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I. GENERAL POLICY

The following recommendations are primarily based on our past business experience in the field of asphalt modification. The purpose of this manual is to assist Architects, Specifiers, Building owners and Contractors in addressing their roofing and waterproofing requirements. These specifications should not be construed as absolute. The proper selection and application of a roofing system is dependent on the roof design, climatic conditions, code requirements and building occupancy and other factors specific to each individual project. Final responsibility for the design and suitability of any roofing membrane lies with the designers, architect, consultant, contractor and owner. Architects and designers should be aware of all local building codes and regulations not presented in this guide.

MBTechnology assumes no responsibility for non-warranted roofs using MBTechnology's products. Warranties will not be given on projects where MBTechnology has no control over material application or conditions under which such roofs are applied. MBTechnology assumes no liability with respect to variations from specifications outlined in this manual unless set forth in writing and signed by MBTechnology's manager of technical services. By publishing the specifications and design criteria herein, MBTechnology should not be construed as having created any warranty either implied or expressed, except what has been outlined in our published warranty/guarantee forms.

In our continued effort to update and improve we reserve the right to change or modify the contents of this specification manual without prior notice.

II. PRODUCT INFORMATION

Asphalt of bitumen is still the best-known waterproofing material. However, it has poor aging characteristics, is brittle in cold weather and fluid in hot weather and has no resistance to fatigue. Elastomeric compounds such as SBS (Styrene-Butadiene-Styrene) substantially improve these properties. SBS rubber has some fantastic properties. It is flexible and has the memory to return to its original form. SBS forms a rubber matrix of butadiene when blended with asphalt. The styrene end blocks act as links holding the elastomeric matrix together. The styrene and butadiene matrix increase the flow characteristics and improve the low temperature flexibility and fatigue resistance to failure of asphalt.

II.1 MBTechnology's Product Line

MBTechnology's philosophy lies in producing products geared towards the needs of architects, specifiers, owners and contractors. This fundamental principle is reflected in our entire line of roofing products and systems. MBTechnology produces 7 families of roofing products, one of the most complete lines of SBS roofing products produced in the USA. We were the pioneer in introducing to the market a fire rated heat welded elastomeric roofing system. MBTechnology also offers a complete line of dual reinforced and metal embossed waterproofing systems. MBTechnology has the capability of producing products that are not outlined in the specification manual. Please contact us for more details. This manual outlines products that are used in majority of current roofing specifications.

MBTechnology's products have been successfully applied in the Arctic regions of Alaska to the high desert regions of Nevada. Our international experience is worldwide, covering the Pacific Rim, Latin America and Asia.

II.2 *layflat* SBS

MBTechnology's line of SBS modified base sheets. The product is required as a base layer in most warranted roofing systems. *Layflat SBS* is available 4 weights, 28 lb., 45 lb., 53 lb. and 70 lb. per square. Some of the interply products are available with high tensile scrim or polyester reinforcements (refer to product data sheet). The SBS base sheets reduce wrinkling, buckling and asphalt migration associated with BUR oxidized asphalt base sheets. The final result is a roof that can be applied faster with superior aesthetics and a smoother finish. *Layflat SBS* LF60 is used as an interply layer or as a base layer in mop applications. The use of *layflat SBS* LF40 in lieu of *layflat SBS* LF25 as a nailable base sheet is acceptable and interchangeable in all applications.

II.3 *fireguard* SBS

Fireguard SBS is a technological breakthrough in the roofing industry. *Fireguard SBS* is a fire resistant cap membrane manufactured with specially formulated fire resistant agents. The membrane has a U.L. Class A /B fire rating over combustible /non-combustible decks, without the need for gravel, emulsion or rock. The weight of the installed system can be as low as 150 lb. per 100 square feet compared to over 500 lb. per square for a Class A rated BUR system requiring gravel, or over 1000 lb. for a ballasted single ply system. *Fireguard SBS* can be applied in hot asphalt, cold

adhesive or heat welded. The membrane is available with puncture resistance polyester, high tensile scrim reinforcement, random fiberglass or a dual reinforcement of polyester and glass.

II.4 *fastorch* SBS

Fastorch SBS is an elastomeric granulated or smooth surfaced specifically designed for torch applications. The mineral surface is available in several granule colors. *Fastorch* SBS cap membrane has a high multidirectional strength and is available with single or dual reinforcement consisting of a polyester or fiberglass mat. Smooth surface *fastorch* SBS products come in a variety of weights and reinforcements depending on the application and specification requirements. Fiberglass reinforced *fastorch* SBS products are available for multi-ply torch application. The combination of the elastomeric SBS coating and the puncture resistance of the polyester mat creates a roofing membrane far superior to any existing single ply or APP membranes. In applications requiring fire ratings *fireguard fastorch* SBS is specified. The product has obtained a Class A /B fire rating by U.L. without the need for additional protective coatings or gravel.

II.5 *supercap* SBS

An economical SBS modified cap sheet. *Supercap* SBS cap sheets are used in combination with 2 or more layers of *layflat* SBS. The cap sheet is a premium alternative to conventional non-modified BUR cap layers and is Class A fire rated over combustible decks with no need for gravel, rock or emulsion. Warranty for *supercap* is limited to 10 year.

II.6 *superflex* SBS

A highly elastic polyester-reinforced membrane. The flexibility of the product makes it ideal for flashing and single ply applications. *Superflex* membranes can be applied over one layer of *layflat* SBS / *layfast* SBS base, and it qualifies for a 10 year warranty. Since only one application of asphalt / adhesive is needed, there is tremendous savings in labor and asphalt costs. *Superflex* membranes are available in smooth and granulated surfacing.

Various reinforcement options are available: This includes polyester and dual reinforced (polyester & glass reinforced) membranes. *Superflex* SBS offers versatility of application with hot asphalt or cold adhesive.

II.7 *metalflex* SBS

An elastomeric membrane manufactured with an embossed foil surfacing and reinforced with a woven fiberglass mat. *Metalflex* SBS is available in standard aluminum and colored aluminum. The aluminum top surface offers unparalleled reflectivity and weather ability. It is Class A fire rated over combustible deck with no slope restrictions. *Metalflex* SBS is applied via heat welding application only

II.8 *layfast* SBS (Steep Slope Underlayment)

Superior Elastomeric Modified Asphalt Underlayment for Tile, Shingle, and Metal Roofs

Most of the quality tile, shingle, and metal roofing manufacturers offer 30+ year warranties— these usually cover deterioration of tile and shingle only. Since the underlayment is the only moisture barrier used in the assembly, employing an inferior underlayment with less life expectancy will compromise the system's integrity.

Addition of SBS rubber to asphalt gives *layfast* an electrometric property that is not available in common felt. *Layfast* SBS contains a higher percentage of asphalt for increased waterproofing. Its inorganic fiberglass reinforcement eliminates the rot and deterioration associated with saturated felt.

The majority of architects and contractors have realized the necessity of a better underlayment such as self-adhesive membranes for valleys and eaves. Most self-adhesive membranes are manufactured with SBS modified asphalt, which is the same compound used in *layfast* SBS. By specifying *layfast* in the field and a self-adhesive membrane in valleys and eaves, you are specifying a 100% SBS underlayment system throughout the roofing system and prolonged its waterproofing capability. Compared to self adhesive membranes *layfast* is mechanically fastened thus allowing the system to breathe.

Layfast SBS . . . Superior to Felt. Here's Why:

Versatile: ICC approved (Report #4083) and ideal for Tile, Shake, Shingle, and Metal Roofs.

Economical: For pennies more offer a superior product to your customer. Typical cost to use *layfast* in place of felt is about \$0.02–\$0.08/square foot more.

Less Decomposition: Fiberglass reinforced (inorganic) doesn't rot like felt. Felt is reinforced with recycled paper—and you have seen what happens to paper

products like newspaper after they're left out in the weather.

More Elastic: SBS rubberized asphalt provides a more pliable and elastic membrane. Minimizes buckles and wrinkles by lying flatter and smoother . . . saving time.

Durable: Side laps do not curl up over time. Does not scuff or tear easily and is less susceptible to damage from other trades.

Proven Track Record: Layfast has been used successfully for more than 10 years.

Here's how layfast SBS Stacks up to Felt

30# ASTM D226		Layfast SBS TU35	Layfast SBS Advantage
Breaking Strength	MD40	MD65	Higher Tear Resistance
Compound	Asphalt	Rubberized Asphalt	Increased Longevity
Weight Lbs/100 sq. ft.	26 lb.	38-70 lb	More Protection
Moisture Content	4.1% max.	0.42%	More Water Resistant

Layfast SBS is available in three weights.

Layfast SBS is available in three weights, 35-43-70 lbs/square. It can be used in lieu of 30 & 40 # felt as an underlayment under shingle, tile, and metal roofs.

For tile and metal roofs we recommend the use of TU70 / TU43 and for shingle roofs the use of TU35/TU43.

If you are currently specifying two layers of 30# felt one layer of TU70 will save application time and is heavier.

For Architects and Specification Writers

Since layfast is still mechanically fastened (like 30/40# felt), there is no change in drawings / specifications. To specify layfast, insert the following language in the tile / shingle / metal roof specification section where the underlayment is specified.

For tile and metal roofs we recommend the use of TU70 and for shingle roofs the use of TU43.

Underlayment shall be layfast SBS TU70 / TU43 as manufactured by MBTechnology (800-621-9281). The membrane shall comply with all requirements as outlined in ASTM D226 standards for underlayment and approved by ICC. Application shall be done in accordance with manufacturer's most recent specification manual. Minimum requirements:

Compound	SBS Rubberized Asphalt
Reinforcement	Fiberglass Mat
Weight	Minimum of 43—70 -lb./100 sq. ft.
Breaking Strength	MD 65 lb./in. ASTM D226, CD 46 lb./in.
Moisture Content	less than 0.5% ASTM D226

Layfast SBS is ICC (formerly ICBO) approved and complies with ASTM D226 standards, which most tile, shingle, and metal manufacturers require.

II.9 Coating

Elastomeric roof coating that enables the final assembly to achieve requirements set forth by California Title 24 for "Cool Roof" and qualifies for Leed Credit. This coating is available in 5 and 55 gallons.

CO24 BASE & CO24 TOP Coating can be applied with Spray, brush, and roller.

II.10 Cold Adhesive

Asbestos free, specially formulated cold process adhesive, which contains a special blend of enhancing modifiers to meet California VOC requirements. This product is available in 5 and 55 gallons.

MB adhesive is used with MBTechnology cold process systems. It can be applied with brush, roller or squeegee.

III. ROOFING SYSTEMS

MBTechnology has assembled 5 separate roofing series based on the needs of contractors, specifiers, architects and our own experience in the field of modified bitumen waterproofing. All the roofing systems presented below except for the *metalflex* system are available in 7 different colors. Other roofing systems not presented in this manual, can be custom designed for the contractors, owners and architects to meet their requirements. Please contact us for assistance in designing specialty systems.

III.1 fireguard Series

Fireguard SBS roofing systems are lightweight multi ply roofing systems with exceptional elasticity; puncture resistance, and low temperature flexibility. The components are made of a high-grade SBS modified bitumen blend. The top layer (cap sheet FG (FT) 160CWH) has two reinforcements consisting of a fiberglass and polyester mat

The polyester reinforcement offers superior puncture and tear resistance, enabling the membrane to withstand roof movement and traffic. The fiberglass mat at the bottom of the membrane stabilizes the membrane during application.

Fireguard SBS cap sheet is manufactured with fine ceramic white granules (other colors available on request)—this means the system doesn't require the application of gravel, giving it a light installed weight of approximately 200–240 pounds / 100 square feet and making inspection and repair easier.

Fireguard SBS roofing system is manufactured with fire retardant chemicals and qualifies the assembly for UL Class A/B fire rating over combustible and noncombustible deck. The system is also listed with F.M. (Factory Mutual) to meet I-90 wind uplift and meets ASTM D 6162, 6163 standards for SBS modified bitumen membranes.

Compared with single-ply membranes, which are applied in one layer of 40–80 mils thickness, fireguard SBS systems are applied in 2–3 ply applications ranging in thickness from 220 mils to 300 mils. The redundancy of multiple layers reduces chances of workmanship error and increases ability of the roofing system to withstand traffic and numerous penetrations. . Fireguard SBS system consists of a base, ply and cap membrane (over wood and lightweight concrete), and 2 ply over insulated substrate. The system weighs 200–240 lbs / 100 square feet depending on the warranty duration.

Fireguard SBS system has been marketed for more than 15 years with an excellent track record. It has been applied on various projects throughout the country and even the world, including

- California National Guard
- Chicago Housing Authority
- Los Angeles Unified School District
- Tracy Army Depot
- Jacksonville Naval Air Station
- Harris County Juvenile Detention Center, Texas

- Port of San Francisco
- San Francisco Civic Auditorium
- University of Washington
- U.S Bulk Mail Facility, Jacksonville FL
- Sheraton Maui
- Diamond Head Health Center
- Port of Vladivostok (far east Russia).
- L.A Fitness

APPLICATION

Fireguard SBS roofing system offers flexibility of three different application methods to meet most job conditions.

Heat Welded: Ideal for areas where it is impractical to use hot asphalt (i.e., hospitals, schools, high-rises). The heat-welded system offers the owner a 100% SBS system, since the adhesive is built in and melted during the heat welding process.

Cold Adhesive: Minimizes odors during the project.

Hot Asphalt: The most economical way to apply the membrane. Better suited for new construction and larger projects.

III.2 metalflex Series

The spectacular Metal Clad System

Metalflex SBS membranes are manufactured with a top surface of embossed aluminum foil that is laminated during production. Metalflex SBS utilizes the time-proven waterproofing characteristics of SBS-modified asphalt and the protective qualities and reflectivity of aluminum foil. The aluminum surface offers exceptional reflectivity (Initial 89% ASTM C-1549) and also qualifies the assembly for a Class A fire rating with no slope restriction, which cannot be achieved with single-ply and asphalt-based roofing systems. The system is also listed with F.M. (Factory Mutual) to meet I-90 wind uplift and meets ASTM D6298 standards for SBS modified bitumen membranes with foil surfacing.

The majority of single-ply and modified asphalt systems have a fire rating limited to a slope of 2:12. The embossed aluminum foil offers exceptional spread of flame resistance, which qualifies metalflex SBS for a Class A fire rating with no slope restriction. This makes it ideal for projects with a barrel roof or for areas with slopes greater than 2:12.

Whether it's energy efficient aluminum or bright Polar White surfacing with factory-applied paint finish,

metalflex SBS foil-faced surface lends a dramatic look to any project.

Compared with single-ply membranes that are applied in one layer of 40–80 mils thickness, metalflex SBS systems are applied in 2–3-ply applications ranging in thickness from 220 mils to 300 mils. The redundancy of multiple layers reduces chances of workmanship error and increases ability of the roofing system to withstand traffic and numerous penetrations.. Metalflex SBS system consists of a base, ply and cap membrane (over wood and light weight concrete), and 2-ply over insulated substrate. The system weighs 175–225 lbs/100 square feet depending on the warranty duration.

Metalflex SBS system has been marketed for more than 15 years with an excellent track record and has been applied on various projects throughout the country.

Surfacing

Metalflex SBS is available in two grades, plain aluminum and colored aluminum (white and beige). Custom colors available on request—contact us for minimum run and lead-time.

Application

Metalflex SBS system is applied via heat welding. The heat welded application eliminates any fumes / odors associated with the application of the membrane.

Energy Star

MBTechnology is proud to offer products with the ENERGY STAR® label. ENERGY STAR® was created to help consumers easily identify products, homes, and buildings that save energy and money and help protect the environment. As the government-backed, trusted symbol for energy efficiency, the ENERGY STAR® label identifies highly efficient products and designates superior energy performance in homes and buildings. Metalflex SBS membranes qualify for the Energy Star label. www.energystar.gov

III.3 supercap Series

The supercap series is a superior alternative to conventional BUR systems. MBTechnology’s super cap system is Class A fire rated without the need for additional coatings. This system can be applied with cold adhesives or hot asphalt. The cap membrane has less SBS content than our fully modified system and offers the owners an SBS modified system with minimal

cost differential over a traditional 4 ply B.U.R. The warranty for supercap system is limited to 10 year.

III.4 60/90 Series

The 60/90 series is an industry standard 2 or 3 ply SBS modified roofing system. The 60/90 series is Class A /B rated over combustible decks. It combines the elasticity, weatherability and thermal shock resistance of SBS asphalt in a 3-ply combination. The special fire rating achieved by the 60/90 series makes the use of gravel or rock obsolete. The result is a system weighing about 200 lb. per square as opposed to a BUR roof weighing over 600 lb. per square. The 60/90 system is very versatile since the reinforcements in the interplay and the cap sheet can be varied by the specifier to match project requirements. The base membrane can be high tensile scrim, polyester or standard fiberglass mat. The fireguard series offers the contractor and the architect the flexibility of 2 application methods either hot asphalt, or cold adhesive.

For projects in seismic area or susceptible to deck movement we recommend the use of fireguard series membrane, which has a polyester mat for enhanced elongation.

III.5 fastorch Series

Our complete series of elastomeric fire rated torch grade systems. MBTechnology’s fastorch series is more flexible and offers a smoother finish than conventional torch applied systems on the market. The cap sheet in our fastorch series is a Class A /B fire rated dual reinforced membrane. Single reinforced polyester cap membranes can be substituted in certain circumstances with prior approval from the corporate office. For added strength and flexibility, our fastorch series includes specifications with 2 polyester mats and 3 fiberglass membranes. This series is ideal for applications where the use of hot asphalt is either forbidden or impractical. The fastorch series is perfect for cool weather applications, since all the components can be installed in temperatures down to 45 F. MBTechnology recommends torching as the preferred application method in cooler weather. Sections’ VII.1 “Material Storage & Handling” and IX.7 “cool Weather Application” must be referenced prior to application.

III.6 MA Mechanically Attached

MBTechnology’s MA (Mechanically Attached System) offers contractor and building owner a cost effective system whereby the first layer (fastorch SBS

FT120PSA) is loose laid and mechanically fastened to the insulation (in accordance to FM approval). All the side and end laps are then heat welded. The cap layer is then fully adhered to the base layer via heat welding or cold adhesive. The end result is a cost effective system, which eliminates the use of protection board and can be eligible for 10-15-20 year warranty.

IV. ROOF DECK DESIGN CRITERIA

Proper deck design is a major criteria's in assuring a long lasting roofing system. Correct structural design of the roof is the sole responsibility of the architect, designer, contractor or owner. Acceptance of the deck for roofing, including considerations of deck structure, substrate condition, use of vapor retarders, moisture content of deck insulation, expansion joints, and area dividers is the responsibility of the designer.

Roof decks shall provide positive drainage, and sloped to prevent ponding water. A minimum slope of ¼" per foot is recommended by ARMA (Asphalt Roofing Manufacturers Association) and UBC (Uniform Building Code, section 3207.A). Drains and outlets should be installed to remove water completely from the roof surface. All roofing systems are adversely affected by ponding water and inadequate drainage. Industry standards require water to evaporate within 48 hours after precipitation has occurred. MBTechnology does not warrant areas of roof, which has ponding water or inadequate drainage.

Roof decks must be constructed according to the manufacturer's specifications, and should comply with all local building codes. Roofing decks must provide sufficient strength to sustain anticipated live and dead loads during and after construction without excessive deflections detrimental to the roofing system. Recommendations provided in the specifications manual are minimal. The designer must refer to the deck manufacture's technical manuals in making certain whether the planned design meets all drainage and strength requirements. MBTechnology's acceptance of a roof deck solely refers to the condition of the surface of the roof deck. The roofing system warranty could be voided by problems created from improper deck design or incorrect construction.

All decks must be firm, solid, free of sharp edges or depressions, free of moisture or effects of freezing, free of dust or debris and capable of supporting all anticipated deck loads.

NOTE: For deck types not listed contact MBTechnology's manger of technical services.

IV.1 Wood Decks

Wood decks must be a minimum of 1" nominal thickness and constructed of dry, tongue and groove lumber. Boards should have a bearing on rafters at each end and be securely nailed in place. Knot holes greater than ½" and cracks larger than ¼" must be repaired or if feasible covered with an inverted cap sheet or a heavy membrane and nailed in place. Wood decks must be securely fastened and must be totally cured before the application of any waterproofing membranes. Wood Plank lumber and plywood panels should be protected from the weather both on the job site and after installation

IV.2 Plywood decks

Plywood must be APA (American Plywood Association) approved and must meet U.S. Product Standards 1 (PS-1) requirements. All plywood panels must be clearly identified with APA grade trademarks. All plywood must be a minimum ½" thick exterior grade with all sides securely nailed to joists or cross blockings, a maximum of 2" apart. All joints must be blocked. Non veneer panels like particle boards are not acceptable surfaces for application of any waterproofing membranes.

IV.3 Structural Wood Fiber Decks

Structural wood fiber decks are not an approved deck for any of MBTechnology's roofing membrane. No MBTechnology warranties will be issued on these decks.

IV.4 Poured Concrete Decks

Concrete curing guidelines must be strictly adhered to. Concrete must be fully cured, smooth and level. All protuberances and sharp ridges must be leveled prior to the application of any waterproofing membranes. Wet or frozen concrete decks are not suitable surfaces for roofing application. Concrete decks must be tested for proper adhesion of asphalt and primer prior to start of the job.

The deck surface must be primed with an asphalt primer at the nominal rate of 1 gallon per square and allowed to dry before installation of roofing membrane.

Direct application to concrete is only allowed if concrete is over 2 years old and is dry and doe s not

contain moisture. In such cases spot mop or spot weld (do not solid mop or torch directly to primed concrete) the base layer to the deck. Solid mopping or torching directly to primed concrete is not acceptable.

IV.5 Precast Concrete Decks

Precast concrete sections must be installed in accordance to the manufacturer's installation guidelines. Sections must be securely fastened to the structural frame to prevent lateral or transverse movements. All joints must be properly aligned and grouted. The surface must be even and smooth before an application of primer. Deformed slabs must be removed, or leveled with masonry fill or a leveling course of insulation to eliminate potential pending water areas. Space between slabs shall not exceed 1/8". It is recommended that joints be taped to avoid bitumen flow between slabs.

The deck surface must be primed with asphalt primer at the nominal rate of 1 gallon per square and allowed to dry before installation of roofing membrane. The deck must be covered with an appropriate insulation before application of the roofing membrane.

IV.6 Prestressed Concrete Decks

Roofing membrane shall not be applied directly to these decks. A leveling course shall be installed prior to application of roofing membrane. It is recommended that a minimum of 2" of lightweight concrete be installed over the prestressed concrete sections. It is empirical that the fill surface be smooth and fully cured. The roof system should be properly vented to remove excess moisture. The proper spacing of the roof vents is the sole responsibility of the designer or the architect.

IV.7 Lightweight Insulating Concrete Decks (Perlite, Vermiculite)

All lightweight insulating concrete decks must be installed by a contractor approved by the deck manufacturer. Lightweight concrete decks must be fully cured and dry prior to application of any waterproofing membranes. Provisions should be provided for venting both the underside and topside of such decks. Deck design must allow for roof vents spaced a minimum of 30 ft. o.c. The high moisture contents of lightweight concrete could be very detrimental to any applied waterproofing system. MBTechnology is not responsible for inadequate venting design of such roofs. MBTechnology recommend architects and specifiers to

obtain a performance guarantee from the lightweight manufacturer for the duration of the system warranty.

Concrete must be at least 2" fill with maximum 1"/ft slope. Perlite or similar type decks must be of density greater than 1:6 with compressive strength greater than 130 psi and fastener pull out of no less than 40 lb. per square foot. Uncured and wet decks will create blistering and system deterioration. Installing any roofing system prior to receipt of a written approval from the deck manufacturer will void our warranty responsibility. Prior to application of the roofing system, a layer of layflat SBS base sheet must be mechanically fastened to the roof deck. Fasteners are listed in the fastener section.

IV.8 Poured Gypsum Decks

Poured gypsum decks contain a high percentage of moisture. It is therefore imperative that proper venting be provided to avoid moisture buildup under the roofing system. Gypsum decks must be at least 2" in thickness poured over a vented deck system. Provisions must be made for venting and expansion and contraction of such decks. Proper design of roof vents and expansion joints are the sole responsibility of the architect and designer.

Prior to installation of the roofing materials precautions must be taken to insure that deck is smooth, free from projections and ridges and dry and frost free. All depressions must be filled with materials approved by the deck manufacturer. Prior to application of the roofing system, a layer of laflat SBS base sheet must be mechanically fastened to the roof deck. Fasteners are listed in the fasteners section. Fastener pull out resistance shall be a minimum of 40 lb.

IV.9 Steel Decks

Steel deck construction must meet UL, FM Class I and Steel Deck Institute structural guidelines. The deck must be a minimum 22 gauge, galvanized, welded or mechanically fastened, forming a rigid unit. For additional deck and insulation requirements designer should consult Factory Mutual's Loss Prevention Data Sheet I-28. Insulation is required; installed per manufacturer's specifications and spanning all rib openings.

IV.10 Asphalt and Perlite Aggregate Decks

Asphalt and Perlite aggregate roofs are not acceptable substrates. The deck must be completely isolated before the installation of a new roofing system. Written

approval from MBTechnology's manager of technical services is required for all warranted systems prior to start of any job.

V. GENERAL DESIGN REQUIREMENTS

Special consideration must be given by the designer to the following items:

V.1 Cant Strips

Cant strips are required at all points of intersection for the roof deck (or insulation surface) and the parapet wall. Cant strips must be approximately 4" in vertical and horizontal dimension with a roof incline of not more than 45 degrees. Wherever feasible, install cants on insulation or insulation stops by nailing cant strips to the deck and the adjoining parapet walls. If nailing is not possible, cant strips can be secured in mastic or hot asphalt. Pressure treated perlite or rot-proof wood cant strips shall be specified with torch applied systems. Perlite, urethane, or wood fiber strips are recommended in all hot asphalts or cold adhesive applications. Masonry cants shall be so constructed as to provide a vertical offset equal to the thickness of the roof insulation. Metal cants are not acceptable.

V.2 Drainage

Adequate drainage allowing complete water run-off is critical. Decks must be free from ponding within 48 hours of precipitation has occurred. Regular inspections to keep drains free from debris or ice is an essential element of owner maintenance. Areas of inadequate drainage due to poor roof design are excluded from warranty coverage.

V.3 Expansion Joints

Expansion joint design as to the location and number of joints remains the responsibility of the architect and the designer. However, field experience has shown that expansion joints should be provided in the following conditions to protect the roofing membrane from expansion/contraction of the substructure.

- a) When the roof deck changes direction such as in "L", "T" or "U" wing designs.
- b) Whenever additions are made to existing buildings.
- c) Where decking, or steel framing change direction.
- d) When two adjoining decks are constructed of dissimilar structural materials.
- e) Every 200 feet of continuous deck span.
- f) Wherever designer deems necessary.

NOTE: Designers should also bear in mind that extreme climatic conditions will cause excessive structural movements. Such conditions may warrant the need for additional expansion joints.

V.4 Freezer Plants, High Humidity Facilities

Cold storage facilities require complete separation of the "freezer section" and the roof deck. High humidity interiors such as swimming pools, laundries, breweries, shower facilities also require complete separation of the high humidity interior and the roof deck. In all cases, adequate ventilation between the two sections must be provided. MBTechnology assumes no responsibility for membranes directly applied to roofs or such facilities.

Roofing projects over such facilities will be reviewed by MBTechnology's manager of technical services on a case by case basis. Approvals or exceptions will be provided only after receipt of a written notice from the designer indicating the design suitability and the readiness of the deck to receive roofing material. Written approvals are required before the start of any project.

V.5 Cooling Towers

Circulating water in cooling towers is usually chemically treated to stop excess residue buildups. MBTechnology does not warranty roof damages resulting from such chemical attacks. Waterproofing decks with installed cooling towers is acceptable only after a project review by the manager of technical services.

V.6 Metal Flashings

Metal flashings as recommended by NRCA and SMACNA; while not part of the membrane roofing system, metal flashings should be installed to provide proper membrane protection at the top of parapets and along vertical walls where added support is required (Section V.10 Termination Bar). All metal flashings must be a minimum 24 gauge galvanized or stainless steel, 16 oz. copper or 3 lb. lead and firmly secured to the deck.

V.7 Nailing Strips

Four inches (4") wide pressure-treated wood nailing strips must be provided on non-nailable decks with slopes exceeding 1" per foot. Strips shall be set flush to the surface and parallel to the slope throughout the span of the deck. Strips are to be installed at all

perimeter and roof penetrations areas. If insulation is specified, strips must be the same thickness as the insulation. Spacing of nailers must be in accordance to insulation manufacturer's recommendation. On slopes over 2" per foot, strips have to be installed flush with the insulation and at right angles to the slope. If spacing guidelines are not provided by the insulation manufacturer, nailer spacing should be as follows:

Slope ("ft)	Spacing
0-3/4"	20' o.c.
3/4" -2"	10' o.c.

V.8 Pitch Pockets/Pitch Pocket Sealants

Pitch pans are not recommended and are not to be used on MBTechnology warranted projects if other alternatives are available. However, in extreme cases where the use of a pitch pan is unavoidable, a small pitch pocket filled with elastomeric pitch pan filler and self leveling non shrink sealants is acceptable in lieu of the membrane flashing. A metal crown must be installed over the pitch pan and secured to the pipe with an adjustable metal strap. A continuous bead of urethane caulking will be applied to the upper edge of the clamp. Pitch pans are considered maintenance items and must be maintained by the owner. All pitch pan construction shall be in full compliance with NRCA and SMACNA approved application standards. Please refer to "Section XIII.FLASHING DETAILS".

V.9 Roof Vents

Roof vents are not recommended as a means for drying out wet insulation (ASTM Publication Code No. 04-789000-10). NRCA venting recommendations indicated limited use, only with concrete fill decks where vapors or gases can cause substrate pressure on the membrane.

V.10 Termination Bars

"Riglet" metal termination devices are highly recommended on vertical walls and in areas where the membrane cannot be secured on top of a horizontal surface. Caulking the top edge of the termination bar assembly is acceptable. All membranes must be totally sealed at the top of the termination bar.

V.11 Vapor Retarders

The use of vapor barriers or vapor retarders based upon indoor and outdoor temperatures, building usage,

occupancy and relative humidity. Vapor retarders are not part of the roofing system. Need for vapor barriers to eliminate condensation in the roofing system requires special study by the designer or the architect and remain the responsibility of the design engineer or the architect.

Heated buildings in regions where outside winter temperatures average below 45 F and internal relative humidity exceeds 45 percent usually have vapor retarders incorporated into their designs. Vapor barriers should also be included in designs of pressurized cooling plenums.

V.12 Walkways

Roof areas where equipment maintenance is required or areas with pedestrian traffic require protective walkpads to minimize roofing membrane damage.

V.13 Water Cutoffs

Temporary water cutoffs are required during breaks in application of the roofing membranes. All exposed edges must be covered to keep moisture from invading the system. Water cutoffs are temporary and therefore must be removed prior to resumption of work. Warranty coverage will be voided if the roofing material becomes wet during application, unless water penetrated areas are completed dried out or the affected material is removed and replaced. Water cutoffs consisting of one layer of glazed layflat SBS LF25 or 2 plies of felt are acceptable.

VI. INSULATION

This section outlines certain guidelines in the application and usage of insulation materials in connection with MBTechnology's roofing systems. Insulation manufacturer's technical manuals contain detailed specification on fastening, joint staggering, taping, mitering, multi-layer application, mopping, torching, etc. Insulation manufacture's installation procedures must be followed. MBTechnology is not responsible for damage to the roofing system caused by fault fastening procedures. Design specifications must include R value, thickness, number and spacing of nailing strips, number of layers, and method of attachment to substrate. MBTechnology highly recommends double layer installation of insulation in system where the first layer of insulation is mechanically fastened to the deck.

Our roofing systems are compatible with the following insulation boards when insulation is applied in strict

accordance with manufacturer's and Factory Mutual guidelines. We will not be responsible for riding or blow-off problems or system failures caused by insulation which is damaged, incorrectly installed or improperly fastened. Insulation must be kept completely dry prior to and during application of roofing system (Section V.9 Roof Vents). Water cutoffs are essential at exposed edges of insulation at the close of each work day (Section V.13 Water Cutoffs). For insulation types not listed below, please contact MBTechnology's manager of technical services.

Fiberglass-ASTM C-726
Federal Specification HH-I-526

Perlite-ASTM C-728,
Federal Specification HH-I-529

Polyisocyanurate-Factory Mutual-4450,
Federal Specification HH-I-1972/Gen.

Wood Fiberboard-ASTM C-208,
Federal Specification HH-I-535

Polyisocyanurate Composites-Contact manager of
Technical services

Polyisocyanurate, fiberglass is not suitable insulations for direct applications. They should be covered with ¾" perlite board, dens deck or a suitable recover board suitable for torch , mop or cold adhesive applied system.

MBTechnology does not approve the use of our system with EPS (Extruded / Expanded Polystyrene Insulation boards). Although our U.L testing approves the use of such insulation, however they are not acceptable to MBTechnology and not warrantable.

VI.1 Fasteners

Proper attachment of all membrane underlayments (insulation, recover boards, base or ply sheets) is essential. Design of roofing systems requiring insulation should take in to consideration all FM guidelines (I-7, I-28, I-49, I-60, I-90, 4470) and local codes for mechanical and/or asphalt attachments. MBTechnology assumes no responsibility for system problems which result from fastener failures or improper fastener design and installation. Following is a data guide on mechanical fasteners available to the industry.

Deck Type	Fastener Type	Manufacturer
Lightweight Insulating Concrete	Zonotite (for base Sheets)	W.R. Grace and Company
	Olympic CR Base Sheet Fasteners	Olympic Fasteners
Concrete	FM 90 Fasteners	ES Products
	Rawl Speed-Lock Toggle Bolt	Rawl plug Company
Poured Gypsum	Dekfast 14" – 15"	Construction Fasteners
	CD-10 (3" Plates)	Olympic Fasteners
	Rawl T-Spike	Rawl plug Company
Wood/Plywood	Nail Tite Type A	ES Products
	NTB-1H	Olympic Fasteners
	Olympic CR Base Sheet Fasteners	Olympic Fasteners
	Polymer Gyptec	ITW Buildex Corp.
Steel	1" Annular Grooved (Base sheets)	Simplex Nail
	11 Gauge annular thread roofing nail	Independent Nail Company
	Deckfast 12" or 14"	Construction Fasteners
	CD-10 (3" Plates)	Olympic Fasteners
	14-10 Roofgrip	ITW Buidex Corp
	Woodie /Rawl #14	Rawl plug Company
Steel	Perlok Fasteners	Performance Building Products
	Deckfast 12" or 14"	Construction Fasteners
	Standard Fastener	Olympic Fasteners
	14-10 Roofgrip	ITW Buildex Corp.
	Rawl #14	Rawl / plug Company

Tin discs (28 gauge 1 3/8" diameter minimum) shall be used if nail head is less than 7/16". Nails shall be long enough to enter nailers by at least 3/4" but shall not pass through nailers.

VI.2 Application

Rigid insulating material must be kept dry at all times. Wet insulation should never be installed. Extreme caution should be taken in ensuring that all insulation is completely dry before the installation of the roofing membranes. The insulation must present a smooth and clean surface before application of asphalt or any roofing membranes. Installation must be according to manufacturers published guidelines. All rigid insulation must be mechanically fastened to the roof deck with appropriate fasteners. There are certain adhesives in the market, which are approved for adhering insulation to structural concrete deck. Please consult the insulation and adhesive manufacturers requirement. Hot mopping of the first layer of insulation board is not acceptable since application does not meet Factory Mutual's wind uplift requirements. Hot mopping of second layer of insulation is only recommended for panels of 4'x4' maximum size.

VII. GENERAL RECOMMENDATION

V.II.1 Material Storage and Handling

All MBTechnology roofing membranes must be kept dry and away from direct exposure to adverse elements prior to and during application process. If material is kept outdoors, it must be covered. Rolls must be stored in a vertical position off the ground and on a solid surface to avoid end damage. Pallets shall not be stacked more than two high without supporting racks. Use of protective plywood between stacked pallets is recommended. Materials should not be directly stored outside in temperatures above 90 F. In cooler weathers all materials must be kept above 50 F prior applications.

UNDER NO CIRCUMSTANCES SHOULD WET MATERIAL BE APPLIED.

V.II.2 Safety Precautions

Safe roofing requires an ongoing safety training and awareness program for all contractor personnel. Failure to observe OSHA regulations or local safety codes may result in injury and excessive damage to the building. All workers must be instructed on the proper method of using a fire extinguisher. Torch equipment must be periodically checked for gas leaks and worn out hoses and faulty regulators must be replaced immediately.

V.II.3 Maintenance

MBTechnology's SBS mineral surfaced roofing systems are relatively maintenance free and last for years without expensive surface recoating and refurbishing. Regardless of the roofing system the owner should have a maintenance program in place. It is strongly recommended that a competent roofing contractor be selected to perform annual system inspections to identify and correct problems, which can lead to deterioration and premature failure. An in-house maintenance program must be performed by an individual who is trained to identify early warning signs of potential system failures. The maintenance program must include the following:

- Periodic removal of dirt and all foreign articles from the roof surface.
- Cleaning of drainpipes and roof drains.
- Coated roof surfaces require on-going attention to make certain that the original coverage is maintained at all times (Section VIII.8 Surfacing). Areas, which are peeling or wearing off must be serviced immediately.
- Replacement of damaged caulking around skylights, metal work details, termination bars.
- Inspection must identify areas where drainage patterns were altered due to structural movements or construction work on the building since the last roof inspection. Ponding water areas should be corrected. Additional water weight can cause roof deflections and can be cumulative over a period of time resulting in structural and roofing system damage.

Periodic inspection of perimeter flashings and roof surfaces to make certain the membrane is fully adhered, and has not been damaged by system movement, or from work activity on roof.

V.II.4 Repair

This section refers to the repair of small areas of the roofing membrane. We strongly recommend that repairs be done by an MBTechnology eligible roofing contractor. This section does not address repairs to large sections of the roof. MBTechnology SBS modified bitumen products are ideal for repairing existing asphalt roofing systems. The ease of application does make repair work possible with in-house maintenance

personnel and provided they have been properly trained in roofing safety procedures and the application of modified bitumen systems. Only MBTechnology polyester, or combination (polyester/fiberglass) reinforced membranes can be used for repair work. Projects where UL fire rating are mandated, 160 mil fireguard SBS or metalflex SBS must be used for all repairs. Projects where UL fire ratings are not required, repairs can be done with fastorch SBS or superflex SBS membranes. Specifications and conditions outlined in Section IV. And Section V. applies to all repairs.

Emergency use of mastic on warranted jobs is acceptable as a temporary expedient, but must be replaced with a permanent repair as soon as weather conditions allow.

V.III AUXILIARY MATERIALS

V.III.1 Application Equipment

The following is a partial list of required application equipment. Consult NRCA & your local code agencies for additional equipments.

General

- Minimum of 4 fire extinguishers of 20 BC classification
- Hooked blade knives
- Chalk line
- Restraining gear

Torch Applications

- 4"-6" round nose trowels
- D.O.T. approved tanks
- UL rated regulators-adjustable 0-60 psi
- 350 psi rated hose with a 1750 psi burst resistance rating
- 45 psi single or twin torch
- 20 psi detail torch
- 45-60 psi torching wagon

Hot Applications

- Kettle with accurate fully readable thermometers
- Mops
- Felt layer
- Mop carts with pneumatic wheels

Cold Applications

- Spray rig

V.III.2 Asphalt

Asphalt shall be certified for full compliance with the requirements for Type IV asphalt, per ASTM D-312. Mexican asphalt is not allowed on any MBTechnology warranted projects. Each container or bulk shipping ticket shall indicate the Equiviscous Temperature, EVT, the Finished Blowing Temperature, FBT, and the Flash Point, FPT.

Heating oxidized asphalt above its published finished blowing temperature for over 4 hours can cause asphalt degradation and result in a change of softening point. A reduced softening point causes poor membrane adhesion due to a decrease in viscosity and holding power of the asphalt. Asphalt should never be heated beyond its flash point. The ideal application temperature is the EVT temperature printed on package. A deviation of 25 F above below the EVT is acceptable. If the EVT is not provided, MBTechnology recommends:

Slope	Asphalt Type	Softening Point Temperature	Application Temperature
¼"-2"	Type IV	210-225F	425-475F
Type IV asphalt must be used on all projects in hot climates where temperatures are in excess of 100F.			

- Type III asphalt should only be used with prior written permission from MBT Technical supervisor.

In cold weather applications, special care should be taken to insure proper application temperatures at the point of mopping. Asphalt must not be overheated to compensate for cold conditions. MBTechnology will not accept responsibility for problems caused by slippage. MBTechnology does not approve the use of San Joaquin asphalt.

V.III.3 Cold Adhesive

Cold adhesives or roofing cements should comply with ASTM D3019 Type III. Cold adhesives should be applied at ambient temperatures above 50 F. SBS modified bitumen adhesives are preferred over standard grade adhesives. Special precautions should be taken for applications in cooler climates to insure even distribution of the adhesives. Avoid flames in presence

of cold-adhesive fumes. Do not apply more than one layer within a 15-hour period. MBTechnology requires the use of its adhesive (IAC 7MBT) for projects requiring NDL guarantee.

V.III.4 Coal Tar

Coal Tar or its derivatives are incompatible with SBS modified bitumen and should not be used in combination with any of MBTechnology's product lines. Under no circumstances shall coal tar or its derivatives come in contact with the roof membrane.

V.III.5 Mastics

SBS modified bitumen membranes are compatible with most modified Type 9 mastics and adhesives. Mastics with excessive cutback content can damage the SBS membrane. Electrometric mastics, adhesives, and caulking products are required over standard grade adhesives and mastics. Wet surface plastic roof cements are not compatible with SBS modified membranes and are therefore not allowed on any project. All mastics must conform to Federal Specifications SS-C-153 Type I. Specific recommendations are available from MBTechnology's manager of technical services.

V.III.6 Membrane Base Flashing

Close attention must be made to membrane flashing details (Section XIII. FLASHING DETAILS). Flashing areas are often the source of leaks and the start of system failures. Deviation from flashing detail recommendations will be sufficient grounds for voiding the system warranty. Only polyester, combination polyester/fiberglass reinforced or scrim reinforced metalflex SBS membranes are allowed as flashing materials.

V.III.7 Primer Asphalt

Primer asphalt must conform to ASTM D-41 or Federal Specifications SS-A-701. Diluted primer is not acceptable. Heat welding or torch applications require light acid etching of surfaces.

V.III.8 Surfacing

Asphaltic roof surfaces can be "coated" or covered with mineral granules, gravel, or slag to increase system longevity. Once the system surface has been coated it is required that the coating be maintained at its original

application level. The following is a list of acceptable roof surfacing.

Mineral Granules MBTechnology products are produced with a granulated mineral surface, available in white, slate gray, Navajo buff, Kelly green, terra cotta, rustic red and autumn brown. Factory applied granule surfacing does not require on going recoating of the roof surface. For cosmetic reasons, application of an acrylic or aluminum emulsion coating over the granules is acceptable. Contact MBTechnology for a free color chart.

Emulsion and Aluminum Coatings may be helpful in extending system life. However, in order to meet the original purpose of their application, the surfacing must be kept at original application level during the warranty period. Use of such coatings may involve on going maintenance program to recoat the deck surface every few years. MBTechnology accepts no responsibility for problems associated with performance of field-applied coatings, such peeling and flaking. Fiberated aluminum coatings must meet ASTM D2824 Type III (non asbestos) standards. Emulsions must meet ASTM D1227 standards.

Gravel or Slag Clean, dry gravel (400 lb.) or slab (300 lb.) meeting ASTM D-1863 is required. Apply with asphalt flood coat at rate of 60 lb. per square. Gravel surfacing on slopes greater than 1" is not recommended. This is due to the slipping of the flood coat. Under such circumstances MBTechnology proposes the use of other surfacing materials.

V.III.9 Lead Flashings

All metal flashings shall be primed with asphalt primer prior to hot mopping or cold application of modified bitumen membranes. Torch applications require acid etching of all lead flashings. Lead flashings must be set in elastomeric mastic on top of the interplies. The flashing will be subsequently stripped in with one or two plies of layflat SBS or superflex SBS membranes. In two-ply applications where the first ply is a nailed base sheet, the flashing must be either applied over the cap membrane or applied over a polyester reinforced superflex SBS or fastorch SBS target sheet. The target must extend 6" beyond the edge of lead flashing.

V.III.10 Plastic Roof Cement

Roof cement is used for sealing concrete, roof slabs or around edges in very small quantities. Roof cement is not allowed as a repair item on warranted or non

warranted roofs. All roof cements must meet ASTM D4586 Type II (non asbestos grade).

IX. APPLICATION

This section outlines general guidelines and constraints on torching, mopping and cold adhesive applications. All layers base, interply and cap shall be fully 100% adhered to each other and to the approved substrate such as Den-deck or wood fiberboard. For a more specific application guidelines please refer to Section XIV. SPECIFICATIONS. Two very important topics, flashings detail application and cool weather applications are also reviewed in this section. Please note that the items presented here are guidelines to applications of MBTechnology products, however stricter NRCA procedures apply in all cases not addressed within this section.

IX.1 Base, ply and Cap Sheet Fastening & Length Requirements

LAYFLAT SBS BASE SHEETS ARE REQUIRED ON MOST WARRANTED JOBS. The use of unmodified base sheets meeting ASTM D4601 Type II is acceptable to MBTechnology. Written approval for such a substitution must be obtained beforehand from the corporate office. All base sheets must be fastened to meet local wind uplift codes. Base sheets may be mechanically fastened, hot mopped or applied with cold adhesive. To assure a flat unwrinkled surface, specifically in cooler weather, the base sheet may be relaxed for few minutes prior to application. Proper application is critical in avoiding system failure or wind uplift. Base sheet application must start at the low point of the roof, proceeding upwards. Application of base sheet is excess of what can be covered during the day (phasing) is not acceptable.

On nailable decks with slopes less than 1/2" per foot, base sheet must be applied in shingle fashion staggering at the low point of the roof proceeding upwards. Base sheets shall be lapped 2" on the sides and 4" at the ends, with all end laps staggered. On nailable decks with slopes greater than 1/2" per foot; in addition to the above requirements the end laps shall also be staggered not less than 3' apart. Sheets will be nailed at 9" intervals along the edges. The second row of fasteners will be nailed 12" from the edge, 18" apart.

On decks with slope exceeding 1" per foot, all cap membranes must be applied parallel to the slope and

back nailed to the deck. Back nail all head laps 2" from the edge and in 6" intervals. All side laps will be nailed at 8" intervals. Treated wood nails must be provided on non-nailable decks or on decks with applied insulation. The spacing of the nails must coincide with the end laps of the cap membrane. Contact MBTechnology for fastening requirements on slopes 2" per foot.

ROLL LENGTH:

Rolls of cap shall never be put down in full-length rolls. They should be cut to the following lengths.

A. CAP SHEET

Slopes of	1/4" up to 1 1/2"	17-foot max (1/2 roll)
Slopes of	1 1/2" to 2"	11-foot max (1/3 Roll)

B. PLY SHEET

Slopes of	1/4" up to 1 1/2"	97-foot max (LF25 only)
		64-foot max (LF40 only)
		49-foot max (LF60 only)

Slopes of 1 1/2" to 2" will be 35-foot max (all grades of Lay Flat used as interply)

IX.2 Flashings

Proper application of flashing details is critical and in most cases is the determining factor in roof performance. It is therefore imperative that the contractor strictly adheres to detailed flashing drawings presented in this manual.

Field and Base Plies: All field and base plies shall extend a minimum of 2" above the cants, and fully adhered to adjoining walls, curbs or nailers.

Base Flashings: All base flashings shall extend a minimum of 8" above the roof surface (a maximum of 24" if supported by a termination bar or metal counter flashing); and shall extend a minimum of 6" on to the roof deck. For walls over 24" in height all base flashings must be torch applied and applied in stages and nailed approximately 6" o.c. at the top.

Parapet Walls: Non-nailable parapets must be primed with priming asphalt. Wood surfaces shall first receive a layer of layflat SBS base sheet nailed 12" o.c. in all directions. Torch application of parapet walls is highly recommended and is required for parapets over 2' high. Application must start at the base of the parapet wall and proceed upwards. Each parapet membrane-flashing piece is precut to a maximum length of 4' before application. If the parapet is higher than 2',

additional courses are added in shingle fashion with 4" - 6" laps until the flashing system reaches the top and over the horizontal surface of the parapet. Metal counter flashing or a modified bitumen crown counter-flashing can be welded over the parapet top. Parapet flashings terminating on a vertical surface more than 18" off the deck must be reinforced with a termination bar, properly caulked and protected with metal counter flashing.

Drains: Please refer to Section XIII. FLASHING DETAILS for application guidelines. In addition, all drains require the installation of a lead sheet over the base and the interplies, primed and set in elastomeric mastic. The lead surfacing is subsequently stripped and the cap sheet applied.

Penetrations: Roof penetration flashing can be applied by torch or hot moped. Basic principles outlined in the section on parapet walls apply. A detail torch is the far better tool for use on smaller flashings, assuring far more precise work without scorching adjoining membrane surfaces. Most penetration flashings, except possibly pipe flashings, do not normally require mechanical support. Projects through roof decks including equipment supports, pipes, conduits and sign supports must be wrapped and lead flashing applied over the interplay. All metal flanges designed to receive SBS flashing membranes shall have a minimum 4" width and shall be primed with asphalt primer prior to installation. All metal flanges shall be stripped in a minimum of 6" in all directions beyond the primed or etched areas. Sleeves and hoods must be welded or strapped to form a cap flashing. Pitch pans are not recommended. Please refer to Section V.8 for specifics.

Cold Adhesive application is not recommended. In projects where cold adhesive is used, all flashings must be torch applied with a small detail torch. Hot asphalt, application is satisfactory where flashing is properly anchored by nailed, termination bar, or clamp ring to avoid slipping in extremely hot weather. Metalflex SBS MF160WAL flashings have difference application procedures. For details please contact MBTechnology's manger of technical services.

IX.3 Heat Weld Application

Torch application is not approved when ambient temperature is below 45 F. Residual moisture in substrate and roofing materials can be trapped in the system and cause blistering. Do not apply roofing during precipitation, or when decks are wet from water, snow,

or frost. In cooler climates, membranes must be relaxed and slightly heated before commencement of torching.

SBS modified bitumen membranes are different from typical APP torch membrane and have major advantages over such products. Contractors are encouraged to contact MBTechnology for information on all fastorch SBS products. Overheating of the underside of the membrane will cause excessive softness of the top and even cause the granule surface to run. The factory applied burn off film on the under side of all MBTechnology's fastorch SBS grades will easily guide the application through a smooth application process.

Metalflex Application

Metalflex membrane application guideline.

Application of foil-faced membrane is different than granulated membranes. Enclosed are brief points, which will guide you and your crew in proper application of membrane. Please see that your crew is aware of these procedures, since they are required for issuance of warranty. For further information and assistance contact our sales department at 800-621-9281. Metalflex SBS should only be applied via heat welding in some instances we will allow hot asphalt for field of roof only, please contact us for specific.

1. Metalflex SBS shall only be applied with torch.
2. It is very important not to deform the waffle Pattern, since this will reduce life expectancy of membrane. In order to avoid this you should use a damp sponge (for flashing) or a wet mop (for field) to broom the membrane in into place. **Do not walk on the membrane.** For field of roof do not walk on membrane and always pull the membrane. This can easily be done with a torch-hook.

For flashing application always torch-apply the membrane into place using three-foot widths (cut off the end of the rolls) always lapping the factory selvage edge. Extend the flashing a minimum of six (6) inches beyond the toe of the cant onto the prepared surface of the finished roof and up the wall to the min 8" height.

For end laps application you need to peel off 8" of the foil. This is done by cutting the foil with a sharp utility knife, making sure that the cut is not deep enough to penetrate the reinforcement and only cuts the foil. Then lightly heat the aluminum foil, which has been cut to facilitate peeling off. To cover the asphalt bleed out

use an aluminum paste and rub over the areas, which have asphalt bleed out.

Slopes 2 and higher.

For slopes of 2:12 and higher the only accepted method of application is heat welded. For slopes up to 2" per foot application will be in strict accordance to MBTechnology specification number. For slopes of 2:12 and higher all membranes will be applied parallel to the slope with minimum side and end laps of 4" and 6" respectively. All end laps will be staggered a minimum of 36". All side laps must be staggered 18" between successive plies. Depending on the slope application of membranes should be according to the following guidelines.

2" - 3.5" per foot:

Application of base sheet must be installed parallel to the incline and fastened with two evenly spaced rows at 18" on center, staggered and 9" along the edge laps with lengths not to exceed 11'. The interply will be then torch welded to the base sheet and back nailed. Spacing of the fasteners on the side laps should not exceed 8". End laps should be fastened using a total of 9 fasteners in a double row, evenly spaced configuration. All fasteners will be covered by cap sheet. The cap sheet will be torch welded to the interply and back nailed along side and end laps. The fastening pattern will be similar to that of the interply. All fasteners should be covered by a succeeding ply extending a minimum of 2" beyond the lower most edge of the fastener caps. Application of the cap will be similar to the above with the exception of rolls lengths, which should be reduced to 11'.

IX.4 Hot Asphalt Application

Interply mopping of asphalt must be at the rate of 25lb. per 100 square feet. MBTechnology accepts a deviation of 4 lb. from the nominal amount. Spot mopping shall be applied in 9" diameter circle 24" apart at the rate of 15 lb. per square. Asphalt should be applied with a maximum mop lead of about 8 feet (2.4 m), and an SBS-modified bitumen sheet should be placed in the asphalt as soon as possible. Consideration should be given to using mops with relatively short handles and lightweight head sizes; this will minimize the potential for over-extending mop lead. Hot asphalt application is not acceptable when ambient temperature is below 50 F, as asphalt temperature can quickly drop below the minimum point-of-application temperature. Residual moisture in the substrate and

roofing materials can be trapped in the system and cause blistering. Do not apply roofing during precipitation, or when decks are wet from water, snow or frost. Do not kick out rolls into hot asphalt. Temperature permitting, base sheets and light interply layers can be rolled and broomed in to the asphalt. Asphalt should be applied in a continuous manner without voids. All air pockets must be rectified at the point of application when the asphalt is hot. Poor ply adhesion due to improper mopping procedures or incorrect asphalt temperature is unacceptable. Asphalt used to apply mop-applied SBS-modified bitumen sheet products should be heated as hot as possible but without damaging the asphalt or creating hazardous conditions.

GUIDELINES FOR HOT ASPHALT APPLICATION ON SLOPES OVER 1/2" per foot.

Hot asphalt application shall only be used for slopes up to 2.0" per foot. TYPE IV asphalt shall be used for all applications of 1/2" per foot and over slope.

Non-Nailable Decks: On decks with a slope over 1/2" per foot the roofing felts must be installed parallel to the incline and must be nailed. Pressure – treated wood nailers shall be attached to the deck, run perpendicular to the incline, be capable of retaining the nails securing the roofing felts, have the same thickness as the insulation and be at least 3 1/2" wide. Wood nailers shall be provided at the ridge and at the following approximate intermediate points:

<u>INCLINE</u>	<u>NAILER SPACING</u>
1/2" -1"	36'
1" -2"	18'

Nailer may also be laid out to conform to the roll length being used. For slopes between 1/2' – 2" per foot nailers should be spaced to accommodate 16 foot length rolls. For slopes between 2" – 2.5" per foot the nailers should be spaced to accommodate 11-foot length rolls.

Cut the modified bitumen membranes (base, ply, cap) to conform to the nailer spacing. Nail the end lap across the width of the sheet, with the first nail spaced 3/4" from the leading edge of the sheet, and the remaining nails spaced approximately 8" o.c. The nails shall be staggered across the width of the nailer to reduce the risk of the sheet tearing along the nail line. Nails must have an integral 1" diameter cap. Where capped nails

are not used, fasteners must be driven through caps having a 1" diameter.

Nailers must also be used around perimeters, opening and penetrations, for nailing felts, gravels stops, roof fixtures and fascia systems.

Nailable and Light weight Concrete Decks: On decks with a slope of ½" and over per foot the roofing felts must be installed parallel to the incline. Nail the end laps of the membrane across the width of sheet on 8" centers. All nails to be mopped over and covered by the lap of the next sheet. For slopes from ½" – 1" per foot 17' length can be used. For slope of 1" - 2" per foot 11' length should be used.

IX.5 Mechanically Attached Application

Install the base sheet dry and in parallel courses. Fasten the membrane in accordance with FM approvals with mechanical fasteners.

Seal all the laps by heat welding. Install the base flashing membrane heat weld over primed substrate. Adhered cap sheet onto base sheet by heat welding, cold adhesive or hot asphalt. Install the cap sheet flashing membrane via heat welding.

IX.6 Cold Adhesive Application

Cold adhesive application requires special precautions. Cold process application is NOT allowed when ambient temperature is below 50 F, as lap cure time can exceed 15 hours. Temperatures above 60 F are ideal for expediting lap cure time. Roofing should not be applied if precipitation is anticipated prior to completion of lap cure, or when water, snow or frost is present. Keep open flames of torches away from adhesive fumes. Keep roof traffic to a minimum of 7 days until the adhesive sets and system surface firms. Caution should be exercised by other trades to avoid damaging the membrane as they proceed with their work. Cold adhesives must be applied at a rate of 1 ½ gallon per square. Excessive cold adhesive will damage the SBS membrane.

IX.7 Re-roofing

MBTechnology recommends a complete tear-off for all reroofing projects. In cases where a complete tear-off is either too costly or impractical, reroofing over existing system is permitted under conditions outlined below.

MBTechnology SBS modified bitumen membranes are ideal for roofing over existing structures, however each reroofing application is unique and therefore must be individually considered. The final decision on all reroofing matters lies with the designer, architect or owner. Prior to reroofing decisions the existing roof must be thoroughly inspected and prepared for reroofing application. The inspection should determine whether:

The deck is structurally sound and is capable of withstanding the additional weight of the new roof.

The existing drainage system is adequate and will provide complete removal of water from the deck.

Areas are affected by moisture. Damaged and wet areas must be completely replaced and dried out before application of the new roofing. Test cuts or use of moisture detecting devices may be required in determining the location and the extent of water damage.

Damaged and old flashing details must be removed and repaired or replaced to conform with flashing requirements detailed in this publication.

Areas exhibiting ponding water must be corrected

Areas exhibiting blistering and buckling must be corrected.

Project must be in full compliance with local codes and Factory Mutual wind uplift requirements regarding reroofing.

A reroofing project with an existing gravel surface, meeting the above conditions must be swept clean of all loose aggregates before the application of any membranes. A ½" recover board must be mechanically fastened to the deck before proceeding with the application of the new roof.

Uniform Building Code (UBC) prohibits reroofing on decks, which have been previously reroofed. MBTechnology does not issue warranties if more than two existing roofs are in place. Warranties do not cover leakage caused by defects in the old roofing system.

IX.8 Cool Weather Application

Hot asphalt application is not allowed in cold weather under 50 F even though SBS membranes remain flexible. MBTechnology recommends torch application

as the preferred method in cooler temperatures down to 45 F.

Special measures must be taken in cool weather roof applications. In the event of cooler weather especially where ambient temperatures are near 50 F, and it is essential that the mopping process continue, the following conditions must be met:

- *Materials must be stored in a location where ambient temperature is above 50 F.*
- *Utilize insulated 2 pipe circulatory pump as the asphalt carrier.*
- *All asphalt handling equipment must be properly insulated. Cut membranes in shorter lengths of 11' to 17' in length.*
- *Prior to application, relax all membranes with top or granule side down.*
- *Mopper shall be no further than 3-4' in front of the roof.*
- *Do not over compensate by heating the asphalt above the Equiviscous Temperature (EVT) as it will permanently damage the asphalt.*
- *Material has to be fly-in to the asphalt. This includes all cap and medium to heavy weight interplay sheets.*
- *Torch application may require that the material be unrolled slowly and slightly heated with a propane torch before application.*

UNDER NO CIRCUMSTANCES SHOULD THE MATERIAL BE MOPPED IN TEMPERATURES UNDER 50 F, OR TORCH APPLIED IN TEMPERATURES UNDER 45 F.

IX.9 Phased Application

Phased application of MBTechnology products is not acceptable under any conditions. Roofing systems applied in such a manner are subject to blistering and poor interplay adhesion, due to entrapment of moisture by the exposed layer. Install only as much roofing material as can be completed and covered in one day. No section of the roof should be left exposed and unfinished.

X. SERVICES

X.1 Eligible Roofing Contractor Program

Most roofing system failures are caused by improper application. Quality material will not perform properly if misapplied. MBTechnology selects eligible roofing contractors to install its systems. Only systems applied by our eligible roofing contractors are qualified for workmanship warranties.

Contact manager of technical service for eligibility as an MBTechnology select contractor. MB Technology will appoint its eligible roofing contractors based on business experience, financial stability, local and industry reputation and roofing competence.

X.2 Warranties

MBTechnology offers both a material warranty and a roof system guarantee, covering workmanship and materials. MBTechnology will issue workmanship warranties applied by MBTechnology eligible roofing contractors, performed according to specifications. The material and workmanship warranty requires a work in progress and a final inspection by an MBTechnology inspector. MBTechnology offers standard warranties from 10 to 20 years, depending on the substrate and the materials used. Contact MBTechnology for details.

All specifications presented in this publication are eligible for a 10-15-20 year warranty.

X.3. MB Care Free Roof Inspection Program

A systematic roof inspection and maintenance program is essential to the satisfactory long-term performance of any roof. Through such a program, potential problems can be discovered in their initial stages or prevented altogether.

Once the roofing system is installed, most manufacturers only return to the roof in case of leakage. Our warranty is different, since we will inspect the roof every 3-5 years at no charge to the owner. A comprehensive report is then prepared, describing the condition of the roof. This report will alert the owners to any areas that require maintenance. In case of minor problems on the roof (e.g., loose flashing), we will repair them at no charge, even if it has not yet resulted in leakage. MBCare program requires the use of following products and is currently only available for projects installed in California.

Heat Weld Application: Cap sheet shall be FGFT160CWH.

Cold / Hot Asphalt Application: Cap sheet shall be fireguard SBS/SEBS FG160CWH.

To receive your free sample copy of such report please contacts us at info@mbtechnology.com.

XI. APPROVALS

MBTechnology systems are rated as Class A, B, C by Underwriters Lab and Warnock Hersey and Class 1 by Factory Mutual. Products have also been tested to various applicable ASTM standards. In addition, our systems have approvals from numerous local and regional governments. Please contact MBTechnology for more details.

XII: COOL ROOF (California Title 24)

The State of California requires a “Cool Roof” when installing a new roof, or when re-roofing if the following criteria apply:

- Roof covers non-residential building, high-rise residential, or hotel/motel occupancy,
- Slope of the roof is less than 2:12,
- It is over air-conditioned space,
- A permit is required.

To qualify as a cool roof, the material must meet the following criteria:

A minimum reflectivity of 70%
Minimum thermal emittance of 0.75,
Products are labeled with CRRC label.

SBS modified bitumen roofing systems can achieve this by application of an elastomeric coating. Our CSI-formatted specifications address the application of the coating. Additional information about “Cool Roof” and Title 24 can be obtained at:

www.consumerenergycenter.org/coolroof

We have developed a unique coating, which enables our system to achieve the California Title 24 requirement for “Cool Roof”. This unique coating is a multi purpose 100% acrylic elastomeric coating for use over SBS modified bitumen membrane. The base coat is applied at a rate of 1.5 gallons/square followed by the

topcoat at a rate of 1.5 gallons /square, for a total coverage of 3 gallons/square.

XIII: LEED - Leadership in Energy & Environmental Design Building Green Guide

LEED was founded in 1993 and promotes the concept of designing buildings where all of the components of the roof, wall, windows, lighting, and HVAC work together to optimize performance attributes of one each system. Typical cost increase for LEED projects is between 2% and 8%.

This section gives an overview of the various ways that a roofing system contributes to achievement of specific LEED credit.

United States Green Building Council (USGBC) was formed to administer LEED.

- Formed in 1993
- Mission: The USGBC is the nation’s foremost coalition of leaders from across the building industry working to promote buildings that are environmentally responsible, profitable, and healthy places to live and work.
- The LEED program for new construction went into pilot testing in 1998.
- The cost impact for LEED averages 2% increases with a range of 1.5% to 8%.
- LEED design is now 5% of the present new construction market, half of which federal and institutional buildings. Rapid growth is occurring in the commercial market as well.

This section gives a brief overview of the standard and a detailed look at how roofing systems contribute to the attainment of specific credits.

NC – New Construction. There a 6 categories for the LEED program.

POINTS	CATEGORIES	ABBREVIATION
17	Energy & Atmosphere	EA
15	Indoor Environmental Quality	EQ
14	Sustainable Sites	SS
13	Materials & Resources	MR
5	Water Efficiency	WE
5	Innovation & Design Process	ID

Total Points Possible 69
For basic certification 26

Silver	33
Gold	39
Platinum	52

Standard Controls – Documentation needed on each credit that is signed by the architect

Standard – LEED-NC for new construction

LEED & ROOFING

Roofing materials are associated with 9 factors, which are:

- Storm water management
- Heat island effect: Roofing
- Optimized energy performance
- Construction waste management
- Resource reuse
- Recycle content
- Regional materials
- Ozone protection
- Low-emitting materials

MBTechnology roofing system qualifies for the following two (2) factors that give credit points

Material resource (MR) Credit 5

- MR Credit 5.1 Regional Materials: 20% manufactured 1pt

Use material manufactured within 500-mile radius of building site to save on transportation cost

Manufacturing locations for MBTechnology products is 500 miles to all locations in California, Las Vegas and Reno.

Sustainable Site (SS) Credit 7

- Sustainable Sites (SS) Credit 7.2 Heat island effects: Roofing 1pt
- Cool Roof
 - Energy Star-listed product
 - Emissivity > 0.9 per test method ASTM E 408
 - “Cool Roof” must be minimum of 75% of the roof area

All of our cap membranes coated with our elastomeric coating meets this requirement.

Other possible ways to earn LEED credit associated with roofing systems are:

Materials & Resources (MR) Credit 3

- MR Credit 3.1 Resource Reuse: 5% -1pt
- MR Credit 3.2 Resource Reuse: 10% -2pt

Reuse building materials and products to reduce demand for virgin materials and to reduce waste.

- There are cases where one could leave the old roof in place and roof over it, provided the old roof is not leaking and does not have trapped moisture. The warranty will be limited to 10 years. In this case, one uses a protection board, which is mechanically fastened over the roof, and the new roof is then installed over the protection board.

Contact MBTechnology so we can inspect the project to determine if it is suitable for such application.

Materials & Resources (MR) Credit 4

- MR Credit 4.1 Recycle Content: 5% - 1pt
- MR Credit 4.2 Recycle Content: 10% - 2pt

Recycle material content of all the materials used in the project shall account for a minimum of 5% or 10% of the total materials used.

- By using a polyisocyanurate insulation: 16--43% post-industrial based on thickness (Note: check with manufacturer.)

LEED Certification letter can be downloaded from our web site www.mbtechnology.com .

XIV. SPECIFICATIONS

Specification templates presented in the following pages are to be used in connection with the requirements and criteria outlined previously

The slope requirements outlined in the templates are not the Underwriters Laboratory or other agencies slope restrictions on fire ratings. Since MBTechnology is constantly reviewing and improving its ratings, it is not feasible to outline them in this publication. Please contact us for specifics.

The general requirements, material requirements and the application procedures within each template

highlight areas that specially apply to that section. Other sections of the manual are still valid and should be taken in to consideration when reviewing each template. In a case of approved substitutions, please replace the cap sheet in the original specifications number with the substituted cap membrane. Application and specifications plates for insulated decks also apply for all recover applications. Extended warranties are not applicable to reroof applications. The specification format is as follow:

DECK TYPE-NUMBER OF PLIES-APPLICATION
METHOD-CAP SHEET

Possible values for each portion is as follow:

DECK TYPE:

- W Wood
- L Light Weight Concrete, Poured Gypsum
- I Insulated
- C Non Nailable

NUMBER OF PLES

2 –4

METHOD OF APPLICATION

- H Hot Asphalt
- C Cold Adhesive
- T Torch Application

CAP MEMBRANE

Any of our granulated or foil surfaced cap membranes.

Example: W2H-FG160CWH in the fireguard series refers to a 2-layer hot asphalt fireguard specification over wood decks. The cap membrane is fireguard SBS FG160CWH. If the roof system requires additional surfacing it will be reflected at the end of the specification numbering system. As an example, L2T-FT160CSA-fibrated aluminum refers to a 2-ply torch applied system over lightweight concrete coated with a fib rated aluminum surfacing.