



SECTION 1 – GENERAL REQUIREMENTS

Part 1 WARRANTY

1.0 WARRANTY PROGRAM

- A. IB Roof Systems offers a variety of premium material and roof system warranties designed to meet the building owner's needs and requirements. Available warranties include our various material warranties or our premium Total System Warranty for both residential and commercial projects. Our roofing products are available through a nationwide network of experienced, independent IB Authorized Applicators who sell and install IB materials. IB provides training and technical support to these firms who operate and remain wholly independent from IB Roof Systems. IB assumes no responsibility for representations, warranties, errors, or omissions made by those other than IB authorized personnel.
- B. Warranties for IB products and roof system installations are available only when installed by an IB Authorized Applicator in accordance with IB Specifications, Construction Details, and the requirements of our Warranty Program; and upon payment in full of all labor and materials supplied in connection with the IB Roof Systems installation. Certain warranties offered by IB Roof Systems require payment of a warranty fee and are subject to approval and visual inspection by IB Technical Services for completion in accordance with IB warranty program requirements. All Total System Warranty projects require the submittal of an IB Notice of Award for review and approval prior to project start.
- C. Roof assemblies and systems not contained in this Manual may be eligible for issuance of an IB warranty only when approved in writing by an IB Technical Services Manager. Changes, additions, or alterations of IB specifications, installation requirements, approved materials, construction details or warranty terms and conditions require written approval of an authorized IB Technical Services Manager. For additional information on IB's Warranty Program, refer to the Warranty Information Section of this Manual.

1.1 IB ROOF SYSTEMS INSTALLATION

- A. IB TPO Roof Systems are eligible for issuance of an IB Roof Systems Warranty upon installation in accordance with IB TPO Specifications and Warranty Program by an IB Authorized Applicator. Selection of an IB roof assembly to meet project design requirements is the responsibility of the building owner, design professional and roofing contractor.
- B. IB TPO Roof Systems provides project and contractor assistance through a qualified team of Field Technical and Sales Representatives. Additional online and telephone support is available during regular business hours Monday through Friday on our Technical Help Line and covers all applications of IB TPO membranes and IB supplied components.

1.2 GENERAL POLICIES

- A. This Manual contains the most recent and relevant information we have relating to the application of IB (IBRS) Roofing Systems and is based on our years of experience in the roofing industry. They have been prepared and are offered as a general guide to assist architects, consultants, engineers, roofing contractors, and owners in the design and application of roofing systems.
- B. IB Roof Systems does not practice engineering, design, or architecture. Neither the issuance of these guidelines, nor the review of any building construction, nor the inspection of roof plans by IBRS representatives shall constitute any warranty by IBRS of such plans, specifications, and construction, nor in any way constitute any acceptance by IBRS of same.
- C. The design responsibility remains with the architect, consultant, engineer, roofing contractor or owner. The construction details illustrated and described herein are furnished solely for guidance purposes and are provided for consideration by the designer and/or the roofing contractor. These guidelines should not be construed as being all-inclusive, nor should they be considered as a substitute for good roofing design and application practices.
- D. IBRS will, under no circumstances, accept responsibility for the performance of its products when damage results from such things as improper building design, construction faults, or defects in workmanship. IBRS does not manufacture roof decks and is not responsible for their performance.
- E. All IBRS products are asbestos free. Under no circumstances shall IBRS have any liability for expenses arising out of or associated with the pre-existing presence of asbestos-containing materials or any other allegedly hazardous substance or material upon the roof to which the new IBRS roofing system is being applied.

- F. IBRS membranes are manufactured within customary industry tolerances. The dimensions and specifications indicated in this Manual for IBRS' membranes are averages in accordance with related standard practice.
- G. IBRS reserves the right to change or modify, at its discretion and without prior notice, the physical properties and characteristics of its products and application specifications, warranty terms and/or policies contained herein. Please contact the IB Technical Services department with any specific concerns.
- H. The IBRS Membrane System as described in IB Material Warranties does not include, among other things, roof deck, vapor barrier/retarder, thermal insulation / cover boards, adhesives, fastening components, support blocking, roof curbs or penetrations, separation sheets, roof accessories, metal work or metal terminations.
- I. The IBRS Roof System as described in IB Total System Warranty does not include, among other things, roof deck, vapor barrier/retarder, insulation not sold by IBRS, or roof accessories, support blocking, roof curbs or penetrations, metal work, or metal terminations not sold by IBRS.
- J. Good workmanship is essential in applying any roof system; therefore, qualified supervision of the roof application should be exercised. The roofing contractor has the sole responsibility for the quality of the application of the IB roof system.
- K. General Requirements, including Design and Safety Considerations and Warnings, and Installation Requirements are a part of and must be used in conjunction with all IBRS system specifications.
- L. IBRS Material Warranties are available only when the IB membrane is installed in accordance with the terms and conditions set forth in this Manual, and by an IBRS Authorized Applicator.
- M. IBRS Total System Warranties are available only when the IB roof system is installed in accordance with the terms and conditions set forth in this Manual, and by an IBRS Authorized Applicator of applicable status.
- N. IBRS reserves the right to refuse to make available our Warranty on projects which are not acceptable to IB Roof Systems, Inc., or where job site conditions or procedures used do not comply with IBRS's published requirements.
- O. Refer to the IB Warranty Program for additional Warranty requirements.
- P. IBRS will not write any letters regarding the installation or application of a roofing system that is not to be covered by an IB Total System Warranty, nor will it write a letter regarding information that is not published in this Application and Specification Manual or other IB product literature.
- Q. Unless otherwise informed in writing by the IBRS Technical Services Manager, only the materials and procedures referenced in this Manual are to be employed in the application of IBRS's roofing systems, including flashing details. The use or misuse of any materials and methods not approved by IB Roof Systems, Inc. is in no way the responsibility of IBRS.
- R. No IBRS Warranty will be valid regardless of issuance, when the IBRS membrane has been installed over the following:
 - 1. Cold Storage buildings without proper vapor seals
 - 2. Heated Tanks
 - 3. Structures within US or globally sanctioned countries
 - 4. Structures with conduit or piping installed between the roof deck and the roof membrane
 - 5. Thermal insulations not approved or deemed incompatible by IB Roof Systems
 - 6. Lightweight insulating concrete (LWIC) unless venting is provided in accordance with IB Roof Systems, Inc. specifications
 - 7. Recovering over any existing roofing system containing moisture and/or improperly prepared surface
 - 8. Any surface which is not readily accessible for inspection or where access to IB Roof Systems is denied
 - 9. Plywood decks or oriented strand board sheathing (OSB) of 7/16" (11 mm) thickness without continuous solid end blocking
 - 10. Structures with high interior humidity conditions
 - 11. Any surface containing asbestos
 - 12. Any system containing Cold Tar Pitch unless appropriate separation layers and vapor seals have been incorporated
 - 13. Any system containing sprayed polyurethane foam insulation and/or existing sprayed foam (PUF) roof assemblies
 - 14. Areas that pond water (refer to NRCA definition for ponding water)
 - 15. Interior gutter systems
- S. IBRS does not use or maintain the building's owner's roof, and it is not responsible for its routine maintenance and care. IBRS is not responsible for consequential damages in case of roof system failure.
- T. IBRS has no control over or responsibility for a building's contents, type, quantity, positioning, or protection.
- U. Information contained in this Manual is presented in good faith and to the best of IB Roof System's knowledge does not infringe upon any patents, foreign or domestic.
- V. IBRS reserves the right to change or modify, at its discretion, and without prior notice, any of the information, requirements, specifications, or policies contained herein. This Manual supersedes all catalogs and previous manuals.



1.3 STATEMENT OF WARRANTY AND LIMITATION OF LIABILITY

LIMITED PRODUCT WARRANTY

THE FOLLOWING PRODUCT WARRANTY IS APPLICABLE FOR THIS PRODUCT UNLESS AN IB LIMITED MATERIAL WARRANTY OR IB TOTAL SYSTEM WARRANTY IS ISSUED IN LIEU OF THIS LIMITED PRODUCT WARRANTY. IB Roof Systems, (“IBRS”), warrants that, subject to the terms, conditions, and limitations below, the IB TPO (“Product”) will not leak as the result of a product manufacturing defect for a period of twelve (12) months from the date of purchase if applied by an IBRS authorized applicator in conformance to IBRS specifications. THIS WARRANTY SUPERSEDES AND REPLACES ALL OTHER EXPRESSED (WRITTEN OR ORAL) AND IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE, ALL OF WHICH ARE HEREBY EXPRESSLY DISCLAIMED. THIS WARRANTY IS THE OWNER’S SOLE AND EXCLUSIVE REMEDY. IBRS SHALL NOT BE LIABLE UNDER ANY THEORY OF LAW OR EQUITY (INCLUDING BUT NOT LIMITED TO NEGLIGENCE, BREACH OF WARRANTY OR STRICT LIABILITY) FOR ANY GENERAL, SPECIAL CONSEQUENTIAL, INCIDENTAL OR OTHER DAMAGES OF ANY KIND, INCLUDING BUT NOT LIMITED TO LOST PROFITS, INJURY OR DAMAGE TO ANY BUILDING OR STRUCTURE, ITS CONTENTS, OR ANY PERSON DUE TO ANY CAUSE, INCLUDING WITHOUT LIMITATION PRODUCT FAILURE, LEAKS, MOISTURE, CONDENSATION, MOLD, ORGANISMS, CHANGE IN APPEARANCE, LOSS OF REFLECTIVITY, VAPOR OR ODORS. Inspection(s) (if any) of the installation or condition of a roof are solely for IBRS’ information and convenience, and any such inspection(s) shall not create any additional duty, liability, or warranty by IBRS, express or implied, nor any additional remedy for the Owner or any other person. The owner is solely responsible for the investigation and remedy of any non-covered leaks or conditions. This Warranty is governed by the laws of the State of Texas. Purchase of the IB TPO constitutes irrevocable consent to exclusive jurisdiction and venue in state or federal courts in Dallas or Tarrant County, Texas in all disputes against IBRS arising out of or relating to the purchase, use or warranty of this product. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, OR LIMITATION OR EXCLUSION OF IMPLIED WARRANTIES, SO THESE EXCLUSIONS AND LIMITATIONS MAY NOT APPLY TO YOU. NO REPRESENTATIVE, EMPLOYEE, OR AGENT OF IBRS IS AUTHORIZED TO MODIFY THIS WARRANTY except in writing as authorized by IBRS’ Technical Services Director.

Part 2 GENERAL BUILDING DESIGN

2.0 BUILDING DESIGN / USE

- A. IB roof systems are designed for use over a large variety of commercial, educational, industrial, and residential building structures.
- B. The choice of a particular installation method is influenced by specific project conditions including size, height, roof slope, roof deck construction, accessibility, fire/safety/code considerations and site sensitivity and climatic conditions. Design and selection of an appropriate IB roof assembly requires careful consideration of building design criteria, construction, occupancy and use, location, environmental elements, and applicable building codes by a qualified design professional. IB Roof Systems does not practice architecture or perform engineering. The responsibility for selection and design of the roof assembly, supporting structure and building envelope remains with others and not IB Roof Systems. Not every published specification is suitable for every project condition; therefore, proper consideration must be given before selecting a particular roofing product, specification and/or installation method for each individual project.
- C. The roofing assembly is an integral part of the building envelope and requires integration with building structural components, cladding, fixtures, equipment, and other envelope components for proper performance. The building owner, design professional and contractor should review project design criteria, existing conditions, anticipated roof use and exposures to confirm compatibility of materials and suitability for use on a particular project.
- D. The installation of an IB roof system must often meet certain regulatory and building owner insurance requirements (state or local code, FM, UL, etc.) and the minimum warranty requirements of IBRS. When conflicts arise, the regulatory requirements prevail unless the IB product or construction exceeds the requirements of the regulatory code. If an apparent conflict exists between the regulatory code and IBRS requirements, IB Technical Services should be contacted to avoid potential problems.
- E. Ensure the roof deck, walls, wood nailers, and substrates are structurally sound, securely attached, capable of supporting required loads and suitable for installation of an IB roof system. Do not install IB roof assemblies over unsound or non-approved substrates.

2.1 SPECIALIZED BUILDING CONSTRUCTIONS

- A. IB TPO Roof assemblies may be selected for use over properly designed unique or special purpose building constructions such as hangars, arenas, cold storage facilities, pools, and plaza decks. Prior to installation a thorough review of the selected roof assembly and construction details should be performed to address design conditions presented by structures containing elevated levels of internal moisture or humidity, those subject to unusually hot or cold interior/exterior temperatures, structures with elevated external or internal pressure conditions, unusual environmental or operational exposures, and those incorporating use of the roof as a walking deck, vegetative roof or a substrate for specialized equipment or overburdens such as photovoltaic solar arrays.
- B. Installation requirements may include the incorporation of vapor and air barriers, alternate thermal insulations, additional ventilation, supplemental fastening and installation of approved protection or overburden components.
- C. Warranted roof installations involving specialized constructions require prior written approval by an IB Roof Systems Technical Services Manager. Contact IB Roof Systems for assistance with projects incorporating these and other similar design requirements.

2.2 SUBSTRATE INFORMATION – GENERAL

- A. IB roof assemblies may be installed over a large variety of standard roof decks and substrates. Acceptable substrates must withstand all applicable design loads required by the authority having jurisdiction including those imposed during new, reroofing or recover roof construction and service or maintenance activities.
- B. Roof decks and substrates must be smooth, clean, and dry without depressions, offsets or excessive gaps between units or intersections with vertical walls and penetrations. Gaps or cracks greater than 1/4" (6.3 mm) must be filled with a compatible repair material. A design professional should be consulted for modifications to the existing structure.
- C. Responsibility for the condition, performance, attachment and suitability of the roof deck, walls, structural members, framing, nailers, cladding, and other building components remain with the building owner.
- D. Decks and substrates approved to receive IB roofing materials must be free of defects, excessive moisture content, inadequate attachment, deflection, settling, rust, loss of structural integrity, excessive movement, or improper design. Defects should be reported to the building owner or their representative immediately for corrective action.
- E. Engineering evaluation and/or field testing to determine roof system fastener withdrawal resistance, attachment performance of selected roof assembly adhesives, uplift resistance of existing roof assembly, and moisture content of substrates and/or existing roof assemblies is strongly recommended prior to the start of work and may be required by IB Roof Systems for issuance of our warranties.
 - 1. Pull tests to confirm fastener withdrawal resistance into various substrates should be conducted in accordance with ANSI / SPRI FX-1.
 - 2. Insulation adhesive testing to confirm adequacy of attachment of insulation to various substrates should be conducted in accordance with ANSI / SPRI IA-1.
 - 3. Surface moisture testing of structural concrete roof decks should be tested in accordance with ASTM D4263 plastic sheet method.
 - 4. Moisture scans to locate areas of elevated moisture content in existing roof assemblies and substrates can be conducted through nuclear, infrared and capacitance type roof surveys. Areas indicating potential moisture content should be reviewed and confirmed, with any wet areas removed prior to the installation of new roofing materials.
 - 5. Visual survey and inspection of all substrates, deck and structural support components and existing conditions are recommended prior to the start of roofing work.

2.3 DRAINAGE

- A. Proper control and design of the roof drainage system is the responsibility of the Owner and design professional, respectively.
- B. Roof decks should be designed and constructed to provide adequate drainage. Steep slope roof assemblies typically drain over perimeter roof edges or into external or interior gutters. Low slope roof decks commonly utilize both perimeter edge drainage and interior drainage by means of primary and secondary drainage outlets.

- C. Specific project drainage requirements depend on a variety of factors including building design, roof deck and perimeter edge design, building location, historical maximum rainfall rates, building storm water drainage system design and local code requirements.
- D. Building codes require the provision of positive slope in the roof assembly to facilitate roof drainage and direct water runoff into an approved storm water drainage system.
- E. Retrofit and replacement roof installations should include a review by the building owner, project designer and roofing contractor of the existing roof drainage system, its condition, performance, and applicable local code requirements. System upgrades such as provision for additional primary or secondary roof drains and overflow outlets, or the enlargement of existing roof drains, outlets and associated storm water piping should be coordinated with the scope of roof work.
- F. TPO roof systems by IB are designed for use with the following types of roof drains, outlets, and perimeter edge details:
 - 1. Cast iron roof and overflow drains with integral clamping rings.
 - 2. IB supplied spun aluminum drains with IB TPO flashings.
 - 3. Sheet metal scuppers constructed with IB TPO clad flashing metal or designed for use with IB TPO flashings.
 - 4. Approved IB Edge Details constructed with IB TPO clad flashing metals, IB Termination Bar, or approved IB 2-Piece Edge or Fascia Details with Kynar coated metal.
- G. In some circumstances, copper or stainless or other non-clad metal may be desired at roof drains, outlets, and perimeter edge details. While the use of generic non-clad flashing metal or other non-clad metal flashings/terminations may be utilized, these are not considered part of the IB Roof System. This includes but is not limited to:
 - 1. Non-IB aluminum, copper, or stainless-steel flashing or metal.
 - 2. Plastic roof drains
 - 3. Non-IB sheet metal scuppers.
 - 4. Other pre-manufactured metal fascia, 2-piece edge metal or flashings which are not sold by IB Roof Systems.

2.4 VAPOR RETARDERS

- A. Proper design and control of the flow of air and moisture vapor through the building envelope are the responsibility of the building owner and design professional. IB recommends vapor flow calculation considering specific building construction, occupancy, and climatic conditions to determine the need and requirements for a vapor retarder within the assembly.
- B. The lack of adequate moisture vapor control can result in the accumulation of moisture within the roofing assembly. Consideration of vapor flow and dew point conditions should be undertaken during initial project design and upon subsequent modifications or changes to the building envelope, building use or occupancy. Reroofing and recover roof replacements can alter existing vapor flow conditions and should be reviewed by the building owner with their selected design professional or roofing contractor. The review should include evaluation of the need for a vapor retarder or maintenance of an existing assembly, the provision of additional thermal insulation or ventilation, the effect of any added components such as radiant or air barriers, and other work necessary to avoid condensation or moisture build-up within or below the roofing assembly.
- C. Consideration for vapor control must be included as part of modification of the underlying construction, occupancy, and use of the interior conditions to ensure it does not negatively impact the performance of the roof/re-roof assembly.
- D. Vapor Retarder Installation
 - 1. Vapor retarders installed to control moisture vapor flow through the ceiling-deck-roof assembly may be used in conjunction with IB roof systems as components of the building envelope. As separate building components, vapor retarder type and construction must be compatible with the selected IB roof assembly and installation requirements and the requirements of the vapor retarder materials manufacturer.
 - 2. Materials used as vapor retarders are classified according to their specific perm rating or permeance for the rate of vapor transmission. Project designers should consider the specific perm rating required by local code and applicable construction to provide adequate moisture vapor control for a structure's vapor flow conditions. Typical classification by perm ratings.
 - a. Class I: Less than or equal to 0.1 Perm
 - b. Class II: 0.1 to 1.0 Perm
 - c. Class III: 1.0 to 10 Perm

3. When used, vapor retarders should be located on the warm side of the assembly installed to the structural deck, over an approved thermal barrier, separation sheet or minimal layer of approved IB insulation.
4. Vapor retarders require careful detailing at side and end laps, perimeter edge and wall terminations, penetrations, flashings, and openings in the roof to establish a continuous seal and prevent unplanned moisture vapor intrusion into the roof assembly. Use only manufacturer recommended adhesives and accessories.

2.5 THERMAL BARRIERS / FIRE SHEETS

- A. Thermal barriers can be utilized over a variety of combustible and non-combustible roof deck constructions to enhance the fire resistance of a roofing assembly. Roof assemblies are classified as Class A, B, or C tested in accordance with UL 790 or ASTM E108.
- B. IB Fire Sheet 10 is a fire-resistant thermal barrier separation sheets that may be used directly over combustible roof decks, over layers of thermal insulation or as a separation sheet over an existing roof assembly to enhance overall fire resistance of select IB roof assemblies.
- C. Select IB roof assemblies may also utilize layers of approved moisture resistant gypsum cover boards, fire-rated gypsum sheathing boards, and moisture resistant cement boards above the deck and below the IB roof membrane for specific fire rated constructions.
- D. IB Fire Sheets and thermal barrier boards shall be installed in accordance with IB specifications and the requirements of the applicable fire rated construction.

2.6 SEPARATION SHEETS

- A. Application of IB roof assemblies over certain structural decks, thermal insulations or existing roof assemblies may require separation through the installation of an approved Atlas Fire Sheet 10, IB Separator Sheet, IB Poly Separator Sheet, IB HD Poly Separator Sheet, an HDPE sheet or similar IB approved protection membrane; or by means of an approved IB insulation or cover board.
- B. These separation components shall be installed in accordance with IB specifications and the applicable requirements.

2.7 EXPANSION JOINTS

- A. Expansion joints located on the roof deck are designed to relieve movement occurring within building components and reduce stresses that could adversely affect the roof assembly. Coordination is required to ensure roof deck expansion joints are integrated into building structural control and expansion joints and are properly flashed. Determination of expansion joint need, placement and design are the responsibility of the project designer and building owner.
 1. Typical expansion joint locations may include:
 - a. At decking material changes or changes in the direction of structural framing
 - b. Where wings of a building structure join such as T, U, I, L, or similarly shaped structures.
 - c. Where structural control and expansion joints in the building structure assembly occur
 - d. At intersections of building additions to existing structures
 - e. Where differential movement conditions exist at wall to roof intersections
 - f. Where differential interior conditions intersect within the building envelope, such as conditioned to non-condition space or at cold storage areas.
 2. Roof expansion joint details should be constructed with curbs set 8" (20.3 cm) or more above the roof or installed with an approved IB TPO Low Profile Expansion Joint detail directly to the roof surface.
 3. Expansion joints should be set in a continuous line extending fully through the edge of the roof with approved wood nailers secured along both sides of the joint.
 4. Temporary construction ties at expansion joints must be removed. Do not install roof insulation or membrane materials directly across joint openings without consideration for joint movement and stress.
 5. Provide watertight detailing and functional integration of the expansion joint with other roof flashings and termination details at expansion joint terminations, intersections, and closures.
 6. Protection of the finished roof assembly is recommended with expansion joint cross-over access installed at walkways and where service work is expected to reduce the potential for foot traffic and equipment damage.

7. Avoid expansion joint construction and placement that restricts or prevents the free flow of water to outlets. Do not block or intersect drainage outlets and valley lines or attempt to route roof drainage over an installed expansion joint.

2.8 AREA DIVIDERS

- A. Area dividers are commonly used to separate sections of a roof. Common uses include segmentation of large roof areas, separation of dissimilar roof assemblies, and separation of existing left in place roof sections from new roof areas during reroofing. They are not suitable for use as expansion or structural control joints.
- B. Typical construction consists of a raised curb secured to the structural roof deck providing 8" (20.3 cm) or more vertical height above the finished roof with standard IB TPO Base Flashing Detail. The roof drainage plan should include adequate provisions for drainage and avoid the blockage or restriction of water runoff to drains and outlets.
- C. Where the same or compatible IB roof membranes are utilized in new construction, low profile area dividers installed in accordance with IB specifications may be used between roof sections.
- D. Area dividers commonly receive either a sheet metal cap or are fully covered with IB membrane.

2.9 WOOD NAILERS

- A. Wood nailers and blocking are considered part of the building structure and are not part of the IB Roof System or IB Warranty. Nailers and dimensional blocking must be securely attached to resist the required loads and provided in accordance with project plans and IB Roof Systems Construction Details.
- B. Nailers and wood blocking should be constructed from #2 or better, kiln-dried dimensional lumber with nailers installed to match the thickness of installed roof insulation. Nailer width should extend 1/2" (13 mm) beyond the back edge of perimeter edge metal flange. Secure nailers and blocking to building structural members, deck and / or walls to withstand the calculated wind and other design loads. IB Roof Systems recommends the use of non-treated lumber where suitable in accordance with project design criteria and exposure.
- C. Consideration should be given to the selection of appropriate type and corrosion resistance performance of fasteners and anchors for specific applications and exposures. Treated lumber using compounds such as Alkaline Copper Quaternary (ACQ), Copper Boron Azole (CA-B) or similar copper-based wood preservatives exhibit higher rates of corrosion in fasteners and metal, particularly when exposed to moisture and / or elevated humidity conditions. Contact IB Roof Systems Technical Services for specific compatibility of IB TPO membranes with various preservative treatments.
 1. Use stainless steel fasteners and anchors for copper based treated nailer or blocking installations exposed to elevated levels of moisture or elevated humidity conditions.
 2. Standard e-coated fasteners and anchors meeting the requirements of FM Approval Standard 4470 are acceptable for non-exposed, dry applications.
 3. Areas of nailer / blocking contact with incompatible or moisture bearing materials and substrates should receive a suitable separation layer or protective sealant.
- D. Nailers along perimeter edges, corner regions and top of parapet walls should be designed and installed to resist calculated wind loads in accordance with ANSI / SPRI ES-1 and local building code requirements. Corner area securement should be increased by a factor of two or more as required to enhance wind resistance in these areas of heightened uplift pressures. For FM insured projects, refer to FM Loss Prevention Data Sheet 1-49 for wood nailer securement design.
- E. Nailers should be secured with corrosion resistant anchor bolts or fasteners with integral heads or through washers sufficient to resist pull through or back-out; approved for the specific substrate to which they are attached. Space fasteners a maximum of 24" (61 cm) oc. with at least three (3) fasteners per nailer, depending on nailer length. Each fastener must resist a minimum pull-out force of 200 lbs. ft (298 kg/m) in any direction or the design load, whichever is greater. Reduce spacing by half or 6" (15.2 cm) oc. or less at corner regions. Fastener heads must be countersunk below nailer top surface.
- F. Where two or more nailers are required, attach the second nailer to first sufficient to resist design loads with corrosion resistant fasteners installed a minimum of 12" (30.5 cm) oc. staggered and 6" (30.5 cm) oc. staggered within corner areas.
- G. Retrofit Metal Decks: Nailers shall be installed in two or more layers to match the total height of flute filler and recover insulation. The base nailer shall be set between and match height of existing standing seams / ribs, fastened a maximum of 12" (30.5 cm) oc. with a minimum of two fasteners between each rib. Fasteners should be installed through the metal deck and into structural steel or wood framing beneath. The top nailer must be set above the height of metal ribs and provide a continuous, smooth nailing surface.

Part 3 THERMAL ROOF INSULATION AND SUBSTRATES

3.0 ROOF INSULATION

A. General

1. IB roof assemblies may be installed over a variety of insulated and non-insulated roof decks. The amount, type and location of thermal insulation used above or below the roof deck is typically determined by building design, location, intended use, applicable building codes and specific project design criteria.
2. IB Energy Board polyisocyanurate, EPS, XPS, and composite roof board insulations are available in various thicknesses in both flat and tapered board stock. Determination of required thickness of insulation to meet specific thermal resistance values should consider the insulation LTTR value, applicable building codes, and the basis of project design for minimum total U-value and/or minimum insulation R-value as an assembly component.
3. IB supplied water-resistant gypsum cover boards, water-resistant cement boards, and high-density polyisocyanurate cover boards are available in various thicknesses as non-tapered board stock. They are used within IB roof assemblies above or below primary thermal insulation boards, and within recover roof assemblies as separation layers from existing substrates and membranes.
4. Installation of IB membranes over expanded (EPS) or extruded (XPS) polystyrene insulations require separation of the membrane, flashing rolls and IB manufactured flexible flashings from direct contact with these insulation materials with an IB approved cover board insulation.
5. IB roof membranes are designed for installation only over approved insulations. Sprayed polyurethane foam insulation and/or existing sprayed foam (PUF) roof assemblies are not approved as substrates for an IB roof assembly.
6. Insulation materials not supplied by IB Roof Systems are not part of the IB Roof System. Non-IB supplied materials may be used as a non-warranted component within an IB roof assembly only upon prior review and written approval by an IB Technical Services Manager.
7. Roof assemblies incorporating air or vapor barriers require review by the building owner and project designer to ensure sufficient insulation is installed above the barrier layer to prevent moisture vapor condensation below it.
8. Recover assemblies with additional insulation can change the location of the dew point within the roof construction. Existing roof systems left in place may function as a vapor barrier or retarder within the new recover assembly and are a potential source of moisture. Damage from moisture entrapment and condensation can occur if moisture is present in the existing roof assembly or deck, or where moisture vapor is allowed to migrate through the existing assembly and into the new roof.
9. Air and vapor barriers require effective termination and sealing throughout the field of roof and at terminations, edges, and penetrations to prevent air intrusion and moisture vapor from entering the roof assembly.
10. Wind uplift approvals and fire resistance ratings for insulated IB roof assemblies can include required minimum and maximum thicknesses. IB recommends the project designer review applicable IB listings and code approvals for information on allowable thicknesses that meet project design requirements.

3.1 APPROVED ROOF INSULATIONS

- A. Polyisocyanurate: Rigid flat board stock or tapered polyisocyanurate foam insulation with integral non-asphaltic fiber-reinforced felt or coated inorganic fiberglass facers laminated to both sides.
1. IB Energy Board II: ASTM C1289, Type II, Class 1, Grade 2 (20 psi), (1.4 kg/cm); or Grade 3 (25 psi), (1.8 kg/cm)
 2. IB Energy Board III: ASTM C1289, Type II, Class 2, Grade 2 (20 psi) (1.4 kg/cm); or Grade 3 (25 psi), (1.8 kg/cm)
 3. IB Recover Energy Board III: ASTM C1289, Type II, Class 1, Grade 2 (20 psi) (1.4 kg/cm); or Grade 3 (25 psi), (1.8 kg/cm)
 4. IB HD ISO: ASTM C1289, Type II, Class 4, Grade 1, 80 psi (min.), (5.6 kg/cm); or 110 psi (7.7 kg/cm) compressive strength. High-density polyisocyanurate foam core with coated glass facers.
- B. Expanded Polystyrene (EPS): Rigid, closed cell expanded polystyrene foam flat or tapered insulation board stock conforming with the requirements of ASTM C578, Types I, II, VIII or IX as required by IB specification.
1. EPS: ASTM C578 Type VIII, nominal density of 1.25 pcf; Compressive Strength: 13 psi (0.9 kg/cm)
 2. EPS: ASTM C578 Type II, nominal density of 1.5 pcf; Compressive Strength: 15 psi (1.0 kg/cm)
 3. EPS: ASTM C578 Type IX, nominal density of 2.0 pcf; Compressive Strength: 25 psi (1.8 kg/cm)
- Note: EPS insulation requires use of approved cover board or non-polystyrene insulation board as top layer.

Note: Certain applications of direct fastened or adhered installation may require minimum nominal density of 1.5 pcf or greater. Applications, where fastening through a cover board are incorporated, may permit a nominal density of 1.25 pcf or less.

4. EPS Flute Fill: ASTM C578 Type I nominal density of 1.0 pcf or greater. Available with square cut, tapered cut, or panel profile design. Intended to be loose laid or simultaneously fastened with an approved cover board.
- C. Extruded Polystyrene (XPS) roof insulation; Rigid, closed cell, flat, or tapered extruded polystyrene foam insulation with integral formed skin or planed exterior faces, conforming to the requirements of ASTM C578, Type IV; nominal minimum compressive strength of 25 psi (1.8 kg/cm).
Note: Requires use of approved cover board or non-polystyrene insulation board as top layer.
- D. Gypsum Roof Board: Moisture-resistant, gypsum roof boards in various thicknesses with integral water-resistant cores available in un-faced, fiberglass faced or primed fiberglass facer formats conforming to the requirements of ASTM C1177 or C1278.
- E. Cement Board: Moisture-resistant, cement roof boards in various thicknesses with integral water-resistant cores available in un-faced, fiberglass faced or primed fiberglass facer formats conforming to the requirements of ASTM C1325.

3.2 INSULATION APPLICATION

- A. Storage and Handling
 1. Maintain all insulation materials in a weather-protected, ventilated environment. Keep clear of the ground secured against wind, moisture, and damage.
 2. Prevent condensation beneath product packaging, coverings and temporary plastic shipping wrappers or shrouds by removing, opening and/or covering materials with breathable tarpaulins.
 3. Do not leave insulation materials exposed to ultraviolet rays or inclement weather. Install only as much insulation as will be roofed with membrane and sealed against weather before the end of each day's work.
 4. Avoid storage of materials on-site or on the roof during extended periods of inclement weather. Secure all materials stored on the roof against wind damage and exposure to the elements.
 5. Do not use materials that become damaged or wet, contain visible defects or do not comply with IB specifications and requirements.
 6. Follow all rooftop safety guidelines and practices when handling insulation boards on the roof. Additional precautions should be taken when working near the edges of the roof and at openings when handling insulation boards, particularly where windy conditions exist or in areas subject to gusts.
- B. General Insulation Application Guidelines
 1. The roof deck shall be smooth, free of debris, clean, dry, and securely attached. Do not install materials over wet or frozen substrates. Openings, projections, curbs, and fixtures should be in place prior to the start of work.
 2. Conduits should be run above the completed roof assembly supported in accordance with IB approved pipe support details. Do not cut insulation boards for conduit placement on the deck or within the roofing assembly. Inspect the underside of the roof deck for location of below deck conduit, piping or equipment that might be located where fastening of the roof insulation, membrane and flashings may occur.
 3. Do not install warped or curled insulation boards. Set insulation over the substrate with board edges fitted uniformly and closely together. Do not kick into place. Avoid joints or gaps greater than 1/4" (6.3 mm) and fill gaps which are greater than 1/4" (6.3 mm) with matching insulation material.
 4. Over approved steel decks, install insulation with long dimension board edges parallel to and bearing on the ribs. Do not install board thicknesses with flute span ratings less than required for the flute opening dimension of the steel deck. Follow manufacturer flute span ratings for each type and thickness of approved insulation board.
 5. Stagger board joints a minimum of 12" (30.5 cm) in one direction. For multiple layer installations, all joints must be staggered and offset both horizontally and vertically a minimum of 12" (30.5 cm) from preceding courses and layers.
 6. Installation in multiple layers is recommended when single layer board thicknesses exceed 3" (76 mm).
 7. Fan-fold polystyrene recover boards are not approved for direct application to new or existing steel roof decks.
 8. IB supplied insulations with dimensions up to 4' x 8' (1.22m x 2.44m) may be fastened in place with approved IB fasteners and 3" (7.6 cm) insulation plates. Adhered IB insulations with dimensions up to 4' x 4' (1.22m x 1.22m) may be attached with approved IB insulation adhesive at the minimum rate of 12" (30.5 cm) oc. Install insulation in accordance with IB specifications. Weighting adhered insulation boards

in place during installation to ensure proper adhesive embedment/engagement is recommended. Secure insulation to the roof deck to meet or exceed required project uplift resistance and code requirements unless loose laid as part of a ballasted IB roof assembly.

9. Perimeter and corner zone securement of the roofing assembly shall be increased in accordance with IB specifications and installation details. Supplemental insulation and membrane fastening, reduced spacing between or within fastener rows, and increased application of approved insulation adhesive may be required to conform to local building codes and expected wind loads calculated in accordance with ASCE 7 and ANSI / SPRI WD-1.
10. Additional insulation securement may be required above vapor retarder and air barrier assemblies. Mechanically attached insulation installed above these assemblies requires fastening at a minimum rate of 1 fastener per 2 square feet or as required by the applicable roof assembly wind uplift approval.
11. Adhered recover assemblies using IB insulation adhesive may require priming of the prepared substrate or existing roof surface with an IB approved substrate primer. Adhesion to asphalt bearing surfaces or existing membranes requires careful review, preparation, and insulation adhesion uplift testing to ensure adequate performance.
12. Expanded (EPS) or Extruded (XPS) insulations are not acceptable for use with IB roof membranes unless used as a base layer beneath an approved IB cover board or second (top) layer of non-polystyrene insulation board.
 - a. Polystyrene insulations are not compatible with solvent bearing adhesives, and other materials. Fully adhered IB TPO membranes insulated assemblies that contain polystyrene insulation require use of IB TPO Water Based Adhesive membrane adhesive or low-rise foam spatter adhesive over the approved non-polystyrene insulation. Avoid exposure to solvent containing materials at flashings and penetrations.
 - b. Avoid use of polystyrene insulations where building occupancy and use may expose the roofing assembly to solvents or solvent vapors.
 - c. Do not install polystyrene insulation over existing coal tar roofs.
 - d. Plaza deck, paver and other roof assemblies with overburden components may require use of polystyrene insulations with compressive strengths higher than 25 psi (1.8 kg/cm).
 - e. Installations of dark colored IB membranes over polystyrene insulations in hot climate zones require prior approval by IB Roof Systems Technical Services.
13. The responsibility for verification of substrate performance and fastener or insulation adhesive withdrawal resistance remains with the building owner, design professional or contractor. Fastener withdrawal and insulation adhesive uplift resistance should be reviewed and confirmed as meeting or exceeding minimum IB Roof Systems requirements and applicable building codes. IB Roof Systems assumes no responsibility for the design, condition, structural performance or load resistance of the roof deck and other building substrates including walls, claddings, wood blocking and equipment or fixtures.
 - a. Fastener pull tests should conform with the requirements of ANSI / SPRI FX-1.
 - b. Insulation adhesive uplift testing should conform to the requirements of ANSI / SPRI IA-1.
 - c. Test results must be submitted to IB Roof Systems Technical Services for prior review on all IB Total System Warranty projects requiring IB Wind Riders for high wind zone application.

Part 4 ROOF MEMBRANE INSTALLATION

4.0 EQUIPMENT

- A. The following equipment may be needed to install IB TPO roofing systems:
 1. Power Equipment:
 - a. 10,000 - 12,000-Watt Generators
 - b. Robot Welder
 - c. 100' 120V or 240V Extension Cord
 - d. Screw Guns
 - e. Hand-Held Hot Air Welder
 - f. Induction Welder and Magnets
 - g. Electric Drill
 - g. Hammer Drill
 2. Required Hand Tools and Equipment
 - a. Brooms (soft and stiff)
 - b. Lawn or Flooring Roller
 - c. Chalk Line
 - d. Marker/Writing Utensil
 - e. Measuring Tape
 - f. Utility Knife
 - g. Membrane Shear or Scissors
 - h. Seam Probe
 - i. Silicone Seam Roller
 - j. Caulking Gun
 - k. Rags
 - l. Brushes and Rollers

3. Miscellaneous Tools
 - a. Drill Bits (Carbide & Steel)
 - b. Circular & Reciprocal Saw
 - c. Hand Saw
 - d. Hammer & Rubber Mallet
 - e. Rivet Gun
 - f. Screwdriver Set
 - g. Shovel
 - h. Ladder
 - i. Adhesive Applicator (Cartridge Gun, Cart, or Sprayer)
 - j. Pull Out Tester
 - k. T-Square & Level
 - l. Paddle Mixer & Stirring Sticks
 - m. Pliers & Vise Grip Pliers
 - n. Metal Crimper
 - o. Snips
 - p. Wire Brush
4. Personal Protection Equipment

First Aid Kit	Gloves
Site Specific PPE	Mask or Respirator
Eye Protection	Safety Shoes
Safety Helmet	Safety Vest

4.1 ROOF MEMBRANE GENERAL INSTALLATION REQUIREMENTS

- A. IB roof systems installed in accordance with IB specifications and installation details are designed to provide a watertight roofing assembly that resists the elements and exposure to normal weathering conditions over the roof's expected lifecycle. IB TPO membranes, system components and accessories are tested and designed for use within approved IB roof assemblies.
- B. Use of non-IB labeled, supplied, or approved components will result in exclusion of those products from IB warranty coverage unless expressly approved in writing by an IB Technical Services Manager; and may result in the rejection of the entire roof assembly for coverage under an IB warranty.
- C. IB Roof System materials are sold to and intended for installation only by IB Authorized Applicators in accordance with our published specifications and requirements as well as project specific requirements, if any.
- D. Building Code Compliance: The building owner, design professional and roofing contractor are solely responsible for the design and installation of the roofing assembly in compliance with the requirements of the local building code and authorities having jurisdiction.
 3. Fire Resistance: Review applicable code requirements for external and internal fire resistance ratings for the roofing assembly. IB roof assemblies are typically tested in accordance with UL 790 and ASTM E108 for external fire resistance classification. Internal fire resistance hourly P-Series ratings incorporating many IB specifications are available for use with specific project designs.
 4. Wind Uplift Performance: Roof system design and installation must provide adequate wind uplift resistance for design pressures as calculated using ASCE 7, revision as adopted by local authorities having jurisdiction and the building code.
 5. System Performance Criteria: Review project requirements for compliance with applicable local building codes and specific design criteria. Typical roof assembly installation requirements and material performance properties are contained within various national building codes, reference, performance, and design standards including:
 - j. International Building Code (IBC)
 - k. International Residential Code (IRC)
 - l. International Energy Conservation Code (IECC)
 - m. International Green Construction Code (IGCC)
 - n. International Mechanical Code (IMC)
 - o. International Fire Code (IFC)
 - p. International Plumbing Code (IPC)
 - q. International Existing Buildings Code (IEBC)
 - r. ASTM
 - s. ANSI / SPRI
 - t. ASCE 7
 - u. ASHRAE
 - v. FM (FM Approvals)
 - w. SMACNA
 - x. UL
 - y. Sustainable Design Standards-LEEDS, American High-Performance Buildings Coalition, Green Building Initiative Green Globes Certification
 - z. Reflectivity Performance Standards-CRRC, Energy Star, Title 24

- aa. Local Ordinance, Modifications and Adoptions to Building Codes

4.2 MATERIAL HANDLING AND STORAGE

- A. Store IB materials in a weather protected environment, clear of ground and secured against wind, moisture, ultraviolet rays, and physical damage. Material storage indoors or within jobsite containers and trailers until ready for installation on the roof is recommended.
- B. Avoid exposure of stored materials to extreme temperatures. Adhesives, sealants, and caulks require protection from freezing and exposure to excessive heat above 90°F (32.2°C). Store at temperatures above 40°F (4.4°C) and within recommended storage temperature ranges.
- C. Prevent condensation beneath product packaging, coverings and temporary plastic shipping wrappers or shrouds by removing, opening and/or covering materials with breathable tarpaulins.
- D. Avoid exposure of materials to sources of ignition or combustion.
- E. IB materials should be delivered and received in original IB packaging in a dry, undamaged condition with seals and labels intact. Receipt of materials damaged during transport or containing defects should be reported immediately to IB Roof Systems. Do not install damaged or defective materials.
- F. Rooftop Storage and Handling:
 - 1. Materials and equipment stored on the roof must be properly staged and supported to avoid overloading and/or permanent deflection of deck.
 - 2. Distribute roofing materials in a uniform manner to avoid damage to existing structure or unsafe storage conditions; secured against wind and exposure to the elements.
 - 3. Avoid use of newly installed IB roof areas as a staging area for materials or equipment storage, or exposure to excess construction traffic and work of other trades. When traffic over completed roof areas is necessary, provide adequate temporary protection to prevent damage and contamination of the finished roofing. Use protective plywood, cushioning layers of compatible insulation and tarps as necessary to avoid damage.
- G. Storage and disposal of construction debris, packaging, containers, and hazardous materials shall comply with project specifications and the requirements of the authority having jurisdiction.

4.3 QUALITY CONTROL DURING APPLICATION

- A. IB TPO Membranes and flashings require installation in conformance with published IB specifications and details. Deviations from IB requirements require prior review and written approval of an IB Technical Services Manager. Where discrepancies exist between existing project conditions or specifications and IB requirements, the contractor shall promptly notify the design professional, building owner and IB Roof Systems for resolution prior to commencing work.
- B. Use only original IB products labeled, supplied and / or approved by IB Roof Systems for use in conjunction with approved IB specifications.
- C. Installer shall be an IB Authorized Applicators utilizing personnel trained in the application of thermoplastic membranes and IB roof assemblies. Contractors shall implement and maintain a regular quality control program to ensure the installation is in conformance with IB specifications.
- D. Projects requesting an IB Total System Warranty require submittal of a Notice of Award to IB Roof Systems prior to installation. Final Inspection by an IB Field Technical Representative is required to determine roof system compliance with IB Warranty Program requirements.
- E. Field Technical Representatives are available for technical support and assistance during project start-up, interim and final inspection. Punch lists detailing corrective work and conditions requiring repair shall be provided to the IB Authorized Applicators for correction and must be completed to receive the IB Warranty.

4.4 WEATHER PRECAUTIONS

- A. Install roofing only when ambient temperatures and environmental conditions exist to maintain a satisfactory roofing system application as defined below. Ensure forecasted weather conditions will permit work to be performed in accordance with project and IB requirements.
 - 1. Proceed with roof installation only when ambient temperatures are 40°F (4.4°C) and rising.
 - 2. When temperatures are below 55°F (12.8°C), adhesives, sealants, and caulks should be kept warm. Ground storage of materials during cold weather is recommended within heated interior spaces, jobsite trailers or containers, and in temporary containers or areas on the roof immediately prior to installation.

3. Product shelf life, curing cycles and performance properties can be adversely affected by exposure and storage of materials in extremely warm temperatures above 90°F (32.2°C). Jobsite materials should be stored out of direct sunlight, protected from the elements and extreme temperatures.
 4. Care must be taken when installing adhesives, sealants, and caulks during cold or extremely warm temperatures and in periods of elevated humidity, wind, or other adverse environmental weather conditions.
 5. Normal activation, open and setting times can vary with climatic, altitude and other environmental factors, and may require adjustments to installation methods to achieve specified application rates and proper performance.
- B. Do not install materials over wet or frozen substrates. Avoid installation of membrane and insulation adhesives to deck and substrates where surface temperatures are below or above recommended application ranges.
- C. Follow all cold weather installation precautions and material application guidelines. Do not apply water-based adhesives during freezing weather or when temperatures are forecasted to fall below freezing within 24 hours of application.

4.5 INSPECTION AND PREPARATION OF SURFACES

- A. The building owner is responsible for the condition and performance of all roof decks and substrates including existing roof areas left in place and scheduled to receive new roofing.
- B. Substrates and existing surfaces should be inspected for deterioration, defects and entrapped or excess moisture prior to the start of work.
1. Wet or deteriorated areas and decking shall be replaced or repaired prior to the start of work.
 2. Fastener and adhesive pull tests should be conducted to confirm adequate substrate / roof deck condition and acceptable withdrawal resistance.
 3. Existing substrates, flashings or materials scheduled for reuse should be carefully inspected and properly prepared to ensure they are compatible and suitable for incorporation into the new roof system: free of defects, voids, excessive deflection, contaminants, or moisture.
- C. Roof deck and flashing substrates must be clean, dry, and adequately supported and secured to resist required structural design loads and loads imposed during construction.
- D. Penetration, equipment, wood nailers, drainage outlets and flashings shall be in place, properly secured, and ready to receive roofing prior to the start of work.
1. Abandoned equipment and penetration should be removed with openings repaired before installation of new roofing materials.
 2. Inspect existing drainage outlets and the roof drainage plan for adequate roof drainage and conformance to code requirements.
 3. Review existing flashing conditions, perimeter edges, walls, terminations, and penetrations and for adequate clearances, heights, and conformance with IB specifications and construction details.
- E. Substrates and materials requiring primer shall be primed in accordance with manufacturer and IB specifications.
- F. Review work plan to avoid excess loading of roof areas during material transport, temporary storage, and installation. Protect building components and fixtures from damage during work.

4.6 RECOVER INSTALLATION

- A. IB TPO Roof Systems are acceptable for recover installation where the existing roof construction will be left in place in some conditions. The building owner, project designer and contractor should review and take a variety of key design factors into consideration, in addition to conforming with applicable building codes.
- B. Factors requiring consideration prior to a decision to recover include but are not limited to the following:
1. Recover roofing assembly compliance with applicable fire, wind, owner required insurance / system performance design criteria and the requirements of the authority having jurisdiction.
 2. Condition, make-up, and number of layers of all existing roof assemblies present on the roof.
 3. Determination and required scope of repairs to correct existing conditions adversely affecting current or future roof performance such as uncontrolled moisture / air vapor intrusion, condensation, inadequate ventilation, structural defects, movement / deflection, inadequate drainage, design deficiencies, adverse environmental or building use exposures, and other conditions which may negatively affect the performance of the new roof.

4. Condition, type, suitability, potential moisture content and required scope of repair for the existing roof construction, structural roof deck, walls, wood nailers, metal flashings, curbs, equipment supports, penetrations, flashing details, and drainage outlets for installation of the new roof system.
 5. Compatibility of existing roof materials and substrates with the proposed new roof system.
 6. Ability of the structure to support additional loads and weight of the proposed new roof assembly and required construction traffic.
 7. The building owner, design professional and contractor should consider the impact of changes or alterations in the original roof system design, construction or function that may occur during roof replacement.
 - c. Common roof design and performance factors affected include potential changes in roof / building thermal performance, moisture / air vapor transmission and retention, design loads on building components and cladding, dew points, ventilation requirements, changes to existing roof drainage plans and other similar roof system design features.
 - d. Consideration should also be given to any changes in building occupancy or use, and to the effects of addition or demolition of equipment and other rooftop fixtures or penetrations.
- C. Roof systems eligible for Recover installations with separation sheets include the following general roof types and assemblies:
1. Smooth and Mineral Surfaced Asphalt BUR and Modified Bitumen.
 2. Adhered or Mechanically Attached Single Ply-including PVC, TPO, EPDM, other as approved by IB Technical Services incorporating relief cuts in a grid pattern.
 3. Note: Coal Tar Pitch BUR is not considered compatible and requires review and prior approval by IB Technical Services. See also, this section, part 4.7 Special Treatment of Coal Tar and Other Incompatible Substrates.
- D. Roof systems eligible for Recover installations with insulation or recover insulation boards include the following general roof types and assemblies:
1. Smooth and Mineral Surfaced Asphalt BUR and Modified Bitumen.
 2. Gravel Surfaced Asphaltic BUR or Modified Bitumen with loose aggregate removed.
 3. Adhered or Mechanically Attached Single Ply-including PVC, TPO, EPDM, other as approved by IB Technical Services incorporating relief cuts in a 20-ft grid pattern.
 4. 24 gauge or heavier Standing Seam or select Exposed Fastener Metal Roof Systems.
 5. **Note:** Coal Tar Pitch BUR is not considered compatible and requires review and prior approval by IB Technical Services. See also, this section, part 4.8 Special Treatment of Coal Tar and Other Incompatible Substrates.
- E. Recover IB roof assemblies can be considered when the following conditions are present:
1. No more than one existing roof membrane assembly is present.
 2. Existing roof assembly and substrates are dry. Roof systems containing elevated moisture over more than 20-25% of their area typically require full tear-off and replacement.
 3. Building structure and substrate to which IB Roof Systems components are to be attached can support and will provide adequate resistance to additional and expected in-service design loads, including the weight of the new assembly, both during construction and once in place.
 4. The building owner, design professional and / or contractor have reviewed the existing roof conditions and applicable project design requirements and have selected an IB Recover Roof System for retrofit roof replacement.
 5. Existing roof assembly and substrates are compatible with the selected IB roof system, suitable for recover roof installation in accordance with IB specifications and construction details and comply with IB Warranty Program requirements.
- F. Recover General Installation Requirements
1. Repair all defects and deficiencies in existing substrates prior to the start of work. Decking and substrates should be visually examined and inspected to determine suitability for installation of new materials. Equipment scheduled for demolition should be removed and the area ready to receive new roofing.
 2. Building owner, design professional and/or contractor shall complete required engineering evaluations, moisture scans, pull tests, field uplift testing and other required materials or performance testing prior to beginning work. Conditions not in compliance with project requirements and IB specifications must be corrected.
 3. Remove all existing penetration and membrane termination flashings including metal edging, base flashings, integral metal flashings, counter-flashings and drain flashings. Clean residues and contaminants from substrates, curbs, wood nailers, drains and flashings; inspect and correct flashing details for adequate height, clearances, securement, areas of deterioration and other conditions not conforming with IB specifications.

4. Existing vertical surfaces at walls and curbs retaining excess contaminant or incompatible materials require separation from new materials with a layer of plywood / OSB sheathing or approved cover board. IB separation sheets may be used for separation of existing substrates at mechanically attached base and wall flashings.
5. Where required by project design or regulatory requirements, separation may include installation of IB Fire Sheets.
6. Substrates must be clean, smooth, dry, and well secured. Remove and replace deteriorated decking and all wet materials. Steel decking exhibiting rust shall be inspected for condition and evaluated for suitability to receive new materials. Repair areas of minor rusting with a rust inhibitor coating.
7. For recover applications, remove all existing aggregate ballast, pavers, and overburden materials. Provide temporary securement against wind uplift as needed during roofing work.
8. Maintain adequate roof drainage and avoid restricting or blocking drainage outlets or pathways during roof work. Install new or additional drainage openings prior to the start of work with drain components, leaders, and flashings ready for roof assembly installation as work progresses.
9. Recover assemblies over existing metal roof systems typically require modification and additional review of project details and terminations with detailed review of the existing metal roof system. IB Roof Systems offers a variety of roof systems suitable for application over existing metal panel roofs. Project review and prior approval by an IB Technical Services Manager is required.

4.7 REROOFING INSTALLATION

- A. IB defines reroofing as the process of tearing off and replacing an existing roof covering with a new roof covering.
- B. IB Roof Systems are acceptable for installation on reroofing projects with tear-off of the existing roof construction to the structural roof deck. The building owner, project designer and contractor should review and take a variety of key design factors into consideration, in addition to conforming with applicable building codes.
- C. Factors requiring consideration prior to a decision to remove the existing and reroof include but are not limited to the following:
 1. Condition, make-up, and number of layers of all existing roof assemblies present on the roof.
 2. Determination and required scope of repairs to correct existing conditions adversely affecting current or future roof performance such as uncontrolled moisture / air vapor intrusion, condensation, inadequate ventilation, structural defects, movement / deflection, inadequate drainage, design deficiencies, adverse environmental or building use exposures, and other conditions which may negatively affect the performance of the new roof.
 3. Condition, type, suitability, potential moisture content and required scope of repair for the existing structural roof deck, walls, wood nailers, metal flashings, curbs, equipment supports, penetrations, flashing details, and drainage outlets for installation of the new roof system.
 4. Compatibility of existing structural roof deck with the proposed IB Roof System.
 5. Ability of the structure to support additional loads and weight of the proposed new roof assembly and required construction traffic.
 6. New roofing assembly compliance with applicable fire, wind, owner required insurance / system performance design criteria and the requirements of the Authority Having Jurisdiction.
 7. The building owner, design professional and contractor should consider the impact of changes or alterations in the original roof system design, construction or function that may occur during roof replacement.
 - c. Common roof design and performance factors affected include potential changes in roof / building thermal performance, moisture / air vapor transmission and retention, design loads on building components and cladding, dew points, ventilation requirements, changes to existing roof drainage plans and other similar roof system design features.
 - d. Consideration should also be given to any changes in building occupancy or use, and to the effects of addition or demolition of equipment and other rooftop fixtures or penetrations.
- D. Reroofing should be considered when the following conditions are present:
 1. More than one existing roof membrane assembly is present.
 2. Existing roof systems containing 25% or more moisture content of their area typically require full tear-off and replacement.
 3. The existing roof system will not support adhesion of a new roof system, and the structural roof deck is not suitable to receive or provide adequate resistance of mechanical attachment of a new roof system.
 4. Building structure and substrate to which IB Roof Systems components are to be attached can support and will provide adequate resistance to additional and expected in-service design loads, including the weight of the new assembly, both during construction and once in place.

5. The building owner, design professional and / or contractor have reviewed the existing roof conditions and applicable project design requirements and have determined that roof replacement is necessary.
 6. The existing structural roof deck is compatible with the selected IB roof system and suitable for roof replacement installation in accordance with IB specifications and construction details and compliance with IB Warranty Program requirements.
- E. Reroofing General Installation Requirements
1. Repair all defects and deficiencies in existing roof deck prior to the start of work. Decking and substrates should be visually examined and inspected to determine suitability for installation of new materials. Equipment scheduled for demolition should be removed and the area ready to receive new roofing.
 2. Building owner, design professional and/or contractor shall complete required moisture scans, pull tests, field uplift testing and other required materials or performance testing prior to beginning work. Conditions not in compliance with project requirements and IB specifications must be corrected.
 3. Remove all existing roofing materials, insulation, fasteners, penetration flashings, and membrane termination flashings including metal edging, base flashings, integral metal flashings, counter-flashings and drain flashings. Clean residues and contaminants from substrates, curbs, wood nailers, drains and flashings; inspect and correct flashing details for adequate height, clearances, securement, areas of deterioration and other conditions not conforming with IB specifications.
 4. Existing vertical surfaces at walls and curbs retaining excess contaminant or incompatible materials require separation from new materials with a layer of plywood / OSB sheathing or approved cover board. IB separation sheets may be used for separation of existing substrates at mechanically attached base and wall flashings.
 5. Where required by project design or regulatory requirements, separation may include installation of IB Fire Sheets.
 6. Substrates must be clean, smooth, dry, and well secured. Remove and replace deteriorated decking and all wet materials. Steel decking exhibiting rust shall be inspected for condition and suitability to receive new materials. Repair areas of minor rusting with a rust inhibitor coating.
 7. Maintain adequate roof drainage and avoid restricting or blocking drainage outlets or pathways during roof work. Install new or additional drainage openings prior to the start of work with drain components, leaders, and flashings ready for installation as work progresses.

4.8 SPECIAL TREATMENT OF EXISTING COAL TAR ROOFS AND OTHER INCOMPATIBLE SUBSTRATES

- A. Coal Tar based roof assemblies are incompatible with most TPO based roof membranes. They contain inherent characteristics and physical properties that can create significant challenges to successful retrofit installation.
1. Whenever possible, complete tear-off and preparation of substrates to receive an appropriate Reroofing assembly should be undertaken to avoid adverse conditions present with existing Coal Tar roofs.
 - a. Coal tar bitumen contains compounds and can generate vapor or fumes that are detrimental to the performance of TPO and other roof membrane materials.
 - b. Coal tar membranes exhibit cold flow properties even at low temperatures that can result in bitumen movement and / or migration through joints, screw holes and other openings created during normal reroofing activities.
 - c. Typical edge and flashing detailing for coal tar built-up roofs are designed to restrict bitumen migration at penetrations and perimeter edges. Mechanical fastening of recover insulation boards, membranes, and flashings; and disturbance or damage to existing coal tar flashing details during retrofit roof installation can result in bitumen drippage within the building interior or onto exterior surfaces.
 - d. Recover projects over existing Coal Tar roofs require prior approval from an IB Technical Services Manager. For recover over existing Coal Tar roofs to be considered, the following preparation and separation steps are required:
 1. Installation requires removal of loose aggregate surfacing and full separation from contact with the coal tar membrane and associated residues.
 2. A poly separation sheet is usually required to between the existing Coal Tar and the insulation that must be added.
 3. Fully adhered, white IB TPO roof systems over a minimum of 1-1/2" (3.8 cm) of IB Energy Board II or III polyisocyanurate is required for recover installation over properly prepared existing Coal Tar membranes.
 4. Expanded polystyrene (EPS) insulation may not be used in conjunction with a recovery over existing Coal Tar roofs.
 - e. Roof system insulation adhesives require field withdrawal resistance testing to confirm acceptable adhesion and uplift resistance to the existing substrate. Contact IB Technical Services for additional

requirements on IB TPO roof system reroofing and recover installations over existing Coal Tar membranes.

- f. Other roof systems that are considered incompatible for direct TPO SM membrane contact include but are not limited to asphaltic roofs, modified bitumen roofs, and EPDM single-ply roofs. Always check with IB Technical Services for compatibility of an existing substrate.
- g. Smooth surfaced asphaltic roofs and modified bitumen roofs can be separated with an approved separation sheet, approved insulation, or recovery board, or may receive IB TPO FB (fleece back) membranes set in an embedment of approved low rise polyurethane membrane adhesive.
- h. EPDM single-ply roofs can be separated with an approved separation sheet, insulation, or recovery board, or may receive IB TPO FB (fleece back) membranes mechanically attached over the properly prepared EPDM membrane.
- i. Un-faced expanded or extruded polystyrenes (EPS or XPS) are incompatible with direct contact to TPO membranes and must be separated with an approved insulation, or recovery board.
- j. Most asphaltic based or butyl-based underlayment sheets are incompatible with direct contact to TPO membranes and must be separated with an approved separation sheet, approved insulation, or recovery board.

4.9 GENERAL ROOF INSTALLATION

- A. The roof system work plan should avoid traffic whenever possible over previously completed roof areas. Projects with multiple roof sections or levels may require more than one staging area and should progress from the upper or highest roof sections to the lower roof sections. Protect completed work from damage, construction traffic and the work of other trades.
- B. Install the roof assembly in accordance with the conditions of the work contract, applicable local building codes and IB Roof Systems specifications and application details.
- C. Follow safe roofing practices for all elements of project staging, materials handling, installation, personal protection, and fire safety in adherence with applicable project, local, state, and federal safety regulations, and requirements.
- D. Do not install more material than can be completed in a watertight manner by the close of day. Where temporary waterproofing is required prior to final roof system installation, consideration should be given to the installation of a compatible temporary roof, including associated temporary cut-offs.
 - 1. Selected temporary roof membranes may qualify and be left in place as a vapor retarder depending on project design and suitability for use with the selected IB roof system.
 - 2. Contact IB Roof Systems for additional information on the use of temporary roofs.
- E. Night seals are required in accordance with IB specifications and installation details to provide closure and protection of partially completed roof areas during construction. Consideration should be given to installing adequate temporary weather protection and compatible roof system night seals including potential weather exposure and length of time left in place. Remove and discard night seal materials and roofing materials that become wet, contaminated, or damaged before the continuation of work.
- F. For occupied structures and projects where odor or fume control concerns exist, care should be taken during project planning to assess potential entry points into the structure. Consideration should be given to the use of compatible air / vapor barrier seals at openings in the roof deck, terminations, walls, and penetrations; and selection of mechanically attached construction details and / or low fuming, reduced VOC content adhesives and accessory products where appropriate for the specific application.
- G. Membrane Application: Ensure substrates are clean, dry, and properly secured in accordance with project requirements and IB specifications. Remove all debris, dirt, trash, or contaminants from insulation surfaces prior to installation. Measure and mark courses as needed to maintain alignment and keep roll courses square to the overall roof deck and structure. Avoid contamination of membrane surfaces within the seam areas (side, end, and flashing laps) during application of bonding adhesives. Ensure all seam areas are clean and free of debris or other contamination prior to welding. Use only IB Roof Systems recommended cleaning procedures and products where necessary to clean membrane prior to seaming or after completed installation.
 - 1. Install membrane using one of the following methods:
 - a. Adhered membrane application. Refer to Adhered Specification Section.
 - b. Induction welded membrane application. Refer to Induction Welded Specification Section.
 - c. Mechanically attached membrane application. Refer to Mechanically Attached Specification Section.
 - 2. For adhered and induction welded systems, the membrane shall be lapped a minimum of 3" (7.6 cm). For mechanically attached systems, the membrane shall be lapped a minimum of 6" (15.2 cm) to allow for in-seam fasteners and plates.

3. The minimum recommended weld width for seams completed with an automatic hot-air welder is 1-1/2" (3.8 cm). Seams, laps, and flashings completed with a hot-air hand welder shall maintain a minimum 1-1/2" (3.8 cm) weld width. Hand welded seams and laps shall be rolled with a silicone roller during welding to ensure a continuous welded seam.
4. Regular test welds shall be conducted during all hot-air welding operations to verify attainment of watertight, properly welded membrane laps and seams, and to adjust welding parameters and settings as required. IB recommends test weld samples be retained for review, dated, and labeled, as part of a thorough Quality Control program by the installer.
5. Only install as much roofing in one day as can be seamed and completed to a watertight condition. Seam areas must be kept clean and free of contaminants, adhesives, dirt, or moisture. Clean spills and accidental seam contamination immediately before drying or setting occur. Follow IB recommended cleaning procedures for welding to existing weathered membrane or cleaning areas of contamination. IB Membrane Cleaner may be used to wipe and remove moisture from within membrane laps prior to welding.
6. Install IB TPO T-Joint Patches at all T-joint locations in field laps and flashing seams membrane installations. Hot-air weld T-joint patches over the prepared seam intersections and laps in accordance with IB TPO Construction Details.
7. All seams and laps shall be visually inspected and physically probed after they have been set and cooled. Probe all seam areas to locate cold welds or presence of voids.
8. Repair all seam defects and deficiencies the same day they are discovered.
9. Apply a bead of IB TPO Cut Edge Sealant to all cut edges of roofing membrane.

4.10 WIND RESISTANCE

- A. IB Roof Systems' standard fastening and roof assembly attachment guidelines are approved by IB Roof Systems for use in accordance with our current specifications.
- B. IB standard attachment guidelines meet minimum IB installation and warranty requirements for application of IB roof assembly specifications over approved roof decks and substrates.
- C. Conformances to specific local building code, insurance or project design criteria may require selection and use of IB specifications and attachment schedules that exceed IB standard minimum attachment schedules.
- D. Wind exposures and design wind loads requiring additional fasteners and supplemental roof system securement above standard fastening rates can result from a variety of project-specific factors. These include but are not limited to buildings with calculated field of roof design wind uplift pressures above -30 psf; domed, irregularly shaped, or multi-story roofs; Partially Enclosed or Exposure D building classifications; structures located in higher risk Windstorm, Hurricane, Coastal or Special Wind Regions; and Risk Category III or IV buildings.
- E. Projects requiring IB Total System Warranty Wind Riders may require additional fasteners and supplemental roof system securement.
- F. Calculations of roof system wind uplift design and resistance loads are the responsibility of the project design professional and should be conducted in accordance with local code and the current edition ASCE 7 design standard edition required by the Authority Having Jurisdiction.
- G. Determination of wind uplift pressures at various Roof Zones vary according to the edition of ASCE 7 in use by the governing building code. ASCE 7-16 includes provision for a new, potential Zone 1' (Prime or Interior) for roofs with certain height to width aspect ratio and size. The locations and dimensions of Field of Roof Zone 1, Perimeter Zone 2 and Corner Zone 3 have also changed and should be reviewed by the building owner, design professional and contractor prior to project start.
- H. Roof deck fastener withdrawal resistances for each deck type should be confirmed and must meet or exceed IB required minimums.
- I. Fasteners and plates shall be IB labeled or approved by IB Roof Systems for use with the specific deck type and installation.
- J. Supplemental fastening and securement of roof assembly components along perimeter roof edge terminations to meet higher anticipated wind loads is required.
 1. Perimeter and Corner Zone securement and wind uplift resistance of the roofing assembly shall be increased in accordance with IB specifications, installation details, and IB warranty requirements.
 2. Use of IB roof assemblies with higher approved wind resistance ratings, supplemental insulation and membrane fastening, reduced spacing between or within fastener rows, and increased application of approved insulation adhesive may be required to conform to local building codes and expected wind loads calculated in accordance with ASCE 7 and ANSI / SPRI WD-1 or as required by the Owner's insurer or project requirements.

- K. Buildings constructed with a continuous minimum 36" (0.91m) perimeter parapet wall height may use Perimeter Zone dimensions and uplift design pressures through the Corner Zone regions.
- L. Refer to ASCE 7 as adopted by local building code or Authority Having Jurisdiction for calculation of required Perimeter and Corner Zone locations, dimensions, and related design uplift pressures. The building owner, design professional and contractor must review project design criteria and wind uplift loads to determine the location, width and required roof assembly wind load resistance for these areas.
 - 1. Perimeter and Corner Zone widths are calculated using the requirements of ASCE 7 and local code. The following general guidelines are informational and do not reflect all conditions specific to a particular building and roof. Refer to the applicable edition of ASCE 7 and IB Construction Details MS-01, MS-02, MS-03, and MS-04 for additional information.
 - 2. Field, Perimeter and Corner Zone locations and dimensions vary according to several factors and the provisions of ASCE 7. Zone areas detailed below may not be present for all building conditions and shapes.

4.11 WIND RESISTANCE AT PERIMETERS AND CORNERS PER ASCE 7-10

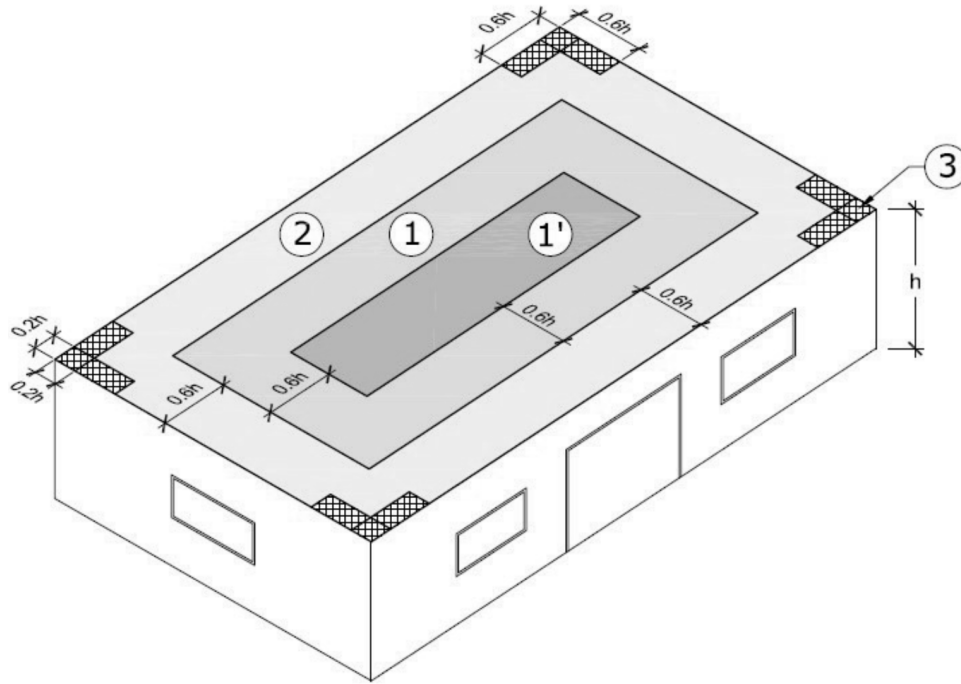
- A. Roof Areas - The requirements to calculate roof areas are as follows:
 - 1. Roof Height \leq 60 ft., the perimeter is the smaller dimension of: 10% of the building lesser plan dimension (overall longest length or width, whichever is less), or 40% of the roof height, but not less than 4% of the building lesser plan dimension (overall longest length or width, whichever is less), but not less than 3 feet.
 - 2. Roof Height $>$ 60 ft., the perimeter is: 10% of the building lesser plan dimension (overall longest length or width, whichever is less) but not less than 3 feet.
 - 3. For mechanically fastened systems, spacing between fastener rows should be no greater than 60% of the width of the field sheets in the perimeters, and no greater than 40% of the width in the corners.
 - 4. For induction-welded systems, fastener rate (contributory area) shall be no greater than 60% of the field fastener rate.
- B. Corner Areas - All corners shall be the intersections of the perimeter areas. Refer to the local code requirements, project specifications or FM Global requirements when determining corner layouts for perimeter sheets. If parapets are greater than 36" continuous around the entire roof area the corners may be treated as a perimeter. Typically, one of the following layouts is used in the corners:
 - 1. The perimeter rolls should be fastened all the way into the corner. The other perimeter sheets are fastened up to the previously installed perimeter sheets, and then the fastener rows are continued to the corner through the top of the previously installed sheets. Install a cover strip of reinforced membrane extending 2" (5.08 cm) on each side over the fasteners for a watertight seal. This method is known as "picture framing".
 - 2. The perimeter rolls should be run perpendicular to the flutes in steel deck applications. Additional fasteners should be installed in rows that are no greater than 40% of the width of the field sheets. These fastener rows should then be stripped in with reinforced IB TPO Membrane or IB TPO Cover Strip. This method is known as the "finger" method.
 - 3. For induction welded systems, fastener rate (contributory area) shall be no greater than 40% of the field fastener rate.

4.12 WIND RESISTANCE AT PERIMETERS AND CORNERS PER ASCE 7-16

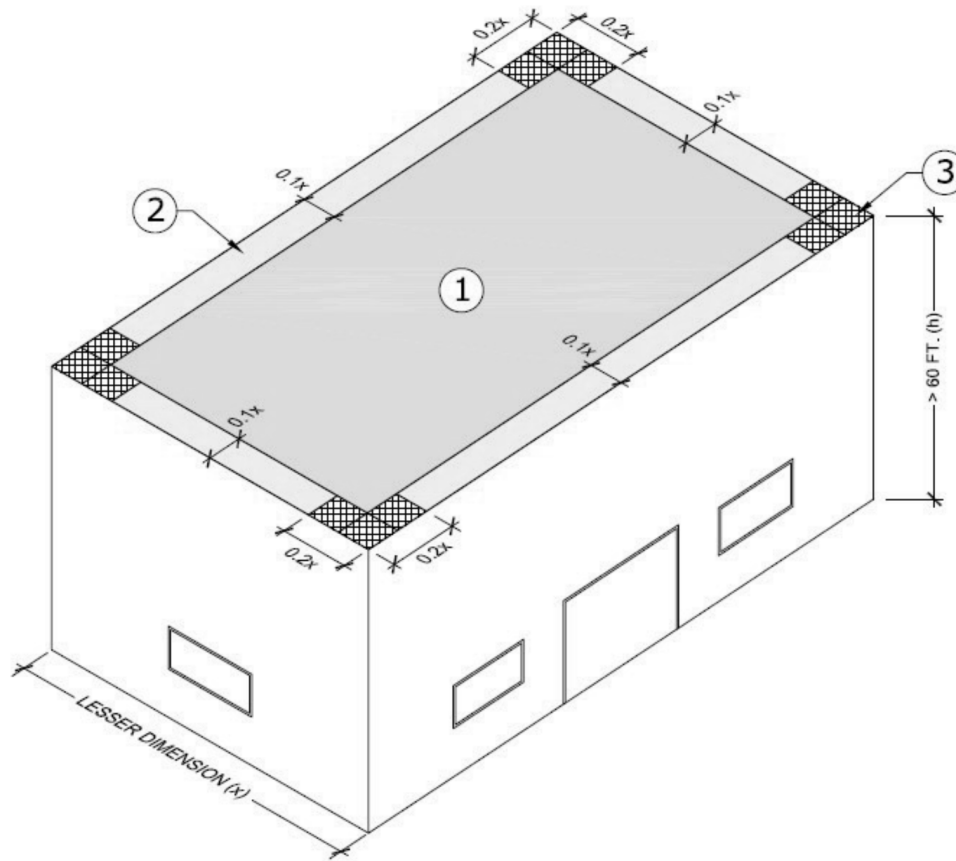
- A. Roof Areas - The requirements to calculate roof areas are as follows:
 - 1. Roof Height \leq 60 ft:
 - a. Zone 3 (Corners), "L" shaped with legs 60% of the building height long, and 20% of the building height wide.
 - b. Zone 2 (Perimeters), 60% of the height of the building.
 - c. Zone 1 (Field), 60% of the height of building (Note – this brings the inner boundary of field to 120% of the height of the building from all edges.)
 - d. Zone 1' (Field Prime), Any area remaining (Note – this zone is not always present depending on building size/shape.)
 - 2. Roof Height $>$ 60 ft:
 - a. Zone 3 (Corners), "L" shaped with legs 20% of the lesser plan dimension (overall longest length or width, whichever is less) long and 10% of the lesser plan dimension wide (overall longest length or width, whichever is less).
 - b. Zone 2 (Perimeters), Equal to 10% the building lesser plan dimension (overall longest length or width, whichever is less), but never less than 3 ft.
 - c. Zone 1 (Field), Any area remaining.

- B. Corner Areas - All corners shall be the intersections of the perimeter areas. Refer to the local code requirements, project specifications or FM Global requirements when determining corner layouts for perimeter sheets. If parapets are greater than 36" continuous around the entire roof area the corners may be treated as a perimeter. Typically, one of the following layouts is used in the corners:
1. The perimeter rolls should be fastened all the way into the corner. The other perimeter sheets are fastened up to the previously installed perimeter sheets, and then the fastener rows are continued to the corner through the top of the previously installed sheets. Install a cover strip of reinforced membrane extending 2" (5.08 cm) on each side over the fasteners for a watertight seal. This method is known as "picture framing".
 2. The perimeter rolls should be run perpendicular to the flutes in steel deck applications. Additional fasteners should be installed in rows that are no greater than 40% of the width of the field sheets. These fastener rows should then be stripped in with reinforced IB TPO Membrane or IB TPO Cover Strip. This method is commonly referred to as the "finger" method.
 3. For induction welded systems, fastener rate (contributory area) shall be no greater than 40% of the field fastener rate.

ASCE 2016 (< 60°)



ASCE 2016 (> 60°)



4.13 MECHANICALLY ATTACHED PERIMETERS AND CORNERS – PRESCRIPTIVE ENHANCEMENT

- A. Mechanically attached, insulated IB roof assemblies require pre-securement of the underlying insulation boards with approved IB fasteners and insulation plates or IB insulation adhesive.
 - 1. Insulation boards secured with approved IB insulation adhesives must be installed in accordance with the requirements of the IB Roof Assembly Wind Uplift Approval Listing and IB adhesive specifications. Bead applied insulation adhesives are limited to a maximum spacing between rows of 12" (30.5 cm) oc.
 - 2. Mechanically attached insulation boards shall be secured with IB approved fasteners and insulation plates at the minimum rate of 6 fasteners per 4' x 8' (1.22m x 2.44m) board and 4 fasteners per 4' x 4' (1.22m x 1.22m) board.
 - 3. IB approved fan-fold recover boards shall be secured in accordance with IB construction details with IB approved fasteners and insulation plates at the minimum rate of 1 fastener per 12 sq. ft.
 - 4. Consult IB Technical Services for additional securement requirements on mechanically attached roof assemblies over air barriers or vapor retarders.
- B. Mechanically Attached Perimeter Zone Membrane Attachment: Securement of the IB roof assembly along Perimeter Zones must be increased in accordance with IB specifications and construction details.
 - 1. Spacing between rows of fasteners at membrane side laps shall be reduced to a maximum of 67% of the field of roof spacing within the Perimeter Zone.
 - 2. Standard IB installation details incorporate the use of half-width membrane rolls for practicality and convenience throughout the required Perimeter and Corner Zone areas, fastened within the side laps at the same spacing as the Field of roof. The use of half-width membrane sheets along Perimeter Zones also improves wind uplift resistance through a reduction in contributory wind uplift loads on membrane fasteners.
 - 3. As alternates:
 - a. Option 1: IB batten bar and reinforced IB TPO Cover Strip may be installed at the mid-point between in-seam fastening rows on full-width membrane courses within the Perimeter Zone. Batten bars shall be fastened with approved IB fasteners using the same fastener spacing as the field of roof.
 - b. Option 2: IB TPO IW insulation plates may be installed below IB TPO SM membranes at the mid-point between in-seam fastening rows, on full-width membrane sheets within the Perimeter Zone. IB TPO IW insulation plates shall be fastened with approved IB fasteners over approved insulation, using the same fastener spacing as the field of roof.
 - 4. Steel Decks: Install perimeter zone courses perpendicular to deck ribs for Factory Mutual projects and field design pressures -75 psf and above. Install IB Batten Bar and Cover Strips at mid-points between full-width field courses where roof edge is parallel to deck ribs.
- C. Mechanically Attached Corner Zone Membrane Attachment:
 - 1. Spacing between rows of fasteners at membrane laps shall be reduced to a maximum of 50% of the field of roof spacing within the Corner Zone.
 - 2. Corner Zone half-sheet courses may be installed picture frame method and increase securement by means of extending half-sheet fastening rows through the corners in both directions. At intersections of perimeter half-sheets, continue row fastening at same rate for field of roof through the corner to perimeter walls or roof edges. Install IB TPO Cover Strip over extended fastener line.
 - 3. As alternates:
 - a. Option 1: Two rows of IB Batten Bar and reinforced IB TPO Cover Strip may be installed between in-seam fastening rows on full-width membrane courses within the Corner Zone. Batten bars shall be fastened with approved IB fasteners using the same fastener spacing as the field of roof.
 - b. Option 2: Two rows of IB TPO IW insulation plates may be installed below IB TPO SM membranes between in-seam fastening rows, on full-width membrane courses within the Corner Zone. IB TPO IW insulation plates shall be fastened with approved IB fasteners using the same fastener spacing as the field of roof.
- D. Fasten membrane courses in-seam along perimeter and corner half-sheets or through IB Batten Bar with reinforced IB TPO Cover Strips, in accordance with Table A.6 (Standard In-Seam Membrane Fastening Schedule for Mechanically Attached Roof Membranes), or applicable IB Roof Assembly Wind Uplift Approval Listing requirements.
 - 1. Approved IB TPO mechanically attached roof assemblies require the following minimum number of half-sheets installed along building perimeters and corners:

4.14 MECHANICALLY ATTACHED PERIMETERS AND CORNERS – ALTERNATE MEMBRANE SECUREMENT FOR STANDARD IB WARRANTY

- A. Minimum perimeter and corner securement to qualify for issuance of a standard IB roof system warranty must meet or exceed the row spacing and fastening requirements of IB General Construction Details or as approved in writing by IB Technical Services Manager.
- B. Minimum single perimeter half sheet and corner securements as contained in these details may be used in conjunction with roof installations receiving standard published IB Roof System warranties and are subject to maximum gale force wind speed limitation (54 mph).
- C. As an alternative for perimeter half sheet securement, induction welded perimeter methods may be employed to eliminate perimeter half sheet securement provided that the enhancement complies with securement requirements as calculated for the building design of the project requirements.
- D. Confirmation of suitability for use and conformance to project requirements remains the responsibility of others than IB Roof Systems. Minimum standard IB details may not conform with specific project design and/or local code requirements. IB recommends the roofing contractor, project designer and building owner review project requirements for expected roof assembly design uplift pressures, calculated perimeter, and corner zone dimensions, and required roof system uplift resistance values.

4.15 ADHERED PERIMETERS AND CORNERS

- A. Supplemental fastening of perimeter and corner roof insulation and cover boards for Adhered roof membranes:
 - 1. Install IB approved roof insulation and cover boards within Perimeter and Corner Zone areas in accordance with Table A.2 (Insulation Fastener Schedule for Adhered IB Roof Membranes) or increase insulation board fastening within Perimeter Zone areas by 50% over required Field of Roof fastening rate with a minimum rate of 1 fastener per 2 square feet. Corner Zone fastening shall be at the rate of 1 fastener per 1 square foot.
 - 2. Supplemental fastening at the enhanced perimeter or corner rate shall be applied to any partial boards falling within these zones.
 - 3. Insulation boards installed with approved IB insulation adhesives shall be installed in accordance with Table A.4 (IB Insulation Adhesive Schedule for Adhered IB Roof Membranes) or applicable IB Roof Assembly Wind Uplift Approval Listing requirements.

4.16 FLASHINGS

- A. General: Refer to the Flashing Section within the applicable Installation Specification and IB Construction Details of this Manual, which outlines and/or depicts flashing requirements for typical construction conditions. Install flashing materials as shown in the roofing details. Contact IB Technical Services for conditions not addressed in the IB Construction Details or for approval of alternative flashing options.
 - 1. IB Roof Systems requires installation of all roof construction details in accordance with published IB Construction Details utilizing IB manufactured and approved accessories, membranes and required components.
 - 2. IB Base and Wall Flashing Details are approved for use over a variety of substrates conforming with IB requirements including structural poured and precast concrete, masonry block, dimensional lumber, plywood, and oriented strand board sheathing, approved pre-manufactured metal curbs and IB supplied, approved cementitious and/or gypsum-based parapet wall sheathing and roof cover boards.
 - 3. Wood and steel-framed walls shall be surfaced with approved plywood, OSB or IB approved gypsum cover board products designed for direct application of roofing materials. Framed walls with approved gypsum sheathing require provision of a suitable wood nailing strip or wood blocking for the termination and attachment of flashing membranes.
 - 4. Base flashings shall be constructed with IB reinforced membrane the same mil thickness as used in the field of roof and shall be installed as a separate component from installation of the field membrane. Field membrane courses may not be extended up vertical surfaces at base flashings and walls, except where alternate membrane terminations are incorporated at the base of the curb/wall.
 - 5. The minimum flashing height is 8" (20.3 cm) above the finished roof surface.
 - 6. Base flashings and wall coverings may typically be installed either as Adhered, Induction Welded, or Mechanically Attached in place and should conform to the height recommendations and limitations below. Insufficient height or termination of base flashings and penetrations below a roof's potential water accumulation depth, or where exposed to wind-driven rain or snow loads should be avoided. Sealants and caulks may be inadequate in preventing water entry under these conditions and will require periodic inspection and regular owner maintenance.

7. Proper securement of IB Roof Systems field and flashing membranes is required to ensure adequate resistance to wind and other loads to which the roof system will be subjected. For standard IB Roof System installations, follow the following securement requirements for mechanical fastening of IB field of roof and flashing membranes at roof system terminations, penetrations, vertical intersections, walls, and perimeter edges.
8. The maximum distance from the wall that horizontal mechanical attachment can be installed is 6" (15.2 cm). For horizontal mechanical attachment beyond 6" (15.2 cm), move the attachment to the vertical substrate.
9. Use only IB supplied and approved fasteners, plates, anchors, and accessory products for the securement of IB membranes and flashing products.
10. Mechanically attached flashings shall be attached in accordance with IB Construction Details, published IB Specifications, and the following Flashing Securement Table.
11. Split / rough face concrete masonry block units are not suitable for direct flashing application. Smooth-faced units should be installed at areas to receive base and wall flashings with provision for through wall or reglet style counterflashing. Surface mount flashing terminations are not permitted at concrete masonry block wall substrate.
12. Walls clad with smooth, corrugated or standing seam metal panels, lap siding, hardboard, EIFS, stucco / cement finish or similar exterior claddings require the installed IB base flashing to extend up vertical surfaces behind the cladding with a minimum 2" overlap. Bottom edge of cladding or finish materials shall include provision of a sheet metal closure and counterflashing.
13. For occupied structures and projects where odor or fume control concerns exist, care should be taken during project planning to assess potential entry points into the structure. Consideration should be given to the use of compatible air / vapor barrier seals at openings of the roof deck, terminations, walls, and penetrations; and selection of construction details and low fume, reduced VOC, content adhesives and accessory products which are approved for the specific application.
14. Flashing of curbs, parapets, expansion joints, and other penetrations of the roof must be performed using approved IB TPO reinforced membrane and IB factory-manufactured accessories. Non-reinforced membrane may be used for flashing pipe penetrations, penetration pockets, and scuppers, as well as inside and outside corners, in accordance with IB TPO details when the use of IB factory-manufactured accessories cannot be used or with prior approval from Technical.
15. Follow IB TPO Flashing Details and procedures for all curb, wall, terminations, and penetration flashings including metal edging/coping and drainage outlets using IB manufactured and supplied accessories.
16. Tie-ins to sloped roof areas, transitions of roof plane or installation at valleys with slopes 2" in 12" or greater require termination and securement of the field membrane in accordance with IB Construction Details. Refer to IB Construction Details for additional requirements.
17. Install sheet metal in compliance with IB TPO Flashing Details and SMACNA guidelines for type, grade and forming of seams.
18. Use only IB TPO clad coated metal stock formed metal edging and flashing components for construction of flashing details where welded membrane or welded flashing terminations to coated metal flanges are required.
19. All clad coated metal flashing corners and joints must be reinforced with an additional layer of IB TPO NR Metal Joint Patch or larger piece of TPO NR Detail Flashing if required by joint size.
20. Surfaces with existing asphalt, coal tar, mastics, sprayed polyurethane foam or similar incompatible materials shall be removed, thoroughly cleaned, or separated from contact with new IB TPO flashings by a slip sheet, approved insulation or cover boards, or approved plywood, etc.
21. Gypsum boards not designed for roofing including DensGlass® board are NOT to be used as a substrate for fully adhered attachment on parapet walls, according to the manufacturer.
22. Conduits and wiring shall be properly secured and supported above the IB roof system on approved piping / conduit support details.
23. Wood blocking and wood nailers shall be provided where required by project details and in accordance with IB Construction Details.

4.17 FLASHING INSTALLATION

A. General Application Guidelines

1. Substrate surfaces shall be smooth, clean, dry, and properly secured in place, ready to receive flashing materials prior to the start of work.
2. Hand welding of flashing membrane and accessory laps and seams by means of a hand welder shall maintain a minimum 1-1/2" (3.8 cm) weld width. Flashing seams and laps shall be probed after completion

and adequate set time for watertight seam integrity and proper bond. Regular test welds prior to and during progress of work is an important part of project quality control and consistency in proper membrane seaming.

3. When using bonding adhesives, be sure to use the adhesive specific to membrane and follow ambient weather conditions restrictions for use. Avoid contamination of lap and seam areas prior to welding with membrane or insulation adhesives, caulks, or primers.
4. All membrane flashing corners shall be reinforced with an additional layer of IB TPO Pre-molded Corner or IB TPO Universal Corner.
5. Remove and discard flashing materials or membrane used for temporary seals prior to completion of final flashing application.
6. Where tie-ins are required for new or existing air or vapor barriers and retarders, consult IB Technical Services and the specific material manufacturer for recommendations and requirements on required detailing.

B. Curbs:

1. Flashings can be installed either with adhesive applied to the membrane and substrate, or loose applied up to 18" (45.7 cm) high.
2. Secure membrane flashing at the top edge with a termination bar, flat stock, or counter flashing. Apply a bead of IB Water Stop sealant between the curb surface and membrane flashing, and underneath all termination bars and surface mounted counter flashings. Exposed termination bars must be mechanically fastened 6" (15.2 cm) oc. Termination bars that are counter flashed must be fastened 12" (30.5 cm) oc.
3. If wood is present at the top of the curb, secure membrane to the inside of the curb using ring shanks nails 12" (30.5 cm) oc. after wrapping the membrane to the inside of the curb. This can be used in lieu of the termination bar if nailed on the top or preferably the back side of the wood.
4. Roof field membrane must be fastened along the base of curbs, ducts, equipment supports, and field terminations a minimum of 12" (30.5 cm) oc. with approved fasteners and barbed seam plates.

C. Parapets:

1. Flashings can be installed either with adhesive applied to the membrane and substrate or loose applied up to 18" (45.7 cm) high. Maximum standard parapet wall height conditions are:
 - a. Mechanically Fastened Parapet Walls:
 - Wall heights 18" (45.7 cm) or less, refer to Standard Mechanically Attached Wall Detail
 - Wall heights exceeding 18" (45.7 cm), additional membrane sheets shall be installed and secured in horizontal row fashion 12" (30.5 cm) oc.
 - b. Adhered Parapet Walls:
 - Wall heights 60" (1.52m) or less, refer to Standard Adhered Wall Detail.
 - Wall heights exceeding 60" (1.52m), the adhered membrane shall be additionally fastened in the vertical lap at in-seam spacing at 12" (30.5 cm) oc. (Refer to IB Construction Detail T-WD-02 Adhered Tall Wall).
2. For mechanically attached, loose laid flashing application install membrane with 5" side laps and 3" end laps. Fasteners and barbed seam plates shall be supplied by IB, approved for the specific substrate type.
3. Secure membrane flashing at the top edge with a termination bar, counter flashing, or metal cap flashing. Apply a bead of IB Water Stop sealant between the wall surface and membrane flashing, and underneath all termination bars and surface mounted counter flashings. Exposed termination bars must be mechanically fastened 6" (15.2 cm) oc. Termination bars that are counter flashed must be fastened 12" (30.5 cm) oc.
4. Roof membrane must be mechanically attached along the base of walls and field terminations a minimum of 12" (30.5 cm) oc. with approved fasteners and barbed seam plates.
5. Metal counter flashings with fully adhered or dry-hung membrane wall flashings are required on warranty terms longer than 20 years. (They are not required for warranty term lengths of 20 years or less.) All termination bars, either exposed or covered, must be sealed with IB Seal-NT or IB Sealer.
6. Metal cap flashings must have continuous cleats or be face-fastened 12" (30.5 cm) oc. on both the inside and outside of the walls.

D. Adhered Base and Wall Membrane Flashings:

1. The thickness of the flashing membrane must be the same as the thickness of the roofing membrane.
2. For fully adhered application, install membrane with 3" end and side laps using only IB adhesives approved for vertical substrate installations. Follow all IB requirements and recommendations for acceptable environmental conditions and temperatures and required application rates. Application during colder weather requires special attention to material storage and handling and typically requires longer open times for adhesive set-up and curing.

3. Adhesive application rates will vary according to the porosity and condition of the substrate surface. A light prime coat of adhesive or manufacturer's approved primer may be required particularly at concrete and masonry block surfaces prior to application of primary flashing membrane adhesive. Where required, allow prime coat to dry thoroughly.
4. When using IB TPO Bonding Adhesive, IB TPO LVOC Adhesive, IB TPO CA LVOC Adhesive, IB TPO Spray Contact Adhesive or other approved TPO spray contact adhesive, the following substrates are generally suitable: new primed gypsum roof board; Type X gypsum board, cement roof board, properly prepared structural concrete (absent of curing and sealing compound); new or properly prepared OSB (untreated), new or properly prepared CDX plywood (untreated), wood board curbs (untreated), and dry, sound masonry (absent of curing or sealing compounds).
5. Apply IB TPO Bonding Adhesive, IB TPO LVOC Adhesive in accordance with IB specifications and requirements at the following application rates:
 - a. The substrate must be clean, dry, firm, free of loose particles, and free of dust, grease, and mold release agents. Protect surfaces not to be adhered.
 - b. IB TPO Bonding Adhesive, IB TPO LVOC Adhesive, and IB TPO CA LVOC Adhesive: Apply as contact adhesive to both the underside of the membrane and to approved vertical substrates at the approximate rate of one gallon per 60 square feet of net applied coverage area. Allow the adhesive open time to a dry substrate / tacky on back of membrane condition. Dry condition is tacky without stringing to a dry finger touch.
 - c. Press or roll flashing membranes to vertical surfaces immediately after installation to ensure full contact eliminating air pockets and wrinkles.
 - d. Follow all cold weather and applicable handling procedures and do not apply when ambient or substrate temperatures are below 40°F (4.4°C). Do not use it during inclement weather, on wet surfaces or on any roof deck showing signs of deterioration or loss of structural integrity. Do not use after the expiration date. Please note: IB TPO Bonding Adhesive, IB TPO LVOC Adhesive, and IB TPO CA LVOC Adhesive should not be used and is not compatible for direct use to Expanded (EPS) and Extruded (XPS) Polystyrene board substrates, EPDM, PVC, or KEE membranes..
 - e. Avoid application or contamination of seam areas and laps with bonding adhesive. Clean and remove all contaminants immediately and before final welding and completion of the seam.
6. Apply IB TPO Spray Contact Adhesive or other approved TPO Spray contact adhesive in accordance with IB specifications and requirements at the following application rates:
 - a. The substrate must be clean, dry, firm, free of loose particles, and free of dust, grease, and mold release agents. Protect surfaces not to be adhered.
 - b. IB TPO Spray Contact Adhesive or other approved TPO spray contact adhesive: Follow manufacturer's guidelines and application instructions for use. The following are basic instructions when using the approved TPO spray contact adhesive. Apply as adhesive to both the underside of the membrane and to approved vertical substrates with an adhesive pattern at 90° angles (opposite direction) to each other. (Example: Spray one substrate vertically and spray the other substrate horizontally). Apply a consistent and thorough coat of adhesive at approximately 1,000 sq. ft. net applied coverage (both surfaces) per kit. Extra coverage is recommended at substrate edge. Allow the adhesive sufficient open time to form a dry substrate / tacky on back of membrane condition. Dry condition is tacky without stringing to a dry finger touch.
 - c. Press or roll flashing membranes to vertical surfaces immediately after installation to ensure full contact eliminating air pockets and wrinkles.
 - d. A thin prime coat of additional adhesive may be required over rough or porous surfaces such as masonry or block walls. Allow adhesive prime coats to dry fully prior to application of membrane materials and bonding adhesives.
 - e. Follow all cold weather and applicable handling procedures and do not apply when ambient or substrate temperatures are below 40°F (4.4°C). Do not use it during inclement weather, on wet surfaces or on any roof deck showing signs of deterioration or loss of structural integrity. Do not use after the expiration date. Note: TPO spray contact adhesive should not be used and is not compatible for direct use to Expanded (EPS) and Extruded (XPS) Polystyrene board substrates, EPDM, PVC, or KEE membranes..
 - f. Follow IB TPO Flashing Details and procedures for all wall and curb flashings substituting an approved TPO spray contact adhesive in lieu of IB TPO Bonding Adhesive, IB TPO LVOC Adhesive, and IB TPO CA LVOC Adhesive in applicable conditions.
 - g. Wear protective glasses with side shields or goggles, nitrile gloves, and clothing that protects against dermal exposure. Recommend dispensing product in a well-ventilated area with certified respiratory protection; however, well-ventilated exterior applications may not need respiratory protection.

h. It is the responsibility of the employer to complete a PPE evaluation and/or exposure assessment to determine if respiratory protection is required. Read all instructions, Product installation guidelines, and Safety Data Sheets (SDS) prior to use of any product. For additional information go to the website of the approved TPO spray contact adhesive manufacturer.

E. TPO Clad Perimeter Edge Flashings:

1. Perimeter edge details should be installed in accordance with ANSI / SPRI ES-1 and applicable local code requirements. Continuous metal cleats one gauge heavier than the edge metal or as required for pre-manufactured IB edge systems shall be installed along perimeter edges. As an alternative, IB TPO clad edge metal may be externally fastened in accordance with IB Construction Details with approved fasteners.
2. TPO Clad Metal is applicable for both drip edge and gravel stop conditions as well as the exterior edges of parapet walls. TPO Clad Metal constructed of galvanized metal may be used for warranties up to 20 years. For extended length warranties (greater than 20 years) use IB TPO Clad Drip Edge or IB TPO Clad Gravel Stop of Stainless-Steel construction, IB Drip Edge Profile Flashing or IB Metal coping systems only.
3. Roof edge flashings constructed with IB coated metal are secured through the metal flanges nailed 4" (10.2 cm) oc. staggered or using IB HD #14 Fasteners at 12" (30.5 cm) oc. into wood nailers.
4. Form exposed edge metal flanges with a 1/2" (13 mm) hem formed where applicable for use with a continuous metal cleat. Clad metal termination bars and miscellaneous metal flashings should be formed with fully closed 1/2 (13 mm) hems with or without caulk lip kick-out as required.
5. Flashings formed from TPO clad metal for perimeter drip edge, gravel guard edge, 90° or other transitions, clad metal termination bars and similar linear lengths of metal flashing require sealing of butt-joints in accordance with published IB TPO Butt-Joint Details. Install metal flashings with a 3/8" (9.5mm) to 1/2" (12.7 mm) gap between ends to allow for expansion. Seal joint with application of a 2" (5.1 cm) strip of foil bond-breaker tape and cover with a minimum 5" (12.7 cm) wide strip of non-reinforced IB TPO membrane centered over the joint and extending down the outside face prior to application of final reinforced flashing strip-in membrane.
6. Perimeter Edge Metal Wall Closures, 90° flashings with inside/outside corners and similar constructions shall be formed to provide a continuous clad metal flange with all overlapping joints sealed, riveted, and covered with a strip of non-reinforced membrane prior to application of reinforced flashing membrane.
7. Lapped TPO clad perimeter edge metal and similar metal flashing butt-joints are susceptible to fatigue and splitting of flashing and / or field membranes at these locations due to movement and expansion of metal flashings. IB Roof Systems does not recommend use of lapped butt-joint details nor warrants against leaks or damage caused by metal movement.
8. Install a 6" (15.2 cm) IB TPO Cover Strip to TPO clad metal flanges and field membrane and heat-weld in place.
9. Apply a bead of IB TPO Clear Cut Edge Selant to flashing edges.

F. Non-Clad Perimeter Edge Flashings:

1. Perimeter edge details should be installed in accordance with ANSI / SPRI ES-1 and applicable local code requirements. Continuous metal cleats one gauge heavier than the edge metal or as required for pre-manufactured IB edge systems shall be installed along perimeter edges. As an alternative, IB TPO clad edge metal may be externally fastened in accordance with IB Construction Details with approved fasteners.
2. Roof edge flashings constructed with non TPO coated metal are secured through the metal flanges nailed 4" (10.2 cm) oc. staggered or using IB HD #14 Fasteners at 12" (30.5 cm) oc. into wood nailers.
3. Form exposed edge metal flanges with a 1/2" (13 mm) hem formed where applicable for use with a continuous metal cleat.
4. Flashings formed from non TPO clad metal for perimeter drip edge, gravel guard edge, 90° or other transitions, clad metal termination bars and similar linear lengths of metal flashing require sealing of butt-joints in accordance with published IB TPO Butt-Joint Details. Install metal flashings with a 3/8" (9.5mm) to 1/2" (12.7 mm) gap between ends to allow for expansion. Seal joint with application of a 2" (5.1 cm) strip of foil bond-breaker tape.
5. Prime metal with IB TPO Primer prior to applying SA Cover Tape.
6. Install a 6" (15.2 cm) width of IB SA Cover Tape or IB TPO HW/SA Cover Tape to the metal flange and installed TPO membrane. When using the IB TPO SA Cover Tape, heat-weld the non-SA portion that is installed over the membrane using hot-air welding techniques.
7. Apply a bead of IB TPO Clear Cut Edge Selant to flashing edges.
8. Lapped perimeter edge metal and similar metal flashing butt-joints are susceptible to fatigue and splitting of flashing and / or field membranes at these locations due to movement and expansion of metal flashings. IB Roof Systems does not recommend use of lapped butt-joint details nor warrants against leaks or damage caused by metal movement.

- G. Manufactured Edge Systems (IB or IB supplied):
1. Note: For extended length warranties (greater than 20 years) use IB TPO Clad Drip Edge or IB TPO Clad Gravel Stop of Stainless-Steel construction, IB Drip Edge Profile Flashing or IB Metal coping systems only.
 2. IB TPO field membrane or wall flashing membrane shall be turned over the roof edge or parapet wall and down outside face of wall extending past bottom of wood nailer a minimum of ½" (13 mm).
 3. The outside edge of wood nailer(s) must be aligned flush with or extend slightly past outermost edge of wall.
 4. Follow any applicable pre-installation and post installation requirements of the manufacturer's edge system design requirements.
 5. Install edge system or coping system per manufacturer's installation and securement instructions. Comply with design uplift pressures calculated under ASCE 7 and as required by local building codes or Authority Having Jurisdiction.
 6. Important: Remove protective film immediately upon installation.
- H. IB TPO Pipe Flashings:
1. Install pipe penetration flashings around pipes and circular penetrations using IB TPO Pipe Flashings, or TPO Split Pipe Flashings. Terminate and secure field membrane near the base of the penetration 6" (15.2 cm) oc. with a minimum of 3 fasteners and plates for pipes less than 12" (30.5 cm) diameter, and 12" (30.5 cm) oc. with a minimum of 4 fasteners and plates for penetrations larger than 12" (30.5 cm) in diameter. Mark and trim cone flashings to an opening size smaller than the pipe outside diameter to provide a 1/2" (13 mm) or wider flared top edge when set and drawn down over the pipe. Apply a continuous bead of approved Water Stop behind the top of the pipe flashing and slide the flashing over penetration and center. The flared upper edge of cone flashing must fit tightly against the pipe without gaps or voids. Heat weld perimeter edge of the target sheet to field membrane. Apply stainless steel banding clamp and seal with a continuous bead of approved IB sealant around the top of the completed penetration. Probe and repair all non-welded areas.
 2. Install pipe penetration flashings around pipes and circular penetrations using IB TPO SA Pipe Flashings. Prior to application, use the IB Membrane Cleaner to ensure no oil, dirt, moisture, or other foreign materials are present on either the receiving substrate or the rooftop penetration that could damage the pipe flashing. Prime the field membrane surface with IB TPO Primer prior to applying IB TPO SA Pipe Flashing. IB TPO SA Pipe Flashing is designed to be self-adhered to over approved IB TPO SM and IB TPO FB membranes. Cut out a circle on the top of the pipe flashing that is narrower than the rooftop penetration and then slide it down over the penetration. Make sure the pipe flashing is snug around the penetration and sits well with the receiving substrate. Mark where the top of the pipe flashing will sit on the penetration once installed. Then, lift the pipe flashing up and apply a minimum ¼" bead application of the IB Water Stop Sealant around the penetration and slide the pipe boot back down over the Water Stop Sealant (no need to wait for sealant to skin over). This will create a watertight seal between the pipe boot and the penetration. Install the metal pipe clamp at the top of the pipe boot and tighten it to finish the seal. Remove the release film from the tape and apply hand pressure to the flange of the pipe flashing to the TPO membrane to fuse them together. Use a roller to ensure a proper contact has been made uniformly around the flashing to the roof membrane.
 3. Where required for irregular size or pipe flashings with greater than an 8" (20.3 cm) diameter, contact IB Roof Systems for assistance with custom pipe flashing requirements. Where custom flashings are not available from IB, field fabricated no-cone pipe flashing details may be constructed from reinforced IB membrane target sheets with non-reinforced upper membrane in accordance with IB Construction Details.
- I. IB TPO Penetration Pans:
1. Where used, install IB TPO Clad Pitch Pans and fill pans with IB approved Sealant / Filler for pitch pans. IB TPO Clad Pitch Pans must be secured in place over the installed IB membrane with IB Fasteners approved for the substrate type. Split pan seams must be sealed with a continuous bead of M-1 Sealant and closed with a pop-rivets spaced approximately 1" (25 mm) oc. (not supplied).
 2. Fill sealant pans with IB One-Part Pourable Sealant or IB Sealer. Pans may be partially filled with non-shrink quick-set grout, allowing a 2" (5.1 cm) minimum thickness of IB One-Part Pourable Sealant or IB Sealer and filled to the very top or overflow the pocket.
 3. Pitch pan sealant will require periodic inspection and regular owner maintenance.
 4. Solid soldered stainless steel sheet metal cap flashings above the pans are recommended to reduce owner required sealant maintenance.
- J. Irregular Shaped Penetrations:

1. Where irregularly shaped supports are not suitable for pipe or curb flashing application, install IB TPO Clad Pitch Pans or IB Penetration Pans and fill pans with IB approved Sealant / Filler for pitch pans. IB Pitch Pans must be secured in place over the installed IB membrane with IB Fasteners approved for the substrate type. Split pan seams must be sealed with a continuous bead of M-1 Sealant and closed with a pop-rivets spaced approximately 1" (25 mm) oc. (not supplied).
 2. Fill sealant pans with IB One-Part Pourable Sealant or IB Sealer. Pans may be partially filled with non-shrink quick-set grout, allowing a 2" (5.1 cm) minimum thickness of IB One-Part Pourable Sealant or IB Sealer and filled to the very top or overflow the pocket.
 3. Pitch pan sealant will require periodic inspection and regular owner maintenance.
 4. Solid soldered stainless steel sheet metal cap flashings above the pans are recommended to reduce owner required sealant maintenance.
- K. Hot Exhaust Stacks & Hot Pipe Vents:
1. Hot pipe and similar hot exhaust vents with operating / surface temperatures above 120°F (48.9°C); require the use of an approved IB TPO Hot-Pipe Flashing Detail. Install an insulated metal jacket or curb flashing with separate sheet metal rain collar prior to application of IB TPO pipe flashing. As an alternative, an insulated metal curb may be installed with sheet metal cap flashing.
- L. Dryer / Exhaust Vents:
1. For dryer, kitchen, and bath exhaust vents use appropriate exhaust vents. Connect vent pipe to exhaust below deck. Tighten hose clamp at pipe connection, apply duct tape where both pipes connect, if necessary, to prevent any exhaust leakage. Secure the metal flange of the vent to the roof deck with a minimum of 4 fasteners using appropriate IB Fasteners for deck type. Install provided IB TPO No Cone Flashing over the exhaust pipe and hot air weld the perimeter of the target flashing to the field membrane with a minimum 1-1/2" (3.8 cm) weld to provide a watertight seal. Install the vent hood over the pipe and tighten clamp to secure into place.
 2. **Note: Not intended for use over plumbing vents, furnaces, chimneys, water heater or other gas-fired equipment, or roof ventilation purposes.**
- M. Drains:
1. Roof drains shall be cast iron or minimum 11 gauge or heavier spun aluminum type for new installations manufactured with integral clamping rings and strainers.
 2. Sump areas approximately 36" x 36" (0.91m x 0.91m) for primary drains and 36" x 48" (0.91m x 1.22m) for primary / overflow drain sets, should be formed into the deck, or constructed with tapered insulation to facilitate drainage and water removal from the roof. Sump area shall be tapered a minimum of 1/2" (13 mm) per foot and shall not exceed 3" (7.6 cm) per horizontal foot slope.
 3. Drain flashings shall be installed in accordance with IB Construction Details with a seamless drain target sheet. Field membrane shall be terminated around the drain and fastened 12" (30.5 cm) oc. with IB fasteners and barbed seam plates.
 4. Insulation and substrate surfaces should be tapered and sumped to drains and outlets. Flash drains with a reinforced, smooth back target sheet in accordance with IB TPO Flashing Details. Do not extend the field or flashing seams through roof drain flashings or beneath clamping rings. Secure target sheet around drain sump fastened a minimum of 6" (15.2 cm) oc. with approved fasteners. Make small cuts or holes around drain bolts and seal the underside of target flashing to prepared drain flange in a continuous bed of IB Water Stop sealant. Install clamping ring to provide a watertight compression seal. Cut an opening in the membrane directly above and slightly wider than the drain opening with a minimum of 1/2" (13 mm) past the inside edge of drain bolts.
- N. Retrofit Drains:
1. IB TPO Retrofit Drain with a factory applied IB reinforced TPO membrane target flashings are available for use in most new construction and retrofit drain applications. There are two types of models (standard retrofit and overflow retrofit). Each drain incorporates an EPDM Super Seal gasket that does not require any additional tools to install to create a water-tight connection to the existing drain pipe.
 2. Select appropriate drain to connect to or fit inside of the existing drain pipe.
 3. Stretch the EPDM Super Seal gasket over the outer drain stem pipe so that the outlet is seated on the small lip.
 4. Disassemble the drain assembly by removing the 3/8" stainless steel retaining bolt using a 9/16" wrench and cast aluminum strainer. Remove the compression unit from drain body for reinstallation at the end.
 5. Lubricate outside edges of the Super Seal gasket using silicone compound (provided by others).
 6. Insert the IB TPO Retrofit Drain completely into drain pipe centering the drain into the existing water leader or drain and press all the way down to the roofing system slowly rotating and pushing into position until a minimum of 2-1/2" depth into the drain water leader is achieved. Ensure super seal is properly

seated at bottom of drain throat and apply silicone lubricant (provided by others) to super seal to ease as you insert into drain pipe.

- a. Lift membrane flange and secure the drain flange to the roof deck using a minimum of four IB Fasteners that are evenly spaced around the flange. The flashing membrane must cover and extend past the fastener head.
- b. Flash drain flange in accordance with membrane manufacturer's instructions. Hand welding of flashing membrane seams by means of a hand welder shall maintain a minimum 1-1/2" (3.8 cm) weld width.
- c. After the flashing has cooled, probe for any locations that have not been fully welded in the seam area.
- d. Apply IB TPO Cut Edge Sealant 360 degrees around outer flange.
- e. Install Aluminum Strainer in accordance with manufacturer's instructions.

O. TPO Clad Scuppers:

1. There are three typical styles of IB TPO Clad Scuppers: Standard Through Wall Scupper, Standard Overflow Through Wall Scupper and Through Wall Box Scupper with Drop Drain & Overflow Cut-Out. Each style is made to order as a custom scupper.
2. Metal through-wall scuppers shall be installed over the completed base and wall flashing assembly. A wood nailer is required at the juncture of the deck and wall for securement of the scupper flange to the deck. Scupper flanges shall be secured using a minimum of two IB Fasteners per flange that are appropriate for the specific substrate.
3. Hand welding of scupper target flashing membrane seams by means of a hand welder shall maintain a minimum 1-1/2" (3.8 cm) weld width. Flashing seams shall be probed after completion and adequate set time for watertight seam integrity and proper bond.
4. Apply a bead of IB Seal-NT or IB Sealer to the scupper box at the outside wall face.
5. Mechanically attached base and wall flashings require separate securement 6" (15.2 cm) oc. through IB Aluminum Termination Bar around perimeter edge of scupper opening prior to placement and securement of the clad metal scupper.

P. Blocking and Equipment Supports:

1. Use of appropriate grade and type round structural pipe supports in lieu of irregularly shaped penetrations such as c-channel, angle iron, I-beam, or Unistrut type channels, angles or beams are recommended to facilitate use of standard pipe flashings. Penetration supports subject to regular movement or vibration such as at equipment stands, screen walls, or other elevated rooftop equipment should be flashed with IB U-Anchor Flashing Systems.
2. IB U-Anchors are customized to fit roof top conditions and provide anchorage and equipment support solutions that are compatible with the IB TPO roof membrane.
3. Wood support blocking, typically 4" x 4" (10.2 cm x 10.2 cm), is usually installed under light-duty or temporary roof mounted equipment, such as electrical conduit, gas lines, and condensation and drain lines.
4. Place wood blocking on oversized IB TPO Membrane Isolation Pad, fold two sides vertically, and fasten with roofing nails into the blocking.

Q. TPO Expansion Joints:

1. Roof expansion joint details may be field fabricated to meet expansion joint needs. There are three typical expansion joint construction styles: a curb-to-curb style set 8" (20.3 cm) or more above the roof or installed with an approved low profile, or canted profile style directly to the roof surface into the structure support or wood nailers.
2. Field construction of expansion joints consists of a membrane retainer sheet, expansion joint filler, foam backer rod, and an IB membrane cover strip.
3. Expansion joints should be set in a continuous line extending fully through the edge of the roof with approved wood nailers secured along both sides of the joint.
4. Temporary construction ties at expansion joints must be removed. Do not install roof insulation or membrane materials directly across joint openings.
5. Provide watertight detailing and functional integration of the expansion joint with other roof flashings and termination details at expansion joint terminations, intersections, and closures.
6. Protection of the finished roof assembly is recommended with expansion joint cross-over access installed at walkways and where service work is expected to reduce the potential for foot traffic and equipment damage.
7. Avoid expansion joint construction and placement that restricts or prevents the free flow of water to outlets. Do not block or intersect drainage outlets and valley lines or attempt to route roof drainage over an installed expansion joint.

8. Roof membrane must be mechanically attached along the base of the expansion joint with screws and plates a minimum of 12" (30.5 cm) oc.
 9. The retainer sheet must extend from one side of the expansion joint to the other and cover the secured field membrane on each side of the joint, extending past the fastener plate sufficiently to provide specified welded seam width of a minimum of 1-1/2" (3.8 cm).
 10. The retainer sheet shall be secured along to the wood nailer or the top of the raised wood curb a minimum of 6" (15.2 cm) oc.
 11. The cavity of the expansion joint is filled with expansion joint filler (specified by others). The expansion joint bellows must be a minimum of one and one-half times larger than the width of the expansion joint opening to allow for sufficient expansion / contraction.
 12. An additional layer of IB membrane is loose laid over the expansion bellows and then welded to the membrane retainer sheet.
 13. Hand welding of flashing membrane seams by means of a hand welder shall maintain a minimum 1-1/2" (3.8 cm) weld width. Flashing seams shall be probed after completion and adequate set time for watertight seam integrity and proper bond.
- R. U-Anchor Solar Array Support System:
1. Depending on engineering requirements determined by others, the U-Anchor may be required to be secured to structural supports. Install the U-Anchor as per instructions provided by Anchor Products. Follow any applicable pre-installation and post installation requirements according to the engineered design.
 2. Hand welding of the U-Anchor TPO flashing membrane seams by means of a hand welder shall maintain a minimum 1-1/2" (3.8 cm) weld width. Flashing seams shall be probed after completion and adequate set time for watertight seam integrity and proper bond.
 3. Attach the solar system mounting bracket and assembly to the U-Anchor posts as per instructions provided by Anchor Products.
- S. U-Anchor Pipe Support System:
1. Depending on engineering requirements determined by others, the U-Anchor may be required to be secured to structural supports. Install the U-Anchor as per instructions provided by Anchor Products. Follow any applicable pre-installation and post installation requirements according to the engineered design.
 2. Hand welding of the U-Anchor TPO flashing membrane seams by means of a hand welder shall maintain a minimum 1-1/2" (3.8 cm) weld width. Flashing seams shall be probed after completion and adequate set time for watertight seam integrity and proper bond.
 3. Secure the pipe support mounting bracket and assembly to the U-Anchor posts as per instructions provided by Anchor Products.
- T. Pipe Supports:
1. Conduits and piping shall be properly secured and supported above the completed roof on approved support details. Surface-mounted supports bearing on the membrane surface shall be installed over a course of IB TPO Walk Tread or other IB approved protection pad.
- U. Satellite Dish Supports:
1. Install satellite dish support bases over a protective layer of minimum 60-mil IB TPO membrane or IB TPO Walk Tread which is to be continuously perimeter welded to the field membrane in accordance with IB TPO Flashing Details.
- V. U-Anchor Satellite Support Securement System:
1. Depending on engineering requirements determined by others, the U-Anchor may be required to be secured to structural supports. Install the U-Anchor as per instructions provided by Anchor Products. Follow any applicable pre-installation and post installation requirements according to the engineered design.
 2. Hand welding of U-Anchor TPO flashing membrane seams by means of a hand welder shall maintain a minimum 1-1/2" (3.8 cm) weld width. Flashing seams shall be probed after completion and adequate set time for watertight seam integrity and proper bond.
 3. Secure the satellite dish mounting bracket and assembly to the U-Anchor as per instructions provided by Anchor Products.
 4. Secure the base of the dish as per instructions provided by Anchor Products.
- V. Lightning Protection Clips:
1. Lightning protection base / clips shall be limited to designated locations over a minimum 3" (7.6 cm) wide IB TPO flashing membrane strips which are continuously perimeter heat-welded to the roof membrane.
 2. The lightning protection base / clips shall be adhered to the membrane strip using a generous bead of M-1 Sealant, IB Sealer, or another compatible sealant.

4.18 WALKWAYS & SAFETY STRIP

- A. IB TPO Walk Tread should be installed over the completed IB roof membrane at hatches, doorways, ladders, and established access points to the roof; and around rooftop fixtures, equipment or other areas requiring periodic service work and traffic from maintenance personnel. Additional walk pads may be installed throughout the roof as designated walkways for personnel access.
- B. IB TPO Walk Tread is designed for continuous perimeter edge heat-weld seaming to the finished IB roof membrane surface. Refer to IB Construction Details for additional information.
- C. Clean roof membrane with IB Membrane Cleaner.
- D. Walk pads shall be cut into manageable lengths spaced a minimum of 3" apart at ends to allow for drainage. Place walk pads to avoid installation directly overlaps and seams in the field of roof and around flashings.
- E. Consideration should be given to placement of walk pads to avoid restriction or blockage of roof drainage.
- F. IB TPO Safety Tape provides a visual and physical safety warning on roof top areas of caution and potential hazards including designation of the roof perimeter.
- G. Prime TPO roof membrane with IB TPO Primer according to the application instructions to prepare the membrane for the safety strip.
- H. Place IB TPO Safety Tape at designated locations to provide a clear visual and physical safety warning to individuals on the roof, enhancing hazard awareness and roof perimeter areas.

Part 5 INDUCTION WELD MEMBRANE ROOF INSTALLATION

5.0 INDUCTION WELDED ROOF SYSTEMS

- A. Follow Induction Weld device equipment manufacturer's specifications, precautions and guidelines for operation and care of induction weld equipment.
- B. Induction welding requires special safety precautions prior to, during and after installation. When working with induction welding equipment, the installer must use extra care and extreme caution to prevent accidents such as damage to property, electrical shock, and physical injury. Carelessness can lead to loss of life, injury (such as electrical shock and burns), and loss of property. Installers should always reference the equipment manufacturer's user manual for how to properly use the equipment.
- C. Induction welded, insulated IB roof assemblies require securement of the underlying insulation boards with approved IB fasteners and IB IW TPO coated insulation plates.
 - 1. Mechanically attached insulation boards shall be secured with IB approved fasteners and insulation plates at the minimum rate per Table A.5 – Insulation Fastening Table for Induction Welded Roof Membranes.
- D. Insulation Attachment:
 - 1. Insulation must be fastened to the roof deck in TPO induction welded roof systems per the appropriate fastening pattern details, depending on membrane type and uplift requirements. For specific requirements, contact IB Technical Services at 800-426-1626.
 - 2. NOTE: IB TPO induction weld plates must be used in IB TPO induction weld systems; IB TPO and IB PVC induction weld plates are not interchangeable. IB TPO induction weld plates are a different color than IB PVC induction weld plates.
 - 3. Do not overdrive the plate and fasteners, as this will lead to poor bonding adhesion to the membrane when applied.
 - 4. Take caution to ensure there is no moisture on the board or membrane prior to application. Any water or dew will decrease the bonded welding circumference.
 - 5. Induction weld plates are only approved for TPO membranes that are 60 mil thick and greater.
- E. Induction Weld Method
 - 1. Roll out one roll of membrane over the acceptable substrate. Let it relax for 15 to 30 minutes or as needed to compensate for any residual roll tension.
 - 2. Perform calibration and set up as detailed by the induction welder's owner's manual. Refer to the induction welder's owner's manual for setup, calibration and welding.
 - 3. Center the induction welder over the first plate in the pattern and activate the weld. WARNING: The induction welder must be centered over the plate to create a 100% bond. If an error occurs during activation, refer to the induction welder owner's manual for corrective action.
 - 4. Immediately place a cooling magnet over the welded plate. WARNING: Keep magnet in place for at least 45 seconds while the assembly cools.
 - 5. Repeat process for each plate. To increase the pace, work across the sheet, moving cooling magnets from one row to the next as needed. It is best to work in the direction of the aligned rows.
 - 6. To eliminate damage to the membrane, keep the magnets and surface of membrane clean and free from debris or contamination both prior and during the induction welding process. Always wipe the magnet clean

when moving to the next plate. When removing the magnet do not twist it off, as it may damage the membrane.

7. To determine if a weld has been made, place the plunger next to a welded plate and create enough suction to lift the membrane. If welded, you will see a complete round outline of the plate. If the assembly is not welded, the membrane will lift up from the plate. Mark any plates that are not welded as a reminder to complete the weld.

Part 6 PHOTOVOLTAIC (PV) SOLAR ARRAY SYSTEM ROOF INSTALLATION

6.0 PHOTOVOLTAIC (PV) SOLAR ARRAY OVERBURDEN ROOF SYSTEMS

- A. General: The following are IB Roof Systems recommendations and general policies concerning the installation of Photovoltaic (PV) solar array systems over an IB Roof System. The determination of the most suitable PV technology, racking, and installation method is the responsibility of the Building Owner, design professional, or its designated representative. IB Roof Systems does not recommend self-adhered amorphous PV systems as many self-adhesive components are not compatible with TPO membranes.
- B. Policies & Warranty Limitations: Roof assemblies that incorporate PV solar array components above the completed roof installation are permissible with various IB Roof Systems; however, some limitations and warranty implications may apply.
 1. PV solar array materials which are approved for use over IB Roof Systems assemblies remain the sole responsibility of their manufacturer or other parties. The mounted PV solar array in and of itself does not present a physical or material compatibility issue and will not nullify a new or existing IB Roof System Warranty. However, the PV solar array is considered an “overburden” per the terms and conditions of the IB Warranty and as such, overburden materials may require removal during the service life of the roof to permit roof inspection, repair, maintenance, or additions to the assembly.
 2. The responsibility for removal and replacement of overburden materials installed above IB roof membranes for inspection, repair, maintenance, or alteration remains with the building owner or other parties.
 3. The roofing system must be designed and installed in accordance with IB published specifications, and PV system details must be accepted by IB prior to installation to avoid any lessening of coverage of the IB Warranty term.
 4. IB does not guarantee the solar mount system utilized in the solar installation or any other non-IB products on the roof. IB therefore specifically disclaims any liability arising out of or in connection with the integrity, installation, or performance of, or damages sustained by or caused by the roof mount or PV systems.
 5. IB Solar ready roof specifications are compatible with the use of IB supplied U-Anchor attachment flashings to install solar framing or anchoring of ballast trays. Contact IB Roof Systems for additional information on the use of these hot air welded accessories with integral IB TPO target flashings. Projects requiring alternate PV solar mount options may be submitted to IB Roof Systems for review on a project basis.

6.1 PHOTOVOLTAIC (PV) SOLAR ARRAY DESIGN CONSIDERATIONS

- A. Design Considerations: The following guidelines and recommendations apply to all PV solar array systems installed over an IB Roof System:
 1. The structural integrity of the building must be such that it will safely support the additional weight of the PV solar array.
 2. The substrate beneath the membrane must be in sound condition and capable of supporting the PV solar array and all anticipated construction and in-place service loads.
 3. Match roof membrane thickness and field performance to the required service life of the PV system.
 - a. Heavier gauge thickness membrane.
 - b. Reflective colored membranes to protect against UV.
 - c. Adhered systems are highly recommended for PV systems.
 - d. Determination of compatibility of the PV system to the roofing system
 - e. Determination of type of attachment method of the PV system to the roof system
 4. Consideration should be given to the use of thermal insulation materials with compressive strengths equal to or greater than 25 psi, along with use of High-Density Polyisocyanurate or gypsum cover boards directly below the roof membrane.
 5. The PV solar array must be designed and installed by a licensed authorized integrator.

6. It is the responsibility of the building owner to ensure compliance with local building codes.
 7. PV solar arrays should be positioned to ensure that all field seams and penetrations are accessible for inspection and service. Failure to do so may result in requiring removal of the PV solar array to facilitate inspections and/or repairs in the future.
 8. Structural Load Capacity:
 - a. The roofing system and building structural framing should be evaluated to verify there is enough load capacity to support the weight of the PV system (modules, conduits, and electrical equipment), wind uplifts, and snow loadings. A licensed structural engineer should provide stamped drawings and calculations.
 - b. All vertical and horizontal loads should be transferred to the building structure without deforming or overloading the roofing system.
 - c. The roof deck should also be evaluated for loads due to traffic during installation and PV/Paver stacking.
 9. Drainage
 - a. Installation of a PV system should not interfere with the drainage of the roof system.
 - b. Consider the following:
 1. Elevate framing and conduits above the roof surface to allow drainage.
 2. Install crickets on any perpendicular to drainage flow and greater than 24" wide.
 3. Projections through the roof system should not be located within 2 feet of valleys or designated drainage areas adjacent to drains, scuppers, or gutters.
 4. Consider modifying solar racking heights to counter the varying thickness of tapered insulation.
 10. Thermal Movement
 - a. The PV array and electrical conduits are subject to thermal movement. The effect of thermal movement may be reduced by:
 1. Splitting larger arrays into smaller sub-arrays.
 2. Using racking clips and attachments that accommodate thermal expansion without transferring movement to the underlying roofing systems. Some racking manufacturers have provisions for thermal expansion built into the PV systems.
 3. Using flexible flashing details for mechanically attached racking systems.
 4. Incorporating thermal expansion fittings in straight electrical conduit runs.
 5. Racking systems should not cross over expansion joints.
- B. Service Access for Maintenance**
1. PV systems should be placed away from mechanical units, rooftop equipment, designated walkways, permanent anchors, and other rooftop structures to provide access for service or maintenance of equipment.
 2. Allow adequate space for service traffic paths. The roof system surface in these areas must be protected by walkways pads or pavers.
 3. Consult the International Fire Code (IFC) for firefighting access recommendations for roof access hatches, access pathways, and equipment clearances.
 4. The Walk Tread or additional layer of membrane shall be continuously perimeter heat-welded to the roof membrane, not the base mount. Welding seams by means of a hand welder shall maintain a minimum 1-1/2" (3.8 cm) weld width.
- C. Electrical Connections**
1. The number of roof penetrations should be kept to a minimum. Cables passing through the roof assembly should not travel horizontally within a roof system, such as directly under the roof membrane or in a notched-out section of the insulation.
 2. Penetrations of electrical conduit into the building should be properly flashed to the roof system. Electrical conduit passing through a roof assembly should be run inside a sheet-metal enclosure with roof curbs [e.g., doghouse]. A gooseneck-type penetration detail can be used where a cable needs to pass through a roof assembly and be flashed.
 3. Penetration pockets (pitch pockets or pitch pans) are acceptable as a last alternative for flashing PV system electrical connections passing through a roof assembly. Refer to IB Flashing Section, part 4.15 item H. for Pitch Pocket installation methods and requirements.
- D. Codes, Standards & Guidelines**
1. Below is a list of references to codes, standards, and guidelines relevant to installation of a solar PV system on a roof. The local Authority Having Jurisdiction (AHJ) should be consulted to determine the specific requirements for code compliance of the solar PV system.
 - a. American Society of Civil Engineers (ASCE):

1. ASCE 7; Minimum Design Loads for Buildings and Other Structures. Revision as adopted by local code and Authority Having Jurisdiction.
 - b. ASTM International (ASTM):
 1. ASTM E108: Standard Test Methods for Fire Tests of Roof Coverings
 2. ASTM E2908: Standard Guide for Fire Prevention for Photovoltaic Panels, Modules, and Systems
 - c. International Code Council (ICC)
 1. International Building Code (IBC)
 2. International Electrical Code (IEC)
 3. International Fire Code (IFC)
 - d. National Electrical Installations Standards (NEIS):
 1. National Electrical Contractors Association (NECA) NECA 412: Standard for Installing and Maintaining Photovoltaic (PV) Power Systems
 - e. National Roofing Contractors Association (NRCA): Low Slope Roofing and Waterproofing Manual, Current Edition.
 - f. Underwriters Laboratories (UL):
 1. UL 790: Standard Test Method for Fire Tests of Roof Coverings
 2. UL 1703: Standard for Flat-Plate Photovoltaic Modules and Panels
 3. UL1897: Standard for Safety, Uplift Tests for Roof Covering Systems
 - g. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA): Architectural Sheet Metal Manual, 2012 Edition.
 - h. ANSI / SPRI / RP-4: Wind Design Standard for Ballasted Single-Ply Roofing Systems
- E. Pre-Job Conference: A pre-job meeting should be held with the building owner, designer, PV system manufacturer, roof system manufacturer, general contractor, electrical contractor, roofing contractor, and any other interested party whose work may have an effect on successful project completion. The PV system designer's specifications/plans and flashing details should be reviewed during the pre-job meeting. The following items should also be discussed at the pre-job conference:
1. Establish construction schedules and work methods that will prevent damage to the PV system flashing and the roof system.
 2. Establish procedures for reporting and repairing any damage to flashings or any part of the roof system.
 3. Designate access, staging, work, storage, and disposal areas.
 4. Establish suitable weather conditions and working temperature criteria to which all parties agree.
 5. Establish safety regulations/requirements and good roofing practices.

6.2 NON-PENETRATING & BALLASTED PHOTOVOLTAIC (PV) SOLAR ARRAY METHODS

- A. Non-penetrating Attachment of PV Solar
1. Non-penetrating attachment methods that rely solely on adhesive attachment or a compression seal for anchoring to the membrane are not permitted.
 2. Any anchoring system, whether used as a primary or ancillary securement method, should be tied directly to a structural component of the building. Failure to comply will result in negating the issuance of a membrane system warranty or termination of all existing warranties.
 3. The only authorized exception is the use of the U-Anchor 2000 over Fully Adhered IB Roof Systems. This requires design and engineering calculations by a qualified designer and approval by Anchor Products.
- B. Non-Penetrating Racking Systems
1. The solar racking system should be designed so that external forces acting on the rack do not compromise the waterproofing integrity of the roofing system. Loads to be considered include horizontal wind load, vertical wind uplift load, vertical dead load, and vertical snow load, as well as non-specific vibratory loads from external forces or building equipment.
 2. Racking systems should have:
 - a. Thermal and dynamic movement provisions within the racking system.
 - b. Minimal UV exposure of washers/gaskets.
 - c. Base mounts of ballasted PV systems with sufficient area to distribute vertical loads without cutting or compressing the underlying roofing system.
 - d. Compatible corrosion-resistant rack components.
 3. Mechanically attached and plate-bonded induction welded roofing systems have the possibility of billowing due to high wind or building pressure differences. Billowing could lead to localized abrasion of a roof membrane at contact between membrane and PV mounting system.

- a. For racking systems installed above consider increased racking height due to the possibility of billowing from high wind or building pressure differences.
 4. Racks should have enough clearance above the membrane to permit safe access and service of the roof. Racking systems should allow ease of removal by trained personnel without significantly exposing the roof system to the possibility of damage. Failure to do so may result in requiring removal of the PV solar array to facilitate inspections and/or repairs in the future.
- C. Ballasted PV Systems
1. For non-penetrating ballasted PV racking systems, the use of an additional layer of membrane as a sacrificial sheet (min. 60-mil) in-between contact surfaces at the roof and the base of ballasted racking systems is required. The additional layer of membrane shall be continuously perimeter heat-welded to the primary roof membrane, not the base mount. Welding seams by means of a hand welder shall maintain a minimum 1-1/2" (3.8 cm) weld width.
 - A. The slip sheet helps reduce wear & tear from incidental movement of the array, as well as helps reduce heat build-up on the primary waterproofing membrane.
 - b. The slip sheets should be a minimum 4" (10.2 cm) wider than the contact surface area of the rack base mount on all sides.
 - c. For ballasted PV systems, the roof slope should not exceed 2:12.
 - d. Ballast pavers should be type-tested for long-term durability, including freeze-thaw durability.
 - e. Billowing could cause ballasted PV systems to shift and can also lead to localized abrasion of a roof membrane at contact between membrane and PV mounting system.

6.3 PENETRATING PHOTOVOLTAIC (PV) SOLAR ARRAY METHODS

- A. Flashing of PV System Mounts
1. Racking systems that require penetration of the roofing membrane must be flashed in accordance with the appropriate IB Construction Detail. All flashing details must be performed by an IB Authorized Applicator.
 2. For penetrating photovoltaic installations, IB recommends the U-Anchor by Anchor Products, which is designed to be welded to the IB membrane with compatible IB membrane and is considered a universal receiver for mounted system connection points. To determine the most appropriate U-Anchor unit and placement – contact Anchor Products at 888-575-2131 or www.anchorp.com.
 3. The following attachment system using IB membrane flashings are eligible for the flashing and seaming to be covered under the roof system warranty:¹
 - U-Anchors by Anchor Products for IB TPO
 - U-Anchor 2000 – IB TPO
 - U-Anchor 2400 – IB TPO
 - U-Anchor 3400 – IB TPO
- A. When U-Anchors are not utilized, penetrations must be flashed in accordance with the appropriate IB Flashing detail. PV systems using support stands should use round steel pipes or square tubes to facilitate effective flashing installation methods. All flashing details must be completed by an IB Authorized Applicator and should be flashed in accordance with the appropriate NRCA or IB Construction Details. Note: IB TPO Pipe Flashings and field wrapped pipe flashings used to flash PV Solar support mounts are excluded from Warranty Coverage.
5. Installation of thicker flashing membranes, additional layers of flashing membranes is recommended for highly reflective PV system arrays.

6.4 PHOTOVOLTAIC (PV) SOLAR ARRAY LAMINATE METHODS

- A. Self-Adhering Thin Film PV Systems
1. Compatibility of PV laminates must be determined. Note: Some self-adhering film laminates use butyl-based adhesives which are not compatible with TPO.
 2. For compatible self-adhering PV laminates, the PV laminate must not be adhered directly to the primary IB membrane. A sacrificial layer of IB membrane shall be used as a slip sheet and continuously welded to the existing membrane.

6.5 PHOTOVOLTAIC (PV) SOLAR ARRAY INSTALLATION OVER RECOVER ROOFS

- A. PV System Installation over Recover Roofs: For existing roof conditions, before installing a PV system over an existing roof, consider whether the remaining roof system service life is equivalent to the expected life of the



PV system (typically >20 years). If it is expected that the PV installation will function longer than the existing roof system, re-covering or roof replacement should be considered. Other factors to consider include additional roof system penetrations, increased rooftop traffic, increased surface temperatures, etc.

1. The new IB roofing system must be designed and installed in accordance with IB published specifications, and PV system details must be accepted by IB prior to installation to avoid any lessening of coverage of the IB Warranty term or cancellation of the IB Warranty if the PV system does not meet IB's minimum requirements.
2. Refer to IB Recover Installation policies for minimum requirements.

6.6 PHOTOVOLTAIC (PV) SOLAR ARRAY INSTALLATION OVER EXISTING IB WARRANTIED ROOFS

A. PV System Installation over an Existing IB Warrantied Roof:

1. IB must be notified prior to any additions, alterations, or modifications or other substantial work is to be performed on or through the IB Roof System. Notice must be given to the IB Roof Systems Technical Department at warranty@ibroof.com prior to the commencement of the work. Alterations performed or undertaken without prior IBRS approval; or that is not in compliance with IBRS specifications and installation instructions may result in cancelation of the IB Warranty.
2. Shop drawings of the PV system layout and installation specifics must be provided to the IB Technical Department for our warranty records, including all flashing details that will be used to install the PV system.
3. Note: IB Roof Systems does not approve mounting systems; IB only reviews the flashings to be incorporated into the IB roofing system. IB reserves the right to decline coverage if it is determined that the PV installation may be detrimental or compromise the performance of the IB roofing system within its warranty period.
4. IB Roof Systems may, at its option, recommend or require specific roof detailing consistent with IB Roof System Warranty Requirements.
5. An initial inspection of the existing roofing system must be performed by an IB Technical Field Services Representative to assess the condition of the roof. This is a fee-based inspection.
6. Any repairs/modifications to the existing roof system identified by IB Technical Field Services must be done at the owner's cost prior to the installation of the PV system.
7. Any roof modifications, including penetrating the IB membrane, required or performed as a result of the PV installation must be performed by an IB Authorized Applicator.
8. The existing IB roof must be protected during installation of the PV system to prevent damage. This includes the staging and assembly areas and other heavily traveled areas.
9. The addition of a PV System over an existing IB roof may require additional installation of walkway pads, protection pads, slip sheets and sacrificial sheets welded to the primary roofing membrane.
10. To avoid future PV system removal costs to the building owner, the PV system should provide adequate clearance for access to the roof membrane should maintenance or repairs be required.
11. An inspection of the roofing system must be completed by IB Technical Field Services after the installation of the PV system and any deficiencies/damage caused by the installation must be repaired by an IB Authorized Applicator. This is a fee-based inspection.
12. IBRS reserves the right to require additional inspections as necessary to ensure that our requirements are met. These are fee-based inspections.
13. Inspection fees must be pre-paid via credit card prior to being scheduled. Fees for inspections shall be payable in advance prior to re-issuance or reinstatement of the IB Roofing Warranty. After all requirements are met and fees paid, IB will issue an addendum to the warranty confirming coverage of the existing IB Roof or reinstatement of the IB Warranty subject to all terms and conditions set forth in the warranty.

6.7 CARE, MAINTENANCE & INSPECTIONS

A. Care, Maintenance & Inspections:

1. Refer to the Owner's Roof Maintenance Guide & Maintenance Program for helpful tips concerning protecting the roof for maximum performance and life of the IB roofing system.
2. Care should be taken by those accessing the roof to perform maintenance of the PV System.
3. Note: Solar racking systems are not manufactured nor sold by IB. Refer to the IB Overburden Warranty Clause for warranty terms and Owner Responsibilities.
4. Should IB be contacted to investigate a warranty claim, or to make warranty related repairs, providing access to the membrane (removal and replacement of the PV System) is the responsibility of the Building Owner.
5. There is an Inspection Fee Schedule for Solar System Installations:



6. Contact IB Roof Systems Technical Services at 1-800-426-1626 regarding IB policies and/or warranty implications related to photovoltaic systems.

END OF SECTION

TABLE A.1 – SUBSTRATE REQUIREMENTS

Deck	Required Criteria	Application
APA Plywood Sheathing	Plywood sheathing shall be C-D, Exposure 1-min. 4-ply-not less than 15/32" thick	Maximum joist spacing 24" oc. or less with min. 1/8" to 1/4" spacing between panels
APA Oriented Strand Board Sheathing (OSB)	OSB sheathing shall be PS 2-10, Exposure 1, Structural 1 not less than 7/16" thick	Install with all sides bearing on and secured to joist and cross blocking in accordance with APA-The Engineered Wood Association requirements
Wood Plank	Minimum 1" nominal thickness and have a nominal width of 4" to 6". Tongue and Groove or shiplap planks. Kiln-dried lumber	All boards must be supported on rafters at each end and be securely fastened. Cover knotholes or cracks greater than 1/4" with securely nailed sheet metal
22 ga. Steel	Cold formed steel decking— minimum finish coat of primer paint on both sides. G-90 galvanized steel recommended-minimum 22 gauge	Comply with Factory Mutual gauge and span requirements, and guidelines contained in FM LPDS 1-28 and 1-29
24 – 26 ga. Steel	Requires written approval from IB Technical Services Manager	Mandatory fastener withdrawal tests in accordance with ANSI / SPRI FX-1 required
Structural Concrete	Minimum deck thickness for structural concrete is 4 inches	Roof deck shall be allowed to cure prior to application of the roofing system. Evaluate surface moisture and deck dryness as required with the ASTM D4263 or hot bitumen test procedures.
	Minimum 2500 psi compressive strength	
	Finished to a smooth uniform surface free of sharp edges, ridges, and irregular surfaces	
	Sumps for roof drains shall be provided in the casting of the deck	
Structural Concrete	Wood nailers shall be cast into the deck at perimeter edges and openings for non-insulated assemblies	Repair cracks greater than 1/8 inch in width in accordance with the deck manufacturer's recommendations.
	Underside of deck shall be constructed to allow drying and prevent moisture entrapment. Deck forms shall be removed or vented. Do not install materials or finishes to underside of deck that are impermeable or restrict drying.	
Precast / Pre-Stressed Concrete	Minimum deck thickness 2"	Inspect deck panels prior to roof installation. Correct offset and variations in camber between units.
	Fill joints with suitable masonry grout at vertical offsets between panels troweled to provide a smooth, uniform surface	
Lightweight Insulating Concrete	Minimum deck thickness of 2"	Comply with requirements of deck manufacturer. Do not install during periods of inclement weather, rain or ambient temperatures below freezing. Frozen decks shall be replaced. Inspect deck for signs of entrapment or excess moisture. Cellular lightweight insulating concrete may be installed over approved galvanized non-slotted decking or structural / precast concrete decks.
	Minimum compressive strength of 200 psi and a minimum density of 22 pcf for adhered roofing systems	
	Lightweight Insulating Concrete fill must be cured and dry for adhered application of IB roof assemblies	
	Installation over non-venting substrates requires review and written approval of IB Technical Services Manager	
Cementitious Wood Fiber	Minimum deck thickness of 2"	Decks shall be protected from the weather during storage and application; any wet or deformed decking shall be removed and replaced. Composite deck panels containing EPS / XPS polystyrene insulation are not suitable for use with solvent-based roof system adhesives.
	Secure all panels to supports to resist uplift and lateral movement	
	Grout and level deflections and irregularities between panels to provide a level, smooth deck	
Gypsum	Installation in high humidity environments requires careful design, maintenance, and air / moisture control to prevent excess moisture accumulation and deck deterioration	Comply with requirements of deck manufacturer. Do not install during periods of inclement weather, rain or ambient temperatures below freezing. Frozen decks shall be replaced. Decks should be inspected for signs of entrapment or excess moisture. Mandatory fastener withdrawal tests in accordance with ANSI/SPRI FX-1 required.
	Minimum deck thickness of 2"	
	Poured decks reinforced with steel mesh over gypsum formboard	
	Precast units formed with reinforced steel edges for clipped or fastened application to supports	

TABLE A.2 – INSULATION FASTENER SCHEDULE FOR ADHERED IB TPO ROOF MEMBRANES

Deck Types: min. 22 ga. Steel, min. 4" Structural Concrete, 1/2" – 3/4" Plywood, 1" or greater Wood Plank, Tongue and Groove								
Insulation Type		Thickness	4' x 4'			4' x 8'		
			Field	Perimeter	Corner	Field	Perimeter	Corner
Polyisocyanurate	IB Energy Board II/III	1.0" – 1.4"	6	9	12	12	18	24
	IB Energy Board II/III	1.5" – 1.9"	5	8	10	10	15	20
	IB Energy Board II/III	2.0" Min.	4	6	8	8	12	16
Polystyrene	EPS / XPS ²	1.0" Min.	6	9	12	12	18	24
	EPS / XPS ²	1.5" Min.	6	9	12	12	18	24
Cover Board	DensDeck® Prime / DensDeck StormX DEXCell® FA Glass Mat Board	.25" Min.	5	8	10	10	15	20
	Securock® UltraLight Coated Glass Mat Securock® Gypsum Fiber Roof Board	.25" Min.	5	8	10	10	15	20
	DensDeck® ProFast™ Prime Roof Board	.375"	4	6	8	8	12	16
	DensDeck® Prime / DensDeck® StormX Prime	.50" - .625" Min.	4	6	8	8	12	16
	DEXCell® FA Glass Mat Board / DEXCell® Cement Roof Board	.50" - .625" Min.	4	6	8	8	12	16
	Securock® UltraLight Coated Glass Mat Securock® Gypsum Fiber Roof Board	.50" - .625" Min.	4	6	8	8	12	16
	IB HD ISO, IB Recovery Energy Board III	.50"	4	6	8	8	12	16
Deck Types: Min. 24 ga. Steel, LWIC over Steel Form Deck ¹ , 7/16" OSB, Cementitious Wood Fiber, Poured Gypsum								
Insulation Type		Thickness	4' x 4'			4' x 8'		
			Field	Perimeter	Corner	Field	Perimeter	Corner
Polyisocyanurate	IB Energy Board II/III	1.0" – 1.9"	8	12	16	16	24	32
	IB Energy Board II/III	2.0" Min.	6	9	12	12	18	24
Polystyrene	EPS / XPS ²	1.0" Min.	8	12	16	16	24	32
	EPS / XPS ²	1.5" Min.	8	12	16	16	24	32
Cover Board	DensDeck® Prime / DensDeck StormX DEXCell® FA Glass Mat Board	.25" Min.	8	12	16	16	24	32
	Securock® UltraLight Coated Glass Mat Securock® Gypsum Fiber Roof Board	.25" Min.	8	12	16	16	24	32
	DensDeck® ProFast™ Prime Roof Board	.375"	5	8	10	10	15	20
	DensDeck® Prime / DensDeck® StormX Prime	.50" - .625" Min.	6	9	12	12	18	24
	DEXCell® FA Glass Mat Board / DEXCell® Cement Roof Board	.50" - .625" Min.	6	9	12	12	18	24
	Securock® UltraLight Coated Glass Mat Securock® Gypsum Fiber Roof Board	.50" - .625" Min.	6	9	12	12	18	24
	IB HD ISO, IB Recovery Energy Board III	.50"	6	9	12	12	18	24
<p>The above fastening guidelines are approved by IB Roof Systems for use in accordance with our current specifications and meet minimum IB installation requirements for issuance of standard published IB warranties. Roof deck fastener withdrawal resistance must meet or exceed IB required minimums. Fasteners and plates must be IB labeled and approved for the specific deck type. Buildings with field of roof design velocity pressures above -30 psf and projects requiring IB Wind Riders may require additional fasteners and roof system securement. IB Roof Systems does not practice architecture or engineering. It is the responsibility of the designer of record, building owner or roofing contractor to determine required roof assembly wind resistance and comply with applicable code requirements. Contact IB for additional information and refer to published IB roof assembly Approval listings, General Requirements, Specifications, and Construction Details for information on roof components and fastening rates to meet specific project design requirements.</p>								
<p>¹Requires prior written approval of IB Technical Services for existing dry Cellular LWIC over minimum 24-gauge Steel Form-Deck ²Requires minimum 1.5 lb./ft³ density and minimum .25" layer of IB approved Gypsum or HD polyisocyanurate cover board or minimum 1.0" layer of IB Polyisocyanurate board above EPS/XPS insulation</p>								

TABLE A.3 – SUBSTRATE WITHDRAWAL RESISTANCE AND INSULATION FASTENER TABLE

Deck / Substrate Type	Fastener Withdrawal – Average Resistance Values ¹	Insulation Fastener / Plate Recommendations		Fastener Penetration into Deck
		Fastener	Plate	
1" minimum Wood Plank	450 lbs.	SD #12, HD #14	3" Round Galvalume	1" Min.
1/2" minimum C-D, Exposure 1 Plywood	425 lbs.	SD #12, HD #14	3" Round Galvalume	1/2" through
5/8" OSB	350 lbs.	HD #14, XHD#15	3" Round Galvalume	1/2" through
7/16" OSB	275 lbs.	HD #14, XHD#15	3" Round Galvalume	1/2" through
22 ga. Steel	525 lbs.	SD #12, HD #14, XHD #15	3" Round Galvalume	3/4" through
24 ga. Steel	425 lbs.	HD #14, XHD#15	3" Round Galvalume	3/4" through
Cellular LWIC over 24 ga. Steel Form	425 lbs.	HD #14, XHD#15	3" Round Galvalume	3/4" through
Structural Concrete	800 lbs.	IB HD #14 or Dekspike	3" Round Galvalume	1-1/4" Min.
Poured Gypsum	300 lbs.	Deklite or GypTec	3" Round Gyp Plate	1-1/2" Min.
Cementitious Wood Fiber	300 lbs.	Deklite or GypTec	3" Round Gyp Plate	1-1/2" Min.

¹Fasteners shall be IB Roof Systems supplied and approved for the specific substrate / roof deck type

TABLE A.4 – IB INSULATION ADHESIVE SCHEDULE FOR ADHERED IB TPO ROOF MEMBRANES

Approved Decks / Substrates	Insulation Type ²	Thickness	Field	Perimeter	Corner
<ul style="list-style-type: none"> - Structural Concrete - Cellular Lightweight Insulating Concrete - Cementitious Wood Fiber - Approved Existing Roof Systems¹ 	Polyisocyanurate	1.0" Min.	12" oc. (max.)	8" oc. (max.)	6" oc. (max.)
	EPS (1.5 pcf) ³ / XPS (1.55 pcf) ³	1.5" Min.			
	HD ISO / Approved Composite	1.5" Min.			
	Gypsum Cover Board	.25" Min.			
	Cement Roof Board	.375" Min.			
	HD ISO Cover Board	.50" Min.			

The above insulation adhesive guidelines are approved by IB Roof Systems for use in accordance with our current specifications and meet minimum IB installation requirements for issuance of standard published IB warranties. Roof deck insulation adhesive withdrawal resistance must meet or exceed IB required minimums. Contractor must confirm adequate adhesion to substrates with insulation adhesive pull tests in accordance with ANSI / SPRI IA-1. Insulation adhesive must be IB labeled and approved for the specific deck and substrate type. Buildings with field of roof design velocity pressures above -30 psf and projects requiring IB Wind Riders may require additional adhesive and supplemental roof system securement. IB Roof Systems does not practice architecture or engineering. It is the responsibility of the designer of record, building owner or roofing contractor to determine required roof assembly wind resistance and comply with applicable code requirements. Contact IB for additional information and refer to published IB roof assembly Approval listings, General Requirements, Specifications and Construction Details for information on roof components and adhesive application rates to meet specific project design requirements.

¹Prepared and primed existing smooth or granule surfaced asphaltic BUR and MB roof systems meeting IB specifications and requirements.

²Roof insulation boards must be IB Roof Systems labeled, supplied, or approved for use with IB roof membranes and assemblies.

³Requires minimum .25" layer of IB approved gypsum board, .375" cement board, .5" high density polyisocyanurate cover board, .5" high density wood fiber board, or minimum 1.0" layer of IB approved polyisocyanurate board above EPS/XPS insulation

TABLE A.5 – INSULATION FASTENING TABLE FOR INDUCTION WELDED IB ROOF MEMBRANES

Deck / Substrate Type	Fastener Withdrawal – Average Resistance Values ¹	Insulation Fastener Recommendations		Fastener Penetration into Deck
		Fastener/Plate	Per 4' x 8' Board Fastening Pattern F/P/C	
Structural Concrete	800 lbs.	IB HD #14, CD-10 or Dekspike	6-9-12	1" Min.
22 ga. Steel	525 lbs.	XHD #15	6-9-12	3/4" through
24 ga. Steel	425 lbs.	XHD #15	8-12-16	3/4" through
16 ga. Purlin	700 lbs.	IB #12 Purlin	12" oc.	3/4" through
½" minimum Plywood	425 lbs.	HD #14	8-12-16	½" through
1" minimum Wood Plank	450 lbs.	HD #14	8-12-16	1" Min.
LWIC over Steel Form Deck	425 lbs.	XHD #15	8-12-16	3/4" through
7/16" minimum OSB	Contact IB Technical Services for prior approval and fastening schedule per project			
5/8" minimum OSB	Contact IB Technical Services for prior approval and fastening schedule per project			

¹Fasteners shall be IB Roof Systems supplied and approved for the specific substrate / roof deck type.
²Fastening density based on 4' x 8' board size and conformance with IB required withdrawal resistance values

TABLE A.6 – STANDARD IN-SEAM MEMBRANE FASTENING SCHEDULE FOR IB TPO MECHANICALLY ATTACHED ROOF MEMBRANES

Deck Types	Fastening Rate*	IB Fastener	IB Plate	Pull-Test Resistance Values
Structural Concrete	12" oc.	IB HD #14, CD-10 or Dekspike	2" or 2-3/8" Barbed	450 lbs.
22 ga. Steel	12" oc.	IB XHD #15	2-3/8" Barbed	525 lbs.
24 ga. Steel	6" oc.	IB XHD #15	2-3/8" Barbed	425 lbs.
26 ga. Steel	Contact IB Technical Services for prior project approval and fastening schedule			
16 ga. Purlins	12" oc.	IB #12 Purlin	2-3/8" Barbed	800 lbs.
15/32" minimum Plywood	6" oc.	IB HD #14 or XHD #15	2-3/8" Barbed	360 lbs.
19/32" minimum Plywood	12" oc.	IB XHD #15	2-3/8" Barbed	525 lbs.
1" minimum Wood Plank	12" oc.	IB HD #14 or XHD #15	2-3/8" Barbed	525 lbs.
LWIC over Steel Form Deck ¹	12" oc.	IB XHD #15	2-3/8" Barbed	425 lbs.
Cementitious Wood Fiber	6" oc.	IB Deklite or Gyptec	2" Barbed Gyp Plate	300 lbs.
Poured Gypsum	6" oc.	IB Deklite or Gyptec	2" Barbed Gyp Plate	300 lbs.
7/16" minimum OSB	6" oc.	IB HD #14 or XHD #15	2-3/8" Barbed	275 lbs.
5/8" minimum OSB	6" oc.	IB HD #14 or XHD #15	2-3/8" Barbed	410 lbs.

*Fastening rates are based on maximum sheet width of 10 feet with a 6" wide overlap and a maximum field design pressure of -30 psf. Areas with higher design pressures require an enhanced fastener density and/or reduced sheet width.

¹Requires prior written approval of IB Technical Services. Limited to existing dry Cellular LWIC fill over minimum 24 ga. Steel Form Deck with fastener penetration through the steel deck.

The above fastening guidelines are approved by IB Roof Systems for use in accordance with our current specifications and meet minimum IB installation requirements for issuance of standard published IB warranties. IB Roof Systems does not certify or assume responsibility for the design, condition, or performance of the roof deck; or its conformance to local code or IB minimum fastener withdrawal resistance requirements. Fasteners and plates must be IB labeled and approved for the specific deck type. Buildings with field of roof design wind uplift pressure above -30 psf and projects requiring IB Wind Riders may require additional fasteners and roof system securement. IB Roof Systems does not practice architecture or engineering. It is the responsibility of the designer of record, building owner or roofing contractor to determine required roof assembly wind resistance and comply with applicable project design and code requirements. Contact IB for additional information and refer to published IB roof assembly approval listings, General Requirements, Specifications and Construction Details for information on roof components and fastening rates to meet specific project design requirements.

TABLE A.7 – WIND RESISTANCE ENHANCEMENTS AT FIELD, PERIMETER, AND CORNER ZONE AREAS – STANDARD RECTANGULAR BUILDINGS WITH ROOF ANGLES 0° to ≤ 7°

ASCE 7-10	
Roof Heights ≤ 60'	Field of Roof (Zone 1): Interior area of roof, exclusive of Perimeter Zone 2 and Corner Zone 3 areas.
Roof Heights ≤ 60'	Perimeter (Zone 2): Perimeter edges of roof, extending inward from roof edge a distance of .1 x Building Width (Lesser plan dimension), or .4 x mean height of roof (whichever is less), with a minimum of 4% of least horizontal dimension or 3 feet.
Roof Heights ≤ 60'	Corner (Zone 3): Dimensions set by the width and intersection of the building's Perimeter Zones.
ASCE 7-16	
Roof Heights > 60'	Field of Roof (Zone 1): Interior area of roof, exclusive of Perimeter Zone 2 and Corner Zone 3 areas.
Roof Heights > 60'	Perimeter (Zone 2): Perimeter edges of roof, extending inward from roof edge a distance of .1 x Building Width (Lesser plan dimension), with a minimum of 3 feet.
Roof Heights > 60'	Corner (Zone 3); Roof heights above 60 feet require the length of the Corner Zone along each perimeter edge outward from the corner, to be multiplied by a factor of two.
ASCE 7-16	
Roof Heights ≤ 60'	Field of Roof (Zone 1') : Interior area of roof which may remain when Zones 1, 2, and 3 are present; extending inward from inside edge of Field of Roof Zone 1 Note: Not present on all buildings and roof layouts.
Roof Heights ≤ 60'	Field of Roof (Zone 1): Interior area of roof, extending inward from inside edge of Perimeter Zone 2 to a distance of .6 x Mean Height of Roof.
Roof Heights ≤ 60'	Perimeter (Zone 2): Perimeter edges of roof, extending from roof edge inward a distance of .6 x Mean Height of Roof. Roofs with continuous parapet walls 3' in height or greater may use Perimeter Zone 2 wind uplift calculations and securement within Corner Zone areas.
Roof Heights ≤ 60'	Corner (Zone 3): Corner areas are L-shaped, extending inward and along the roof edge in both directions from the corner; width equal to .2 x Mean Height of Roof and length equal to .6 x Mean Height of Roof.
Roof Heights > 60'	Field of Roof (Zone 1') : Interior area of roof which may remain when Zones 1, 2, and 3 are present; extending inward from inside edge of Field of Roof Zone 1
Roof Heights > 60'	Perimeter (Zone 2): Perimeter edges of roof, extending from roof edge inward a distance of .1 x Building Width (Lesser plan dimension) with a minimum of 3 feet.
Roof Heights > 60'	Corner (Zone3): Roof heights above 60 feet require the length of the Corner Zone along each perimeter edge outward from the corner, to be multiplied by a factor of two.

TABLE A.8 – HALF SHEET SECUREMENT TABLE AND PERIMETER AND CORNER ZONE WIDTHS

Roof Height	Perimeter Zone Width		Corner Zone Length		Corner Zone Width		Prescriptive # of 5' Width Sheets	
	ASCE 7-10*	ASCE 7-16	ASCE 7-10*	ASCE 7-16	ASCE 7-10*	ASCE 7-16	ASCE 7-10*	ASCE 7-16
15	6'	9'	6'	9'	6'	3'	2	2
30	12'	18'	12'	18'	12'	6'	3	4
45	18'	27'	18'	27'	18'	9'	4	6
59	24'	36'	24'	36'	24'	12'	5	8

*ASCE 7-10 allows perimeter zone width calculation of .1 x building width (lesser plan dimension) or .4 x building height, whichever is less.

TABLE A.9 – BASE AND WALL FLASHING ALLOWABLE HEIGHT

Detail Condition	Fully Adhered	Mechanically Attached
Base flashings: recommended minimum completed height	8"-12" above field membrane	8"-12" above field membrane
Base and wall flashings: allowable maximum heights (without intermediate fastening rows)	60" above field membrane	18" above field membrane

TABLE A.10 – INDUCTION WELDED WALL SUBSTRATE WITHDRAWAL RESISTANCE AND FASTENING TABLE

Wall / Substrate Type	Insulation / Cover Board Type attached to Wall	Thickness	Fastener ¹	Insulation Fastener Recommendations ²			
				4' x 4'		4' x 8'	
				Perimeter	Corner	Perimeter	Corner
<ul style="list-style-type: none"> - Brick - Masonry - Structural - Concrete - ¾" Plywood 	IB EnergyBoard II, IB Energy Board III, or other Approved ISO	Min. 1.0" – 1.9"	IB HD #14, Dekspike or CD-10	6	8	12	16
	IB EnergyBoard II, IB Energy Board III, or other Approved ISO	Min 2.0"	IB HD #14, Dekspike or CD-10	5	6	9	12
	DensDeck® Prime / DEXCell® FA Glass Mat Board	Min. 0.25"	IB HD #14, Dekspike or CD-10	6	8	12	16
	Securock® UltraLight Coated Glass Mat Securock® Gypsum Fiber Roof Board	Min. 0.25"	IB HD #14, Dekspike or CD-10	6	8	12	16
	DensDeck® Prime / DensDeck® StormX Prime	Min. .50" - .625"	IB HD #14, Dekspike or CD-10	5	6	9	12
	DEXCell® FA Glass Mat Board / DEXCell® Cement Roof Board	Min. .50" - .625"	IB HD #14, Dekspike or CD-10	5	6	9	12
	Securock® UltraLight Coated Glass Mat Securock® Gypsum Fiber Roof Board	Min. .50" - .625"	IB HD #14, Dekspike or CD-10	5	6	9	12
	IB HD ISO, IB Recovery Energy Board III	0.50"	IB HD #14, Dekspike or CD-10	6	8	12	16
Fastener/isoweld plates direct into approved substrate		IB HD #14, Dekspike or CD-10	5	6	9	12	
<ul style="list-style-type: none"> - ½" Plywood - 24 ga. steel 	IB EnergyBoard II, IB Energy Board III, or other Approved ISO	Min. 1.0" – 1.9"	IB HD #14, Dekspike or CD-10	6	8	12	16
	IB EnergyBoard II, IB Energy Board III, or other Approved ISO	Min 2.0"	IB HD #14, Dekspike or CD-10	5	6	9	12
	DensDeck® Prime / DEXCell® FA Glass Mat Board	Min. 0.25"	IB HD #14, Dekspike or CD-10	6	8	12	16
	Securock® UltraLight Coated Glass Mat Securock® Gypsum Fiber Roof Board	Min. 0.25"	IB HD #14, Dekspike or CD-10	6	8	12	16
	DensDeck® Prime / DensDeck® StormX Prime	Min. .50" - .625"	IB HD #14, Dekspike or CD-10	5	6	9	12
	DEXCell® FA Glass Mat Board / DEXCell® Cement Roof Board	Min. .50" - .625"	IB HD #14, Dekspike or CD-10	5	6	9	12
	Securock® UltraLight Coated Glass Mat Securock® Gypsum Fiber Roof Board	Min. .50" - .625"	IB HD #14, Dekspike or CD-10	5	6	9	12
	IB HD ISO, IB Recovery Energy Board III	0.50"	IB HD #14, Dekspike or CD-10	6	8	12	16
Fastener/isoweld plates direct into approved substrate		IB HD #14, Dekspike or CD-10	5	6	9	12	

¹Fasteners shall be IB Roof Systems supplied and approved for the specific substrate / roof deck type.
²Fastening density based on 4' x 8' board size and conformance with IB required withdrawal resistance values

TABLE A.11 – FLASHING SECUREMENT

Detail Condition	Fully Adhered	Mechanically Attached
Membrane termination to roof deck or base of walls:	12" oc.	Fasten at in-seam spacing for field of roof / Min. 12" oc.
Perimeter edge wood nailers, and parapet walls		
Curbs, expansion joints, wood blocking, columns, and similar vertical terminations in the field of roof		
Membrane termination: At pipes and small penetrations in field of roof (less than 12" oc. diameter)	6" oc. / Min. of 3 fastener and plates per detail	6" oc. / Min. of 3 fastener and plates per detail
Membrane termination: At drains and large pipe / stack flashings in field of roof (12" oc. diameter or greater)	12" oc. / Min. 4 fasteners and plates per detail	Fasten at in-seam spacing for field of roof / Min. 12" oc. (Min. 4 per detail)
Base flashing: Top edge at walls or parapets	12" oc.	12" oc.
With reglet or approved counterflashing / coping		
With termination bars		
Intermediate rows: at high walls	12" oc.	Fasten at in-seam spacing for field of roof / Min. 12" oc.
Transitions, valleys, and tie-ins to sloped areas	12" oc.	Fasten at in-seam spacing for field of roof / Min. 12" oc.
Base flashing: Top edge at field of roof curbs, wood blocking, expansion joints, and similar vertical terminations	12" oc.	12" oc.
Perimeter Metal Edge Flashings:	Nails: 3" oc.	Nails: 3" oc.
IB TPO Clad Drip Edge or IB TPO Clad Gravel Stop	Screws: 12" oc.	Screws: 12" oc.
Continuous metal cleat (22 ga. Min.)	Screws: 12" oc.	Screws: 12" oc.
IB Drip Edge Profile Flashing	Screws: 12" oc.	Screws: 12" oc.
IB Aluminum Lip Termination Bar	Screws: 6" oc.	Screws: 6" oc.
Sheet metal coping with exterior cleat (inside face securement)	Screws: 24" oc.	Screws: 24" oc.

¹The above fastening schedules are minimum IB requirements for standard published IB warranty installations. Fastening schedules for high-wind and specific project design conditions, and/or to comply with ES-1 and applicable building codes may require supplemental increased fastening for compliance.