Parapet Wall Design
Brian Erickson, P.E., RRC  Ryan Krug -
8:30 am – 10:00 am
Speakers

• **Brian D. Erickson, P.E., RRC**
  - Vice President – Midwest, Pie Consulting & Engineering
  - Licensed PE in 6 states
  - Registered Roof Consultant
  - Iowa State University and University of Colorado
  - 3rd Speaking Opportunity at AIA MN!

• **Ryan Krug, BECxP, CxA+BE**
  - Project Manager, Pie Consulting & Engineering
  - Certified Building Envelope Commissioning Agent
  - Iowa State University
  - Curtainwall Guru – Trump Tower
Parapet Wall Design - Outline

- History of Parapets
- Weather/Air/Thermal/Vapor Barrier Integration
- Thermal Barrier Focus
- Construction Sequencing
- Curtainwall/Spandrel Parapets
- Wind Considerations
Parapet Wall Design

Brief History

Biblical Times - Deuteronomy 22:8 - "When thou buildest a new house, then thou shalt make a battlement for thy roof, that thou bring not blood upon thine house, if any man fall from thence."

London – Building Act of 1707 – Banned projected eaves; Brick parapets were required.

IBC – 705.11 – Parapets shall be provided on exterior walls of buildings.
  • Exceptions – Fire separation distance, floor footprint, etc.
  • 30 inches above the roof to wall intersection.
  • Same fire rating as the wall assembly.
  • Non-combustible faces for the uppermost 18-inches.

OSHA Standard 1926.502 – Fall protection systems criteria and practices.
Parapet Wall Design

Benefits

• Provide fall protection from the structure.
• Provide fire protection to the structure.
• Supplements design aesthetic.
  • Hide roof HVAC components.
• Reduce roof wind loads.
Parapet Wall Design Basics

- Slope the coping toward the roof
- Provide a waterproof membrane under the coping
Parapet Wall Design Challenges

- Challenging to ensure continuity to the weather, air, vapor, and thermal barriers.
Weather/Air/Vapor/Thermal Barriers

• **Weather Barrier** – The building assembly component which prevents moisture from infiltrating through the exterior wall assembly and damaging assembly or interior items.

• **Air Barrier** – The building assembly component which prevents transfer of air through the exterior wall assembly.

• **Vapor Barrier** – The building assembly component which manages water vapor transfer through the exterior wall assembly.

• **Thermal Barrier** – The building assembly component which impedes the flow of heat through the exterior wall assembly.
Weather Barrier
Weather Barrier
Weather Barrier
Air Barrier
Air Barrier
Condensation
Condensation
Thermal Barrier
Parapet Wall Design
Assembly Configurations & Thermal Modeling
Parapet Wall Design
Assembly Configurations & Thermal Modeling

As Designed Parapet at Steel Stud Web

As Designed Parapet at Cavity Mid-span
Parapet Wall Design
Assembly Configurations & Thermal Modeling

As Designed Parapet at Steel Stud Web

As Designed Parapet at Steel Stud Web With Roof Side Insulation
Parapet Wall Design
Assembly Configurations & Thermal Modeling

As Designed
Parapet at Cavity Mid-span

Modified Parapet at Cavity Mid-span with ccSPF on Interior of Exterior Sheathing
Parapet Wall Design
Assembly Configurations & Thermal Modeling
Thermal Barriers – Detailing/Sequencing
Roof – Air/Vapor Barrier

Roof Membrane

Wall – Air/Vapor/Weather Barrier
Thermal Barriers

(1) 12 ga. CONTINUOUS FORMED METAL WITH 3/4" PLYWOOD TO PROVIDE PARAPET GAP SUBSTRATE - FASTEN TO EXISTING METAL STUD RECEPTOR 8" O.C. STAGGERED

(1) 16 ga. CONTINUOUS Z-GIRT WITH WEEP HOLES 24" O.C. FASTENED WITH EPDM WASHED FASTENERS 16" O.C.

FULLY ADHERE ROOF MEMBRANE - LAP DETAIL MEMBRANE OVER EPDM AND INSTALL TERMINATION BAR WITH FASTENER 8" O.C.

SEAL TOP EDGE AND FASTENER HEADS WITH JOINT SEALANT

ASSUME 5% METAL STUD REMEDIATION AT EACH STUD ALONG THE PARAPET

(1) PLYWOOD SHEATHING

INFILL CAVITY OF STEEL STUDS WITH 2" SPF FROM MINERAL WOOL INSULATION TO THE THICKNESS OF THE ROOF INSULATION. HEIGHT VARIES DUE TO TAPERED INSULATION

REFER TO DETAIL 60101 FOR DETAILED ROOFING INFORMATION

EXISTING CONSTRUCTION SHADED

(1) INSTALL CONTINUOUS VAPOR BARRIER AND UPTURN ON CURB EXTEND UP TO VIN. 2" ABOVE REINFORCED PERIMETER STRIP

INFILL GAP BETWEEN EXISTING DECK AND PARAPET SHEATHING WITH NEW CONTINUOUS 20 GA. 6" X (GAP + 3") METAL ANGLE

GAP IN DECK VARIES FROM 1/2" TO 1"

(1) 4-INCH MINERAL WOOL INSULATION FIRESTOPPING AT SLAB EDGE AND STEEL STUD CAVITY INSTALL BRACING AS REQUIRED TO SUPPORT INSULATION
Integration
Integration
Integration
Integration
Parapet Wall Design
Curtain Wall
Parapet Wall Design
Curtain Wall

• Glass/aluminum are the weather, air, and vapor barriers for a glazing system.

• Typically, foil faced mineral wool or metal back pans are utilized in conjunction with insulation to increase the system U-Value.

• Potential Problem – Air migration through discontinuities of the interior air barrier could result in condensation formation within the glazing system.
  • Glazing framing connections.
  • Anchor locations.
  • Slab lines.

• Ideally, fully sealed back pans with a discontinuous gasket at the horizontal member would be utilized to manage potential condensation through the glazing weep system.
Curtain Wall - Parapets

- Treated wood blocking
- Continuous sealant
- Coping panel by MTL panel MFR
- Roof membrane flashing lap over parapet, TYP.
- 4" cold formed metal stud framing
- 5/8" glass mat faced exterior gypsum sheathing
- 3" rigid insulation
- Spandrel glazing; insulated, 1" thick
- 2" curtain wall insulation
- Spandrel glazing
- Aluminum curtain wall window system - unitized (CW-01) 7 1/2" depth
- Mullion cap extension by CW MFR
Curtain Wall - Parapets

1. Head Detail @ Parapet
   - System: Epoxy 560 (1/2" x 4")
   - Finish: Clear Anodized

2. Inter. Horiz. @ Back Pan
   - System: Epoxy 560 (1/2" x 4")
   - Finish: Clear Anodized

Frame Dimension:
- D.O.: 2 1/2"
- H.D.: 1 1/4" + 6"

Notch:
- 12 Ga. Galvanized Steel Plate - Must Extend to Primary Seal (By Others)

Anchor:
- "F" Anchor (#KX21)
- "M" Anchor (#KZ89)

Insulation:
- 2" Rigid Insulation (By SuperL)

Pan:
- 22 Ga. Back Pan (By SuperL)

Aluminum Front Pan:
- 1/8" Aluminum Front Pan
- Attach w/ Del Sided Tape and Seal Perimeter (Finish to Match Curtainwall)

Architectural Note:
1 1/2" Dimension is the maximum possible due to anchor location.
Curtain Wall - Parapets
Curtain Wall - Parapets
3/4" Plywood

Membrane Flashing

2 Layers 2" Mineral Wool Insulation

Air Barrier Transition Membrane Over To Foil Face of Insulation - Set With Soft Joint Before Plywood/Insulation

1" x 1 1/2" x Cont. Aluminum Tube Screw To Vertical Mullions

Seal Insul To Edge of Mullions With Alum. Tape

Low Roof Deck 126° - 7°

Air Barrier

Air Barrier Transition/ Membrane Set Before Blocking

Tape Reinforce At Air Barrier/ Soft Joint

Vapor Retarder Scrim Face On Warm Side. Provide 1" Infull Strips At Each Vert. Mull - Seal To Adjacent Scrim
ARCHITECTURAL PRECAST

24 GA PREFIN METAL COPING WITH SPLICE PLATES, KEEPERS, AND GASKETED FASTENERS

MRT WOOD BLOCKING

ROOF MEMB UP WALL AND OVER PARAPET

24 GA. METAL COUNTER FLASHING

MOD BIT ROOF ON RIGID INSUL OVER VAPOR BARRIE

SPRAY APPLIED CEMENTITIOUS FIRE PROOFING AT BEAMS, COLUMNS, AND MTL ROOF DECK

ARCHITECTURAL PRECAST CONC PANEL
Wind Resistance – Copings/Blocking

- IBC Section 1504.5 – Edge Securement for Low-Slope Roofs
  - Low slope membrane roof system metal edge securement, except gutters, shall be designed and installed for resistance in accordance with ANSI/SPRI ES-1, except the basic wind speed shall be determined from Figure 1609.

5.1. NAILER SECURED SYSTEMS
The attachment of the nailer to the structure shall be sufficient to resist the design wind uplift load and the load determined under Section 7.1. At outside building corners regions, nailer securement shall be designed to resist a load 1.5 times the load determined under Section 7.1. Wood nailers shall have minimum thickness of 1.5 inch (38 mm). For edge flashings used to secure the roofing (e.g., gravel stops), the substrate (e.g. nailer) shall extend at least 1/2 inch (13 mm) beyond the back edge of the horizontal flange of the roof edge device. The following fastener safety factors shall be applied to design loading.
Wind Resistance – Copings/Blocking
Questions?

Yeah, I have a lot of questions.
Questions?

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