



# Roof, Exterior Wall and Waterproofing Design Issues + Construction Defects

BAFAC

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Making Buildings Perform Better

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# 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, and Registered Waterproofing Consultant (RWC)



- **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.

# ABBAE Firm Overview

- Allana Buick & Bers (ABBAE) is an Architectural Engineering firm specializing in Building Envelope Systems
- ABBAE is one of the 5 largest building envelope consultants in the country
- ABBAE has over 33 years of experience & over 12,500 projects
- ABBAE is also a leading Forensic Defect firm with hundreds of forensic projects (litigation)
- Locations – 16 offices across California, Nevada, North Carolina, Oklahoma, Oregon, Texas, Virginia, Washington, Colorado and Hawaii



# Staff & In-House Expertise

- Licensed Professional Engineers – Civil, Structural, and Mechanical
- Registered Architects
- Building Enclosure Commissioning Process Providers (BECxPs)
- Registered Building Envelope Consultant (RBEC)
- Registered Roofing Consultants (RRCs)
- Registered Waterproofing Consultants (RWCs)
- Registered Exterior Wall Consultant (REWCs)
- Registered Roof Observers (RROs)
- Certified Exterior Insulation and Finish System (EIFS) inspectors
- Curtain Wall Specialists
- ICC Certified Building Inspectors
- Quality Assurance Monitors
- Water Testing Experts
- Leak Investigation and Diagnosis Experts
- Infrared Imaging and Nuclear Moisture Scanning Experts

# ABBAE Building Expertise

- Building Envelope Systems

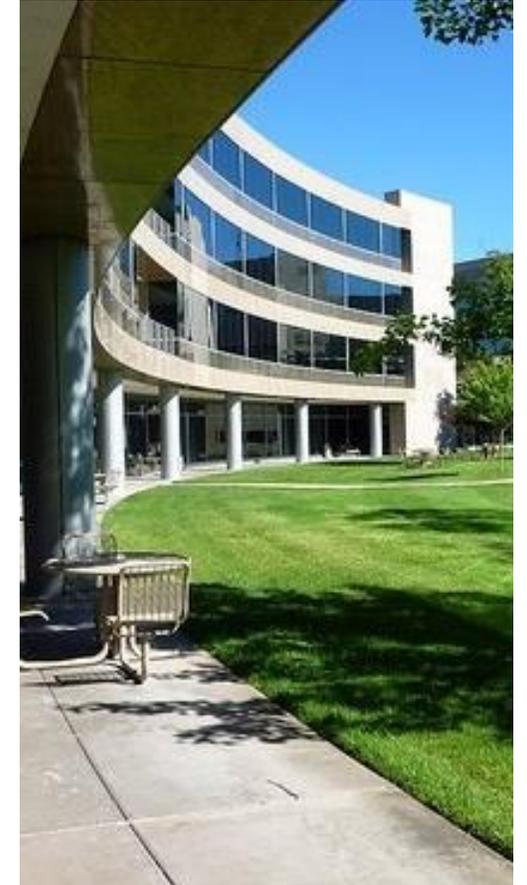
- Roofing Systems
  - High-Slope/Low-Slope Roofs
  - Green/Garden Roofs
  - Drainage Systems
  - Pedestrian Plazas
- Exterior Wall Systems
  - Wall Cladding/Siding/GFRC/pre-cast
  - EIFS/cement plaster/stucco
  - Sheet Metal Flashings
- Windows and Glazing Systems
  - Punched Windows
  - Curtain Wall/Window Wall Systems
  - Sliding Glass Doors
  - Skylights

- Building Envelope Systems (cont'd)

- Roofing & Waterproofing Systems
  - Deck/Balcony/Lanai Waterproofing
  - Podium Waterproofing
  - Pool/Spa Deck Waterproofing
  - Above-Grade/Below-Grade Waterproofing
  - All types of low and steep sloped roofing
- Commissioning BECx
  - OPR/BOD/Commissioning Plan
- Mechanical/HVAC Systems
  - HVAC design
  - Plumbing systems
  - Commissioning and testing

# ABBAE Core Services

- Consulting and third-party peer review services
- Engineer of record for building envelope systems
- Contract administration services
- Inspection services (usually direct with owner)
- Air and water performance testing
- Mock-up design, observation, and testing
- Building assessments and forensic investigations
- Litigation support and expert witness services
- Educational seminars with AIA credits



# You Will Learn...

- How important good design is, and how important it is to hire a design professional
- About common design defects of roofing systems
- A decision making matrix for selecting roofing materials, that can then be applied to all types of capitol improvement projects:
  - Building exterior systems
  - Sealants
  - HVAC systems
  - Waterproofing

# Evaluation Tools

- Every Facility Manager has differing needs and requirements for the building and especially for the roof
- As an example for this decision making tool, we have chosen 7 roofing systems to analyze:
  - Built Up (Hot and Cold Process)
  - Single Ply
  - Foam
  - Composition Shingle
  - Peel and Stick
  - Metal

# Selection Criterion for roofs

- Low initial installation cost
- Noise, Fumes, other operational issues
- Ease of Maintenance
- Cost of Maintenance
- Energy Efficiency
- Lowest Life Cycle Cost (if installed properly)
- Reliability (Long term proven performance)



***Cricket is undersized in some locations, or not provided at all. Need to be deeper and redesigned. Note deterioration.***





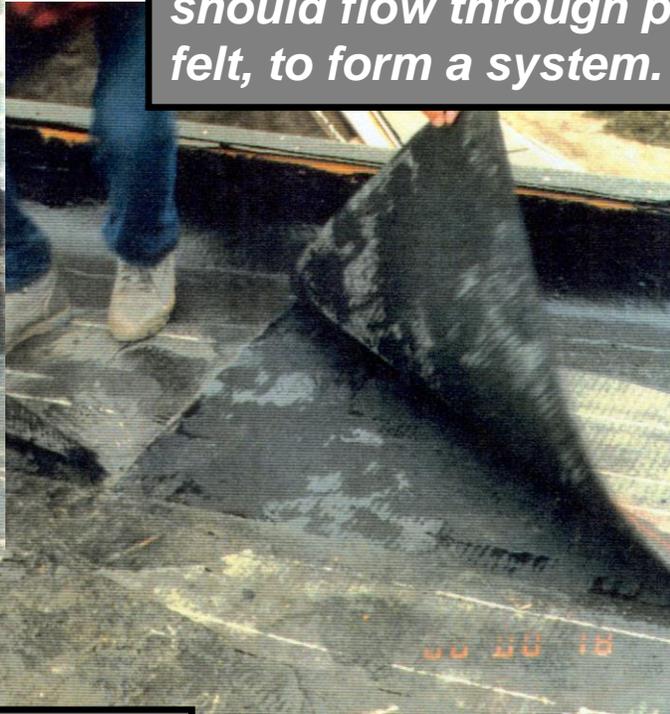
***Two examples of conduits installations that were not designed – installed without proper flashing.***



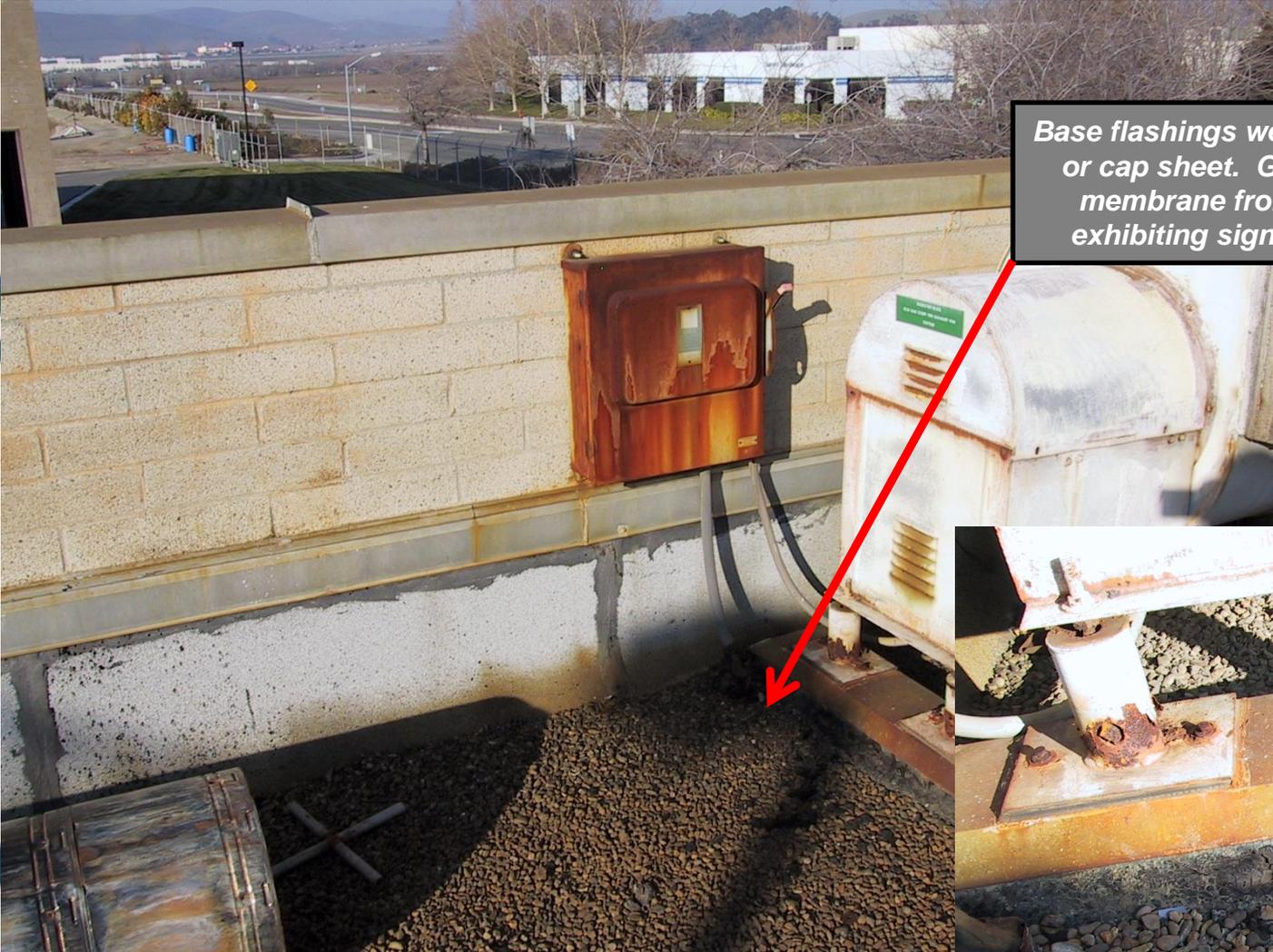
*An example of a pipe penetration system that was not designed properly.*



*In built up roofs, bitumen is more than just adhesive – it should flow through pores in felt, to form a system.*



*Lack of brooming results in poor adhesion.*



*Base flashings were not surfaced with a protective layer or cap sheet. Granules on the cap sheet protect the membrane from UV rays. Base flashings are also exhibiting signs of deterioration. See photo below.*





*Improper application of roofing courses*

# Single Ply Installation





*Equipment storage on roof is especially problematic on single ply*



***Impact damage from dropped equipment.***



***Equipment supports not integrated into roof***

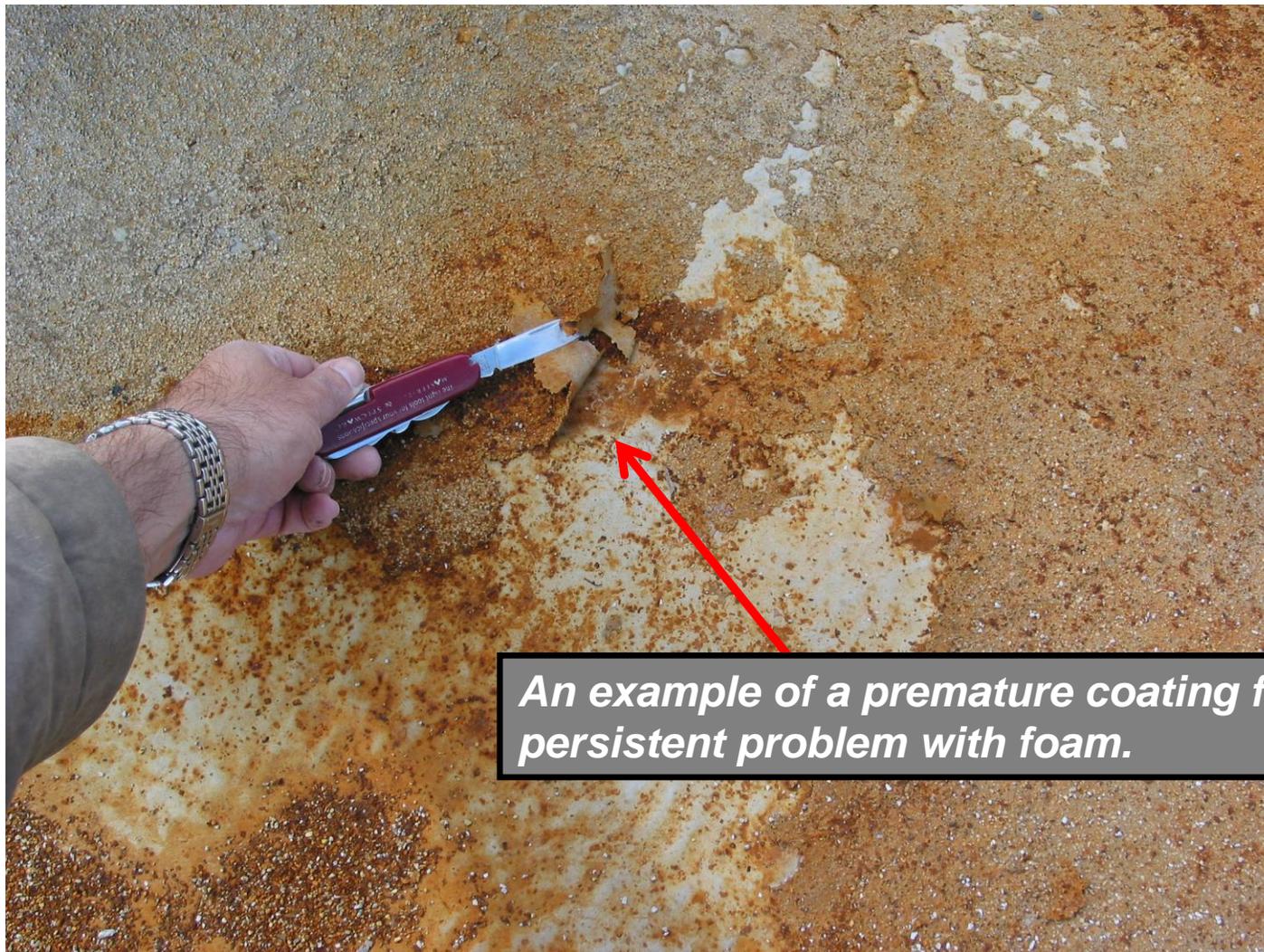






*Large seam split*





***An example of a premature coating failure – a persistent problem with foam.***



***Coating has delaminated after only a few years, exposing the foam to water intrusion.***



# Composition Shingle





# Peel and Stick



# Industrial Metal Roofs





***Improper design leads to Failures***