

Roof Design Considerations

Information Sheet



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- Different values will be required for summer and winter conditions due to differences in air layers immediately above the roof surface and immediately below the roof deck.
- Climate considerations and mechanical efficiencies are provided in tabular form for most major cities and typical equipment types.
- Performing calculations for two or more insulation thicknesses or types will allow for a reasonably accurate comparison of the cost of additional insulation to the value of energy savings.

Roof Drainage

Why Roofs Should Drain

- Standing water can result in deck deflection and possible structural damage.
- Water on the roof can promote vegetation, fungi and bacterial growth.
- In the event of an opening in the roof membrane, standing water can significantly worsen damage to the roof system, the building itself, and interior contents by providing a reservoir of water ready to gravitate through the membrane opening.
- Required by model building code.
- To prevent premature deterioration of roof membrane and flashing assemblies.

How to Obtain or Improve Drainage

- Provide structural slope in the deck assembly.
- Install a tapered insulation system. For recommendations on tapered roof insulation to provide slope for drainage, contact the GAFMC Technical Hotline at: 1-800-766-3411.
- Install tapered lightweight insulating concrete.
- Add additional drains.
- Use crickets, saddles and sumped drains.



Drainage Requirements

- Proper and adequate drainage is required and is the responsibility of those involved in the design and construction of the roof substrate and supporting structure. GAFMC recommends at least 1/4" per ft. slope with proper grading to and placement of outlets. Guarantees will not cover leaks or damages in areas of a roof that pond water. GAFMC defines "ponding" as water that does not drain or dissipate from the roof surface within 48 hours after precipitation ends. Ponding can also result from other water sources, including improperly piped air conditioning condensate and steam condensate lines.

About Roof Drains

- A roof will drain free of water only as rapidly as drains and leaders will allow. When interior roof drains are used, they should be properly located and sufficient in number and size to drain all accumulated water from the surface of the roof in accordance with the local code. Special consideration should be given to the location of the drains and/or scuppers and gutters to insure their usefulness when deflection of the decking may reasonably be expected to occur after its installation.
- Roof drains designed to lengthen the period of drainage by metering the flow of water to storm sewers and constructing drainage of the roof in conformance with certain codes are at best hazardous to the overall performance of a roofing system. Anything that reduces good, immediate drainage of a roof presents a hazard.

- The size and locations of drains will vary with the slope of the deck, the roof surface (smooth or gravel), and the intensity of the possible maximum rainfall in the areas in which the building is to be erected. Many roof problems can be traced to improper spacing of drains, insufficient size of drains and leaders, inadequate gutter and valley drainage, and lack of scuppers and overflow drains.
- Drains should be appropriate size to allow for rapid removal of water according to local codes, maximum expected rainfall and ANSI requirements.
- Always recess drain heads below roof surface level to allow immediate water runoff. Drains and drain flashing shall be set a minimum of 1" (25 mm) below the roof level and located at least 18" (46 cm) away from all walls. Where the building has parapet walls, it is often necessary to form crickets with a definite high point between proposed drains and a definite low point at the drain location. Tapered insulation should be used at all drain edges to sump drains.
- Drains should not be less than 3" (2.6 cm) in diameter. When the location of drains has been determined, the actual roof areas draining to each outlet should be computed.
- Drains should be located to avoid forcing water to flow beyond a sharp turn. Intermediate drains should be located at not over 75 ft. (22.86 m) to 50 ft. (15.24 m) intervals for steep roofs.
- Outlets should always be provided with suitable strainers to prevent debris from clogging the outlet or leader. Strainers should be made of a corrosion resistant material.
- Leaders: The cross sectional area of a leader should be uniform for its entire length. Tapered leaders may cause choking or backing up of water flow. The cross sectional area of the leader should be no less than the cross sectional area of the drain outlet.
- Provisions should be made to prevent leaders from freezing below the roof line.
- Overflows are a safety factor and should be installed above every drain/scupper. When they are eliminated to satisfy architectural requirements, if allowable by local building codes, adequate provisions should be made to increase the size of the drains and leaders. Overflows should be installed in accordance with local building codes and below the counterflashing.
- Gutters should be larger, never smaller, than the leader. When leaders are spaced more than 50 ft. (15.24 m) apart, the size of the gutter should be increased 1" (25 mm) for every additional 20 ft. (6.10 m) between leaders. When leaders are spaced less than 50 ft. (15.24 m) apart, a gutter the same size as the leader can be used providing the leader is not less than 4" (10 cm).
- The outside edge of the gutter should be at least 3/4" (19 mm) lower than the roof level or eave so that water will not back up or stand on the roof in case the leader becomes clogged.