The Role of Testing

How testing is used in product development, in quality control programs and for diagnosing problems.

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Evolution

Testing in the EIFS world is evolving.

EIMA has received ANSI status.

ASTM E06.58 is working on testing, performance and quality assurance Standards.

Codes will also get in the act.

Applications of Testing

1. Product and system development
2. Code qualification ("research reports")
3. Quality assurance and Quality control
4. Diagnosing problems

Product development

1. Material properties of components
2. Compatibility of components
3. Manufacturing consistency
4. Competitive position
5. Code defined performance requirements

Data provides datum for tests during construction.

Quality Assurance / Quality Control

Quality Assurance:

The overall program to conduct, administer and document quality control activities.

Quality Control:

Actions required by a quality assurance program

(Examples: shop drawing review, product submittals, inspection, testing, disassembly)

Defining Quality Assurance

"This better not leak."

"Make sure everything is okay."

"If this leaks, I'll have your .#..@..!..*#@"

	Testing: / Inspection:
Procedure	ASTM E1105 / Checklist
Scope	2 RS, sealant / Every window
Frequency	6 site visits / random
Pass / Fail Criteria	Controlled / Company
Access, patching, payment	By Owner / By GC
Reporting	Letter reports to…
Qualifications	AAMA certified

Scope of testing

Subsystem / component qc:

Windows only
EIFS only
Masonry / roof / etc.

System qc:

Interface
Integration
Interaction

Diagnostic and Forensic Testing

1. Compare system performance on different parts of a building
2. Compare system performance with an absolute requirement (minimum)
3. Determine cause(s), extent and significance of a problem. *Note difference from inspection.*

Role of Testing in an Evaluation

Known problem

- Performance history
- Project documents
- Focused Inspection and Observation
- Analysis
- Testing
- Verification
- Reporting

Role of Testing in an Evaluation

ASTM E2128 – Standard Guide for the Evaluation of Leakage Through Building Walls.

Background

- **Know what is supposed to happen.**
  - Customary details – cladding, windows, roofs, decks, penetrations.
  - Construction practices.
  - Manufacturers' recommendations.
  - Project plans and specifications.

Usual Suspects

- Windows and doors
  - Around
  - Through
- Decks, balconies, stoops, porches
- Roof / wall intersections
  - Kick-outs
- Utility penetrations

Problem location – multiple components

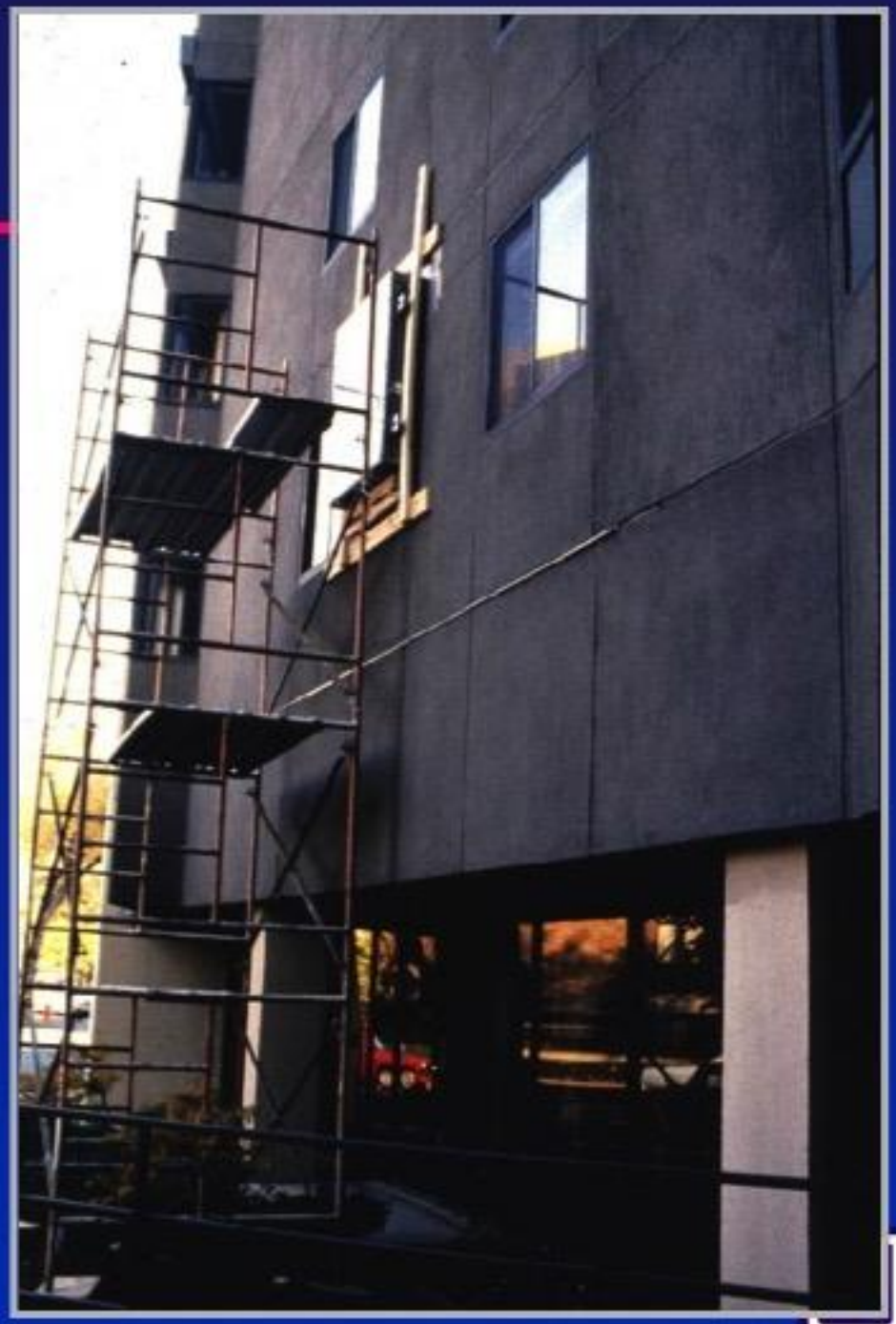
Testing approach – ASTM E 1105

Interior access

Monitor performance

Testing approach:

Adaptation of
ASTM E 514



Monitor Performance

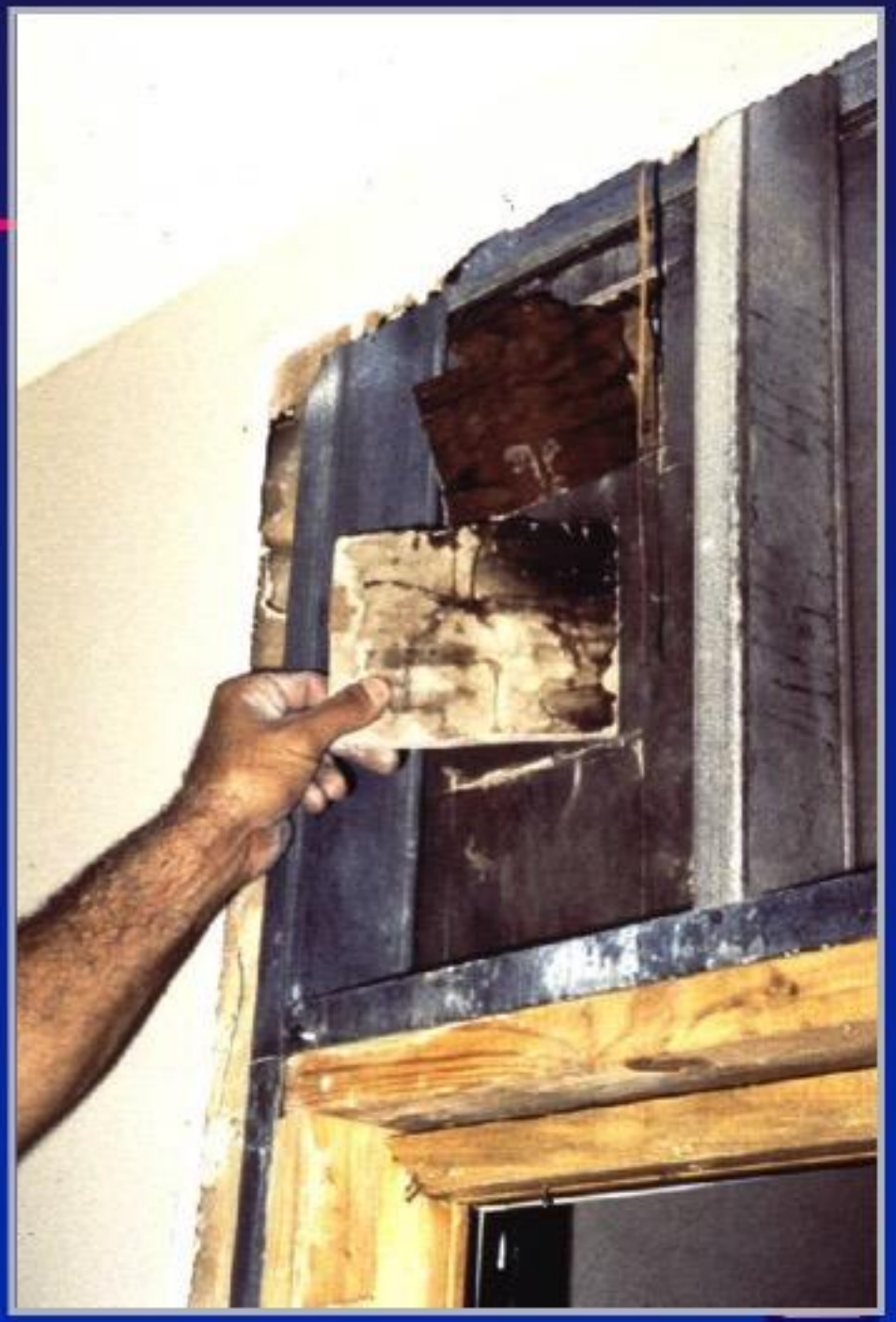
Observations from the interior:

Remove drywall to expose the back of the sheathing.

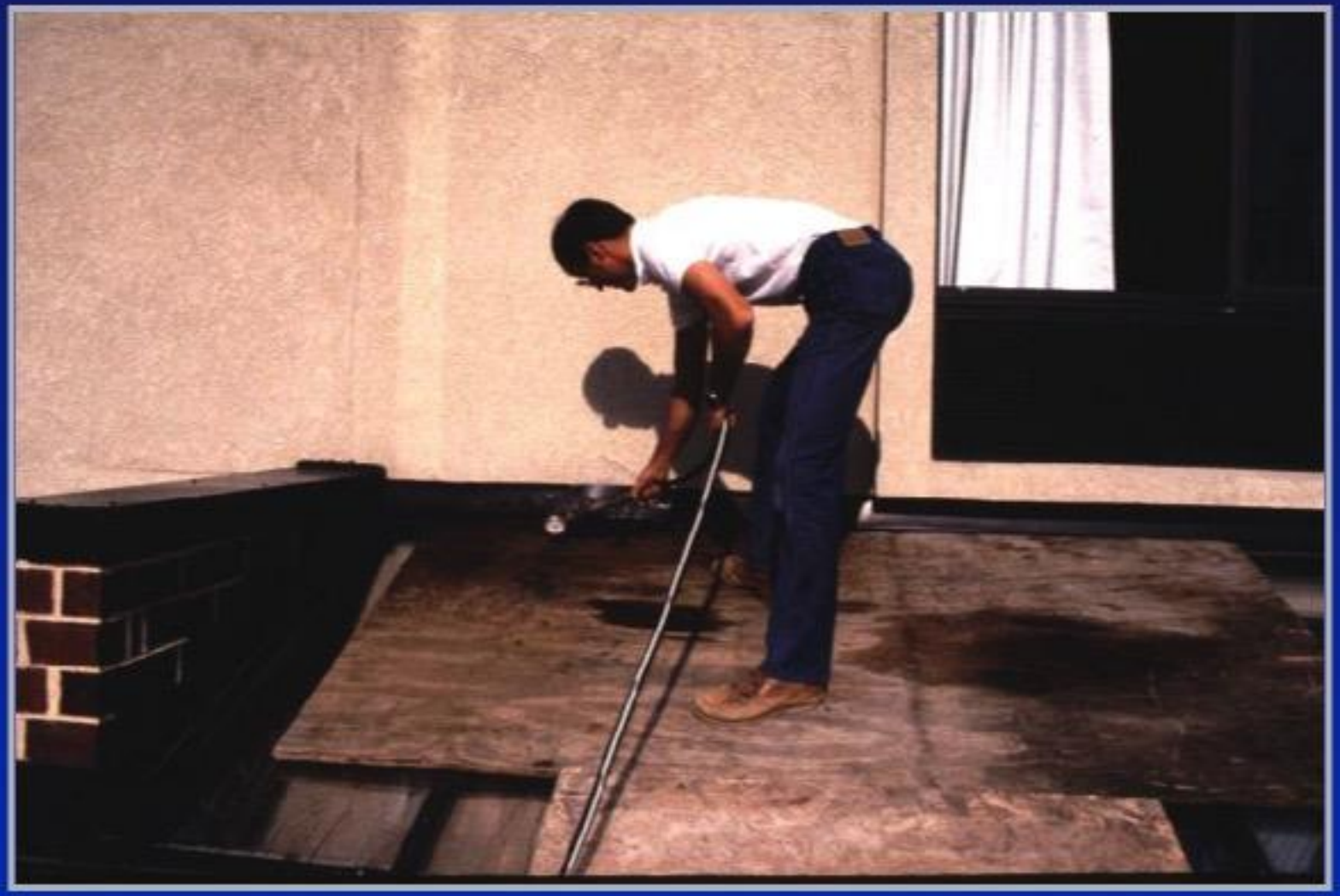
Monitor Performance

Observations from the interior:

Remove a section of sheathing to observe the face paper and the back of the ESP.

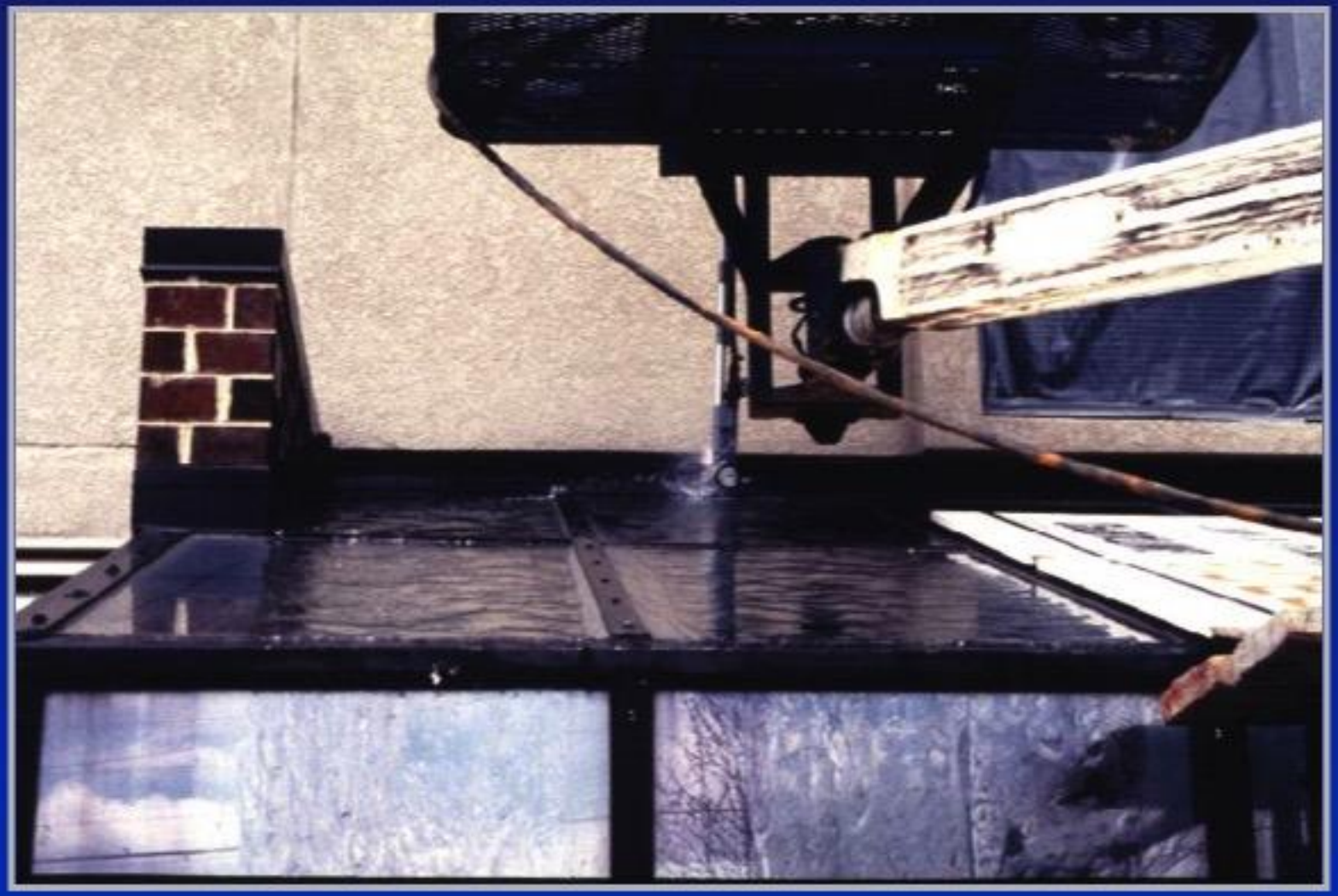


Testing approach – adaptation of AAMA 501.2



Calibrated nozzle

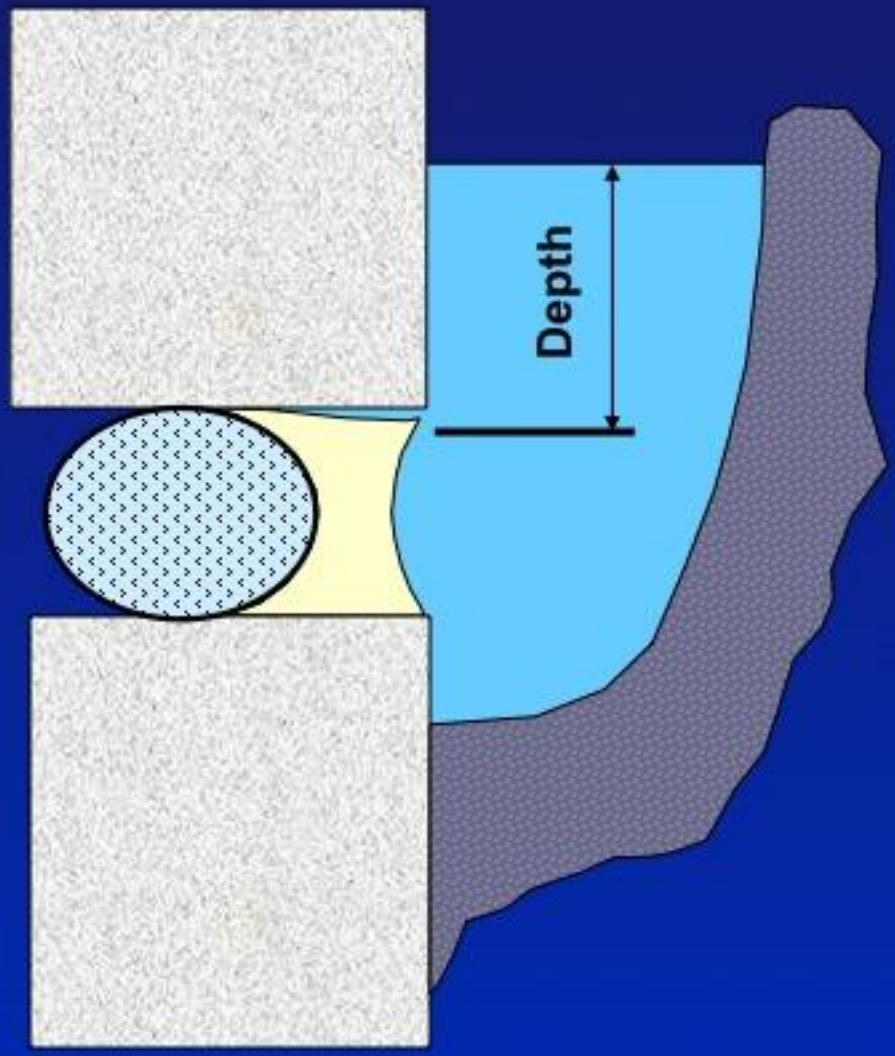
Calibrated nozzle



"Water Trough"

Plumbers putty, modeling clay
Or Duxseal

Equivalent pressure



1” water = 5.2 psf

Trough on sloped surface

Bond strength – ASTM D 4541

Bond strength

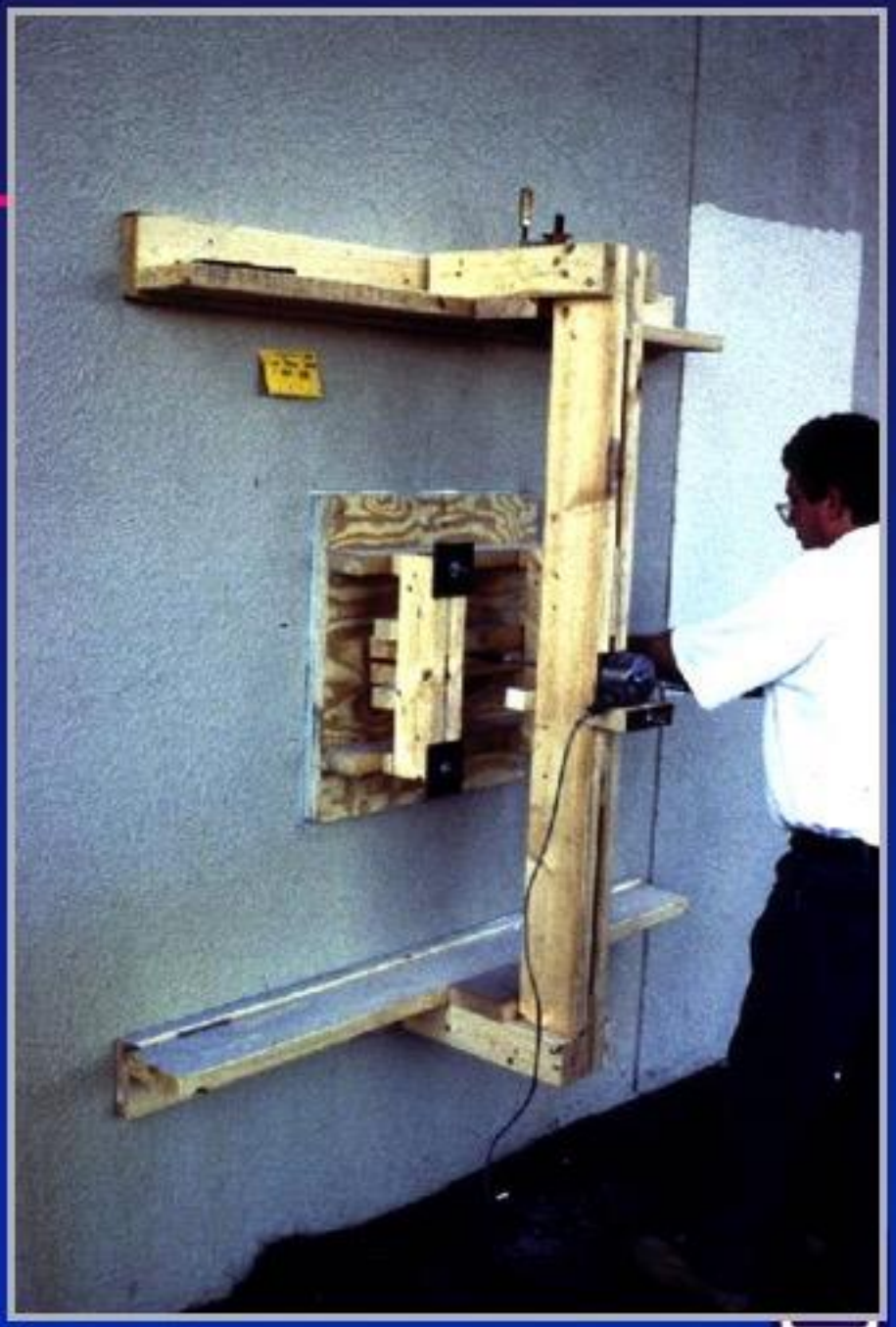
FM pull test

Full system

Usually fails as The substrate

For gypsum sheathing:
75# to 100# per screw

FM



Sealants

Verification: Type
Shelf life (outdated)

Inspection: Surface preparation (clean, primed)
Profile (2 to 1, 3-sided)
Push or probe

Testing: Peel test ASTM C 794
Cut and pull

Push or probe – verify adhesion

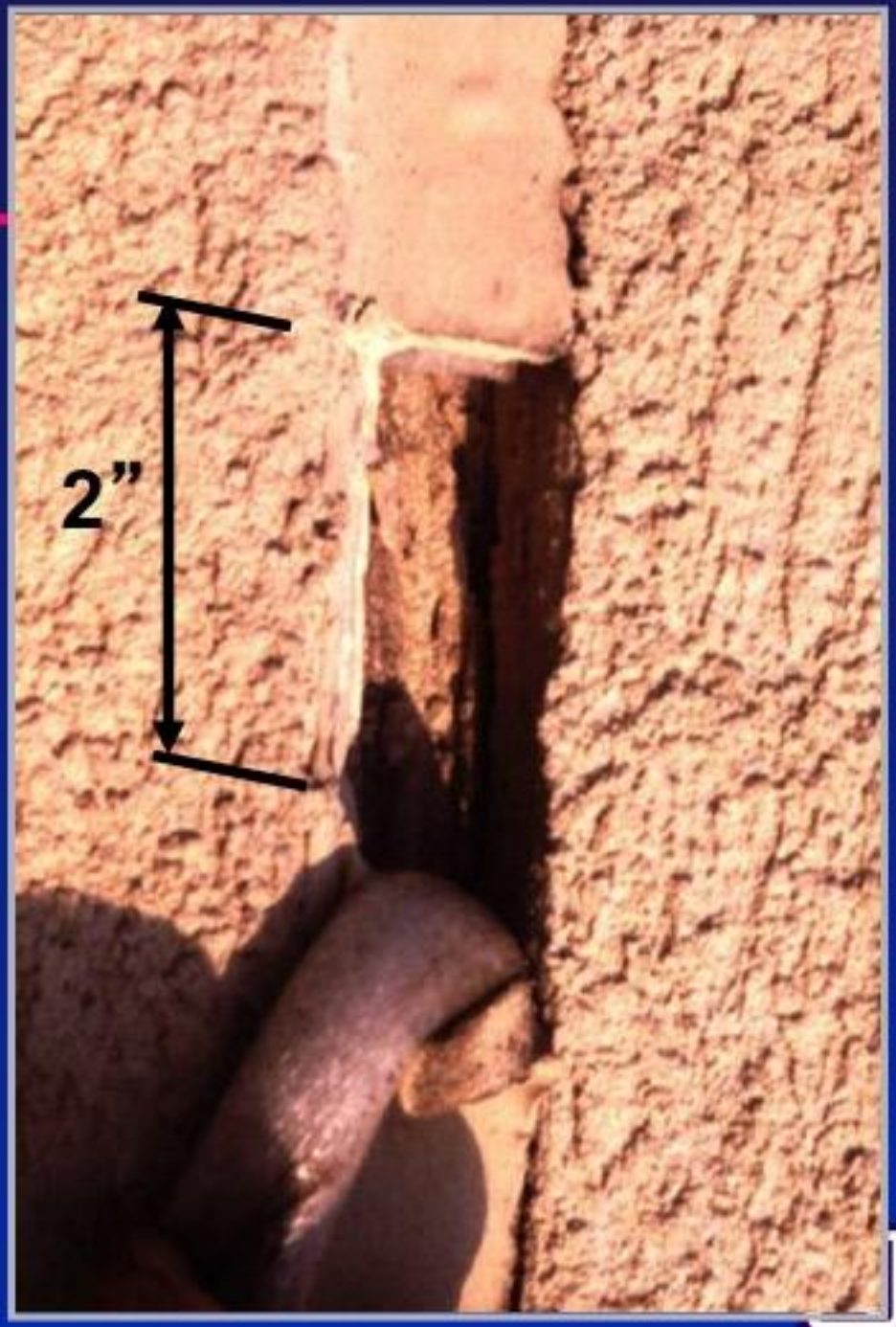
Push or probe – determine depth

Cut and pull (SWRI, soon ASTM)

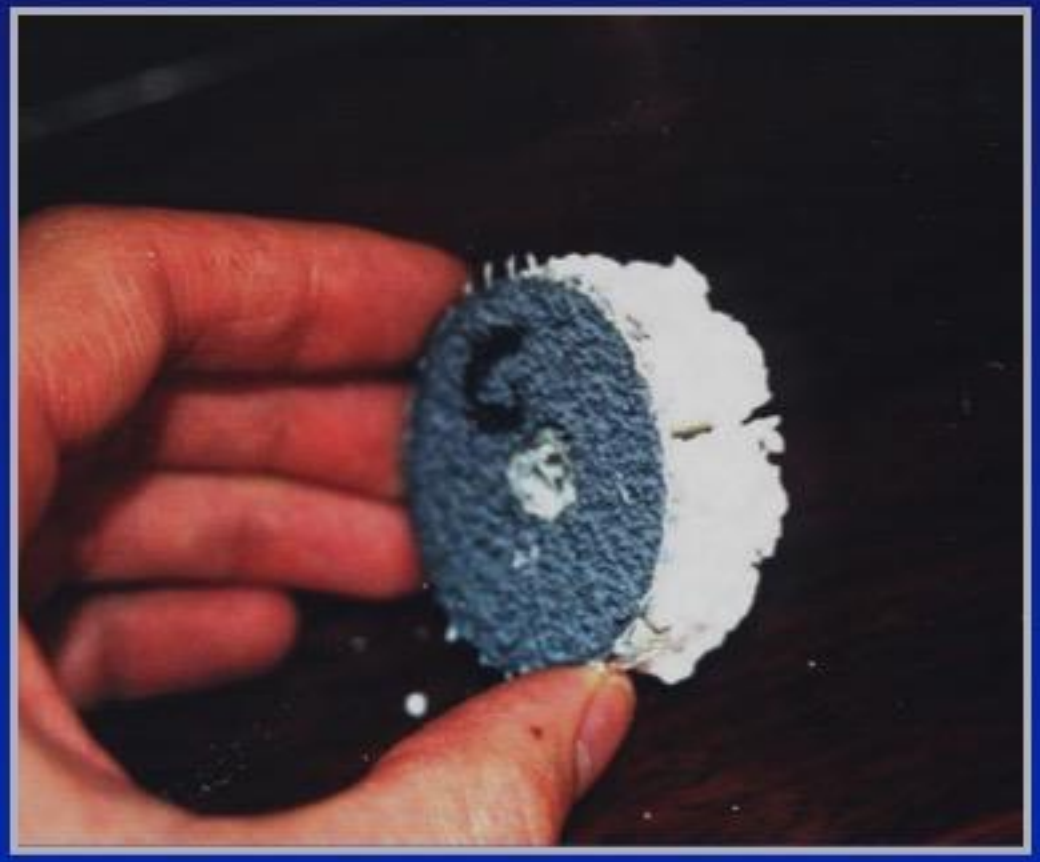
Cut and pull

Create a tab.

Objective:
Fail in cohesion rather than adhesion



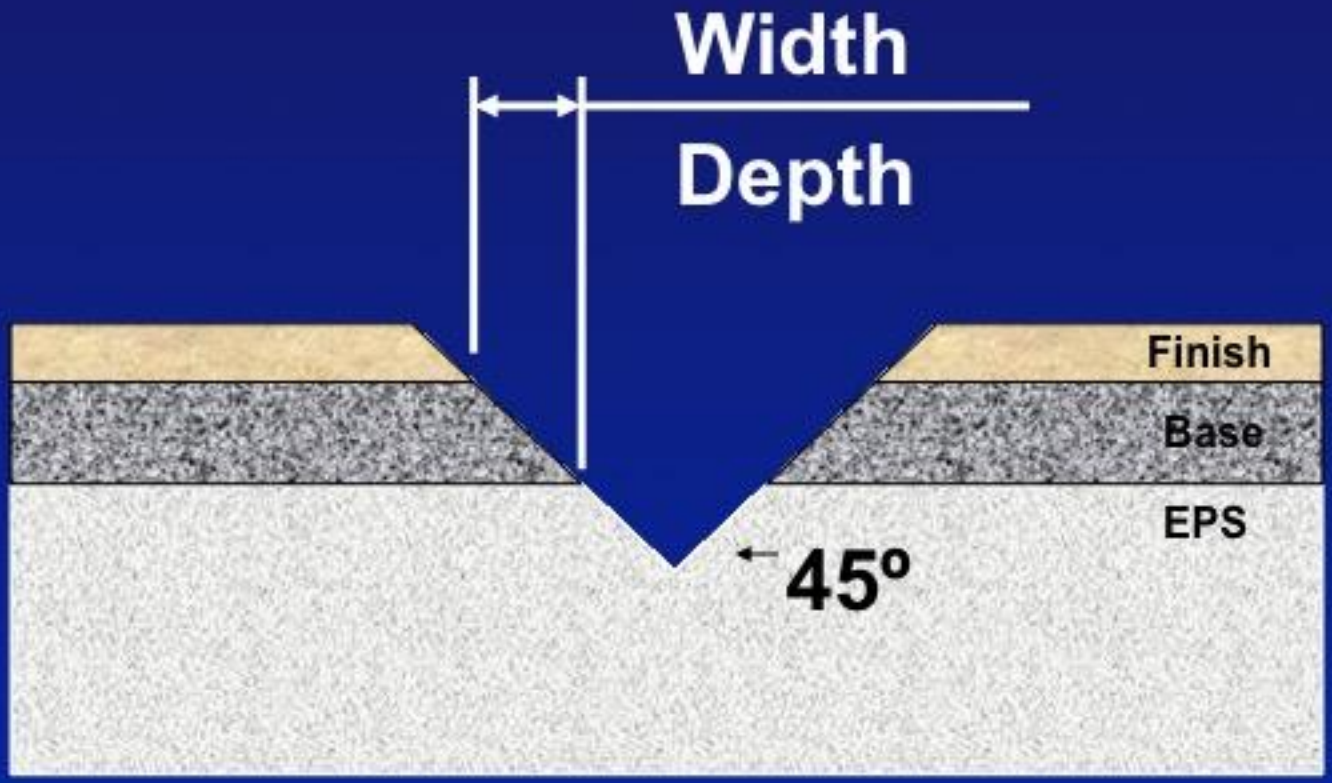
Thickness



Remove a plug and measure with caliper, micrometer or comparator

Not so easy to do accurately

Thickness



45 degree carbide tipped router bit
Diamond burr
Optical comparator

Thickness

Observations: Flashing

End dams

Laps and splices

Termination (top, bottom, corners)

Integration

Underside

Drips

Observations

Board joints and backwrapping.

Observations

Leak tracing to determine the source of water infiltration.

Tests showed that this deterioration was not due to leakage at this window, so where did it come from?

Observations

This gap could not be the entry path at this window.

Observations

Improper EIFS closure around window perimeter. Water enters from floor above and drains within the wall and the window mullions.

Observations

Diagnostic Testing - ASTM E1105

Masking

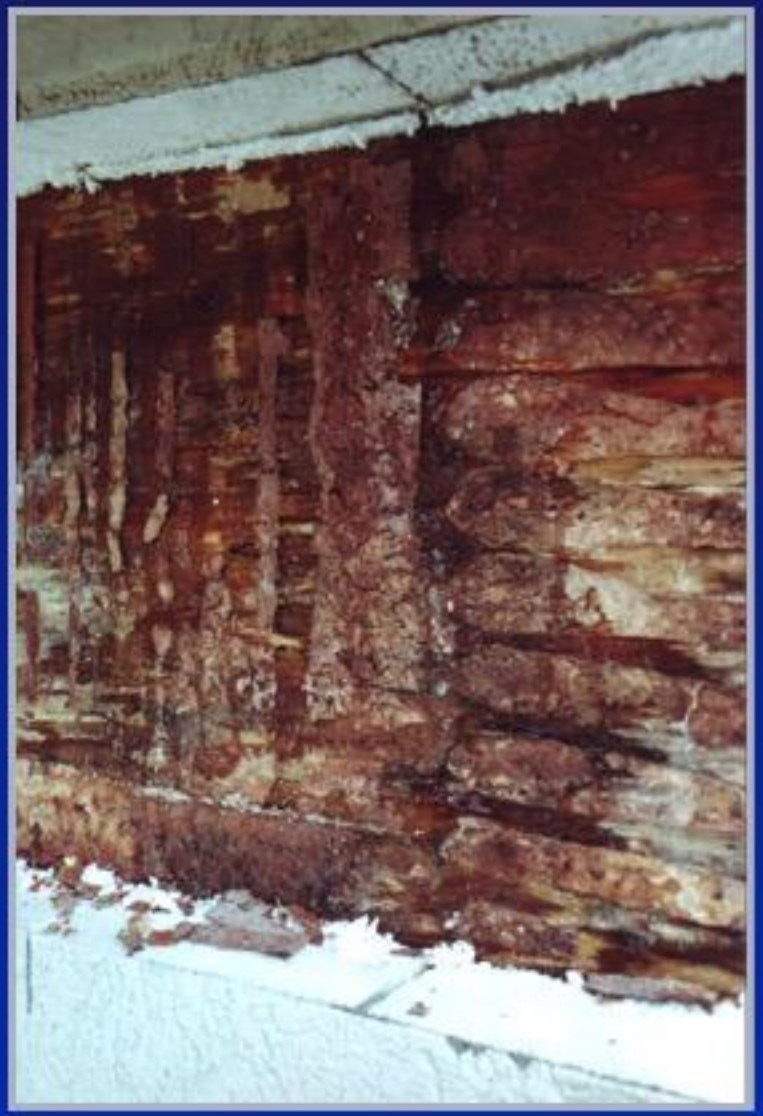
Isolating the window

Chamber

Exterior chamber

Observation opening

Test Results



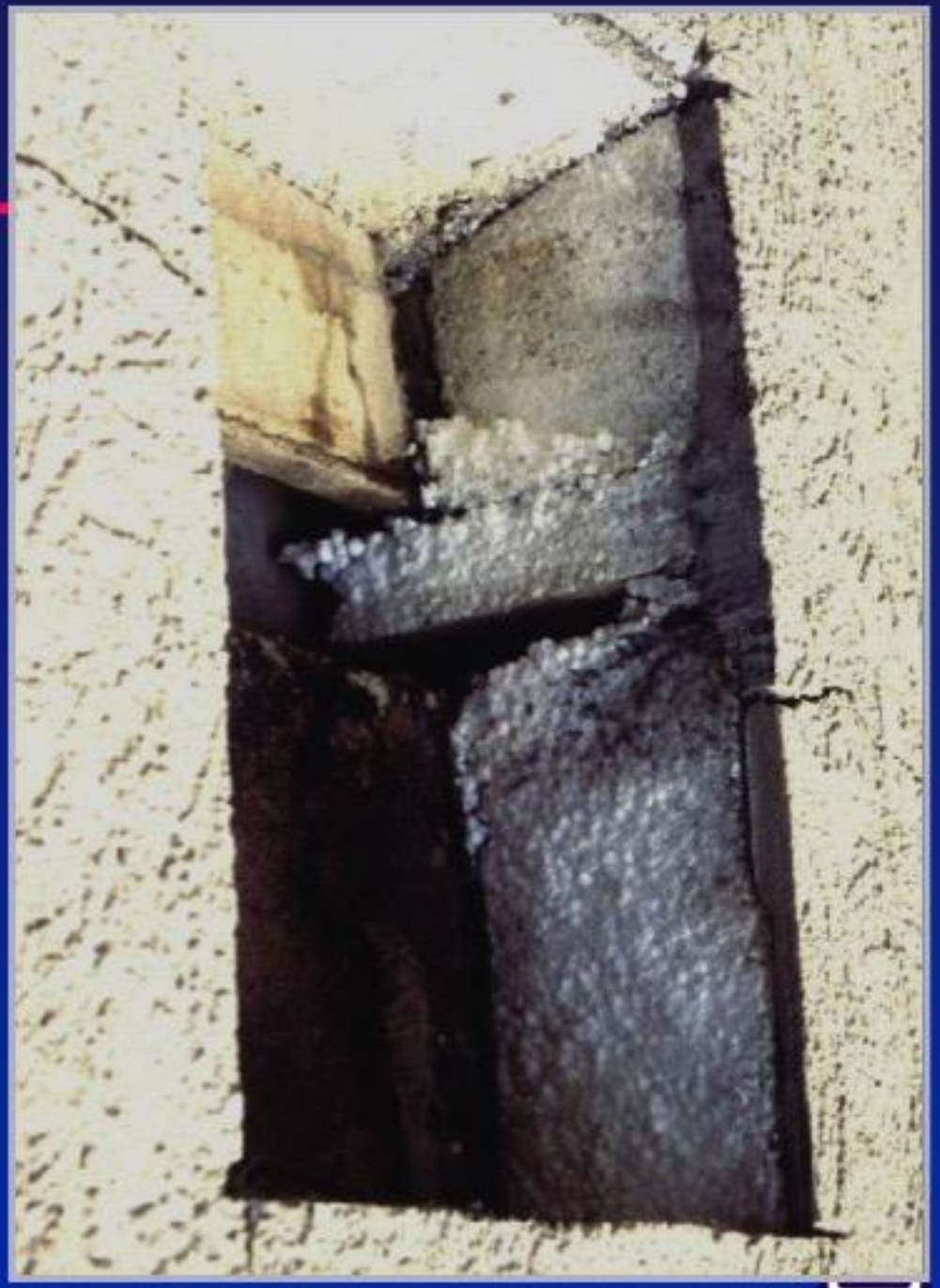
Observations: Concealed

What can be said about adhesion?

Observations:

Concealed

Hidden short cuts that can ruin a project, but are not obvious at the beginning.



Observations: Damage

Observations: Damage

Observations: Damage

From subsequent trades:

Attachments (antenna, signage, etc.)

Handrails

Lighting

Penetrations: electrical, water, phone, cable TV, air conditioning.

Observations: Details

Observations: Details


GYPSUM

Experience and Training

- **Receive appropriate training and begin under the guidance of an experienced moisture analyst.**
  - Typical wall behavior.
  - Local components (winners and losers).
  - Local talent (winners and losers).
  - Usual suspects.

Testing: closing thoughts

- Testing in EIFS world is evolving.
- Keep up with changing technology.
- Agree on objectives and procedures before starting tests.
- Straightforward and informed observations can be a useful as high-tech tests.
- Observing behavior during a test can be as informative as the pass/fail result.
- Follow standard procedures to extent possible and document deviations.