

FIRESTONE BUILDING PRODUCTS

ROOF INSPECTION, MAINTENANCE & REPAIR GUIDE

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SECTION I

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.

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 manufacturer's warranty. Accordingly, the building owner should contact a licensed contractor to obtain a proposal for ongoing inspection and maintenance services.

For additional information, including the most current details and specifications, please refer to the Firestone Technical Database at www.firestonebpc.com.

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A. Inspecting ForROOF TRAFFIC

INTRODUCTION:

The Firestone Roofing System is designed to be a waterproofing component – not a traffic bearing component of the building envelope. However, 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. Cuts and punctures may produce small bubbles in a film of water as pressure is 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, construction grade butyl caulk, or silicone. 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. (See Section II.)
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. (See Section II for roof walkway specifications and guidelines.)
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 or TPO, 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.

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 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 may 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.
 - missing or displaced roof ballast.
 - large cuts or slices in the roof membrane with areas of missing or displaced ballast.
 - shuffled or displaced insulation boards beneath the roof membrane.
 - loose or missing sheet metal flashing components.
2. Adhered Roofing Systems.
 - loose or disbonded areas of roof membrane.
 - large cuts or slices in the roof membrane
 - deflection or distortion of the insulation boards beneath the roof membrane.
 - "tented" insulation fasteners and plates.
 - loose or missing sheet metal flashing components.

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3. Mechanically Attached Roofing Systems.
 - large cuts or slices in the roof membrane.
 - deflection or distortion of the insulation boards beneath the roof membrane.
 - "tented" or loose roofing fasteners and plates.
 - loose or missing sheet metal flashing components.

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:
 - Small cuts and punctures can be sealed temporarily.
 - 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".
 - 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.

Note: The inspection for moisture infiltration requires professional roofing experience. Firestone recommends that this inspection be performed by a Firestone Licensed Applicator at least once a year.

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:

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 transitions, 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 may 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, construction grade butyl caulk, or silicone. 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 and TPO seams typically can be restored by "stripping in" the seam with a new covering of membrane material. See Section II for specific repair procedures.
 - 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 an inherent loss of dimensional stability in excess of the design criteria. 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 be caused by a failure of the substrate, and can indicate that the base attachment itself is beginning to experience stress. 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 a significant wind event or a substrate failure detrimental to the systems ability 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 duct tape, construction-grade butyl caulking, or silicone.
2. Permanent Restoration of Roof Seams. Restoration of aged base attachments should be performed by a licensed roofing contractor. (See Section II for specific base attachment repair procedures.)

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 & Joists Large Rooftop Units Roof Drains Wall Scuppers Gutters & Downspouts	Accumulated Debris Visible Deflection Discoloration of Curbs & Walls Loose Sheet Metal Cracked Caulking
Wind Storm Damage	Roof Perimeter Roof Membrane Surface	Loose Perimeter Sheet Metal Loose Areas Of Roof Membran Buckled Insulation Displaced Roof Ballast
Moisture Infiltration	Adjoining Walls & Parapets Large Rooftop Units Skylights	"Soft" Roof Insulation Discoloration Of Walls Loose Sheet Metal Flashings Missing Weather Seals Cracked or Sunken Caulking
Roof Membrane Seams	T-Joints Angle Changes	Edge Cavitation or Curling Entrapped Moisture
Base Attachments	Parapet Walls & Curbs Roof Edge	Membrane "Bridging" Loose Fasteners
Conditions Observed:		Actions Recommended:
Attach Roof Sketch		Use Additional Pages As Necessary

Please fax completed form to Firestone Building Products at: 1-317-575-7210

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SECTION II

ROOF REPAIR & RENOVATION

Even with periodic inspection and maintenance, roofing systems will require repair from time to time. Although roof repair is typically conducted as a response to some type of damage to the roof, a **pro-active** approach to roof repair and renovation can improve the performance and extend the service life of most modern roofing systems. The procedures and specifications contained in this section provide valuable general information about the efficient and effective repair of different roofing systems, including EPDM and modified bitumen roofs.

These procedures and specifications are offered as a complementary service only, and Firestone disclaims any liability, under any theory of law, arising out of the use of these procedures.

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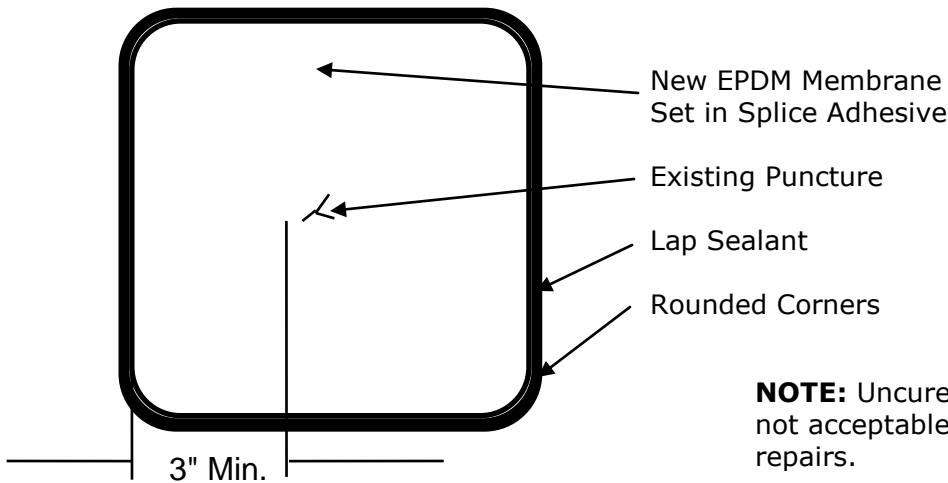
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A. REPAIR OF CUTS AND PUNCTURES

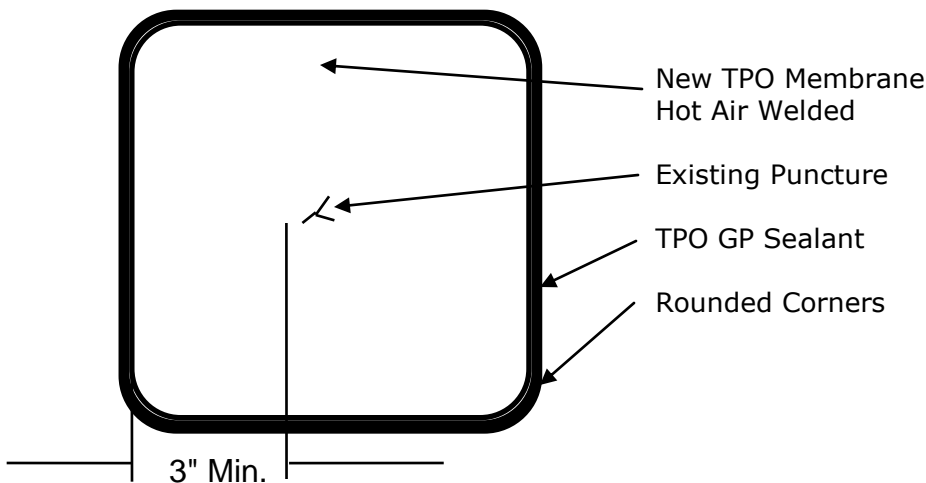
NOTE: THESE DRAWINGS SHOW GENERAL PROCEDURES FOR TYPICAL ROOF SYSTEM REPAIR AND RENOVATION. PLEASE REFER TO FIRESTONE TECHNICAL SPECIFICATION MANUALS FOR ADDITIONAL INFORMATION. ROOF REPAIRS AND RENOVATIONS SHOULD BE PERFORMED ONLY BY A PROFESSIONAL ROOFING CONTRACTOR WHO IS LICENSED AND TRAINED BY THE ROOF SYSTEM MANUFACTURER.

1. Typical Repair of EPDM Membrane:



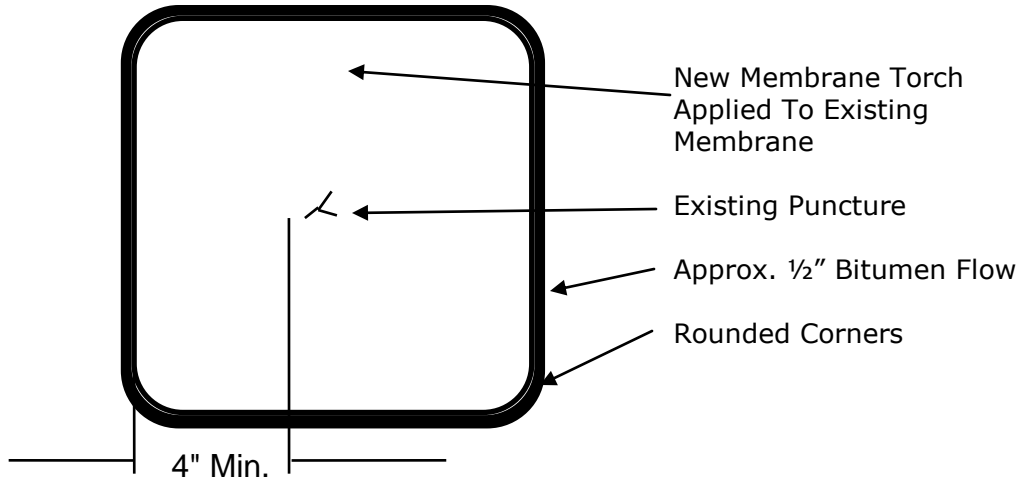
Note: The application of new EPDM membrane to existing in-service EPDM membrane requires special cleaning and priming procedures. Refer to Section F - "Cleaning and Priming of In-Service Membrane."

1. Typical Repair of TPO Membrane:



Note: The application of new TPO membrane to existing in-service TPO membrane requires special cleaning and priming procedures. Refer to Section F - "Cleaning and Priming of In-Service Membrane."

3. Typical Repair of Modified Bitumen Membrane:

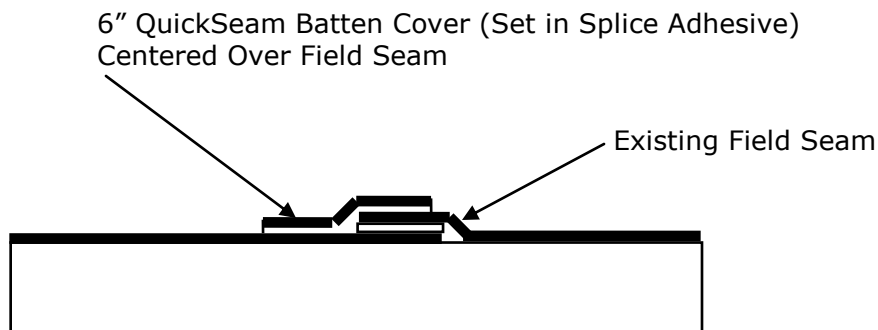


Note: Prepare existing surface by heating with a roofing torch and embed any exposed roofing granules and or lightly remove (without distorting the membrane compound) any applied coating with a heated trowel. After preparing the receiving surface and allowing to cool, apply primer to all surfaces receiving the new membrane patch.

B. EPDM FIELD SEAM REPAIR

NOTE: THESE DRAWINGS SHOW GENERAL PROCEDURES FOR TYPICAL ROOF SYSTEM REPAIR AND RENOVATION. PLEASE REFER TO FIRESTONE TECHNICAL SPECIFICATION MANUALS FOR ADDITIONAL INFORMATION. ROOF REPAIRS AND RENOVATIONS SHOULD BE PERFORMED ONLY BY A PROFESSIONAL ROOFING CONTRACTOR WHO IS LICENSED AND TRAINED BY THE ROOF SYSTEM MANUFACTURER.

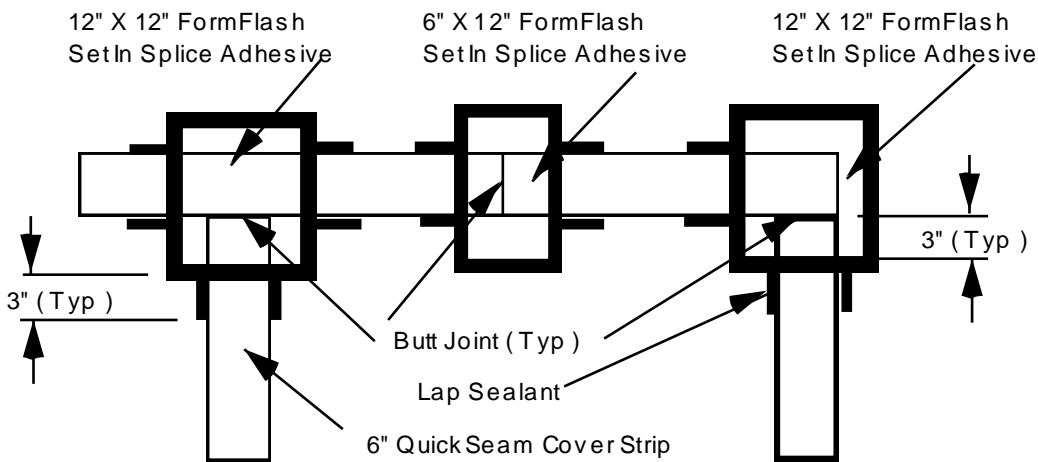
1. Typical Seam Cross-Section:



Note: The application of new EPDM membrane to existing in-service EPDM membrane requires special cleaning and priming procedures. Refer to Section F - "Cleaning and Priming of In-Service Membrane."

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2. Typical Joint Details:

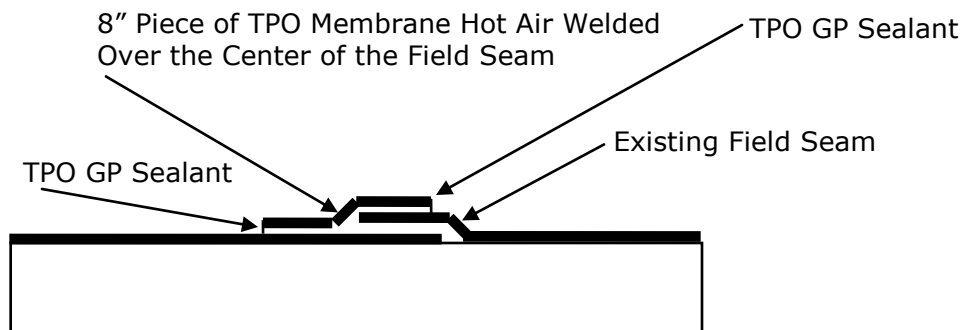


Note: The application of QuickSeam Tape and FormFlash to existing in-service EPDM membrane requires special cleaning and priming procedures. Refer to Section F - "Cleaning and Priming of In-Service Membrane."

C. TPO FIELD SEAM REPAIR

NOTE: THESE DRAWINGS SHOW GENERAL PROCEDURES FOR TYPICAL ROOF SYSTEM REPAIR AND RENOVATION. PLEASE REFER TO FIRESTONE TECHNICAL SPECIFICATION MANUALS FOR ADDITIONAL INFORMATION. ROOF REPAIRS AND RENOVATIONS SHOULD BE PERFORMED ONLY BY A PROFESSIONAL ROOFING CONTRACTOR WHO IS LICENSED AND TRAINED BY THE ROOF SYSTEM MANUFACTURER

1. Typical Seam Cross-Section:

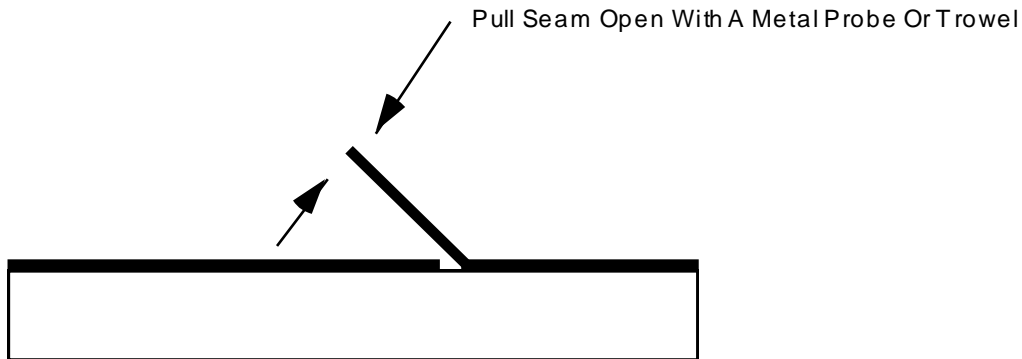


Note: The application of new TPO membrane to existing in-service TPO membrane requires special cleaning and priming procedures. Refer to Section F - "Cleaning and Priming of In-Service Membrane."

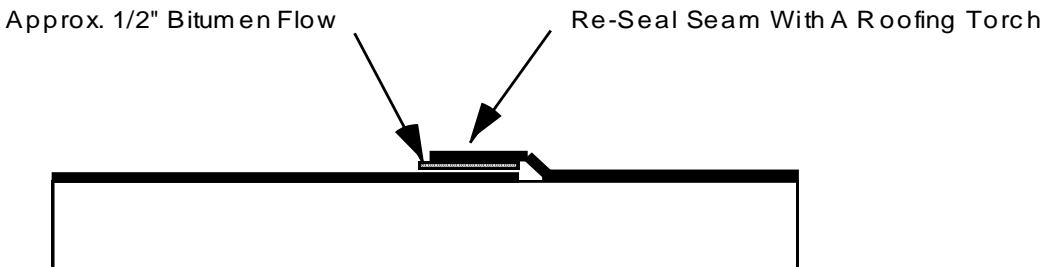
D. MODIFIED BITUMEN FIELD SEAM REPAIR

NOTE: THESE DRAWINGS SHOW GENERAL PROCEDURES FOR TYPICAL ROOF SYSTEM REPAIR AND RENOVATION. PLEASE REFER TO FIRESTONE TECHNICAL SPECIFICATION MANUALS FOR ADDITIONAL INFORMATION. ROOF REPAIRS AND RENOVATIONS SHOULD BE PERFORMED ONLY BY A PROFESSIONAL ROOFING CONTRACTOR WHO IS LICENSED AND TRAINED BY THE ROOF SYSTEM MANUFACTURER.

STEP 1:



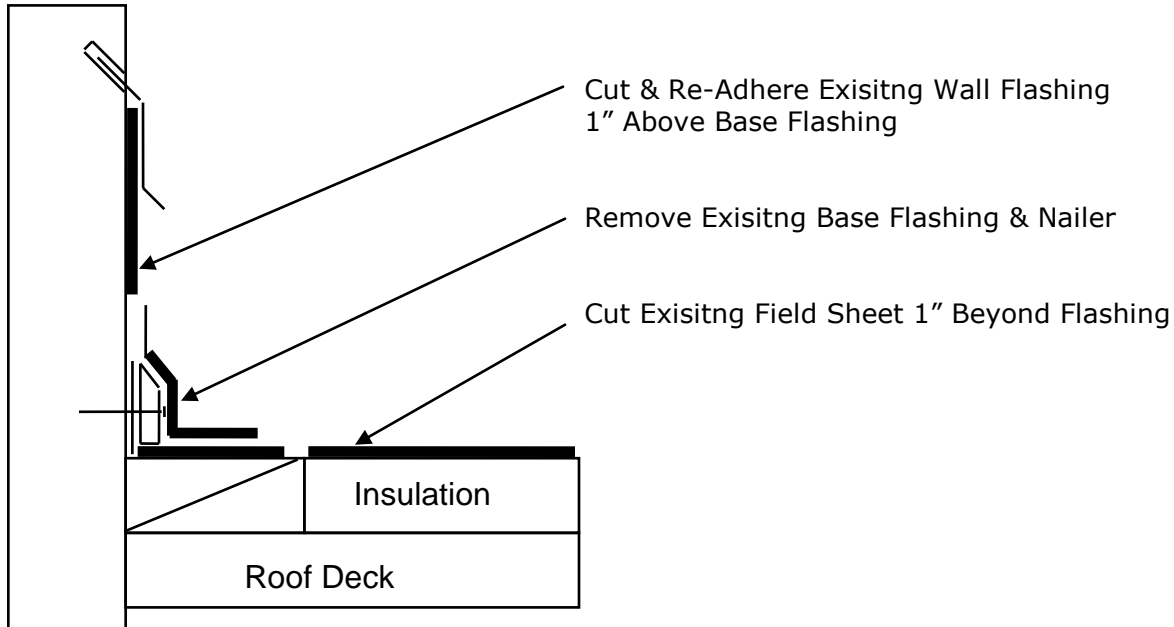
STEP 2:



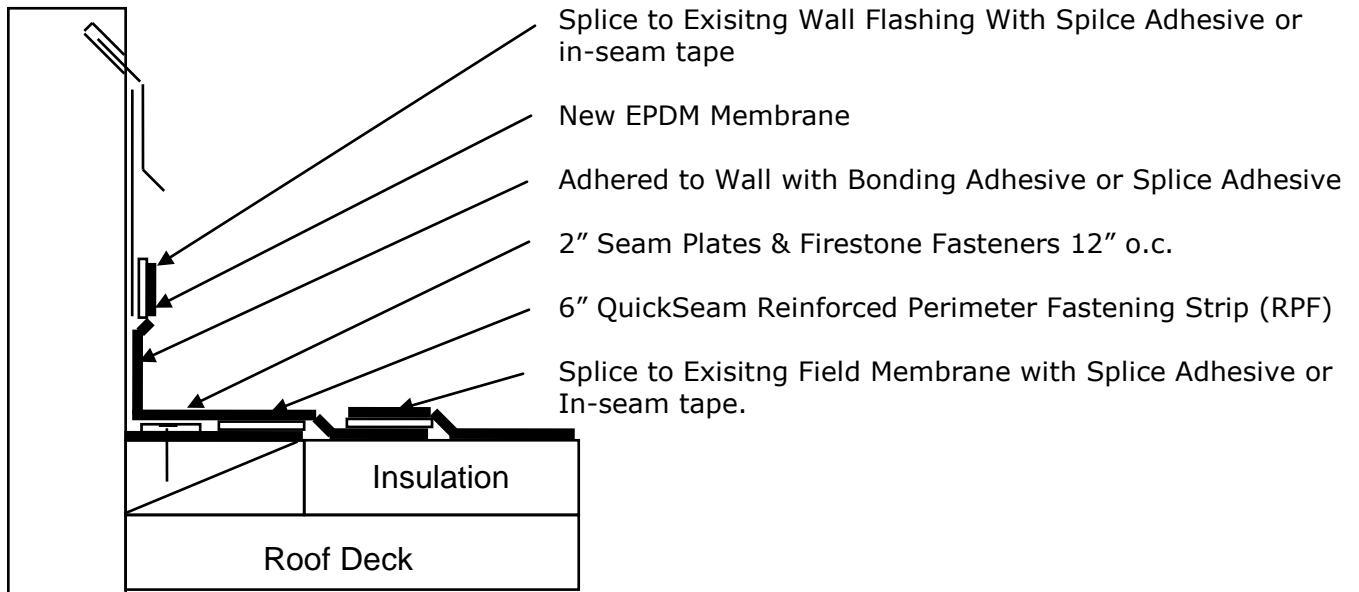
E. EPDM BASE TIE-IN REPAIR

THESE DRAWINGS SHOW GENERAL PROCEDURES FOR TYPICAL ROOF SYSTEM REPAIR AND RENOVATION. PLEASE REFER TO FIRESTONE TECHNICAL SPECIFICATION MANUALS FOR ADDITIONAL INFORMATION. ROOF REPAIRS AND RENOVATIONS SHOULD BE PERFORMED ONLY BY A PROFESSIONAL ROOFING CONTRACTOR WHO IS LICENSED AND TRAINED BY THE ROOF SYSTEM MANUFACTURER.

STEP 1:



STEP 2:



Note: The application of new EPDM membrane to existing in-service EPDM membrane requires special cleaning and priming procedures. Refer to Section F - "Cleaning and Priming of In-Service Membrane."

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F. CLEANING OF IN-SERVICE EPDM MEMBRANE

THIS IS A PERFORMANCE SPECIFICATION. It is required that the **membrane be dark gray in color without streaks** before proceeding with any bonding or splicing activity. The cleaned area must be larger than the repair area.

1. Cleaning may be achieved by one of the following methods:
 - Brush wash by hand with a solution of mild dish soap and water and a stiff bristlebrush. Rinse the receiving surface with water until clean. Take care not to flood the receiving surface (and cause leaks).
 - Use an electric floor scrubber and a wet vacuum. Rinse the receiving surface with water until clean. Take care not to flood the receiving surface (and cause leaks).
 - Use a power water washer and a wet vacuum. Take care not to flood the receiving surface (and cause leaks).
2. Allow the receiving surface to thoroughly dry. If necessary, dry the washed surface with clean towel or rags. Make sure that no moisture can be trapped.
3. It is also acceptable to broom clean the membrane in the repair area and apply Firestone Membrane Pre-Wash using a garden sprayer at the rate of 300 to 500 square feet per gallon. (See TIS Sheet for exact procedure) After Pre-Wash has dried for approximately ten minutes, use a pressure washer providing 4 gallons (15.1 L) per minute at 3000 PSI (20.6 MPa) to remove the Pre-Wash and accumulated dirt and debris. A 40° fan spray nozzle for pressure washer is suggested.

NOTE: If utilizing Firestone Membrane Pre-Wash is the contractor's preferred method of cleaning the existing membrane, identify this preference clearly within your labor price submittal and include the necessary amount of Pre-Wash so we may adjust our material provision accordingly.

4. Wash the existing EPDM **twice** with Firestone Clear Splice Wash and clean, white, cotton rags, allowing the surface to evaporate and dry between washings. **Change cleaning rags often.**
5. Wash the mating side of the repair piece **once** with Firestone Clear Splice Wash and clean, white, cotton rags, allowing the surface to dry before the application with Splice Adhesive. Change cleaning rags often. No cleaning of QuickSeam Tape products is necessary. If QuickSeam Tape becomes dirty, it must not be used.
6. "Clean" membrane **must be dark gray in color without streaking** of any substances.

CLEAR SPLICE WASH RECOMMENDED COVERAGE RATES @ 250 SF/GAL

6" --- 500 LF	8" --- 379 LF
10" --- 301 LF	12" --- 250 LF
15" --- 200 LF	18" --- 167 LF

Listed coverage rates may vary depending on ambient weather conditions.

NOTE: After cleaning and priming the in-service membrane, proceed with the application of the new EPDM membrane, FormFlash, Lap Sealant and QuickSeam Tape in accordance with current application specifications for new construction.

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G. CLEANING OF IN-SERVICE THERMOPLASTIC MEMBRANE

1. Ensure that the existing area to which new Thermoplastic membrane is to be mated is clean, smooth, and free of all contaminants.
2. Thoroughly clean this area with detergent and water. It is recommended that a water-soluble granular cleaner be used such as T-M-T brand, which is manufactured by the U.S. Borax Company. Liquid cleaners tend to leave a film residue that can interfere with heat-weld quality.
3. It is recommended that a polypropylene scouring pad be used for maximum cleaning. This is the type manufactured by 3M. Coupled with the granular detergent it allows for enough abrasive action to thoroughly clean the sheet without causing damage to it.

NOTE: DO NOT USE STEEL WIRE BRUSHES UNDER ANY CIRCUMSTANCES.

4. It is imperative that the area be thoroughly rinsed several times to remove all detergent and contaminants before heat welding. Further, the area must be allowed to dry completely before continuing. If blisters form upon heat welding, the area has not been allowed to dry sufficiently and heat welding should discontinue.
5. After allowing to dry sufficiently, the heat-welding areas on the existing membrane shall be cleaned a second time with Denatured Alcohol and clean cotton rags to remove all surface impediments and eliminate any surface curing which may have occurred.

AGAIN: THOROUGH CLEANING WITH DENATURED ALCOHOL SOLVENT IS THE MOST CRITICAL PROCEDURE TO ENSURE THE PERFORMANCE OF THE NEW TO EXISTING MEMBRANE HEAT-WELD.

6. All heat welding shall be in accordance with Firestone Thermoplastic details and specifications as published. Keep in mind that the existing sheet is aged, which may call for more allowance. Care should be taken not to overheat and scorch either membrane.
7. Upon completion, allow newly welded seams to cool.

IMPORTANT: ALL WELDS MUST BE THOROUGHLY PROBED AND CHECKED FOR COMPLETE INTEGRITY AND REWELDED OR STRIPPED IN AS REQUIRED.

H. APPLICATION OF SPLICE ADHESIVE AND LAP SEALANT

1. Stir the Splice Adhesive thoroughly before and during use to achieve a uniform mix with no sediment on the bottom and no un-mixed components evident.
2. Apply Splice Adhesive to the previously cleaned membrane using Firestone-supplied solvent resistant paint brush. Adhesive is to be applied in a thick, even, smooth coat at the rate of 150-175 lineal feet per gallon for a 3" splice (40 square feet per gallon). Adhesive is to be applied **COMPLETELY** to both the receiving surface and the repair piece simultaneously with long brushmarks. Do not overwork the adhesive film. No adhesive should be applied directly to the QuickSeam tape materials.
3. Allow the adhesive to set-up on each surface until tacky so as not to stick or string to the touch of a dry finger. Adhesive film should also be pushed with the index finger to assure it is dry within the film. (The Touch-Push Test)
4. Mate the repair piece onto the receiving surface, centering it over the area in need of repair. Do not stretch or wrinkle the cover strip while mating it. A minimum 3" EPDM to EPDM lap splice must be achieved.
5. With 2" – 3" silicon rollers, roll the newly spliced piece twice; first across (or perpendicular to) the mated surface, and then second along the length of the spliced edge.
6. After the splice has been allowed to cure no more than four hours, clean any contaminants from the base membrane a minimum of one inch on each side of the lap edge with a damp, clean, cotton rag of Clear Splice Wash. This step is only necessary if the seam edge has become dirty or contaminated. Do not soak the lap edge with Clear Splice Wash.
7. Immediately after cleaning, apply a 2" wide thin coat of Splice Adhesive to the seam step-off.
8. After the Splice Adhesive has dried a minimum of four hours, apply a 3/8" bead of lap sealant and trowel the sealant so as to leave a mound over the lap edge. Coverage should be about 20 LF per caulking tube.

STANDARD COVERAGE RATES

Splice Adhesive 40 SF per GAL

Seam/Coverstrip width	Coverage Rate	Seam/Coverstrip width	Coverage Rate
3"-----	160 LF/GAL	15"-----	32 LF/GAL
4"-----	120 LF/GAL	18"-----	27 LF/GAL
6"-----	80 LF/GAL	24"-----	20 LF/GAL
8"-----	60 LF/GAL	QUICKSEAM width	Coverage Rate
10"-----	50 LF/GAL	5"-----	200 LF/GAL
12"-----	40 LF/GAL	6"-----	160 LF/GAL
		9"-----	110 LF/GAL

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I. WALKWAY SYSTEMS

The Firestone Roofing System is designed to be a waterproofing component – not a traffic bearing component of the building envelop. Effective roof walkway systems must be designed to accommodate two different forces:

1. Puncture forces, which can cut the roofing membrane. Puncture forces can be exerted on the roof membrane by dropped tools, broken glass, nails, metal scraps, etc., especially when such sharp objects are stepped on by foot traffic.
2. Compressive forces, which can crush the underlying roof insulation. Although little formal research has been conducted regarding the forces exerted by foot traffic on the roof, it is generally acknowledged that an individual will exert a foot force anywhere from 10 psi to 30 psi, depending on body mass, shoe profile and momentum. This wide range of variability is very important since many common types of roof insulation, such as expanded polystyrene and polyisocyanurate foam, have relatively low compressive strengths.

While rubber walkway pads will provide effective membrane protection against cutting and puncture, these pads are relatively thin and they cannot distribute large compressive forces. If frequent or heavy roof traffic loads are anticipated over a roof system which uses a low compressive strength insulation, one or more of the following products should be considered:

1. Smooth Concrete Pavers. Concrete pavers have very high compressive strengths and can significantly distribute the force of foot traffic. Because the edges of the pavers can be sharp, and because concrete over time may crack or spall, it is advisable to install a protective fabric mat or a redundant layer of roofing membrane beneath concrete pavers. Before an extensive concrete paver walkway is installed, the live load capacity of the roof deck and building structure should be evaluated to verify that the structure can accommodate the added weight of the pavers.
2. High-Density Roof Boards. Compressive forces can also be distributed by installing a high-density roofing board directly over the roof insulation prior to installing the roofing membrane. Examples of common roofing boards are:
 - CoverDeck. This product is a high performance mineral fiber coverboard that combines high wind and water resistance with excellent lightweight/high strength characteristics. Typical thicknesses are 3/8" and 5/8".
 - Class E Wood Fiber. (Federal Specification LLL-I-535B). This product is similar in compressive strength to conventional wood fiber wall sheathing. Typical thicknesses are 1/2" and 1".
 - "Dens-Deck" Roof Board. This product is a moisture-resistant gypsum sheathing product with fiberglass facers. Typical thicknesses are 1/4", 1/2", and 5/8".

If a high-density roof board is selected, it will still be necessary to install rubber walkway pads over the membrane to protect against cutting and puncture.

3. Protected Membrane Systems. Protected membrane systems utilize a layer of high density extruded polystyrene board loosely laid directly above the roofing membrane and covered with a fabric mat and concrete pavers.

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NOTE: As with any concrete paver system, ballast rock, or garden system, the load capacity of the roof should be evaluated before installing this type of system. Although this type of system can provide very excellent protection against both crushing and puncture, it is very difficult to service if a leak does occur. Because of this, the roofing warranty coverage available for protected membrane systems may be less than the warranty coverage available with other roofing systems.

SECTION III

FIRESTONE WARRANTY SERVICE

Firestone's Warranty Services Department is responsible for assuring a timely and effective response to all customer service requests for warranted Firestone roofs. In addition, Warranty Services is charged with maintaining effective channels of communication between the owners of Firestone roofs and the licensed contractors who install these roofs so that all parties are involved in assuring the long-term performance of Firestone roofing systems.

*Firestone Warranty Services can be contacted Monday through Sunday by calling **1-800-830-5612**. Requests for service can also be faxed directly to 1-317-575-7210 or by email at warrantyclaims@firestonebp.com.*

Warranty Services is staffed with knowledgeable warranty administrators and experienced roofing professionals who can respond to customer calls by issuing emergency repair orders, arranging for field investigations and resolving questions concerning Firestone's warranty programs and policies. Typically, Firestone's response begins with an immediate notification to the roofing contractor who originally installed the roof, so that the Firestone contractor is involved in all communications and actions regarding the performance of the roof. Because of this, the success of our warranty service program is a joint effort between Firestone and the independent Firestone licensed contractors who serve as the first and most important contact with owners of Firestone Roofing Systems.

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A. REPORTING LEAKS TO FIRESTONE:

A leak or any other request for service affecting a warranted Firestone roof should always be reported directly to Firestone. The leak can be reported by telephone call, Fax or email, by either a representative of the building owner or by a Firestone contractor. In all cases, the following information is vitally important in order to assure a timely and effective response:

- Building Identification.
- Building Address.
- Building Owner Name.
- Building Owner Key Contact Person and Telephone Number.
- FBPCO (Roof Drawing) Number.
- Warranty Number.
- Date Leak Observed.
- Notifier Name with Telephone and Fax Number.
- Accurate Description Of Leak.
- Purchase Order Number for any Non-Warranted Repairs

A FAX number for the notifier is very important, since Firestone will send an acknowledgment to confirm our issuance of a work order to a responsive repair contractor.

Firestone encourages both building owners and roofing contractors to use the above mentioned methods to communicate a roof leak to Firestone. A special Fax Leak Notification form has been prepared by Firestone and is included in this manual. (See Section D.)

B. WARRANTY RESPONSE PROCEDURES

During the first two years of the roofing system warranty, requests for warranty service are referred from Firestone to the original installing contractor. Upon receipt of the leak report, Firestone immediately calls the original contractor and mails a "Leak Repair Notification". This letter requests that the contractor, in accordance with the terms and conditions of Firestone's license agreement, initiate contact with the building owner, arrange to investigate the leak and make appropriate warranty repairs. The contractor is also requested to completely fill a work order, and return it to Firestone within two weeks.

At the same time the contractor is mailed the "Leak Repair Notification", the building owner is mailed a "Warranty Services Follow-Up". This letter advises the owner that the original contractor has been advised to investigate the roof conditions and to complete any necessary repairs within ten working days.

In response to a leak notification received after the first two years of the warranty, Firestone will issue an emergency purchase order for the investigation and repair of leaks. Because the original installing contractor is a vital link in the long-term performance of the roofing system, Firestone typically will authorize the original contractor to perform all emergency repair work whenever:

- The roof is located within a reasonable travel distance from the contractor's office or shop. In most cases Firestone's purchase order will authorize a maximum 2 hours of travel each way to and from the roof.
- The roof has not experienced excessive leak reports.
- The original contractor is an active licensed contractor, has provided Firestone with hourly labor rates and insurance certificates, is able to respond within 48 hours and has provided satisfactory repair service previously.

Upon receipt of a leak notification, Firestone will issue a "Warranty Service Work Order" and Roof Analysis Sheet followed by a purchase order. This work order and analysis sheet will be faxed directly to the roofing contractor in order to minimize the time needed to respond to a leak. At the same time, a separate acknowledgment letter is also faxed directly to the building owner, so that the owner can follow up directly with the roofing contractor.

In the event that an emergency repair response does not produce an effective resolution of the leak or whenever a building owner has a concern about the performance of the roof system, Firestone will arrange for Warranty Services Investigator to visit the building site and conduct a thorough investigation of the roof. Depending on project location and existing schedules, Firestone can typically respond with a personal visit to the building site within three to four weeks of a request for service. Warranty Service Representatives are also available to respond to any telephone inquiries during our normal business hours. To contact a member of Firestone's Warranty Services staff, please call 1-800-428-4442.

C. NON-WARRANTED REPAIRS

Because many of the leaks that occur on Firestone warranted roofs are caused by conditions relating to building maintenance and are not covered by the terms of the Firestone warranty, Firestone has adopted a pro-active policy to inform and educate building owners about the importance of roof inspection and maintenance.

This pro-active policy starts with the distribution of extensive inspection and maintenance information. Comprehensive roofing inspection and maintenance guidelines can be obtained from any Firestone sales or technical representative.

In addition, Firestone always advises building owners that non-warranted repairs associated with requests for emergency warranty service will be invoiced in accordance with item 2 (c) of Firestone's current Red Shield Warranty:

"Should the investigation reveal that the leak is excluded under the Terms, Conditions and Limitations, the Owner is responsible for payment of the investigation costs."

If non-warranted repairs are made by the Firestone contractor who is responding to an emergency repair work order, and if the contractor is unable to arrange for appropriate reimbursement directly with the building owner, Firestone will pay the contractor for any reasonable repairs that are necessary to protect the serviceability of the roof system. In turn, Firestone will issue an invoice to the building owner for these repairs. *Firestone's invoice will cover only those costs clearly associated with non-warranted repairs. All invoices issued by Firestone will also include a detailed description of the specific non-warranted repairs performed and a customer contact to obtain additional information concerning the invoice and the repairs performed.*

Examples of typical non-warranted emergency repairs include:

1. Repair of membrane cuts and punctures.
2. Caulking or re-sealing of non-Firestone building components, such as:
 - Sheet metal flashings.
 - Mechanical unit housings.
 - Skylights and roof hatches.
 - Metal mansards and fascia.
3. Flashing of roof openings made by other trades.
4. Repair of roofing components damaged by wind storms or other natural events in excess of warranty coverage.
5. Repair of roofing membrane and flashing damaged by contaminants such as oil and grease.

D. LEAK NOTIFICATION BY FAX

*INSTRUCTIONS: Fax this form to **1-317-575-7210***

What Is The Name Of The Building?	What Is The Building Address? (Including Zip Code):
What Is The Building Owner Name?	What Is The Building Owner Address?
What Is The FBPCO (Roof Drawing) Number On Your Warranty?	What Is The Warranty Number On Your Warranty?
Who Can Our Repair Agent Contact To Gain Access To The Roof?	What Is The Telephone Number For The Building Contact?
When Was The Leak Observed?	Please Provide A Description Of Leak:
What Is Your Name?	What Is Your Phone Number?
IMPORTANT: Firestone can provide you an immediate fax response advising you who will be responding to your request. To what fax number may we send this confirmation?	Please advise us of any other requests or comments:

Thank you for providing us with this important information. Upon receipt of this form, Firestone's Warranty Service Department will issue an emergency work order via fax to an authorized Firestone repair contractor. In addition, we will fax an acknowledgment directly to you to advise you the name and telephone number of the authorized contractor who will be responding to your service request. If you have any questions concerning your Firestone roof or your roofing warranty, please do not hesitate to call us at 1-800-428-4442.

E. POST WARRANTY ALTERATION FORM

In order for Firestone to keep your roofing system fully covered, you must report any changes made to the roof following the warranted inspection. Failure to the procedures outlined in the following document, including not notifying Firestone, will jeopardize the warranty on the specified project. This form can be submitted electronically at www.firestonebpc.com.

F. Warranty Transfer Form

In order to transfer an existing Firestone Warranty, building owners and their authorized agents must complete the following form. This form can be submitted electronically at www.firestonebpc.com.