Building Enclosure Detailing for Balconies

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Outline

→ Building science basics
  → Control layers (water, air, heat)
  → The 4 D’s (deflection, drainage, drying, durability)
→ Case studies
  → How and where bad stuff happens
  → How to do the tricky stuff right
→ A better way forward
Building Science Basics

→ Water control
→ Air control
→ Heat control
Roof, Deck, or Balcony?

- Roof
  - Separates interior and exterior space
  - The top of a building
- Deck
  - A roof that you also walk on
- Balcony
  - Outside building’s heated perimeter
  - A protection beyond the face of the building enclosure
Deck or Balcony?
Building Enclosure Functions

→ Support:
  → Loads – structural and environment

→ Finish:
  → Look good?

→ Control:
  → Heat flow – thermal barrier
  → Air flow – air barrier
  → Vapor diffusion – vapor barrier
  → Water penetration – water barrier
  → Light and solar radiation
  → Noise, fire, and smoke

→ All of these apply to balconies too!
Continuity of Control Layers

→ Balconies typically project through the vertical wall and interrupt the control layers
→ What happens to the control layers at the interface?
  → Where is the air barrier?
  → Thermal barrier?
  → Water barrier?
  → Vapor barrier?
How to design a detail:

- Identify the 4 control layers within each assembly
- Connect each of the layers across the detail
- Do not lift your pencil off the page
- Select appropriate materials to make the necessary transitions
  - There isn’t a ‘right’ way here
Cantilevered Balcony – Control Layers

Water barrier (red):
- Over a sloped and drained balcony surface
- The details are critical

Air barrier (green):
- Use the shortest path possible
- Prevent interior air from entering balcony soffit
- Vent soffit

Thermal barrier / vapor barriers
Lots of thought given to water control layer and rightfully so

Air barrier and thermal barrier continuity often overlooked

Difficult to reliably detail sheet membrane around penetrating joists

Spray foam often used for air and thermal control
Continuity of Air / Thermal Control Layers
The 4 D’s of Water Penetration Control

→ **Deflection**
  - Minimize the amount of exposure to bulk water - overhangs, drip edges, crickets
    - If it doesn’t get wet, it can’t leak

→ **Drainage**
  - Slope and drain all areas that are to the exterior of the water control layer

→ **Drying**
  - Wetting is OK if it dries before it causes a problem
  - Balcony and parapet walls – limited drying
  - Venting helps – if the air is dry

→ **Durability**
  - Use materials that can get wet
Case Studies

→ Lessons learned
Water Enters at Details!

- The field of the membrane, or the selection of the membrane, is rarely the culprit
- Membrane durability is important for longevity and durability, but most premature failures have little to do with membrane selection
- Continuity of water control layer at interfaces and details
- 2D details do not adequately depict the 3D interfaces
Water Enters At Details
→ Difficult to make metal flashing watertight
→ Include membrane below and provision for drainage
#1 – Metal Flashings / Copings
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![Diagram showing details of metal flashings and copings with questions about wall bracing, minimum slope, deck span, and structure between deck and joists.](image-url)
Drip Edges Matter
#2 – Membrane durability & maintenance

→ Liquid applied traffic coatings can work well... or poorly

→ Adequate thickness and reinforcement at joints in substrate critical
  → Plywood seams
  → Flashing transitions

→ Maintenance required
#2 – Membrane durability & maintenance
#3 – Overlooked Fascias

- Fascias need to be treated like walls
  - WRB
  - Drainage between cladding and WRB
  - Use rainscreen approach
- More exposed to water than most wall areas
- No ‘free’ drying from heat loss from interior space
→ Parapets often badly damaged
  → Higher exposure
  → Limited drying (no heat flow)

→ Details:
  → Tops
  → Guardwall to deck
  → Guardwall to wall
  → Through-wall scuppers

→ Repair:
  → Replace walls with rails
  → Fix the remaining details
#4 – Guardwalls (Parapets)
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#4 – Guardwalls (Parapets)
→ Concealed membrane with concrete topping slab
→ Edge draining design but limited ability for water to drain at w.p. level
→ Unvented soffits
→ Repair:
  → Remove and replace topping slab, membrane, and all transition details
  → Reframe with new cantilevered joists 3 ft. into interior of bldg.
#5 – Concrete Topping Slab
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Deck Unit 206
April 2, 2008
#5 – Concrete Topping Slab

Critical to have good drainage at w.p. level!

Water barrier + drainage behind fascia
Concrete balconies are not immune to deterioration
Numerous repairs required to exposed concrete buildings
Carbonation of reinforcing steel, freeze-thaw damage
Rebar corrosion, spalling
Often replaced with precast or steel
#6 – Structural Concrete Balconies
#7 – Non-Durable Materials
#7 – Non-Durable Materials

![Image of non-durable materials](image-url)
#7 – Emergency Shoring
#8 - Exhaust Vents
#8 - Exhaust Vents
How to Make Balconies Work
Cantilevered Balcony - Saddles

Can you spot them?
Cantilevered Balcony - Saddles

→ 3-dimensional integration of assemblies
→ Include a 3-dimensional detail
Continuity of Water Control Layer
Balcony Corner – Wood Frame
Balcony/Deck Edge – Concrete Frame
Balcony Corner Saddle Flashing
Balcony Corner Saddle Flashing
Balcony Corner Saddle Flashing
Balcony Corner Saddle Flashing
Balcony Edge Flashing – Concrete Topping

Metal Railing

Min. 20 ga. GSM cover plate anchored through spacer

Filter fabric adhered to cover plate with bead of sealant

P.T. Wood blocking slightly smaller than railing plate

Self-adhesive flashing reinforcing sheet over building paper under blocking

4" Concrete Topping Slab

Drainage composite

P.T. Plywood – slope to outside ¼" per ft. min.

(2) Layers of self-adhesive membrane

Strip of self-adhesive membrane over balcony edge – capture building paper on vertical wall
Guardwall Flashing Details

- Framing
- Wall Sheathing
- Sheathing Paper
- P.T. Wood Sloped Blocking
- Sloped Blocking Membrane Flashing
- Wall Membrane Flashing
- Sheathing Paper
- Corner Membrane Flashing
- P.T. Wood Strapping
- Metal Parapet Flashing
- Stucco Cladding
- Exterior Caulking
Parapet to Wall Flashing
A Better Way?

→ Avoid the hard details altogether
“Everything should be made as simple as possible, but not simpler.”

Albert Einstein
Pre-Finished Balcony

→ Balcony is a ‘bolt-on’ architectural component, but not part of building enclosure
→ Air, water, and thermal control layers continuous behind pre-finished balcony
→ Simplifies detailing – no saddles
→ Continuous water, air, thermal layers
Current Project

07 25 11  SELF-ADHERED MEMBRANE, LAP OVER METAL FLASHING

07 62 00  METAL FLASHING, EXTEND MINIMUM (6) INCHES UP WALL

05 50 00  1/4" STEEL PLATE AND L2X2X3/16 ANGLE SUPPORT, WELD TO STEEL FRAME

05 50 00  POWDER COATED, SLIP RESISTANT, INTERLOCKING ALUMINUM DECK TREAD ON ALUMINUM JOISTS

1/4" / 12"

BOLT-ON STEEL FRAMED BALCONY, SSD

05 50 00  STEEL KNIFE PLATE AND ANGLE AS REQUIRED BY BALCONY MANUFACTURER; 07 90 05 SEALANT ALL AROUND KNIFE PLATE, FLUSH WITH FACE OF STUCCO.
Current Project – Bay Area

Make ‘bolt-on’ component out of durable material:
- Preservative treated wood
- Precast concrete (coated?)
- Coated steel
Precast Bolt-On Balconies
Discussion + Questions

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