"BUILDING ENCLOSURE PERFORMANCE TESTING"

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Today's Presenter:

Darek Brandt, PE

Regional Engineer / Principal Consultant

Professional Service Industries, Inc.

Orlando, Florida

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CONTINUING EDUCATION AIA

“BUILDING ENCLOSURE PERFORMANCE TESTING”

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“BUILDING ENCLOSURE PERFORMANCE TESTING”

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COURSE DESCRIPTION

THIS PROGRAM WILL REVIEW VARIOUS OPTIONS FOR PERFORMANCE TESTING OF BUILDING ENCLOSURES, FROM MOCK-UPS TO IN-SITU INSTALLATIONS OF VARIOUS BUILDING ENCLOSURE MATERIALS, COMPONENTS, AND SYSTEMS. COMMON ASTM AND AAMA TESTING STANDARDS WILL BE REVIEWED, AS WELL AS CURRENT AND PROPOSED CODE TESTING REQUIREMENTS. CASE STUDIES WILL BE PRESENTED TO ILLUSTRATE THE BENEFITS OF PERFORMANCE TESTING OF THE BUILDING ENCLOSURE, WHEN PERFORMANCE TESTING SHOULD BE PERFORMED, AND A GENERAL UNDERSTANDING OF COSTS RELATED TO PERFORMANCE TESTING.

LEARNING OBJECTIVES

- REVIEW HISTORY OF ASTM AND AAMA TESTING STANDARDS.
- REVIEW CURRENT AND PROPOSED CODE TESTING REQUIREMENTS.
- OUTLINE AND DESCRIBE COMMON PERFORMANCE TESTING STANDARDS.
- REVIEW BENEFITS OF LABORATORY TESTING, MOCK-UP TESTING, AND FIELD TESTING AND WHICH TESTING PROGRAMS MAY BE BEST SUITED FOR A PROJECT.
- REVIEW WHEN IN THE CONSTRUCTION SCHEDULE TESTING SHOULD BE PERFORMED.
- PROVIDE A GENERAL UNDERSTANDING OF COSTS ASSOCIATED WITH PERFORMANCE TESTING.

LET'S TAKE IT FROM THE TOP: *WHAT IS* THE BUILDING ENVELOPE?

THE BUILDING ENVELOPE IS THE PHYSICAL SEPARATOR BETWEEN THE CONDITIONED AND UNCONDITIONED ENVIRONMENT OF A BUILDING. THE BUILDING ENVELOPE PROVIDES RESISTANCE TO AIR, WATER, HEAT, LIGHT AND NOISE. THE BUILDING ENVELOPE PROVIDES WEATHER, AIR, AND THERMAL BARRIERS. COMPONENTS INCLUDE 1) FLOORS, 2) ROOFS, 3) WALLS, 4) WINDOWS/CURTAINWALLS, 5) DOORS.

BUILDING ENVELOPE COMPONENTS

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

WATERPROOFING, TRAFFIC COATINGS, WATER REPELLENTS, INSULATIONS, EIFS, WEATHER BARRIERS, VAPOR RETARDERS, AIR BARRIERS, SHINGLES, ROOF TILES, ROOF PANELS, WALL PANELS, SIDING, BUILT UP ROOFING, MEMBRANE ROOFING, COATED FOAM ROOFING, SHEET METAL ROOFING, SHEET METAL FLASHING AND TRIM, ROOF EXPANSION JOINTS, JOINT SEALANTS

BUILDING ENVELOPE COMPONENTS

DIVISION 8 – OPENINGS

DOORS AND FRAMES, SLIDING DOORS AND FRAMES OVERHEAD COILING DOORS, ALUMINUM FRAMED ENTRANCES AND STOREFRONTS, GLASS ENTRANCES AND STOREFRONTS, GLAZED ALUMINUM CURTAINWALLS, ALUMINUM WINDOWS, STEEL WINDOWS, WOOD WINDOWS, VINYL WINDOWS, FIBERGLASS WINDOWS, SKYLIGHTS, GLAZING, LOUVERS, WALL VENTS

WHY IS THE BUILDING ENVELOPE IMPORTANT?

WHY IS THE BUILDING ENVELOPE IMPORTANT?

1. BUILDING EFFICIENCY & ENERGY CONSUMPTION

   FEDERAL EXECUTIVE ORDERS AND LEGISLATION HAVE ESTABLISHED TARGETS:

   EXECUTIVE ORDER 13693 "PLANNING FOR FEDERAL SUSTAINABILITY IN THE NEXT DECADE", SECTION 3(H)(I): "BEGINNING IN FISCAL YEAR 2020 AND THEREAFTER….ALL NEW CONSTRUCTION OF FEDERAL BUILDINGS GREATER THAN 5,000 GROSS SQUARE FEET THAT ENTERS THE PLANNING PROCESS MUST BE DESIGNED TO ACHIEVE NET ZERO ENERGY BY 2030.

   WHAT IS NET ZERO? THE BUILDING CAN "PRODUCE" AS MUCH ENERGY AS IT "CONSUMES"

WHY IS THE BUILDING ENVELOPE IMPORTANT?

1. BUILDING EFFICIENCY & ENERGY CONSUMPTION

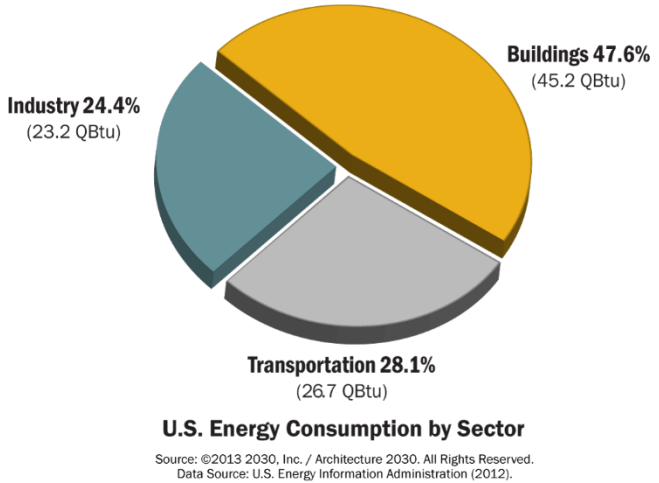
   STATE AND LOCAL INITIATIVE HAVE ESTABLISHED NET ZERO ENERGY TARGETS:

   MASSACHUSETTS: THE EXECUTIVE OFFICE OF ENERGY AND THE ENVIRONMENT'S PLAN TO TRANSFORM BUILDINGS TO NET ZERO ENERGY

   OREGON: THE ENERGY TRUST OF OREGON'S PATH TO NET ZERO PILOT PROGRAM

   WASHINGTON: A PUBLIC/PRIVATE COLLABORATION DEVELOPING A HIGH PERFORMANCE BUILDING DISTRICT IN DOWNTOWN SEATTLE WITH GOAL OF CARBON NEUTRALITY BY 2030.

IT'S A FACT. BUILDINGS USE A LOT OF ENERGY



U.S. Energy Consumption by Sector

There are approximately 6 million commercial and industrial facilities in the U.S. with a combined annual Energy cost of $400 billion.

Energy Star estimates that 30% of the energy used in commercial buildings is used inefficiently or unnecessarily.

If 10 percent improvement, savings = $10 billion

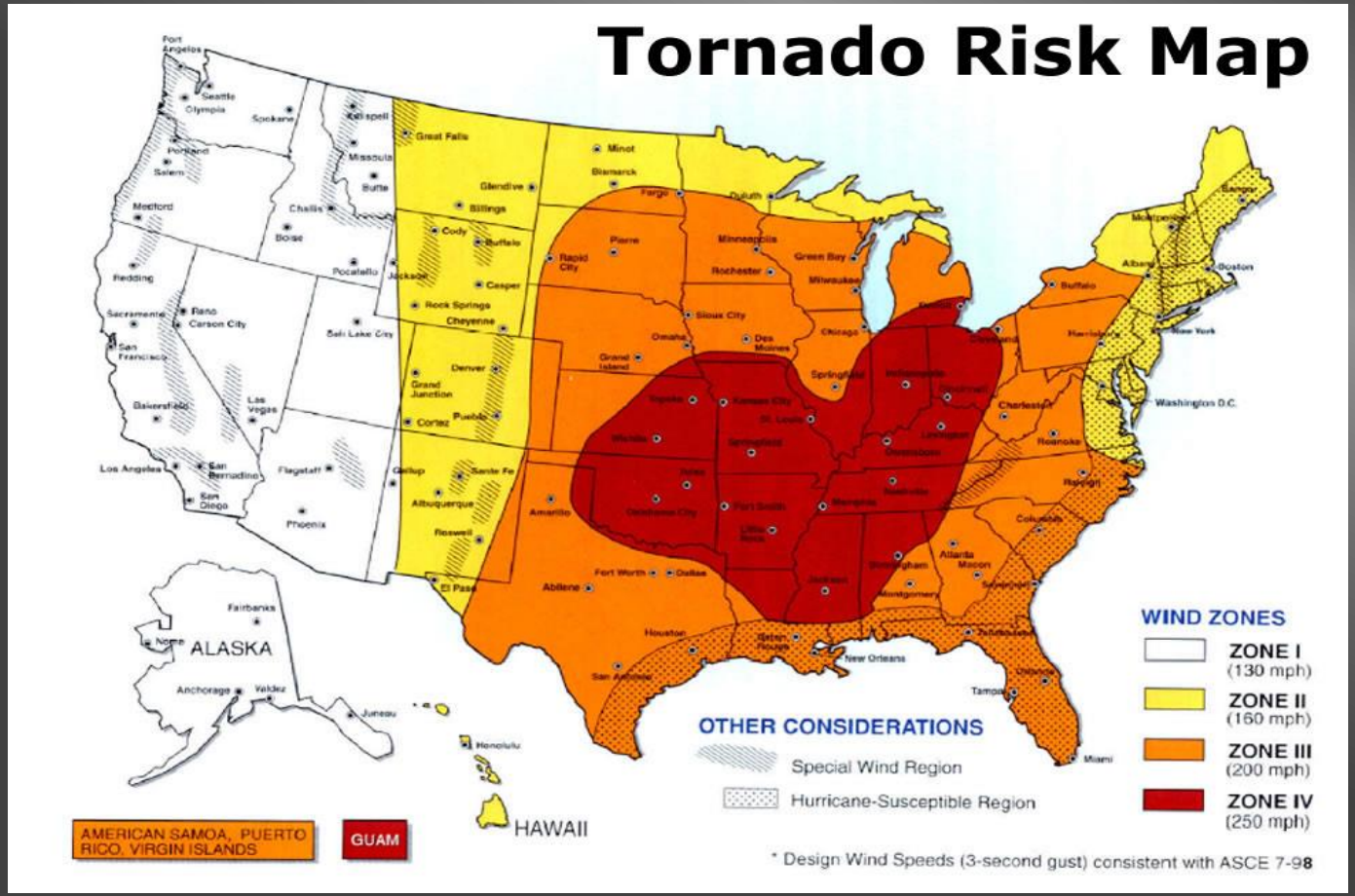
WHY IS THE BUILDING ENVELOPE IMPORTANT?

2. OCCUPANT SAFETY – EXTREME WEATHER EVENTS

LARGE MISSILE IMPACT WINDOWS AND DOORS

ROOF SYSTEMS THAT PROVIDE ADEQUATE UPLIFT RESISTANCE

BIG PICTURE – THE ENVELOPE IS THERE TO PROTECT US FROM THE WEATHER


Tornado Risk Map
WIND ZONES
ZONE I
(130 mph)
ZONE II
(160 mph)
ZONE III
(200 mph)
ZONE IV
(250 mph)
OTHER CONSIDERATIONS
Special Wind Region
Hurricane-Susceptible Region
ALASKA
HAWAII
AMERICAN SAMOA, PUERTO RICO, VIRGIN ISLANDS
GUAM
* Design Wind Speeds (3-second gust) consistent with ASCE 7-98

WHY IS BUILDING ENVELOPE IMPORTANT?

3. OCCUPANT COMFORT / LIABILITY

- MOISTURE INTO BUILDING CAN LEAD TO MOLD
- MOIST AIR IN BUILDING WILL NOT PROVIDE A COMFORTABLE LIVING ENVIRONMENT
- MANY LAWSUITS REGARDING BUILDINGS INVOLVE MOLD

“DOES IT SMELL BAD IN HERE TO YOU?”

“I’M HOT!”
I’M COLD!

HOW DO WE ENSURE A HIGH PERFORMANCE BUILDING ENVELOPE? - TEAMWORK

AS A CONSTRUCTING OWNER – HIRE QUALIFIED DESIGNERS, BUILDERS, CONSULTANTS, HAVE AN APPROPRIATE BUDGET, HAVE A PLAN FOR MAINTENANCE, DON'T LET GOOD DESIGN AND CONSTRUCTION GO TO WASTE.

AS AN DESIGNER – SELECT GEOGRAPHICALLY APPROPRIATE SYSTEMS, SPECIFY QUALITY PRODUCTS IN DESIGNATED SPEC SECTIONS, PROVIDE SUFFICIENT DETAILING, CAREFULLY REVIEW NOAS, SUBMITTALS, SAMPLES, USE SPECIALTY CONSULTANTS

AS A CONSULTANT / BUILDING ENVELOPE COMMISSIONING AGENT (BECXA) – SHARE IDEAS, VALUE ENGINEER, REVIEW PLANS AND SPECS, HELP DEVELOP APPROPRIATE LEVEL OF TESTING, PERFORM QA SITE VISITS, RECOMMEND IDEAS FOR TESTING, WORK "FOR" THE TEAM, NOT "AGAINST", ENSURE END USER UNDERSTANDS BUILDING SYSTEMS AND HOW TO MAINTAIN THEM

HOW DO WE ENSURE A HIGH PERFORMANCE BUILDING ENVELOPE? - TEAMWORK

AS A TESTING AGENCY – BE PREPARED, USE QUALIFIED STAFF AND CALIBRATED EQUIPMENT, UNDERSTAND TESTING REQUIREMENTS, FOLLOW APPROVED TESTING METHODS

AS A BUILDER – SEPARATE TRADES SUFFICIENTLY, HIRE QUALIFIED, APPROVED SUBCONTRACTORS, HOLD SUBS ACCOUNTABLE FOR QUALITY THROUGH USE OF QA VISITS AND PUNCHLISTS, EMBRACE CONSULTANT / COMMISSIONING AGENT

AS A BUILDING OWNER/USER – UNDERSTAND THE SYSTEMS AND PERFORM REGULAR INSPECTIONS AND PROPER MAINTENANCE, HIRE QUALIFIED CONTRACTORS FOR MAINTENANCE/REPAIRS, BE PROACTIVE.

AS A BUILDING OCCUPANT – REPORT BUILDING ISSUES (ROOF/WINDOW LEAKS, ODD SMELLS, ETC.)

EASIEST WAY TO DETERMINE IF AN ITEM IS FUNCTIONING AS INTENDED? – TEST IT

REASONS TO PERFORM BUILDING ENCLOSURE TESTING

1. TO CONFIRM THAT INSTALLATION IS CORRECT AND ADEQUATE. DID OWNER GET WHAT THEY PAID FOR?
2. TO CONFIRM THAT INSTALLED UNIT/COMPONENT MEETS DESIGN REQUIREMENTS/PERFORMANCE CRITERIA
3. TO IDENTIFY PROBLEMS THAT OTHERWISE MIGHT HAVE BEEN CARRIED FORWARD
4. COST SAVINGS – OUNCE OF PREVENTION…AIR LEAKAGE, MOLD REMEDIATION
5. HELP COMPONENTS REALIZE FULL USEFUL LIFE

HOW TO DETERMINE HOW MANY/WHAT TO TEST

1. ARCHITECT'S PROJECT SPECIFICATION. BUT CAREFUL, THESE CAN BE BOILER PLATE AND NOT TAILORED TO PROJECT. ARCHITECT RARELY PAYS FOR TESTING.
2. BUT IN REALITY….BUDGET RULES….OFTEN TESTING IS OVER SPECIFIED FOR BUDGET
3. ONE SIZE DOES NOT FIT ALL. BUILDING LOCATION/CLIMATE HELPS DEFINE PRIORITIES. WIND, RAIN, SNOW, UV EXPOSURE, HUMIDITY, TEMPERATURE
4. SYSTEMS INSTALLED DETERMINE TESTING. EXAMPLE: WINDOW CLASS

HOW TO DETERMINE HOW MANY/WHAT TO TEST

5. TESTING SHOULD INCLUDE A TRUE SAMPLE OF BUILDING, EACH ELEVATION
6. INSURANCE PROVIDERS CAN REQUIRE SPECIFIC TESTING. EXAMPLE: FM GLOBAL
7. BUILDING/ENERGY CODE REQUIREMENTS. EXAMPLE: AIR LEAKAGE RATE TESTING
8. OWNER REQUIREMENTS DETERMINE. EXAMPLE: UF INFRARED ROOF SCANS, US ARMY AIR LEAKAGE RATE TESTING, USACE PROTOCOL

HOW DO WE KNOW THAT ALL FIRMS ARE USING THE SAME TESTING TECHNIQUES?

1. STANDARDIZATION WAS (AND STILL IS) CRITICAL
2. THE EARLIEST IS ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS). ESTABLISHED IN 1898 TO ADDRESS FREQUENT RAIL BREAKS OCCURRING AT THE TIME
3. OTHER EARLY ENTRIES INCLUDE ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE), ESTABLISHED 1918.
4. OTHERS INCLUDE AAMA (AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION), ESTABLISHED 1936

DOES THIS MEAN THAT ALL TESTING FIRMS ARE THE SAME?

1. ABSOLUTELY NOT. ALL FIRMS ARE NOT CREATED EQUAL. PEOPLE MATTER.
2. HIRING AN ENVELOPE TESTING FIRM IS SIMILAR TO ANY OTHER PROFESSIONAL SERVICE. TYPICALLY YOU WILL GET WHAT YOU PAY FOR
3. WHAT JUSTIFIES A HIGHER PRICE? EXPERIENCE, STAFF, INTERNAL PROCEDURES/PROTOCOL, ATTENTION TO DETAIL, RESPONSE TIME. DO THEY CARE ABOUT CLIENT?
4. WHEN IN DOUBT, ASK FOR A LIST OF SIMILAR PROJECTS/REFERENCES. EQUIPMENT PROPERLY MAINTAINED/CALIBRATED? ARE THEY PROFESSIONAL?

COMMON B.E. PERFORMANCE TESTS

1. Water Penetration Testing

Often referred to as “Rack and Chamber”– ASTM E 1105

THINGS TO REMEMBER

1. THERE ARE TWO DIFFERENT GENRES OF FENESTRATION TESTING. LABORATORY AND FIELD. THEY HAVE DIFFERENT TEST DESIGNATIONS. ASTM E 283/331 ARE LABORATORY TESTS. ASTM E 783/1105 ARE FIELD.
2. OFTEN SPECIFICATIONS ARE TOO BROAD/NONSPECIFIC. FOR EXAMPLE, TEST TO: AAMA/WDMA/CSA 101/I.S.2/A440-08. 150 PAGE DOCUMENT DOES NOT MENTION AAMA 501, 502, 503, ASTM E 1105 OR ASTM E 783. MENTIONS ONLY LAB TESTS, NOT FIELD.

THINGS TO REMEMBER

3. IF CHAMBER TESTING IS INTENDED, IT'S BEST TO SPECIFY TESTING BY AAMA 502 OR 503 WHICH REFER TO METHODS 783 AND 1105 – MOST WELL KNOWN DESIGNATIONS. WHY? ASTMS DO NOT DETAIL HOW TO DETERMINE TEST PRESSURES. AAMA TESTING IS EASIER. THERE IS NO LABORATORY VERSION.
4. WHEN TO SPECIFY ASTM E 783/1105 VS. AAMA 501? CHAMBER TEST IS A MORE COMPREHENSIVE TEST. BUT THIS TEST IS BEST FOR SMALLER "PUNCH" OPENING TYPE WINDOWS. CURTAINWALL IS BETTER TESTED BY AAMA 501, UNLESS TEST CHAMBER INCORPORATES A TRANSITION. OFTEN, INTERIOR SLABS INTERFERE.

THINGS TO REMEMBER

5. INTERIOR FINISHES? THEY SHOULD BE LEFT OFF UNTIL WINDOW TESTING IS COMPLETE. THIS WAY THE TRANSITION FROM WALL TO WINDOW CAN BE TESTED, WHICH IS WHERE THE LEAKS OCCUR. ALSO BEST FOR VIEWING LEAKS.
6. DURING CHAMBER TESTING, IT'S IMPORTANT (AND RECOMMENDED BY ASTM) TO BEAR PRESSURE CHAMBER ON THE WALL ADJACENT TO FENESTRATION BEING TESTING. IN OUR TESTING EXPERIENCE, IT IS VERY UNLIKELY THAT THE FENESTRATION IS FAULTY. THE VAST MAJORITY OF FAILURES OCCUR AT THE FENESTRATION TO WALL TRANSITION (FLASHING, SEALANT, ETC.).

COMMON B.E. PERFORMANCE TESTS

2. Air Infiltration Testing

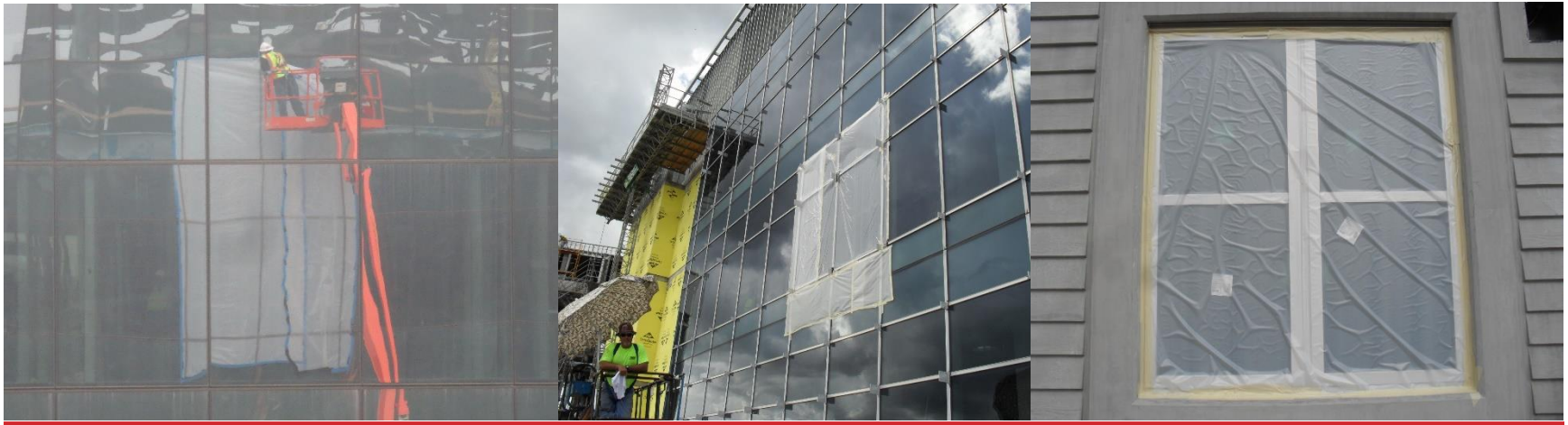
ASTM E 783 – Inside Pressure Chamber

THINGS TO REMEMBER

7. WALL TYPE MAKES A DIFFERENCE. REMEMBER, IF SPECIFYING 783/1105, CHAMBER MUST BE ABLE TO BEAR ON STRUCTURAL WALL. WHAT IF A STUD WALL? MORE DIFFICULT TO BEAR CHAMBER ON A STUD WALL. 1105 BEST FOR CMU, TILT WALL CONSTRUCTION.
8. WATER SOURCE. DIFFICULT FOR TESTING FIRM TO BRING WATER SOURCE TO SITE. NEED SUFFICIENT WATER PRESSURE TO MAKE UP FOR HEAD LOSSES DUE TO HOSE LENGTH AND ELEVATED TEST LOCATIONS. 1105 NEEDS 10-20 PSI AT NOZZLES. AAMA NEEDS BETWEEN 30 AND 35 PSI AT NOZZLE. SOURCE NEEDS TO BE PROVIDED, USUALLY 50 PSI AT SOURCE WILL DO. POWER SOURCE AS WELL.

COMMON B.E. PERFORMANCE TESTS

2. Air Infiltration Testing



ASTM E 783 – Creating a Flow Difference

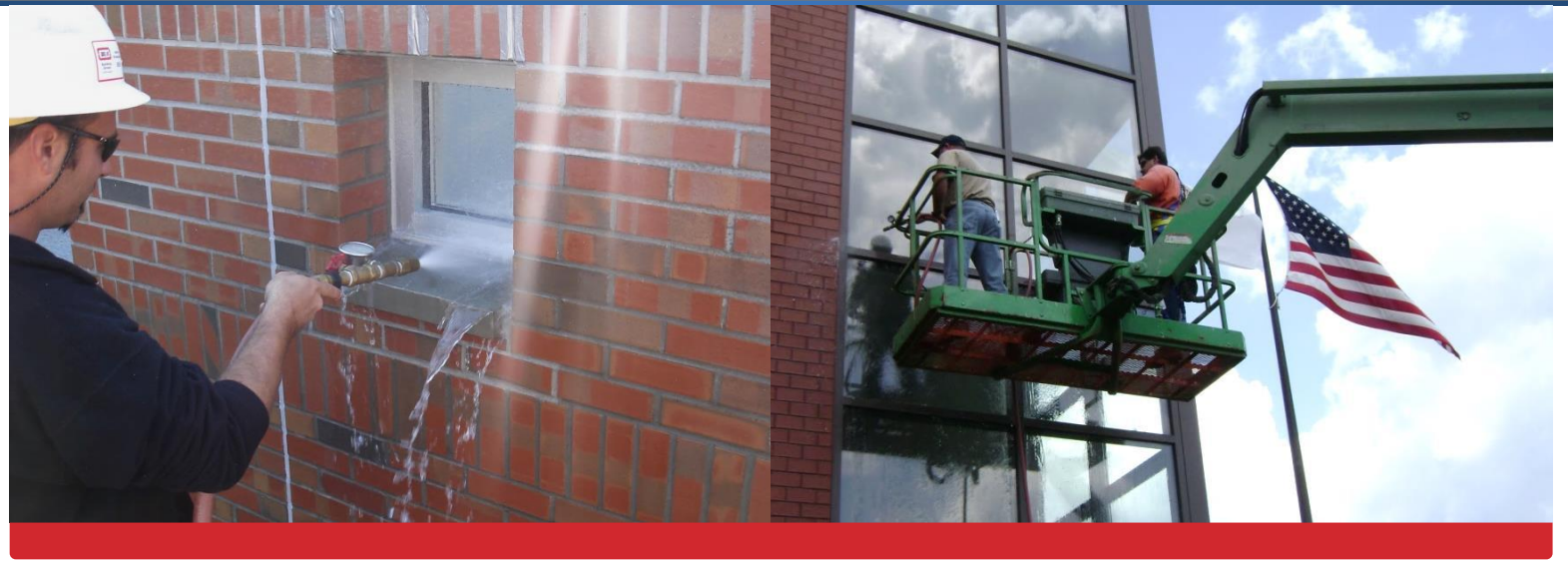
COMMON B.E. PERFORMANCE TESTS

2. Air Infiltration Testing

ASTM E 783 – Inside Pressure Chamber

COMMON B.E. PERFORMANCE TESTS

3. Water Infiltration Testing



"Spray Nozzle" – AAMA 501.2 Testing

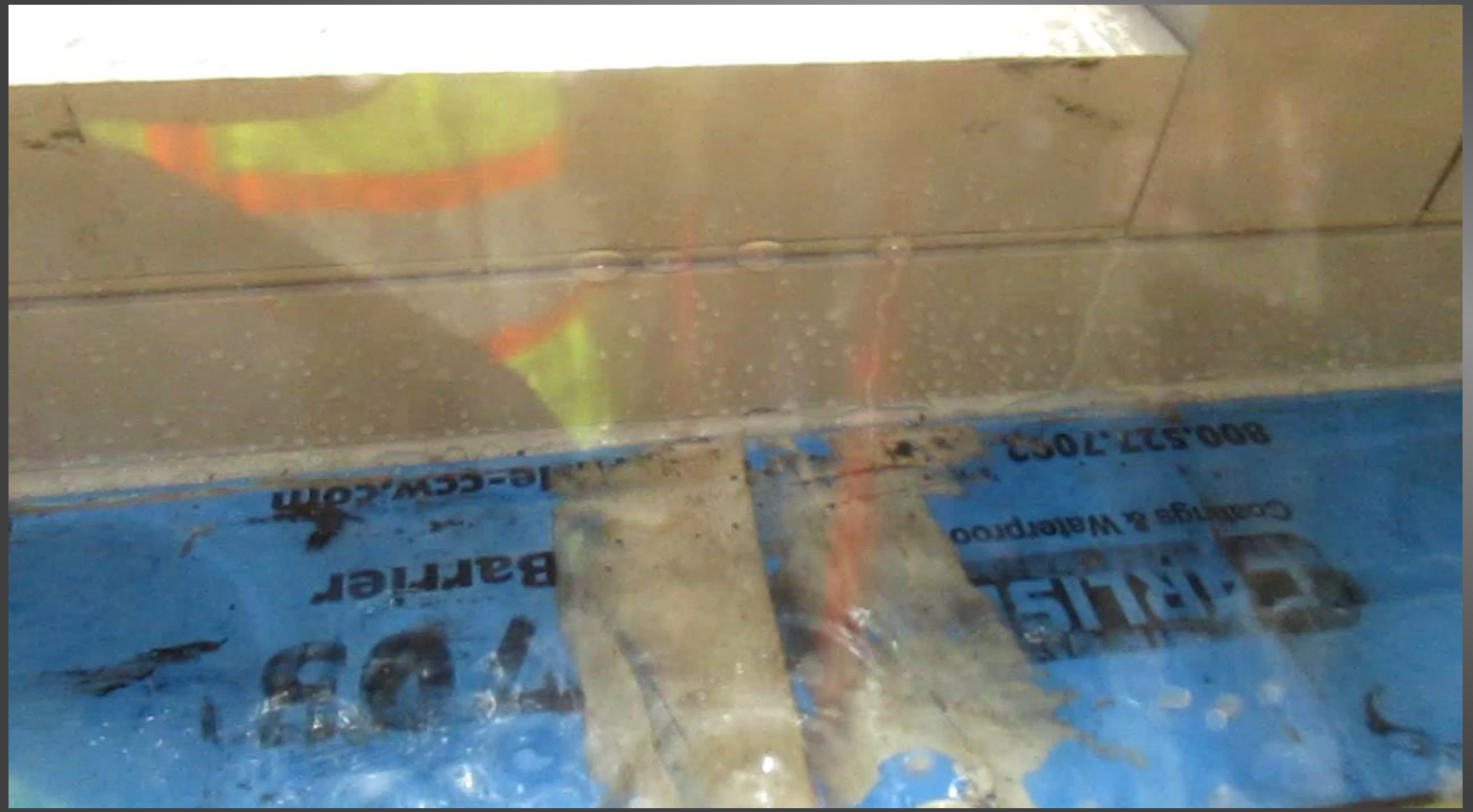
THINGS TO REMEMBER

9. AAMA 501 TESTING IS UTILITARIAN. CAN BE EFFECTIVELY USED TO WATER TEST MANY ENVELOPE ITEMS. INSTEAD OF VECTOR MAPPING OR FLOOD TESTING, USE AAMA TESTING. ALSO USE FOR BUILDING COMPONENT TRANSITIONS OR FOR ROOF FLASHING OR GUTTERS/DRAINS, DOWNSPOUTS. FAST, EASY EFFECTIVE, INEXPENSIVE.
10. WHAT DOES THIS COST? TYPICALLY, COMBINATION 1105/783 TEST IS ROUGHLY $1,000-$1,500 PER TEST. AAMA TESTS ARE TYPICALLY A BIT LESS, ROUGHLY $650-$750 PER TEST.

COMMON B.E. PERFORMANCE TESTS

3. Water Infiltration Testing

AAMA 501.2


Barrier
Coatings & Waterproo

THINGS TO REMEMBER

12. 783/1105 PROS – MORE EXHAUSTIVE TEST METHOD. CREATES A CONTROLLABLE PRESSURE ON TEST SPECIMEN. CONS – SELECTING TEST LOCATIONS IS TRICKY.

13. AAMA 501 PROS – FASTER, EASIER, LESS EXPENSIVE. TEST LOCATIONS ARE MORE FLEXIBLE. CONS – DOES NOT CREATE PRESSURE.

14. DETERMINING TEST PRESSURES. ASTMS DO NOT SAY HOW. AAMA DOCS DO. AAMA 503 4.3.1: "THE FIELD WATER PENETRATION TEST PRESSURE SHALL BE 2/3 OF THE SPECIFIED WATER PENETRATION TEST PRESSURE. SPECIFIED? YES, BY AAMA 101, FOR LAB TESTING. LAB TESTING IS TYPICALLY 20% OF POSITIVE DESIGN PRESSURE.

THINGS TO REMEMBER

15. BEST WAY TO DETERMINE FIELD TEST PRESSURES. OBTAIN A COPY OF THE LABORATORY TESTING REPORT. REQUIRE THAT THIS BE SUBMITTED AS PART OF SUBMITTAL. THIS WILL STATE WINDOW RATING AND POSITIVE DESIGN PRESSURE. DOUBLE CHECK THIS DOCUMENT WITH PROJECT DESIGN PRESSURES. IF CHECKS, THE FIELD PRESSURES SHOULD BE 0.67 TIMES WHAT WAS USED IN LAB.
16. ALLOWABLE AIR INFILTRATION? 1.5 TIMES THE SPECIFIED RATE. SPECIFIED? YES, AS DETERMINED BY AAMA 101 FOR LAB TESTING. WHY THE INCREASE? CONSTRUCTION TOLERANCES. LAB IS PERFECT. JOB SITE IS NOT.

COMMON B.E. PERFORMANCE TESTS

4. Dynamic Water Penetration Testing

AAMA 501.1

COMMON B.E. PERFORMANCE TESTS

5. Air Barrier Leakage Rate Testing

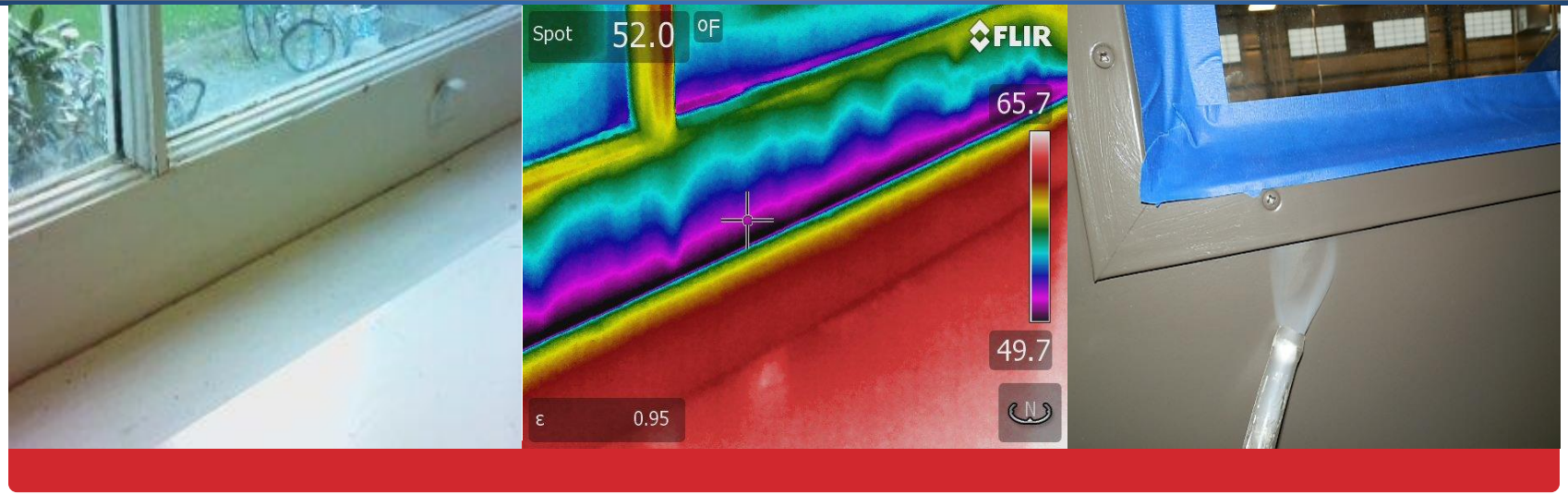
Often referred to as “Blower Door” testing - ASTM E 779

OHIO BUILDING CODE REQUIREMENTS

- DEPENDING ON COMPLIANCE PATH CHOSEN, BLOWER DOOR TESTING IS OPTIONAL OR REQUIRED BY RESIDENTIAL CODE OF OHIO (RCO). SEE RCO CHAPTER 11, SECTION 1101.2.

COMMON B.E. PERFORMANCE TESTS

6. Air Barrier Leakage Site Detection



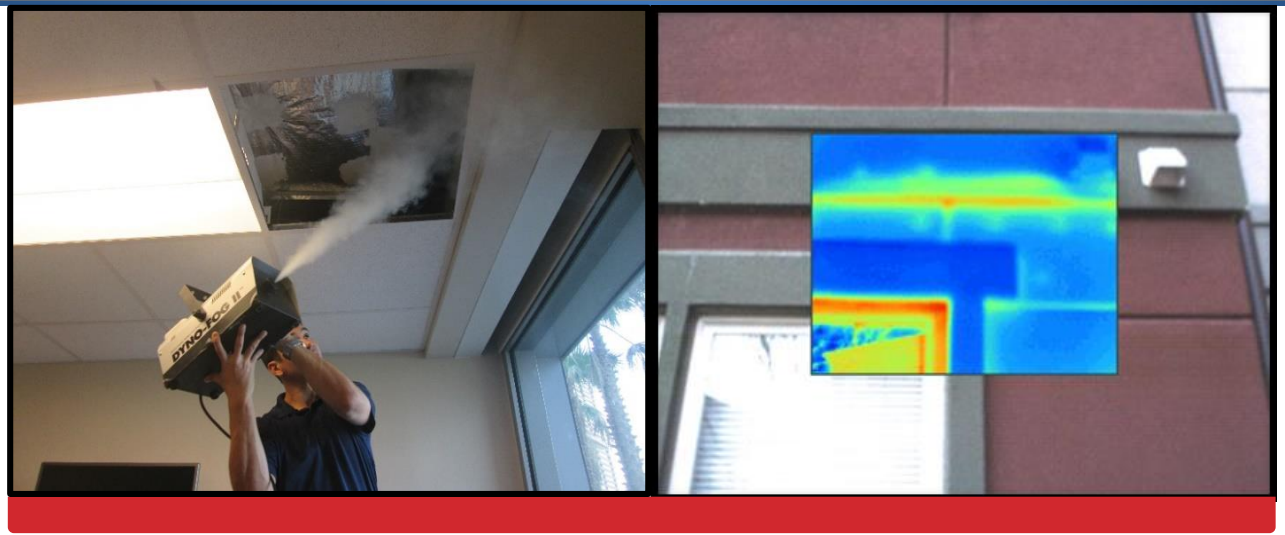
ASTM E 1186 – 3 ways to find leakage

THINGS TO REMEMBER

1. INTERNATIONAL ENERGY CONSERVATION CODE REFERENCES BLOWER DOOR TEST AS AN OPTION FOR COMPLIANCE OF ENVELOPE TIGHTNESS.
2. E 779 DETAILS THE PROCEDURE TO USE TO PRESSURIZE THE ENTIRE BUILDING. IT STATES OBTAINING AT LEAST 6 DATA POINTS DURING PRESSURIZATION AND DEPRESSURIZATION. HOWEVER, NO CRITERIA IS LISTED. RECOMMEND 0.4 CFM/CF OF AIR BARRIER AREA AT 50 PASCAL. USACE ALSO HAS A TEST METHOD WHICH REQUIRES 0.25 CFM/SF AT 75 PASCAL.
3. E 1186 DETAILS HOW TO FIND AIR LEAKAGE LOCATIONS. IR, SMOKE OR SOUND.

COMMON B.E. PERFORMANCE TESTS

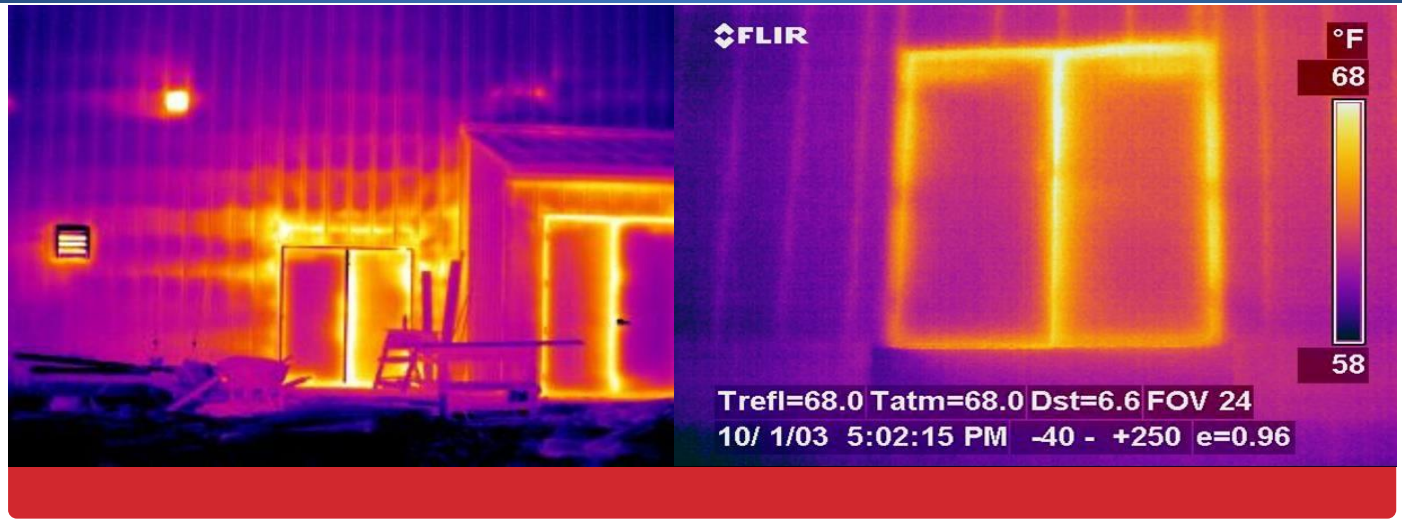
6. Air Barrier Leakage Site Detection



ASTM E 1186

COMMON B.E. PERFORMANCE TESTS

6. Air Barrier Leakage Site Detection



ASTM E 1186

THINGS TO REMEMBER

4. OTHER WAYS WE'VE SEEN SPECIFIED: 1186 ONLY. BUT HOW DO YOU PRESSURIZE? USE E 779 AND E 1186. ASTM E 2178 NOT APPLICABLE FOR FIELD. THIS IS A LAB TEST FOR A MATERIAL. ASTM E 2357 NOT APPLICABLE EITHER. FOR USE IN LAB OR ON MOCK UP. IN OUR EXPERIENCE, MOCK UP AIR LEAKAGE TESTING IS NOT A WORTHWHILE ENDEAVOR. PROBLEMS IN BUILDINGS ARE TYPICALLY UNPLANNED. MOST LEAKAGE WILL OCCUR AT TOP OR BOTTOM OF WALL. DETAILS THERE ARE CRUCIAL TO A TIGHT BUILDING.
5. BUT HOW DO YOU REPAIR ONCE IT FAILS? NEEDS TO BE FROM SIDE AIR BARRIER WAS APPLIED. MAY REQUIRE REMOVAL OF SOME EXTERIOR FAÇADE.

COMMON B.E. PERFORMANCE TESTS

6. Air Barrier Leakage Site Detection

COMMON B.E. PERFORMANCE TESTS

6. Air Barrier Leakage Site Detection

COMMON B.E. PERFORMANCE TESTS

6. Air Barrier Leakage Site Detection

THINGS TO REMEMBER

6. PRO – CONFIRMS THE AIR BARRIER INSTALLATION. ALLOWS HVAC SYSTEMS TO WORK AT THEIR OPTIMUM. CONS – EXPENSIVE TEST. ROUGHLY $5,000 (5,000 SF) TO $40,000 (100,000 SF), DEPENDING ON BUILDING COMPLEXITY/ZONES
7. LARGER BUILDINGS REQUIRE MORE FANS. UP TO ROUGHLY 10,000 SF WITH ONE FAN. 100,000 SF BUILDINGS MAY REQUIRE AS MANY AS 10 FANS.
8. REQUIRES THE BUILDING TO BE SHUT DOWN. ALL DOORS, WINDOWS, HATCHES CLOSED DURING TEST. MANY TIMES TEST HAS TO BE PERFORMED AT NIGHT AS TO NOT IMPACT CONSTRUCTION DURING A BUSY TIME OF PROJECT. UP TO A 3 OR 4 DAY PROCESS FOR LARGE BUILDINGS.

COMMON B.E. PERFORMANCE TESTS

7. Drainage Cavity Testing

ASTM C 1715

THINGS TO REMEMBER

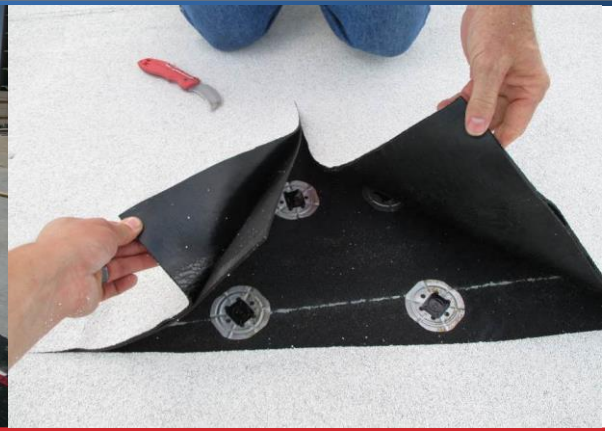
1. NOT ALL THROUGH WALL FLASHING IS CREATED EQUAL. TOP OF FLASHING DETAIL CRITICAL. IF IT LEAKS, WHERE DOES IT GO?
2. CON – HOW DO YOU REPAIR? REMOVAL OF BRICK.
3. OPINION: QA SITE VISITS A BETTER USE OF TIME AND MONEY.
4. COST FOR TESTING, $2,500 TO $3,500 A DAY.

COMMON B.E. PERFORMANCE TESTS

8. Roof Uplift Testing – Uplift Dome or Bonded Panel

Wind Uplift Testing

Bonded Pull Testing



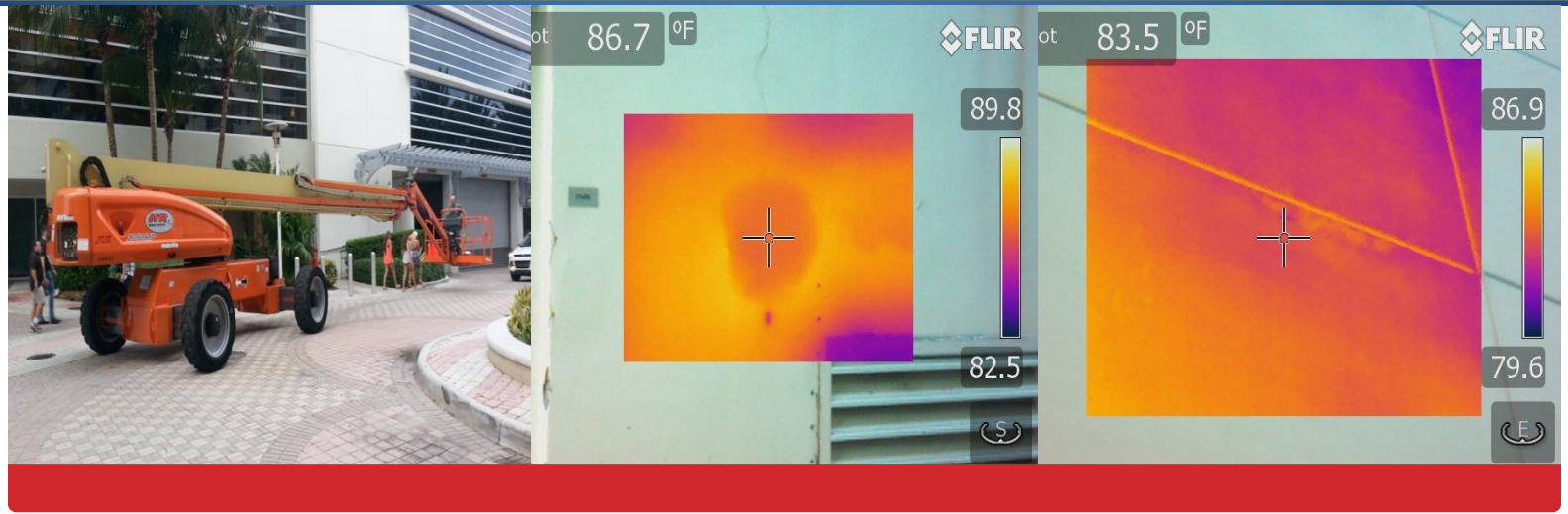
Investigative Cuts

THINGS TO REMEMBER

1. COST PER TEST? ROUGHLY $750 PER TEST.
2. DESIGNATIONS? FM 1-52 AND LOCAL BUILDING CODE (TAS 124-11 IN FL)
3. PROS – CONFIRMS ROOF PERFORMANCE. EVEN WITH ROOF QA (PART TIME), INSTALLATION CAN BE POOR. ROOF NOAS ARE SOMETIMES (SADLY) ALTERED. IN FLORIDA, ALWAYS BEST TO SPECIFY THIS TEST. RECOMMEND PERFORMING EARLY INSTALLATION TESTS INSTEAD OF ALL AT THE END. THIS WAY CAN REDUCE FULL REROOF OR SUSPECT REMEDIATION IDEAS.
4. CONS – CAN LEAD TO COSTLY ROOF REPLACEMENTS, DELAYS AND LITIGATION.

COMMON B.E. PERFORMANCE TESTS

9. Infrared Surveys



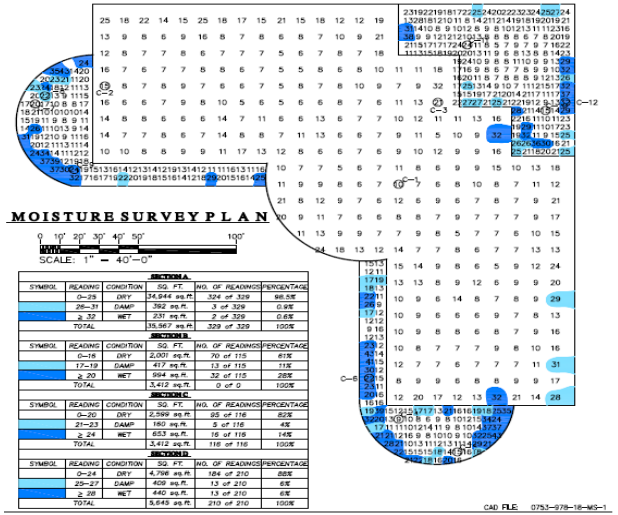
Exterior Stucco Survey

COMMON B.E. PERFORMANCE TESTS

10. Nuclear Roof Surveys

COMMON B.E. PERFORMANCE TESTS

10. Nuclear Roof Surveys



THINGS TO REMEMBER

1. TRAPPED MOISTURE ONE OF BIGGEST POST INSTALLATION ISSUES FOR ROOFS.
2. W CAN LEAD TO BLISTERING, WHICH MOST ROOF MANUFACTURERS WILL NOT WARRANT. CAN LEAD TO PHYSICAL DEGRADATION OF ROOF COMPONENTS, ROOF DECK, FASTENERS, ADHESIVES. CAN LEAD TO MOLD GROWTH.
3. COST, ROUGHLY 25 TO 75 CENTS PER SF OF ROOF. 10,000 SF = $5,000 TO $7,500. 100,000 = $25,000.
4. PROS: CAN ACCURATELY DEFINE AREAS OF TRAPPED MOISTURE. CONS: ADDED EXPENSE. NOT NEEDED IF FULL ROOF REPLACEMENT (INCLUDING INSULATION)

COMMON B.E. PERFORMANCE TESTS

11. Sealant Testing

ASTM C 1193

THINGS TO REMEMBER

1. ALTHOUGH MANUFACTURERS OR PRODUCT REPS OFTEN WILL PROVIDE THESE TESTS, THEY HAVE DIFFERENT INTERESTS. MAINLY, THE INTERESTS OF THEIR PAYING CUSTOMER.
2. ADHERING SEALANTS IS IMPORTANT TO PREVENT WATER INTRUSION AT JOINTS.
3. COST? $250 PER TEST.
4. PROS – CHEAP, EASY, QUICK. CONS – DESTRUCTIVE.

COMMON B.E. PERFORMANCE TESTS

12. Adhesion Testing

EIFS / Stucco / Coatings / Membranes

COMMON B.E. PERFORMANCE TESTS

12. Coating Thickness/Composition Determination

EIFS / Stucco / Coatings

THINGS TO REMEMBER

1. ALTHOUGH MANUFACTURERS OR PRODUCT REPS OFTEN WILL PROVIDE THESE TESTS, THEY HAVE DIFFERENT INTERESTS. MAINLY, THE INTERESTS OF THEIR CUSTOMER.
2. ADHERING COATINGS IS IMPORTANT TO PREVENT WATER INTRUSION AT JOINTS.
3. COST? $500 PER TEST – REQUIRES TWO TRIPS.
4. PROS – CHEAP, EASY, QUICK. CONS – DESTRUCTIVE.

COMMON B.E. PERFORMANCE TESTS

13. Relative Humidity, 14. Moisture Transmission Testing

ASTM F2170

ASTM F1869

THINGS TO REMEMBER

1. RH TESTING REQUIRES A CRITERIA. OFTEN PERFORMED FOR ROOF TESTING, BUT WHAT IS ALLOWABLE? TEST METHOD DOES NOT SAY WHAT IS ACCEPTABLE, ONLY HOW TO PERFORM TEST. MANUFACTURER OFTEN BECOMES INVOLVED.
2. PROS, EASY, CHEAP. CONS – DESTRUCTIVE. NEED TO GET DOWN TO BARE CONCRETE.
3. COST? ROUGHLY $500 PER TEST.

LEARNING IS OVER (FINALLY) QUESTIONS?

Darek Brandt, PE
Professional Service Industries, Inc.
407-304-5560