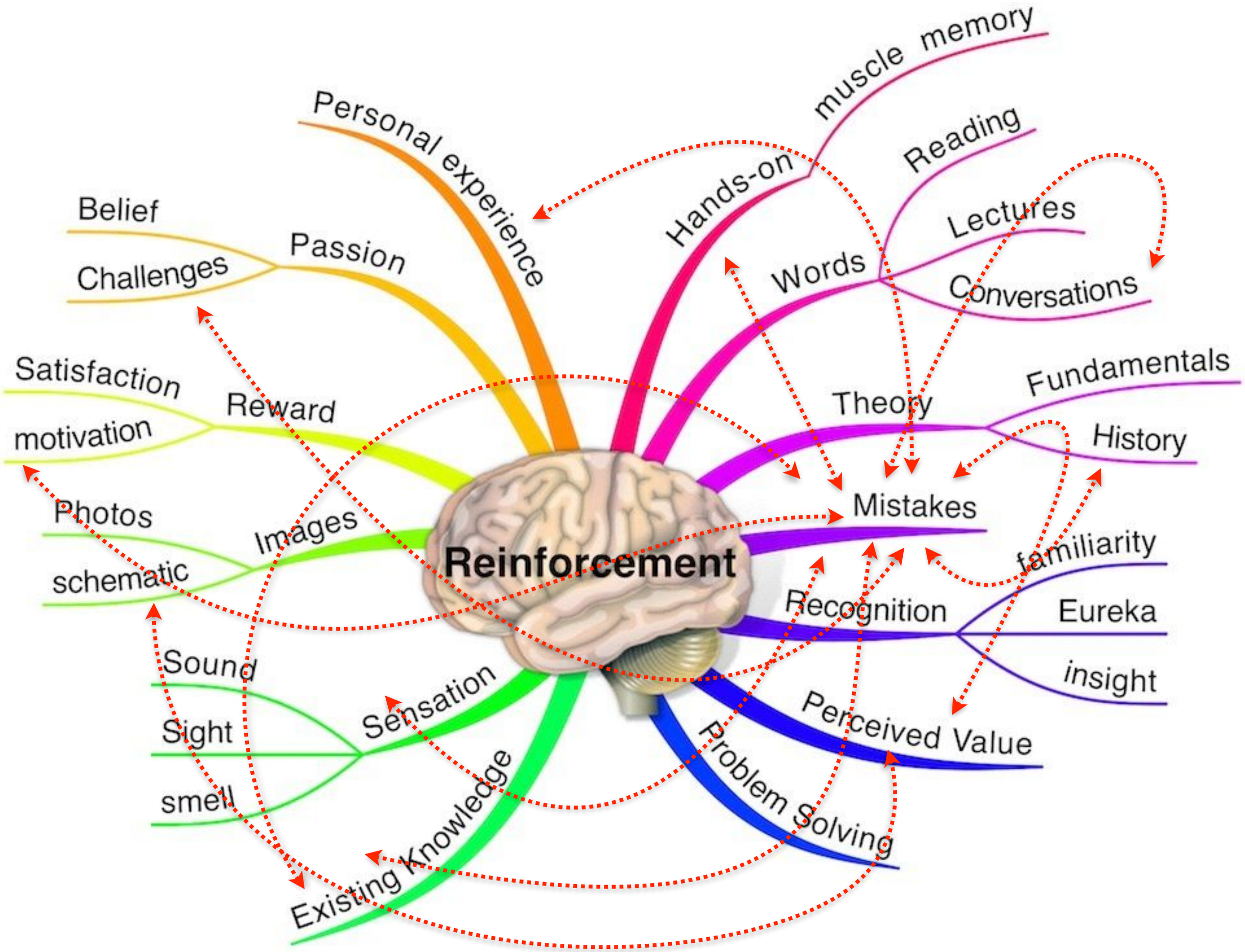
Mentoring/Shadowed Audit Evaluation



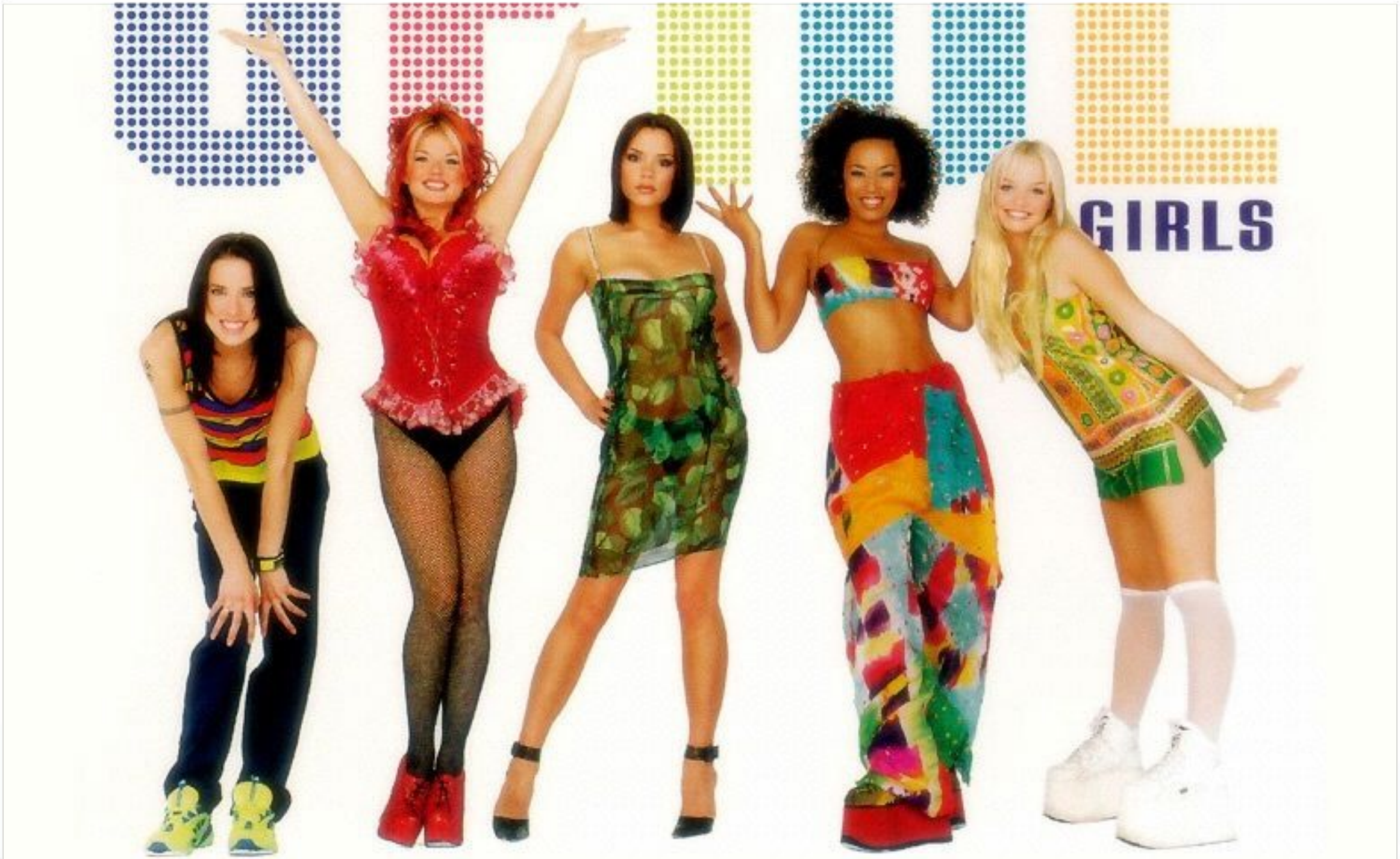
Learning Styles




Personal experience
muscle memory
Hands-on
Reading
Lectures
Words
Conversations
Belief
Challenges
Passion
Satisfaction
motivation
Reward
Fundamentals
Theory
History
Mistakes
Photos
schematic
Images
Reinforcement
familiarity
Recognition
Eureka
insight
Sound
Sight
smell
Sensation
Perceived Value
Problem Solving
Existing Knowledge

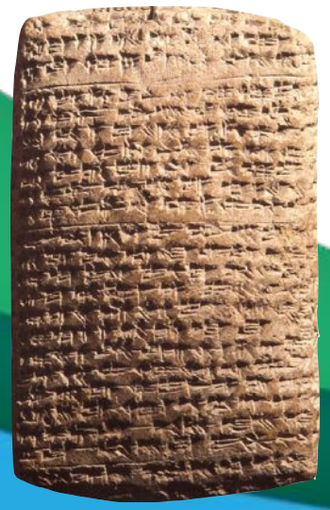

Personal experience
muscle memory
Hands-on
Reading
Lectures
Words
Conversations
Belief
Challenges
Passion
Satisfaction
motivation
Reward
Fundamentals
Theory
History
Mistakes
Photos
schematic
Images
Reinforcement
familiarity
Recognition
Eureka
insight
Sound
Sight
smell
Sensation
Perceived Value
Existing Knowledge
Problem Solving

Building Scientists - Contractors - Raters



Common Language

- What's a Rim Joist?
- What makes a water heater orphaned?
- How far off can my CFM50 measurement be?
- What counts as "above-grade?"
- How soon after the lead is generated do I have to call the customer?
- What do *you* call "Conditioned Floor Area?"
- What are the goals of the program?



Ideally, these are *rhetorical* questions

"The difference between the right word and the almost right word is the difference between lightning and the lightning bug."

— Mark Twain

"The void created by the failure to communicate is soon filled with poison, drivel and misrepresentation."

— C. Northcote Parkinson

Case Study in Evolution: ENERGY STAR 3.0

- Loads of technical specifics in the checklists
- Most of the responsible parties are *required* to attend content-specific training prior to participation
- We're on the 7th version of the specs/checklists (almost the 8th)
  - revisions to standards
  - revisions to clarifying rubrics/footnotes

ENERGY STAR 3.0 Checklists

ENERGY STAR Certified Homes, Version 3 (Rev. 07)
Water Management System Builder Checklist [1,2]

Home Address: _____ City: _____ State: _____ Zip Code: _____

1. Water-Managed Site and Foundation	Must Correct	Builder Verified	Rater Verified	N/A
1.1 Patio slabs, porch slabs, walks, and driveways sloped ≥ 0.25 in. per ft. away from home to edge of surface or 10 ft., whichever is less. [3]	☐	☐	☐	☐
1.2 Back-fill has been tamped and final grade sloped ≥ 0.5 in. per ft. away from home for ≥ 10 ft. See Footnote for alternatives. [3]	☐	☐	☐	☐
1.3 Capillary break beneath all slabs (e.g., slab on grade, basement slab) except crawlspace slabs using either: ≥ 6 mil polyethylene sheeting, lapped 6-12 in., or ≥ 1 in. extruded polystyrene insulation with taped joints. [4, 5, 6]	☐	☐	☐	☐
1.4 Capillary break at all crawlspace floors using ≥ 6 mil polyethylene sheeting, lapped 6-12 in., & installed using one of the following opt's: [4, 5, 6]				
1.4.1 Placed beneath a concrete slab; OR,	☐	☐	☐	☐
1.4.2 Lapped up each wall or pier and fastened with furring strips or equivalent; OR,	☐	☐	☐	☐
1.4.3 Secured in the ground at the perimeter using stakes.	☐	☐	☐	☐
1.5 Exterior surface of below-grade walls of basements & unvented crawlspaces finished as follows: a) For poured concrete, masonry, & insulated concrete forms, finish with damp-proofing coating. [7] b) For wood framed walls, finish with polyethylene and adhesive or other equivalent waterproofing.	☐	☐	☐	☐
1.6 Class 1 vapor retarder not installed on interior side of air permeable insulation in ext. below-grade walls. [8]	☐	☐	☐	☐
1.7 Sump pump covers mechanically attached with full gasket seal or equivalent.	☐	☐	☐	☐
1.8 Drain tile installed at the exterior side of footings of basement and crawlspace walls, with the top of the drain tile pipe below the bottom of the concrete slab or crawlspace floor. Drain tile surrounded with ≥ 6 in. of ⅛ to ¾ in. washed or clean gravel and with gravel layer fully wrapped with fabric cloth. Drain tile level or sloped to discharge to outside grade (daylight) or to a sump pump. [9]	☐	☐	☐	☐
2. Water-Managed Wall Assembly				
2.1 Flashing at bottom of exterior walls with weep holes included for masonry veneer and weep screed for stucco cladding systems, or equivalent drainage system. [10]	☐	☐	☐	☐
2.2 Fully sealed continuous drainage plane behind exterior cladding that laps over flashing in Item 2.1 and fully sealed at all penetrations. Additional bond-break drainage plane layer provided behind all stucco and non-structural masonry cladding wall assemblies. [10, 11]	☐	☐	☐	☐
2.3 Window and door openings fully flashed. [12]	☐	☐	☐	☐
3. Water-Managed Roof Assembly				
3.1 Step and kick-out flashing at all roof-wall intersections, extending ≥ 4" on wall surface above roof deck and integrated shingle-style with drainage plane above; boot / collar flashing at all roof penetrations. [13]	☐	☐	☐	☐
3.2 For homes that don't have a slab-on-grade foundation and do have expansive or collapsible soils, gutters & downspouts provided that empty to lateral piping that discharges water on sloping final grade ≥ 5 ft. from foundation, or to underground catchment system not connected to the foundation drain system that discharges water ≥ 10 ft. from foundation. See Footnote for alternatives & exemptions. [4, 14]	☐	☐	☐	☐
3.3 Self-sealing bituminous membrane or equivalent at all valleys & roof deck penetrations. [4]	☐	☐	☐	☐
3.4 In 2009 IECC Climate Zones 5 & higher, self-sealing bituminous membrane or equivalent over sheathing at eaves from the edge of the roof line to > 2 ft. up roof deck from the interior plane of the exterior wall. [4]	☐	☐	☐	☐
4. Water-Managed Building Materials				
4.1 Wall-to-wall carpet *not* installed within 2.5 ft. of toilets, tubs, and showers.	☐	☐	☐	☐
4.2 Cement board or equivalent moisture-resistant backing material installed on all walls behind tub and shower enclosures composed of tile or panel assemblies with caulked joints. Paper-faced backerboard shall not be used. [15]	☐	☐	☐	☐
4.3 In Warm-Humid climates, Class 1 vapor retarders not installed on the interior side of air permeable insulation in above-grade walls, except at shower and tub walls. [8]	☐	☐	☐	☐
4.4 Building materials with visible signs of water damage or mold *not* installed or allowed to remain. [16]	☐	☐	☐	☐
4.5 Framing members & insulation products having high moisture content *not* enclosed (e.g., with drywall) [17]	☐	☐	☐	☐

Builder Employee: _____
Builder Signature: _____ Date: _____

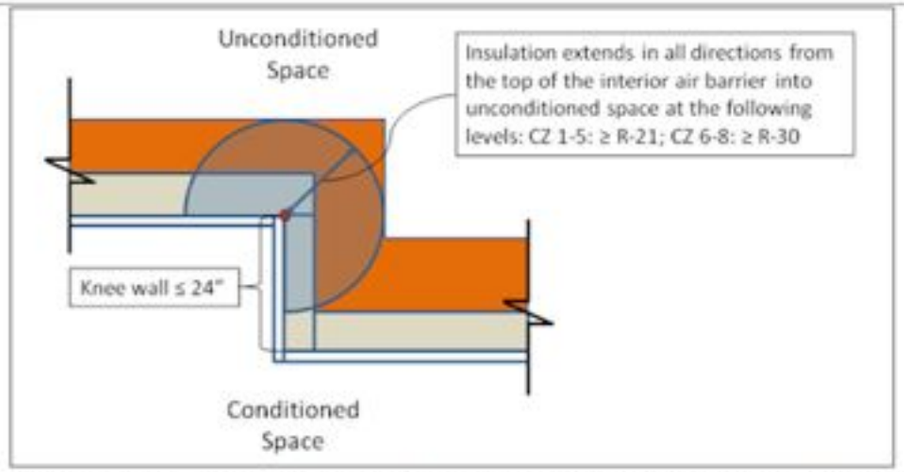
Builder has completed Builder Checklist in its entirety, except for items that are checked in the Rater Verified column (if any) [2]
Rater Signature: _____ Date: _____

Notes:

1. The specifications in this Checklist are designed to help improve moisture control in new homes compared with homes built to minimum code. However, these features alone cannot prevent all moisture problems. For example, leaky pipes or overflowing sinks or baths can lead to moisture issues and negatively impact the performance of this Checklist's specified features.

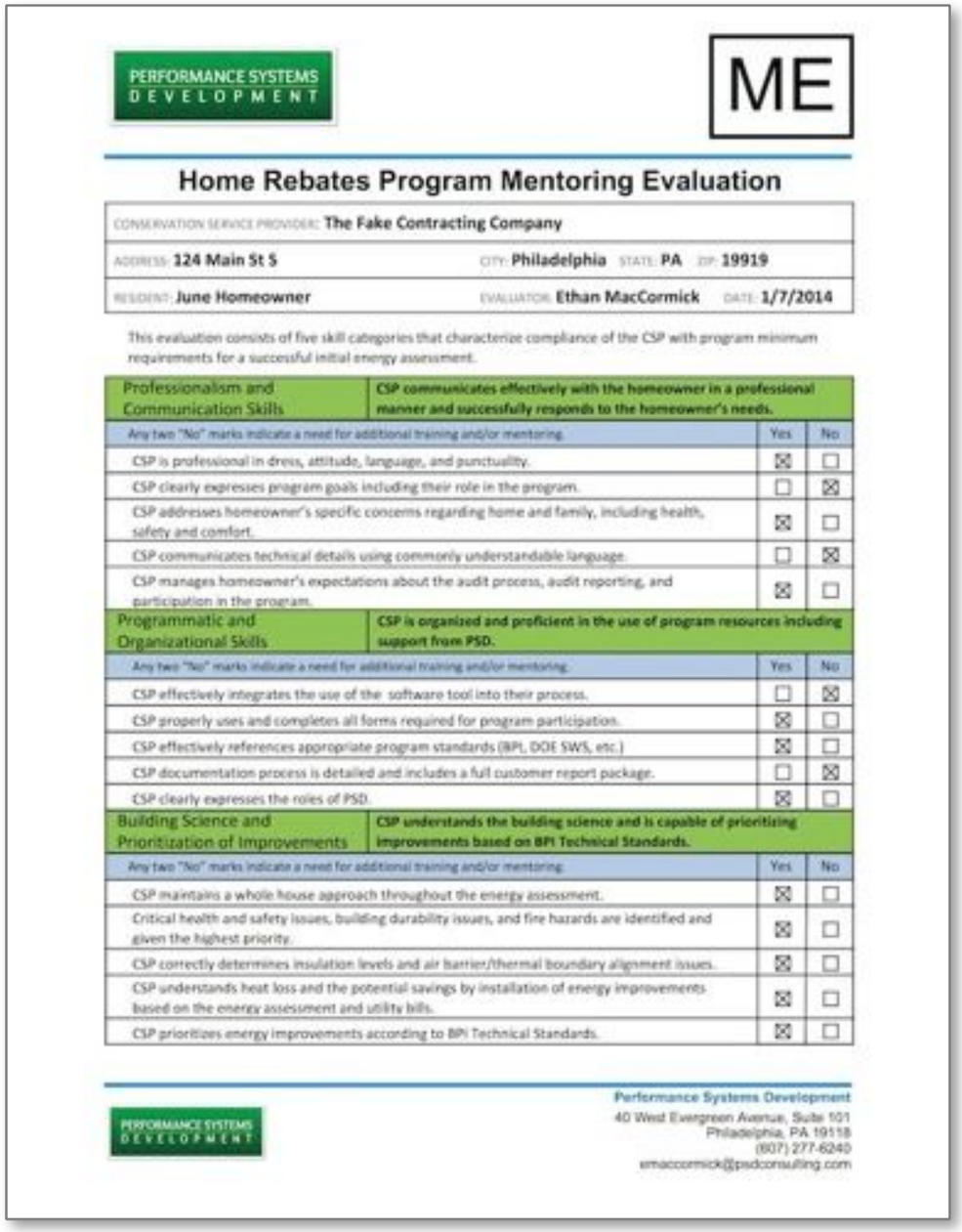
ENERGY STAR 3.0 Policy Record Updates

ENERGY STAR Certified Homes Policy Record

				 To reflect these changes, a new Footnote will be added to Item 3.1.3 to provide this exemption. It will read as follows: "Exterior air barriers are not required for attic knee walls that are ≤ 24 in. in height if an interior air barrier is provided and insulation extends in all directions from the top of this interior air barrier into unconditioned space at the following levels: CZ 1-5: ≥ R-21; CZ 6-8: ≥ R-30."
00283	**12/31/2012**	**Thermal Enclosure System Rater Checklist (Version 3, Rev. 06)**	**Change**	**Item 4.2 - Slab edge insulation alternative for existing homes** **Issue:** Partners certifying existing homes have expressed concern that this requirement would require excavation around, or removal of, the slab, which is not typically within the scope even for a gut rehabilitation. If the slab edge is not already insulated, the perimeter around the slab would need to be excavated or the slab itself removed and replaced to add the required insulation. **Resolution:** Uninsulated sections of slabs create thermal bridges that reduce the efficiency of the thermal enclosure system and can impact the comfort of the home. Insulating 100% of the slab edge eliminates these thermal bridges. To meet this same intent, rigid insulation ≥ R-3 is permitted to be installed on top of an existing slab prior to the installation of the flooring. To reflect this alternative, the following will be added to the end of Footnote 4: "Alternatively, the thermal break is permitted to be created using ≥ R-3 rigid insulation on top of an existing slab (e.g., in a home undergoing a gut rehabilitation). In such cases, up to 10% of the slab surface is permitted to not be insulated (e.g., for sleepers, for sill plates). Insulation installed on top of slab shall be covered by a durable floor surface (e.g., hardwood, tile,

QA Templates Supplied Early to Contractor

- Mentoring Evaluation
- Scope of Work Evaluation
- Quality Control Evaluation
- Quality Assurance Evaluation



PERFORMANCE SYSTEMS DEVELOPMENT

ME

Home Rebates Program Mentoring Evaluation

CONSERVATION SERVICE PROVIDER: **The Fake Contracting Company**			
ADDRESS: **124 Main St S**	CITY: **Philadelphia**	STATE: **PA**	ZIP: **19919**
RESIDENT: **June Homeowner**	EVALUATOR: **Ethan MacCormick**	DATE: **1/7/2014**	

This evaluation consists of five skill categories that characterize compliance of the CSP with program minimum requirements for a successful initial energy assessment.

Professionalism and Communication Skills	**CSP communicates effectively with the homeowner in a professional manner and successfully responds to the homeowner's needs.**	
Any two "No" marks indicate a need for additional training and/or mentoring.	Yes	No
CSP is professional in dress, attitude, language, and punctuality.	☒	☐
CSP clearly expresses program goals including their role in the program.	☐	☒
CSP addresses homeowner's specific concerns regarding home and family, including health, safety and comfort.	☒	☐
CSP communicates technical details using commonly understandable language.	☐	☒
CSP manages homeowner's expectations about the audit process, audit reporting, and participation in the program.	☒	☐
Programmatic and Organizational Skills	**CSP is organized and proficient in the use of program resources including support from PSD.**	
Any two "No" marks indicate a need for additional training and/or mentoring.	Yes	No
CSP effectively integrates the use of the software tool into their process.	☐	☒
CSP properly uses and completes all forms required for program participation.	☒	☐
CSP effectively references appropriate program standards (BPI, DOE SWS, etc.)	☒	☐
CSP documentation process is detailed and includes a full customer report package.	☐	☒
CSP clearly expresses the roles of PSD.	☒	☐
Building Science and Prioritization of Improvements	**CSP understands the building science and is capable of prioritizing improvements based on BPI Technical Standards.**	
Any two "No" marks indicate a need for additional training and/or mentoring.	Yes	No
CSP maintains a whole house approach throughout the energy assessment.	☒	☐
Critical health and safety issues, building durability issues, and fire hazards are identified and given the highest priority.	☒	☐
CSP correctly determines insulation levels and air barrier/thermal boundary alignment issues.	☒	☐
CSP understands heat loss and the potential savings by installation of energy improvements based on the energy assessment and utility bills.	☒	☐
CSP prioritizes energy improvements according to BPI Technical Standards.	☒	☐

PERFORMANCE SYSTEMS DEVELOPMENT

Performance Systems Development
40 West Evergreen Avenue, Suite 101
Philadelphia, PA 19118
(607) 277-6240
emaccormick@psdconsulting.com

"Precision of communication is important, more important than ever, in our era of hair trigger balances, when a false or misunderstood word may create as much disaster as a sudden thoughtless act."

— James Thurber

“Nothing we use or hear or touch can be expressed in words that equal what is given by the senses.”

— Hannah Arendt

Talk talk talk talk talk talk talk talk talk talk talk talk show and tell talk talk do some diagnostics talk talk talk complain talk talk show fidget draw pictures talk talk

Population at one Mentoring Event:

Utility	***2***
Implementer	***4***
Contractor	***4***
Homeowner	***4***

Typical Settings for Mentoring

- Retrofit
  - Initial program onboarding
  - Mentoring Evaluations / Shadowed Audits
  - Quality Control Site Visits
  - Scheduled or “As Needed” field training/mentoring
- New Homes
  - Initial program onboarding
  - Ride-alongs
  - Scheduled or “As Needed” field training/mentoring

Typical Response to QA Issues

- “It’s kind of an informal process, that becomes more formal the more severe the issue”
  - “Starts with a phone call
  - Might require meeting onsite together
  - In extreme situations I might arrange to go do a training or demonstration.”

- *Kevin Rowley*

Useful Relationships

““I’m a big fan of that dude. He’s an asset to your company.”

— Ohio Rater and Program Participant

(Talking about our QA technician)

- “It is good to rub and polish our brain against that of others.”

— Montaigne

A Case History toward Mentoring: RESNET Rater Certification

Challenge the exam	1990s to mid-2000s
Perform 2 Ratings in the Presence of a Trainer	Mid-2000s
Perform diagnostic testing in the Presence of a Trainer	Late 2000s
At least one field-supervised rating by QA Provider prior to certification	2010s
CAZ Training “Hands On” plus simulation experience	Mid 2010s
RFI Field Mentoring requirement and mobile mentoring tool	2015

Ethan MacCormick
emaccormick@psdconsulting.com