Building Skin Failures

Karim Allana, PE, RRC, RWC
Allana Buick & Bers, Inc.
karim@abbae.com

Kanton Bern
Canton de Berne

ADVANCED
BUILDING SKINS

Karim P. Allana, PE, RRC, RWC

EDUCATION: **B.S., Civil Engineering, Santa Clara University**

REGISTRATION: **P.E., Civil Engineering, California, Washington, Nevada and Hawaii**

CERTIFICATION: **Registered Roof Consultant (RRC), Roof Consultants Institute, Registered Waterproofing Consultant (RWC), Roof Consultants Institute**

OVERVIEW:

- CEO and Senior Principal at Allana Buick & Bers.
- Former Turner Construction Employee (Project Engineering and Superintendent)
- Over 37 years experience providing superior technical standards in all aspects of building technology and energy efficiency.
- Principal consultant in forensic investigations of building assemblies, failure analysis, evaluation and design of building infrastructure and building envelope evaluation and design.
- Expert in all aspects of building envelope technology.
- Completed numerous new construction, addition, rehabilitation, remodel and modernization projects for public and private sector clients.
- Specialization in siding, roofing, cement plaster, wood, water intrusion damage, window assemblies, storefronts, below grade waterproofing, energy efficiency, solar engineering and complex building envelope and mechanical assemblies**.**

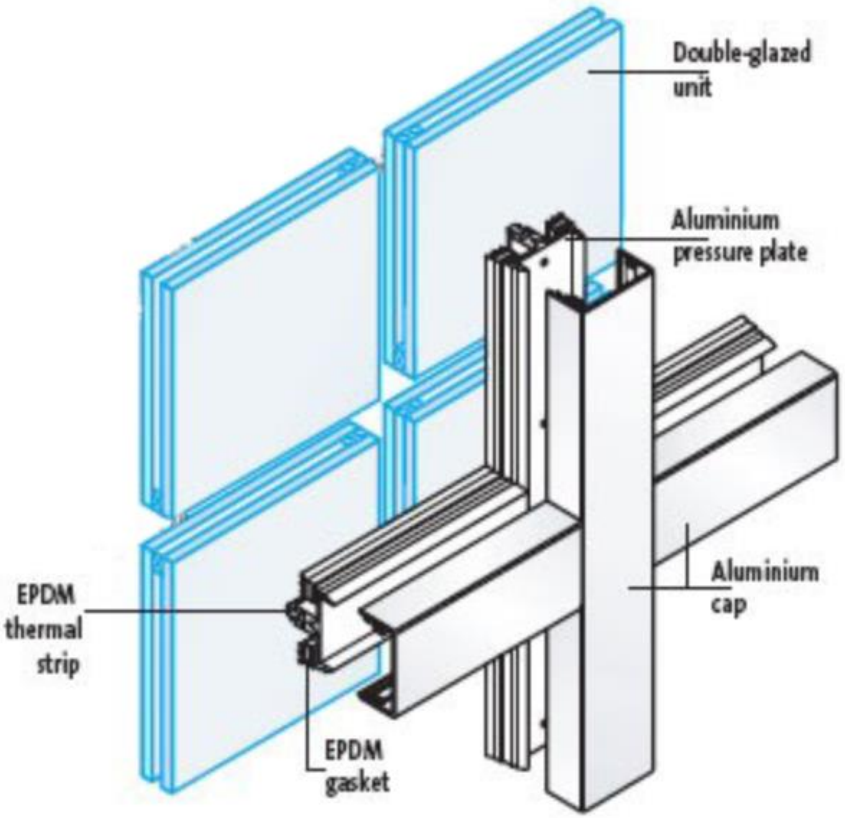
Common Modes of Failure

- Gasket Failure
  - Water Intrusion
  - Air infiltration
- Aluminum Coating Failure
  - Missing primers
  - Coating thickness issue
  - Contaminents
- Corrosion of glass
  - Edge deletion issue
  - Standing water on seals
- IGU Polyisobutylene (PIB) Failure
- Aluminum Thermal Break Failure

Gasket Failure

What is a Gasket?

- Gaskets - strips of synthetic rubber compressed between the glazing and frame or frame to frame
- Generally extruded EPDM
- Can be special ordered with silicone

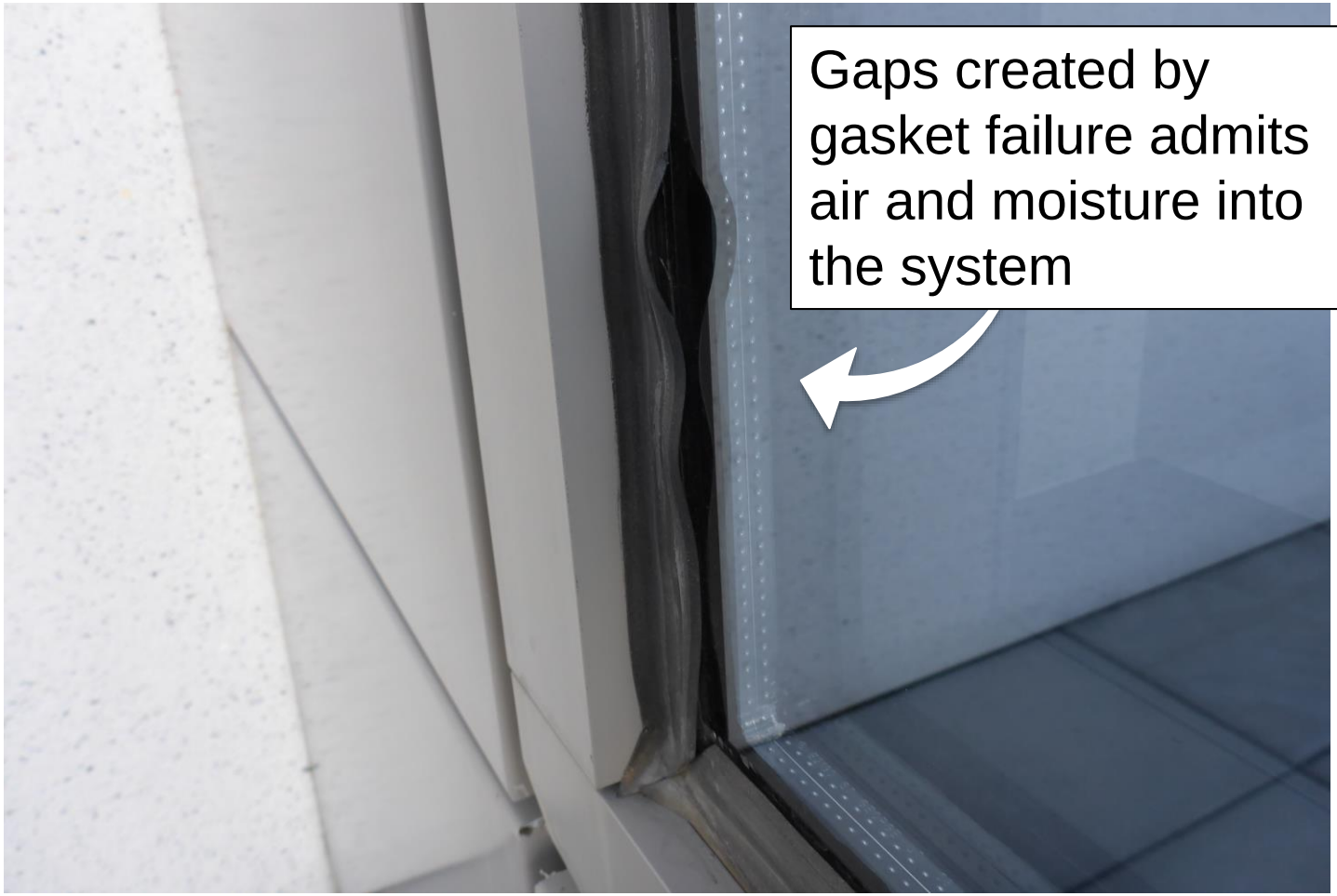


Gasket Failures

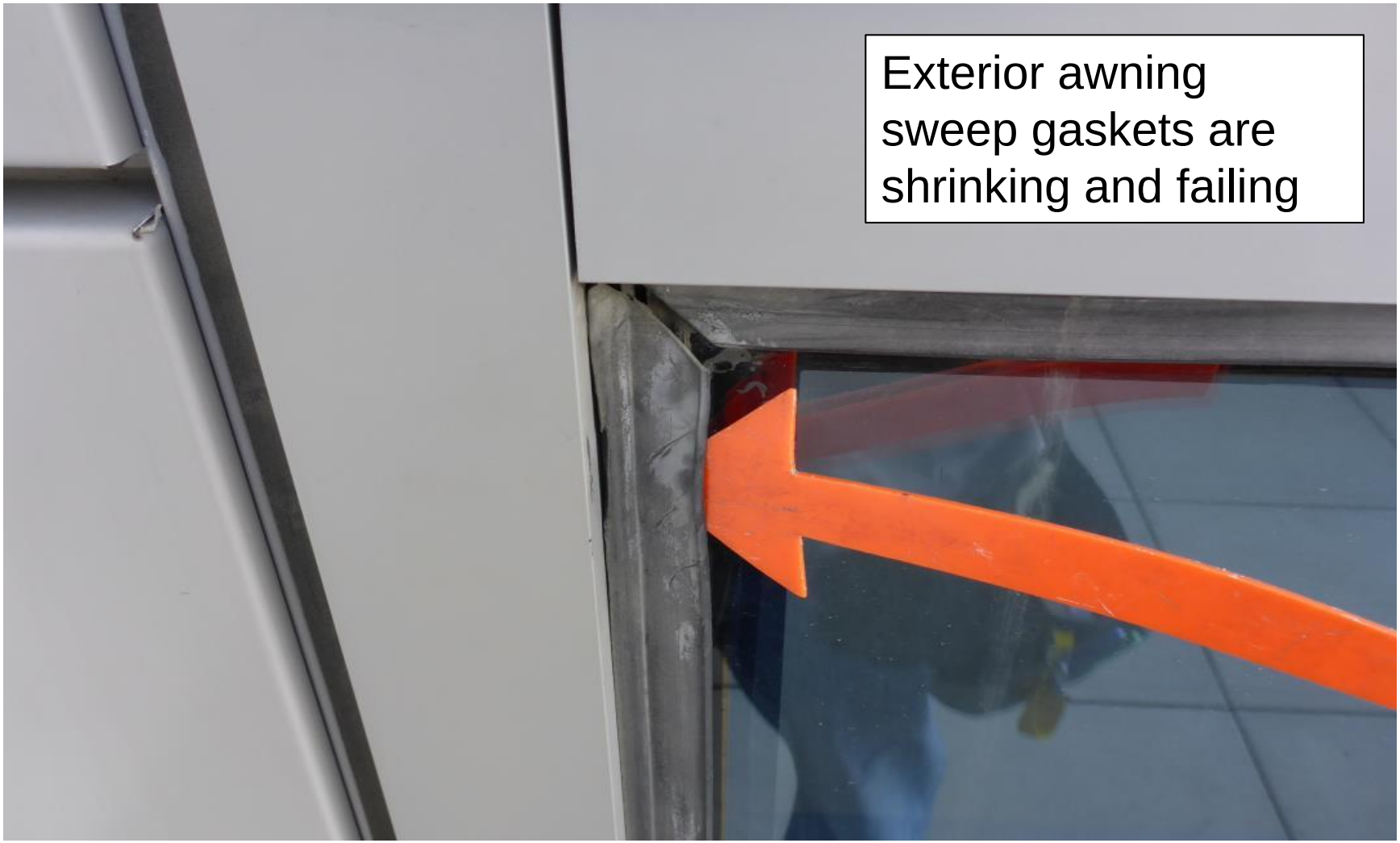
- Drying out, shrinking and cracking
- Exposure to UV radiation
- Exposure to freeze-thaw cycles
- Improper maintenance
- Failures experienced in 4-6 years

Mondavi Gasket Shrinkage / Failure

Gasket Failure



Gasket Failure- San Jose Condo

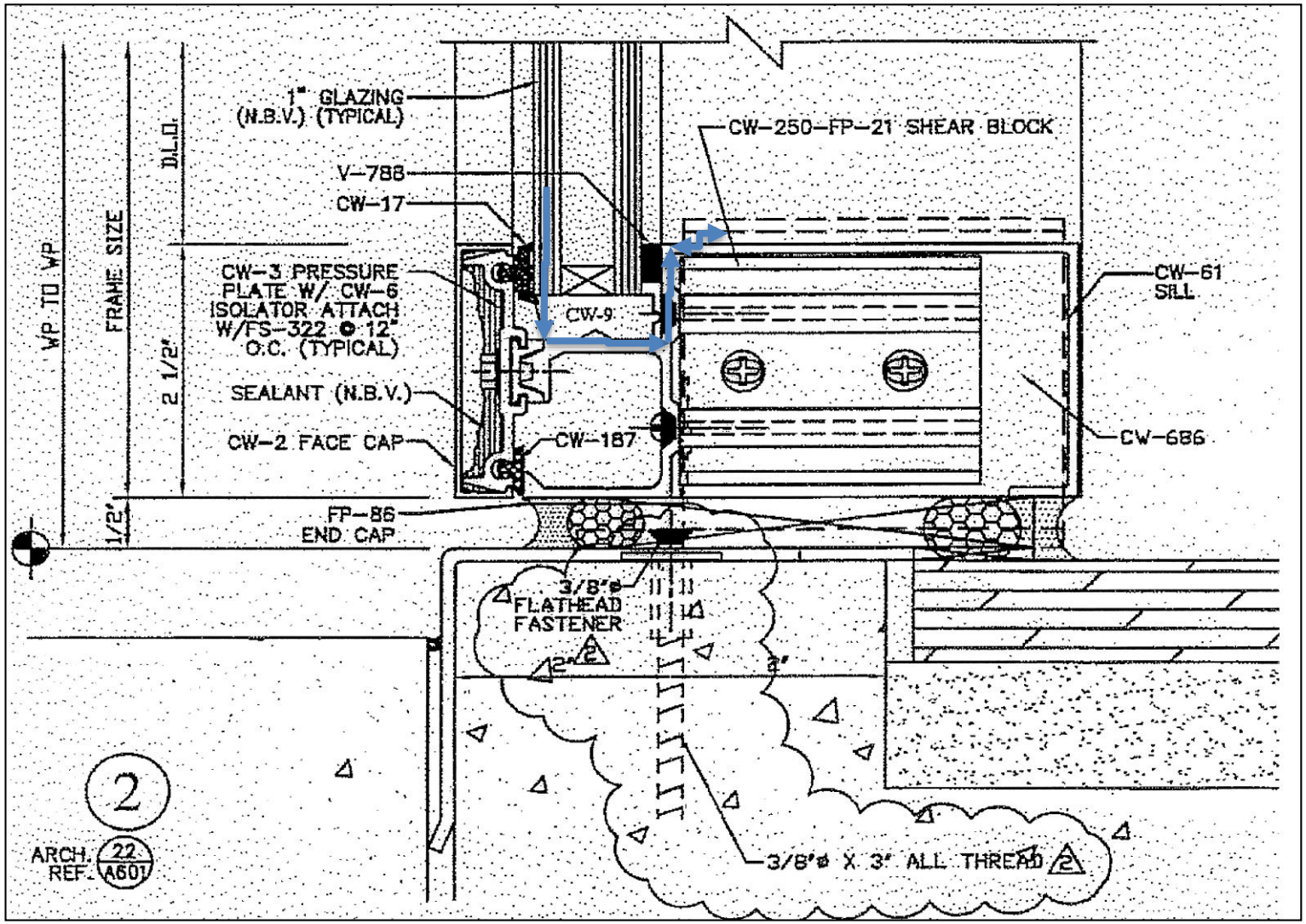


Gasket/Seal Failure Effects

- Water intrusion
- Air infiltration
  - Energy loss
  - Condensation

Typical EPDM Mullion Gasket Shrinkage

15/16” glazing installed produces a loose seal and leaks



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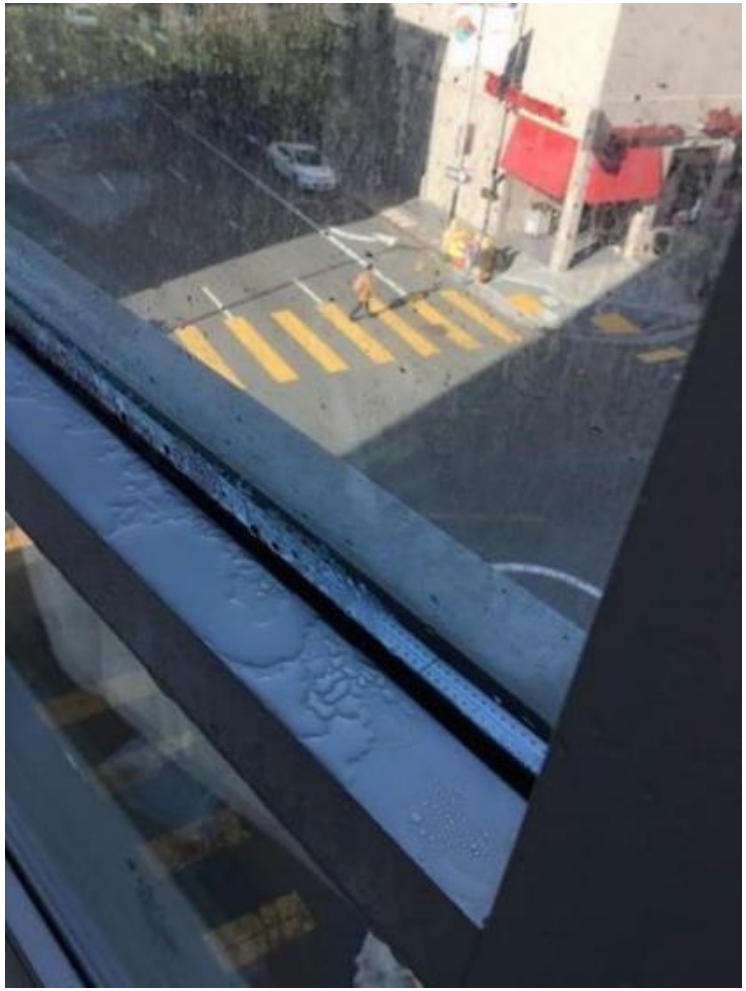
Gasket Shrinkage Water Intrusion

Air Infiltration Can Cause

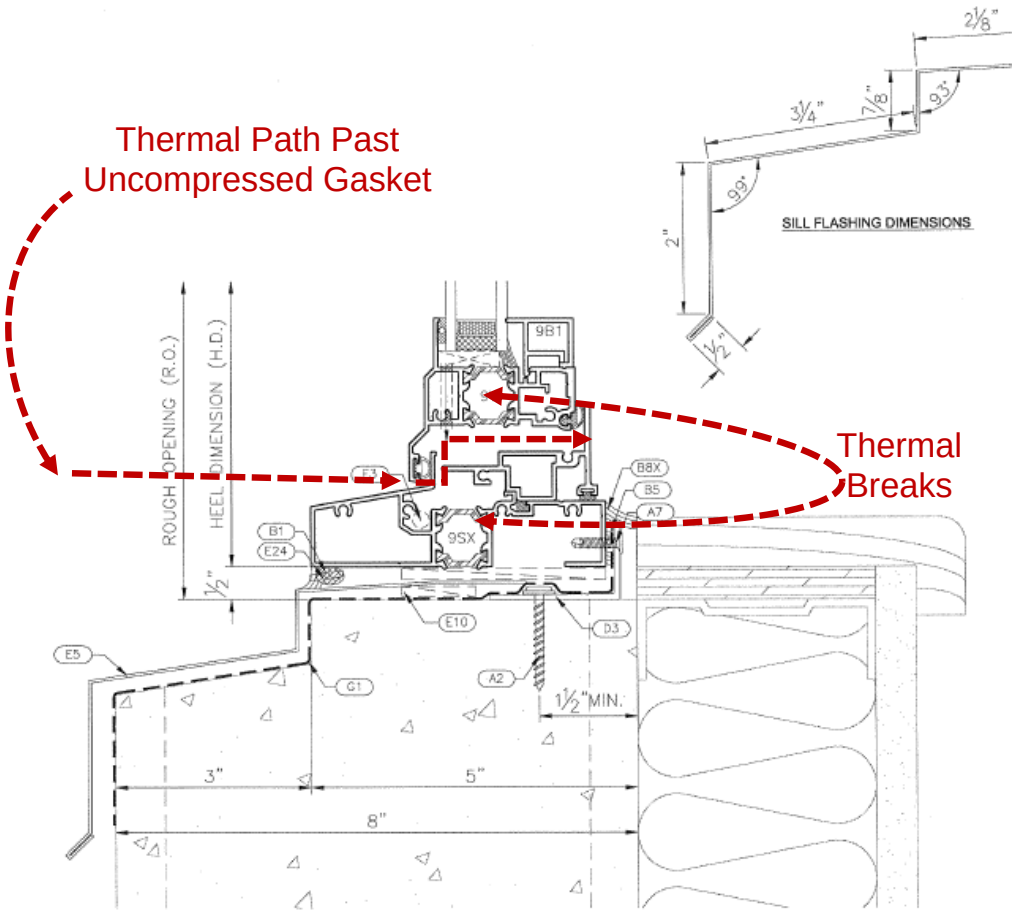
- Air Infiltration can lead to:
  - Energy loss
  - Condensation
    - Commonly mistaken for water intrusion

Condensation Due to Air Leakage



Condensation Due to Gasket Failure

How Condensation Can Occur



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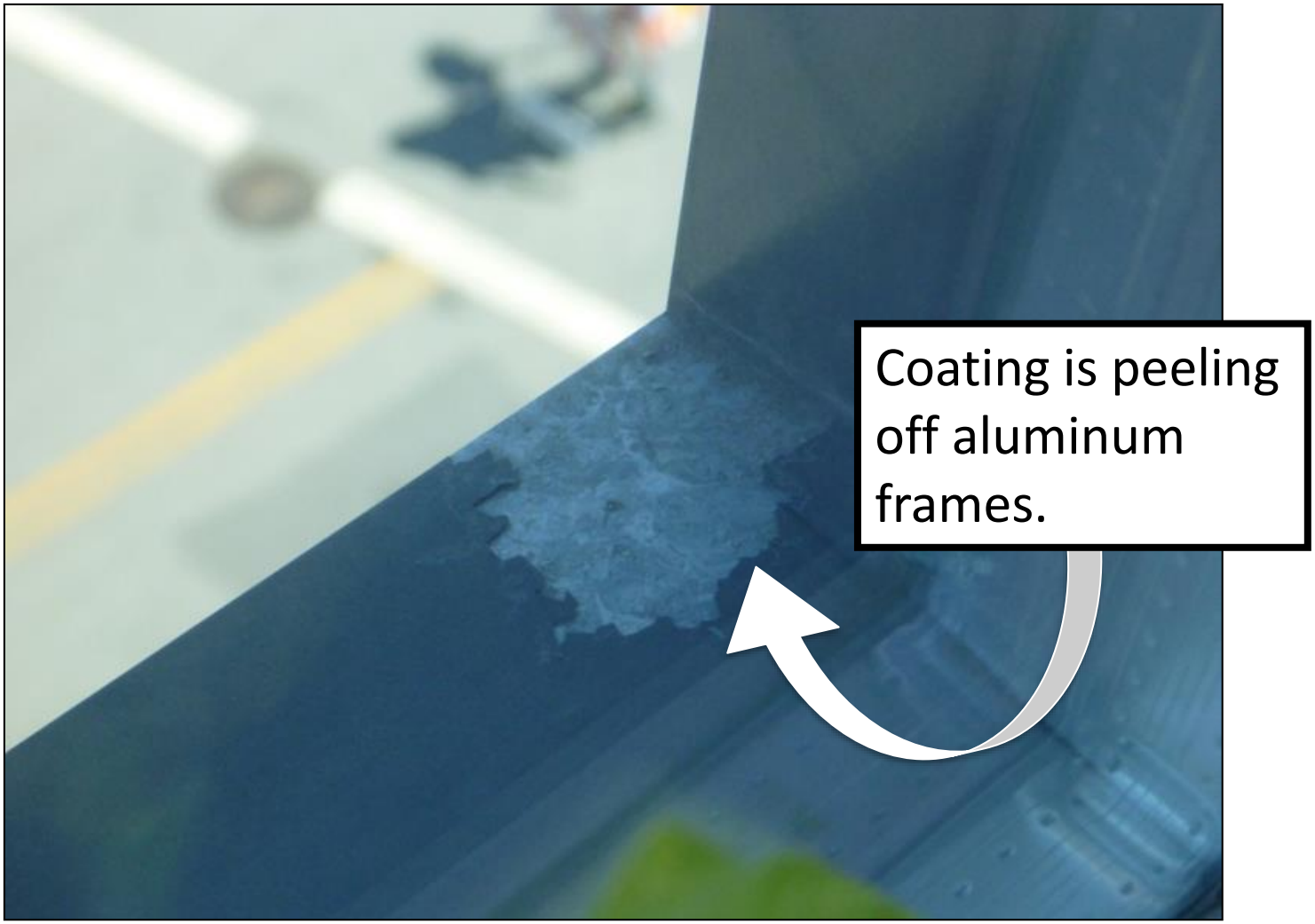
Avoiding Gasket Failure

- Specifying high quality gasketing materials
- Quality control testing/commissioning to check for specified materials
- Using wet seals on inside in conjunction with gaskets

Aluminum Coating Failure

Aluminum Coating Failure

Aluminum Coating Failure



San Francisco Condo #1

Coating Failure Causing Pitting

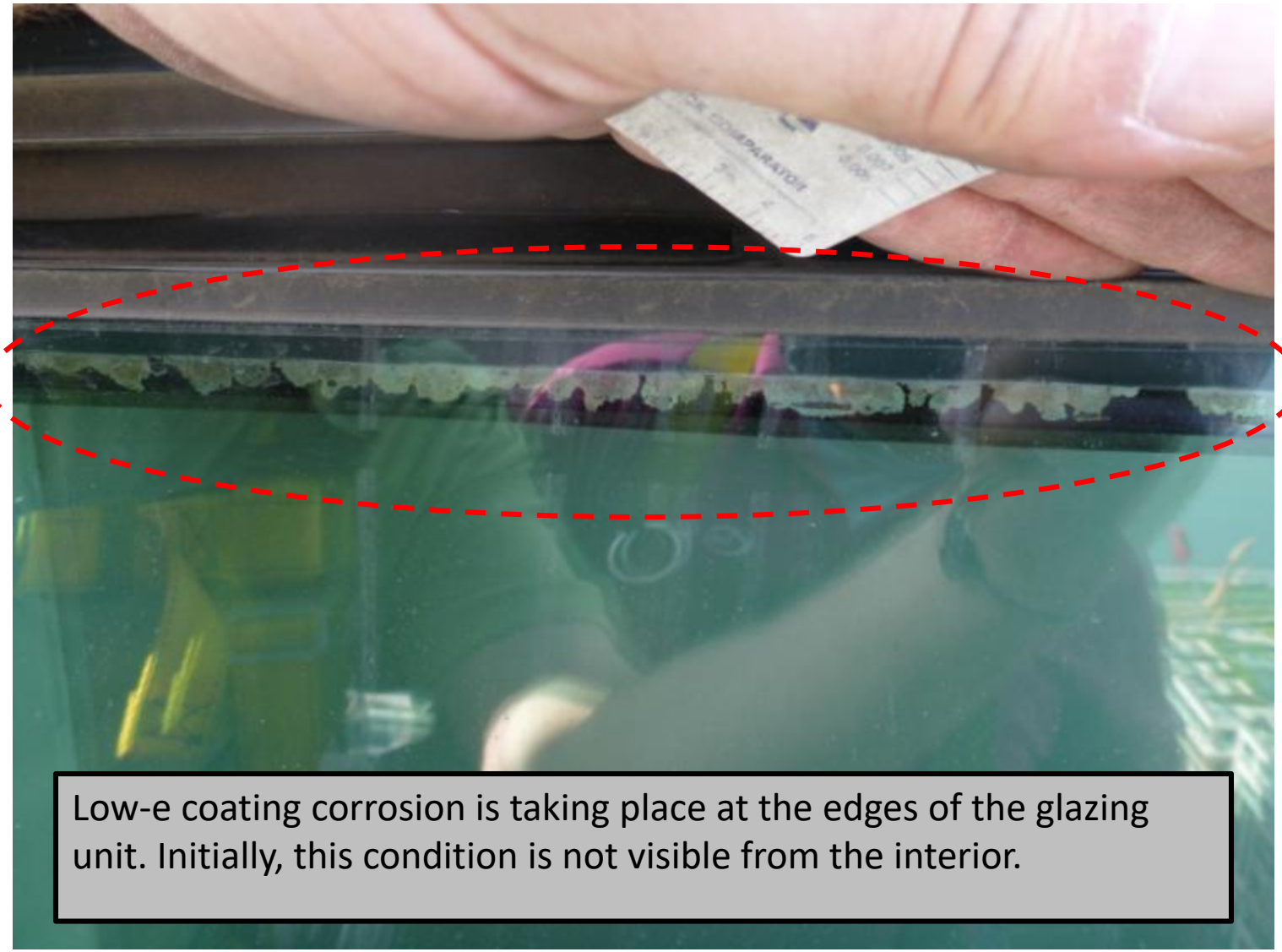
Aluminum Coating Failure Causes

- Proper surface preparation and pre-treatments are not followed
  - Missing primer
- Coating requirements are not followed
  - Improper thickness of coating
- Lack of surface prep – leading to trapped contaminants

Corrosion of Glass

Corrosion/Tarnishing of Silver Coatings

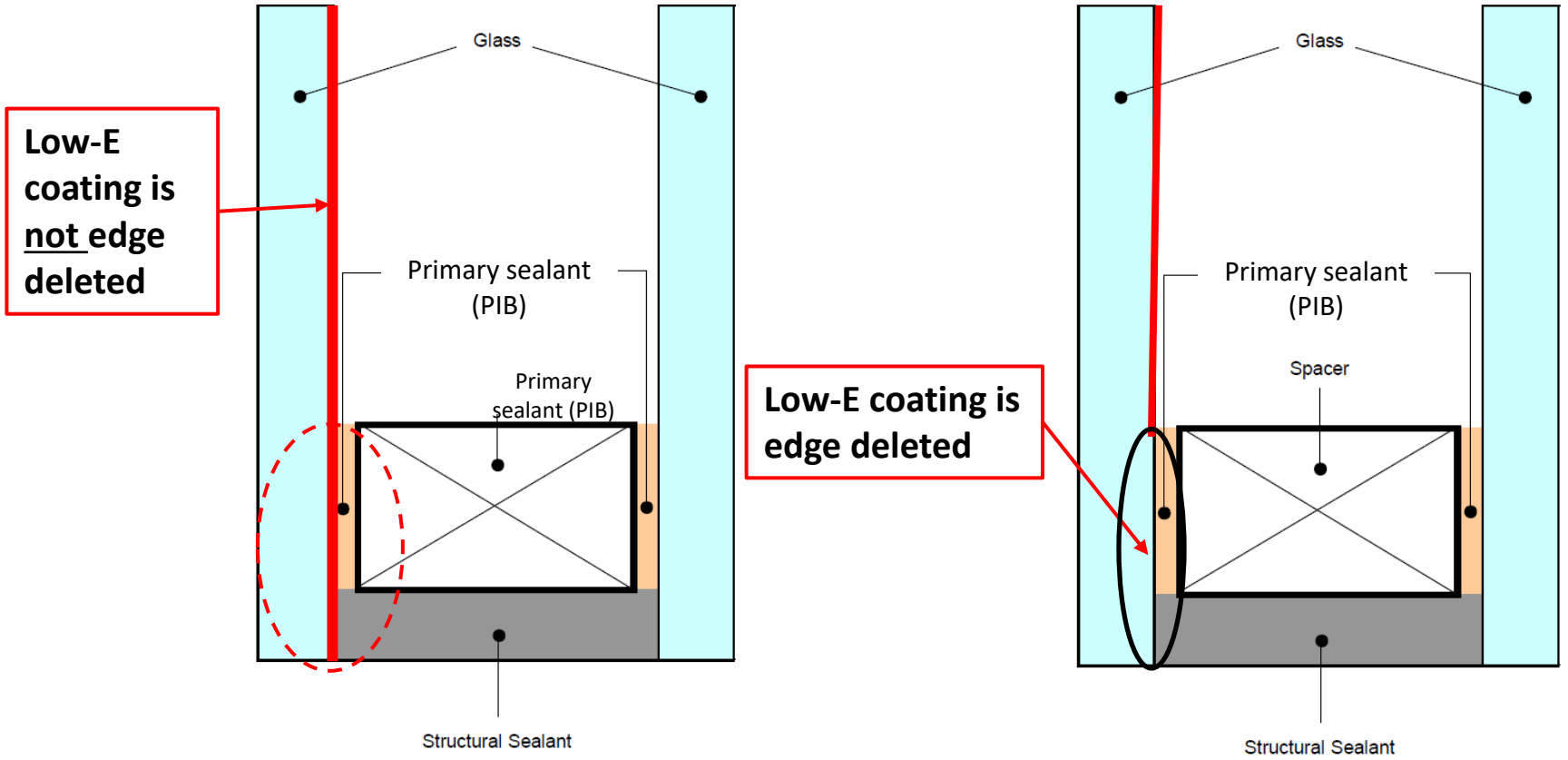
Start of Low-E Coating Corrosion



Low-e coating corrosion is taking place at the edges of the glazing unit. Initially, this condition is not visible from the interior.

What Edge Deletion?

- Low-E coating needs to be edge deleted. If not edge deleted, the exposed edge could start corrosion and spread to inside.
- Once corrosion starts, it breaks down the seals causing overall unit failure



Edge Deletion During Manufacturing

Prevention

- Proper edge deletion needs to occur during the manufacturing process to ensure moisture does not attack edge of coating
- Design of the glazing and curtain wall assembly should not allow water to stand on top of the silicone sealant because, silicone is permeable
- Design installation of glass should be on blocks and properly drained to prevent dual glazing to sit in water

Insulated Glazing Unit (IGU) Polyisobutylene (PIB) Migration

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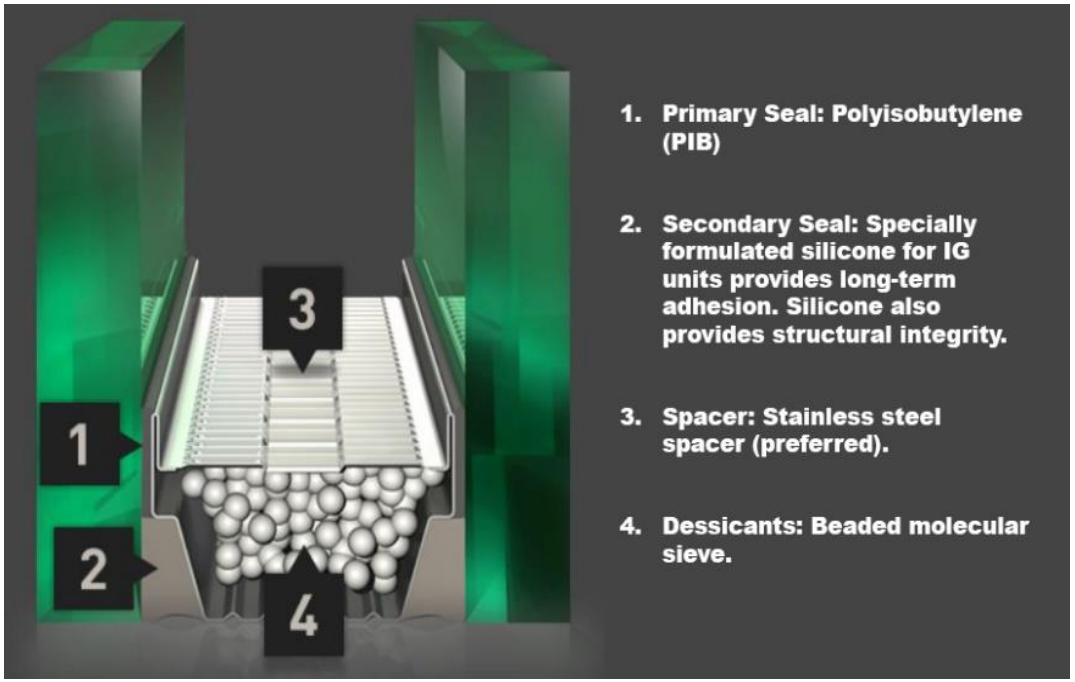
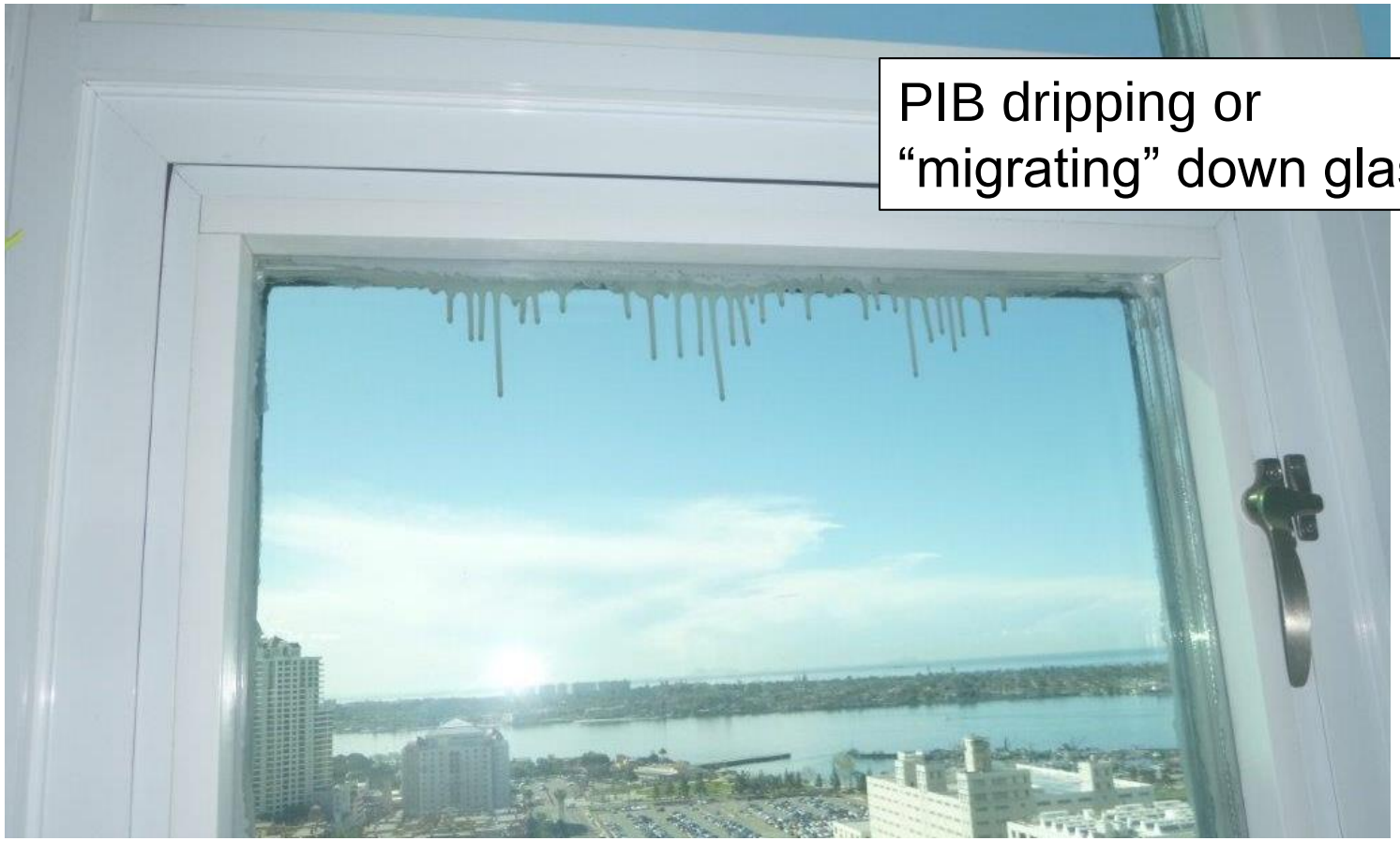
PIB Migration

- PIB (primary) and secondary sealants prevent air/ water infiltration in IGU airspace
- PIB moves from window edge, obscuring vision



PIB Migration/Failure in IGU



PIB Migration, Moving/Walking Up

Case Study- SF Condo w/ PIB Migration

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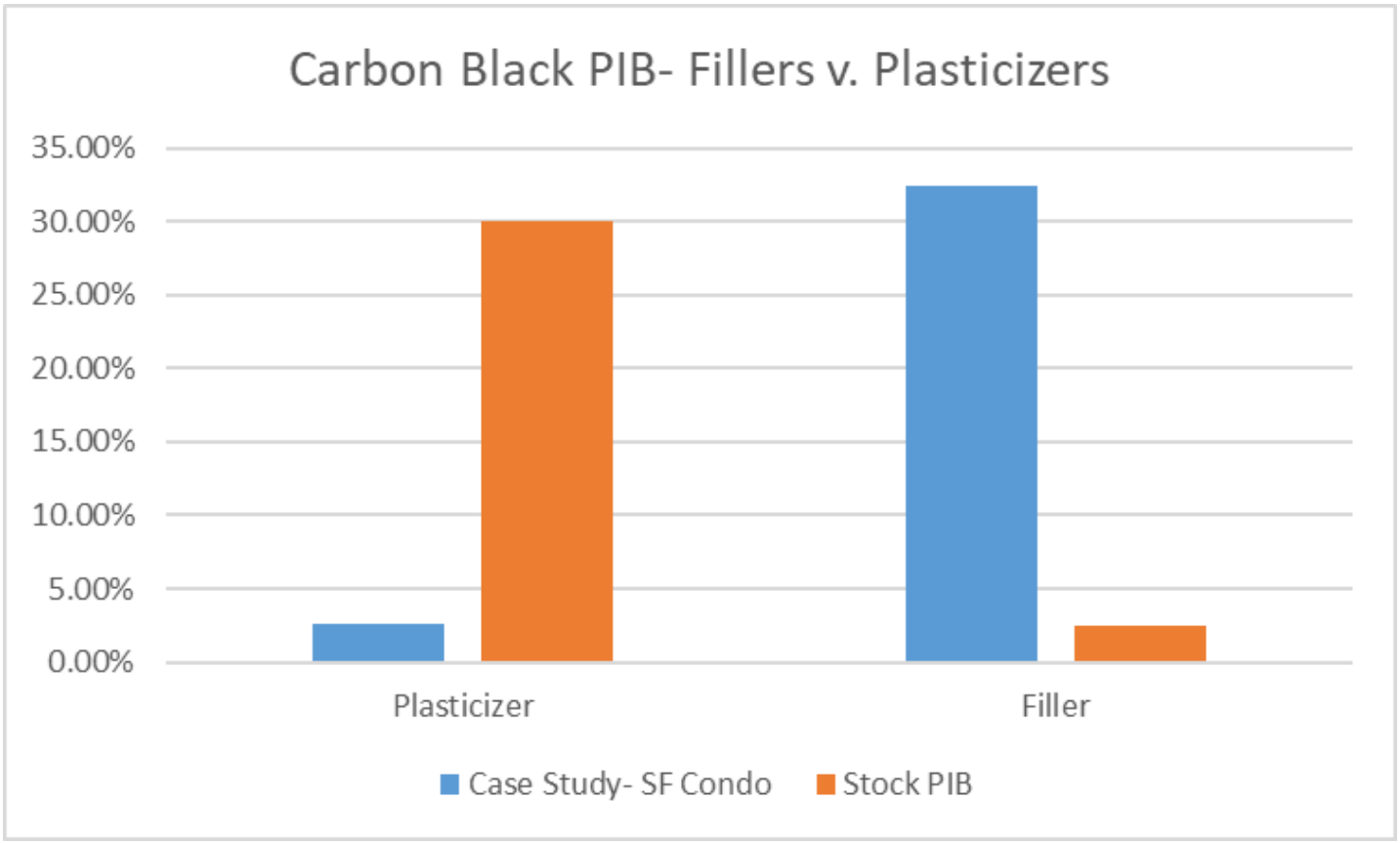
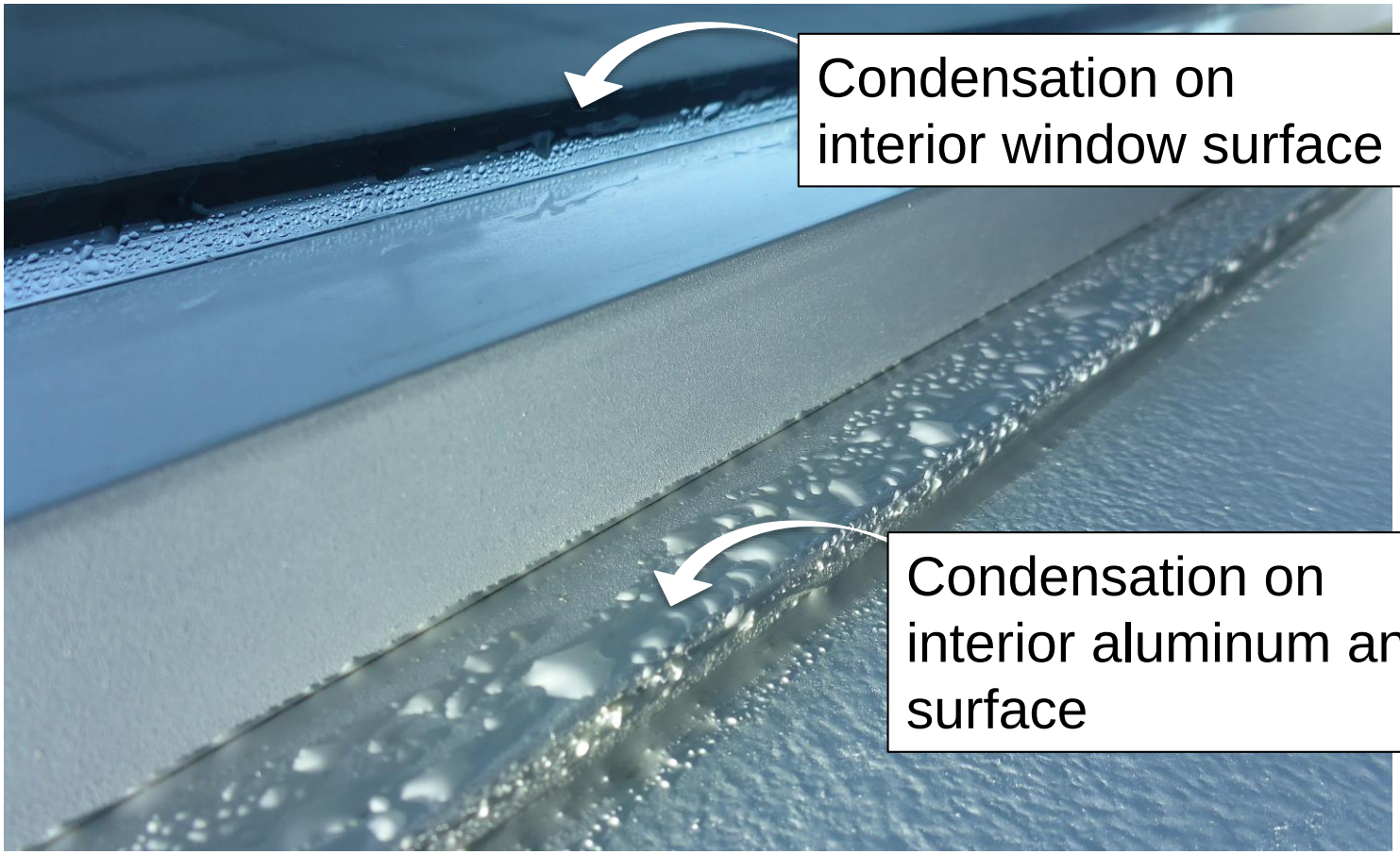
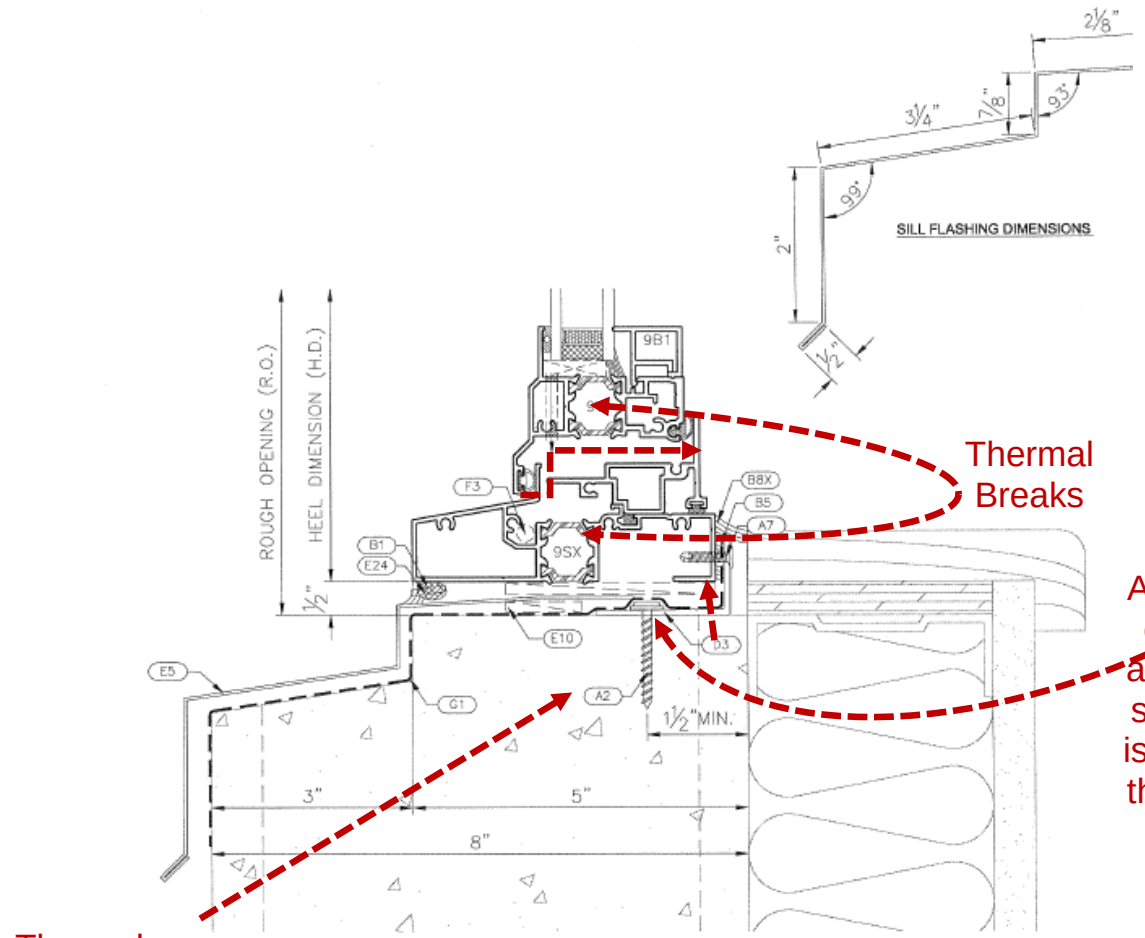


Thermal Break Failure

Condensation



How Thermal Break Failure Occured



Thermal Breaks

Aluminum back angle in contact with concrete; and in contact with back side of aluminum frame is a thermal bridge. Both the angle and frame are condensing

Thermal Path Through Concrete

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Avoiding Condensation

- Window design should include thermally broken systems
- Design considerations include:
  - Carefully design thermal breaks in and around glazing elements and rough openings in walls
  - Hygrothermal modeling to determine CRF requirements
  - Avoiding thermal bridges in design
  - Descriptive and fully illustrated perimerter flashing conditions

Lessons Learned

- Conscientious Design
  - Understansing modes of failures
  - Proper material selection of internal seals, water pathways and sealants is key
  - Specifying design issues like edge deletion, and „wet“ pockets of glazing
  - Learn from new modes of failures
  - Quality control and commisioning to ensure performance

- Evaluation and Testing
  - For both new construction and remediation
  - Material testing of system sub-components such as coatings, seals,and construction

The End