Single Ply Roofing Systems (PVC)

Mechanically Fastened Guide Specification

1.0 General

1.01 Description

A. **Scope**
   1. Furnish and install an **UltraGard PVC Mechanically Fastened Roofing Membrane** with flashings and all other incidental and accessory items to comprise a roofing system.
   2. All work shall be in strict accordance with standard detail drawings and specifications issued by Johns Manville (JM) for UltraGard PVC roofing systems.

B. **Related Work**
   The work includes, but is not necessarily limited to the installation of:
   1. Vapor retarders
   2. Insulation
   3. Slipsheet
   4. Fasteners
   5. Roof membrane
   6. Membrane flashings
   7. Metal flashings
   8. Walkways
   9. Sealants
   10. Adhesives
   11. Wood blocking
   12. Expansion joints
   13. Drains
   14. Fascia and Copings
   15. Plumbing modifications
   16. Mechanical modifications
   17. Electrical modifications

1.02 Submittals

A. The roofing contractor shall submit all required items at the time of bidding in one comprehensive package. This package includes:
   1. Copies of specification.
   2. Samples of the major components (i.e., membrane, insulation and flashing) of the roofing system.
   3. The JM UltraGard PVC roofing systems printed product data.
   4. Specimen copies of the JM UltraGard Guarantee.
   5. Dimensioned shop drawings of the roof including building height.

1.03 Quality Assurance

A. The roofing contractor must be authorized by JM to install UltraGard PVC roofing systems.
B. The roofing contractor must have been trained by a technical representative of JM and be familiar with the UltraGard PVC product.
C. The roofing contractor shall submit the completed Pre-Installation Notice (PIN) to the JM Technical Services Department for acceptance before ordering material.
D. No deviations shall be made from this specification or UltraGard PVC roofing systems Detail Drawings without prior written authorization from the JM Technical Services Department.
E. Upon completion of the installation, and after written notification to JM that all work has been completed in strict accordance with the contract specifications and the JM requirements, a guarantee evaluation shall be made by a representative of JM for the purpose of determining whether the system installed meets the JM requirements to issue the Guarantee.

1.04 Delivery, Storage and Handling

A. Deliver all materials to the jobsite in their original, tightly sealed containers or unopened packages.
B. All materials shall be clearly labeled with the name of the manufacturer and product identification.
C. All materials must be protected from damage during transit, handling, storage and installation. Place all materials on pallets and fully protect from moisture.
D. All materials shall be stored in a dry area and protected from the elements. Membrane rolls shall be stored flat on pallets.
E. Adhesive shall be stored at temperatures between 50°F and 80°F (10°C and 27°C).
F. All flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow precautions outlined by material manufacturer/supplier.
G. All materials determined to have been damaged shall be replaced with new materials.

1.05 Job Conditions

A. This specification is acceptable for use with structures designed to support lightweight roof assemblies. The adequacy of the structural support must be verified by the owner, or the technical representative of the owner and is that person's sole responsibility to determine. Potential live loads, such as snow or ponding water, should be considered.
B. UltraGard PVC roofing systems materials may be installed under certain adverse weather conditions such as extremes of high and low temperatures, or high humidity conditions but only after consulting the JM Technical Services Department since special precautions may have to be applied. Installation costs, production rates and material performance may be affected by the foregoing conditions.
C. Only as much new roofing as can be made weathertight each day shall be installed each day. This includes all flashing work.
D. Any substrate to receive new insulation, membrane or flashing shall be thoroughly dry. Should surface moisture occur, the contractor shall provide adequate equipment to dry the substrate.

E. Prior to and during application, the contractor shall ensure that all dirt, debris and dust shall be removed from surfaces to be roofed for both new and reroofing substrates.
F. On all reroof jobs and for all lightweight deck systems, pullout tests shall be performed by the representative of the owner or roofing contractor to verify the condition of the deck or substrate and to confirm system design pullout values. A minimum of 10 pullout tests for areas up to 500 squares (4645 m^2), thereafter 2 tests per 100 squares (929 m^2) is considered sufficient. Tests should be taken approximately 60% in perimeters and 40% from field areas. A written report of pullout test results shall be submitted to the JM Technical Services Department for review.
G. Precautions shall be taken to prevent wind blow-off or wind damage during the course of the roofing application. This may necessitate additional securement of temporary construction.
H. The contractor shall verify and ensure that all roof drain lines are unblocked before starting work. If any drain blockages are found, they shall be reported to the owner or their representative and the JM Technical Services Department in writing.
I. Temporary waterstops shall be installed at the end of each work day or if inclement weather conditions dictate. These temporary waterstops shall be removed at the start of the next work day and disposed of properly.
J. Do not install the UltraGard PVC roofing membrane in direct contact with any product containing asphalt, coal tar pitch, creosote, or other harmful materials. Consult the JM Technical Services Department for special installation requirements and see Section 3.07 for slipsheet requirements.
K. Do not allow waste products containing petroleum, grease, acid, solvents, vegetable or mineral oil, animal oil, animal fat, etc. or direct steam venting to come into direct contact with the UltraGard PVC Roofing Membrane. Contact the JM Technical Services Department for recommendations if such conditions exist.
L. The contractor shall follow all safety regulations as recommended by OSHA.
M. All work shall be scheduled and executed without exposing interior building areas to the effects of inclement weather. The existing building and its contents shall be protected against all risks. Arrange work sequences to avoid use of newly constructed roofing for storage, walking surfaces and equipment movement. Contractor shall provide all necessary protection and barriers to segregate the work areas and prevent damage to adjacent areas. If excessive foot traffic over newly installed membrane is necessary, contractor shall provide plywood or polyester felt protection to prevent damage.
N. All existing roofing materials to be removed for construction shall be immediately removed from the construction site to a dumping area authorized to receive such debris.
O. Any unusual or concealed conditions discovered during the course of the work is to be reported to the owner or their representative immediately in writing and work shall be halted until the owner or their representative has responded with a solution to the problem.
P. When a system is specified to meet an Underwriter's Laboratories, Inc. rating, all materials used in the system must be UL labeled and approved for use for that particular system.
Q. All local building codes and requirements must be followed where applicable. It is the sole responsibility of the roofing contractor to determine any and all local building code requirements and to ensure that the roofing system selected complies with such requirements.
R. Certain project conditions may require some modification to this specification. Contact the JM Technical Services Department if any of the following conditions exist:
    1. Roof height greater than 60' (18.3 m).
    2. Geographical location in wind exposure Zone 3, or higher, per the Factory Mutual current edition of Loss Prevention Data Sheet 1-28.
    3. Geographical location in a 100 mph (161 km/hr) or greater wind zone, per the ANSI 100 year mean recurrence interval wind isotach.
    4. Location with a "D" exposure as determined in ASCE 7.
    5. Buildings with high internal humidity, such as swimming pools, textile mills, paper mills, etc.
    6. Buildings which are highly pressurized or have the potential for high internal pressures.
S. If a roofing contractor desires to solvent-weld certain details, it is their sole responsibility to ascertain local VOC requirements in force and verify that it is acceptable to use solvent for making seams at these detail areas.

1.06 UltraGard Guarantees and Warranties

A. **UltraGard Guarantees and Warranties**
JM offers a choice of either material warranties or more comprehensive roofing guarantees to the owner. The desired warranty or guarantee shall be selected from the following list prior to starting the project.

1. **NDL (No Dollar Limit) -** This Guarantee assures the owner that JM, under the Roof Guarantee Agreement, is responsible for maintaining the roof in a watertight condition if leaks occur solely as a result of deterioration of or improper workmanship in applying the JM UltraGard materials or products. The obligation under the UltraGard NDL Guarantee is for a specific number of years (typically 10 or 15 years) and specifies no maximum monetary amount of coverage (No Dollar Limit).
2. **Material Warranty -** This Warranty assures the owner that JM, under the Material Warranty Agreement, is responsible, at the election of JM, to either re-supply a prorated amount of like material **or** to issue a credit for the prorated cost of the defective material. This warranty applies only to the UltraGard membrane determined to be defective **and**, when roof leaks are occuring, due to that defective membrane. The obligation under the Material Warranty is for typically 10 or 15 years and specifies that the monetary obligation shall not exceed the prorated material cost as set forth in the schedule provided in the Material Warranty.

B. **Maintenance**
Long-term performance of a roofing system depends on adequate ongoing maintenance programs. JM requires building owners establish regularly scheduled annual inspections to ascertain the condition of the roof system and to perform those maintenance items required to keep the roofing system performing properly. Records of all maintenance work performed must be retained for the entire warranty period. Please consult JM for specific recommendations.

Part 2 - Products

2.01 General

A. The UltraGard PVC Mechanically Fastened Roofing System components shall be produced or supplied by JM.
B. Components to be used that are other than those manufactured by JM may be accepted based on chemical compatibility and published performance data. The specifications, installation instructions, limitations and/or restrictions of the respective manufacturers must be reviewed by the designer for acceptability for use with the UltraGard PVC roofing systems products. All of these components may be considered on a case-by-case basis and must be accepted in writing by the JM Technical Services Department.

2.02 Roofing Membrane

A. UltraGard SR____ , V-2___ or UltraGard Plus___ Mechanically Fastened Roofing Membrane ____ mils (____ mm) nominal thickness.
B. UltraGard PVC Membrane shall equal or exceed the minimum physical properties published in the UltraGard PVC roofing systems product data sheets.
C. Membrane shall conform to ASTM D 4434 Standard Classification: Type _____ .

2.03 UltraGard PVC Materials Supplied by JM

A. **Solvent** - UltraGard PVC Solvent Welding Solution shall be furnished with the label attached.

B. **Seam or Lap Sealant -** UltraGard PVC Sealant shall be a liquid PVC sealing compound, and shall have a consistency equal to that of “honey” at room temperature.

C. **Caulk -** UltraGard PVC Polyurethane Caulk is a single component, non-sag, elastomeric polyurethane sealant.

D. **Adhesive -** UltraGard PVC Membrane Adhesive shall be used for bonding the UltraGard PVC flashing membrane to vertical substrates of wood, metal and concrete.

E. **Aluminum Tape -** UltraGard PVC roofing systems supplied Aluminum Tape shall be a 3 mil (0.08 mm) tape with acrylic adhesive used over UltraGard PVC-Clad Metal joints prior to UltraGard PVC roofing systems DM-80 strips being welded over the joints.

F. **Slipsheets -** JM offers a variety of slipsheets for use in its UltraGard roofing systems dependent upon the particulars of an application. Some of these are the following:
1. Polyethylene slipsheet - a cross-laminated clear polyethylene film weighing 6 oz. per sq. yd. (0.2 kg/m^2).
2. 9 oz. per sq. yd. (0.30 kg/m^2) Polyester Mat Protection Material - needle-punched polyester fabric.
3. DN Flameguard Slipsheet - a laminated aluminum foil/kraft paper with a flame-extinguishing adhesive and a fiber glass scrim reinforcement for use in some UL and/or FM assemblies or in reroofing over coal tar pitch roofs in combination with the appropriate thickness of insulation.

G. **UltraGard PVC Membrane Cleaner -** UltraGard PVC Membrane Cleaner is a clear liquid used for cleaning asphalt and dirt from membrane surface.

H. **Flashing Membrane -** May be UltraGard SR-50, SR-60, SR-80, V-2 50 or V-2 60 depending on the thickness of the field sheet.

I. **Flashing Metal -** UltraGard PVC-Clad Metal is 24 gauge (0.61 mm) galvanized steel laminated to 40 mils (1.0 mm) of nonreinforced membrane in soft white, grey and black colors used for flashing and edge metal detailing.

J. **Termination Bar -** The UltraGard Termination Bar shall be an extruded aluminum bar 3⁄32" (3 mm) thick used to terminate adhered, reinforced membrane base flashings in certain constructions.

K. **Membrane Fasteners and Plates -** UltraGard PVC roofing systems offers a variety of membrane and insulation fasteners and plates to meet specific job conditions and substrates.

L. **Walkway -** Walkway shall be UltraGard PVC WBP-100 Heavy-Duty Walkway consisting of PVC membrane 0.10" (2.5 mm) thick for traffic areas.

M. **Prefabricated Details -** UltraGard PVC Inside/Outside Corners, UltraGard PVC Vent Pipe Boots in sizes to fit pipes from 3⁄4" - 11" (20 mm - 275 mm), and UltraGard PVC Penetration Pans shall be used.

N. **Penetration Pan Filler -** UltraGard PVC Pourable Sealer is a polyurethane sealant for use in penetration pans.

O. **UltraGard PVC-Clad Metal Joint Cover Strips -** for use in waterproofing joints of UltraGard PVC-Clad Metal.

P. **UltraGard PVC 7" (175 mm) Disc Caps -** are prefabricated round pieces of membrane for use in the UltraGard PVC disc-cap method of installation to cover the steel plates and fasteners used to secure the membrane to the roof through the top of the sheet.

2.04 Insulation Materials

A. **Insulation**
1. Insulation shall be installed as a separation layer over the existing substrate and/or to obtain the desired thermal value.
2. Insulation shall be compatible with UltraGard PVC Membranes or have an acceptable slipsheet placed between the insulation and the membrane.
3. The following roofing insulation boards are acceptable for use in an UltraGard PVC Mechanically Fastened Roofing System:
   a. ISO 1 and Tapered ISO 1 polyisocyanurate insulations having a nonasphaltic facer meeting or exceeding the requirements of ASTM C 1289 with a minimum compressive resistance of 18 psi (124 kPa).
   b. Fesco, Tapered Fesco or ½" Retro-Fit perlite insulation meeting ASTM C 728.
   c. High density wood fiberboard with nonasphaltic binders.
   d. Expanded polystyrene with foil or kraft laminated facers on both sides or in conjunction with an acceptable slipsheet if no facer is laminated to the board, having minimum density of 1.35 pcf (21.6 kg/m³) and meeting ASTM C 578, Type II physical properties.
   e. Extruded polystyrene (with an acceptable slipsheet) meeting ASTM C 578, Types IV, VI or VII physical properties.
4. Insulation(s) shall have a minimum "R" value of _____.
5. Insulation(s) thickness shall be a minimum of _____ inches (_____ mm).
6. Insulation warranty by others.
   a. Insulation manufacturers other than JM shall send their recommendations for the use of their product to the owner with a copy to JM and their specific guarantee conditions for the duration of the UltraGard Roofing Systems Guarantee.
7. **Insulations not supplied by JM shall be approved in advance by the JM Technical Services Department.**

2.05 Other Materials

A. **Wood Nailers**
1. Nailers shall be #2 or better lumber. Nailers shall be pressure treated for rot resistance (wolmanized or osmose treated). Creosote and asphaltic preservatives are not acceptable.
2. Wood nailers shall conform to the Factory Mutual Loss Prevention Data Sheet 1-49 recommendations.

B. **Vapor Retarders**
1. Vapor retarders shall meet specified code and/or insurance requirements.
2. Vapor retarders shall be compatible with insulation and other accessories.
3. Vapor retarders shall be acceptable to or manufactured by JM.

2.06 Precautions

A. Do not use UltraGard PVC roofing systems products near fire or flame.
B. Avoid breathing vapors of solvent, sealant and adhesives. Use with adequate ventilation. Avoid prolonged contact of solvents, sealants and adhesives with skin.
C. Do not use open flames to expedite drying of surfaces, sealants or adhesives.

D. Consult Material Safety Data Sheets and container labels for specific safety instructions. MSDS sheets are available by calling the JM Product Information Center at 1-800-654-3103 or through the JM Fax Express at 1-888-329-3977.
E. Do not paint UltraGard PVC-Clad Metal or membrane with oil-based paint. Consult the JM Technical Services Department for recommendations.
F. Do not allow muratic acid used to clean masonry to come in direct contact with the UltraGard PVC Roofing Membrane.

Part 3 - Execution

3.01 General

A. When installing UltraGard PVC Mechanically Fastened Roofing Membrane in cooler weather, it is recommended that liquids such as solvents, sealants, etc. be stored at warmer temperatures (50°F [10°C] or more but not exceeding 80°F [27°C]) until just prior to use in order to facilitate the installation.

3.02 Substrate Conditions

The following general conditions apply to the substrate that will receive an UltraGard PVC Mechanically Fastened roofing system for both reroof and new construction:

A. The roof deck must be structurally sound to provide proper securement for mechanical fasteners. Areas showing a loss of integrity because of corrosion, rotting, warping, concrete spalling, etc., must be repaired or replaced prior to installing the roofing system.
B. It is imperative that the roofing contractor make test cuts at each roof area prior to reroofing. The condition of the substrate must be suitable to receive an UltraGard PVC Mechanically Fastened Roofing System. Wet insulation must be removed and replaced. See Single Ply Roofing Institute (SPRI) Guidelines for determining wet insulation.
C. A determination must be made regarding the presence or absence of coal tar pitch within the existing roof assembly. The presence of coal tar pitch requires special precautions unless the coal tar pitch is 10 years or older and is separated from the UltraGard PVC membrane by a layer of insulation a minimum of 1½" (40 mm) thick having a minimum "R" value of 10.0 (hr•ft²•°F)/Btu (1.76 m²•°C/W) and followed by an UltraGard DN Flameguard slipsheet. All joints must be butted tightly together or have joints completely taped to prevent volatiles from damaging roof membrane.
D. Contact the JM Technical Services Department when substrate is exposed to excessively high humidity and/or a corrosive environment. Special fasteners or details may be required.
E. It is acceptable to install an UltraGard PVC Mechanically Fastened roofing system over the following deck substrates in new construction, provided that an acceptable insulation and/or the appropriate slipsheet is installed over the substrate as needed:
   1. Structural metal deck (22 gauge [0.76 mm] minimum) shall conform to recommendations outlined in the Factory Mutual Loss Prevention Data Sheet 1-28.
   2. Plywood (½" [15 mm] minimum) shall be exterior grade (minimum CDX grade).
   3. Structural concrete and pre-cast, pre-stressed concrete (3,000 psi [20,685 kPa] minimum) shall be cured and dry to industry standards and the surface shall be smooth and free of moisture or frost. All sharp ridges or other projections above the surface shall be removed before roofing.
   4. Lightweight insulating concrete fill and metal formwork (minimum 26 gauge [0.45 mm] metal formwork) - the roof deck shall be cured and dry to the manufacturer of the deck and/or industry standards and shall be smooth and free of ridges and depressions. All necessary venting as recommended by the roof deck manufacturer shall be accomplished.
   5. Wood plank (1" [25 mm] minimum) shall conform to the Factory Mutual requirements for Class I impregnated decks.
   6. Cementitious wood fiber decks - Certain cementitious wood fiber decks may be acceptable to receive an UltraGard PVC Mechanically Fastened roofing system after pullout tests have been completed and appropriate fasteners have been selected. Please consult the JM Technical Services Department for the most recent recommendations.
   7. Gypsum concrete deck - shall be cured and dry to the manufacturer and/or industry standards. The surface of the deck shall be smooth and free from ridges and depressions.
   8. Contact the JM Technical Services Department for detailed requirements for these deck types and others not listed above.

3.03 Preparation of Existing Substrate

A. General
   1. To prevent delays or interruptions, coordinate work with other trades or suppliers to ensure that components to be incorporated into the UltraGard PVC Mechanically Fastened roofing system are available as the work progresses. Examine substrates to which the roofing materials are to be applied to ensure that their condition is satisfactory for the application of the UltraGard PVC Mechanically Fastened roofing systems. Do not

permit voids greater than ¼" (8 mm) width in the substrate. Concrete substrates shall be cured and free of laitance and curing compounds. Substrates for roofing materials shall be dry and free of oil, dirt, grease, sharp edges and debris. Inspect sub strates and correct defects before application of roofing membrane.

2. Blisters, buckles and ridges shall be cut and patched to provide a reasonably level substrate surface.
3. Gravel over existing nailers must be totally removed prior to installing new nailers and flashings. Verify that the existing nailers are securely anchored to the roof decks.
4. When an additional thickness of insulation is being added, new nailers must be added to match the height of the new insulation. Nailers must be securely anchored to the roof deck per Section 3.05.
5. All roof surfaces shall be free of ponded water, ice or snow.
6. Specifier and/or roofing contractor shall determine the condition of the existing roof deck and roofing. Areas with deteriorated decking or wet insulation or other materials shall have those affected materials removed and replaced.
7. When removing an existing roof during reroofing, remove only that amount of roofing and flashing that can be made watertight with new UltraGard PVC roofing systems materials in a one-day period or previous to the onset of inclement weather.

3.04 Vapor Retarder Installation (Where Specified)

General

Specific climatic and job conditions may require the use of a vapor retarder. It is the sole responsibility of the design professional to determine the need for a vapor retarder, and its type and location in the roofing system. A vapor retarder may often act as an "air barrier" which may have a positive effect in reducing internal air pressure. Air barriers should be strongly considered for buildings subject to high internal air pressure such as airplane hangars and buildings with many loading bays such as warehouse facilities.

The National Roofing Contractor's Association recommends the installation of vapor retarders when interior relative humidity is 45% or greater, and/or the outside mean average January temperature is below 40°F (4°C).

Install a vapor retarder over a suitable substrate with all side and end laps and all penetrations sealed in accordance with the instructions provided by the manufacturer. The vapor retarder may be loosely laid or adhered with the recommended adhesive by the manufacturer. In re-roofing where the existing built-up roof is to remain, the built-up roof may be an adequate vapor retarder as long as all splits or tears are repaired in order to provide a total barrier to vapor penetration.

JM recommendations for base sheet attachment must be followed as a minimum. Contact the JM Technical Services Department for specific requirements.

3.05 Wood Nailers

A. Install nailers at the perimeter of the roof and around all roof penetrations and projections (unless otherwise shown on UltraGard PVC roofing systems Detail Drawings).
B. Nailers shall be firmly anchored to the decks at a maximum 2'-0" (0.61 m) o.c. and shall resist a pullout force of 200 lbs./lineal foot (2.9 kN/m) in any direction. A ½" (15 mm) vent space shall be provided between adjacent lengths of nailers. Fasteners shall be installed within 6" (150 mm) of each end. Spacing and fastener embedment shall conform to Factory Mutual Loss Prevention Data Sheet 1-49 recommendations.
C. Height of nailers shall match the surface level of the insulation and roof membrane.
D. All woodwork to be reused shall resist a minimum force of 200 lbs./lineal foot (2.9 kN/m) in any direction and shall be free of rot. If any existing woodwork is questionable, it should be removed and replaced with suitable new materials.

3.06 Insulation Installation

A. **General**
   1. Insulation shall be installed in accordance with the JM current published specifications and recommendations for use with mechanically fastened roofing.
   2. Insulation shall be secured to the roof deck in accordance with the JM requirements. As a minimum requirement, it shall be secured at a rate of 5 fasteners per 4' x 8' (1.22 m x 2.44 m) board, 4 fasteners per 4' x 4' (1.22 m x 1.22 m) board or 3' x 4' (0.92 m x 1.22 m) board and two fasteners per 2' x 4' (0.61 m x 1.22 m) board, and with tight joints in parallel courses with end joints staggered. When more than one layer of insulation is to be used, succeeding layers shall be laid staggered in relation to the previous layer of insulation and all joints shall be staggered.
   3. Insulation shall be neatly cut to fit around all penetrations and projections with a maximum allowable gap of ¼" (8 mm).
   4. Open joints shall be repaired with like insulation material.
   5. When the insulation is installed on steel decks after a complete tear-off, or in new construction, edges shall be checked so that no edges are left unsupported along the flutes.
   6. Insulation shall be feathered or tapered to provide a sump area a minimum of 36" x 36" (0.92 m x 0.92 m) at all drains.
   7. Install no more insulation in one day than can be covered with the UltraGard PVC Membrane or when the onset of inclement weather is anticipated.

8. Install tapered insulation in accordance with the JM Tapered Design Group shop drawings.

B. **Mechanical Attachment**
1. All insulation boards must be mechanically attached to "standard" decks unless specifically accepted for hot asphalt securement for the particular application by UltraGard PVC roofing systems.
2. "Standard" decks shall be defined as 22 gauge (0.76 mm) or heavier steel decks, poured structural concrete 3000 psi (20,685 kPa) or greater, ½" (15 mm) or greater plywood, and 1" (25 mm) minimum wood plank. Other deck types may be accepted by JM for mechanical attachment of insulation in certain, specific applications. Contact the JM Technical Services Department in these cases.
3. All insulation must be secured to the structural deck with fasteners acceptable to JM at rates published by the insulation manufacturer and recommendations published by Factory Mutual Research Corp. for adhered applications as a minimum standard. Additional fastening may be required to provide an acceptable substrate depending upon actual project conditions.

3.07 Slipsheet Installation

Slipsheet installation shall be in accordance with the appropriate following method:

A. Cross-laminated 6 mil (0.15 mm) polyethylene shall be loosely laid. Lap joints shall be 4" (100 mm) minimum. If installing in windy conditions, install fastener and plate in lap area of slipsheet every 3' (0.92 m) o.c. to prevent displacement.

B. Overlap 9 oz. per sq. yd. (0.30 kg/m^2) polyester fleece a minimum of 4" (100 mm) at each edge. Leave joints untaped. If installing in windy conditions, install fastener and plate in lap area of slipsheet every 3' (0.92 m) o.c. to prevent displacement.

C. The installation of the slipsheet shall be immediately followed by the installation of the roof membrane and fasteners to prevent displacement of the slipsheet.

3.08 Membrane Installation

A. **General**

Unroll the UltraGard PVC roofing membrane and position without stretching. Allow the membrane to relax at least 15 minutes when the temperature is above 60°F (16°C), or 30 minutes when the temperature is below 60°F (16°C), prior to installation. Inspect for any damaged membrane. Remove sections of membrane that are creased or damaged. Lap sheets a minimum of 5" (125 mm), for In-Lap Fastening, leaving space for mechanical fasteners and plates and space for a 1½" (40 mm) minimum weld width. For Disc-Cap and Strip Weld Fastening, laps shall be a minimum 1½" (40 mm) for continuous weld area.

B. **In-Lap Fastening**
1. Perimeter - When installing UltraGard PVC Mechanically Fastened roofing systems, install two perimeter sheets parallel to the perimeter and fastened with UltraGard PVC roofing systems accepted fasteners and plates at the predetermined spacing in the lap area in a line centered approximately 1½" (40 mm) from the edge of the sheet leaving ½" (15 mm) of membrane outside the plate. Weld lap area to metal base flashing continuously a minimum 1½" (40 mm) weld width.

   Perimeter areas shall be determined by the following method:

   For Factory Mutual insured buildings, follow guidelines in the FM Loss Prevention Data Sheet 1-29, i.e., 40% of the roof height or 10% the lesser plan dimension, whichever is less.

   Fasteners shall be supplied and installed in, accordance with these specifications. When installing UltraGard PVC Roofing Membranes, use a minimum of two perimeter sheets.

2. Field Areas
   a. Membrane should run perpendicular to the direction of steel deck flutes and the orientation of wood decks.
   b. All membrane overlaps are recommended to be installed to facilitate the flow of water.
   c. All membrane sheets shall be overlapped a minimum of 5" (125 mm) to provide space for fastener and plate placement and for a continuous minimum 1½" (40 mm) weld width.

C. **Disc Cap and Strip Weld Fastening**
1. To allow for a continuous minimum 1½" (40 mm) wide welded seam, install perimeter sheets and field sheets with a minimum 2" (50 mm) wide lap.
2. The accepted fasteners and plates are fastened through the top of the sheets at predetermined spacing for corner areas, perimeter areas and field areas.
3. Using either a 7" (175 mm) Disc Cap or a continuous 6" (150 mm) wide strip of membrane as a cover over the fastening points, weld 1½" (40 mm) minimum weld width continuously around Disc Cap or on both edges of strip for strip-weld.
4. Use 6" (150 mm) reinforced membrane to strip-in end laps on all UltraGard Plus (Fleece backed) membranes.

D. The roofing contractor shall check all welded seams for continuity and integrity using a rounded screwdriver or other suitable blunt object. Seam checks shall be made daily by the contractor. Sample of seams 2" (50 mm) wide and 12" (300 mm) long shall be taken a minimum of three times a day from completed seams; at least one to be from the first seam made of the day. Each

test cut shall be patched by the contractor at no extra charge to the owner. Test cuts shall be used to determine adequate seam strength on the rooftop by the roofing contractor.

3.09 Welding of Lap Areas

A. **General**
1. UltraGard PVC roofing systems may be welded in two ways, either by solvent welding or by hot air welding, but only hot air welding is acceptable for installing field seams.
2. JM recommends the use of hot-air welding when temperatures are below 40°F (4°C) or when significant moisture is present in amounts that would prevent positive seaming.
3. All surfaces to be welded shall be clean and dry. No adhesive shall be present within the lap areas.

B. **Hot Air Welding**
1. Machines for hot air welding are available from several different sources. Each set of instructions by the manufacturer for use shall be followed, as well as all local codes regarding electric ground ing, supply and other related functions. Since most automatic welding machines require 218 to 230 volts, he use of a portable generator on the roof is recommended for greater flexibility.
2. Hand-held welding machines are also available to weld membrane. After the preheated nozzle tip is applied in the overlap area and the material starts to flow, immediately follow with a hand roller to press the heated membrane surfaces together with slow, even movements. Keep the roller within 1" (25 mm) of the nozzle tip. Angle the hot air tool so that the flowing air faces the roller. The temperature of the hot air tool shall be adjusted so that a minimum of smoke is developed and material from the bottom of the sheet begins to soften and flow from the seam. Seam strength may be tested when cool. For best results, testing seams eight hours after hot air welding is recommended.

C. **Solvent Welding - For Detailing Only**
1. All seam surfaces must be clean and dry. Clean dirty seam surfaces with a dry or damp cotton rag and with a mild detergent and water. Remove any detergent residue. Dry surfaces thoroughly before solvent welding.
2. When hand welding with solvent, evenly coat approximately 16"-18" (400 mm - 450 mm) of seam length with UltraGard PVC Solvent Welding agent, simultaneously pressing down the top sheet to the brush by hand. Ensure that both surfaces to be welded are coated with solvent at the same time. Immediately weight the seam with a sand-filled polyethylene bag. Continue welding along the seams and lift (do not drag) the sand bag from section to section. Testing of the solvent-welded seam should not be accomplished before 24 hours have elapsed.
3. Never solvent weld when air temperatures are below 40°F (4°C) or during excessively high humidity conditions which would cause condensation on the membrane and prevent positive seaming. At temperatures just above 40°F (4°C), pre-heating with hot air may be necessary. Exercise caution when solvent welding on cool mornings as any condensation (dew) on the membrane will prevent a proper weld.
4. The roofing contractor is responsible for determining all local regulations regarding Volatile Organic Compounds (VOCs) and whether UltraGard PVC Solvent Welding Solution is appropriate for use in that specific locale.

D. **Quality Control of Seams**
After either seaming method, the seams are checked for integrity with a blunt-ended probe. Any openings or “fishmouths” shall be repaired with a hand-held hot air tool fitted with a narrow nozzle tip and with a roller. Each day, several sections of seams welded the previous day (if solvent-welding) or the same day if hot air welding, shall be pulled apart by the roofing contractor to test the quality of the welds. Should the welds be deficient, a more thorough examination of the work performed must be carried out and necessary repairs made. UltraGard PVC Seam Sealant is used to seal the membrane edges where reinforcing fabric is cut and exposed and shall be completed by the end of each working day.

3.10 Flashing Installation

A. **Metal Flashing**
1. UltraGard PVC-Clad Metal flashing shall be installed in accordance with UltraGard PVC roofing systems Detail Drawings.
2. Complete all metalwork concurrently with roofing and flashings so that a watertight condition exists daily.
3. UltraGard PVC-Clad Metal transitions are required at all peaks, valleys and slope intersections where the net change in slope exceeds 1½" in 12" (40 mm in 300 mm). In some cases, reinforced membrane may be sufficient for ridges, but should be fastened securely at all transition areas. Contact the JM Technical Services Department for specific recommendations.
4. Metal shall be installed to provide adequate resistance to bending and to allow for normal thermal expansion and contraction.
5. All metal joints shall be watertight and staggered over nailer joints to prevent joints in nailers and joints in metal from aligning.

6. Base flashings shall extend a minimum of 8" (200 mm) above roofing level.
7. All metal flashings and terminations shall be securely fastened in the plane of the roof deck with fasteners recommended by JM.
8. Fasteners and roofing nails used to secure flashings to wood nailers shall be stainless steel, galvanized metal or other corrosion-resistant material, with a head diameter of not less than ⅜" (10 mm), and with fastener penetration into the wood nailer of at least 1½" (40 mm).
9. Scuppers and metal overflows shall be assembled using UltraGard PVC-Clad Metal.
10. All UltraGard PVC-Clad Metal shall be fabricated to form hemmed edges to prevent sharp metal edges from cutting the membrane, except when in conjunction with wood nailers.

B. **Membrane Flashings**

1. All membrane flashings shall be installed concurrently with the roof membrane as the job progresses. Temporary flashings are not allowed without prior written approval from the JM Technical Services Department. Should any water penetrate the new roofing because of incomplete flashings, the affected area shall be removed and replaced at the expense of the contractor.
2. Membrane flashings shall be fully adhered using UltraGard PVC Membrane Adhesive or loosely-laid, secured to 3" (80 mm) UltraGard PVC-Clad Metal strips attached at a maximum spacing of 18" (450 mm) o.c. in the vertical direction.
   a. If the membrane flashings are to be fully adhered using UltraGard PVC Membrane Adhesive, the following conditions must be met.
      1. All surfaces to be fully adhered should be compatible, dry and smooth with no excessive surface roughness. If an existing asphalt surface is present, a ½" (15 mm) minimum plywood or 26 gauge (0.45 mm) minimum galvanized metal asphalt barrier must be placed over the asphaltic surface.
      2. After the proper surface has been prepared, UltraGard PVC Membrane Adhesive shall be applied using a minimum ½" (15 mm) nap paint rollers at a rate of approximately 2½ gallons per 100 square feet (1.0 liters/m²) of surface area depending on the type of substrate. Apply adhesive in smooth, even coatings, avoiding globs, puddles or other types of irregularities.

         Adhesive should be applied to the area of substrate to be flashed. Let adhesive dry sufficiently to produce strings when touched with a dry, clean finger. UltraGard PVC Membrane used as a flashing shall be cut to a workable length and shall have an even coating of UltraGard PVC Membrane Adhesive applied to it at a rate of approximately ½ gallon per 100 square feet (0.2 liters/m²). Carefully roll onto the previously coated substrate, after the adhesive coating the membrane has dried sufficiently as indicated above. Coverage rates will vary depending on substrate and environmental conditions.

         Avoid wrinkling the membrane when applying to substrate. The amount of adhesive which can be successfully applied to the membrane will vary depending on ambient temperatures, humidity and manpower. After mating membrane to the substrate, carefully roll the membrane with a hand roller to promote maximum positive contact between the membrane and the substrate. Overlap all adjacent flashing sheets a minimum of 2" (50 mm). The UltraGard PVC Flashings shall extend a minimum of 6" (150 mm) onto the field sheet and adhered securely, or a minimum of 3" (80 mm) in front of the fastener plates with a minimum 1½" (40 mm) weld width. All side laps shall overlap a minimum of 2" (50 mm) with a minimum 1½" (40 mm) weld width.
3. Areas of the flashing membrane to be welded are not to have UltraGard PVC Membrane Adhesive applied to them.
   a. When loose flashing membranes are used, UltraGard PVC-Clad Metal strips 3" (80 mm) wide must be used to provide positive mechanical attachment to the various substrates. The UltraGard PVC-Clad Metal 3" (80 mm) strip is spaced 18" (450 mm) maximum center-to-center in the vertical direction and is attached horizontally at 12" (300 mm) maximum center-to-center. Wider spacing may be considered depending on substrate and local wind conditions but only if accepted by JM in writing. If existing asphalt is present, use appropriate asphalt barrier. Contact the JM Technical Services Department for recommendations.
   b. All flashings shall extend a minimum of 8" (200 mm) above roofing level.
   c. All flashing shall be solvent welded or hot air welded at their connections with the roofing membrane.
   d. UltraGard PVC membrane flashing shall be terminated according to UltraGard PVC roofing systems Detail Drawings.

3.11 Walkway Installation

Walkways shall be provided in areas where routine rooftop maintenance occurs and in areas where regular rooftop traffic is expected.

A. **UltraGard PVC WBP-100 Heavy-Duty Walkway Installation**
   1. Install UltraGard PVC WBP-100 Heavy-Duty Walkway material over clean, dry surfaces.
   2. Lay out areas where UltraGard PVC WPB-100 Heavy-Duty Walkway material is to be installed with most of the material being oriented so that it is placed between the field seams in maximum lengths of 30' (9.2 m) with each adjacent and abutting section gapped a minimum of 6" (150 mm).
   3. Solvent weld or heat weld (minimum 1½" [40 mm] wide weld) the perimeter of the properly positioned UltraGard PVC WBP-100 Heavy-Duty Walkway Material. Check seams for any voids or inconsistencies which might prevent watertightness.
   4. Apply seam sealant at all welded edges.

B. **Precast Pavers**
   1. Install the precast concrete paver system acceptable to JM over one layer of 9 oz. per sq. yd. (0.30 kg/m^2) polyester fleece or other acceptable protection layer.

3.12 Waterstops

A. Install temporary cutoffs around incomplete edges of the roofing assembly at the end of each work day and when work must be postponed because of inclement weather. Straighten the insulation line using pieces of insulation loosely laid, and seal the UltraGard PVC roofing systems sheet membrane to the deck or existing membrane. Use a heavy application of roof cement or hot asphalt at least 6" (150 mm) in width overlayed with an embedded reinforcement. Remove the temporary seals completely when work resumes, cutting out the contaminated membrane. Remove all sealant, contaminated membrane, insulation fillers, etc. from the work area and properly dispose off-site.

3.13 Maintenance

A. Long-term performance of a roofing system depends on adequate ongoing maintenance programs. JM requires building owners establish regularly scheduled annual inspections to ascertain the condition of the roof system and to perform those maintenance items required to keep the roof system performing properly. Records of all maintenance work performed must be retained for the entire warranty period. Please consult JM for specific recommendations.

Fastening Patterns

Mechanically Attached Corner & Perimeter Design Recommendations

In the roof corners and perimeter the distance between **rows of roof cover** fasteners or batten bars should be the following maximum percentages of the Approved spacing. These reduced spacings are used in all Approval classifications:

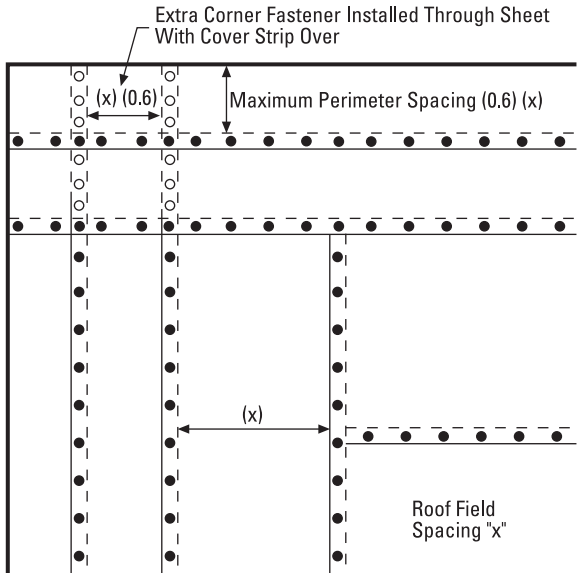
Roof Perimeter: Distance between rows is ≤ 60% of the Approved roof field spacing.

Roof Corners: Distance between rows is ≤ 40% of the Approved roof field spacing. An alternative for Class 1-90 and below is to install perimeter fastener rows (60% of roof field as above) in **both** directions in the corners. Refer to Figure 7. When the cover overlaps in the corner areas, these fasteners should be installed from above the uppermost cover layer.

- For membranes fastened along the side laps:

Increased fastening density is obtained by using narrower sheets, or intermediate rows of fasteners installed through the sheet with a cover strip applied over the fasteners. Fastening increase is **not** obtained by increasing the number of fasteners along each row. See Example 1.

- An alternative is to install the Approved fully adhered version of the single-ply membrane (provided one exists) in the corners and perimeter. A termination (batten) bar must be provided at the junction of the adhered and mechanically fastened areas, and fastened 6 in. (152 mm) on center with the same screws used to secure the roof cover. The number of **insulation** fasteners in the adhered areas should be increased over the Approved roof field spacing for the adhered membrane system. See Example 2.



Notes:

1. Fastener spacing along all rows is the same as field spacing.
2. If two layers of membrane are installed in the corner areas, all fasteners must secure the top layer.

Example 1: A batten-attached system with Approved fastener spacing for Class 1-60 of rows 6 ft (1.8 m) on center and screws 6 in. (152 mm) on center would use 3.6 ft (1.1 m) maximum on center row spacing, with 6 in. (152 mm) on-center screw spacing in the perimeter and 2.4 ft (0.7 m) maximum on-center row spacing with 6 in. (152 mm) on-center screw spacing in the corners. An option would be to use row spacing of 3.6 ft (1.1 m) maximum in both directions in the corners per figure below.

Example 2: A batten-attached system with Approved fastener spacing for Class 1-90 of rows 5 ft (1.8 m) on-center and screws 6 in. (152 mm) on-center. The same system is Approved when adhered to the insulation with the insulation fastened at 1 per 2 ft^2 (0.2 m^2). The insulation at the perimeter would need 1 fastener per 1.33 ft^2 (0.13 m^2) (50% increase) and 1 fastener per 1.14 ft^2 (0.11 m^2) (75% increase) in the corners. A termination (batten bar) is needed at the junction of the adhered and mechanically fastened areas.