8120 – Roof Systems

1.1 A NOTE ON ILLUSTRATIONS

A. All figures in this chapter section are simplified versions of a possible architectural detail/assembly and are not intended as construction details.

1.2 RECOMMENDED WALL-LOW ROOF TRANSITION

A. Application

1. Low Roof to Vertical Masonry Wall

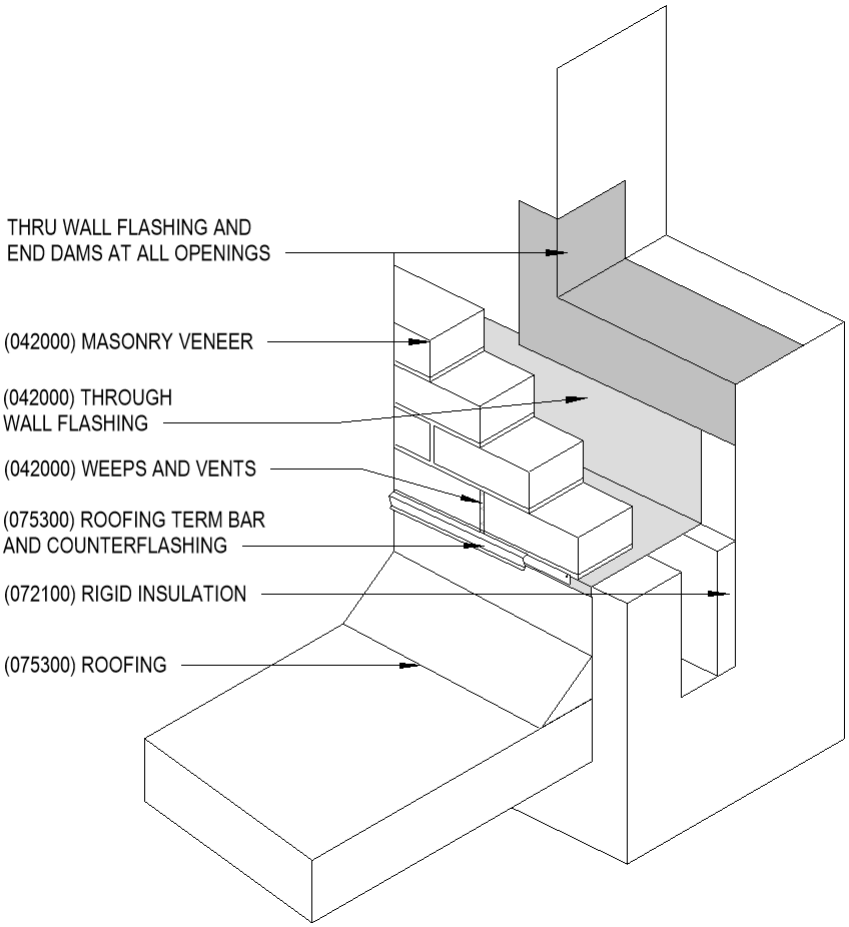
B. Components

1. Roof and Wall Systems – Selected by Design Professional
2. Metal Flashings and Counter Flashings – Selected by Masonry (Sub)Contractor
3. Vertical leg of metal flashings at inside of masonry wall could be anchored with termination bar
4. Air Barrier System Required

    a. Self-adhering sheets
    b. Close-cell polyurethane spray foam

C. Performance

1. Prevent water from entering cavity and into interior space.
2. Provides path for water in cavity to exit to exterior.
3. Detail roof/wall intersections to provide a continuous air barrier system.
4. **Figure 1.2-A: Recommended Wall-Low Roof Transition**



1.3 SHINGLE ROOF

A. Application

1. Steep Roofing
2. Slope – Minimum 4:12
3. Hip roofs require special consideration

B. Components

1. Roof Membrane

   a. Shingles
   b. Underlayment
   c. Nailable Sheathing

2. Roof Insulation

   a. (Vented) nail board/insulation (2” minimum air space – care must be taken during construction to maintain this air space). The designer is to check with the manufacturer on maximum length of vented nail board insulation from eave to ridge to confirm adequate ventilation flow.
   b. Rigid insulation: Minimum R-20 c.i.

3. Vapor Retarder

   a. Where required. Refer to Chapter 9.

4. Structural Support

   a. Steel deck or cementitious deck.

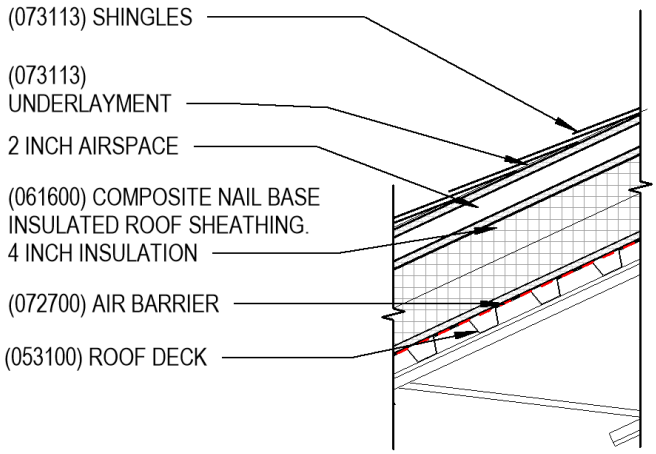
5. Air Barrier System Required
6. Ice dam protection at all eaves and valleys

C. Performance

1. Features

   a. Detail roof/wall and roof plane intersection and all openings and penetrations to provide a continuous air barrier system.
   b. Refer to NRCA Roofing Manual: Chapter 3, “Condensation Control & Ventilation for Steep-Slope Roof Assemblies”

2. **Figure 1.3-A: Shingle Roof System**



1.4 METAL ROOF WITH RIGID OR BATT INSULATION

A. Application

1. Steep Roofing for both insulation types is ideal, but absolute minimum for batt insulation is .25:12
2. For Rigid Insulation:

    a. Slope – Minimum 3:12
    b. 2:12 will be considered for uncomplicated roofs.

B. Components

1. Roof ***Surface***

    a. Metal roof

2. Roof Insulation

    a. Batt/blanket insulation
    b. or Rigid Insulation

3. Vapor Retarder

    a. Where required. Refer to Chapter 9.

4. Thermal Barrier

    a. Where required. Refer to Chapter 9.

5. Structural Support

    a. Roof purlins for batt insulation.
    b. Steel roof deck or cementation deck for rigid insulation.

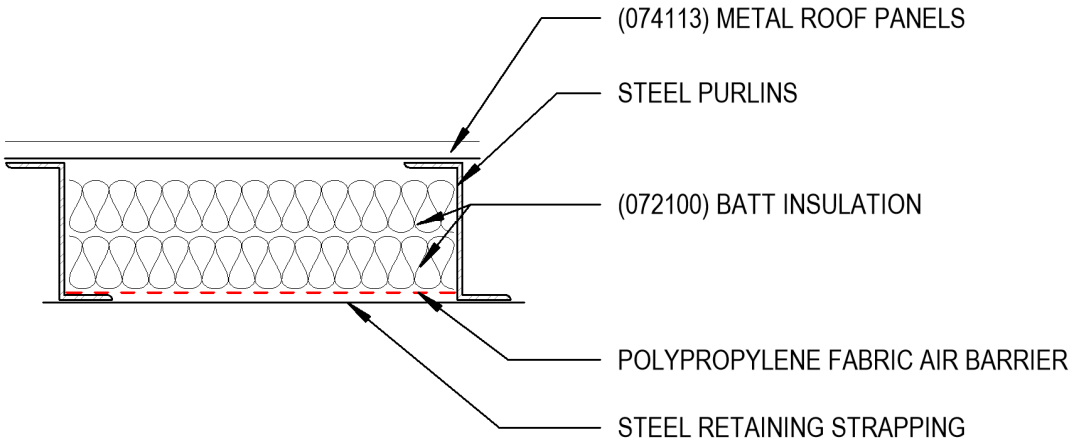
6. Air Barrier System

C. Performance

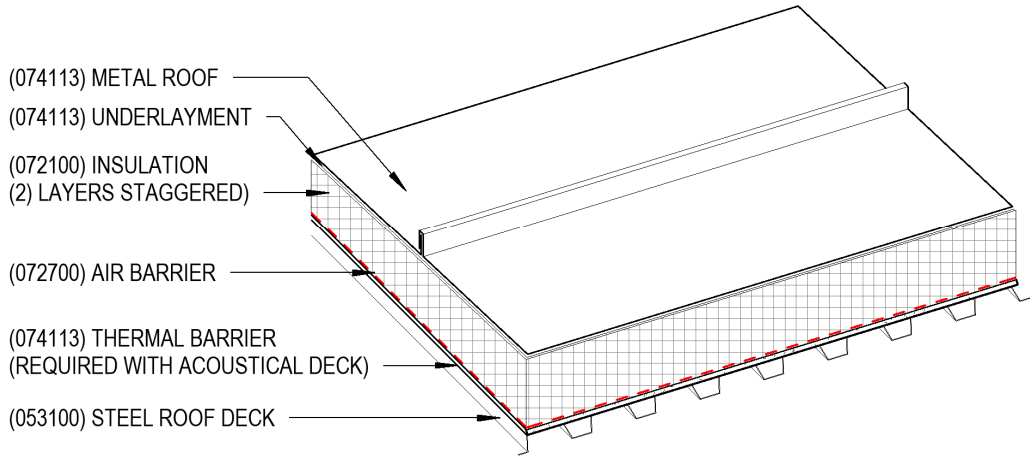
1. Features

    a. Detail roof/wall intersections and all openings and penetrations to provide a continuous air barrier system.

2. **Figure 1.4-A: Metal Roof with Batt Insulation**



3. **Figure 1.4-B: Metal Roof with Rigid Insulation**



1.5 RECOMMENDED ROOF RIDGE

A. Application

1. All sloped roof ridge conditions.

B. Components

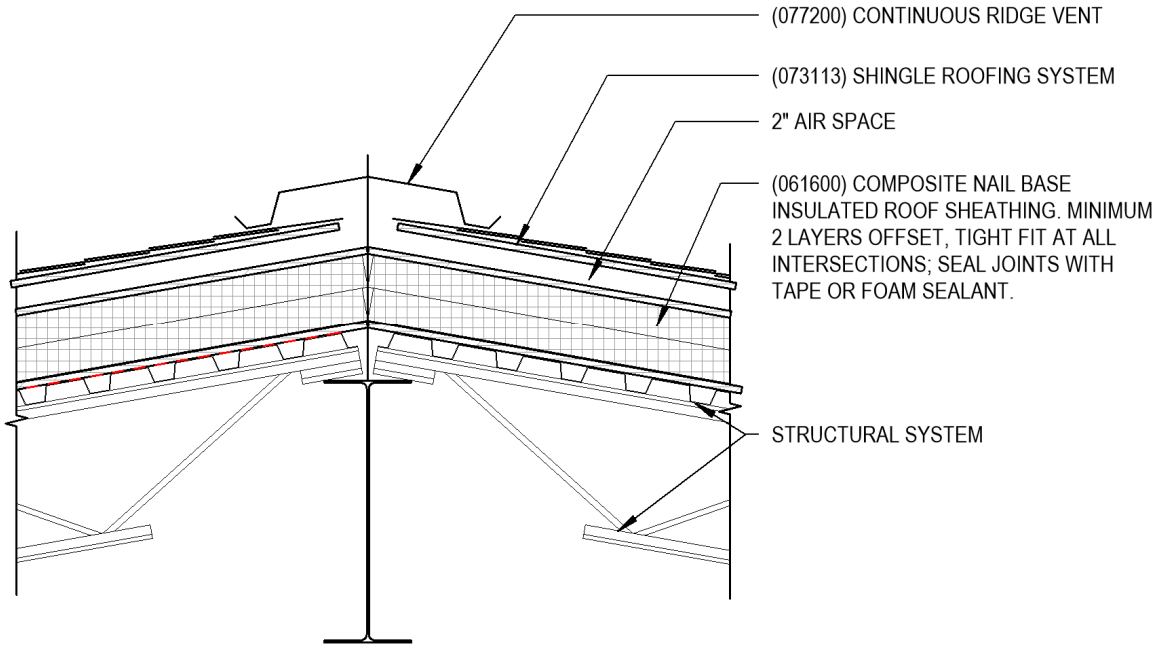
1. Roof System – Selected by Design Professional
2. Structural System – Selected by Design Professional
3. Air Barrier System Required

C. Performance

1. Features

   a. Detail all roof plane intersections and all openings and penetrations to provide a continuous air barrier system.

2. **Figure 1.5-A: Recommended Roof Ridge**



1.6 BUILT-UP ROOFS

A. Application

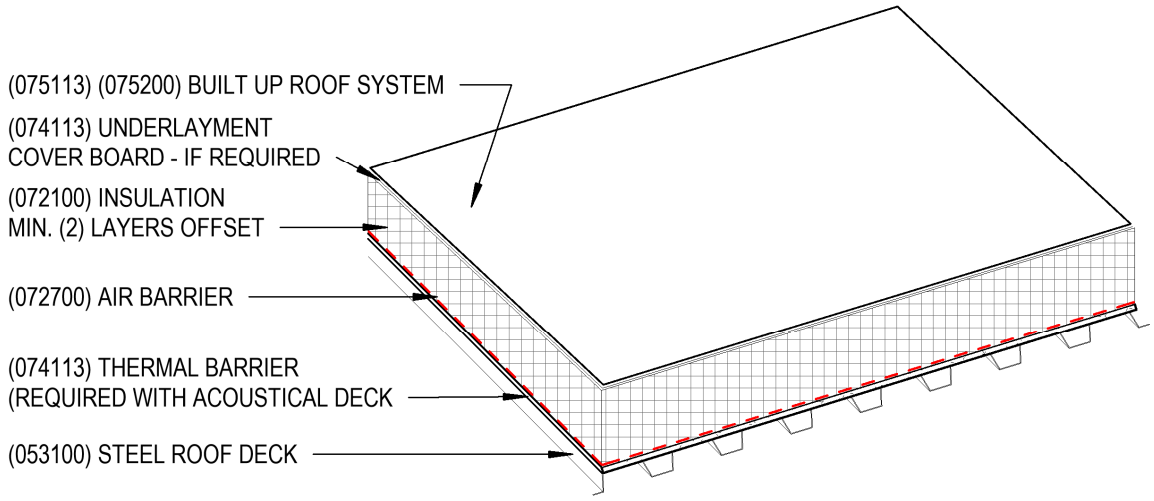
1. All low sloped roof areas
2. Slope – minimum 0.25:12

B. Components

1. Roof ***Surface***
    a. Built-up/polymer modified bitumen
2. Cover Board - if required
3. Roof Insulation
    a. Rigid insulation
4. Vapor Retarder
    a. Where required. Refer to Chapter 9
5. Thermal Barrier
    a. Where required. Refer to Chapter 9
6. Structural Support
    a. Steel deck or cementitious deck
7. Air Barrier System

C. Performance

1. Detail roof/wall intersections and all penetrations and openings to provide a continuous air barrier system.
2. **Figure 1.6-A: Built-Up Roof**



1.7 MEMBRANE ROOF

A. Application

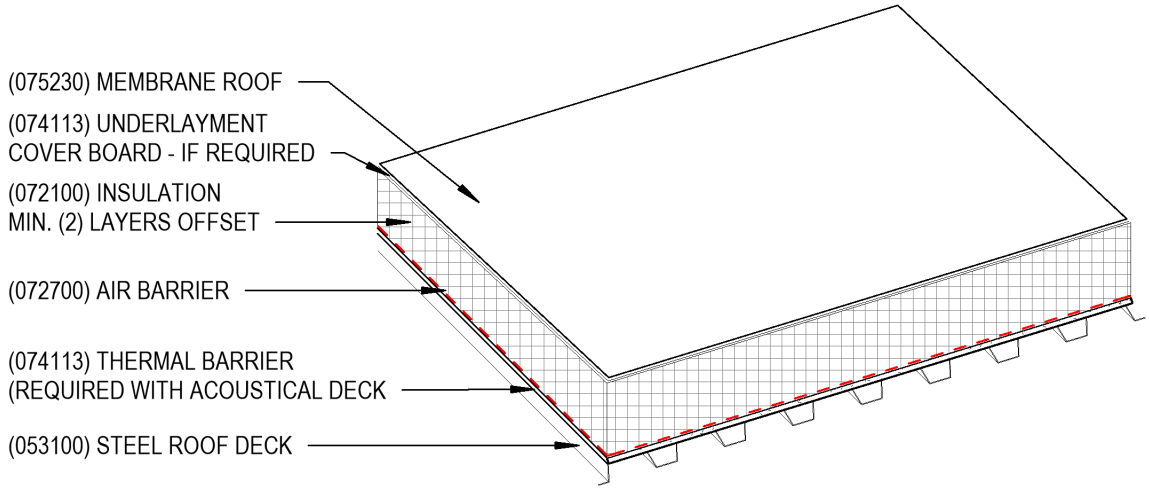
1. All low sloped roof areas
2. Slope – minimum 0.25:12

B. Components

1. Roof membrane
    a. Thermoplastic/thermoset
2. Cover Board/Slip Sheet
    a. Coverboard is required.
    b. ***Slip sheet*** where required. Refer to Chapter 9
3. Roof Insulation
    a. Rigid insulation
4. Vapor Retarder
    a. Where required. Refer to Chapter 9
5. Thermal Barrier
    a. Where required. Refer to Chapter 9
6. Structural Support
    a. Steel deck or cementitious deck
7. Air Barrier System
    (The roof membrane is the air barrier in this system)

C. Performance

1. Detail roof/wall intersections and all penetrations and openings to provide a continuous air barrier system.
2. **Figure 1.7-A: Membrane Roof**



Footnote: Coverboard is required.

1.8 ROOFING LIFE CYCLE AND COST COMPARISON

A. Introduction

1. Roofing is a very important piece of any project. It is a critical defense against water and weather. There are many different systems out there, but they have differences in cost and maintenance that should be considered as the choice is made of which system to pursue. The below table compares installation cost, warranty coverage, expected life, and required maintenance of the commonly installed roofing systems on schools.

Roofing Life Cycle Cost Study

Material	Material + installation per SF	Warranty in years (varies by manufacturer)	Expected system service life in years	Anticipated number of replacements in 50 years	Recommended Maintenance	Frequency of Maintenance	Construction Considerations	Cost of Maintenance	Maintenance per year	Total life cycle cost
ROOFING										
TPO	**$$**	60 Mil - 20 yrs 72 Mil - 25 yrs 80 Mil - 30 yrs	20	2	Maintenance program would add min 30-50% of expected lifecycle.	2 times a year	Ensure tapered insulation eliminates ponding.	$2,500 / year	■	▲▲
PVC	**$$$**	60 Mil - 20 yrs 72 Mil - 25 yrs 80 Mil - 30 yrs	20	2	Maintenance program would add min 30-50% of expected lifecycle.	2 times a year	Ensure tapered insultation eliminates ponding.	$2,500 / year	■	▲▲▲
EPDM	**$$**	20-25	40	1	Regular maintenance program and inspections.	As needed 2 times a year	Tight seams along any edges to slow shrinkage.	$1000 / year	■	▲▲
Metal	**$$$$**	20-25	30 until recoating	N/A [1]	Routine every 5 years. Recaulk counter flashings and pipe penetration boots.	Once every 5 years	Complexity of Roof Geometry greatly affects cost/SF.	Based on Contractor and size/scope of project	Varies	▲▲
Shingles	**$$**	25-30	15-20	2-3	Regular maintenance program and inspections. Patch leaks as they come about.	2 times a year As needed	Proper overlap and exposure to limit damage or roof failure.	Based on Contractor and size/scope of project	Varies	▲▲

[1] Note 1 - The Metal Roof expected life is approximately 50 years. It would need replaced at this time.

KEY	Material + installation per SF
$	lowest
$$	low
$$$	medium
$$$$	high
$$$$$	highest

KEY	Maintenance per SF
■	lowest
■	low
■	medium
■■	high

KEY	Total life cycle cost
▲	low
▲▲	medium
▲▲▲	high

END OF SECTION