



**Physical Plant Administration
Facilities Maintenance Department**

ROOF INSPECTION & MAINTENANCE

All roofs require periodic inspection and maintenance in order to perform as designed and to provide a long and effective service life. Periodic inspection and maintenance is also typically required by roofing system manufacturers to keep roofing warranties in full force and effect. Although all building owners should establish a periodic roof inspection program, inspection and maintenance of any roof should be undertaken only by qualified persons who are familiar with safe roofing practices, including all applicable occupational, health and safety regulations relating to the roofing and construction industries.

Because modern roofing systems contain a wide variety of components and installation techniques, all roof inspections should be conducted by a licensed roofing contractor or similar roofing professional. Typically two inspections should be conducted each year, one in the spring and one in the late fall. If the roof is warranted, at least one roof inspection each year should be conducted by the licensed contractor who originally installed the roof.

Please note that the cost of periodic inspection is typically not included in the original cost of a manufacturers warranty. Accordingly, the building owner should contact a licensed contractor to obtain a proposal for ongoing inspection and maintenance services.

INDEX TO INSPECTION AND MAINTENANCE GUIDELINES:

Section	Subject
A.	Roof Traffic
B.	Contaminants
C.	Drainage
D.	Wind Storm Damage
E.	Moisture Infiltration

F.	Roof Membrane Seams
G.	Base Attachments
H.	Inspection Checklist

A. Inspecting ForROOF TRAFFIC

INTRODUCTION:

Almost all roofing systems are subjected to some amount of foot traffic. Typically, roof traffic is necessary to service roof-top equipment. Occasionally, roofs may also be subjected to unauthorized foot traffic. Because roof traffic can damage the roofing system, periodic inspection is very important to assure that any damage is identified and addressed quickly.

WHERE TO LOOK:

1. Roof Access Points. The roof surface area immediately adjacent to a point of access, such as a ladder, hatch or door typically receives more foot traffic than any other area of the roof.

2. Walkways and "Natural" Pathways. Even if a walkway system is provided, always look for the "natural" pathway, or the most direct route between access points and areas of frequent maintenance. If roof walkways are installed in a square or right angle configuration, look for diagonal "short cuts" between adjoining walkways.

3. Rooftop Mechanical Equipment. Look around any equipment that requires periodic service.

4. Litter. The presence of bottles, cans or other litter is usually an indication of roof traffic and use.

WHAT TO LOOK FOR:

1. Cuts & Punctures. Small cuts in a roofing membrane are difficult to detect if the membrane is covered with a layer of dust or dirt. If cuts and punctures are suspected, the membrane should be cleaned with water and inspected. Most cuts and punctures will produce small bubbles in a film of water applied to the surface of the membrane.

2. Compressed or Crushed Roof Insulation. Most roof insulations have relatively low compressive strengths and can easily be compressed or crushed if traffic loads exceed the strength of the insulation. Crushed insulation can be indicated by the presence of ponding water and "tented" insulation fasteners which did not compress along with the insulation.

REMEDIAL ACTIONS:

1. Emergency Repair of Small Cuts & Punctures. Most single-ply cuts and punctures can be repaired temporarily by covering the cut or puncture with duct tape. Clean the membrane around the cut with a non-abrasive cleaner and apply a piece of duct tape extending beyond the cut or puncture at least one inch in all directions. Most cuts and punctures in asphalt membranes can be repaired temporarily by applying plastic roof cement to the affected area. Make arrangements for a permanent repair as soon as possible.

2. Permanent Repair of Cuts & Punctures. Permanent repair of cuts and punctures should be performed by a licensed roofing contractor.

3. Compressed or Crushed Roof Insulation. Insulation which has been crushed should be replaced with new insulation. Because this procedure will also require extensive repairs to the roofing membrane, this work should be performed by a licensed roofing contractor

PREVENTATIVE ACTIONS:

1. Roof Walkways. If roof traffic is extensive, the installation of a new or an enhanced roof walkway system should be considered.

2. Roof Access Log. In order to control and monitor roof access, procedures should be established to record the personnel, purpose, time and duration of all rooftop visits.

B. Inspecting ForCONTAMINANTS

INTRODUCTION:

Although most roof membranes provide outstanding resistance to natural weathering, their durability can be adversely affected by contact with many organic substances, including oils, fats, and organic solvents. Because exposure to these types of contaminants will cause many roofing membranes to lose strength and resiliency, periodic inspection is very important to assure that any damage is identified and addressed quickly.

WHERE TO LOOK:

1. Air Conditioner Compressors. Frequently, air conditioning units will leak oil, or oil may be spilled during periodic maintenance.
2. Kitchen Exhaust Fans. Grease from cooking exhausts can accumulate, especially if filters are not cleaned frequently.

WHAT TO LOOK FOR:

1. Membrane Swelling. Some single-ply membranes, such as EPDM, will exhibit swelling or buckling of the membrane. This is an indication that the membrane has absorbed the contaminant and that fundamental physical properties of the membrane have been compromised.
2. Membrane Splitting & Cracking. Contact with oils or organic solvents can embrittle asphalt roofs and some single-ply membranes by accelerating the loss of lighter weight components.

REMEDIAL ACTIONS:

1. Membrane Swelling, Splitting or Cracking. Membrane which has swelled or cracked should be replaced by a licensed contractor.

PREVENTATIVE ACTIONS:

1. Redundant Membrane Layer. If contamination, especially from cooking exhausts, is considered to be chronic, a redundant layer of roofing membrane should be applied around the exhaust vent and the roof surface area typically affected by grease deposits. This additional layer should be installed by a licensed roofing contractor.
 2. Grease Traps. A number of proprietary grease traps are available which can be placed around exhaust units to absorb fats and grease. Typically, these units will require periodic maintenance to function properly. These units can be installed by any contractor competent in sheet metal work, but the installation should be coordinated with a licensed roofing contractor.
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C. Inspecting ForDRAINAGE

INTRODUCTION:

Ponding or standing water can cause problems for both asphalt and single-ply roofing systems. Because asphalt compounds are not inherently resistant to the sun's rays, most modified bitumen and built-up roofing membranes use either a layer of factory-applied granules, a field-applied liquid coating or a layer of roofing gravel to protect the membrane from ultraviolet degradation. Under constant exposure to standing water, however, granule and gravel coatings will tend to wash off and liquid coatings may blister and peel. Once this important coating is removed, the underlying asphalt membrane will begin to degrade due to direct exposure to sunlight. Although single-ply roof membranes provide excellent resistance to water and sunlight, the potential for damage to the roof is also significant when water is allowed to stand on a roof. A small cut or puncture in the roof membrane may cause little damage on a well-drained roof surface, but the same puncture located in an impacted drainage area can produce extensive damage to the roof insulation, roof deck and building contents. Although effective roof drainage can be achieved through a variety of methods, all roofs should be designed and maintained to provide a consistent and effective path for water to completely drain off and away from the roof surface within 24 to 48 hours of a rain storm. Effective drainage must also accommodate build-ups of snow and ice that may typically occur during winter months.

WHERE TO LOOK:

1. Mid-Span of Roof Beams and Joists. Because most horizontal structural members deflect in the center of the span, ponded areas are located frequently along the mid-span of these framing members.
2. Large Rooftop Units. Heavy rooftop units can frequently cause deck deflection and create a ponding area around the unit.
3. Roof Drainage Components. Typical roof drainage components include:
 - a) roof drains,
 - b) wall scuppers,
 - c) gutters & downspouts.

WHAT TO LOOK FOR: Although improper roof drainage can best be observed immediately after a rain storm, most impacted drainage conditions will leave "tell-tale" indications even after standing water has evaporated:

1. Accumulated Debris. Debris frequently accumulates in ponding areas. Because water eventually evaporates from impacted areas, a concentric pattern of debris or dirt is a good indication of a ponding condition.

2. Visible Sagging or Deflection.

3. Discoloration of Curbs and Walls. The discoloration may be due to a build-up of snow or ice, or it may be an indication that water may "back up" during very severe rain storms.

4. Damage to Drainage Components. Please refer to Item E - "Inspecting For Moisture Infiltration"

REMEDIAL ACTIONS:

1. Remove Debris. Bag and remove from the roof.

2. Repair Drainage Components. Please refer to "Inspecting Roof Sealants and Sheet Metal."

PREVENTATIVE ACTIONS:

1. Add Roof Drains. Roof drains can be added to remove water from impacted areas.

2. Add Taper Systems. Water in impacted areas can be diverted by adding tapered "saddles" and "crickets".

3. Redundant Membrane Layer. If it is not economically possible to re-work an impacted drainage area, the potential for damage can be reduced by the application of redundant layer of membrane and flashing, in order to reduce the possibility of cutting or puncture.

D. Inspecting ForWIND STORM DAMAGE

INTRODUCTION:

Wind storms can damage roofing systems in several different ways. The effect of the wind itself can exert a force on important roof system attachments that prevent the roof system from separating from the roof deck and building. Wind forces can also damage exposed sheet metal items, such as gutters and downspouts. In addition, the force of the wind-borne debris may cause puncture or cutting of the roof membrane. In fact, severe

wind storms can even dislodge rooftop units and cause the units to blow across the roof, causing extensive roof membrane damage.

WHEN TO LOOK: As soon as possible after any significant wind storm.

WHERE TO LOOK:

1. Roof Membrane Surface.
2. Rooftop Units.
3. Roof Edge Metal, Gutters & Downspouts.

WHAT TO LOOK FOR:

1. Ballasted Roofing Systems.
 - a. Look for missing or displaced roof ballast.
 - b. Look for shuffled or displaced insulation boards beneath the roof membrane.
2. Adhered Roofing Systems.
 - a. Look for loose or disbanded areas of roof membrane.
 - b. Look for deflection or distortion of the insulation boards beneath the roof membrane.
 - c. Look for "tented" insulation fasteners and plates.
3. Mechanically Attached Roofing Systems.
 - a. Look for large cuts or slices in the roof membrane.
 - b. Look for deflection or distortion of the insulation boards beneath the roof membrane.
 - c. Look for "tented" or loose roofing fasteners and plates.
4. Displaced or Damaged Rooftop Units or Damaged or Missing Sheet Metal Components.
5. Membrane Cuts and Punctures.

REMEDIAL ACTIONS:

1. Remove Debris.
2. Replace or Re-Disperse Roofing Ballast. This must be done carefully in order to avoid puncturing the membrane.
3. Repair Damaged Roof Membrane & Components. Permanent repairs should always be performed by a licensed roofing contractor. In order to respond to emergency situations, the following actions can be taken by the building maintenance staff:
 - a) Small cuts and punctures can be sealed temporarily.
 - b) If large areas of membrane have become detached and are actively billowing, it is very important to cut the membrane to reduce the internal pressure build-up. Even though this procedure may cause some water to enter the roof system, it may prevent additional detachment of the membrane and the potential for a roof "blow-off".
 - c) Roof membrane which has detached at the perimeter anchorages should be re-secured by weighting the membrane with sand bags or by securing with a wood batten or nailer.

PREVENTATIVE ACTIONS:

1. Add Roof Ballast. If some areas of ballast stone are frequently displaced by winds, consider adding a larger size of ballast stone or replacing ballast stone with concrete pavers. Note: Ballast should not be added to a roof without a review of the roof load capacity by a structural engineer.
2. Review Roof System Design. If damage consistently occurs in certain areas of the roof, the roof system design should be reviewed by an engineer or roof consultant.

E. Inspecting ForMOISTURE INFILTRATION

INTRODUCTION:

Moisture can enter into a roofing system many different ways. In addition to water entry due to roof membrane leaks, moisture can enter a roofing system due to condensation from internal humidity, infiltration through building walls, water entry through equipment housings and latent moisture entrapped beneath the roof system.

WHERE TO LOOK:

1. Building Walls & Parapets. Many types of wall construction, especially masonry and stucco, can allow moisture infiltration due to porosity and cracking. Particular attention should be paid to metal flashings associated with walls, including wall copings, reglets, counter-flashings, and termination bars.
2. Large Rooftop Units. Frequently the metal housings around these units may allow water entry.
3. Skylights. Skylight glazing beads and metal trim flashings typically require periodic maintenance.

WHAT TO LOOK FOR:

Although improper roof drainage can best be observed immediately after a rain storm, most impacted drainage conditions will leave "tell-tale" indications even after standing water has evaporated:

1. "Soft" Roof Insulation. If the roof insulation appears to be "soft" under foot, it may have absorbed excessive moisture.
2. Cracking, Spalling or Discoloration Of Walls. The deterioration may be an indication of moisture entry.
3. Loose Metal Wall Flashings. Look for any discontinuities in the firm, uniform compression between metal flashings and the wall surface.
4. Covered "Weep Holes". Look for masonry weep holes that have become clogged or were accidentally covered over by the roof flashings.
5. Missing Or Broken Weather Seals On Equipment Housings. Frequent maintenance of rooftop equipment may allow weather seals and sheet metal joints to lose water-tightness.
6. Cracked or Sunken Caulking. Almost all joints in metal flashings are sealed with an application of sealant or caulking. Any cracking or other discontinuity is a potential source of water entry.

REMEDIAL ACTIONS:

1. Replace Wet Roof Insulation. A licensed roofing contractor should perform this work.
2. Re-Attach and Re-Caulk Metal Components. Maintenance of metal flashings and caulking joints typically can be performed either by a roofing contractor or trained maintenance personnel.

3. Repair Deteriorated Walls. Repair of walls can be performed by a variety of trades. Be sure to select a recognized professional.

PREVENTATIVE ACTIONS:

1. Roof Moisture Survey. If a new roof will be installed over an existing roof, or whenever moisture is suspected to be entrapped within a roof deck, a roof moisture survey should be conducted by a recognized professional, and the findings of the survey should be used by the roof designer to select the most appropriate roofing system.
2. Rooftop Equipment Maintenance Standards: A roof access log should be maintained in order to review and monitor the maintenance of rooftop equipment.

F. Inspecting..... ROOF MEMBRANE SEAMS

INTRODUCTION:

Modern roof seams are designed to provide many years of water-tight performance, but these seams are subjected to stresses which over time may produce water entry, especially at intersections and angle changes. Typically, field seams do not need to be inspected during the normal ten to fifteen warranty period unless observations of possible leakage have been observed. After the normal warranty period, it is advisable to completely renovate the field seams by re-covering with a new layer of seaming material.

WHERE TO LOOK:

1. "T"-Joints. "T" joints occur where two sheets of roofing membrane intersect. Because of the extra thickness of membrane at these locations, these joints may over time begin to open up due to the "memory" of the membrane.
2. Angle Changes. Roof seams which travel through an angle change, such as a deck-to-wall joint, are subject to the same long-term stresses as "T" joints, and may begin to open up over time.

WHAT TO LOOK FOR:

1. Edge Cavitation. The leading edge of the seam may be starting to open up, allowing dirt to accumulate in a cavity at the seam edge.
2. Entrapped Moisture. Seams which are taking on moisture will typically exhibit "bubbling" along the seam edge when foot pressure is applied to the seam.

REMEDIAL PROCEDURES:

1. Emergency Repair of Field Seams. Most single-ply field seams can be repaired temporarily by covering the seam edge with duct tape. Clean the membrane around the edge with a non-abrasive cleaner and apply a piece of duct tape extending beyond the affected area at least one inch in all directions. Most seams in modified bitumen membranes can be repaired temporarily by applying plastic roof cement to the seam edge. Make arrangements for a permanent repair as soon as possible.

2. Permanent Restoration of Roof Seams. Restoration of aged roofing seams should be performed by a licensed roofing contractor.

a. Single-Ply Seams. EPDM seams typically can be restored by "stripping in" the seam with a new covering of membrane material.

b. Modified Bitumen Seams. Minor repairs to modified bitumen seams can be performed by pulling open the affected seam area and re-sealing the seam using a roofing torch. When seam deficiencies are widespread, the only effective long-term repair is the installation of a new layer of modified bitumen membrane over the affected roof surface area.

G. Inspecting..... BASE ATTACHMENTS

INTRODUCTION:

Modern perimeter attachments are designed to provide many years of secure performance, but these attachments are subjected to stresses which over time may produce distortion of the base attachments. Typically, base attachments do not need to be inspected during the normal ten to fifteen warranty period unless observations of distortion have been observed. After the normal warranty period, it may be advisable to completely renovate the base attachments by installing new base attachments.

WHERE TO LOOK:

1. Parapet Walls and Equipment Curbs.
2. Sheet metal Roof Edges.

WHAT TO LOOK FOR:

1. "Bridging". "Bridging" refers to the tendency for roofing membrane to pull away from any angled intersection due to the inherent "memory" of the

manufactured roofing sheet. Minor bridging, extending beyond the angle change less than one inch, can typically be expected from any roofing membrane after a reasonable period of service. Bridging greater than one inch may indicate that the base attachment itself is beginning to experience stress, and this stress may lead to water entry through roof seams which run through the angle change of the base attachment.

2. Loose Fasteners. The observation of loose or "tented" fasteners beneath the membrane at the base attachment may indicate that the original installation of the fastener was inadequate to accommodate long-term stress on the base attachment.

REMEDIAL PROCEDURES:

1. Emergency Repair. If bridging or distortion at a base attachment is causing active leakage, try to seal the leak with a construction-grade butyl caulking.

2. Permanent Restoration of Roof Seams. Restoration of aged base attachments should be performed by a licensed roofing contractor.

H. ROOF INSPECTION CHECKLIST

Roof Identification:	Building Address:
Date Roof Installed:	Original Contractor:
Manufacturer's Warranty No:	Date Of Warranty Expiration:
Date Of Roof Inspection:	Inspected By:

ITEM:	WHERE TO LOOK:	WHAT TO LOOK FOR:
Roof Traffic	Roof Access Points Walkways Mechanical Units	Membrane Cuts & Punctures Crushed Roof Insulation Trash & Sharp Objects
Contaminants	Mechanical Units Kitchen Exhausts	Oil Spills Cooking Fats & Grease
Drainage	Mid-Span Of Beams &	Accumulated Debris

	<p>Joists</p> <p>Large Rooftop Units</p> <p>Roof Drains</p> <p>Wall Scuppers</p> <p>Gutters & Downspouts</p>	<p>Visible Deflection</p> <p>Discoloration of Curbs & Walls</p> <p>Loose Sheet Metal</p> <p>Cracked Caulking</p>
Wind Storm Damage	<p>Roof Perimeter</p> <p>Roof Membrane Surface</p>	<p>Loose Perimeter Sheet Metal</p> <p>Loose Areas Of Roof Membrane</p> <p>Buckled Insulation</p> <p>Displaced Roof Ballast</p>
Moisture Infiltration	<p>Adjoining Walls & Parapets</p> <p>Large Rooftop Units</p> <p>Skylights</p>	<p>"Soft" Roof Insulation</p> <p>Discoloration Of Walls</p> <p>Loose Sheet Metal Flashings</p> <p>Missing Weather Seals</p> <p>Cracked or Sunken Caulking</p>
Roof Membrane Seams	<p>T-Joints</p> <p>Angle Changes</p>	<p>Edge Cavitation or Curling</p> <p>Entrapped Moisture</p>
Base Attachments	<p>Parapet Walls & Curbs</p> <p>Roof Edge</p>	<p>Membrane "Bridging"</p> <p>Loose Fasteners</p>

Conditions Observed:	Actions Recommended:

Attach Roof Sketch

Use Additional Pages As Necessary