



Firestone SBS Modified Bitumen Roofing System
Design and Application Guide

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Modified Bitumen Product Information

SBS Membranes	Code	Compound	Surface	Reinforcement	Thickness	
					inch	mm
SBS	30	SBS	Granule	Polyester with Glass Strands	0.150	3.8
SBS Torch	40	SBS	Granule	Polyester with Glass Strands	0.150	3.8
SBS FR	31	Fire Retardant SBS	Granule	Polyester with Glass Strands	0.150	3.8
SBS FR Torch	41	Fire Retardant SBS	Granule	Polyester with Glass Strands	0.160	4.1
SBS Glass FR	50	Fire Retardant SBS	Granule	Glass Fiber Mat	0.150	3.8
SBS Glass FR Torch	51	Fire Retardant SBS	Granule	Glass Fiber Mat	0.150	3.8
SBS Smooth	32	SBS	Smooth	Polyester with Glass Strands	0.145	3.7
SBS Premium	33	SBS	Granule	Polyester with Glass Strands	0.160	4.1
SBS Premium FR	36	Fire Retardant SBS	Granule	Polyester with Glass Strands	0.160	4.1
SBS Premium FR Torch	48	Fire Retardant SBS	Granule	Polyester with Glass Strands	0.160	4.1
SBS Metal Flash Al	43	SBS	Aluminum	Glass Fiber Mat	0.150	3.8
SBS Base	S	SBS	Smooth	Glass Fiber Mat	0.090	2.3
SBS Glass Torch Base	46	SBS	Smooth	Glass Fiber Mat	0.120	3.0
SBS Premium Base	X	SBS	Smooth	Fiberglass Scrim/Mat Bi-laminate	0.160	4.1
SBS PolyBase	44	SBS	Smooth	Polyester with Glass Strands	0.090	2.3
SBS Poly Torch Base	45	SBS	Smooth	Polyester with Glass Strands	0.120	3.0
BASEGARD SA	48	SBS	Smooth	Glass Fiber Mat	0.060	1.5
APP Membranes	Code	Compound	Surface	Reinforcement	inch	mm
APP160	16	APP	Smooth	Polyester with Glass Strands	0.150	3.8
APP160 Cool	16C	APP	Smooth	Polyester with Glass Strands	0.150	3.8
APP170	17	APP	Smooth	Polyester with Glass Strands	0.165	4.2
APP170 Cool	17C	APP	Smooth	Polyester with Glass Strands	0.165	4.2
APP180	18	APP	Granule	Polyester with Glass Strands	0.165	4.2
APP180 Cool	18C	APP	Granule	Polyester with Glass Strands	0.165	4.2
APP180 FR	18FR	Fire Retardant APP	Granule	Polyester with Glass Strands	0.165	4.2
APP180 FR Cool	18FRC	Fire Retardant APP	Granule	Polyester with Glass Strands	0.165	4.2
APP Premium FR	T	Fire Retardant APP	Granule	Fiberglass/Polyester-Tri-laminate	0.170	4.3
APP 80 Glass Base	80	APP	Smooth	Glass Fiber Mat	0.080	2.0
APP 80 Glass Base Cool	80C	APP	Smooth	Glass Fiber Mat	0.080	2.0
APP Premium Base	Q	APP	Smooth	Glass Fiber Mat	0.080	2.0
BUR Products	Code	Compound	Surface	Reinforcement	inch	mm
MB Base M	M	Oxidized Asphalt	Smooth	Glass Fiber Mat	0.045	1.1
Ply IV (4)	F	Oxidized Asphalt	Smooth	Glass Fiber Mat	0.035	0.9
Ply VI (6)	FP	Oxidized Asphalt	Smooth	Glass Fiber Mat	0.035	0.9
Venting Base	VB	Oxidized Asphalt	Smooth	Glass Fiber Mat	0.115	2.9

Deck Type	Surfacing	Specification Numbering System
I = Insulated S = Steel C = Concrete P = Primed N = Nailable -Plywood -Oriented Strand Board -Gypsum -Cementitious Wood Fiber L = Lightweight Concrete E = Existing Smooth BUR	G = Granule GR = Flood Coat and Gravel AC = AcryliTop Coating AL = Aluminum Coating P = PMR	<div style="text-align: right; margin-bottom: 10px;">I S 31 G</div> <p style="text-align: center;"> Insulated Firestone SBS Base SBS FR Granule </p>

FIRESTONE BUILDING PRODUCTS COMPANY
 250 W 96th Street • Indianapolis Indiana 46260
 Phone 1-800-428-4442 • Web Site: www.firestonebpco.com

1.01 INTRODUCTION

This section is intended to serve as the preface to the Design Guides for all Firestone Building Products roofing systems. Additional technical information is available at the Firestone Building Products Technical Database, <http://technicaldatabase.fsbp.com>.

- A. Firestone is pleased to offer job-specific technical assistance for our roofing contractors, and for the design community. **Contact your Firestone Roof Systems Advisor at 1-800-428-4511** to discuss the needs of your project, how our products can meet specification requirements, application techniques, codes, warrantability of systems, and any other technical question.
- B. Purpose of this Guide to General Design Criteria
 - 1. The information contained in this guide is intended to assist **Firestone Red Shield Licensed Applicators** in meeting the requirements necessary to obtain a Warranty from Firestone Building Products (FSBP).
 - 2. Architects, engineers, roof consultants, and other specifiers may also use this information in their design of warrantable Firestone roofing systems.

1.01.1 General Considerations

- A. Design
 - 1. Always consult a design professional, architect, engineer, roof consultant, etc., before making any design decisions.
 - 2. Firestone does not practice architecture or engineering.
- B. Structural Loads
 - 1. Concentrated loads from rooftop equipment may cause deformation of insulation/underlayment and damage to the membrane if proper protection is not provided. To protect the roofing system, sleepers are recommended.
 - 2. The building must be able to support the load created by the staging, installation, and in-place service of the roofing system.
 - 3. It is the responsibility of the design professional to determine these loads and load capacities.
- C. Projects with Extreme Design Considerations
 - 1. Contact Firestone prior to bid to ensure that Firestone minimum warranty requirements are met, whenever any of the following are present:
 - a. Buildings with positive air pressure, canopies, and/or any building where the total wall openings exceed 10% of the total wall area on which the openings are located (airport hangars, warehouses, etc.).
 - b. Cold storage buildings and freezer facilities.
 - c. Buildings where mold or fungi are present.
 - d. Modified Bitumen (SBS, APP) and BUR projects over 250' in height.
 - e. Metal Roofing System projects over 250' in height.
 - f. Single Ply Adhered Roofing System projects over 250' in height.
 - g. Single Ply Ballasted Roofing System projects over 75' in height.
 - h. Single Ply Mechanically Attached System (MAS) projects over 120' in height.
- D. Projects Requiring Enhancements or Specific Components
 - 1. **Contact Firestone prior to bid**, should any of the following be required:
 - a. Projects with extended wind speeds greater than 55 mph.
 - b. Projects that require coverage for leaks caused by damage from hail.
 - c. Projects that require coverage for leaks caused by incidental cuts and punctures.
- E. Projects with Potential for Chemical Incompatibility
 - 1. **Petroleum-based products**, incompatible chemicals, animal fats/greases/oils, and other products can be harmful to roofing membranes and accessories, and should not come into direct contact with roofing materials.

2. **Contact Firestone prior to bid** to determine the potential effects of chemical reaction should any substances be present which may harmful to the roofing system, and to determine if additional protection of the roofing membrane may be needed.
- F. Coordination with Other Trades
1. **Work and traffic by other construction trades** can cause roofing membrane damage, insulation crushing or displacement, and accessory/flashing failure. Coordination between various trades is essential to avoid unnecessary rooftop traffic over completed sections of the roof and to prevent subsequent damage to the roofing system.
 2. Protect the roofing system from damage during construction.
- G. Building Codes
1. It is the responsibility of the specifier to review all applicable building codes to determine their impact on the specified Firestone roofing system. To locate code-complaint Firestone roofing systems, consult the Firestone Code Approval Guide for the appropriate system type, at: <http://technicaldatabase.fsbp.com/guides/CodeApprovalGuides/>.
 2. Authorities Having Jurisdiction.
 - a. Local building codes and building owner insurance requirements directly impact the design of a roofing system. The Authorities Having Jurisdiction (AHJ) – local, state, or regional building codes – should be consulted prior to designing the roofing system. Where building code or insurance requirements differ from those of Firestone, Firestone requirements should be followed as the minimum acceptable for warranty.
 3. FM Global/FM Approvals
 - a. Where FM Global wind uplift and/or fire ratings (such as, “1A-90”) are specified as Performance Requirements, it is important to first determine if the building is insured by FM Global, or if the requirements have instead been chosen by the specifier. If the building is insured by FM Global, it is recommended that you contact the local FM Engineer prior to specifying or bidding a project, in order to understand any job-specific requirements which may be imposed by FM Global on the project.
 - b. Firestone roofing materials carry the FM seal, and hundreds of FM Approvals-rated Firestone roofing systems may be found in the Firestone Code Approval Guides.
 4. UL/Underwriters Laboratories
 - a. Where UL fire resistance codes (such as, “Class A”) are specified, it is important to determine whether the deck is classified as Combustible [C] or Non-Combustible [NC]. Next, determine the rating –A, B, or C – that is required. Last, locate rated roofing systems that comply with the specified code.
 - b. Firestone metal roofing systems that have been tested and rated by UL for wind uplift resistance may be found in the Firestone Code Approval Guide for metal roofing systems.
- H. Drainage
1. Drainage and slope are design considerations, and should be evaluated by the specifier in accordance with all applicable building codes and industry standards.
 2. The National Roofing Contractors Association (NRCA) recommends that a roofing assembly be designed to drain any ponding water within 48 hours of a rain event.
 3. The NRCA and prevailing building codes recommend that a minimum roof slope of ¼" (6.4 mm) per foot be obtained to facilitate proper drainage and maximize long-term performance of the roof system. Firestone recommends following the NRCA guidelines.
 4. Good roofing practice dictates proper drainage to prevent possible excessive live loads and, in the event of a roof leak, to minimize potential interior damage to the roofing assembly and to the interior of the building.
 5. Slope may be achieved by tapering the structure or through the use of tapered ISO 95+ or Resista polyiso insulation; a sufficient number of roof drains should also be specified and properly located to allow for positive drainage.
 6. Tapered insulation formed into edges, saddles or crickets is recommended to alleviate incidental areas of ponding water.

7. Firestone is not responsible for the performance of the drainage or slope of an installed roofing system. The presence of ponding water does not void the Firestone warranty.
- I. Vapor Barriers and Air Barriers
 1. The need for a vapor barrier or air barrier is the decision of a design professional.
 2. Buildings with high moisture content, vapor drive or other conditions that could drive moisture into the roofing system are often specified with vapor and/or air barriers as part of the roofing system.
 3. **Firestone V-Force Vapor Barrier Membrane** should be used whenever a vapor barrier is specified in a Firestone roofing system.
 - J. Construction Generated Moisture (CGM)
 1. CGM typically occurs to increased moisture created during construction by a number of possible sources. The heating of interior spaces during construction in cold weather, enclosing the space above concrete foundations and floors before the concrete has sufficiently dried, and a number of other means, including perimeter tilt-up panels, the heating and air-conditioning return air system, immediate occupancy of the building, etc., all may have significant contributions to the amount of moisture within the building's initial air content. Perhaps the most common cause, however, is a concrete foundation and/or floors. While the moisture present within new concrete will likely dissipate over time, its initial content enhances the potential for condensation water drips when the building is heated during its initial cold weather cycle.
 2. A design professional should review the potential initial moisture content of the building's interior when preparing the roof specification, and to recommend specific design enhancements.
 3. The following are design enhancements that may be applied to help mitigate CGM:
 - a. Multiple layers of staggered insulation joints.
 - b. The necessity and location of a vapor barrier like the Firestone V-Force Vapor Barrier Membrane within the roofing assembly.
 - c. Enhancing the "R" value of the installed insulation to reposition the "dew point" to a location within the roof assembly to where condensation will not be allowed to form.
 - d. Specifying a fully adhered roof assembly.

1.01.2 Warranty

The following Firestone warranties include the Firestone brand materials and the workmanship of the Firestone Red Shield Applicator, when the system is installed in compliance with all technical specifications per the Firestone Technical Database <http://technicaldatabase.fsbp.com/>.

- A. The Firestone Red Shield Warranty
 1. 5, 10, 15, or 20 years.
 2. Covers repair of any leak warrantable in nature.
 3. No Dollar Limit (NDL), Non-prorated, no limit to man hours necessary to perform repairs.
 4. Includes all Firestone roofing products used in the roofing system.
- B. The Firestone Red Shield Medallion Warranty
 1. 25 years.
 2. All details must be installed according to 30-year standards.
 3. Covers repair of any leak warrantable in nature.
 4. No Dollar Limit (NDL), Non-prorated, no limit to man hours necessary to perform repairs.
 5. Includes all Firestone roofing products used in the roofing system.
- C. Extended Warranty Coverage
 1. The warranties listed above are eligible for the following extended coverage, within specific design limitations. Contact your Firestone Roof Systems Advisor regarding design limitations.
 - a. Increased Wind Speed (72-120mph, depending on system criteria).
 - b. Hail up to 2" in diameter.
 - c. Incidental Cuts & Puncture (reinforced single ply membranes only).
- D. The Firestone Platinum Warranty

1. 30 years.
 2. Covers repair of any leak warrantable in nature.
 3. No Dollar Limit (NDL), Non-prorated, no limit to man hours necessary to perform repairs.
 4. Includes all Firestone roofing products used in the roofing system.
- E. Firestone Membrane Warranties
1. The Firestone Membrane Limited Warranty
 - a. 5, 10, 15, or 20 years.
 - b. Covers leaks caused by manufacturing defect or premature aging.
 - c. Prorated and limited to cost of replacement membrane.
- F. Other Firestone Warranties
1. AcryliTop PC-100 Adhesion Warranty.
 2. AcryliTop PC-100 Reflectance Warranty.
 3. UltraPly TPO Reflectance Warranty.
 4. ISO 95+ Thermal Resistance Warranty.
 5. SkyScape Warranty (Standard, Overburden, and/or Plant Life).
 6. SunWave Warranty for Firestone SunWave daylightlights.
 7. Paint Finish Warranty for all Firestone metal roofing products, including edge metal.

1.01.3 Quality Assurance

- A. Materials
Firestone brand products must be used exclusively in Firestone warranted roofing systems. The performance or integrity of products by others is not included in the Firestone Warranty.
- B. Technical Deviations
Any deviation from Firestone technical specifications, warranty criteria, or detail drawings must be approved by a Firestone Roof Systems Advisor.
- C. Inspection
Completed installations will be inspected by a FSBP Quality Building Services (QBS) Technical Representative to verify that the roofing system has been installed according to current Firestone technical standards. This inspection is solely for the determination of warrantability by Firestone.

1.02 SBS MODIFIED BITUMEN PRODUCTS

- A. Hot Asphalt Application

DISCLAIMER: *Firestone warrants only approved adhesion asphalt. Contact your Firestone Sales Representative or Roof Systems Advisor for a list of approved asphalt sources.*

Applicators are directed to handle and process Firestone adhesion asphalt in accordance with the requirements of this guide in order to minimize the thermal history and thereby protect the aging properties of the adhesion asphalt. Adhesion asphalt must provide continuous coverage between Firestone products.

Please refer to the National Roofing Contractors Association and Asphalt Roofing Manufacturers Association guidelines for adhesion asphalt type requirements, handling and use. Follow all OSHA and NRCA safety regulations.

Observe the following precautions and application guidelines for hot asphalt application.

1. Use only Firestone approved adhesion asphalt.
2. Adhesion asphalt must provide continuous inter-ply coverage.
3. Firestone warrants approved adhesion asphalt when properly applied in accordance with NRCA, and ARMA requirements and the requirements of this guide for the following:
 - a. Firestone SBS and BUR products designed for asphalt attachment.
 - b. Between layers of Firestone insulation designated for adhesion with hot asphalt.

4. Assure that all health and safety measures are followed when installing hot asphalt to protect the installers as well as occupants of the building and passers nearby. Assure compliance to all building codes and safety regulations when using hot asphalt.
 - a. Mopping asphalt must never be heated above the flashpoint temperature.
 - b. Mopping asphalt must never be heated above the finished blowing temperature.
 5. Asphalt primer: Asphalt primer must meet the requirements of ASTM D 41 Type II.
 6. Asphalt properties may change when stored at high temperatures for long periods of time. Asphalt may become softer or may experience what is known as "fallback". Fallback is the degradation of the asphalt to the point that its physical properties (i.e. softening point) deteriorate which could then cause roof slippage. To reduce the chances for fallback, the following recommendations should be implemented:
 - a. Use higher softening point asphalt. Use either ASTM D 312 Type III or Type IV from a Firestone approved source. Contact your Firestone Sales Representative or Roof Systems Advisor for a list of approved asphalt sources.
 - b. Decrease the kettle temperature as much as possible, while maintaining the minimum application temperature.
 - c. Use material as quickly as possible, thus reducing exposure time.
 - d. Insulate all lines and equipment used to transport asphalt.
 7. Firestone does not warrant the performance of adhesion asphalt that is not Firestone approved.
 8. Assure that all health and safety measures are followed when installing hot asphalt to protect the installers as well as occupants of the building. Assure compliance to all building codes and safety regulations when using hot asphalt.
 9. Refer to the National Roofing Contractors Association and Asphalt Roofing Manufacturers Association guidelines for adhesion asphalt requirements for handling, use and safety.
 10. When using hot asphalt to install roofing materials assure that all State, Local and National health and safety measures are followed, to protect the installers as well as occupants of the building. Assure compliance to all building codes and safety regulations when using hot asphalt.
 11. Refer to the National Roofing Contractors Association and Asphalt Roofing Manufacturers Association guidelines for adhesion asphalt handling. Follow all OSHA and NRCA safety regulations.
- B. Phased Construction/Temporary Roofing:
1. Phased Construction
 - a. Phased Construction is defined by the NRCA as "The installation of a roof system in two or more separate time intervals. Final surfacing is not considered a phase, and can be delayed in its application." Final surfacing, as defined by Firestone, is a flood coat and gravel or an approved roof surfacing, such as Firestone AcryliTop. In this definition, the granule cap sheet in a roof system is not considered the final surfacing and should not be phase constructed.
 - b. Firestone does not recommend phased construction. Phased construction results in unprotected roof sections, which can allow moisture into the base plies or trap moisture, dust or debris between the plies of the roof system. These application defects may increase the incidence of blistering in the Firestone roof system
 - c. A better option than phased construction is a temporary roof, which allows for the delayed installation of the roof system until more suitable weather, or until other trades can complete their projects. A temporary roof can be designed and installed in the same way as a vapor retarder, and becomes a vapor retarder in the final construction.
 2. Temporary Roofing
 - a. If installation of the roof system is required during unsuitable weather, or before completion of wood blocking, curbs, penetrations, or the erection of walls, a temporary roof may need to be installed.

- b. The base plies for the Firestone roof system are not to be considered a temporary roof as the base plies are an integral component of the roof system.
 - c. If a temporary roof is needed to meet construction requirements, Firestone recommends installing a modified asphalt base sheet or two fiberglass roofing plies in an appropriate adhesive over an approved substrate, to be used as the temporary roof. This temporary roof can serve to protect the interior of the building during the early stages of construction. It may then be removed or repaired, if necessary, and can be left as a vapor retarder prior to the installation of the finished Firestone roofing system. SBS Modified Bitumen base sheets may not be exposed for more than 90 days. SBS Base sheets left exposed for more than 48 hours must be primed with D-41 primer prior to the completion of the roof assembly. In all cases, base sheets to receive a cap sheet or covering ply must be clean, dry and free of debris.
 - d. If roof insulation is installed under the temporary roof, the insulation shall be inspected for wet or damaged areas, so that such areas may be removed and replaced prior to installation of the Firestone roof system.
 - e. When a temporary roof is specified as a vapor retarder, precaution shall be exercised in protecting the temporary roof from other construction tradesmen. Damage to the temporary roof may impair its effectiveness as a vapor retarder. If the vapor retarder is installed as a temporary roof during construction, the vapor retarder shall be examined, and if necessary, repaired to ensure watertight integrity prior to installation of the remainder of the roof system.
 - f. For additional information regarding temporary roofs, refer to the NRCA's Roofing and Waterproofing Manual.
 - g. The determination of the necessity and location for a vapor retarder or an air barrier are project specific requirements, which is the responsibility of the building owner or his design professional. The proper assessment of the building, the need for, and the proper design of, an air barrier and vapor retarder are critical to the long-term operation of the roofing system
- C. Vapor Retarders
1. Firestone does not review or calculate dew point analyses and therefore, does not accept responsibility for damage due to recurrence rate or location of the dew point. Although not all projects require a vapor retarder, a design review should be considered for all projects. The inclusion of an air barrier or vapor retarder may affect the Underwriter Laboratory or Factory Mutual rating including the attachment of the Firestone roof system.
 2. A vapor retarder may be necessary when high interior humidity is of concern. High interior relative humidity is present in swimming pools, laundry facilities, paper mills, and bottling plants. In these cases vapor drive may form a dew point under the roof membrane or in the insulation.
 3. In these types of environments the vapor drive can be substantial and the potential exists for moisture accumulation within the roof assembly if an effective vapor retarder is not included in the roof assembly. This movement is reversed in some air-conditioned buildings in humid summer conditions.
 4. Vapor retarders are installed to prevent several types of roof assembly failures:
 - a. Reduced R-value when wet insulation becomes a conductor of heat rather than an insulator.
 - b. Deterioration of the roof membrane, insulation, structural decks, and associated building components.
 - c. Delamination of roof components from trapped moisture, which freezes and thaws, eventually evaporating under solar heat with the resulting vapor pressure causing blisters and delamination of the roof assembly components.
 5. The following is a partial list of situations which can influence the need for a vapor retarder:
 - a. Building usage as related to vapor drive.

- b. External temperature in relation to internal temperature.
 - c. The humidity of the interior and/or exterior air.
 - d. Building code requirements.
 - e. Construction generated moisture, particularly during winter construction.
6. A vapor retarder's effectiveness generally depends upon the following factors:
- a. The vapor retarder's perm (permeance) rating which should be as close to zero as possible.
 - b. The adequacy design of the vapor retarder membrane.
 - c. The integrity of the vapor retarder's seals at perimeters and penetrations.
 - d. The integrity of the vapor retarder's membrane after other tradesmen finish their projects.
 - e. The vapor retarder's location within the insulated roof assembly.
7. Construction roof traffic shall be restricted to prevent damage to the vapor retarder. In the event damage does occur, repair the vapor retarder damage with the same roof components and quantities as specified for the vapor retarder installation.
8. SBS Modified Bitumen base sheets may not be exposed for more than 90 days. SBS Base sheets left exposed for more than 72 hours must be primed with D-41 primer prior to the completion of the roof assembly. In all cases, base sheets to receive a cap sheet or covering ply must be clean, dry and free of debris.
9. Contact one of the four generally accepted agencies for help in determining the need for a vapor retarder. They are:
- a. National Roofing Contractors Association (NRCA) guidelines
 - b. U. S. Army Corp of Engineering Cold Regions Research and Engineering Laboratory (CRREL) guidelines
 - c. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
 - d. Oak Ridge National Laboratory (ORNL)
10. Vapor Retarder properties:
- a. A vapor retarder is defined as a building envelope element that limits diffusion of moisture into an assembly. Diffusion is water vapor migration in a material. Its rate depends on two factors:
 - i. Water vapor pressure difference across the roof assembly.
 - ii. Resistance of materials along the migration path. Some materials have more resistance than others. Placing a high-resistance material in a roof assembly may help control moisture migration
 - b. Vapor retarders are intended to limit moisture diffusion. Therefore, the main property requirement of a vapor retarder is low water vapor permeance. Water vapor permeance is defined as:

"The time of water vapor transmission through a unit area of flat materials or construction induced by a unit vapor pressure difference between two specified surfaces, under specified temperature and humidity conditions".
11. Design Responsibility
- a. The roof system designer is responsible for the design requirements of the roof deck, vapor retarder, and rigid insulation along with the roof system. This is more important when specifying roof systems over high humidity buildings. A professional architect or engineer should determine the need for a vapor retarder, as well as the type, placement and location of a vapor retarder. The inclusion of an air barrier or vapor retarder may affect the Underwriter Laboratory or Factory Mutual rating including the attachment of the Firestone roof system.
 - b. The list below, are examples of common vapor retarder applications.
 - i. 2 plies of Mopped Firestone Type IV (4) M or VI (6) M Ply Sheet over a nailed Firestone MB Base Sheet.

- ii. Mechanically attached fiberglass or polyester venting base sheet with 18" (457 mm) side and end laps covering the fasteners, mopped with Firestone approved hot asphalt.
 - iii. Existing dry and sound uninsulated built-up roof system (all splits and blisters repaired).
 - iv. Mopped Firestone Type IV (4) M or VI (6) Ply Sheet over an existing dry and sound uninsulated built-up roof system. If gravel surfaced, then gravel shall be removed by power brooming, vacuuming and spudding.
 - v. 2 plies of Mopped Firestone Type IV (4) M or VI (6) Ply Sheet set in Firestone approved hot asphalt over an acceptable mechanically attached barrier board.
 - vi. 2 plies of Mopped Firestone Type IV (4) M or VI (6) Ply Sheet set in Firestone approved hot asphalt directly on a properly prepared structural concrete deck.
 - vii. Fully adhered Firestone SBS Base Sheet set in Firestone approved hot asphalt, cold adhesive, or SBS Torch Base heat fused, over an acceptable mechanically attached barrier board.
 - viii. Fully adhered Firestone SBS Base Sheet set in Firestone approved hot asphalt, Firestone Multi-Purpose MB Cold Adhesive, or SBS Torch Base heat fused, directly on a properly prepared structural concrete deck.
 - ix. SBS Modified Bitumen base sheets may not be exposed for more than 60 days. SBS Base sheets left exposed for more than 48 hours must be primed with D-41 primer prior to the completion of the roof assembly. In all cases, base sheets to receive a cap sheet or covering ply must be clean, dry and free of debris.
 - x. The inclusion of an air barrier or vapor retarder may affect the Underwriter Laboratory or Factory Mutual rating including the attachment of the Firestone roof system.
- c. It is the roof system designer's responsibility to:
- i. Assure that the methods of attachment of the roof system to the vapor retarder selected are approved by Firestone and compatible with the roof system.
 - ii. Assure that the approved vapor retarder will extend continuously and evenly throughout the roof plane to provide a complete seal against the intrusion of moist air from the building interior. Integration of the wall and roof air retarder systems is essential.
 - iii. Take the appropriate steps necessary to deal with the effect of construction moisture on a new roofing system, particularly during winter, when temporary propane heat is required.

D. Air Barriers

1. While some Firestone roof systems may require an air barrier to receive a Firestone warranty, a professional architect or engineer must determine the need for an air barrier, as well as the type, placement, and location of the air barrier.
2. Air barriers are a component of building envelope systems that control the movement of air into and out of buildings.
3. An air barrier may consist of a single material or of two or more materials which, when installed as a system, make up an air impermeable, structurally adequate barrier.
4. Air barrier systems are generally comprised of building components and materials that have an air permeability not exceeding 0.004 cfm/ft² under a pressure differential of .3 in. water.
5. No single component or material has the capability to provide a complete air barrier system for a building; therefore, air barrier systems include many components and materials that are interfaced with each other. Firestone recommends that the individual

manufacturers of these products provide written certification that their products, when used together, meet this requirement.

6. If the air barrier is to perform its intended role, it must meet a number of requirements:
 - a. Continuity: the assembly must be linked together to ensure that there is no break in the air tightness of the envelope.
 - b. Structural Integrity: The air barrier must be capable of resisting the imposed load or must be supported by one that can. It must be capable of resisting the strongest wind load acting as either a pressure or suction without rupturing or breaking away from its support. The air barrier and its support must be sufficiently rigid to resist displacement.
 - c. Air Impermeability: A major requirement of an air barrier is that it offers a high resistance to airflow.
 - d. Durability: Durability depends largely on how a material reacts to a specific environment such as moisture, temperature, ultra-violet radiation, and to the presence of other materials (incompatibility)

1.04 SUBSTRATE AND SUBSTRATE REQUIREMENTS

A. General:

1. The Firestone roof systems depend on a suitable substrate to weatherproofing the building.
2. It is the roofing contractor's responsibility to ensure that the substrate is acceptable for the Firestone roof system
3. The substrate to which the Firestone roof system is installed must:
 - a. Be structurally sound.
 - b. Be dry, smooth, flat and clean.
 - c. Be free of sharp fins, or foreign materials that could damage the membrane.
 - d. Meet the minimum requirements for the system.
4. Concrete decks must cure for a minimum of 28 days so that the surface will be dry prior to the application of a roof membrane.
 - a. NRCA recommends that concrete decks be tested for adequate dryness by two methods:
5. When using Firestone approved hot asphalt to adhere approved insulation or ply sheets to a structural concrete substrate, the concrete must be primed with an ASTM D 41 asphalt primer. The primer is applied at a rate of 1-1/2 to 2 gallons per 100 square feet (0.61 to 0.82 L/sq. m) and allowed to fully cure prior to application of insulation or roof membrane.
6. Concrete additives can have a negative impact on the adhesion of asphaltic membranes and insulation products. As a result, Firestone does not accept for warranty, freshly poured concrete decks that contain concrete additives used to modify curing.
7. Firestone does not accept for warranty any concrete substrates that have been sealed with chemical sealers.
8. When applying BASEGARD SA to ISOGARD™HD, RESISTA, ISO95+ GL, SECUROCK or DensDeck Prime, one of the following heat sources must be applied to the top surface of BASEGARD SA; 1) a heat welded Firestone MB torch cap sheet, 2) a Firestone SBS sheet in approved hot asphalt or 3) Firestone POLYISO insulation adhered with I.S.O. Stick, or I.S.O. Twin Pack.
9. To avoid blister formation Roof substrates must be clean, dry and free of debris.

B. Fastener Pullout Requirements:

1. Substrates for membrane and or the insulation attachment are required to provide sufficient pullout resistance for the fasteners and the roof system.

**Table 1.04-1
The Minimum Fastener Pullout Resistances For Specific Systems**

System	Minimum Fastener Pullout
Insulation Mechanically Attached to Deck	300 lbs. (136.1 Kg)
Base Sheet Mechanically Attached to Deck	300 lbs. (136.1 Kg)
Base Sheet Nailed to Deck	40 lbs (18.1 Kg)
Contact your Roof Systems Advisor at 800-428-4511 when the structural deck does not meet the minimum fastener pullout requirements.	

2. See the Firestone Attachment section of this Guide for the minimum adhesive pull test requirements for insulation adhesives.
3. Pullout Tests: Due to the variety of physical conditions that can affect pullout resistance, Firestone recommends that on-site tests be conducted by an independent testing laboratory, the fastener manufacturer's representative or the roofing contractor, to determine actual pullout values. The following deck types are those which may not provide sufficient pullout resistance:
 - a. Steel decks thinner than 22 gauge (0.76 mm).
 - b. Concrete less than 3000 psi (20,684 kPa).
 - c. Plywood or oriented strand board less than 7/16" (11.1 mm) thickness.
 - d. Wood plank less than 3/4" (19 mm) thickness.
 - e. All poured or pre-cast gypsum, cementitious wood fiber and lightweight insulating concrete decks.
 - f. Existing masonry or brick.
 - g. Any other substrate that does not have a published pullout capacity greater than the minimum required for the applicable roof system.
 - i. The sections of the substrate where integrity is most in question should be used for testing. Test areas should include corners and drain areas and perimeters. The recommended minimum number of pullout tests are as follows:

**TABLE 1.04 –2
RECOMMENDED NUMBER OF PULLOUT TESTS**

Roof Size		Number of Pullout Tests
Less Than 10,000 ft ²	Less Than 1,000 m ²	6
10,000 ft ² - 50,000 ft ²	1,000 m ² – 5,000 m ²	10
50,000 ft ² - 100,000 ft ²	5,000 m ² – 10,000 m ²	20
Over 100,000 ft ²	10,000 m ²	1 per 5,000 ft ² / 500 m ²

- ii. When new construction or other conditions prevent preliminary on-site pullout tests, the fastener manufacturer should supply estimated pullout values for design and bid purposes. On-site verification of the pullout capacity must be confirmed prior to system installation. (Consider requesting a unit price bid for potential increased fastening requirement).
- C. Moisture Considerations:
1. The roofing contractor is responsible for ensuring that the substrate is suitable to receive a Firestone roof system. All damaged and/or wet insulation or substrate must be removed and replaced prior to the application of the Firestone roof system.
 2. A moisture survey should be conducted to determine the moisture content of any existing roof system component. All damaged and/or wet components of the existing system that would be detrimental to the new Firestone system must be removed prior to its installation.
 3. Failure to remove any existing system components that could cause damage to the new Firestone roofing system may void the warranty.
 4. The best diagnostic technique is by taking and evaluating a series of roof cores.

5. Three techniques are currently available to evaluate the roof by non-invasive means. Results of these studies must still be correlated with roof cores. These techniques provide measurements of factors that can be associated with the presence of moisture.
 6. Building codes may require a specific minimum slope for drainage. It is the building owner or his design professional's responsibility to consult with the controlling code agency official(s) to determine the specific requirements of each project and each system.
 7. When interior drains are necessary, they must be installed at the low points of a sloped roof deck and maintained in a working condition.
- D. Drainage and Slope:
1. Firestone requires a minimum of 1/4 inch (6.4 mm) per 12 inches (304.8 mm) slope, unless specified otherwise as a condition for warranty approval, to facilitate proper drainage and maximize long-term performance of the roof system.
 2. Ponding water is defined as a condition existing on any area of the roof where water remains more than forty-eight (48) hours after precipitation.
 3. Adequacy of drainage provisions, placement, sizing and/or number of drains required is the responsibility of the building owner or his design professional. Drainage conditions should meet the requirements of applicable codes as well as standard industry recommendations.
 4. In re-roofing or re-cover situations, analysis of the existing drainage conditions is the responsibility of the building owner and/or his design professional. Existing deck deflection or ponding water may necessitate the upgrading of drainage provisions, including relocation of existing drains, possible addition of new drains, increased bar joist support, etc. Firestone does not design roof drainage systems or assume any liability for the adequacy (or lack thereof) of roof drainage systems or facilities.
 5. Proper and adequate drainage of the roof surface is required to assure the long-term performance of the roofing system. Drains should be of sufficient number, size, and located to provide satisfactory and rapid drainage of the entire roof surface (within 24 to 48 hours of precipitation). Although, a minimum roof slope of 1/4" (6.4 mm) per foot is recommended by NRCA, other slopes may be acceptable to receive a Firestone warranty.
 6. Tapered ISO 95+ provides an effective and economical solution where substrate slope will not permit efficient drainage. When properly installed, it can extend the life of the roof assembly by eliminating problems associated with ponded water. Tapered ISO 95+ is available in slopes from 1/16" to 1/2" per foot. Firestone provides a variety of technical support services for the installation of tapered insulation through the **Firestone Tapered Engineering Design Department**.
 7. The following are some of the reasons why proper roof drainage is important:
 - a. Standing water can result in deck deflection and possible structural damage.
 - b. Water on the roof can promote vegetation, fungi and bacterial growth.
 - c. In the event of an opening in the roof membrane, standing water can significantly worsen the damage to the roof system, the building itself, and the interior contents.
 - d. It is required by many, if not all, building codes.
 - e. Proper drainage of the roof system prevents premature deterioration of the roof membrane and roof components.
- E. Cant Strips:
1. Cant strips are a means by which the angle between deck to wall and other types of transitions are reduced so that the roof membrane and flashings can conform better to the adhesion surface.
 2. Cant Strips are required at all angle changes, greater than 45°, between the vertical and horizontal plane.
 3. Acceptable Cant Strip materials:
 - a. Wood or preservative-treated wood
 - b. Wood fiber

- c. Perlite
 - d. Primed concrete
4. Depending on the cant strip material, cant strips may be set in Firestone approved hot asphalt, Firestone Multi-Purpose MB Flashing Cement, or mechanically attached with acceptable fasteners and plates.

Caution: Cant strip materials may be combustible. Proper precautions must be taken to prevent exposure of combustible cant materials to the open flame of a roofing torch or other sources of ignition. Cant material maybe treated with Firestone Flame Out to help reduce the possibility of ignition.

5. If cants are concrete, they must be primed with ASTM D 41 primer prior to installing the roofing membrane and related flashings.
- F. Wood Nailers:
1. For new construction projects, wood nailers must be kiln-dried (Southern Pine, Douglas Fir) structural grade #2 or better.
 2. Wood nailers by others; make these specifications and details available when others will install nailers. Work that compromises the integrity of the system may jeopardize the warranty.
 3. For re-cover projects and new construction projects where a poured-in-place deck will be used, wood nailers must be pressure treated for rot resistance, #2 or better lumber. Asphaltic or creosote-treated lumber is not acceptable. Lumber treated with other wood preservatives such as Pentachlorophenol, Copper Naphthenate or Copper 8-quinolinolate will adversely affect the membrane when in direct contact and are, therefore, unacceptable.
 4. Due to EPA regulations regarding treated wood, new treatments for lumber may be highly corrosive to fasteners. Contact the fastener manufacturer for their recommendations on fasteners if attaching nailers that have been treated with the more corrosive materials.
 5. Chemical treating for fire resistance or other purposes (other than pressure treating for rot resistance, i.e. CCA, ACZA, CBA, ACQ or other copper treatments) may affect the performance of the Firestone membrane and accessories. Contact your Roof Systems Advisor at 800-428-4511 when using chemically treated lumber that will come in contact with the membrane.
 6. Firestone requires wood nailers at the following locations:
 - a. All roof edges.
 - b. Metal penetration pockets.
 - c. Wood nailers must totally support all sheet metal flanges.
 - d. Refer to Firestone Details for other location requirements.
 7. The wood nailer may be omitted when metal flanges are more than 12 inches on a side and when metal flanges are placed and secured directly to the deck.
 8. Firestone All-Purpose (AP) Fasteners may be used for attachment to wood decks for all Firestone Red Shield, Medallion and Platinum warranted roofing systems. Testing with the Firestone AP Fastener in wood decks has yielded outstanding pullout values, and applies to all types of wood decks: OSB, Tongue-and-Groove, Wood Plank, etc.
 9. The building owner or his design professional must specify a wood nailer attachment system that will resist a minimum force of 200 lb per foot (2.9 N/m) in any direction. Firestone fasteners are required for all roofing applications. For further clarification, please refer to Factory Mutual Loss Prevention Data Sheet 1-49.
- G. Expansion Joints:
1. The determination of the necessity and location for expansion joints is a project specific requirement, which is the responsibility of building owner or his design professional. Typical consideration for selection criteria may be one or more of the following:
 - a. Where expansion or contraction joints are provided in the building structural system.
 - b. Roof expansion joints must be located to accommodate movements caused by thermal expansion and building structural movement.

- c. Where structural framing elements such as joists, rafters, purlin, or steel decking change direction.
- d. Deck material changes (e.g. from steel to concrete deck). Where different types of roof decks such as concrete and steel abut each other.
- e. Where additions are connected to existing buildings.
- f. At junctions where interior heating conditions change such as a heated space abutting an unheated space.
- g. Where movement between vertical walls and the roof deck is anticipated.
- h. Roof areas greater than 200 feet (61 m) on any direction.
- i. Coordination and sequencing of expansion joint closure systems and their continuity, compatibility and function of seal is the responsibility of the design team.

Note: The conditions above may not be inclusive. Other conditions may exist in which expansion joints should be considered.

- 2. Expansion joints must not restrict the flow of water.
- H. Area Dividers, Control Joints:
- 1. Area dividers or control joints are raised, double wood members attached to a properly flashed wood base plate that is anchored to the roof deck.
 - 2. Large open expanses can create large thermal stresses. Area dividers can help minimize this by dividing the roof system into smaller sections. The determination of the necessity and location for area dividers is a project specific requirement, which is the responsibility of the building owner or his design professional.
 - 3. The areas of the roof should be rectangular in shape and uniformly spaced where possible.
 - 4. Roof area dividers are recommended for the following conditions:
 - a. Roof areas greater than 200 feet (61 m) on any direction.
 - b. Roofs with H, L, E, T, and U shapes should be subdivided by area dividers into rectangular areas that can be roofed one area at a time.
 - c. Where expansion joints are not provided in the building structure, area dividers may be used to help control thermal stresses within the roof assembly.
 - 5. Area dividers and control joints must not restrict the flow of water or cross roof areas considered for expansion joints.
- I. Sloped Roofs:
- 1. The building owner or the design professional intending to specify back-nailing should consider geographic location, specific job conditions, accepted area application practices, and the type and grade of materials specified when creating an actual specification for a project.
 - 2. When the slope of the roof exceeds ½ ": 12" (4.2%), and hot asphalt attachment is specified, Firestone requires that only Firestone approved SBES Mopping Asphalt or ASTM D 312 Type IV (4) or CSA A123.4 Type III (3) asphalt be used.
 - 3. Contact your Roof Systems Advisor at 800-428-4511 for additional requirements regarding roof slopes over 3": 12" (25%).
 - 4. For roof slopes up to and including ½ ": 12" (4.2%), the side laps can be installed parallel or perpendicular to the slope.
 - 5. For roofs slopes greater than ½ ": 12" (4.2%), the membrane must run parallel to the slope.

**Table 1.04-3
BACK-NAILING REQUIREMENTS FOR SLOPED ROOFS**

Cap Sheet	Attachment	Base Sheet	Attachment	≤1/2" (4.2%)	≥1/2" ≤1" (4.2% 8.3%)	≥1" (8.3%)	≥1" to ≥3" (8.3% 25%)
Any Applicable Granule Surfaced Firestone SBS Cap	Firestone Approved Hot Asphalt	Any Applicable Firestone Base Sheet	Firestone Approved Hot Asphalt Or Mechanically Attached	NFR	Nailers 32' o.c.	Nailers 32' o.c.	Nailers 16' o.c.
					Full Length Sheet	Full Length Sheet	½ Length Sheet
Any Applicable Granule Firestone SBS Cap Sheet	Firestone Multi-Purpose MB Cold Adhesive	Any Sand Surfaced Firestone Base Sheet	Heat Fused, Mechanically Attached, or Firestone Multi Purpose MB Cold Adhesive	NFR	Nailers 32' o.c.	Nailers 32' o.c.	Nailers 16' o.c.
					Full Length Sheet	Full Length Sheet	½ Length Sheet
Any Applicable Firestone Granule Surfaced SBS Cap Sheet	Firestone Multi-Purpose MB Cold Adhesive	Any two Sand Surfaced Firestone Base or Ply Sheets	Heat Fused, Mechanically Attached, or Firestone Multi Purpose MB Cold Adhesive	NFR	Nailers 32' o.c.	Nailers 32' o.c.	Nailers 16' o.c.
					Full Length Sheet	Full Length Sheet	Half Length Sheet
Any Applicable Granule Surfaced Firestone SBS Cap Sheet	Heat Fused	Any Applicable Firestone Base Sheet	Self Adhered, Heat Fused, Mechanically Attached, or Firestone Multi Purpose MB Cold Adhesive	NFR	Nailers 32' o.c.	Nailers 32' o.c.	Nailers 16' o.c.
					Full Length Sheet	Full Length Sheet	Half Length Sheet
Refer to Firestone MB-LS-9 for detailed back-nailing requirements.							
NFR – No Fastener Required at This Slope							

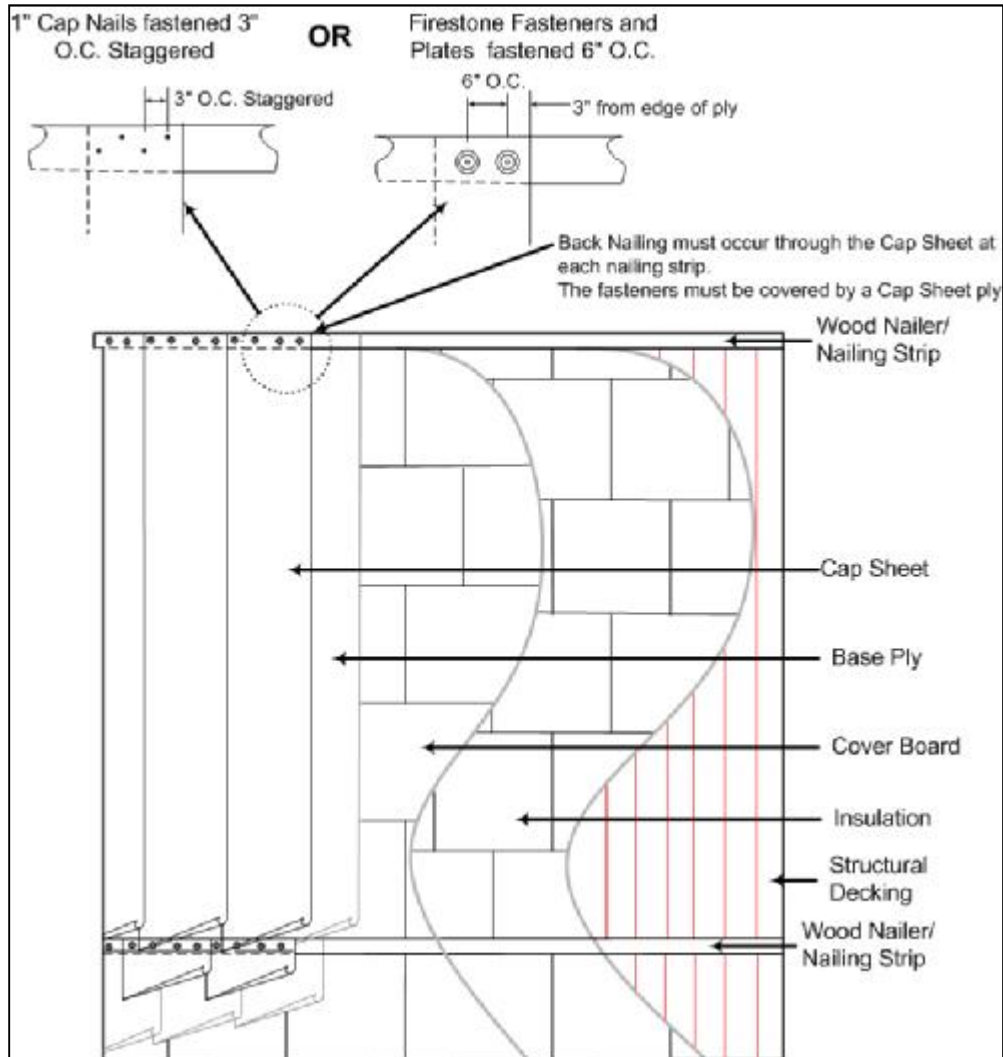
J. Insulation Stops and Back-nailing Nailing Strips:

1. Back-nailing nailing strips are required on all roofs with slopes greater than 4.1% (0.5":12")
2. Insulation stops and are recommended on all roofs with slopes greater than 16.6% (2:12)
3. Back-nailing nailing strips and Insulation stops shall be a minimum of 3 1/2" (88.9 mm) wide and the same thickness as the roof insulation.
4. Back-nailing nailing strips and Insulation stops must be attached to resist a force of 200 lbf per lineal foot (2.9 kN/m) minimum.
5. Insulation stops and back-nailing nailing strips are not needed when system is applied directly to a wood deck or a similar nailable substrate. The cap sheet can be back-nailed directly to a wood deck or similar nailable substrates when back-nailing is recommended.
6. Contact your Roof Systems Advisor at 800-428-4511 for information regarding back-nailing requirements utilizing approved insulation less than 1 inch.

K. Back-nailing Modified Bitumen Base and Cap Sheets:

1. Fasteners and plates may be used in lieu of cap nails. Four per end lap are required. Non-Nailable decks and nailable decks with insulation
2. Cut the cap sheet to conform to nailer spacing. Using capped nails or Firestone screws and plates, nail the end lap across the width of the sheet, with the first nail spaced 3/4" (19 mm) from the leading edge of the sheet. The remaining nails are to be spaced approximately 3" (76.2 mm) on center. The nails should be staggered across the width of the nailer. When Firestone fasteners and plates are used in lieu of cap nails, four per end lap are required.
3. Nailable decks with no insulation
4. Cut the cap sheet to conform to nailer spacing. Using capped nails or Firestone fasteners and plates, nail the end lap across the width of the sheet, with the first nail spaced 3/4" (19 mm) from the leading edge of the sheet. The remaining nails are to be spaced approximately 3" (76.2 mm) on center. The nails should be staggered across the width of the nailer. Firestone
5. Cap nails must have 1" (25.4 mm) diameter steel heads. Plastic heads are not allowed. The shank must be minimum 11-gauge (2.3 mm) annular ring or spiral shank. Nails must be FM Approved.

6. End laps must extend a minimum of 6 inches beyond the edge of the fastener. For example, when fasteners and 3" plates are used (as shown below) each end lap must be a minimum of 9 inches.



1.04 FASTENERS

A. General:

Refer to the Technical Information Sheet (T. I. S.) that references the specific fastener being used and for the deck penetration requirements of that fastener. All fasteners must be suitable for the existing deck type.

1. Roof systems rely on the attachment of the components to the deck substrate to perform its basic functions. Wind creates uplift forces on the roof; therefore, the overall holding power of the fasteners is critical. Firestone recommends that the use of any fastener be investigated should there be concerns about the structural integrity of the deck. Some of the items to be considered include:
 - a. How the fastener(s) might affect the deck.
 - b. The capability of the deck to hold the fasteners and roof system in place in a wind related event.

2. The structural integrity of the deck may have been weakened over time, thus the choice of fastener and roof attachment methods should be considered in determining the best solution to the given deck and situation.
 3. For retrofit roof systems, Firestone HD Fasteners must be used for 15-year or greater warranty, when mechanically fastening insulation using fasteners and plates.
 4. For new and replacement roofing, Firestone HD Fasteners must be used for a 20-year Red Shield Warranty, when mechanically fastening insulation using fasteners and plates
- B. Cap Nails:
1. Cap nails must be FM Approved, and have 1" (25.4 mm) diameter steel heads. Shank must be a minimum of 11-gauge (2.3 mm) annular ring or spiral.
 2. Cap nails cannot be used to attach insulation or for 20 year systems with the exception of light weight concrete and wood decks where a base sheet must be mechanically fastened prior to the installation of the roof assembly.
 3. Firestone insulation plates and fasteners may be used in lieu of cap nails.
 4. Firestone Polymer Fasteners cannot be used with heat welded systems.

**TABLE 1.05-1
ALLOWABLE FASTENER AND SUBSTRATE CONFIGURATIONS**

Firestone Fastener	Acceptable for 20-year Warranty	Steel Decks	Structural Concrete Decks	Plywood or OSB Decks	Cementitious Wood Fiber Decks	Gypsum Decks	Lightweight Insulating Concrete Decks	
							(See Section 1.06 H for additional requirements)	
Fastener							Steel Pan	Concrete
All-Purpose Fastener		✓		✓				
Heavy-Duty Fastener	✓	✓	✓	✓			✓	✓
Concrete Drive Fastener	✓		✓					✓
Polymer Fastener	✓				✓	✓		
Firestone AccuTrac Kit		✓		✓				
HD Plus Fastener	✓	✓						
LWC Base Ply Fastener	✓					✓	✓	✓
	For the attachment of base sheets. Insulation may not be attached with LWC Base Ply Fastener.							
#12 Belted Fastener		✓		✓				
#15 Belted Fastener	✓	✓		✓				
Nail Driver				✓				
	For the attachment of base sheets. Insulation may not be attached with nails of any kind.							
HailGard Fastener	✓	✓	✓	✓			✓	✓
	For the attachment of OSB and Firestone HailGard Insulation. No insulation plate is required.							

✓ = Acceptable for use

**TABLE 1.05-2
ACCEPTABLE FASTENERS**

Firestone Fastener	For the attachment of the following materials:			
	Roofing Insulation (In combination with Firestone Insulation Plate)	Base Sheets (In combination with Firestone Insulation Plate)	Termination Bars	Other Accessories
Fastener	See the specific fastener TIS for specific application data			
All-Purpose Fastener	✓	✓	✓	✓
Heavy-Duty Fastener	✓	✓	✓	✓
Concrete Drive Fastener	✓	✓	✓	✓
Polymer Fastener	Do not use with polymer batten strips.			
	✓	✓		
Firestone AccuTrac Kit	Special battens and plates required.			
	✓	✓		
LWC Base Ply Fastener	Insulation to steel and wood roof decks with Buildex AccuTrac installation equipment. A kit consists of both fasteners and insulation plates for the AccuTrac tool.			
		✓		
#12 Belted Fastener	For the attachment of base sheets. Insulation may not be attached with LWC Base Ply Fastener			
	✓	✓		
#15 Belted Fastener	Insulation to steel (18-24 gage) and wood. Belted fasteners must be installed with the IF160 automatic installation tool available from SFS INTEC. When used for insulation attachment, the Firestone IFC/PH 2.75" x 2/75" (70 mm x 70 mm) plate is used.			
	✓	✓		
	Insulation and membrane to steel (18-24 gage) and wood. The #15 Belted fasteners must be installed with the IF160 automatic installation tool available from SFS INTEC. When used for membrane attachment, the Firestone 2 3/8" (60.3 mm) diameter plate is used. When used for insulation, the Firestone 2.75"x 2.75" (70 mm x 70 mm) plate is used.			
Nail Driver	✓			
	Cap nails are to be used to attach a base sheet to a wood deck and cannot be used to attach insulation. Cap nails cannot be used to attach a base sheet through an existing built-up roof when the roof thickness is over 1/2" (12.7 mm).			
HailGard Fastener	✓			
For use with Firestone HailGard Insulation and OSB to approved decks. No insulation plate required.				
✓ = Acceptable for use				

1.05 DECKS

A. General:

1. Structural roof decks should be designed and constructed to provide sufficient strength to support the anticipated dead and live loads. These include the loads anticipated from construction traffic and rooftop equipment that cannot be moved or shut down and ice and snow accumulation on the roof surface.
2. Deteriorated decks should be repaired or replaced.
 - a. All holes, deformations, depressions, etc. must be reinforced and /or smoothed prior to the roof application.
 - b. Acceptance of a deck for re-roofing is the responsibility of the building owner or his design professional.
 - c. The deck should provide a minimum of ¼"/foot slope to drain.
 - d. Phenolic insulation must be removed prior to re-roofing.
 - e. Sprayed-In-Place polyurethane foam (PUF) roof systems require a COMPLETE TEAROFF of the foam system prior to reroofing.

B. Classification:

1. Structural decks can be classified as nailable or non-nailable for purposes of mechanically attaching or nailing insulation and base sheets. Nailable decks include wood, gypsum and lightweight insulating concrete. These decks are soft enough so that the above-deck components can be secured with fasteners. Cementitious wood fiber and poured or precast structural concrete decks have been referred to as non-nailable. Firestone has fasteners that are approved for use with these decks.
2. Structural decks can be classified as combustible or non-combustible for purposes of fire ratings and code requirements.

**TABLE 1.06-1
STRUCTURAL DECK CLASSIFICATION**

Deck	Nailable and Non-nailable	Combustible or Non-combustible
Steel	Non-nailable	Non-combustible
Concrete	Both	Non-combustible
Wood	Nailable	Combustible
Cementitious Wood Fiber Decks	Both	Non-combustible
Gypsum	Nailable	Non-combustible
Lightweight Insulated Concrete	Nailable	Non-combustible

C. Steel Decks:

1. Firestone recommends that the steel deck be a minimum 22 Gauge (0.76 mm).
2. Factory Mutual Research-Approved steel decks are currently available in 22 gage (.0295 in., 0.794 mm), 20 gage (.0358 in., 0.909 mm) and 18 gage (0.0474 in., 1.204 mm) thick sheets with 1.5 inch (38 mm) deep corrugations. The corrugations (ribs) are cold rolled in the sheets. The deck has a 6 inch (152 mm) module, that is, the ribs are 6 inches (152 mm) on center. All fastening Approvals and recommendations are based on this profile. (Approved and recommended spacing is such that the fasteners will engage the top flange of the deck). Another common configuration is 3 inch (76 mm) deep deck, which usually has an 8 inch (203 mm) module.
3. When mechanically attaching insulation, steel decks are required to have a minimum fastener pullout strength of 300 lb per fastener.
4. The Firestone base sheet or cap sheet may not be adhered directly to a steel deck. Cap sheets and Base Sheets must be adhered to an acceptable insulation or coverboard.
5. On steel decks, the edges of insulation boards running parallel with the deck are required to be supported by the top flange of the metal deck. The board should have a minimum 1-1/2" (38.1 mm) bearing on the steel deck flange. Cantilevering insulation boards over

deck flutes can fracture insulation boards, reducing the support for the membrane, making it susceptible to puncture.

6. If present, it is required that phenolic insulation be removed. Once removed, a visual inspection of the deck condition and other components is required. It is the building owner or his design professional's responsibility to determine the condition of the deck. All deteriorated components must be replaced as necessary.

**TABLE 1.06-2
INSULATION ATTACHMENT FOR STEEL DECKS**

Acceptable Insulation Fasteners		Acceptable Insulation Adhesives
Firestone Heavy Duty Firestone All Purpose Belted Fasteners	3/4" (19mm) through deck.	Firestone I.S.O. SPRAY Firestone I.S.O. FIX Firestone I.S.O. Twin Pack Firestone I.S.O. Stick

D. Structural Concrete Roof Decks:

1. Firestone recommends that the concrete deck be a minimum 3000 Psi (20,684 KPa).
2. When mechanically attaching insulation, structural concrete roof decks require a minimum fastener pullout of 300 lb (1.8 kN) per fastener.
3. Verify with the building owner or his design professional about the suitability of mechanical fastening into pre-stressed and post-tensioned structural concrete.
4. The Firestone base sheet or cap sheet may be adhered directly to a primed poured-in-place structural concrete, using Firestone approved hot asphalt, Firestone Multi-Purpose MB Cold Adhesive, or by heat welding. The concrete must be finished to provide a substrate that is structurally sound, smooth, flat, clean, dry, free of sharp fins or foreign materials that could damage the material.
5. Concrete may contain latent amounts of moisture that may affect the insulation and the roof system. To help protect the components, a Firestone Venting Base Sheet or other vapor retarder material should be installed in accordance with Firestone requirements. The installation of a vapor retarder should be considered regardless of the type of attachment of the insulation and the membrane system.
6. The application of a Firestone base sheet or cap sheet to a structural concrete plank deck, such as a pre-cast concrete deck, may not be an acceptable application. Should the deck not require grouted joints, precautions must be taken to prevent bitumen drippage into the building. Pre-cast concrete panels may not always be a suitable substrate to receive insulation due to the potential for irregularities, even if the joints are grouted. It may sometimes be necessary to consider pouring a leveling layer of structural concrete over the panels prior to roofing.

**TABLE 1.06-3
BASE SHEET AND INSULATION ATTACHMENT FOR STRUCTURAL CONCRETE ROOF DECKS**

Acceptable Fasteners for Insulation and Base Sheet Attachment		Acceptable Insulation Adhesives	Acceptable Base Sheet Adhesives
Firestone Heavy Duty	1" (25.4mm) into the structural concrete deck.	Firestone I.S.O. SPRAY Firestone I.S.O. FIX Firestone I.S.O. Twin Pack Firestone I.S.O. Stick	Firestone Multi Purpose MB Cold Adhesive
Firestone Concrete Drives	1-1/4" (31.7mm) into the structural concrete deck.	Hot Asphalt cannot be used with ISGARD™ HD or RESISTA.	Hot Asphalt cannot be used with ISOGARD™HD or RESISTA™.

E. Wood Decks –Plywood, OSB, and Wood Plank:

1. Firestone requires that wood planks be a minimum 3/4" (19.1 mm) thick.

2. Firestone requires that plywood have a minimum thickness of ½ inch and that OSB decks have a minimum thickness of 7/16" (10.5mm).
3. Firestone base sheet and cap sheets may not be adhered directly to a wood substrate. Cap and/or base sheets must be adhered to an acceptable insulation, coverboard or mechanically attached base sheet. If the membranes are to be attached to a nailed base sheet with Firestone approved hot asphalt or Firestone Multi-Purpose MB Cold Adhesive a ply of sheathing paper is required under the nailed Base.
4. When mechanically attaching insulation or base sheets, wood decks are required to have a fastener pullout of 300 lb (1.8 kN) per fastener.
5. When nailing a base sheet, wood decks are required to have a fastener pullout of 40 lb (0.24 kN) for cap nails per fastener.

**TABLE 1.06-4
BASE SHEET AND INSULATION ATTACHMENT FOR PLYWOOD, OSB, AND WOOD PLANK ROOF DECKS**

Acceptable Fasteners for Insulation and Base Sheet Attachment		Acceptable Insulation Adhesives
Firestone Heavy Duty	1" (25.4 mm) into or through deck.	Firestone I.S.O. SPRAY Firestone I.S.O. FIX Firestone I.S.O. Twin Pack Firestone I.S.O. Stick LiquiGard
Firestone All Purpose Belted Fasteners		

F. Cementitious Wood Fiber Decks:

1. When mechanically attaching insulation, cementitious wood fiber decks are required to have a fastener pullout of 300 lb (1.8 kN) for each fastener.
2. Firestone recommends that cementitious wood fibers deck have a minimum 2" (51 mm) thickness.
3. The Firestone base sheet or cap sheet may not be adhered directly to a cementitious wood fiber deck. The cap sheet and/or the Base Sheet must be adhered to an acceptable insulation, cover board or a mechanically attached base sheet.

**TABLE 1.06-5
BASE SHEET AND INSULATION ATTACHMENT FOR CEMENTITIOUS WOOD FIBER DECKS**

Fasteners for Insulation and Base Sheet Attachment		Insulation Adhesives
Firestone Polymer Fastener	1-1/2" (38.1 mm) into deck	Firestone I.S.O. SPRAY Firestone I.S.O. FIX Firestone I.S.O. Twin Pack. Firestone I.S.O. Stick

G. Gypsum Roof Decks:

1. Firestone recommends that the gypsum roof deck have a minimum 2" (51 mm) thickness.
2. When attaching insulation to a gypsum roof deck, a fastener pullout of 300 lb (1.8 kN) per Firestone Polymer Fastener is required.
3. When mechanically attaching a base sheet to a gypsum roof deck, a fastener pullout of 40 lb (.24 kN) is required per 1.2 inch (30.5 mm) LWC Base Ply Fastener.
4. The Firestone base sheet or cap sheet may not be adhered directly to a gypsum deck. The cap sheet or the Base Sheet must be adhered to an acceptable insulation, cover board or a mechanically attached base sheet.

TABLE 1.06-6

BASE SHEET AND INSULATION ATTACHMENT FOR GYPSUM ROOF DECKS

Insulation Fasteners	Base Sheet Fasteners	Insulation Adhesives
Firestone Polymer Fastener	1.2" LWC Base Ply Fastener	Firestone I.S.O. SPRAY Firestone I.S.O. FIX Firestone I.S.O. Twin Pack Firestone I.S.O. Stick LiquiGard
1-1/2" (38.1mm) into deck.		

H. Lightweight Insulating Concrete Roof Decks:

1. Firestone requires that the lightweight insulating concrete have a minimum 2" (51 mm) thickness.
2. A vapor retarder is required under new systems with insulation.
3. When mechanically attaching insulation through lightweight insulating concrete, into a structural deck, a fastener pullout of 300 lb (1.8 kN) per fastener is required.
4. When mechanically attaching a base sheet to lightweight insulating concrete using 1.7" LWC Base Ply Fasteners, a fastener pullout of 40 lb (0.24 kN) per fastener is required.
5. Firestone base and cap sheets may not be adhered directly to a lightweight insulating concrete roof deck. The cap sheet and/or the Base Sheet must be adhered to an acceptable insulation, cover board or mechanically attached base sheet.

TABLE 1.06-7

BASE SHEET AND INSULATION ATTACHMENT FOR LIGHTWEIGHT INSULATING CONCRETE ROOF DECKS

Acceptable Fasteners for Insulation and Base Sheet Attachment		Acceptable Insulation Adhesives
Acceptable Fasteners into Steel Pan		Not Allowed
Firestone Heavy Duty (HD's)	3/4" (19mm) Minimum penetration of fastener through steel pan	
Acceptable Fasteners Into Structural Concrete Substrate		
Firestone Heavy Duty (HD's)	1" (25.4 mm) into concrete deck	
Firestone Concrete Drives	1-1/4 " (31.8 mm) into concrete deck	
Acceptable Fasteners for Attaching Base Sheet to Lightweight Insulating Concrete		
1.7" LWC Base Ply Fastener		

I. Partial Tear Off and Re-cover Applications:

1. **Partial tear off** is the removal of the existing membrane, installing a new layer of insulation over the existing in place insulation and a new membrane over the new insulation. Partial tear-offs are not eligible for a 20 year warranty.
2. **Recover** is the installation of a new roof system over an existing roof system.
3. The effect of existing moisture on the performance of the new system may be significant depending upon the roofing components selected. Therefore, a moisture survey should be conducted to determine the presence of moisture in the existing roof system components. All components of the existing system that would be detrimental to the new Firestone roof system must be removed and replaced prior to its installation.
4. Limitations in flashing heights may be encountered. Existing building features (i.e., door or window locations, weeps or through-wall flashings) may not allow sufficient clearance to provide proper termination above the potential water level. Detailed consideration of this condition is critical to the integrity of the roofing system. **Contact your Roof Systems Advisor at 800-428-4511 for assistance.**
5. Confirm the structural integrity of the existing deck and specify repair or replacement as required.
6. Existing roof components are not included in the Firestone warranty.

7. It is the responsibility of the building owner and/or his agents, to verify that the existing roof system is sound and intact.
8. All re-cover or retrofit systems using adhesives for insulation attachment require a pull test to verify adhesion.
9. Refer to the *Firestone Attachment Guide* for adhesion pull test requirements for I.S.O. Fix, I.S.O. Spray S, I.S.O. Stick and I.S.O. Twin Pack
10. When using fasteners, verify that the substrate has sufficient fastener pullout resistance to meet system requirements
11. New insulation or cover board is required.
12. The existing insulation must be suitable for use as a component of the new roof system. The existing insulation must be:
 - a. Dry and free of trapped moisture.
 - b. The existing insulation must be re-secured as necessary to meet Firestone, local code, or other specified wind uplift requirements.
 - c. The existing insulation must be an acceptable substrate for the new insulation and the new membrane.
13. If existing insulation is to remain, all damaged or wet components must be replaced prior to installing the new roof system.
14. Existing roof components are not included in the Firestone warranty.

**Table 1.06-8
Special Attachment Considerations for Partial Tear Off and Re-cover Applications**

Deck	Special Considerations
Steel and Nailable Decks (Wood Plank, Plywood, OSB, Gypsum, Cement Wood Fiber, Poured-in-place Concrete decks)	If the existing system is not sound and intact mechanical attachment of the system may be necessary.
Non-Nailable Decks (Poured-in-place Concrete decks, Pre-cast Concrete decks, Post-Tension Concrete decks)	If the existing roof system is not sound and intact, additional securement may be necessary.

- J. Re-cover Applications:
 1. Existing Built-Up and Modified Bitumen Roofs
 - a. Gravel surfacing must be completely removed from existing BUR roofs.
 - b. New insulation or a cover board is required except when installing an appropriate Firestone roof membrane directly to an existing smooth surfaced BUR or Modified Bitumen roof. The warranty period for direct attachment to an approved existing roof is limited to 10-12 years. The existing smooth asphalt roof must not have been coated or re-saturated and must be primed with ASTM D-41 primer prior to the installation of a new asphalt or modified bitumen membrane.
 - c. All damaged or wet components must be removed and replaced prior to installing the new roof system.
 - d. Existing roof components are not included in the Firestone warranty.
 2. Coal Tar Pitch Built-Up Roofs
 - a. New, mechanically attached insulation or a cover board is required to divorce the new roof from the existing coal tar bitumen.
 - b. If existing insulation is to remain, all damaged or wet insulation must be removed and replaced prior to installing the new roof system.
 - c. Loose gravel must be removed until the roof surface is smooth enough to provide a suitable substrate for the insulation. All loose gravel must be removed by vacuuming and/or, power brooming. Spud remaining gravel smooth to provide a level surface.
 - d. Existing roof components are not included in the Firestone warranty.

- e. Flow of existing coal tar into the building may occur when new fasteners penetrate an existing coal tar pitch membrane
- 3. Gravel Surfaced Asphalt Built-Up and Modified Asphalt Roofs
 - a. New properly attached insulation or cover board is required.
 - b. If existing insulation is to remain, all damaged or wet insulation must be removed and replaced prior to installing the new roof system.
 - c. Existing roof components are not included in the Firestone warranty.
 - d. All loose gravel or granules must be removed by vacuuming and/or, power brooming. After all loose gravel has been removed; spud the remaining gravel smooth to provide a level surface.
 - e. Verify that the attachment of the existing roof system is acceptable. If existing insulation is not mechanically fastened, contains fasteners that may be corroded or loose, or the attachment may not be sufficient, re-attachment of the roof system is required prior to the installation of new insulation.
 - f. All loose gravel or granules must be removed by vacuuming and/or, power brooming. After all loose surfacing has been removed; spud the remaining gravel smooth to provide a level surface.
 - g. Prime the surface using an ASTM D 41 asphalt primer.
 - h. Re-secure the existing assembly as necessary to meet local code, insurance wind uplift and Firestone slope/attachment requirements.
 - i. Sprayed-in-place polyurethane foam (PUF) roof systems require a COMPLETE TEAR-OFF of the Sprayed In-Place polyurethane foam system.
 - j. Existing roofs over phenolic insulation requires a COMPLETE TEAR OFF of the entire roof system to the structural deck.
 - k. When Phenolic insulation is removed, a visual inspection of the deck condition and other components is required; all deteriorated components must be replaced as necessary
- 4. Existing Single-Ply Systems
 - a. A mechanically attached insulation or cover board is required
 - b. Re-cover over single-ply roof systems will require that all existing base tie-ins and flashings be removed prior to the installation of a new roof.
 - c. If existing insulation is to remain, all damaged or wet insulation must be removed and replaced prior to installing the new roof system.
 - d. Existing roof components are not included in the Firestone warranty.

1.07 BASE SHEET AND BASE PLIES

- A. General:
 - 1. Depending on the substrate, base sheets may be attached with fasteners, Firestone Multi-Purpose MB Cold Adhesive, Firestone LiquiGard™ Membrane Adhesive; Firestone approved hot asphalt, or heat fusing as required by Firestone specifications.
 - 2. Firestone modified bitumen systems must be installed so that all laps shed water.
 - 3. Base sheets, base plies, or ply sheets must not be glaze coated when used as a substrate for any SBS base or cap sheet.
 - 4. When hot asphalt is used as the method of attachment, Firestone requires that only Firestone approved SEBS Mopping Asphalt or ASTM D 312 Type IV (4) or CSA A123.4 Type III (3) asphalt be used:
 - a. In all multi-ply, SBS systems.
 - b. In all 20 year SBS systems
 - c. Where the slope exceeds 1/2": 12" (4.2%).
 - 5. Firestone requires only Firestone approved adhesion asphalt to be used in all warranted Firestone systems that require application with hot asphalt.

**Table 1.06-1
Allowable Base Sheet Attachments**

Substrate To Which the Base Sheet Will Be Attached	Attachment Method				
	Mechanically Attached	Heat Weld	Multi Purpose MB Cold Adhesive	LiquiGard Adhesive	Firestone Approved Hot Asphalt
Decks					
Structural Concrete	✓	✓	✓	✓	✓
Plywood or Oriented Strand Board	✓				
Wood Planking	✓				
Poured Or Pre-Cast Gypsum	✓			✓	
Cementitious Wood Fiber	✓				
Lightweight Insulating Concrete Decks (See Section 1.06 H for additional requirements)	✓				
Recover					
Smooth Surface BUR, Uncoated	✓	✓	✓	✓	✓
Mineral Surface BUR Mineral Surface Modified Bitumen Gravel Surfaced BUR Coal Tar Pitch BUR Existing Single-Ply Systems	New insulation or cover board is required for warranties in excess of 10 years.				
New Insulation					
ISO 95+	✓		✓	✓	✓ *
RESISTA	✓		✓	✓	
HailGard	✓			✓	
FiberTop	✓				✓
DensDeck (primed)	✓	✓		✓	✓
DensDeck Prime	✓	✓	✓	✓	✓
SECUROCK Gypsum-Fiber	✓	✓	✓	✓	✓
ISOGARD™HD	✓			✓	
Perlite Insulation	✓				✓
Asphalt Base Sheet	✓	✓	✓	✓	✓
*Requires a coverboard					

**TABLE 1.06-2
BASE SHEET SEAM / LAP WIDTH REQUIREMENTS**

Sheet	Interply Adhesive	Seam/Lap Width Requirements	End Lap Width Requirements
Any SBS Base Sheet	Heat Fused Mechanically Attached Adhered with Firestone Approved Hot Asphalt Adhered with Firestone Multi-Purpose MB Cold Adhesive Adhered with LiquiGard	3" (76.2 mm)	6" (152.4 mm)
BASEGARD SA	Self-Adhered with Heat Fused Cap Sheet, or Cap sheet applied in Hot Asphalt	3" (76.2 mm)	6" (152.4 mm)
MB Base Sheet	Adhered with Hot Asphalt Adhered with Multi Purpose MB Cold Adhesive Adhered with LiquiGard	2" (50.8 mm)	6" (152.4 mm)
MB Base Sheet	Mechanically Attached	3" (76.2 mm)	6" (152.4 mm)

B. Hot Asphalt Attachment

1. Base sheets, base plies, or ply sheets must not be glaze coated when used as a substrate for SBS base or cap sheets.
2. When hot asphalt is required, only Firestone approved adhesion asphalt is acceptable for warranty. Firestone approve SEBS Mopping Asphalt or ASTM D 312 Type IV (4) or CSA A123.4 Type III (3) asphalt shall be used:
 - a. In all multi-ply SBS systems.
 - b. In all 20 year SBS systems
 - c. Where the slope exceeds ½ ": 12" (4.2%).
3. Attachment of base sheets with hot asphalt to expanded or extruded polystyrene insulation is not acceptable.
4. Do not encapsulate DensDeck boards in hot asphalt. DensDeck must be mechanically attached or installed using Firestone foam adhesive if sheets are applied to the top in hot asphalt.
5. Roofing plies, base sheets, or cap sheets cannot be fully mopped to polyiso insulation. A coverboard must be used to separate the polyiso insulation from the fully adhered, hot asphalt SBS Base Sheet.
6. The following are overlays over polyiso that are generally acceptable when attaching any ply sheet with Firestone approved hot asphalt
 - a. A base sheet mechanically attached through the polyiso insulation into the structural deck.
 - b. DensDeck Prime, SECUROCK and Firestone Fiber Top. When attaching any DensDeck product Firestone foam adhesive or mechanical attachment must be used if materials are to be applied to the top in hot asphalt.

**TABLE 1.06-3
APPROVED SUBSTRATES FOR USE WITH FULL MOPPING OF BASE SHEET**

Firestone FiberTop	✓
Poured-in-Place or pre-cast structural concrete decks that has been primed with ASTM 41 primer.	✓
Existing properly prepared asphalt uncoated smooth BUR membrane roof.	✓
✓ = Acceptable for use	

C. Mechanical attachment of Base Sheets:

1. The base sheet must be fastened with appropriate Firestone fasteners or Firestone fasteners and insulation plates and installed in accordance with the fastening rate and pattern for the applicable system.
2. Fastening rates and patterns may vary for code compliance. Contact the local code or insurance officials before contacting your Roof Systems Advisor at 800-428-4511.
3. Base sheets can be mechanically attached through insulation to deck where appropriate Adhere to Firestone Base Sheet Seam and Lap Width Requirements

**TABLE 1.06-5
MECHANICALLY ATTACHING / NAILING BASE SHEET AND DECK CHART LISTING ACCEPTABLE SUBSTRATES**

For Retrofit and/or Re-cover, mechanically attach Base Sheets through insulation into the deck and/or through approved roof systems into the deck					Notes
Mechanically Attach Base Sheet Directly To Deck When There Is No Insulation					
Deck	Attachment	Base Sheet Fastening Pattern			
Steel Deck	Firestone Fasteners and Plates	Diagram 1.06-1		✓	Insulation or a cover board is required on steel decks except when V-Force is used between the deck and the insulation.
Concrete Deck	Prime Concrete Deck	Diagram 1.06-1			Heat weld SBS Torch Base Sheets, apply BASEGARD SA direct to deck or hot mop SBS base sheets to concrete.
	Firestone Concrete Drive Fastener and Plates	Diagram 1.06-1	✓	✓	
Plywood, OSB, Wood Planking	Firestone Fasteners and Plates	Diagram 1.06-1	✓	✓	Rosin paper or MB Base should be mechanically attached between SBS plies and Plywood deck boards, Oriented Strand Board, or Wood Planking.
	Firestone Cap Nails	Diagram 1.06-2	✓		Cap nails cannot be used to attach insulation or to attach a base sheet through an existing roof.
Gypsum Decks	Firestone Polymer Fasteners and Plates	Diagram 1.06-1		✓	
	1.2" (32.1 mm) Firestone LWC Base Ply Fasteners	Diagram 1.06-2	✓	n/a	Firestone LWC Base Ply Fasteners cannot be used to: Attach insulation. Attach a base sheet through an existing insulated roof. Attach a base sheet over a gravel surfaced built-up roof. Attach through a smooth surfaced un-insulated built-up roof over 1/2" (12.7 mm) thick.
Lightweight Insulating Concrete Decks	1.7" (44.7 mm) Firestone LWC Base Ply Fasteners	Diagram 1.06-2	✓	n/a	Firestone LWC Base Ply Fasteners cannot be used to: Attach insulation. Attach a base sheet through an existing insulated roof. Attach a base sheet through coverboard, over a gravel surfaced built-up roof. Attach through a smooth surfaced un-insulated built-up roof over 1/2" (12.7 mm) thick.
	HD Fasteners and Plates	Diagram 1.06-1	✓	✓	HD fasteners can be used in concrete decks or steel decks.
	Concrete Drive Fastener and Plates		✓	✓	Concrete Drive Fasteners can be used in concrete decks.
Cementitious Wood Fiber Decks	Firestone Polymer Fasteners and Plates	Diagram 1.06-1	✓	✓	

✓ = Acceptable for use Substrates must meet all requirements listed in Section 1.04.

**Table 1.06-6
Base Sheet Mechanical Attachment Options**

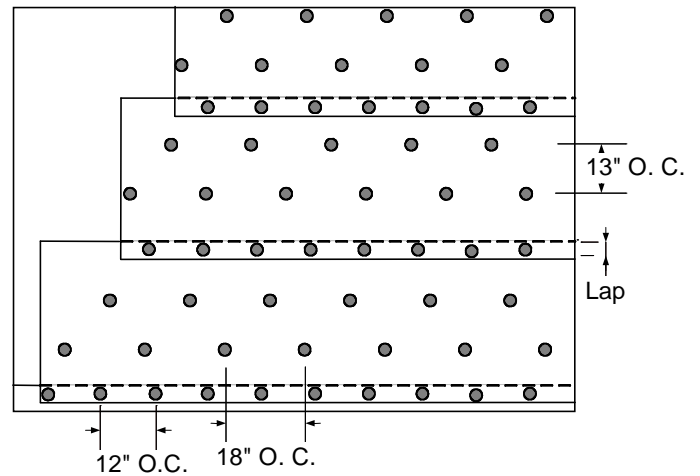
Pattern Diagram	Pattern	Notes
Diagram 1.06-1	Using Firestone insulation plates and fasteners, install two rows staggered at 18" (457.2 mm) o.c., each approximately 13" (330.2 mm) in from edge of sheet and in side laps at 12" (304.8 mm) o.c.	Contact your Roof Systems Advisor at 800-428-4511 when the deck system will not provide a minimum of 300 lbf (1.3 kN) of pullout resistance per fastener.
Diagram 1.06-2	Two rows staggered at 18" (457.2 mm) o.c., each approximately 12" (304.8 mm) in from edge of sheet and in side laps at 9" (457.2 mm) o.c. Attachment pattern, plate/head size, and frequency may be different to meet code requirements.	Contact your Roof Systems Advisor at 800-428-4511 when the deck system will not provide a minimum of 40 lbf (177.9 N) of pullout resistance per fastener.

**Base Sheet Fastening
Pattern Diagram 1.06-1**

Firestone Screws and Plates for use with Steel, Plywood, OSB and Wood Plank Decks

and

Concrete Drive Fasteners for use with Structural Concrete

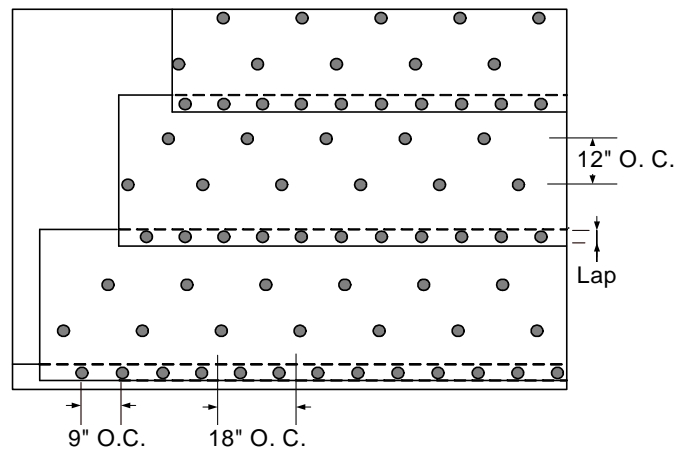


**Base Sheet Fastening
Pattern Diagram 1.06-2**

Firestone Cap Nails for use with Plywood and OSB Decks

and

LWC Base Ply Fasteners and Two Piece Impact Nails for use with Gypsum, Cementitious Concrete, and Light Weight Insulating Concrete Decks



D. Base Sheets Installed in MB Multi-Purpose Cold Adhesive:

1. Attachment of base sheets with Firestone Multi Purpose MB Cold Adhesive to expanded or extruded polystyrene insulation is not acceptable
2. Wood Fiber insulation is not an acceptable substrate for use with Multi-Purpose MB Cold Adhesive.

3. Base sheet flashings must be installed in Firestone Multi Purpose MB Flashing Cement.
4. When applying Base and Cap flashings in Multi Purpose MB Flashing Cement, both the substrate and the back of the sheet must be covered with Flashing Cement.

TABLE 1.06-7
APPROVED SUBSTRATES FOR BASE SHEET APPLIED IN FIRESTONE MULTI PURPOSE MB COLD ADHESIVE

Approved base sheets that have been attached in accordance with Firestone requirements		
Compatible insulations	ISO 95+ ISOGARD™HD RESISTA	✓
Compatible Cover Boards	DensDeck Prime or SECUROCK ISOGARD™HD	✓
Poured-in-place or pre-cast structural concrete decks that have been primed with ASTM 41 primer		✓
Existing properly prepared uncoated smooth asphalt BUR		✓
✓ = Acceptable for use		

E. Heat-Fused Base, Base Sheet:

1. Attachment of base sheets by heat fusing to expanded or extruded polystyrene insulation is not acceptable.
2. Roofing plies, base sheets or cap sheets cannot be heat fused to polyiso insulation including ISO95+GL, ISOGARD HD and RESISTA. An overlay must be used to separate the polyiso insulation from the fully adhered heat fused ply.
3. The following are acceptable overlays for use when attaching ply felts to polyiso
 - a. A base sheet mechanically attached through the polyiso insulation into the deck.
 - b. Firestone BASEGARD SA (a cap sheet must be heat fused or hot mopped to BASEGARD SA with Firestone approved hot asphalt)

TABLE 1.06-8
APPROVED SUBSTRATES FOR HEAT-FUSED BASE SHEET

Compatible Cover Boards	DensDeck, DensDeck Prime and SECUROCK – must be dry! (Dens Deck must be primed with approved primer)	✓
Poured-in-place or pre-cast structural concrete decks that have been primed with ASTM 41 primer.		✓
Existing, properly prepared, uncoated smooth asphalt BUR.		✓
✓ = Acceptable for use		

F. Self Adhered Base Sheet

1. In a two ply Modified Bitumen system that uses BASEGARD SA, a cap sheet must be heat welded to the BASEGARD SA or an SBS sheet must be applied over BASEGARD SA in Firestone approved hot asphalt to activate the adhesive.

**TABLE 1.06-9
APPROVED SUBSTRATES FOR SELF ADHERED BASE SHEET**

Compatible insulations	ISO 95+ ISOGARD™ HD RESISTA	✓
Compatible Cover Boards	DensDeck Prime, Dens Deck and SECUROCK (must be primed with Firestone approved primer) ISOGARD™ HD	✓
Poured-in-place, or pre-cast structural concrete decks that has been primed with a Firestone approved primer.		✓
Existing properly prepared and primed, uncoated smooth asphalt BUR.		✓

G. Base Sheets Adhered in LiquiGard membrane adhesive:

**TABLE 1.06-10
APPROVED SUBSTRATES FOR LIQUIGARD ADHERED BASE SHEETS**

Compatible insulations	ISO 95+ ISOGARD™ HD RESISTA	✓
Compatible Cover Boards	Approved DensDeck Prime and SECUROCK ISOGARD™ HD	✓
Poured-in-place, or pre-cast structural concrete decks that has been primed with Firestone approved primer.		✓
Existing properly prepared, uncoated, smooth asphalt BUR.		✓
✓ = Acceptable for use		

1.07 INSULATION

A. General:

1. Only Firestone brand insulation can be included in a Firestone warranty
2. Insulation must provide a suitable substrate for the proposed roof system in addition to its function as insulation for the building.
3. Insulation thickness requirements may vary for code compliance. Contact local code and/or insurance officials before contacting your Roof Systems Advisor at Firestone Building Products.
4. Refer to the Firestone Attachment Guide for adhesion pull test requirements for I.S.O. Fix, I.S.O. Spray S, I.S.O. Stick and I.S.O. Twin Pack.
5. When using Firestone Wood Fiber/Composite flat and tapered insulation, install the ISO 95+ side down to the deck.
6. **Firestone ISOGARD™ HD should not come in contact with hot asphalt.**
7. Attachment of base sheets with Firestone Multi Purpose MB Cold Adhesive or Flashing Cement, to expanded or extruded polystyrene insulation is not acceptable.
8. The following is a chart showing the types and minimum thickness of Firestone insulation/cover boards acceptable for use as a direct contact substrate for Firestone roof systems when applying a fully adhered base sheet or fiberglass ply sheet. Other approved insulations may be allowed below the immediate substrate insulation.

**TABLE 1.07-2
INSULATION /COVER BOARD ATTACHMENT OPTIONS BY DECK**

Substrate To Which ISO 95+GL Insulation Will Be Attached	Attachment Method						
	Mechanically Attached	I.S.O. Fix	I.S.O. Spray S	I.S.O. Twin Pack	LiquiGard	Multi Purpose MB Cold Adhesive	Firestone Approved Hot Asphalt
		Adhesive attachment may require an adhesive pull test. See the <i>Firestone Attachment Guide</i>					
Decks							
Steel	✓	✓	✓	✓	N/A	N/A	N/A
Structural Concrete	✓	✓	✓	✓	✓	N/A	✓
Plywood Or Oriented Strand Board	✓	✓	✓	✓	N/A	N/A	N/A
Wood Planking	✓	✓	✓	✓	N/A	N/A	N/A
Poured Or Pre-Cast Gypsum	✓	✓	✓	✓	✓	N/A	N/A
Cementitious Wood Fiber	✓	✓	✓	○	✓	N/A	N/A
Lightweight Insulating Concrete Decks	✓	N/A	N/A	N/A	N/A	N/A	N/A
Existing Roof with Phenolic Insulation	Complete tear off required - when Phenolic insulation is removed, a visual inspection of the deck condition and other components is required; all deteriorated components must be replaced as necessary.						
✓ = Acceptable for use N/A = Not Applicable							

**TABLE 1.07-3
INSULATION /COVER BOARD ATTACHMENT OPTIONS BY RE-COVER / RETROFIT**

Substrate to Which Insulation / Cover Board Will Be Attached	Attachment Method					
	Mechanically Attached	I.S.O. Fix	I.S.O. Spray	I.S.O. Twin Pack	Multi Purpose MB Cold Adhesive	LiquiGard
		Adhesive attachment may require an adhesive pull test. See the <i>Firestone Attachment Guide</i>				
Re-cover/Retrofit						
Existing Un-coated Smooth Surface Built-Up Roof or Modified Bitumen Roof	N/A	✓	✓	✓	N/A	✓
Coal Tar Built-Up Roofs	N/A	N/A	N/A	N/A	N/A	N/A
Asphalt Gravel Surfaced Built-Up Roof	N/A	N/A	✓	N/A	N/A	N/A
Gravel Surface Built-Up Roof** or Granule Modified Bitumen Roof	✓	✓	✓	✓	N/A	N/A
Firestone recommends mechanically attaching a Cover Board over existing insulation. The responsibility of identifying and removal of damaged or wet insulation is that of the contractor.						
Sprayed Urethane Roof (PUF)	Complete tear off required					
Existing Roof with Phenolic Insulation	Complete tear off required when Phenolic insulation is removed, a visual inspection of the deck condition and other components is required, all deteriorated components must be replaced as necessary					
Refer to the <i>Firestone Attachment Guide</i> for adhesion pull test requirements for I.S.O. Fix, I.S.O. Spray, and I.S.O. Twin Pack						
□ = Acceptable for use N/A = Not Applicable ** Gravel must be removed prior to installation						

TABLE 1.07-4
INSULATION / COVER BOARD ATTACHMENT TO INSULATION OPTIONS BY INSULATION TYPE

Base Layer of Insulation to which Insulation/Cover Board will be Adhered	I.S.O. Fix	I.S.O. Spray	I.S.O. Twin Pack	LiquiGard	Multi Purpose MB Cold Adhesive	Firestone Approved Hot Asphalt
Adhesive attachment may require an adhesive pull test. See the Firestone Attachment Guide						
Insulation						
ISO 95+	✓	✓	✓	✓	N/A	✓
ISOGARD™ HD	✓	✓	✓	✓	N/A	No
RESISTA	✓	✓	✓	✓	N/A	No
Dens Deck-must be primed	✓	✓	✓	✓	N/A	No
Dens Deck Prime – must be dry!	✓	✓	✓	✓	N/A	No
Asphalt Base Sheet	✓	✓	✓	✓	N/A	✓
Firestone recommends mechanically attaching a Cover Board over existing insulation. The responsibility of identifying and removal of damaged or wet insulation is that of the contractor.						
Refer to the Firestone Attachment Guide for adhesion pull test requirements for I.S.O. Fix, I.S.O. Spray, and I.S.O. Twin Pack						
✓ = Acceptable for use N/A = Not Applicable						

B. Attachment:

1. Insulation may be installed by various methods including fasteners and approved adhesives. It is acceptable to combine fastener and approved adhesive attachment methods in multi-layer applications.
2. Refer to specific Firestone Technical Information Sheets (T. I. S.) for installation and fastening requirements.
3. Tapered insulation less than the 1.0" (25.4 mm) minimum thickness must be fastened at a rate of one (1) fastener and plate per two (2) square foot (0.22 sq. m) = 16 fasteners and plates per 4'X8' board. If possible, install the tapered insulation first, covered by the flat stock.

C. Multiple Layers of Insulation:

1. Where overall insulation thickness is 2 inches (50 mm) or greater, Firestone recommends installing the insulation in two (2) or more layers with staggered joints.
2. Insulation may be installed in one or multiple layer applications for the Firestone warranty. If installed in multiple layers, the joints of each succeeding and adjoining layer must be staggered from the joints of previous layers by a minimum of 6 inches (150 mm) in each direction.
3. When a composite of two insulation layers is installed, the fastening pattern required is dependant on the top board type and thickness. A common fastener may be used to simultaneously fasten all layers to the structural deck.

D. Mechanical Attachment of Insulation and Cover Board to Approved Substrates:

1. Insulation must be fastened with appropriate Firestone fasteners and insulation plates.
2. Firestone All Purpose (AP's) fasteners are not acceptable for any 20-year systems or 15-year re-cover or partial tear off applications.
3. Insulation must be installed in accordance with the fastening rate and pattern for the applicable system, as shown on the [Technical Information Sheet](#).
4. Fastening rates and patterns may vary for code compliance. Contact your Roof Systems Advisor at 800-428-4511 for specific FM Global code compliance requirements.
5. When a composite of two insulation layers is installed, the fastening pattern required is dependant on the top board type and thickness. A common fastener may be used to simultaneously fasten all layers to the structural deck.

6. In areas where tapered insulation thickness is below the 1.0" (25.4 mm) minimum thickness, the insulation must be fastened at a rate of one (1) fastener and plate per two (2) square foot (0.22 sq. m) = 16 fasteners and plates per 4'X8' board.

INSULATION MECHANICAL ATTACHMENT OPTIONS 1.07-5										
Structural Deck To Which Insulation/ Cover Board Will Be Attached	Attachment Method								Minimum penetration of fastener into/through deck	
	Firestone All Purpose (AP) and Plates	Firestone Heavy Duty (HD) and Plates	Firestone Heavy Duty Plus (HD+) and Plates	Firestone Polymer Fasteners and Plates	Firestone Concrete Drives and Plates	Firestone Two Piece Impact Nail	Firestone LWC Base Ply Fastener	Firestone Belted Fastener and Plates		
Steel	✓	✓	✓					✓	3/4" (19mm) through deck	
Structural Concrete		✓	✓		✓				Heavy Duty (HD)	1" (25.4mm) into deck
									Concrete Drives	1-1/4" (31.7mm) into deck
Plywood or OSB	✓	✓	✓					✓	1" (25.4mm) into or through deck	
Wood Plank	✓	✓	✓					✓	1" (25.4mm) into or through deck	
Gypsum					✓	✓			1-1/2" (38.1mm) into deck	
Cementitious Wood Fiber					✓				1-1/2" (38.1mm) into deck.	
Lightweight insulating concrete over steel deck		✓	✓				✓	✓	Heavy Duty (HD) 3/4" (19mm) through steel pan	
Lightweight insulating concrete over concrete deck		✓	✓				✓	✓	1.2" (30mm) into deck.	

✓ = Acceptable for use

TABLE 1.07-6
FASTENER PULLOUT REQUIREMENTS

System	Minimum Fastener Pullout
Insulation Mechanically Attached to Deck	300 Lbs. (136.1 KG)
Base Sheet Mechanically Attached to Deck	300 lbs. (136.1 Kg)
Base Sheet Nailed to Deck	40 lbs (18.1 Kg)

- E. Minimum number of fasteners and plates per insulation board:
See *Firestone T.I.S. Sheet 950 Insulation Attachment Patterns* for the required patterns for the proper placement of approved fasteners and plates for insulation on Firestone roof systems. These fastening patterns apply to the following flat or tapered insulations. The most common fastener density and pattern requirements are shown. For non-standard fastener densities, contact your Roof Systems Advisor at 800-428-4511.

**TABLE 1.07-7
MINIMUM NUMBER OF FASTENERS AND PLATES PER INSULATION BOARD**

Insulation Type and Thickness		Minimum Number of Fasteners Required	
		4' x 4' Boards	4' x 8' Boards
Firestone ISO 95+	0.5"-1.4"	8	16
	1.5"-1.9"	6	12
	2" or Greater	4	8
Firestone ISOGARD™ HD	0.5"-1.0"	6	12*
Dens Deck	0.25" or Greater	6	12
Firestone Composites	1.5" or Greater	8	16
Dens Deck Prime	0.25" or Greater	4	8
*FM GLOBAL 1-90 FASTENING PATTERN FOR ISOGARD™ HD			
For More Information See <u>Firestone T.I.S. Sheet 950 Insulation Attachment Patterns</u>			

- F. Attachment of Insulation/Cover Board to Substrate with Firestone Approved Hot Asphalt:
1. The proposed insulation or cover board must be compatible with the roof substrate, the proposed bitumen and the requirements of the Firestone roof system.
 2. Firestone Approved Asphalt ASTM D-312 Type III (3) or Type IV (4) or CSA A123.4 Type II (2) or Type III (3) must be utilized.
 3. When **DensDeck products cannot be encapsulated in hot asphalt.**
 4. When using Firestone approved hot asphalt for insulation attachment:
 - a. The insulation must be no larger than 4' X 4' (1.2 m X 1.2 m).
 - b. All insulation joints must be staggered from adjoining and adjacent boards and adjacent layers.
 - c. Follow all health and safety measures when installing Firestone approved hot asphalt to protect the installers and occupants of the building.
 - d. See Section 1.04.I for slope restrictions.
 5. Expanded or extruded polystyrene insulation must not be attached with hot asphalt.
 6. ISOGARD™ HD must not be attached with hot asphalt.

**TABLE 1.07-9
APPROVED SUBSTRATES FOR FIRESTONE APPROVED HOT ASPHALT ATTACHMENT OF INSULATION**

Approved base sheets that have been mechanically attached in accordance with Firestone requirements		✓
Approved base plies that have been adhered in accordance with Firestone requirements		✓
Compatible insulations	ISO 95+	✓
Compatible Cover Boards	Approved DensDeck Products and SECUROCK Gypsum-Fiber Note: Do not encapsulate DensDeck in hot asphalt. FiberTop (fiberboard)	✓
Poured-in-place or pre-cast structural	concrete decks that has been primed with ASTM 41 primer	✓
Existing properly prepared asphalt membrane roof systems	Uncoated smooth BUR	✓
	Granule surfaced SBS modified asphalt roof systems	✓
	Gravel surface built-up roof systems	✓
✓ = Acceptable for use		

**TABLE 1.07-10
ALLOWABLE ADHESIVE ATTACHMENT OF INSULATION /COVER BOARD TO STRUCTURAL DECKS**

Structural Deck To Which Insulation or Cover Board Will Be Adhered	ISO FIX			ISO Spray			ISO Twin Pack			LiquiGard			Notes
	Acceptable	Pull Test Required	Not-Acceptable	Acceptable	Pull Test Required	Not-Acceptable	Acceptable	Pull Test Required	Not-Acceptable	Acceptable	Pull Test Required	Not-Acceptable	
Steel	✓			✓			✓					✓	New steel decks may require cleaning to remove processing oils
New Structural Concrete	✓			✓			✓			✓			New poured decks must have a minimum 28-day drying time
Existing Structural Concrete		✓		✓				✓			✓		Existing concrete containing residual asphalt must be cleaned and scraped smooth as possible
Plywood, OSB, Wood Planking	✓			✓			✓			✓			
Cementitious Wood Fiber	✓			✓			✓			✓			
Poured Or Pre-Cast Gypsum		✓		✓				✓			✓		
Lightweight Insulating Concrete Decks (See Section 1.06 H for additional requirements)			✓			✓			✓			✓	
New Base Layer Of Insulation Or Asphalt Base Sheet To Which Insulation Or Cover Board Will Be Adhered	ISO FIX			ISO Spray			ISO Twin Pack			LiquiGard			Notes
	Acceptable	Pull Test Required	Not-Acceptable	Acceptable	Pull Test Required	Not-Acceptable	Acceptable	Pull Test Required	Not-Acceptable	Acceptable	Pull Test Required	Not-Acceptable	
ISO 95+	✓			✓			✓			✓			Maximum 4' x 4' (1.22 m x 1.22 m) boards only on approved insulations ISO FIX Maximum slope: 2:12 Do not apply ISOGARD™ HD in hot asphalt.
ISOGARD™ HD	✓			✓			✓			✓			
HailGard	✓			✓			✓			✓			
DensDeck Products	✓			✓			✓					✓	
SECUROCK Gypsum-Fiber	✓			✓			✓					✓	
Perlite Insulation			✓			✓			✓			✓	

**TABLE 1.07-12
ALLOWABLE ADHESIVE ATTACHMENT OF INSULATION /COVER BOARD TO RETROFIT / RECOVER**

Re-cover / Retrofit to which Insulation or Cover Board will be adhered	ISO FIX			ISO Spray			ISO Twin Pack			LiquiGard			Notes
	Acceptable	Pull Test Required	Not-Acceptable	Acceptable	Pull Test Required	Not-Acceptable	Acceptable	Pull Test Required	Not-Acceptable	Acceptable	Pull Test Required	Not-Acceptable	
Smooth Surface BUR		✓		✓				✓			✓		
BUR with Gravel Removed Uncoated Smooth Surface BUR Mineral Surface SBS Modified Bitumen		✓		✓				✓			✓		All interruptions in the existing roof membrane must be re-sealed to prevent air infiltration.
Uncoated APP Modified Bitumen			✓			✓		✓				✓	With surface pre-treatment
Coal Tar Pitch BUR			✓	✓				✓				✓	With surface pre-treatment
Existing Single-Ply Systems			✓			✓			✓			✓	

G. Adhesive Attachment of Insulation/Cover Board to Substrate:

1. Firestone I.S.O. SPRAY S, I.S.O. FIX, I.S.O. Stick, I.S.O. Twin Pack and LiquiGard Adhesive:
 - a. The insulation must be no larger than 4' X 4' (1.2 m X 1.2 m).
 - b. Stagger all insulation joints from adjoining and adjacent boards and adjacent layers.
 - c. Refer to the Firestone Attachment Guide for adhesion pull test requirements for ISO Fix, ISO Spray, and ISO Twin Pack.
2. Firestone insulation adhesives must be applied in accordance with the installation instructions and Technical Information Sheets (TIS).
3. Assure that all safety measures are followed when installing insulation adhesives to protect the installer as well as the occupants of the building.
4. Existing decks containing residual asphalt must be cleaned and scraped smooth as possible.
5. Existing decks shall be smooth, flat, clean, dry, free of sharp fins, or foreign materials

1.08 ROOF MEMBRANE / CAP SHEET

A. General:

1. Never use hot asphalt to adhere APP products.
2. Base sheets, base plies, or ply sheets must not be glaze coated when used as a substrate for any SBS base or cap sheet.
3. When asphalt attachment is selected, Firestone requires that only Firestone approved Type IV (4)asphalt or Firestone SBES Mopping asphalt be used:
 - a. In all 15, 20 and 25 year warranted SBS systems.
 - b. Where the slope exceeds ½ ": 12" (4.2%).
 - c. When approved asphalt membranes are applied to DensDeck, only Firestone foam adhesives may be used.
 - d. Firestone warrants only Firestone approved ASTM D 312 Type III (3) or Type IV (4) or CSA A123.4 Type II (2) or Type III (3) asphalt.

**TABLE 1.08-1
CAP SHEET SUBSTRATE OPTIONS**

System	Membrane		Acceptable Substrates				
	Cap Sheet	Attachment to Base	Base	Primed Concrete Deck	Approved Firestone Base Sheet	Approved Firestone Insulation	Approved Firestone Cover Board
Self Adhered Base with Heat Fused Cap	SBS Cap	Heat Fused	Self Adhered Base	✓	✓		✓
SBS	SBS Cap	Firestone Approved Hot Asphalt Heat Fused	Approved Base Sheet	✓	✓		✓
SBS	SBS Cap	Firestone Multi-Purpose MB Cold Adhesive or LiquiGard Adhesive	Approved Base Sheet	✓	✓	✓	✓
SBS Torch	SBS Torch Cap	Heat Fused	Approved Base Sheet	✓	✓		✓
SBS or APP to existing, properly prepared uncoated, smooth BUR	SBS or APP Granule surfaced Cap sheets	Mop, Cold Adhesive or Torch appropriate to the cap sheet in use.	N/A	☐	☐		☐
Modified Cap / BUR (Hybrid)	SBS Cap	Firestone Approved Hot Asphalt Heat Fused Multi Purpose MB Cold Adhesive or LiquiGard Adhesive	2 or 3 plies of Type IV (4) M or Type VI (6) M in Firestone Approved Hot Asphalt	✓	✓		✓

✓ = Acceptable for use

B. Cap sheet splicing is accomplished by mating the side and end laps using one of the following methods:

**TABLE 1.08-2
CAP SHEET SEAM AND END LAP WIDTH REQUIREMENTS**

Sheet	Interply Adhesive	Side Lap Width Requirements	End Lap Requirements
Any SBS Cap Sheet	Heat Fused Firestone Approved Hot Asphalt Firestone Multi-Purpose MB Cold Adhesive (end laps require double coverage of cold adhesive)		6" (152.4mm)

1. SBS LAP SPLICE REQUIREMENTS

- a. SBS Laps must be sealed by adhering with Firestone Multi-Purpose MB Cold Adhesive or Multi-Purpose MB Flashing Cement, with hot asphalt at the time of installation, or by heat welding with a propane torch or hot air welder. Torch applied SBS cap sheet end laps must be completed by embedding granules as in Firestone Details MB-LS-1 and MB-LS-3.
- b. All end laps should be cut at a 45o angle prior to sealing as shown in Firestone detail MB-LS-3.
- c. **Hot Air Welded Laps**

- i. Using hot air to weld modified bitumen laps is not recommended as it requires different welding speeds and temperatures depending upon ambient conditions.
 - ii. An automatic heat welder and nozzle specifically designed for heat welding modified bitumen membranes works best if heat welding is used.
 - iii. To prepare for lap welding, test laps should be completed and tested for integrity to determine proper speed and temperature for the welder.
 - d. Liquid Petroleum Gas-Heat Welded Laps**
 - i. Using a round-tipped trowel, open the membrane lap and insert a small torch burner head into the lap.
 - ii. Heat the membrane with the torch until it develops a sheen or glossy appearance, assuring that the bitumen is heated on both the top and bottom surfaces and the burn-off film is removed.
 - iii. The welding temperature is correct when a flow of modified bitumen, approximately 1/4" (6.3 mm) wide, is extruded from the side lap. If the bitumen starts to flow excessively during application (more than 1/2" (12.6 mm), excess heat is being applied and the membrane is being damaged.
- 2. Firestone Approved Hot Asphalt Attachment of Firestone SBS Modified Bitumen Cap Sheets:
 - a. Firestone requires that only Firestone approved SBES Mopping Asphalt or ASTM D 312 Type III (3) or Type IV (4) or CSA A123.4 Type III (3) asphalt be used in all applications where the roof slope exceeds ½ inch per foot, and which require asphalt attachment of SBS base sheets, ply sheets, and cap sheets.
 - b. Attachment of cap sheets with hot asphalt to expanded or extruded polystyrene insulation is not acceptable
 - c. Roofing plies, base sheets, or cap sheets cannot be fully mopped direct to polyiso insulation. An overlay must be used to separate the polyiso insulation from the Firestone Approved hot asphalt adhered sheet.
 - d. The following are overlays over polyiso that are acceptable when attaching any ply sheet with Firestone approved hot asphalt:
 - e. A base sheet mechanically attached through the polyiso insulation into the structural deck
 - f. Dens Deck Prime must be dry! Only Firestone approved ASTM D 312 asphalt can be used when hot asphalt is required. The maximum asphalt temperature cannot exceed 450 °F

TABLE 1.08-3
APPROVED SUBSTRATES FOR USE WITH
FIRESTONE APPROVED HOT ASPHALT ATTACHMENT OF FIRESTONE SBS MODIFIED ASPHALT CAP SHEETS

Approved base sheets that have been attached in accordance with Firestone requirements		✓
Approved base plies that have been adhered in accordance with Firestone requirements		✓
Compatible Cover Boards	Approved Dens Deck Products (Dens Deck must be primed)	✓
Poured-in-place or pre-cast structural concrete decks that has been primed with ASTM D 41 primer		✓
Existing properly prepared asphalt	Uncoated smooth BUR	✓
✓ = Acceptable for use		

- 3. Multi Purpose MB Cold Adhesive Attachment of Base and Cap Sheets
 - a. Application of Sand Backed SBS in Firestone Multi-Purpose MB Cold Adhesive
 - i. Remove the roll wrapper from sand-backed SBS prior to installation of the cap sheet.
 - ii. Un-roll and relax all SBS sheets for approximately 30 minutes prior to installation.
 - iii. Align cap sheets in their final position, assuring that the minimum side and end laps are maintained. More than one sheet can be positioned in this step. Prior

- to completing an end lap, cut the bottom sheet at a 45° angle as shown in Detail MB-LS-1.
- iv. Fold back over roll cores or re-roll the cap sheet in half, exposing the substrate.
 - v. Apply Firestone Multi-Purpose Cold Adhesive to the substrate using a 1/4" (6.4mm) notched squeegee or airless sprayer at a rate of 1-1/2 to 2-1/2 gallons per 100 ft² (0.6 to 1.0 L/m²).
 - vi. Fold back the cap sheet into the adhesive and broom into place. The adhesive may be left open no more than 10 minutes prior to installing base sheet.
 - vii. Repeat the process for the other half of the SBS sheet.
 - viii. Complete the side and end laps of the SBS sheet by sealing with Multi-Purpose MB Flashing Cement or by heat fusing with a propane torch, or an automatic heat welder. Prior to completing an end lap, cut the bottom sheet at a 45° angle as shown in Detail MB-LS-1.
 - ix. Firestone recommends that granules be applied to areas of adhesive bleed-out as the installation progresses. Areas of adhesive bleed-out at inside and outside corners require the application of granules to protect exposed areas from UV exposure.
- b. FLASHING
 - i. When base and cap sheets are applied in Firestone Multi-Purpose MB Flashing Cement both the substrate and the sheet back must be coated with Multi-Purpose MB Flashing Cement.
 - c. SBS torch base and torch cap sheets, backed with polyethylene burn-off film, cannot be applied with Firestone Multi-Purpose MB Cold Adhesive.
 - d. Modified Bitumen Membranes installed with Firestone Multi-Purpose MB Cold Adhesive must be exposed for a minimum of 30 days before AcryliTop for Asphalt and AcryliTop PC-100 can be applied. This requirement applies only to roof systems installed in Multi-Purpose MB Cold Adhesive. Roof Systems must be inspected by a Firestone representative prior to the application of an AcryliTop system.
 - e. Three Ply SBS Modified Bitumen Membranes installed with Firestone Multi-Purpose MB Cold Adhesive must be exposed for a minimum of 7 days after the first two plies are installed and before the third ply can be installed. This requirement applies only to roof systems installed in Multi-Purpose MB Cold Adhesive.
 - f. FiberTop is not an acceptable substrate for use with Multi-Purpose MB Cold Adhesive

TABLE 1.08.4
APPROVED SUBSTRATES FOR USE WITH BASE SHEET, CAP SHEET
AND MULTI PURPOSE MB COLD ADHESIVE

Approved base sheets that have been attached in accordance with Firestone requirements		✓
Approved base plies that have been adhered in accordance with Firestone requirements		✓
Compatible insulations	ISO 95+ ISOGARD™HD	✓
Compatible Cover Boards	Approved Dens Deck Products must be dry! Dens Deck must be primed	✓
Poured-in-place or pre-cast structural concrete decks that has been primed with ASTM D 41 primer		✓
Existing properly prepared asphalt membrane roof systems	Uncoated smooth BUR that has been primed with D-41 primer	✓
Existing properly prepared granule surfaced Modified Bitumen roofs	Uncoated granule surfaced Mod Bit	✓
✓ = Acceptable for use		

C. Heat Fused Application of Firestone cap Sheets:

1. Firestone recommends that all roofing contractors contact their insurance agent or broker to discuss their particular requirements and the potential ramifications of these new guidelines.
2. Torch grade products are installed by heat fusing using a roofing torch.
3. APP and some SBS cap sheets are installed using by heat fusing using an LPG roofing torch.
4. Hot asphalt is not an acceptable adhesive material for use with APP products.
5. Attachment of cap sheets by heat fusing to expanded or extruded polystyrene insulation is not acceptable.
6. Roofing plies, base sheets, or cap sheets cannot be heat fused to polyiso insulation. An overlay must be used to separate the polyiso insulation from the fully adhered heat-fused applied ply. The following are overlays over polyiso that are generally acceptable for use over any heat-fused ply sheet:

**TABLE 1.08.5
APPROVED SUBSTRATES FOR USE WITH
HEAT FUSED-BASE, BASE SHEET, CAP SHEET**

Approved base sheets that have been attached in accordance with Firestone requirements		✓
Approved base plies that have been adhered in accordance with Firestone requirements		✓
Compatible Cover Boards	Approved Dens Deck Products (must be primed)	✓
Poured-in-place or pre-cast structural concrete decks that has been primed with ASTM D 41 primer		✓
Existing properly prepared asphalt membrane roof systems	Uncoated smooth BUR	✓
Properly Protected ISO95+GL	Base Sheet mechanically attached through ISO, DensDeck Prime or SECUROCK and MB Base SA	✓
✓ = Acceptable for use		

1.09 FLASHINGS

A. Design Considerations:

1. Refer to the system application and detail sections. Extended warranties may require special flashing applications.
2. When specified by the roof designer a splice lap must be stripped in accordance with Firestone details MB-C-7 or MB-C-8. Be advised that utilizing these details will compromise the inspector's ability to properly inspect the quality of the splice lap. Contact your RSA (Roof System Advisor) for approved details.
3. Refer to the UltraFlash Application Guide and Firestone Detail Drawings for information regarding liquid flashing.
4. Many factors affect the performance of the flashing system. Design drawings for several common applications are available from the Firestone Web Site.

5. A flashing is a roofing element used to seal the roof system at areas where the roof covering is interrupted or terminated. For example, pipes, curbs, walls, etc. all have special components that, when correctly installed, will help prevent moisture entry into the roof system or building. Flashings divert the water to the membrane. The membrane then carries it to the roof drains. Typically, flashing intercepts water flowing down parapets, down walls of higher adjacent construction and down roof penetrations. There are four typical locations where a flashing is needed:
 - Terminations
 - Junctions
 - Projections
 - Joints
 6. In any flashing detail, there are up to three different flashing components:
 - Base flashing
 - Counter-flashing
 - Cap flashing
 - a. **Base flashing**
An extension of the roofing membrane or a different material that is bonded to the roof to form a waterproof joint. It extends upward along the vertical surface to divert water onto the membrane. The base flashing should reach a higher level than that reached by water on the roof. In some situations, water may have to be temporarily stored on the roof. This may occur during heavy rainfalls, where the drain size is inadequate, where local building regulations require controlled flow drains, or where ice and snow restrict drainage.
 - b. **Counter-flashing**
Counter-flashing is used, in some situations, to carry water onto the base flashing and the membrane. This may be the case where a wall rises above a roof and masonry or concrete wall cladding is carried down to the roof surface. It covers the vertical face of the base flashing. It provides protection for the base flashing and may serve to shed water. Where required, the counter-flashing is secured to the parapet or wall cladding. Counter-flashing may not be required where single-ply membranes are used for the base flashing. If not required, it should not be used, since it will cover defects and hinder maintenance.
 - c. **Cap flashing**
Cap flashings are horizontal coverings for parapets and expansion joints. Cap flashing should be sloped toward the roof and secured to allow differential movement. Failure to provide for adequate flashing height at the design stage may result in serious problems that cannot be corrected subsequently.
- B. Wall/Curb Flashing Materials and Requirements:
1. Refer to the Firestone Detail Drawings at: www.firestonebpc.com
 2. Extended warranties require special flashing applications.
- C. Penetrations (Pipes, Conduits, Etc.):
1. Pipe Flashings:
Whenever possible, all round rigid pipe penetrations should be flashed with lead flashing. Unusually shaped should be installed, and flashed in accordance with Firestone Details using Firestone UltraFlash Liquid Flashing.
 2. Penetration Pockets:
 - a. The following types of penetrations require the installation of a penetration pocket or the use of Firestone UltraFlash liquid flashing:
 - Rigid pipes with an outside diameter less than 1" (25.4 mm).
 - Clusters of pipes.
 - Unusual shapes, e.g., structural beams, channels or angles.
 - b. A minimum clearance of 1" (25.4 mm) between penetrations, pipes, conduits, etc., and on all sides of the penetration pocket, is required to assure adequate space for the application of Pourable Sealer around each penetration.

3. Flexible penetration (electrical and braided cable, etc.) must be installed in a sheet metal gooseneck.
- D. Curbs and Terminations:
1. Where possible, provide a minimum design height of at least 8" (203.2 mm) for all flashing terminations (except penetration pockets).
 2. Minimum flashing height must be 3 inches above the highest water level that could be reached during a deluging rain. Wherever a vertical termination height is 5" (127 mm) or less, contact your Roof Systems Advisor at 800-428-4511.
 3. Do not flash over existing through-wall flashings, weep holes and overflow scuppers.
 4. Terminations must be made directly to a sound, watertight, rigid, vertical substrate. For retrofit conditions, existing loose flashing materials must be removed, or overlaid with 5/8" exterior grade plywood. Terminations are not acceptable directly to gypsum or wooden substrates.
 5. When using a surface-mounted termination, ensure a consistent seal at the wall interface. The surface above the termination must be waterproof.
 6. Gypsum board, used as a substrate for flashings, must be moisture resistant exterior grade with laminated fiberglass facers, which is recommended for this application by the gypsum board manufacturer.
 7. Stucco, cobblestone, textured masonry, corrugated metal panes or any uneven surface is not a suitable substrate to receive conventional flashing materials. Such surfaces must be prepared to provide an acceptable substrate by attaching minimum 5/8" (15.8 mm) exterior grade or pressure treated plywood. Attach as required for structural integrity.
 8. UltraFlash liquid flashing may be used with textured masonry, corrugated metal panes and most uneven surfaces.
- E. Sheet Metal Work:
1. Coping, gravel stops, counter flashings etc., must be supplied by Firestone. If Firestone is not able to supply a given sheet metal product or design, it must be installed in accordance with current Firestone details but will not be included as part of the warranty.
 2. Metal work, which is not in conformance with Firestone specifications and details or that compromises the integrity of the system, may jeopardize issuance of the warranty for the entire project. Firestone does not warrant the performance of products which are not supplied by Firestone.
 3. It is the owner's responsibility to maintain non-Firestone sheet metal in a watertight condition.
 4. Make these specifications available to the sheet metal fabricator/contractor.
 5. Attachment:
 - Counter flashings, copings, and other perimeter or penetration metal work must be properly fastened and sealed by the roofing contractor or others.
 6. All sheet metal work not supplied by Firestone should be fabricated and installed in accordance with the recommendations of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).
 7. All sheet metal work not supplied by Firestone should have a quality weather resistant coating that will not corrode or weather to the point of failure during the warranty period.
 8. Some specific roofing details in Firestone's Technical Specifications may exceed SMACNA recommendations. For such details, the Firestone requirements must be used.
 9. Refer to ANSI/SPRI ES-1 for information on wind design and metal edge treatments
 10. Extended wind speed warranties require enhanced edge details. Contact your Roof Systems Advisor at 800-428-4511 for specific information
- F. WALKWAYS
1. Locations:
 - a. Walkways help protect the membrane from damage due to necessary rooftop service

- traffic.
- b. Walkway systems must be installed on roofs:
 - Subjected to traffic more frequently than once per month.
 - At all access points (ladders, hatches, doorways, etc.) to the roof.
 - Around all serviceable rooftop units.
 - c. If protection of the insulation system is required, additional measures must be specified (i.e., concrete pavers, pre-fabricated walkways).
 - d. The owner is responsible for maintaining walkways.
2. Walkway Material:
- a. Walkways may consist of an additional layer of Firestone modified bitumen cap sheet.
 - b. Do not use Black Granule Surfaced products when installing walkways in cold adhesive. Do not heat seal the edges of walkways installed in cold adhesive.

**TABLE 1.11-1
ACCEPTABLE WALKWAY ATTACHMENT OF MODIFIED BITUMEN WALKWAY MATERIAL**

System	Acceptable Modified Bitumen Walkway Attachment
Smooth Surfaced BUR	Granule Surfaced SBS Mopped in Firestone Approved Hot Asphalt Granule Surfaced SBS Heat Fused
Granule Surfaced SBS	Granule Surfaced SBS Mopped in Firestone Approved Hot Asphalt Granule Surfaced SBS Heat Fused
Contact your Roof Systems Advisor at 800-428-4511 regarding other materials designed to be used as a walking surface.	

G. ROOF COATINGS

1. General:
 - a. Coatings are considered a maintenance item. Firestone recommends that coatings be adequately and regularly maintained.
 - b. Periodic maintenance and recoating may be required to maintain the Underwriters Laboratories, Factory Mutual or other ratings.
 - c. The use of aluminum roof coating prevents fully adhered attachment of a new membrane during retrofit. A new substrate may be mechanically attached to receive the retrofit membrane.
 - d. Proper preparation of the roof surface is important to assure the best possible adhesion of the roof coating. Refer to section 1.09.1 for information regarding preparation of an SBS surface to receive a coating. The Asphalt Roofing Manufacturers Association publishes a brochure entitled "Evaluating and Preparing Modified Bitumen Membrane Roofing for Surface Coating Applications". This information can be obtained by contacting ARMA (Asphalt Roofing Manufacturers Association).

SYSTEM	SBS MODIFIED ROOF SYSTEMS
Firestone AcryliTop PC-100 Base Coat for Asphalt Systems and AcryliTop Coating	✓

Aluminum Coating	N/A
Firestone Multi-Purpose MB Cold Adhesive and Gravel	✓
Firestone Approved Hot Asphalt and Gravel	✓

2. Firestone AcryliTop PC-100 Base Coat for Asphalt Systems and AcryliTop Coating:
 - a. Firestone AcryliTop PC-100 Base Coat for Asphalt systems and AcryliTop Coating may be applied to further protect the Firestone SBS membrane, and flashing surfaces from the effects of weathering or for aesthetic reasons. It is only required for issuance of specific Firestone warranties.
 - b. Modified Bitumen Membranes installed with Firestone Multi-Purpose MB Cold Adhesive must be exposed for a minimum of 60 days at a minimum of 60 oF or 30 days at 100 oF ambient temperature before Acrylic Base Coat for Asphalt and AcryliTop PC-100 can be applied. This requirement applies only to Modified Bitumen roof systems installed in Firestone Multi-Purpose MB Cold Adhesive. If an interim inspection has not been conducted, roof systems must be inspected by a Firestone representative prior to the application of an AcryliTop system.
 - c. Refer to the Technical Information Sheets and Material Safety Data Sheets for AcryliTop PC-100, AcryliTop PC-100 Base Coat for additional information on application, storage and safety.
 - d. Never apply Firestone AcryliTop PC 100 or Firestone Base Coat for Asphalt to Owens Corning "Perma Mop"
3. Gravel Surfacing for SBS Systems:
 - a. Hot Asphalt and Gravel
 - i. For every 100 sq. ft of roof surface, apply gravel in approximately 60 lb/100 sq. ft (2.9 kg per sq. m) flood coat ($\pm 15\%$) of Firestone approved SBES Mopping Asphalt, ASTM D 312 Type III (3), or Type IV (4) or CSA A123.4 Type II (2) or Type III (3) asphalt:
 - ii. 400 lb (19.5 kg/sq. m) of roofing gravel, or
 - iii. 500 lb (24.4 kg/sq. m) of slag (both + 25%)
 - iv. No more asphalt must be spread or poured at one time than can be covered immediately with gravel or slag, to insure proper embedment of the aggregate. Gravel, slag or other accepted surfacing material must comply with ASTM D 1863 and be 1/4" to 3/4" (6.4 mm to 19.1 mm) in diameter, substantially opaque, dry, and free from dust, loam or other foreign materials.
 - b. Firestone Multi-Purpose MB Cold Adhesive and Gravel
 - i. For every 100 sq. ft of roof surface, apply in a 4-gallon/100 sq. ft flood coat of Firestone Multi-Purpose Cold MB Adhesive approximately:
 - ii. 400 lb (19.5 kg/sq. m) of roofing gravel, or
 - iii. 500 lb (24.4 kg/sq. m) of slag (both + 25%)
 - iv. No more Firestone Multi-Purpose MB Adhesive may be spread or poured at one time than can be covered immediately with gravel or slag, to insure proper embedment of the aggregate. Gravel, slag or other accepted surfacing material must comply with ASTM D 1863 and be 1/4" to 3/4" (6.4 mm to 19.1 mm) in

- diameter, substantially opaque, dry, and free from dust and other foreign materials.
- c. Firestone Multi-Purpose MB Cold Adhesive and Granules
 - i. For every 100 sq. ft of roof surface, apply a 4 gallon/100 sq. ft flood coat of Firestone Multi-Purpose Cold MB Adhesive followed by 60-100 lb of Number 11 roofing granules (+ 25%).
 - ii. To insure proper embedment, no more adhesive must be spread or poured at one time than can be covered immediately with granules. Number 11 roofing granules must be opaque, dry, and free from dust, moisture, and foreign materials.
- 4. Glaze Coat Surfacing (3 and 4 ply BUR Systems)
 - a. When job conditions require that surfacing of a ply felt BUR be postponed, the membrane must be glaze coated. The glaze coated BUR membrane may be left un-surfaced for up to six months.
 - b. For every 100 sq. ft of roof surface, install approximately 15 lb/100 sq. ft (6.8 kg per sq. m) flood coat of Firestone approved, Type III (3), or Type IV (4) asphalt.
 - c. Glaze coating is not acceptable for use with SBS modified asphalt systems
 - d. Glaze coating of the base plies in SBS roofs may promote an interply that will be to thick and can contribute to slippage of the membrane

1.10 WARRANTIES

- A. General:
 - 1. 15 and 20-Year Red Shield Warranties require the top 2 layers of membrane be installed in a full mopping of Firestone approved mopping asphalt, a continuous layer of Multi-Purpose MB Cold Adhesive or fully heat fused as appropriate to the roof membrane. The top ply must be granule surfaced. A heat-fused cap sheet over Firestone MB Base SA is applicable for a 20-Year Red Shield Warranty.
 - 2. Firestone approved ASTM D 312 Type III (3), Type IV (4) or CSA A123.4 Type II (2) or Type III (3) or Firestone SEBS Mopping Asphalt is required for a Firestone Warranty, when using hot asphalt to attach a Firestone roofing system. Firestone requires that Firestone SEBS Mopping Asphalt or Firestone approved ASTM D 312 Type IV (4) or CSA A1 23.4 Type III (3) asphalt shall be used in all applications of SBS base and cap sheets for 20 and 25 year warranted systems when the slope of the roof exceeds ½:12. Backnailing requirements, in this guide, specify the type and frequency of fasteners to be used.
 - 3. For new and replacement roofing, Firestone HD Fasteners must be used for Red Shield Warranties in excess of 15 years,, when mechanically fastening insulation using fasteners and plates.
 - 4. For Retrofit roof systems, Firestone HD Fasteners must be used for Red Shield warranties, when mechanically fastening insulation using fasteners and plates.
 - 5. Firestone does not warrant Firestone roof system tie-ins to other roofing systems.
 - 6. Failure of a flashing terminated to an intermediate element (e.g., metal flashing, insulation, surface treatment, etc.), which itself could fail and admit moisture beneath the membrane is beyond the limits of the Firestone warranty.
 - 7. Upon Firestone's inspection and acceptance of the installed roof system, the requested warranty can be issued. Firestone's inspection is not intended as an inspection for benefit of the owner or design professional with respect to contract, building codes or compliance with specifications other than Firestone's. Warranted Firestone roof systems are to be installed only on commercial, industrial, institutional or multi-family commercial housing buildings in the United States and Canada. Issuance of a warranty for projects outside the US and Canada must be submitted to Firestone Solutions Group for consideration prior to bidding. Individual residential construction does not qualify for a Firestone

warranty. Only Firestone-supplied components are eligible to be covered as part of the Firestone Warranty.

8. It is the owner's responsibility to expose the membrane in the event that warranty service is required when access is impaired. Such impairment includes, but is not limited to:
 - Design features, such as window washer systems, which require the installation of traffic surface units in excess of 80 lb (36.3 kg) per unit.
 - Any equipment, ornamentation, building service units and other roof top surfacing materials that are not defined as part of the membrane assembly.
 - Intricately placed or multicolored ballast configurations.
 - Individual pavers utilized as ballast, which weigh more than 80 lb (36.3 kg) per unit, unless otherwise required by Firestone for wind uplift resistance.
 - Interlocking paver systems that utilize mechanical clips, strapping, adhesive, etc.
 - Rooftop equipment that does not provide Firestone with reasonable access to the membrane.
 - Ponded water, snow, ice, and other materials.

(Tables Continue on Following Pages)

**TABLE 1.13-3
SBS ROOF SYSTEMS WARRANTY REQUIREMENTS**

*ADDITIONAL REQUIREMENTS APPLY PLEASE CONTACT YOUR ROOF SYSTEMS ADVISOR AT 800-428-4511.

	Base	Cap	Coating	Flashings
10-year	Mechanically Attached Base (Not required on concrete deck or smooth, uncoated BUR) Firestone MB Base M SBS Base SBS Poly Base SBS Premium Base SBS Poly Torch Base SBS Glass Torch Base SBS Smooth	SBS Cap SBS FR SBS FR Torch SBS Premium SBS Premium FR SBS Premium FR Torch SBS Torch SBS Glass SBS Glass FR SBS Glass FR Torch	None Required on Granule Cap Sheets	1 ply Fully Adhered SBS Granule Cap
15-year	Fully Adhered Base Firestone MB Base SA Or any of the base sheets listed below for 20 year systems	SBS Cap SBS FR SBS FR Torch SBS Premium SBS Premium FR SBS Premium FR Torch SBS Torch SBS Glass SBS Glass FR SBS Glass FR Torch	None Required on Granule Cap Sheets	1 ply fully adhered Firestone MB Base M or other suitable base sheet and 1 ply fully adhered SBS Granule Cap or UltraFlash Liquid Flashing Note: SBS Smooth is <i>not</i> a flashing Cap Sheet
20-year	Fully Adhered Base SBS Base SBS Poly Base SBS Premium Base SBS Poly Torch Base SBS Glass Torch Base SBS Smooth	SBS Cap SBS FR SBS FR Torch SBS Premium SBS Premium FR SBS Premium FR Torch SBS Torch SBS Torch SBS Glass SBS Glass FR SBS Glass FR Torch	None Required on Granule Cap Sheets	1 ply Fully Adhered SBS Base Sheet and 1 ply fully adhered SBS Granule Cap or UltraFlash Liquid Flashing Note: SBS Smooth is not a flashing Cap Sheet
25-year*	Fully Adhered Base SBS Poly Base SBS Premium Base SBS Poly Torch Base SBS Smooth	SBS Premium SBS Premium FR SBS Premium FR Torch	Firestone AcryliTop System for Asphalt or UltraWhite granules	1 ply of fully adhered SBS Premium Base Sheet, Poly Torch Base, or Poly Base. and 1 ply fully adhered SBS Premium UltraWhite Granule Cap

**TABLE 1.13-4
SBS COOL ROOF SYSTEMS WARRANTY REQUIREMENTS**

	Base	CAP Set in Multi Purpose MB Cold Adhesive	Coating	Flashings
10-year	Mechanically Attached Base (Not required on concrete deck or smooth uncoated BUR) Firestone MB Base M SBS Base SBS Poly Base SBS Premium Base SBS Poly Torch Base SBS Glass Torch Base SBS Smooth	SBS Cap SBS FR SBS Premium SBS Premium FR SBS Glass SBS Glass FR SBS Glass FR Torch	None Required on Granule Cap Sheets	1 ply Fully Adhered Firestone MB Base M or any SBS Base sheet 1 ply Fully Adhered SBS Granule Surfaced Cap Sheet
15-year	Fully Adhered Base Firestone MB Base M SBS Base SBS Poly Base SBS Premium Base SBS Poly Torch Base SBS Glass Torch Base SBS Smooth	SBS Cap SBS FR SBS Premium SBS Premium FR SBS Glass SBS Glass FR SBS Glass FR Torch	None Required on Granule Surfaced Cap Sheets	1 ply Fully Adhered Firestone SBS Base and 1 ply Fully Adhered SBS Granule Cap
20-year	Fully Adhered Base SBS Base SBS Poly Base SBS Premium Base SBS Poly Torch Base SBS Glass Torch Base SBS Smooth	SBS Cap SBS FR SBS Premium SBS Premium FR SBS Glass SBS Glass FR SBS Glass FR Torch	None Required on Granule Surfaced Cap Sheets	1 ply Fully Adhered SBS Base Sheet and 1 ply Fully Adhered SBS Granule Cap or UltraFlash Liquid Flashing Note: SBS Smooth is not a flashing Cap Sheet
25-year	2 Fully Adhered Base Plies SBS Poly Base SBS Premium Base SBS Poly Torch Base SBS Smooth	SBS Premium UltraWhite SBS Premium FR UltraWhite SBS Premium Torch UltraWhite	Granule Surfaced Premium SBS coated with AcryliTop system for Asphalt in lieu of UltraWhite Granules	1 ply Fully Adhered SBS Premium Base Sheet, Poly Torch Base, or Poly Base. and 1 ply Fully Adhered SBS Premium UltraWhite Granule Cap

**TABLE 1.13-5
SA BASE SYSTEMS ROOF SYSTEMS WARRANTY REQUIREMENTS**

	Base	Heat Welded Cap	Coating	Flashings
10-year	BASEGARD SA or MB Base SA	SBS FR Torch SBS Premium FR Torch SBS Torch SBS Glass SBS Glass FR SBS Glass FR Torch	None Required	1 ply Fully Adhered Granule Surfaced Cap Sheet
15-year	BASEGARD SA or MB Base SA	SBS FR Torch SBS Premium FR Torch SBS Torch SBS Glass FR Torch	None Required	1 ply Fully Adhered Firestone MB Base M or 1 ply of MB Base SA or BASEGARD SA and 1 ply Fully Adhered Granule Surfaced Cap
20-year	BASEGARD SA or MB Base SA	SBS FR Torch SBS Premium FR Torch SBS Torch SBS Glass FR SBS Glass FR Torch	No Coating Required on Granule Surfaced Cap Sheets	1 ply Fully Adhered Base Sheet and 1 ply Fully Adhered Granule Cap or UltraFlash Liquid Flashing for SBS Only Note: SBS Smooth is not a flashing Cap Sheet

**TABLE 1.13-6
MODIFIED BITUMEN CAP SHEET / BUR ROOF SYSTEMS WARRANTY REQUIREMENTS**

	Ply Sheets	Cap	Coating	Flashings
10-year	1 Ply IV (4) M or 1 Ply VI (6) M or MB Base M	SBS SBS FR SBS FR Torch SBS Premium SBS Premium FR SBS Premium FR Torch SBS Torch SBS Glass SBS Glass FR SBS Glass FR Torch	None Required	1 ply Fully Adhered Granule Surfaced Modified Bitumen Cap
15-year	2 Ply IV (4) M or 2 Ply VI (6) M	SBS SBS FR SBS FR Torch SBS Premium SBS Premium FR SBS Premium FR Torch SBS Torch SBS Glass SBS Glass FR SBS Glass FR Torch	None Required	1 ply Fully Adhered Firestone MB Base M or any SBS Base Sheet and 1 ply Fully Adhered Granule Surfaced Cap or UltraFlash Liquid Flashing for SBS Only Note: SBS Smooth is not a flashing Cap Sheet
20-year	3 Ply IV (4) M or 3 Ply VI (6) M	SBS Cap SBS FR SBS FR Torch SBS Premium SBS Premium FR SBS Premium FR Torch SBS Torch SBS Glass SBS Glass FR SBS Glass FR Torch	None Required	1 ply Fully Adhered Modified Bitumen Base Sheet and 1 ply Fully Adhered Granule Surfaced Cap Sheet or UltraFlash Liquid Flashing for SBS Only Note: SBS Smooth is not a Cap Sheet

**TABLE 1.13-8
FLASHING WARRANTY REQUIREMENTS**

Asphalt Flashing	WARRANTY TERM
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system	10-year	15-year	20-year
SBS	<p>One-ply flashing consisting of one (1) ply of:</p> <p>SBS Cap SBS Cap FR SBS Torch SBS Torch FR SBS Glass SBS Glass FR SBS Glass FR Torch SBS Premium SBS Premium FR SBS Premium FR Torch SBS Metal Flash-AL</p>	<p>Two-ply flashing consisting of one (1) ply of:</p> <p>SBS Cap, SBS Cap FR SBS Torch, SBS Torch FR SBS Glass SBS Glass FR SBS Glass FR Torch SBS Premium SBS Premium FR SBS Premium FR Torch SBS Metal Flash-AL</p> <p>Over one (1) ply of a fully mopped or cold adhered MB Base</p>	<p>Two-ply flashing consisting of one (1) ply of:</p> <p>SBS Cap, SBS Cap FR SBS Torch, SBS Torch FR SBS Glass SBS Glass FR SBS Glass FR Torch SBS Premium SBS Premium FR SBS Premium FR Torch SBS Metal Flash-AL</p> <p>Over one (1) ply of a fully mopped or cold adhered ply of:</p> <p>SBS Base, SBS Poly Torch Base, SBS Glass Torch Base SBS Smooth</p>

**TABLE 1.13-9
FIRESTONE WARRANTY SUMMARY:**

WARRANTY NAME	SPECIFICATION	ELIGIBLE CONTRACTOR	COVERAGE
Red Shield Limited Warranty	Firestone, Asphalt specifications for the term requested	Red Shield	Repair leaks in the roofing system caused by Firestone-supplied materials or the workmanship used to install them. No dollar limit to Firestone expenditures to honor the warranty.
Standard Limited Warranty	Firestone Asphalt specifications for the term requested	Red Shield Registered	Repair leaks in the roofing system caused by Firestone-supplied materials or the workmanship used to install them up to the owner's original cost.
Membrane-Only Warranty	Firestone Asphalt specifications for the term requested	Red Shield	Provide replacement membrane materials sufficient to replace any area of Firestone Roofing Membrane ("Membrane") which leaks as a result of ordinary exposure to the elements or any manufacturing defect in the Membrane. Prorated
MB Membrane Warranty	Firestone Asphalt specifications for the term requested	Red Shield or Registered	Repair any leak in the Firestone Modified Bitumen Roofing Membrane ("Membrane") as a result of weathering due to ordinary exposure to the elements or any manufacturing defect in the Membrane up to the owner's original cost.
MB Product Warranty	Firestone Asphalt specifications for the term requested	Red Shield or Registered	Provide replacement Membrane material or a prorated credit (based upon the remaining months of the un-expired warranty) sufficient to replace any area of Firestone Modified Bitumen Membrane ("Membrane") which leaks as a result of ordinary exposure to the elements or any manufacturing defect in the Membrane up to owner's original cost.
Ply Sheet Warranty	Firestone Asphalt specifications for the term requested	Red Shield or Registered	Re-supply Firestone Ply Sheets to repair or replace the affected area or issue a credit towards the purchase of new materials. The quantity of supplied material or the amount of the credit will be reduced by the amount of usage received prior to notice of failure. At no time will Firestone's costs exceed the original cost of the Ply Sheets.
AcryliTop PC-100 Coating Limited Warranty	Firestone Asphalt specifications for the term requested	Red Shield or Registered	Provide the owner with replacement AcryliTop PC-100 Coating to repair the area should the coating come loose.
Manufacturer's Insulation Warranty	Firestone Asphalt specifications for the term requested	Red Shield	Provide owner with free Firestone ISO 95+ to repair the affected roof area if the Firestone ISO 95+ warps, bows or destabilizes to the point of causing a roof leak as a result of

			any manufacturing defect in the ISO 95+.
10 Year ISO 95+ Thermal Insulation Warranty	Firestone Asphalt specifications	Red Shield	Provide replacement insulation should the Firestone ISO 95+ fail to retain 80% of its published R-value.

This chart is only a summary of the general warranty coverage. Please review each warranty for exact language.

END OF SECTION