	Title: YALE OFFICE OF FACILITIES PROCEDURE MANUAL Chapter: 01 - Yale Design Standard Division: 07 00 00 Thermal and Moisture Protection	Section: <b>07 50 00</b> Requirements for Membrane Roofing
		Date: March 2024
		Author: Office of Facilities

## **PART 1 - INTRODUCTION**

### **1.1 PURPOSE**

This section contains general design criteria for membrane roofing and roof insulation.

## **PART 2 - GENERAL DESIGN REQUIREMENTS**

### **2.1 SYSTEM DESIGN AND PERFORMANCE REQUIREMENTS**

Membrane roofing systems must meet the quality standards contained the National Roofing Contractors Association roofing and waterproofing manual.

#### **A. Minimum Roof Slope**

1. Low-sloped roofs are defined as having a minimum of slope of 1/4"/ft (1:48 pitch). Dead-level roofs are not permitted.
2. Steep roofs are defined as having a minimum of 3/12 pitch.
3. Water conductors or rain water leaders must slope at least 1/8"/ft (1:100).

#### **B. Roof Movement**


1. Roof designs must allow for expansion and contraction as required by the building design or membrane used.
2. Provide control joints that divide roofs into areas not exceeding 150' in length in either direction. Provide full-height, wood blocking expansions joints where there are building expansion joints.

#### **C. Ease of Service**

1. Roof systems must be inspectable and maintainable.
2. All roofing components (not just roof covering) must be easily accessible by maintenance personnel on foot, without the use of portable ladders or other portable devices.
3. Rooftop fixtures must be serviceable by means of simple parts replacement, minimizing the time required on the roof, and eliminating the need for repair work in inclement weather.
4. Provide walking surfaces from the rooftop access to, and around, the perimeter of roof-mounted equipment.

#### **D. Roof Security**

1. Consider the roof area and all roof openings as unsupervised.
2. Fixed homogeneous elements must have a Class I forced entry resistance rating in accordance with ASTM F1233.

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3. Roof openings and assemblies must have at least a Class I forced entry resistance rating in accordance with ASTM F 1233 and a Grade 10 rating in accordance with ASTM F 476 (R96), adapted to suit the assembly.

E. Grease and Chemical Resistance

Wherever grease, oils, or chemicals might be introduced onto the roof, provide roofing materials that are not damaged by such leakage.

F. Ice

Design to avoid damage due to ice formation and buildup on roofing and in water conductors.

G. Membranes protection

Except for EPDM & PVC roofs, all membranes must be protected.

H. Existing Roofs


1. Preserve existing roofing elements in accordance with the project program. New roofs must match adjacent existing roofs.
2. Remove existing roofing elements for new construction in accordance with the project program.
3. Unless otherwise recommended or permitted, remove existing roofing down to the decking.
4. Inspect and clean existing leaders. Replace existing drains and leaders when necessary. Provide for redundancy in the drainage system.
5. Where deficient, increase the roof system's thermal efficiency.
6. Check the load capacity of the existing roof structure to ensure that it can accommodate the proposed roof.

I. High Humidity Environments

1. When roofing over a high humidity environment, provide a vapor barrier on the warm side of the roof insulation. In accordance with ASTM E-96, Procedure A, provide a barrier with a vapor transmission rating that does not exceed 0.25 perms.
2. Do not apply a combustible vapor barrier directly to a metal deck.

J. Roofing Accessories

1. Roof-mounted equipment must rest on curbs that are at least 8" high and extend 8" above the roof membrane. Coordinate the design with mechanical systems to ensure adequate accessibility for maintenance.
2. Roof penetrations for pipes and ducts must have sleeves that are at least 8" high, boots or curbs with overlapping flashing, and hoods and/or draw bands with caulking flanges. Sleeves, boots, and curbs must be properly flashed and tied into the roofing system.

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## 2.2 MATERIALS

Provide membrane roofing and roof insulation materials that conform to the following standards. Inverted roof membrane assemblies are not permitted.

- A. Asphalt System
  - Four-ply asphalt roofing system, with asphalt-saturated, glass-fiber felts
  - Manufactured by Bird, Celotex Corp., GAF, or an approved equivalent
  - Clean, smooth river gravel conforming to ASTM D 1863 specifications
  - 20-year system warranty
  
- B. Coal-Tar System
  - Four -ply coal-tar system, with asphalt-saturated organic felts
  - Manufactured by Allied Signal (Black Armor) or an approved equivalent
  - Clean, smooth river gravel conforming to ASTM D 1863 specifications
  - 20-year system warranty
  
- C. Modified Bituminous Membrane Roofing System—Non-Ballasted
  - 160-mil thick, SBS modified bituminous sheet roofing membrane
  - Manufactured by Johns Manville or an approved equivalent
  - MBR cold application adhesive
  - Flashing material same as the roofing sheet
  - 20-year warranty
  
- 4. Other Roofing Systems
  - Other roofing systems approved by Yale University

## 2.3 ROOF INSULATION

- A. Insulation must have a five-year performance record. Tapered insulation must conform to a 45° or 60° layout.
- B. The roof system design must not cause the dew point to occur at or near the surface of the roof deck.
- C. Roof areas must be sloped for positive drainage.
- D. Bituminous membrane roofing systems must be rigid, glass fiber boards with an integrally-bonded top covering of saturated felt or Kraft paper.
- E. Single-ply membrane systems must conform to the following standards.
  - 1. Isocyanurate insulation board:

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- Faced on both sides
- Density of 2 lbs/ft<sup>3</sup>
- Minimum compressive strength of 25 psi
- Insulation value of k =0.15
- Manufactured by NRG Barriers, Inc. (Barrier Board) or an approved equivalent

2. Extruded polystyrene:

- Compressive strength of 20psi
- Manufactured by Dow Chemical (STYROFOAM) or an approved equivalent

2.4 ACCESSORIES OR SPECIAL FEATURES

- A. Provide prefabricated, concrete walkway pavers for roofing use.
- B. Provide prefabricated curbs manufactured by Conn-Fab or an approved equivalent.

Date	Description of Change	Pages / Sections Modified	ID
12/1/23	Template update	-	Office of Facilities