

### 7A.1 General Information

**7A.1.1** This section provides application information, and outlines specifications currently available from JM Roofing Systems, for SBS (Styrene-Butadiene-Styrene) Modified Bitumen Roofing Membranes. They may be applied with hot asphalt or cold adhesive. Some of these specification also allow the use of heat welding. This same application information applies to Sections 7B and 7C.

**7A.1.2** All general information contained in this section and in the current JM Commercial/Industrial Roofing Systems Manual shall be considered part of these specifications.

**7A.1.3** Specifications are available for systems installed over insulation, nailable, non-nailable, and lightweight fill substrates. JM offers systems that can be installed using either hot asphalt, heat welding or cold application cements.

**7A.1.4** For hot-applied, modified bitumen roofing system applications, JM-approved asphalt is required. JM-approved asphalts are thoroughly evaluated before they are accepted for use in any modified bitumen system. Contact your JM Sales Representative for current approved asphalt suppliers.

**7A.1.5** JM does not recommend the use of traditional asphalt cut-back mastics installed under any SBS modified bitumen product. The use of cut-back mastics over the SBS modified bitumen product (e.g., to strip in the edges of a base flashing) is acceptable. JM has developed three adhesives – MBR® Flashing Cement, MBR® Cold Application Adhesive and MBR® Utility Cement – that are compatible with all of the JM SBS Modified Bitumen Products; they should be used whenever a cold adhesive application is necessary or preferred.

**7A.1.6** Each specification in this section is eligible to receive a JM Roofing Systems Guarantee. The system must be installed by a JM Approved Roofing Contractor who is approved for SBS Modified Bitumen Roofing Systems. The JM Approved Roofing Contractor must use Trumbull asphalt or other JM approved asphalt.

**7A.1.6.1** This manual clearly differentiates between **requirements** and **recommendations**. This manual has been written to assist the specifier to develop a comprehensive bid package. The information is presented in an explanatory fashion rather than the authoritative, instructive manner commonly utilized in construction specifications. When experience, technical knowledge, or established testing procedures support a policy or position, it is clearly identified, (i.e., “JM **requires**” or “is not acceptable”). When the use of a particular product or practice is desirable, the reference is stated as an opinion rather than an absolute fact, (i.e., “JM **recommends**” or JM suggests”). ***It is mandatory that all requirements be complied with, however, it may not be necessary to follow all recommendations to qualify for a Guarantee.***

**7A.1.7** Drainage of water off any roof membrane is necessary to prolong the service life of the system. JM, therefore, has the following policy:

**Drainage: Design and installation of the deck and/or membrane substrate must result in the roof draining freely, to outlets numerous enough and so located as to remove water promptly and completely. Areas where water ponds for more than 24 hours are unacceptable and will not be eligible for a JM Roofing System Guarantee.**

**7A.1.8 Flashings:** Refer to Section 8 of the current JM Commercial/Industrial Roofing Systems Manual for flashing specifications and details.

### 7A.2 Membrane Substrate

**7A.2.1** The surface on which the modified bitumen roofing membrane is to be applied should be one of JM’s roof insulations (Fesco Board, Tapered Fesco Board, Fesco Foam, Tapered Fesco Foam, DuraBoard, DuraFoam, E’NRG’Y 2, Tapered E’NRG’Y 2, ½” Retro-Fit Board, or Fiber Glass Roof Insulation) or an approved structural substrate. **For heat-weld application directly to the insulation, the top layer of insulation must be DuraBoard or DuraFoam.** The surface must be clean, smooth, flat and dry. SBS modified bitumen roofing should not be applied directly to foam plastic insulations, as referenced in NRCA Bulletin #9.

### 7A.3 Roofing Over Non-Nailable Decks

**7A.3.1** These specifications are for use over any type of structural deck which is not nailable, and which offers a suitable surface to receive the roof. Poured and pre-cast concrete decks require priming with JM Concrete Primer prior to the application of hot asphalt.

**7A.3.2** These specifications are also for use over JM roof insulations – Fesco Board, Tapered Fesco Board, Fesco Foam, Tapered Fesco Foam, DuraBoard, DuraFoam, E’NRG’Y 2, Tapered E’NRG’Y 2, ½” Retro-Fit Board, and Fiber Glass Roof Insulation – or other approved insulations which are not nailable and which offer a suitable surface to receive the roof. SBS modified bitumen roofing should not be applied directly to foam plastic insulations, as referenced in NRCA Bulletin #9.

**7A.3.3** These specifications are denoted by an “I” as the third character in the specification designation (e.g., 3CID). See the “Roof Finder Index” in this section for further information.

### 7A.4 Roofing Over Nailable Decks

**7A.4.1** These specifications are for use over any type of structural deck (without roof insulation) which can receive and adequately retain nails or other types of mechanical fasteners recommended by the deck manufacturer. Examples of such decks are wood and plywood. Certain specifications are suitable for use over lightweight insulating concrete decks or over fills made of lightweight insulating concrete. Consult the “Roof Decks” section of the current JM Commercial/Industrial Roofing Systems Manual, or contact a JM Technical Services Specialist for approval of the lightweight concrete to be used.

**7A.4.2** These specifications are denoted by an “N” or an “L” as the third character in the specification designation (e.g., 3CND, 3CLG). See the “Roof Finder Index” in this section for further information.

**7A.4.3** One ply of sheathing paper must be used over wood board decks under the base felt. Sheathing paper is not required over wood decks.

**7A.4.4** All of the specifications in this section require the use of a nailable base felt. Use nails or fasteners appropriate to the type of deck. See fastener data in the “Roof Decks” section of the current JM Commercial/Industrial Roofing Systems Manual.

### 7A.5 General Guidelines for Application of Materials

**7A.5.1** The proper application of roofing materials is as important to the satisfactory performance of the roofing system as the materials themselves. JM strongly recommends the following guidelines for the application of SBS modified bitumen roofing materials be followed.

- A. Never use wet or damaged materials.
- B. Never apply any roofing materials during rain or snow, or to wet or damp surfaces. Moisture trapped within the roofing system may cause severe damage to the roofing membrane, insulation and deck.
- C. Take special care when applying any roofing felt in cold weather. Check the temperature of the asphalt at the mop or spreader to determine that it is at the proper temperature.
- D. Heed the specific cold weather application procedures in this manual.
- E. Always start application at the low edge of the roof per the individual specification diagram.
- F. Never mop ahead of the modified bitumen rolls more than six feet (1.83 m) and, in temperatures below 50°F (10°C), no more than four feet (1.22 m). Observe temperature guidelines for asphalt application.
- G. When using mechanical bitumen applicators or felt laying equipment, be sure that all orifices are open.
- H. All roofing felts should be well set into the hot asphalt utilizing a squeegee or some other device. All ply felts shall be rolled (not “flown”) into the hot asphalt.
- I. SBS modified bitumen sheets shall be rolled or scrolled into a full mopping of hot asphalt. Back-mopping and flopping into a full coating of asphalt is also acceptable for certain SBS products. Base sheets and cap sheets with polyester reinforcement must be allowed to relax in an unrolled position prior to installation.
- J. Do not mix different grades of asphalt or dilute an asphalt with any other material.
- K. Heat the asphalt according to the manufacturer’s recommendations. Check the temperature of the asphalt at the kettle and at the point of application. Have accurate thermometers on the roofing kettles. Adhere to the guidelines for the heating of asphalt that are outlined in this manual.

- L. Always use the proper grade of asphalt. SBS membranes require the use of Type III or IV asphalt.
- M. It is essential that traffic be minimized on a freshly laid roof, while the asphalt is still fluid. Asphalt displacement through the porous fiber glass ply felts can result from rooftop traffic during asphalt “set” time. Depending on specific job factors, this set time can be as long as 45 minutes. Asphalt displacement can result in “phantom” leaks and blistering of the membrane.
- N. Do not use coal tar pitch or coal tar asphalt with any of JM’s modified bitumen products. They are not compatible.
- O. Do not use traditional cut-back asphalt cements under SBS modified bitumen products. The use of these mastics over the top of SBS products, to strip in or to cover nail heads, is acceptable, however the MBR cement products are preferred.
- P. Install the entire roofing system at one time. Phased construction may result in slippage of felts due to excessive amounts of asphalt between the plies of felt. Blisters due to entrapment of moisture are also a common problem, as well as poor adhesion due to dust or foreign materials collecting on the exposed felts of an incomplete roofing system.
- Q. Always install a water cut-off at the end of each day’s work to prevent moisture from getting into and under the completed roof system. Water cut-offs should be completely removed prior to resuming work.
- R. Always comply with published safety procedures for all products being used. See the “Introduction” section of the current JM Commercial/Industrial Roofing Systems Manual, MSDS, and container labels for health and safety recommendations.**

### 7A.6 Roofing Felts

**7A.6.1** JM manufactures different felts for a variety of roofing needs: felts for roof membranes, flashing, venting and vapor retarders.

**7A.6.2** Roofing felts are furnished in rolls consisting typically of one or more squares, except for flashing materials which are sold in rolls containing a specific number of square feet. A “factory” square of roofing contains sufficient material to cover 100 sq. ft. (9.29 m<sup>2</sup>) of roof area.

**7A.6.3** For more information on these products, refer to the “Products” section of the current JM Commercial/Industrial Roofing Systems Manual.

**7A.7 Roofing Bitumens**

**7A.7.1** JM modified bitumen products are designed to be installed with hot asphalt or special cold application cements. Some others may be heat welded. PermaMop, coal tar pitch and coal tar asphalt are not permitted.

**7A.7.2** Asphalt can come from a variety of crude sources. Many of these sources produce high quality mopping grade asphalts and many do not. Various physical properties of asphalts can affect the performance of the roofing system. For this reason, JM qualifies asphalt sources throughout the country and requires that only these asphalts be used to assure good performance and compatibility with the roofing products being used.

JM requires the use of Trumbull®\* or another JM “approved” asphalt within systems which require a JM Roofing Systems Guarantee. These “approved” asphalts are periodically tested to assure conformance to both ASTM and JM asphalt specifications. For the names of approved asphalt suppliers in your area, contact a JM sales representative.

**7A.8 Asphalt Health and Safety Information**

See Section 1.9 for health and safety information.

**7A.8.1** Roofing asphalts are available in four grades. In general, they are grade-specified by softening point. JM recommends the use of only two grades in SBS modified bitumen specifications – Type III and Type IV. The slope of the roof, as well as the climate, governs the grade of asphalt to be used. The success or failure of a roofing system depends greatly on the use of the proper grade of asphalt, as called for in the roofing specification.

**7A.8.2** Asphalts are susceptible to damage from overheating. Overheating, even for short periods, can “crack” or degrade the asphalt; a drop in softening point or a slight oiliness is a symptom. Overheating may result in a “fallback” in softening point which can cause slippage of the roof membrane. As the softening point decreases, the viscosity or “holding power” of the asphalt decreases. This can allow slippage to occur. If the overheating is more gradual, the asphalt may “age”, to the extent that premature failure of the system may result. Application temperatures must be in the range which permit a continuous layer of asphalt, regardless of the application technique used.

**7A.8.3** The JM Research group, in conjunction with the National Roofing Contractors Association and the Asphalt Roofing Manufacturers Association, has been involved with considerable research into a system for classifying mopping grade asphalts. The system gives guidelines for proper heating and application.

**7A.8.4** With this system, which is used in the Continental United States, the following information is printed on the cartons of asphalt, or on the bill of lading for asphalt shipments:

1. The Softening Point, as determined by ASTM D 312.
2. The Minimum Flash Point (FP) of the asphalt, as determined by ASTM Method D 92.

3. The Equiviscous Temperature (EVT), as currently defined by ASTM, is the temperature at which the asphalt viscosity is 125 centistokes. Asphalt applied within  $\pm 25^{\circ}\text{F}$  ( $\pm 14^{\circ}\text{C}$ ) of the EVT at the point of application will provide a nominal 23 - 25 pounds of asphalt per 100 sq. ft. (1.12 - 1.22 kg/m<sup>2</sup>).
4. The Finished Blowing Temperature (FBT) is occasionally provided. This is the temperature at which the blowing of the asphalt was completed.

**Note:** Work done by the NRCA has shown that different EVT values should be used for mop-applied vs. machine-applied asphalt. The original EVT is applicable to mop applications. Asphalt installed by machine should be applied using an EVT based on 75 centipoise. Some asphalt suppliers are now including both EVT values on their products. If only the 125 centipoise (centistokes) EVT value is provided, and a machine installation is to be used, apply the asphalt at 25°F (14°C) higher temperature.

**7A.8.5** JM requires adherence to the following guidelines when the above information is furnished:

1. Use the proper softening point asphalt as specified for the roof slope, type of roofing system and climate.
2. For optimum application, the asphalt should be at the Equiviscous Temperature,  $\pm 25^{\circ}\text{F}$  ( $\pm 14^{\circ}\text{C}$ ), at the point of application. **However, SBS modified bitumen products shall be installed in asphalt with a minimum temperature of 400°F (204°C) at point of application.**
3. Never heat the asphalt to or above the Flash Point, to avoid danger of fire.
4. Heating above the Finished Blowing Temperature shall be strictly regulated, never for longer than 4 hours to preclude excessive asphalt degradation.

**7A.8.6** If the EVT is not available, heating temperature guidelines of the asphalt recommended for use with modified bitumen systems are as follows:

**Recommended Temperatures**

Asphalt Type	Heating	Application
190 Grade (Type III)	500°F (260°C)	400°F to 475°F (204°C to 246°C)
220 Grade (Type IV)	500°F (260°C)	400°F to 475°F (204°C to 246°C)

**7A.8.7** Use of insulated buckets and insulated circulating lines for cold weather application is always desirable. However, if ambient temperatures are low and the distance from asphalt source to the application point of the SBS membrane is great, their use is imperative.

**7A.8.8** The recommended quantity of asphalt has been indicated on each specification in this section. It is important that the asphalt be uniformly spread, without voids, so that felt does not touch felt, so there is complete adhesion between all plies of the system.

\* Trumbull is a registered trademark of Owens Corning.

**7A.8.9** JM considers a  $\pm 25\%$  deviation from the specified asphalt quantity to be acceptable.

**7A.8.10** The use of the proper asphalt, as called for in the various JM specifications, is critical to the performance of the roofing system. A contractor shall not deviate from the asphalt requirements of the roofing system specified, unless the deviation is approved in advance by a JM Technical Service Specialist.

#### **7A.9 Gravel or Slag Surfacing**

**7A.9.1** Some of the SBS modified bitumen systems are designed to be surfaced with gravel or slag. Gravel or slag must be dry before using. Wet gravel or slag will cause foaming of the asphalt and prevent proper adhesion of the surfacing. In cold weather, if difficulty is experienced in obtaining proper embedment in the asphalt, the gravel or slag should be heated prior to application.

**7A.9.2** JM will approve the use of clean slag or gravel meeting ASTM Specification D 1863, which covers aggregates specified both for use in road construction and roofing. Aggregates meeting ASTM D 1863 are generally available commercially throughout the country.

**7A.9.3** Other surfacing material used in place of gravel or slag should be fairly cubical in shape, non-water-absorbent, hard and opaque, and of such size and nature as to result in firm embedment in the asphalt.

**7A.9.4** Do not use transparent or translucent stones, dolomite, or crushed masonry.

**7A.9.5** Gravel should be spread at the rate of approximately 400 lbs. per square (19.5 kg/m<sup>2</sup>), and slag, because of its lower density, at the rate of 300 lbs. per square (14.6 kg/m<sup>2</sup>). Full coverage of the underlying asphalt is required.

#### **7A.10 Application of SBS Modified Bitumens**

**7A.10.1** JM SBS products are installed using hot asphalt or special cold adhesives. Only certain SBS products may be installed using heat weld application techniques, and these products are designated as such. JM does not recommend the use of typical solvent-based adhesives to bond the membrane to the roof. Traditional solvent-based roofing cements can be used to strip-in laps and other terminations, provided that the mastic is not placed under the modified bitumen sheet. Roofing cements used in this manner will allow the solvent in the adhesive to flash off rapidly and not degrade the modified bitumen blend.

**7A.10.2** SBS materials are frequently installed over traditional asphaltic base and ply felts which are applied using typical built-up roofing techniques. However, the use of SBS modified bitumen base felts is becoming more common and these products should be installed using the modified bitumen application techniques described in this section.

#### **7A.11 Hot Asphalt Application**

**7A.11.1** The installation techniques for SBS modified bitumens in hot asphalt are similar to those used for built-up roofing. The sheets must be firmly and uniformly placed in a full mopping of hot asphalt, without voids, and with all edges well sealed.

**7A.11.2** There are, however, a few unique conditions that the applicator must be aware of when installing these materials.

**7A.11.3** The temperature of the asphalt at the point of application is very important, and differs from the requirements for built-up roofing. **The asphalt must have a minimum temperature of 400°F (204°C) when the sheet is set into it.** This will cause the back coating to remelt or “flux”, assuring proper bonding to the substrate.

#### **7A.12 Mop Applied Asphalt**

**7A.12.1** There are several application techniques that can be used when the asphalt is installed by mopping. The modified bitumen sheet can be rolled, scrolled or flopped into the asphalt. Regardless of the application technique employed, the crucial factor is that the modified bitumen sheet make complete contact and embed in the hot asphalt. This can be accomplished by lightly brooming the modified bitumen sheet immediately after it has been installed. It is also good roofing practice to “scuff in” the side and end laps to assure that they are completely sealed.

**7A.12.2** When rolling the modified bitumen sheet into the asphalt, the mechanic should mop no more than 6 feet (1.83 m) in front of the roll to assure that the temperature of the asphalt does not cool and fall below the temperature necessary for good embedment. If the asphalt is allowed to cool too much, an inadequate bond may result. In addition, the viscosity of the asphalt increases, which can result in a wavy appearance or excessive quantities of asphalt. Excessive asphalt can increase the potential for slippage of the membrane.

**7A.12.3** When using this application technique, brooming of the modified bitumen sheet is especially important at the end of the sheet where there may not be sufficient weight from the roll to provide the necessary pressure to embed the sheet into the asphalt.

**7A.12.4** The scrolling technique is also used by many mechanics. This technique was originally used to allow the modified bitumen sheet to relax, to reduce some of the wrinkling and shrinkage associated with the early modified bitumen products. Although this is not required with fiber glass and fiber glass/polyester composite reinforced products, this method is occasionally used. The modified bitumen roll is completely unwound, usually turned upside down, and allowed to “relax”. After the sheet has warmed, it is then turned right-side-up, placed on the roof in the area where it is to be installed and re-rolled or scrolled from both ends. The product is then mopped into place using the same mopping techniques and precautions described for rolling the product into place.



**7A.12.5** Another application technique, called “mop and flop”, is frequently used in the western portion of the United States. The modified bitumen sheet is cut to short lengths, usually between 12 and 16 feet (3.66 and 4.88 m) long. It is placed upside down, adjacent to the roof area where it will be installed, along the laying line of the preceding course. The entire area to be covered by the sheet is then mopped with hot asphalt, as well as the lap area of the upside down sheet. Mechanics then pick the sheet up by the ends and “flop” it, right side up, into the hot asphalt, making certain to align it with the asphalt line created by the sheet itself. Again, brooming the sheet and scuffing the lap are recommended.

**7A.12.6** Polyester reinforced SBS modified bitumen sheets should be unrolled and allowed to relax. Rerolling or scrolling of the sheet is then employed to set the sheet. **The “mop and flop” technique is not acceptable for polyester reinforced SBS modified bitumen sheets.**

#### **7A.13 Mechanically Applied Asphalt**

**7A.13.1** The asphalt can be applied using a mechanical asphalt spreader, which can increase productivity. Some contractors have found that installing the material with a felt layer can also improve production.

#### **7A.14 Cold Adhesive Application**

**7A.14.1** There are situations where the use of hot asphalt is undesirable or prohibited. In such cases, it may be necessary to use alternative materials such as cold adhesives (typically referred to as “cold process cements” or “cold application cements/adhesives”). JM’s Research and Development staff has determined that traditional cut-back asphalt mastics, as well as some of the newer “modified bitumen adhesives”, can have an adverse effect on SBS modified bitumen products. This is due to the very high levels of solvent used in most of these products. Softening, blistering and excessive granule loss can occur as the solvent passes through the membrane. This can cause accelerated aging of the underlying waterproofing with the potential for premature membrane failure.

**7A.14.2** Through the evaluation of numerous alternate adhesive systems, JM has developed two viable cold application systems for use with SBS modified bitumen products.

**7A.14.3** First, there is a unique premium-grade, two-part flashing adhesive. This product has extraordinary physical, adhesive, and waterproofing properties, and are compatible with both SBS modified bitumen products and with conventional asphaltic materials. MBR Flashing Cement is a trowel-grade cement, for terminations, base flashing, and penetration (pitch) pans. This adhesive requires mixing of two components immediately prior to application. MBR Flashing Cement is available in pails containing 4 gallons (15.1 liters) of base material. The pails are large enough to accommodate the addition of approximately 1 pint (0.47 liters) of MBR Cement Activator and the necessary mixing process.

**7A.14.4** Second, there are two mastic-type, one-part adhesives. These materials are compatible with SBS modified bitumen

products. They contain very low levels of solvent, about one-third of that found in most traditional roofing mastics. These adhesives are elastomeric and have good waterproofing properties, and, over time, develop adhesive properties that exceed those of traditional mopping asphalt. These products are MBR Cold Application Adhesive for the field of the roof, and MBR Utility Cement, a trowel-grade cement, for terminations and base flashings.

**7A.14.5** For more information on these cold application products, refer to the “Products” section of the current JM Commercial/Industrial Roofing Systems Manual.

#### **7A.15 Heat Weld Application**

**7A.15.1** The surface over which the SBS membrane is to be installed must be firm, dry, smooth, flat and free of debris and loose material. All surfaces must be designed and installed in accordance with manufacturer’s, industry and acceptable association standards.

**7A.15.2 Drainage: Design and installation of the deck and/or the substrate must result in the roof draining freely and to outlets numerous enough and so located as to remove water promptly and completely. Areas where water ponds for more than 24 hours are unacceptable and will not be eligible for a JM Roofing System Guarantee.**

**7A.15.3** Roofing shall commence at the lowest point of the roof deck with laps installed so that water flows over and not against the lap. Align the roll in the course to be followed and unroll completely. Then reroll both ends to the middle of the roll (scrolling). Using the heat welding apparatus, apply the heat to the surface of the coiled portion of the roll until the surface reaches the proper application temperature (approximately 330°F [166°C]). The flame should be moved from side to side and the membrane slowly unrolled while pressing the heated portion of the roll into the underlying surface. Apply the heat across the full width of the roll and along the 4" (102 mm) side lap area of the previously installed roll making an “L” shape. As the surface of the roll is heated, it will develop a sheen. **The generation of smoke is an indication that the material is being overheated.** Repeat the operation with subsequent rolls, while maintaining a 4" (102 mm) side lap and a 6" (152 mm) end lap. On mineral-surfaced membranes, prior to seaming the 6" (152 mm) end lap, the granules must be embedded by heating the end lap area and then pressing the granules into the compound using a rounded point trowel or an embedding tool. All laps should be rolled with a lap roller and a 1/8" (3 mm) to 3/8" (10 mm) bleed out of SBS compound should extend beyond the lap. Check all laps for proper adhesion.

#### **7A.16 Health and Safety**

**7A.16.1 JM develops and maintains Material Safety Data Sheets (MSDS) for all of its products. These MSDS contain health and safety information for development of appropriate product handling procedures to protect the users of our products. These MSDS are available through the Product Information Center, 1-800-654-3103, via Fax Express®, 1-888-329-3977, or on the JM website, www.jm.com, and should be read and understood by all involved personnel prior to using and handling JM materials. In addition to the MSDS, JM products have health and safety**

precautions printed on the product label or packaging. The user is strongly urged to familiarize himself with this information prior to using the product, and observe certain precautions during use.

#### 7A.17 Precautions For Two-Part Cold Adhesive

**7A.17.1** There are some application precautions that must be taken when using these materials.

- A. JM MBR cement products are significantly different from the adhesive materials used for built-up roofing. The mechanic must use a great deal more care since these adhesives are prepared on the job site. Roofing contractors must advise their crews to precisely follow all storage, handling, preparation, application, and health/safety instructions. JM will not accept responsibility for any use of these products that does not comply with the instructions printed on the cement base container.
- B. MBR Cement Activator must be stored indoors in an area maintained above 60°F (16°C) or crystallization will occur. If crystallization does occur, it can be reversed by carefully warming the container. Refer to the package label for the precise procedures.

#### 7A.18 Two-Part Cold Adhesive Equipment

**7A.18.1** The following equipment is necessary for the safe and efficient preparation and application of JM MBR Bonding Cement.

**7A.18.2 Safety and Personal Protective Equipment:** The following items shall be available for, and used by, every worker:

- A. Impervious gloves, 1 pair for each worker.
- B. Rubber or plastic apron, 1 for every person mixing.
- C. Organic cartridge respirator mask. Note: air-supplied respirators may be required for some applications.
- D. Chemical safety goggles, 1 for each person mixing or spraying.
- E. Soap and water.
- F. Hand cleaner.
- G. Supply of clean rags.
- H. Solvent: paint thinner, or mineral spirits.
- I. Portable fire extinguisher.
- J. Squeeze bottle filled with clean water for use as an eye wash.

**7A.18.3** The following items may be required at the job site to protect the installation and surrounding areas during application:

- A. Heavy wrapping paper or suitable protective sheeting.
- B. 2" (51 mm) wide masking tape.

#### 7A.18.4 Mixing Equipment:

- A. Jiffy Mixer Model PS, or equivalent.
- B. ½" (13 mm) electric drill motor and power source.
- C. Plastic graduated container for measuring activator and base material.

#### 7A.18.5 Application Equipment:

(Some of the items listed below are optional, depending on whether squeegee or spray application is used.)

- A. ¾" (5 mm) saw tooth squeegee.
- B. Binks "Hawk 4L" Spray Unit (or equivalent) to fit a 5 gallon (18.9 liter) pail, and Type 7E2 spray gun (or equivalent) with 47 x ¼" (6 mm) nozzle with 25 feet (7.6 m) of ¾" (19 mm) fluid hose and 25 feet (7.6 m) of ¾" (10 mm) air hose.
- C. 125 cfm (3.54 cmm), 100 psi (690 kPa) air compressor and hose.
- D. Clean 5 gallon (18.9 liter) metal pails.
- E. Solvent: paint thinner or mineral spirits.
- F. All tools normally used in the application of built-up roofing materials.

#### 7A.19. One-Part Cold Adhesive Application

**7A.19.1** MBR Cold Application Adhesive and MBR Utility Cement are similar in consistency and application to traditional built-up roofing cold process cements. These adhesives form a durable, elastomeric, and waterproof layer once cured.

**7A.19.2** MBR Cold Application Adhesive is for use in the field of the roof and is used to adhere roofing plies, modified bitumen sheets, and roof insulation. Fiber glass ply sheets, such as GlasPly Premier and GlasPly IV **cannot** be used with this material. The adhesive is ready to use as shipped and does not require mixing. Do not thin with additional solvents.

**7A.19.3** The adhesive is applied at a nominal rate of 1½ gallons per square (0.61 liters/m<sup>2</sup>) over non-porous substrates, e.g., primed concrete or fiber glass base felts. If applied to porous materials, such as insulations, the application rate will increase, depending on the absorbency of the material.

**7A.19.4** The simplest method of adhesive application is by pouring a 2" to 4" (51 to 102 mm) wide bead of the adhesive along the substrate, about 12" (305 mm) from the lower edge of the work area. The adhesive is spread with a ¼" (6 mm) (max.) saw-toothed rubber squeegee to obtain a uniform bed of adhesive. Spread the adhesive first toward the lower edge of the work area, or to the appropriate laying line of the adjoining felt, creating a uniform coating of adhesive. Continue to spread the adhesive up the roof until the bed of adhesive is wide enough to receive the sheet.

#### 7A.20 One-Part Cold Adhesive Membrane Specifications

**7A.20.1** Refer to Section 7C for membrane construction recommendations.

**7A.21 Steep Slope Requirements-Asphalt and Adhesive Applied**

**7A.21.1 Non-Nailable Decks:** On decks with a slope over 1/2" per foot (41.6 mm/m), 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" (89 mm) wide. Wood nailers shall be provided at the ridge and at the following approximate intermediate points:

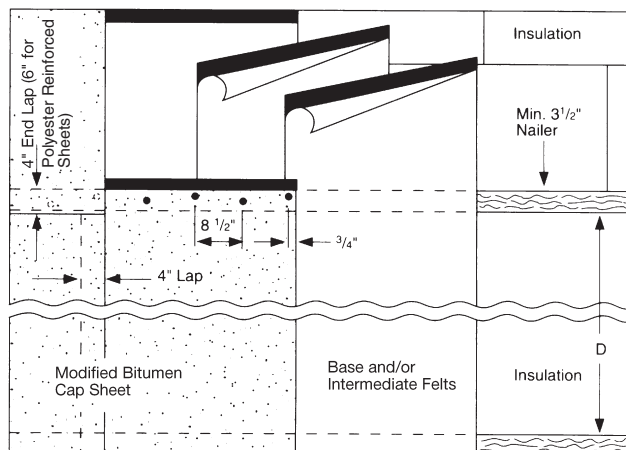
Incline per Foot	Nailer Spacing (D)	Type of Asphalt
0" - 1/2" (0 mm/m - 41.6 mm/m)	Not required	Type III or IV*
1/2" - 2" (41.6 mm/m - 167 mm/m)	32' (9.8 m) (max.) face to face	Type IV
2" - 3" (167 mm/m - 250 mm/m)	10' (3.1 m) (max.) face to face	Type IV

\* Consult with a JM Technical Service Specialist regarding projects in hot climates as Type III asphalt may not be permitted in some areas.

Nailers may also be laid out to conform to the roll length being used. For slopes between 1/2" to 2" per foot (41.6 to 167 mm/m), nailers should be spaced to accommodate full-length modified bitumen rolls. For slopes between 2" to 3" per foot (167 to 250 mm/m), the nailers should be spaced to accommodate half-length rolls.

**7A.21.2** Cut the modified bitumen cap sheet to conform to the nailer spacing. 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, and the remaining nails spaced approximately 8 1/2" (216 mm) 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" (25 mm) (min.) diameter cap. Where capped nails are not used, fasteners must be driven through caps having a 1" (25 mm) (min.) diameter.

**7A.21.3** Nailers must also be used around the roof perimeter, openings and penetrations, for nailing felts, gravel stops, roof fixtures and fascia systems.



**7A.21.4 Nailable and Lightweight Concrete Decks:** On decks with a slope over 1/2" per foot (41.6 mm/m), the roofing felts must be installed parallel to the incline. Nail the end laps of the modified bitumen cap sheet across the width of the sheet on 8 1/2" (216 mm) centers. All nails are to be mopped over and covered by the lap of the next sheet. For slopes from 1/2" to 2" per foot (41.6 to 167 mm/m), a full-length sheet can be used. For slopes from 2" to 3" per foot (167 to 250 mm/m), a half-length sheet should be used.

Incline	Type of Asphalt
0" - 1/2" (0 mm/m - 41.6 mm/m)	Type III or IV*
1/2" - 2" (41.6 mm/m - 167 mm/m)	Type IV
2" - 3" (167 mm/m - 250 mm/m)	Type IV

\* Consult with a JM Technical Service Specialist regarding projects in hot climates as Type III asphalt may not be permitted in some areas.

**7A.22 Steep Slope Requirements – Heat Welded Systems**

**7A.22.1** Heat welded SBS roofing membranes can be applied on inclines up to 3" per foot (250 mm/m) when proper precautions are taken. On non-nailable decks, wood nailers must be used. Nailers act as insulation stops for the roof insulation and as a facility to back nail the membrane.

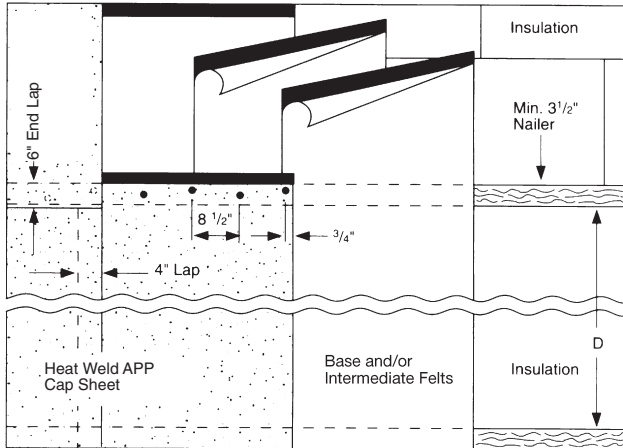
On slopes up to 2 1/2" per foot (208 mm/m), the roofing sheets may be installed either perpendicular or parallel to the roof incline.

**7A.22.2 Non-Nailable Decks:** On decks with a slope over 3 1/2" per foot (291 mm/m), the roofing felts must be installed parallel to the incline and must be back 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 sheets, have the same thickness as the insulation, and be at least 3 1/2" (89 mm) wide. They should be securely attached to the deck with mechanical fasteners to resist a pullout force of 200 pounds (890 N). Wood nailers shall be provided at the ridge and at the following approximate intermediate points:

Incline per Foot	Nailer Spacing (D)
0" - 1 1/2" (0 mm/m - 125 mm/m)	Not required
1 1/2" - 3" (125 mm/m - 250 mm/m)	32' (9.8 m) (max.) face to face

**7A.22.3** Nail the modified bitumen cap sheet at 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, and the remaining nails spaced approximately 8 1/2" (216 mm) 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" (25 mm) (min.) diameter cap. Where capped nails are not used, fasteners must be driven through caps having a 1" (25 mm) (min.) diameter. All nails are to be covered by the lap of the next sheet.

**7A.22.4** Nailers must also be used around the roof perimeter, openings and penetrations, for nailing felts, gravel stops, roof fixtures and fascia systems.



**7A.22.5 Nailable and Lightweight Concrete Decks:** On decks with a slope over 1/2" per foot (125 mm/m), the roofing felts must be installed parallel to the incline. Nail the end laps of the modified bitumen cap sheet across the width of the sheet on 8 1/2" (216 mm) centers. All nails are to be covered by the lap of the next sheet.

### 7A.23 Phase Construction

**7A.23.1** One of the greatest hazards of roof construction is the application of a roofing system in "phases", where a partially completed roof system is left exposed to the weather overnight or longer. This can lead to entrapped moisture which can cause premature failure of the membrane.

**7A.23.2** When the installation of the cap sheet is delayed for any reason, the following procedures should be followed:

- Low spots and valleys must be glazed with Type III or IV asphalt at the rate of 10 - 15 pounds per square (0.49 - 0.73 kg/m<sup>2</sup>).
- Prior to the application of the modified bitumen cap sheet, the surface of the membrane must be examined thoroughly for the presence of any moisture. If moisture is present, the application of the cap sheet is not to proceed until the moisture has been removed or evaporated and the surface is dry. If frothing or bubbling of the hot asphalt occurs, construction must stop immediately.
- The surface of the membrane must be properly cleaned and primed if contaminated by dirt, dust, or debris. The primer must be completely dry prior to installation of the modified bitumen cap sheet.
- Caution must also be exercised to avoid traffic over the newly installed modified bitumen cap sheet while the asphalt is still fluid. This can also contribute to the formation of voids.

**7A.23.3** Under no circumstances shall the installation of the modified bitumen cap sheet be delayed more than 5 days after completion of the intermediate plies of the roofing system.

**7A.23.4** Only multiple felt systems (two or three felts with modified cap sheet) or DynaBase, DynaPly and DynaLastic 180 S should be

considered as the base felt(s) for the delay in application of the modified bitumen cap sheet. Single ply felt or base felt systems must receive the modified bitumen cap sheet on the same day.

### 7A.24 Cold Weather Application – Asphalt or Adhesive Applied

**7A.24.1** SBS modified bitumens require special application techniques when they are being installed in cold weather. The following precautions shall be taken when the ambient temperature drops below 50°F (10°C), and are mandatory below 40°F (4°C):

- Modified bitumen products shall be kept warm, or warmed prior to installation. Store these materials indoors or in heated storage units or warming boxes. If these facilities are not available, placing the materials in direct sunlight may help. Make certain that modified bitumen rolls are stored on end only; do not store rolls on their side.
- The mopping asphalt must be 425°F (218°C) at point of application. This will improve the likelihood of fluxing the back coating on the sheet and the probability of an adequate bond.
- When the rolling or scrolling techniques are used, the asphalt must be mopped in front of the roll no more than 4 feet (1.22 m), and the asphalt must not be allowed to cool before the sheet is laid into it. In cold temperatures, asphalt will "skin over" rapidly, which will prevent adhesion of the membrane.
- When the conditions are extreme (below 40°F [4°C]) these precautions may prove to be inadequate to achieve a smooth installation. If prevailing conditions demand that the job continue, the rolls must be heated or completely unwound and allowed to warm for 12 to 15 minutes or until there are no apparent "waves" in the sheet. This shall be done with the darker side of the sheet up. The sheet may then be installed using rolled, scrolled or "mop and flop" techniques.
- The adhesive can be installed in temperatures between 40°F and 100°F (4°C and 38°C). However, when the temperature is below 50°F (10°C), the adhesive must be stored in a warm area (approximately 70°F [21°C]), for 24 hours before being used, to facilitate spreading. Note: Temperature affects the cure rate of the adhesive. Even in cooler weather, the product will develop bond strengths comparable to fully adhered single ply systems in a relatively short time. The membrane ultimately will develop adhesive bonds that exceed those of systems using asphalt as the adhesive.

### 7A.25 Heat Weld Application

**7A.25.1** The surface over which the SBS membrane is to be installed must be firm, dry, smooth, flat and free of debris and loose material. All surfaces must be designed and installed in accordance with manufacturer's, industry and acceptable association standards.

**7A.25.2 Drainage: Design and installation of the deck and/or the substrate must result in the roof draining freely and to outlets numerous enough and so located as to remove water promptly and completely. Areas where water ponds for more than 24 hours are unacceptable and will not be eligible for a JM Roofing System Guarantee.**



**7A.25.3** Roofing shall commence at the lowest point of the roof deck with laps installed so that water flows over and not against the lap. Align the roll in the course to be followed and unroll completely. Then reroll both ends to the middle of the roll (scrolling). Using the heat welding apparatus, apply the heat to the surface of the coiled portion of the roll until the surface reaches the proper application temperature (approximately 330°F [166°C]). The flame should be moved from side to side and the membrane slowly unrolled while pressing the heated portion of the roll into the underlying surface. Apply the heat across the full width of the roll and along the 4" (102 mm) side lap area of the previously installed roll making an "L" shape. As the surface of the roll is heated, it will develop a sheen. **The generation of smoke is an indication that the material is being overheated.** Repeat the operation with subsequent rolls, while maintaining a 4" (102 mm) side lap and a 6" (152 mm) end lap. On mineral-surfaced membranes, prior to seaming the 6" (152 mm) end lap, the granules must be embedded by heating the end lap area and then pressing the granules into the compound using a rounded point trowel or an embedding tool. All laps should be rolled with a lap roller and a 1/8" (3 mm) to 3/8" (10 mm) bleed out of SBS compound should extend beyond the lap. Check all laps for proper adhesion.

**Note:** The "mop and flop" technique has proven to be very effective in cold weather situations, when short lengths of material are set in asphalt applied with a mechanical spreader. Polyester reinforced SBS modified bitumen may not be installed in this manner.

## 7A.26 Temporary Roof Coverings

**7A.26.1** At times, an owner or general contractor may require the building to be closed in at a time when the weather is not conducive to good roof construction, or the roof area may have to be used as a work platform during construction. Historically, this situation has led to phase construction, which has resulted in premature roof failure.

**7A.26.2** When the complete roof cannot be installed in one operation, the following procedures are recommended:

### A. Nailable Decks:

1. Apply one layer of an approved JM base felt, lapping the felt 2" (51 mm), and nailing 9" (229 mm) o.c. along the lap and 12" (305 mm) o.c. through the center of the sheet. (Sheathing paper should first be installed on wood board decks.)
2. Mop one ply of an approved JM ply felt in ASTM D 312, Type III asphalt and apply a glaze coat of 10 - 15 lbs. per square (0.49 - 0.73 kg/m<sup>2</sup>) of Type III asphalt.
3. When the permanent roof is to be installed, inspect the roof and remove all damaged and blistered areas. Apply a layer of approved JM base felt nailed through the temporary roof and into the deck as the first layer of the roofing system. As an alternate, a layer of approved JM roof insulation may be mechanically fastened (with appropriate fasteners) through the temporary roof into the deck.
4. Proceed with installing the appropriate permanent roof specification.

### B. Steel Decks:

1. Apply a minimum layer of Fesco Board or Fiber Glass Roof Insulation of adequate thickness to the steel deck using appropriate length UltraFast fasteners.

2. Install a ply of a JM ply or base felt and an additional ply of fiber glass felt, both in hot steep asphalt.
  3. Finish with an 10 - 15 lbs. per square (0.49 - 0.73 kg/m<sup>2</sup>) glaze coat of hot steep asphalt.
  4. When the permanent roof is to be applied, inspect the roof area. If the insulation has not been damaged and is dry, remove any blistered or damaged felt. Prime the temporary roof with JM Concrete Primer at the rate of 1 gal./sq. (0.4 liters/m<sup>2</sup>) and then solid mop a layer of insulation board to the temporary roof with hot asphalt. Then apply the permanent roof system. In some regions of the country a JM base felt may be machine spot-mopped directly to the sound temporary roof, followed by the roofing membrane. Consult a JM Technical Services Specialist for acceptability.
  5. If the membrane and/or roof insulation has been excessively damaged, remove all unusable material and replace.
- C. Non-Nailable Decks, other than Steel:
1. Prepare the deck as would be done for a permanent roof.
  2. Solid mop two plies of approved JM ply felt in hot Type III asphalt.
  3. Finish with a 10 - 15 lbs. per square (0.49 - 0.73 kg/m<sup>2</sup>) glaze coat of Type III asphalt.
  4. When the permanent roof is to be installed, inspect and repair all defects in the temporary roof. Clean the surface of the temporary roof and prime with JM Concrete Primer if the surface is unusually worn. Proceed with the installation of the permanent roof.
  5. As an alternate to step 2, spot mop an approved JM base sheet using a mechanical spot mopping machine. Next, solid mop one ply of approved JM ply felt in hot Type III asphalt. When the permanent roof is to be installed, remove the entire temporary roof, prime the deck as required in the "Roof Decks" Section of this manual, and proceed with the installation of the permanent roof.

**7A.26.3** The decision as to whether or not a temporary roof is to be left in place is a judgment factor that must be made by the building owner or his representative. Although a JM representative may make suggestions in this area, JM will not be responsible for any problems that may develop with the roofing system due to the fact that the temporary roof is left in place.

## 7A.27 Protected Roofing Membrane Assemblies (PRMA)

**7A.27.1 General Information.** All general information contained in this section and the current JM Commercial/Industrial Roofing Systems Manual shall be considered part of these specifications.

JM modified bitumen specifications are eligible for use with protected roofing membrane assemblies. When these specifications are modified, the last digit of the specification designation should be changed to a "P" to denote "Protected".

**Flashings:** All flashings must conform to the requirements stated in this section and the current JM Commercial/ Industrial Roofing Systems Manual. The flashing material must extend above the top of the extruded polystyrene insulation a minimum of 8" (203 mm). The standard flashing details for modified bitumen roofing can be found in "Bituminous Flashings", Section 9.

**Drainage:** Design and installation of the deck and/or roof substrate must result in the roof draining freely, to outlets numerous enough and so located as to remove water promptly and completely. Areas where water ponds for more than 24 hours are unacceptable, and will not be eligible for a JM Roofing System Guarantee.

**7A.27.2** When designing a protected membrane roofing system, the designer must make sure that positive drainage exists on the roof. Even though some extruded polystyrene roof insulation products are designed with integral drainage channels, they will retard the flow of water due to the contact between the membrane and the insulation. JM recommends a minimum of 1/4" per foot (20.8 mm/m) slope be obtained on the finished roof membrane. This will greatly reduce the amount of water that will be retained against the membrane after a rain.

**7A.28 Asphalt Recommendations (PRMA)**

**7A.28.1** JM allows the use of only two grades of asphalt in SBS modified bitumen specifications – Type III and Type IV. This recommendation also applies to PRMA specifications, in order to prevent adhesion of the extruded polystyrene insulation to the asphalt top pour.

**7A.28.2** Ballast Requirements (for use with extruded polystyrene roof insulation):

**7A.28.3** The ballast should be similar to ASTM D 448, Gradation #57. The following gradation is typical:

Passing 1/2" (13 mm)	10-60%
Passing 3/4" (19 mm)	100%

**7A.28.4** Ballast is applied at a rate of approximately 10 to 12 lbs. per square foot (48.8 - 58.6 kg/m<sup>2</sup>) in the field of the roof over a layer of filter fabric. Twenty (20) lbs. per square foot (97.6 kg/m<sup>2</sup>) of ballast is required over a 4' (1.22 m) wide area at the roof perimeter and at all penetrations. The following fabrics have been found to be acceptable:

- A. Confil 689H – 3.0 oz./yd. (93.5 g/m) black polyester from International Paper Company.
- B. Rufon P3B – 3.0 oz./yd. (93.5 g/m) black polypropylene from Phillips Fiber Corporation.

**7A.28.5** JM makes no claims as to the quality of these products nor their performance when exposed on the roof. See the product warranty supplied by the fabric manufacturer.

**7A.28.6** When pavers are used as ballast, the pavers must be placed on supports or pedestals. These supports or pedestals can either be commercially available products or 6" (152 mm) square pieces of JM DynaTred Plus (to give a minimum 1/2" [13 mm] air space). These supports should be located at the intersection of the corners of the paver blocks, such that where the four corners come together, all rest on the same 6" (152 mm) square piece of DynaTred Plus or pedestal. The 1/2" (13 mm) air space between the pavers and the insulation will allow moisture vapor to vent to the atmosphere. If the moisture is not allowed to vent to the atmosphere, the top surface of the insulation will begin to absorb water and the thermal

performance will be reduced. ROOF AREAS THAT HAVE PAVERS IN DIRECT CONTACT WITH THE INSULATION ARE EXCLUDED FROM COVERAGE UNDER A JOHNS MANVILLE ROOFING SYSTEM GUARANTEE, INCLUDING THE THERMAL OVERLAY PORTION OF THE GUARANTEE.

**7A.28.7** The use of pavers in high traffic areas, to and around equipment and other maintenance areas, is strongly recommended.

**7A.28.8** It is the owner's and/or specifier's responsibility to determine if the building structure can support the required amount of ballast and still meet the code design requirements for anticipated dead and live loads (including snow, wind, etc.).

**7A.29 Decks (PRMA)**

**7A.29.1** Pre-cast slabs and pre-stressed "T" or "TT" decks require a minimum of one layer of approved JM roof insulation as a leveling course prior to the installation of the roof membrane.

**7A.29.2** For lightweight insulating concrete, gypsum decks, etc., consult a JM Technical Service Specialist for Specifications and Guarantee information.

**7A.29.3** For information on roof deck requirements not mentioned here, refer to the "Roof Decks" section of the current JM Commercial/Industrial Roofing Systems Manual, or contact a JM Technical Service Specialist.

**7A.29.4 Warning:** Extruded polystyrene insulation is combustible and may constitute a fire hazard if improperly used or installed. It should be adequately protected. Use only as directed by the specific instructions for this product. This material should **NEVER** be exposed to an open flame or other source of ignition.

**7A.29.5** All roof deck systems over which the protected system is installed should provide an adequate fire barrier for the extruded polystyrene insulation.

**7A.29.6** For proper protection of plastic foam in storage, consult the National Fire Protection Association (NFPA) standards or the authority having jurisdiction.

**7A.30 Installing Ballasted PRMA Roof Insulation Over Modified Bitumen Roof Membranes**

**7A.30.1** The following are general recommendations for installing ballasted PRMA roof insulation over modified bitumen roof membranes.

**Materials per 100 sq. ft. (9.29 m<sup>2</sup>) of Membrane Area**

Insulation:	Extruded polystyrene roof insulation 100 sq. ft. (9.29 m <sup>2</sup> ) per layer
Fabric:	12' wide, 105 sq. ft. (3.66 m wide, 9.75 m <sup>2</sup> ) 10' wide, 106 sq. ft. (3.05 m wide, 9.84 m <sup>2</sup> ) 8' wide, 107 sq. ft. (2.44 m wide, 9.94 m <sup>2</sup> )
Ballast:	3/4" (19 mm) stone or crushed rock, 1000 - 1200 lbs. per square (48.8 - 58.6 kg/m <sup>2</sup> )*

\*Additional ballast is required at the perimeter and at penetrations.

**7A.30.2 Insulation:** Place extruded polystyrene roof insulation directly on the membrane with channel side down. The insulation boards should be tightly butted together. The maximum allowable gap between boards is  $\frac{3}{8}$ " (9.5 mm). The boards shall be installed to within approximately  $\frac{3}{4}$ " (19 mm) of, but not touching, projections and cant strips.

**7A.30.3** For multilayer installations, install subsequent layers, unattached over the first layer. Stagger all joints in relation to the underlying layer. The bottom layer in multilayer applications must be at least 2" (51 mm) thick and as thick or thicker than the top layer.

**7A.30.4 Fabric:** Loose lay an approved fabric over the extruded polystyrene roof insulation, with all joints lapped a minimum of 12" (305 mm). There should not be any end laps within 6 feet (1.83 m) of the perimeter. The fabric should extend 2" to 3" (51 - 76 mm) above the stone at the perimeter and at penetrations.

**7A.30.5** Wetting the fabric is helpful in holding it in place on the insulation until the ballast is installed.

**7A.30.6 Ballast:** Apply the correct size ballast at the rate of 1000 - 1200 lbs. per square (10 - 12 lbs. per sq. ft. [48.8 - 58.6 kg/m<sup>2</sup>]), over the fabric, as the fabric is being laid out in the field of the roof. For a width of 4 feet (1.22 m) at the roof perimeter or penetrations, install ballast at a rate of 20 lbs. per square foot (97.6 kg/m<sup>2</sup>) or pavers at a rate of 22 lbs. per linear foot (32.7 kg/lin. m). If pavers are used, the fabric is not required. Pavers must be placed on pedestals. Pedestals can be either commercially available products or 6" (152 mm) square pieces of JM DynaTredPlus.

**7A.30.7** Ballast should be washed  $\frac{3}{4}$ " (19 mm) gravel or crushed stone, with fines (smaller than  $\frac{1}{2}$ " [13 mm]) accounting for not less than 10% or more than 60%. This gradation is similar to ASTM D 448, Gradation #57.

## Modified Bitumen Specifications

### 7A.31 Safety Guidelines for Heat Welded Modified Bitumen

**7A.31.1** Heat welded modified bitumen products require special safety precautions prior to, during, and after installation. When working with an open flame, contractors must use extra care and extreme caution to prevent accidents. Carelessness can lead to loss of life, injury and loss of property. The following safety recommendations should be followed:

1. All contractors must be licensed and insured in the geographic area where they will conduct business. The work area must be properly prepared before the welding process begins and weather conditions must be favorable. Procedures and equipment must comply with all applicable code requirements including guidelines mandated by the Occupational Safety and Health Administration (“OSHA”).
2. The roofing contractor must ensure that all mechanics or applicators involved with the application of heat welded modified bitumens are properly trained not only in application and equipment handling, but safety measures. The contractor should verify that all roofing applicators involved with open flame application maintain and carry a valid **Certified Roofing Torch Applicator** (“CERTA”) card as evidence of proper training. Further, the general contractor, jobsite superintendents and the building owner or its representative must also be knowledgeable and/or advised of the proper and necessary safety precautions applicable to heat welded roofing products.
3. **All mechanics or applicators must carry, review, understand and adhere to the safety information and guidelines contained in “Torch Applied/Do’s and Don’ts” as published and supplied by the Asphalt Roofing Manufacturers Association (“ARMA”) which may be supplemented or amended, as well as the ARMA/NRCA “Guide to Torch Safety on Modified Bitumen” video tape. These are available from ARMA at: ARMA, 4041 Powder Mill Road, Ste. 404, Calverton, Maryland 20705-3016 (Ph. 301-348-2002). Do not begin application procedure until you read and fully understand these safety procedures and installation practices.**
4. Written notice must be given to the local fire department where required and any required or necessary permits must be obtained. Even if not required, it is always recommended to give notice to the fire department particularly when using LP gas.
5. Supervisors must ensure that all roofing applicators wear adequate protective equipment including non-synthetic long-sleeved shirts, boots, long pants with no cuffs, that extend over the top of the boot, heat-resistant gloves, safety glasses and a face shield during application.
6. Never heat weld directly to, or near (e.g., the 35 foot rule) combustible materials or surfaces. Extra care must be taken to identify all potentially combustible and flammable material and similar combustible and flammable aspects of a building’s use and design. Be aware of insulation type, parapet walls, curbs, cants, wood, edge strips, expansion joints, electrical wires and conduits, gas lines, chemicals, grease, oil, vapors, exhausts, spills or other materials that could ignite. Combustible materials present on a roof must be moved and materials that are not moveable must be protected from the heat weld process and other fire hazards with fire blankets or shields. Be sure to identify similar materials on adjoining buildings and exercise proper precautions. A fiber glass base sheet should be installed to minimize the risk of fire. Always use combustion-resistant cant strips or other fire-resistant materials.
7. Never heat weld near or into vents, openings or cracks around edges, corners, voids or other penetrations in the building or near any rooftop equipment. Shut off fans and cover openings.
8. Never leave lighted torches unattended.
9. Use only equipment that is specifically designed for heat welded roofing applications and be sure the equipment is listed by a nationally recognized independent testing laboratory. The equipment must be operated in accordance with the manufacturer’s instructions and in accordance with all applicable codes and regulations. All mechanics must be properly trained and familiar with all safety precautions in the use and handling of tanks, regulators and LP gas. Be familiar with National Fire Protection Association (“NFPA”) 58 **“Standard for the Storage and Handling of Liquefied Petroleum Gases”** and appropriate publications of the National Propane Gas Association, 1600 Eisenhower Lane, Ste. 100, Lisle, IL 60532 (Ph. 630-515-0600) and the National Fire Protection Association, 11 Tracy Dr., Avon, MA 02322 (Ph. 800-344-3555). Do not work in areas where LP gas can accumulate. Proper ventilation in accordance with OSHA and the National Institute for Occupational Safety and Health (“NIOSH”) is required. Ensure that all equipment is in good working condition and inspected daily.
10. Maintain at least one fully charged 20 lb. (minimum) ABC-type dry chemical fire extinguisher for each roofing mechanic on the project and have more available near the application area (e.g. within 50 feet [15.3 m]) based on jobsite conditions. Roofing mechanics must have fire extinguisher use training at least annually per OSHA 29 CFR1910.157.
11. Follow fire protection and prevention procedures mandated or recommended by OSHA and/or the National Roofing Contractors Association (“NRCA”) and ensure compliance with all other federal, state and local regulations, including but not limited to those listed in OSHA 29 CFR1962.1 150, 152.1, 153 and 191-110 as they apply to heat weld application.
12. A fire watch of sufficient length must be kept during and after all heat welding is completed. A fire watch is never shorter than **1 hour** after all application has been completed for a given day. A fire watch may need to be longer depending on the size of the roofing project and the design or configuration of the building. Special attention should be given to potential hot spots or smoldering material, such as carts, wall flashings and around penetrations, roof top equipment and the roof perimeter. The person performing the fire watch should use an infrared heat-sensing device to detect hot spots and smoldering materials. For more information, contact the NFPA. Should fire result, take immediate appropriate action; notify the owner of fire response.
13. Remember, it is the contractor’s responsibility to observe all fire prevention and safety policies and practices during the installation of the roof system as well as providing training to their personnel for proper roofing and safety practices as well as responding to emergency situations at the job site. Always keep a first aid kit on the job site; individuals administering first aid must be properly qualified per OSHA 29 CFR1910.151(b).

**JOHNS MANVILLE INTERNATIONAL, INC. DOES NOT SUPERVISE BUILDING OWNERS, CONTRACTORS, MECHANICS OR ANY OTHER PERSON IN THE APPLICATION OF HEAT WELDED APPLIED MODIFIED BITUMENS AND ASSUMES NO RESPONSIBILITY FOR FIRE DAMAGE OR ANY OTHER DAMAGES.**