

Critical Building Envelope Details:

Where are the Problem Areas

Randy Smith, P.Eng.

Principal, Building Sciences

May 29, 2007



A. D. Williams
Engineering Inc.
Consulting Engineers

Introduction

- ✓ What is the building envelope
- ✓ What are the problems we find
 - Water Penetration
 - Premature Deterioration
 - Poor Performance
 - Many Upset Tenants & Owners
 - Litigation



Where are the problem areas

- ✓ Foundations
- ✓ Exterior Walls
- ✓ Windows
- ✓ Roofs



A. D. Williams
Engineering Inc.
Consulting Engineers

Back to the Basics

- ✓ Water Shed vs Drainage Plane
- ✓ Vapour Retarder vs Air Barrier
- ✓ 2 Kinds of Windows
- ✓ 3 Things you Need for a Leak
- ✓ Don't Screw with the Foundation or Roof
- ✓ Building Code is the **Minimum** Allowable Standard
- ✓ Redundancy Redundancy Redundancy



Foundation Problem Areas

✓ Poor Perimeter Drainage

- Where is the ground water
- Below-grade drainage systems
- Poor drainage away from the building
- Those pesky neighbors

✓ Waterproofing systems (or lack there of)

- Residential
- Commercial



Foundation Slides



A. D. Williams
Engineering Inc.
Consulting Engineers

Foundation/Wall Problem Areas

- ✓ Wood Frame Construction
- ✓ Single or Multi-family
- ✓ Rim joist area
 - Very difficult to install vapour retarder
- ✓ Foundation-to-wall joint
 - Inadequate exterior protection
 - Exterior grade elevation



Foundation/Wall Slides



A. D. Williams
Engineering Inc.
Consulting Engineers

Exterior Wall Problem Areas

✓ Poor Building Paper (Drainage Plane) Detailing

- Wood frame construction

✓ Poor Stucco

- Mix design
- Curing
- Wire
- Thickness



More Exterior Wall Problem Areas

- ✓ Poorly Sealed wall Penetrations
 - Mechanical vents/ducts
 - Electrical penetrations
- ✓ Deck-to-Wall Tie-Ins
 - Highrise
 - Wood-frame patio deck membranes
- ✓ Roof-to-Wall Tie-Ins



Exterior Wall Slides



A. D. Williams
Engineering Inc.
Consulting Engineers

Window Problems

- ✓ Residential Quality Windows in Highrise Buildings
- ✓ Water Leakage at the Head of Residential Windows
- ✓ Water Leakage in Composite Residential Windows
- ✓ Broken Nailing Flanges on Vinyl Windows
- ✓ Leakage Through Metal-Clad Windows



Window Pics



A. D. Williams
Engineering Inc.
Consulting Engineers

Roof Problem Areas

✓ Sloped Roofs

- Valleys
- Chimneys
- Poorly Sealed Penetrations
- Skylights
- No roofing felt under shingles
- No ice dam protection at eave
- Eavestroughing & Downspouts



Roof Slides



A. D. Williams
Engineering Inc.
Consulting Engineers

More Roof Problem Areas

✓ Flat Roofs

- Parapets
- Mech/Elec Penetrations
- Membrane Failures



More Roof Slides



A. D. Williams
Engineering Inc.
Consulting Engineers

Flashing Problems

- ✓ Flashing must not allow water to run down the face of the building



A. D. Williams
Engineering Inc.
Consulting Engineers

Flashing Slides



A. D. Williams
Engineering Inc.
Consulting Engineers

What are all These Problems Telling Us?

- ✓ Must pay attention to the small details, joints, corners, connections
- ✓ Building envelope construction is a group effort
- ✓ Choose the right materials for the right reasons
- ✓ Everything will eventually leak so know where the water will go, collect it, channel it safely to the exterior
- ✓ Build in redundancy because nothing is perfect
- ✓ Make your designs constructible



Thank You

“Concero Cautus Fragmentum”



A. D. Williams
Engineering Inc.
Consulting Engineers