Parasolo Thermoplastic Induction Welding Systems Installer Guide

Installer Guide

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I. Application Considerations

A. Temperature

1. Material installation during periods of high ambient temperature and/or humidity levels (typically above 90°F (32°C) and/or 90% relative humidity) can result in poor installation quality due to condensation on the membrane surface, or excessively fast adhesive drying rates in hot, dry weather. Do not install materials when moisture, such as liquid water, dew, condensate, snow or ice, is present on the roof deck or substrate to which the materials are to be applied.
2. Material installation during periods of low ambient temperatures, typically below 40°F (4.4°C), can result in poor installation quality. To avoid these problems:
    1) Store accessory materials in a warming box.
    2) Use as soon as possible after removal from the warming box.
    3) Allow adhesives to properly cure.
    4) Adjust welder settings to ensure proper welds for applicable ambient conditions.

B. Precipitation

1. Do not apply Parasolo PVC, PVC KEE, or TPX membranes and related materials during precipitation or if there is a threat of precipitation during installation.

C. Standing Water

1. Confirm the adequacy of the new roofing system to provide positive slope to drain. Eliminate ponding areas by the addition of drainage outlets or by providing additional slope.

D. General substrate preparation

1. Structural roof deck considerations should follow the guidelines from the most current edition of the Siplast Thermoplastic Roof Systems Design Guide. All surfaces to receive application of the Siplast Parasolo PVC, PVC KEE, or TPX roofing and flashing membranes and related materials should be clean, smooth, dry, frost-free, and free of loose materials or contaminants.

II. Safety & Warnings

A. As with any construction project, safety is a key element. Follow all applicable safety standards and good roofing practices. Read and understand Siplast Design and Installer Guides before starting application. Follow all precautions and directions.

B. Parasolo PVC and TPX materials are not compatible with one another. DO NOT mix Parasolo PVC and TPX membranes, and flashings accessories together in the same roofing system.

C. Only properly trained and professionally equipped roofing contractors experienced in the installation of each of the roofing applications listed herein should install these systems. Always wear protective gear, including but not limited to: hardhats, eye protection, heavy-duty gloves, and snug-fitting clothing.

D. Solvent-containing accessories may be combustible and should always be kept from exposure to heat, flame, or any source of ignition. Dispose of empty containers in posted toxic substance landfills in accordance with local, state, and federal regulations.

E. Thoroughly train all personnel in first-aid procedures, and obey all OSHA safety standards and fire codes. Use extreme caution when working around equipment, such as gas lines or HVAC units, which have electrical or gas connections.

F. PVC, PVC KEE, and TPX roof membranes may be slippery when wet. Exercise caution when walking on PVC, PVC KEE, or TPX membranes during or after a rain shower, or if moisture is present in the form of dew, frost or ice.

III. Delivery, Storage, & Protection

A. Deliver products to the project site in original containers with seals unbroken and labeled with manufacturers name, product brand name, and type.

B. Store materials in a weather-protected environment, clear of the ground and moisture, in accordance with Siplast instructions. Store all adhesives, coatings, and

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sealants to protect them from freezing. Discard and replace frozen materials. Properly seal all liquid material containers after use.

C. Outside storage of roofing materials: Raise all materials stored outside above ground or roof level on pallets and covered with a tarpaulin or other waterproof and "breathable" material. Insulation products should be properly stored and weighted to avoid weather and wind damage.

D. Factory-installed plastic covers are not designed for rooftop storage. Use "breathable" type covers, such as canvas tarpaulins, to protect from weather and moisture. If condensation is present or may accumulate inside of the factory shroud, cut and allow it to vent.

E. Cover and protect materials at the end of each day's work to prevent the formation of condensation and to provide protection from inclement weather.

F. Do not remove any protective tarpaulins until immediately before material will be installed. Extreme heat or cold conditions may require special storage. Reference product data sheets for product storage requirements.

G. Follow Siplast directions and requirements for protection of roofing materials prior to and during installation.

H. Do not use materials that are wet or damaged to the extent that they will no longer serve their intended purposes. Remove all damaged materials from the job site.

I. When staging materials on the roof during application, ensure that the deck and structure are not temporarily overloaded.

J. At the job site, no more material should be stored than what will be used within two weeks. For periods longer than two weeks, the materials should be properly warehoused; i.e., dry, ventilated, on pallets, etc. No more material should be stored on the rooftop than can be used within five days. When prolonged inclement weather threatens, i.e., rainy seasons, no more roofing materials should be supplied to the rooftop than can be used within two days.

K. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during the same day.

IV. Equipment & Tools

A. **Induction Welding Tool:** Reference Section VII Paragraph C for information regarding electromagnetic induction welding equipment.

B. **Heat Welding Equipment:** Successful hot air welding requires the use of specialized, properly maintained and adjusted equipment operated by experienced personnel familiar with hot air welding techniques. Achieving consistent welds is a function of ensuring that the roofing membrane surface is clean and prepared for heat welding. Perform test welds to determine proper equipment settings and to evaluate weld quality after welding has been completed.

C. **Welding equipment consists of three main components:** power supply, hot air welder (either automatic or hand-held), and extension cords. The newest automatic welding equipment provides improved control of speed, temperature, pressure, and membrane. The use of the latest model of automatic welder is highly recommended. Older models may not achieve consistent welds. Follow the equipment manufacturer's recommendations regarding correct equipment operation and adjustment.

1. Current generation automatic hot air welder (recommended).
    a) Minimum Power Supply: 220 volts, 30 amps, 10,000 watt continuous.
2. Current generation hand-held hot air welder (recommended).
    a) Minimum Power Supply: 110 volts, 15 amps, 2500 watt continuous.

3. Commercial Grade 10,000-watt voltage-controlled generator (minimum).
    a) THD (Total Harmonic Distortion) rating should be six or less for quality welds.
    b) 240v & 120v outlets.
    c) GFCI line cords.
    d) Volt meters.
4. Extension Cords
    a) Automatic Welders: #10 wire with a standard plug configuration. Maximum 100' (30.5 m) in length.
    b) Hand-Held Welders: #12 wire with a standard plug configuration. Maximum 100' (30.5 m) in length.
    c) For longer lengths, consult an electrician for line voltage drop. Heavier-gauge extension cords are likely to be required.

D. Stable power supply: Adequate wattage and consistent voltage are critical to obtaining consistent hot air welds and to prevent damage to the welder. The use of a contractor-supplied portable generator is recommended. House-supplied power is acceptable for hand welders only. Do not connect to a power source that is:

1. Used for other equipment that cycles on and off.
2. Is subject to momentary disruptions or power surges.
3. Incapable of providing sufficient power.
    a) THD greater than six may lead to fluctuations which may impact welding.
    b) Outdated welding equipment and inadequate or fluctuating electrical power are the most common causes of poor seam welds.

E. Silicone Hand Roller (used in conjunction with hand-held welders).

1. Ensure that the roller is in good condition. Rollers with rounded edges should be replaced.

F. Equipment Settings

1. Setting up the hot air robotic welder appropriately is key to having a properly installed roof, and performing test welds is one of the most important steps to ensure a properly welded roof. Making appropriate adjustments before you begin the final welding process ensures that the correct combinations are achieved.
2. Test welds should be performed at the beginning of every work period:
    a) Just before welding in the morning.
    b) Upon returning from lunch in the afternoon.
    c) When there has been a significant change in weather (e.g., air temperature, wind speed, cloud cover, etc.).
3. The correct speed and temperature settings for automatic welders are determined by preparing test welds at various settings. The welds are tested by application of pressure causing the seam to peel apart. A satisfactory weld will fail by exposing the scrim reinforcement. This is known as a “film tearing bond”. A deficient weld fails by separating between the two layers of the membrane.
4. Adjustments to equipment settings: Many factors will affect the settings, such as thicker membranes, lower air temperatures, and overcast skies will generally require a slower speed than would be required with thinner membranes, higher air temperatures, and sunny skies. The slower speed provides additional heat energy to compensate for heat-draining conditions. To determine initial automatic air welder setting, use the formula below:
    a) Speed Formula: Start at (ambient temp/10)+ 2 = FPM (Feet Per Minute)
    b) Example: 70/10 + 2 = 9 FPM

    Note: This formula serves as a starting point. Adjustments may need to be made accordingly. New equipment may run faster and hotter. Remember, settings required for a good weld will change based on equipment type, weather conditions, and membrane thickness.

G. Cautions & Warnings

1. Do not touch the welding nozzle and heat shield, and avoid keeping unprotected skin in the flow of hot air. The welding nozzle, heat shield, and hot air being expelled from hot air welders is very hot and can result in severe burns.
2. Any attempt to run a robotic welder at a speed greater than 16 ft. (9.6 m) may result in defective seam welds.
3. Setting the speed of the welder too fast can pose potential problems for the operator to maintain control of the welder. This is particularly true in re-roofing or over uneven substrates.
4. Robotic welders running too fast may not allow the operator to monitor the weld width and ensure that critical T-joint areas have been correctly creased.
5. The operator will keep in mind the relationship between ambient temperature, automatic air welder speed, heat setting, and how much weight is on the machine in order to achieve a film tearing bond/ weld.

H. Test Welds

1. Take 2 pieces of freshly unwrapped Parasolo membrane approximately 18" (457 mm) long.
2. Set the automatic welder's speed and heat. For full size welders, such as the BAK–LarOn, Siplast suggests starting at the following setting:
   a) Temperature between 800˚F (427˚C) and 1,148˚F (620˚C). Speed 10-16 feet (3.05 - 4.88 m) per minute. New equipment may run faster and hotter.
3. For an initial setting, use the formula below as a general guideline.

   Speed Formula: Start at
   (ambient temp/10) + 2 = FPM (Feet per Minute).

   1. Example Scenario: Start by setting the speed at 10 FPM and the temperature at 600°F (315˚C) degrees and do a test weld. Increase temperature by 100°F (38˚C) to 700°F (371˚C) keeping the same rate of 10 FPM. Perform another test weld. Continue doing this in 100°F (38˚C) degree increments keeping the speed the same until the machine is maxed out [typically 1,148˚F (620˚C)] to determine the weld range. Set up the machine in the middle of the weld range.

      Note: Remember, settings required for a good weld will change based on equipment type, weather conditions, and membrane thickness.

   1. Weld the 18" (457 mm) pieces together and then allow the membrane to cool for at least 10 minutes. Cut 1" (25 mm) wide strips across the welded material. The welds are tested by application of pressure causing the seam to peel apart.
   2. An acceptable weld will fail by exposing the scrim reinforcement. This is called a "film tearing bond" or "FTB", which will be between 1" (25 mm) and 1.5" (38 mm) wide.
   3. An unacceptable weld will fail by separating between the two layers of the membrane. This is also known as a "cold weld" or "false weld".
   4. During cooler temperatures it is even more critical to perform test welds in the morning, after any extended break such as lunch, or after significant change in weather (e.g., air temperature, wind speed, cloud cover, etc.).
   5. Hand welding during colder temperatures also needs to be adjusted.
      a) Perform test welds on the membrane you will be using that day.
      b) Do not use scrap material to create test welds.
      c) Perform daily quality control including probing and checking seams at the end of the day.

I. Adjustments to the Hot Air Robotic Welder Settings

1. Many factors will affect the settings, including overcast skies and lower air temperatures. This will generally require a slower speed and lower heat settings. The slower speed and lower heat setting provide the additional heat energy to compensate for heat-draining conditions.
2. The correct speed and temperature settings for automatic welders are determined by preparing test welds at various speed and heat settings.

3. Only make one change at a time and avoid changing heat and speed together.
4. If you are welding at 1,148˚F (620˚C) and do not get a good weld, do not automatically adjust the speed because the temperature may be too high. Lowering the temperature or increasing speed may be a necessary adjustment.
5. If the weld is greater than 1.5" (38 mm), the temperature may be too high and this could lead to a failed weld over time.
6. Having too much weight on the automatic hot-air welder combined with too high of a speed setting can potentially cause wrinkles in the weld area.

J. Automatic Hot Air Welding of Field Seams

1. Successful automatic welding is primarily a function of proper machine adjustment and maintaining a consistent power supply.
2. Clean the membrane free from all dirt and debris prior to hot air welding of seams.
3. Verify correct power supply voltage with a voltmeter.
4. Determine proper welder speed and temperature settings by performing the test weld procedure.
5. Mark all locations where automatic welding starts and stops to identify locations of possible weld discontinuities. These areas should be carefully probed and repaired as required.
6. The weld needs to provide a minimum film-tearing bond of 1" (25 mm) and a maximum film-tearing bond of 1.5" (38 mm).
7. Heat-welded the membrane laps together. All welds need to be continuous, without voids or partial welds. Welds need to be free of burns or scorch marks; however, seaming of Parasolo PVC or PVC KEE membrane should exhibit bleed-out when properly welded. Seams of Parasolo TPX membrane should **not** exhibit bleed-out.
8. All reinforced membrane field seams should be made using an automatic hot air welder.
9. Tend to all T-joints by carefully pressing each joint down by silicone roller edge or other hard- edged tool immediately after the T-joint has emerged from the automatic welder.

   Note: All Parasolo TPX and 80-mil Parasolo PVC or PVC KEE T-joints require the installation of a heat-welded membrane cover patch.

K. Hand-Held Welding of Seams

1. Successful hand welding is a skill that involves individual technique, normally developed and refined over time. Operators should be proficient with different nozzle configurations. Correct selection of welder temperature and nozzle width can have an effect on the quality of the hand weld.
2. Clean the membrane free from all dirt and debris prior to hand-welding.
3. During basic hand welding, the hot air welder is held in one hand, and a hard silicone roller is typically held in the other hand. When hand welding with a roller, finger pressure is often used to place and tack the upper piece of membrane in position. However, always use a silicone roller for final welding. *Tack welding and back-tacking is not permitted in the field welding of seams.*

V. Substrate Preparation

A. Remove all existing roofing materials to the roof decking, including flashings, metal edgings, drain leads, pipe boots, and pitch pockets. Clean substrate surfaces free of all asphalt and adhesive contaminants.

B. Confirm quality and condition of roof decking by visual inspection and by fastener withdrawal testing by an individual trained by the roof fastener manufacturer. Siplast recommends these test results to be kept on file as part of the acceptability of the substrate surface for a Siplast Guarantee. Submission of results to Siplast is not required.

C. Secure all loose decking and remove and replace all deteriorated decking.

D. Confirm that height of equipment supports will allow the installation of full-height flashings.

VI. Insulation and Cover Panel Attachment

A. Fasteners and Plates

Fasteners and Plates		
TPO Coated Plate	**PVC Coated Plate**	
		
Fastener Type	**Substrate**	**Membrane**
Parafast #12 Fastener 	**Steel, Wood**	**Parasolo Smooth**
Parafast #14 Fastener 	**Steel, Wood, Concrete**	
Parafast #15 Fastener 	**Steel, Wood**	
Parafast CD-10 Fastener 	**Concrete**	

B. Panel Attachment

1. Insulation and Cover Panel Layout for New Construction or Complete Tear-off.

   a) For new construction over a metal deck or tear-off down to a metal deck, install insulation panels so that all edges are supported by the high flutes of the decking with no more than ¼" (6.3 mm) gap between adjoining panels. Butt the insulation and cover panels together with no more than a ¼" (6.3 mm) gap between panels.

   b) Install cover panels in a staggered pattern. Approved cover panels include DensDeck, DensDeck Prime, DensDeck StormX Prime, DEXcell Glass Mat Roof Board, DEXcell FA Glass Mat Roof Board, SECUROCK Gypsum Fiber Roof Board, Paratherm HD, and STRUCTODECK HD. Cover panels are required when using EPS or XPS as the insulation system.

   c) When attaching over tapered insulation, it is critical to ensure that the coated stress plates are flat or flush against the insulation surface to ensure proper welding of the plate to the membrane.

   d) Insulation panels that are wet, warped, buckled, or otherwise damaged should be discarded and replaced with new dry panels. This includes panels that become wet or damaged after installation.

   e) Install no more insulation than can be properly covered by the end of each day with a roof membrane.

   f) Keep a minimum 2" (51 mm) separation between the edge of the coated stress plates and membrane seams.

   g) Ensure that plates are properly placed on insulation panels in accordance with Siplast details to avoid straddling plates over insulation joints, as the joint gaps would result in an incomplete weld of the membrane to the coated stress plate.

2. Insulation and Cover Panel Layout for Recover Applications.
    a) When installing Parasolo Thermoplastic Roof Systems in a recover application over an existing roof membrane, an approved separation panel is first installed to separate the existing roof from the new installation.
    b) Install new insulation and/or cover panel, staggering panels a minimum of 6" (152 mm) to prevent continuous vertical joints through the full new insulation thickness. Butt the insulation and cover panels together with no more than a ¼" (6.3 mm) gap between boards.
    c) Insulation panels that are wet, warped, buckled, or otherwise damaged should be discarded and replaced with new dry panels. This includes panels that become wet or damaged after installation.
    d) Install no more insulation than can be properly covered by the end of each day with the roofing membrane.
3. Insulation and Cover Panel Attachment
    a) Use the appropriate length and type of Parafast Fasteners and coated stress plates for the structural deck. Reference the insulation attachment tables in this manual for additional information.
    b) TPO and PVC coated stress plates are different in type and color: TPO coated stress plates are gold in color and PVC coated stress plates are black in color.
    c) Mechanical attachment for the four distinct areas or zones of a roof:
        i. Roofs have four distinct areas or zones; field prime, field, perimeter, and corners. Each of these areas have their own attachment rates.
        ii. These zones or areas have to be determined before the insulation and/or cover panel fasteners are installed. A building's perimeter edges and corner areas or zones are determined by the height and width and other conditions as referenced by ASCE-7.
    d) Panel Securement
        i. Insulation and cover panels are to be mechanically attached to the structural deck in accordance with the relevant insulation attachment table. Install the proper number of fasteners per insulation or cover panel per roof zone or area.
        ii. Fasteners installed in a straight row in one direction with even spacing makes locating fasteners under the membrane easier and speeds installation in the field of the roof.
        iii. Snap chalk lines to lay out prescriptive grid patterns for the field, perimeters, and corners. Consider fabricating a "template" with a termination bar marked with grid measurements to speed up chalk-lining of the grid patterns.

            Note: Siplast Paratherm polyisocyanurate panels are manufactured with grid marks.

        iv. Install the fasteners into the substrate using the appropriate grid pattern as established by the Parasolo Induction Welding Patterns in this Manual.
    e) Panel Securement for Metal Roof Retrofit Applications

        Approved insulation flute fill needs to be of appropriate size and inserted in the existing metal standing seam roof panel to provide a level substrate for installation of the approved cover or insulation boards. In addition to pre-securement of the panels, install purlin fasteners and coated stress plates through the panels into the purlins in accordance with the Membrane Purlin Attachment Table in this guide or the specified code approval agency to meet the project wind uplift requirements. Purlins of 18 gauge thickness or heavier require Parafast Purlin Fasteners. The fasteners are installed into the purlins for maximum uplift resistance without being placed in the seams of the membrane. Once the fasteners are in place, unroll the membrane and weld the membrane

to the coated stress plates in accordance with Section VII of this guide.

v. Fasten at the base of internal walls and curbs, and at all penetrations with Parafast Fasteners with coated stress plates at 12" (152 mm) o.c. maximum spacing without lean or tilt. Ensure that fasteners are installed to achieve the proper embedment depth. A minimum of 4 fasteners per penetration is required. Note: Place fasteners no closer than 4.5" (113 mm) from vertical flashings and a maximum of 6" (152 mm) away to facilitate the proper placement of the induction welder when the membrane is installed. This allows the field sheet to be used as a wall flashing. Specific details are available for these conditions in this Manual. When fastening within 6" (152 mm) of the vertical flashing substrate is not possible, move the attachment to the vertical substrate using the following alternative securement method. As an alternative to horizontal attachment at the base of internal walls and curbs, and at all penetrations, the field membrane may be first installed and extended vertically 3" (76 mm) up walls and curbs and secured to the wall/curb substrate within 2" (51 mm) of the plane of the roof with a Parafast Termination Bar and approved fasteners at a 8" (305 mm) o.c. maximum spacing. This detail is required to be used for all pressurized buildings.

vi. Tighten fasteners enough that the coated stress plates do not turn or rock. Overdriving the fasteners will result in a deformation or “cupping” of the plate and will result in an uneven or inadequate bond to the membrane when welded. Underdriving the fastener will result in a loose plate with insufficient clamping force and a protruding fastener head that could cause damage to the membrane during welding and through normal roof traffic.

vii. Remove and discard overdriven fasteners and plates when the face or top of the plate is distorted. Reinstall a new Parafast Fastener and coated stress plate next to the original location, but not into the same space and hole.

viii. Drive underdriven or “high” fasteners to the proper depth.

ix. When installation of the Parafast Fasteners and coated stress plates are complete, blow or broom clean the area to remove any dirt or debris from the substrate surface or contaminates from the plate’s bonding surface. This is critical so as not to have debris puncture the membrane from beneath or to impair the welding of the membrane to the coated stress plate.

VII. Membrane Installation

A. Ensure the substrate condition is suitable to receive and hold roof membrane materials.

B. Placement

1. Place the roof membrane so that wrinkles and buckles are not formed. Remove all wrinkles or buckles from the sheet prior to induction welding.
2. Full-width rolls can be installed throughout the roof. Half sheets are not necessary.
3. Best practice is to install the membrane so that water sheds over laps rather than abutting them.
4. Round exposed sheet corners a minimum of 1" (25 mm).
5. Overlap the roof membrane a minimum of 3" (76 mm) at sides and ends and heat weld the laps.

Note: A robotic welder should never be run up-slope when welding seams.

C. Membrane Securement

1. Follow the induction welding tool manufacturer's safety, equipment calibration, and operation guidelines when using induction welding equipment.
2. Perform test welds after the equipment is calibrated in accordance with the recommendations of the induction welding equipment manufacturer's guidelines before induction welding the roof membrane. Test welds should always be performed over the same substrate material that the roof membrane is being applied over. A proper weld will show full adhesion to the top of the coated stress plates and exposure of the reinforcement on the back of the membrane in a full circle. If full adhesion is not achieved, the induction welding tool requires recalibration.
3. Induction weld the membrane to the previously installed coated stress plates throughout the field of the roof, at the base of internal walls and curbs, and at all penetrations. Ensure placement of the magnets immediately following welding to the coated stress plates. Leave the magnets in place for the minimum time period recommended by the induction welding tool manufacturer. The Membrane may be heat-welded to coated metal flanges. Specific details are available for these conditions in this Manual.
4. As an alternative to induction welding at the roof perimeter, base of internal walls and curbs, and penetrations, the roof membrane may be mechanically attached with Parafast Fasteners and Membrane Plates at 12" (305 mm) o.c. maximum spacing. A minimum of 4 fasteners per penetration is required. An additional layer of Parasolo Membrane is required to cover the exposed fasteners and membrane plates. Reference Siplast standard details for additional information.

D. Membrane Surface Preparation for Seaming

1. Proper preparation of the area to be heat-welded is critical to forming a good, long-lasting seam. In order to properly fuse seams together, clean and dry the membrane prior to welding.
2. Satisfactory heat welding requires that the membrane be dry and clean of dirt and contaminants. Welds made when the membrane is not clean and dry, may result in contaminants interfering with the weld consequently resulting in a poor or false weld.
3. Factory-fresh membrane typically will not require cleaning prior to welding provided that welding is performed immediately after placement of the membrane. Membrane that has been exposed for a longer period of time will require additional cleaning methods depending on the type of contamination present.
   a) Any material rolled out and put into place needs to be welded the same day, including welding of any detail work.
   b) Membrane that has been exposed overnight or for more than 12 hours, or has otherwise become contaminated, requires cleaning.

E. Seam Cleaning

1. Light Contamination: Membranes that have been exposed to airborne debris, foot traffic, dew, or light precipitation for a few days can usually be cleaned with a cloth moistened with the appropriate Parasolo Membrane Conditioner. Be sure to wait for the cleaner to dry/flash-off before welding.
2. Dirt-encrusted or Weathered/Oxidized Contamination: Membrane that is dirt-encrusted or is weathered/oxidized will require the use of a low-residue cleaner such as Formula 409® and a mildly abrasive scrubbing pad to remove the dirt. Rinse the area thoroughly with clean water and allow it to dry. Follow by cleaning with a cloth moistened with the appropriate Parasolo Membrane Conditioner. Be sure to wait for the cleaner to dry/flash-off before welding.
3. Chemical Based Contamination: Membrane that is contaminated with bonding adhesive, asphalt, flashing cement, grease, oil, and most other contaminants usually cannot be cleaned sufficiently to allow an adequate heat weld to the membrane surface. Removal and replacement of the membrane is required in these situations.

VIII. Flashing Installation

Refer to the specific details that depict flashing requirements for the conditions. Install flashing materials as shown in the construction details.

A. General

1. Flash all perimeter, curb, and penetration conditions with Parasolo Coated Metal sheets, membrane flashing, and flashing accessories as appropriate to the site condition.
2. All Parasolo Coated Metal sheets and membrane flashing corners need to be reinforced with pre-formed corners or non-reinforced membrane.
3. All flashing membranes and accessories are to be heat-welded using a hand welder.
4. When using bonding adhesive, be sure to use adhesive specific to membrane type and ambient weather conditions.
5. Minimum flashing height is 8" (203 mm).
6. When installing fasteners through the field membrane at vertical flashing substrates with termination bars as described in Section VI, install fasteners so that the termination bar is drawn down tightly to the membrane surface. Properly installed fasteners will not allow the termination bar to move (under-driving), but will not cause wrinkling of the membrane or bowing of the bar (over-driving).
7. Installation of Parasolo Smooth Membrane over asphaltic roof substrates or substrates contaminated with asphalt residue needs to have a Parasolo Polymat Separation Layer, a Parasolo Polymat Cushioning Layer or approved sheathing panels under the smooth-back roofing membrane.
8. For Parasolo Smooth Membranes being installed as flashing membrane over surfaces contaminated with asphalt-based materials or asphalt residue, install an approved sheathing panel over the contaminated flashing surface.
9. When using Parasolo adhesives, use any one of the following substrates: polyisocyanurate insulation and high density polyisocyanurate (without foil facer), high density fiberboard, gypsum roof board, cured structural concrete absent of curing and sealing compounds, untreated CDX plywood, and dry, sound masonry substrates absent of curing or sealing compounds.
10. DensGlass® Sheathing Board is not to be used as a substrate for adhered attachment on parapet walls.
    a) DensGlass® is a registered trademark.
11. For adhered Parasolo membranes, fire-treated plywood/wood may be used for parapet walls if covered with an approved gypsum sheathing panel.

B. Parasolo Coated Metal

1. Parasolo PVC and TPO Coated Metal allows much of the metal-work used in typical roofing applications to benefit from the security of heat welded membrane seaming, with a corresponding reduction in required metalwork maintenance during the life of the roof system.
2. Coated metals need to be designed in accordance with Siplast details, the applicable building code and tested for resistance in accordance with ANSI/SPRI/FM 4435/ES-1, “Wind Design Standard for Edge Systems Used with Low Slope Roof Systems.”
3. Sections of coated metal used for roof edging, base flashing, and coping need to be butted together with a 1/4" (6 mm) gap to allow for expansion and contraction. Heat-weld a 6" (152 mm) wide non-reinforced membrane strip to both sides of the joint. A 2" (51 mm) wide aluminum tape can be installed over the joint as a bond-breaker, to prevent welding in this area.
4. Coated metal used for sealant pans and scupper inserts, corners of roof edging, base flashing, and coping need to be overlapped or provided with separate metal pieces to create a continuous flange condition, and secured properly. Strip in coated metal flashings using minimum 6" (152 mm) membranes.

5. Coated metal base flashings need to be provided with minimum 4" (102 mm) wide flanges screwed to wood nailers. Coated metal base flashings need to be formed with a 1" (25 mm) cant.
6. Coated metal flashings are attached to wood nailers or otherwise mechanically attached to the roof deck, or to the wall or curb substrate, in accordance with construction detail requirements.

C. Parasolo Adhered Reinforced Smooth Surface Membrane Flashing

1. The thickness of the flashing membrane needs to be the same thickness and type as the roofing membrane.
2. Apply the adhesive only when the adhesive, substrate, membrane, and outside temperatures are above 40°F (4.4°C) and rising. Application temperatures above 50°F (10°C) are recommended to allow for easier adhesive application.
3. Porous substrates may require double application of adhesive.
4. Application of bonding adhesive
   a) Apply bonding adhesive per application instructions on the appropriate product container.
   5. Carefully position the membrane flashing prior to application to avoid wrinkles and buckles.
   a) Allow the solvent-based adhesive to dry until it is tacky to the touch before mating the flashing membrane.
6. Also available are Parasolo PVC and TPX Corner Curb Wraps, consisting of a pre-formed combination corner and flashing pieces that are 12" (305 mm) in height and can be ordered in various lengths. These flashings are fully adhered in place. Apply adhesive to both the underside of the substrate and the flashing membrane to adhere the membrane.
7. Heat-weld all laps in Parasolo smooth reinforced flashing membrane in accordance with the heat-welding guidelines contained in this guide.

D. Non-Reinforced Membrane Flashing

1. Non-reinforced membrane can be used as a field-fabricated penetration/reinforcement flashing only where pre-formed corners and pipe boots cannot be properly installed.
2. Penetration flashing constructed of non-reinforced membrane is typically installed in two sections, a vertical piece that extends up the penetration and a horizontal piece that extends onto the roofing membrane. The two pieces are overlapped and heat welded together.
3. The non-reinforced vertical membrane flashing may be adhered to the penetration surface. Refer to Siplast standard specifications and details for additional information regarding application requirements.
4. All round and square type pipe flashings require FlexSeal™ Caulk Grade Sealant or Water-Block Sealant between the penetration and the membrane. Add and tighten a stainless steel band and seal the top of the membrane with FlexSeal Caulk Grade Sealant.
5. T-joint Patches
   a) T-Joint cover patches are to be a minimum 4" (102 mm) in size and made of non-reinforced material. Completely hot-air weld the T-Joint cover patch over the T-joint at the intersection of the three pieces of reinforced membrane. During installation, carefully “crease-in” the unsupported membrane at the three step-off locations. Prefabricated or field-fabricated non-reinforced membranes that match the membrane being used in the field of the roof are acceptable for T-joints.
   b) T-joint patches are required at T-joints for all Parasolo TPX membranes and 80-mil Parasolo PVC and PVC KEE membranes.

E. Roof Edging

1. Where required, metal roof edging should be designed in accordance with the applicable building code and tested for resistance in accordance with ANSI/SPRI/FM 4435/ES-1, “Wind Design Standard for Edge Systems Used with Low Slope Roof Systems.” When not required, refer to Items 2 and 4.
2. Flash roof edges when using Parasolo Coated Metal flanged edging with a minimum 3" (76 mm) wide flange nailed 4" (102 mm) o.c. staggered into wood nailers with a reinforced flashing strip welded to the coated metal and to the field of the roof.

a) For Parasolo Membranes, 8" (203 mm) reinforced heat-weldable flashing strips are used. Cover tape products are not acceptable for use with PVC membranes.

3. Metal roof edging needs to be provided with a continuous cleat to secure the lower fascia edge. Secure the continuous hook strip to the building a maximum of 4" (102 mm) o.c.
4. Alternatively, flash roof edges with an approved two-piece snap-on fascia system, adhering roof membrane with bonding adhesive and face-nailing the membrane 8" (203 mm) o.c. prior to installing the snap-on fascia.
5. Flash roof edge scuppers with a scupper insert of Parasolo Coated Metal or a Parasolo prefabricated coated metal scupper that is mechanically attached to the roof edge and integrated as part of the metal edging.

F. Parapet and Building Walls.

1. There are 2 options for flashing parapets and building walls: adhered membrane flashings or metal flashings.
2. Secure membrane flashing at the horizontal top edge with a termination bar. Apply Waterblock Sealant between the wall surface and membrane flashing underneath all termination bars. Mechanically fasten the Termination bar at 8" (203 mm) o.c. Seal the top of Termination bars that have a caulk lip with Parasolo FlexSeal Caulk Grade Sealant. Exposed termination bars are only eligible for 20-year max. guarantee coverage. Termination bars that are counter flashed are required for extended length guarantees.
3. Mechanically attach the roof membrane along the base of walls that are flashed with membrane flashing. Attach with screws, plates, and termination bar. Use a fastener spacing in accordance with the in-lap attachment requirements with a maximum 12" (305 mm) o.c. spacing.
4. Flash wall scuppers with a scupper insert fabricated of Parasolo Coated Metal that is mechanically attached to the wall and integrated as part of the wall flashing. Refer to the Scupper section for other detail options.
5. Where required, metal cap flashings should be designed in accordance with the applicable building code and tested for resistance in accordance with ANSI/SPRI/FM. 4435/ES-1, “Wind Design Standard for Edge Systems Used with Low Slope Roof systems.”
6. Maximum flashing height without intermediate fastening is 54" for flashing adhered with Parasolo Bonding Adhesive.

   Note: Parasolo® PVC Quick Spray Adhesive and Parasolo TPO Quick Spray Adhesive can be applied to walls without any height limitations. Supplemental fastening is not required. The wall flashing needs to be separate from the roof membrane. The roof membrane cannot extend continuously from the field of the roof up the wall. Mechanically attach the roof membrane along the base of the wall and mechanically attach the wall flashing at the top of the wall.

7. Metal cap flashings need to have continuous cleats or be face-fastened 12" (305 mm) o.c. on both the inside and outside of the walls.

G. Round and Square Tube Penetrations

1. Four options are available for penetration flashings: conical pipe boots, split pipe boots, square tube wraps, and field fabrication with unreinforced membrane and target. The Parapro 123 Flashing System may also be used for flashing penetrations through a Parasolo PVC or PVC KEE System. See Paragraph I for more information.

2. Prior to flashing application, mechanically attach the field membrane at the base of each penetration with screws and plates a maximum of 12" (305 mm) o.c., with a minimum of four fasteners per penetration.
3. Install Waterblock Sealant behind the flashing membrane at the top of the flashing, add the draw band and apply Parasolo FlexSeal Caulk Grade Sealant around the top of the flashing. All flashings using Parasolo PVC, PVC KEE, or TPX materials require the installation of a stainless steel draw band around the top of the flashing.

H. Fluid-Applied Penetration Flashings (Parasolo PVC and PVC KEE Systems only.)

1. Penetrations through a Parasolo PVC or PVC KEE System may be flashed using a Siplast fluid-applied flashing system. Compatibility of fluid-applied flashing systems varies by thermoplastic membrane type. The Paraflex 531 Flashing System may be used to flash penetrations through a Parasolo PVC KEE System only and the Parapro 123 Flashing System may be used to flash penetrations through a Parasolo PVC or PVC KEE System (see the Paraflex 531 Flashing System Installer's Guide or the Parapro 123 Flashing System Installer's Guide and published details for more information). The use of Siplast fluid-applied flashing systems is not applicable to Parasolo TPX Systems.
    a) Ensure that the Parasolo PVC or PVC KEE field sheet fits tightly around the penetration. Fill voids where the membrane terminates at penetrations with Parasolo Flexseal Caulk Grade Sealant and allow the sealant to cure.
    b) Mechanically attach the Parasolo field sheet at the base of each penetration with appropriate screws and Parafast Membrane Plates a maximum of 12" (305 mm) o.c., with a minimum of four fasteners per penetration. Galvalume plates are not approved as a substrate for Parapro Flashing Resin.
    c) Remove all foreign materials from the penetration by grinding or sanding. Refer to the substrate preparation chart in the applicable Siplast fluid-applied flashing system installers guide for more information on approved substrates and preparation requirements.
    d) Apply a target of Parasolo PVC or PVC KEE Smooth membrane to cover the Galvalume plates. Extend the target from the penetration to a minimum of 3" (76 mm) beyond the outer edge of the Galvalume plates and weld the target to the field membrane.
    e) Thoroughly clean the membrane surface with Pro Prep and allow it to dry. Use a scouring pad to create a light profile on the surface of the membrane. Wipe any loose material off with a dry shop rag.
    f) Using masking tape, mask the area to receive the flashing. Ensure a minimum flashing height of 6" (152 mm). Mask the top termination of the flashing and the area at the base of the penetration a minimum of 4" (102 mm) from the penetration onto the field sheet.
    g) Cut the Pro Fleece reinforcement for the penetration.
    h) Mix the flashing resin in accordance with the applicable fluid-applied flashing system installers guide including catalyst for Parapro applications. Apply a base coat of Parapro Flashing Resin or Paraflex 531 Liquid Flashing Resin to the vertical penetration surfaces, extending onto the field membrane a minimum of 2" (50 mm).
    i) Apply the pre-cut Pro Fleece to the vertical penetration surfaces by embedding the fleece in the resin, extending the fleece a minimum of 2" (50 mm) onto the field membrane. Saturate all fleece surfaces to be lapped with the fluid-applied flashing resin. Overlap the strips of fleece by at least 2" (50 mm).

j) Apply a generous base coat of the fluid-applied flashing resin to the horizontal surface to be flashed. Apply the pre-cut Pro Fleece to the horizontal surface by embedding the fleece in the resin. Saturate all fleece surfaces to be lapped with the fluid-applied flashing resin. Overlap the strips of fleece by at least 2" (50 mm). Care should be taken to ensure that a sufficient base coat of resin is applied to allow for full adhesion and saturation of the Pro Fleece, especially over and at the perimeter of the fastener plates to avoid tenting and voids once the Pro Fleece is installed.

k) Top coat the embedded Pro Fleece with an additional layer of fluid-applied flashing resin. Remove the masking tape before the resin sets completely.

I. Irregularly Shaped Penetrations

1. Metal Sealant Pans /Pre-Formed Accessories

a) Flash irregularly shaped penetrations with flanged sealant pans formed of Parasolo Coated Metal secured to the deck through the roof membrane with screws 6" (152 mm) o.c., with a minimum of two per side.

b) Strip in metal flanges with 8" (203 mm) wide membrane flashing strips and vertical pop riveted seams with 4" (102 mm) unreinforced membrane.

c) Fill the sealant pans with non-shrink quick-set grout. Top off sealant pans with a 2" (50 mm) minimum thickness of an approved Parasolo Sealant. If using Flex-Seal Caulk Grade Sealant, after priming, increase the grout to within 1/2" (13 mm) from the top of the pocket, and install the FlexSeal to the very top or overfill the pocket.

d) Installation of preformed sealant pans requires the flange of the sealant pan to be fastened with a minimum of 4 fasteners per penetration. A membrane target is installed around the base of the sealant pan over the flanges of the sealant pan and heat welded to the flanges. Install the fasteners near the outside edge of the flanges to allow for proper heat welding of the target. The outside edge of the target membrane is heat welded to the field membrane.

e) If a preformed sealant pan is cut to install around the penetration, strip it in with a minimum 4" (102 mm) wide non-reinforced membrane. The non-reinforced strip-in membrane needs to extend a minimum of 2" (50 mm) beyond the outside edge of the sealant pan flange and be fully welded.

J. Curbs

1. Flashings are adhered with the appropriate adhesive applied to the membrane and substrate.
2. Secure the membrane flashing at the top edge with a termination bar. Apply Parasolo FlexSeal Caulk Grade Sealant or Parasolo Waterblock Sealant between the curb surface and membrane flashing. Mechanically fasten termination bars 8" (203 mm) o.c. If wood is present at the top of the curb, install ring shank nails 12" (305 mm) o.c. 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 inside of the curb.
3. Mechanically attach the roof membrane along the base of curbs and ducts that are flashed with membrane flashing with screws and plates/ termination bar at 12" (305 mm) o.c.
4. Metal counter flashing need to be used to obtain extended guarantee lengths. Seal all termination bars with FlexSeal Caulk Grade Sealant or Waterblock Sealant.

K. Expansion Joints

1. Mechanically attach the roof membrane along the base of raised curb expansion joints with screws and plates a minimum of 12" (305 mm) o.c.
2. Field-fabricated Expansion joint bellows need to be twice the width of the expansion joint opening to allow for proper expansion/contraction.

L. Roof Drains

1. Roof drains need to be fitted with compression clamping rings and strainer baskets. Both traditional cast iron and aluminum drains, as well as, aluminum or copper retrofit drains.
2. Roof drains need to be provided with a minimum 36" x 36" (914 mm x 914 mm) sumped area if possible. The slope of tapered insulation within the sumped area can not exceed 4:12.
3. Extend the roofing membrane over the drain opening. Cut a hole in the roofing membrane directly over the drain opening. Provide a 1/2" (13 mm) membrane flap to extend past the drain flange into the drain opening. Punch holes through the roofing membrane at drain bolt locations.
4. For cast iron and aluminum drains, set the roofing membrane in a full bed of Parasolo Waterblock Sealant (minimum one full tube) on the drain flange prior to securing with the compression clamping ring.
5. For fleece-back roof membrane applications, the fleece-back membrane is cut just short of the drain flange. A separate smooth reinforced membrane drain flashing sheet is then heat welded to the roofing membrane and set into the drain above in a full bed of Waterblock Sealant (minimum one full tube) and secured as above.
6. Do NOT locate lap seams within the sump area. Where lap seams are located within the sump area, a separate smooth reinforced membrane drain flashing a minimum of 9" (229 mm) larger than the sump area needs to be installed. Heat weld the membrane flashing to the membrane. Alternatively, if the seam does not run under the clamping ring, it can be covered with a 6" (152 mm) wide reinforced membrane strip heat welded to the membrane.
7. Tighten the drain compression clamping ring in place.

M. Coated Metal Retrofit Drain Inserts

1. Drain inserts will only be used in the event the original drain is damaged and cannot be repaired without the complete replacement of the drain. It is important to note that drain inserts may reduce water flow.
2. Consult the design professional to ensure that adequate drainage is maintained.
3. Clean the drain lines a minimum of 24" (610 mm) where the drain insert is to be installed. Failure to clear this section of the drain line can prevent the sealing of the drain and degrade the performance of the drain seal that is required.
4. All drains need to be provided with a sump of 36" (914 mm) x 36" (914 mm) minimum dimension if possible. Install Fasteners 12" (305 mm) o.c. or a minimum of 4 fasteners per penetration.
5. The drain insert is installed on top of the roofing membrane and is secured to the roof deck at 6" (152 mm) o.c. with appropriate fasteners.
6. A separate reinforced membrane drain flashing sheet is then heat welded to the roofing membrane. The drain flashing sheet is then heat welded to the compatible drain flange.
7. Install the drain clamping ring if applicable.
8. All drains need to be provided with a strainer basket.
9. Roof drains need to be open and functioning.

N. Scuppers

1. Parasolo Coated Metal roof edge scuppers need to be provided with a minimum 4" (102 mm) wide flange nailed to wood nailers, with hemmed edges and secured with continuous clips in accordance with the gravel stop assembly.

2. Parasolo Coated Metal wall scuppers need to be provided with 4" (102 mm) wide flanges, with additional corner pieces pop-riveted to the flanges to create a continuous flange. All flange corners need to be rounded.
3. Set Scuppers in a bed of FlexSeal Caulk Grade Sealant or Waterblock Sealant.
4. Install wall scuppers over the roof and flashing membrane and secure to the roof deck and wall with appropriate fasteners 6" (152 mm) o.c., with a minimum of 2 fasteners per side.
5. Reinforce all corners with Parasolo TPO Universal Corners or field fabricated from Parasolo non-reinforced materials.
6. Strip in scupper with a flashing membrane target sheet.

O. Heat Stacks

1. The temperature of any heat stack that comes into contact with the Parasolo membrane or flashing should not exceed 140°F (60°C).
2. Field-fabricated two-piece membrane flashings of Parasolo non-reinforced flashing are typically installed at heat stacks. Cone-type prefabricated pipe flashings may work in these applications.
3. Heat stacks need to be equipped with either a cone-shaped or vertical tube-type flashing sleeve so that the membrane flashing is not directly in contact with the heater stack.
4. Mechanically attach the roof membrane to the structural deck with Parafast screws and plates around the penetration base prior to flashing installation.
5. Treat all stack flashings at the top edge with Waterblock Sealant behind the flashing membrane and secured by a stainless-steel clamping band. Seal the detail with FlexSeal Caulk Grade Sealant.
6. Field-fabricated membrane flashings may be adhered to the flashing sleeve with Parasolo adhesives. Make sure to use the correct bonding adhesive with the membrane being installed.

P. Wood Support Blocking

1. Wood support blocking, typically 4" (102 mm) x 4" (102 mm), is commonly installed under light-duty or temporary roof-mounted equipment, such as electrical conduits, gas lines, and condensation and drain lines.
2. Install wood support blocking over a protective layer of Parasolo walkway pads. Place the wood blocking on an oversized slip sheet, fold two sides vertically, and fasten with roofing nails into the blocking.
3. The use of prefabricated pipe stands with rubber-like bases are not recommended.

Q. Satellite Dish Support Bases

1. Install non-penetrating satellite dish support bases over a protective layer of Parasolo membrane.

R. Lightning Suppression

1. Secure lightning suppression cables to the roof surface by means of 2" (50 mm) wide Parasolo Flashing Membrane strips heat-welded to the roof membrane.
2. Secure the lightning rod to a reinforced Parasolo membrane patch that is heat welded in place. Securement should not penetrate the roof membrane.

S. Traffic Protection

1. Install Parasolo Walkway Rolls at all roof access locations including; ladders, hatchways, stairs, and doors. Install walkway rolls at other designated locations, including roof-mounted equipment work locations and areas of repeated rooftop traffic.
2. Space out all Walkway rolls 6" (152 mm) apart to allow for drainage. Place all edges of walkway rolls or pads 6" (152 mm) from any seam.
3. Heat-weld walkway rolls to the roof membrane surface continuously around the walkway roll or pad perimeter.

IX. Roof Design Consideration

- Testing is required to ensure foam adhesive will bond to a given substrate.
- Siplast requires roofing contractors (or a qualified third party) to conduct an adhesion test prior to registering a Siplast Guarantee.

Guidelines

A. Do not use adhesive to install roofing materials on any roof deck or other substrate that shows signs of deterioration or loss of integrity.

B. Siplast recommends that contractors keep test results on file, to be submitted to Siplast upon request. Submission of results to Siplast is not required in the ordinary course; however, Siplast may request them on a job-to-job basis. Failure to perform the required testing or to be able to produce the test results may delay or prevent the issuance of a Siplast Guarantee.

C. Siplast may, at its sole discretion, require additional testing prior to the job start or prior to issuance of a Siplast Guarantee in accordance with the most recent version of ANSI/SPRI IA-1 Standard Field Test Procedure for Determining the Mechanical Uplift Resistance of Insulation Adhesives over Various Substrates.

X. Fastening Tables

TABLE 1
STEEL & CONCRETE DECK ATTACHMENT

Deck Type	Minimum Pull-out Values (lbs)	Parafast Fastener	Coated Plate	Minimum Penetration	Fastening Pattern 4'x8' Boards		
					Field	Perimeter	Corner
Steel 22 gauge (standard 33 ksi)	450	#15 XHD	PVC/TPO	3/4" (19 mm) through the deck	6	8	12
	600	#21		1" (25 mm) through the deck			
Steel 22 gauge (standard 33 ksi)	450	#15 XHD	PVC/TPO	3/4" (19 mm) through the deck	6	8	12
	750	#21		1" (25 mm) through the deck			
Structural Concrete (Min. 2,500 psi)	700	#14 HD	PVC/TPO	3/4" (19 mm) through the deck	6	8	12
	900	CD-10		1" (25 mm) through the deck			
Lightweight Insulating Concrete (over 22 gauge standard)	450	#15 XHD	PVC/TPO	3/4" (19 mm) through the deck	6	8	12
	350	#14 HD		3/4" (19 mm) through the deck			
Lightweight Insulating Concrete (over 24/26 gauge standard)	350	#15 XHD	PVC/TPO	3/4" (19 mm) through the deck	6	8	12
	350	#14 HD		3/4" (19 mm) through the deck			

General Comments/Requirements

The Parasolo thermoplastic Induction Welding System is not acceptable over gypsum or cementitious wood fiber, but it is acceptable over structural or lightweight insulating concrete decks. However, other methods of attachment may be more appropriate, depending on the project type. Contact SIPLAST Technical Services for possible alternatives.

Confirm quality and condition of roof decking by visual inspection, if possible, and by fastener pull-out testing. Remove and replace all deteriorated decking.

The Parafast fasteners and PVC/TPO Coated Plate is used to attach rigid insulation to roof decks. The special coating on the plates allows for Siplast Parasolo membranes to be welded to each plate using the magnetic induction welding tool. Coated Plates are different in type and color; the PVC plates are black in color and the TPO plates are gold in color. The appropriate plate must be used with the appropriate membrane type.

When installing Parafast Fasteners through lightweight insulating concrete that is poured over structural concrete, the fastener must penetrate a minimum of 1" (25 mm) into the structural concrete deck. A 7/32" (5.5 mm) pre-drilled hole is required for Parafast C D-10 fasteners. A 3/16" (4.8 mm) pre-drilled hole is required for Parafast HD #14 fasteners.

Supplemental fastening of insulation using Parafast fastener and insulation plate must be either plastic or a different shape to differentiate from coated plate when additional fastening is required.

24-26 gauge decks require a special approval from SIPLAST. Metal roof panels are not acceptable as roof decks.

Fastener withdrawal testing is recommended.

TABLE 2
PARASOLO THERMOPLASTIC INDUCTION WELDING SYSTEMS
METAL ROOF RETROFIT ATTACHMENT

Maximum Purlin & Fastener Row Spacing	Purlin Type	Parafast Purlin Fastener & Parafast PVC/TPO Coated Plate Maximum Spacing (o.c.)		
		Field	Perimeter	Corner
Up to 5' (1.52 m) [every purlin]	Min. 16 gauge	12" (305 mm)	10" (254 mm)	8" (203 mm)
	Min. 14 gauge	18" (457 mm)	12" (305 mm)	9" (229 mm)

General Comments/Requirements

This attachment table can only be used for projects that are:

- Maximum roof slope = 2:12
- Maximum building height = 40 feet (18.3 m)

The membrane must be attached to the PVC/TPO coated plates that are installed directly into the structural purlins with the appropriate Parafast Purlin Fasteners. The special coating on the plates allows for Siplast PVC/TPO membranes to be welded to each plate using the magnetic induction welding tool. Coated Plates are different in type and color; the PVC plates are black in color, and the TPO plates are gold in color. The appropriate plate must be used with the appropriate membrane type.

The attachment capacity of the purlins to the secondary structure must be greater than the attachment capacity of the metal panels to the purlins.

Fastener pull-out testing in accordance with ANSI/SPRI FX-1 2016 Standard Field Test Procedure for determining the Withdrawal Resistance of Roofing Fasteners is recommended. Minimum 1" (25 mm) Parafast Purlin Fastener embedment is required. Fastener pullout tests shall be conducted on the purlins with approved fasteners. Roof sections with low pullout results will require additional pullout tests or additional purlins.

Fasteners should be staggered 12" (305 mm) between rows.

Supplemental fastening of insulation using Parafast fasteners and insulation plates either plastic or a different shape to differentiate from coated plates may be required.

TABLE 3
PARASOLO THERMOPLASTIC INDUCTION WELDING SYSTEMS
WOOD DECK ATTACHMENT INSULATED ASSEMBLIES

Deck Type	Parafast Fastener	Coated Plate	Minimum Pull-Out Value (lbf)	Max. Building Height	Fasteners Per 4' x 8' (1.2 m x 2.4 m) Insulation Board		
					Field	Perimeter	Corner
	#14 #15	PVC/TPO	300	60' (18 m)	6	10	10

General Comments/Requirements

Confirm quality and condition of roof decking by visual inspection, and by fastener pull-out testing. Remove and replace all deteriorated decking.

The Parafast fasteners and PVC/TPO Coated Plate is used to attach rigid insulation to roof decks. The special coating on the plates allows for Siplast Parasolo membranes to be welded to each plate using the magnetic induction welding tool. Coated Plates are different in type and color; the PVC plates are black in color and the TPO plates are gold in color. The appropriate plate must be used with the appropriate membrane type.

Fasteners shall be of sufficient length to penetrate through the plywood or OSB sheathing a minimum of 3/4" (19 mm) and 1" (25 mm) embedment into the wood plank deck. Fasteners shall not be driven through the joints of the wood plank.

Fastener selection is based on the actual/specific deck performance matched with the fastener being used.

This attachment table can only be used for projects that are:

- Exposure Category B or C
- Enclosed building in a non-special/high wind region, e .g., mountains, coastal
- For buildings exceeding these specifics, please contact SIPLAST for assistance.

No individual pullout value can be less than the absolute minimum listed for the given fastening pattern. If the individual pullout values do not meet the minimum pull-out values, alternative fastening is required.

If your project does not meet these requirements, you must contact SIPLAST for further information.

Fastener withdrawal testing is recommended.

TABLE 4
PARASOLO THERMOPLASTIC INDUCTION WELDING SYSTEMS
WOOD DECK ATTACHMENT UNINSULATED ASSEMBLIES WITH FIRE RESISTANT SLIP SHEET

Deck Type	Parafast Fastener	Coated Plate	Minimum Pull-Out Value (lbf)	Max. Building Height	Fastener Grid Layout (Spacing shows plate/fastener location o.c. and then row spacing)		
					Field	Perimeter	Corner
	#14 #15	PVC/TPO	300	60' (18 m)	32" o.c. rows spaced 24" apart	18" o.c. rows spaced 24" apart	18" o.c. rows spaced 24" apart

General Comments/Requirements

Contact Siplast for information regarding approved fire resistant slip sheets.

Confirm quality and condition of roof decking by visual inspection, and by fastener pull-out testing. Remove and replace all deteriorated decking.

The Parafast fasteners and PVC/TPO Coated Plate is used to attach rigid insulation to roof decks. The special coating on the plates allows for Siplast Parasolo membranes to be welded to each plate using the magnetic induction welding tool. Coated Plates are different in type and color; the PVC plates are black in color and the TPO plates are gold in color. The appropriate plate must be used with the appropriate membrane type.

Fasteners shall be of sufficient length to penetrate through the plywood or OSB sheathing a minimum of 3/4" (19 mm) and 1" (25 mm) embedment into the wood plank deck. Fasteners shall not be driven through the joints of the wood plank.

Fastener selection is based on the actual/specific deck performance matched with the fastener being used.

This attachment table can only be used for projects that are:

- Exposure Category B or C
- Enclosed building in a non-special/high wind region, e .g., mountains, coastal
- For buildings exceeding these specifics, please contact SIPLAST for assistance.

No individual pullout value can be less than the absolute minimum listed for the given fastening pattern. If the individual pullout values do not meet the minimum pull-out values, alternative fastening is required.

If your project does not meet these requirements, you must contract SIPLAST for further information.

Fastener withdrawal testing is recommended.

TABLE 5
PARAFAST PVC RHINOBOND® SYSTEMS
WOOD JOIST ATTACHMENT

Membranes	Parafast Fastener	Coated Plate	Fastener Embedment	Fastener Spacing Along Wood Joists	Wood Joists Spacing
Parasolo PVC Parasolo PVC KEE Parasolo TPX	HD #14	PVC/TPO	1" (25 mm) into 2" x 8" (51 x 203 mm) support [1.5" (38 mm) through plywood or OSB decking joint and into lumber]	12" (305 mm)	96" (2.44 m)
				24" (610 mm)	48" (1.22 m)
				9" (229 mm)[5]	24" (610 mm)
				36" (914 mm)	24" (610 mm)
				24" (610 mm)	24" (610 mm)
				18" (452 mm)	24" (610 mm)

Contact Siplast for recommended fastening frequencies to meet specific testing, Code Agency, or guarantee requirements.

General Comments/Requirements:

Parasolo thermoplastic Induction Welding test results with fasteners driven into 2" x 8" (51 X 203 mm) wood joists over 1/2" (12 mm) plywood or OSB. SIPLAST does not take responsibility for the fastening of the wood substrate to the structure below.

The membrane must be attached to the PVC/TPO Coated Plates that are installed directly into the structural wood joists with Parafast #14 Fasteners. The special coating on the plates allows for PVC/TPO membranes to be welded to each plate using the magnetic induction welding tool. PVC and TPO Plates are different in type and color; the PVC plates are black in color and the TPO plates are gold in color. The appropriate plate must be used with the appropriate membrane type.

Fastener pull-out testing in accordance with ANSI/SPRI FX-1 2016 Standard Field Test Procedure for determining the Withdrawal Resistance of Roofing Fasteners is recommended. Minimum 1" (25 mm) Parafast Fastener embedment is required. Fastener pullout tests shall be conducted in the wood joists with approved fasteners. Roof sections with low pullout results will require additional pullout tests or additional wood joists.

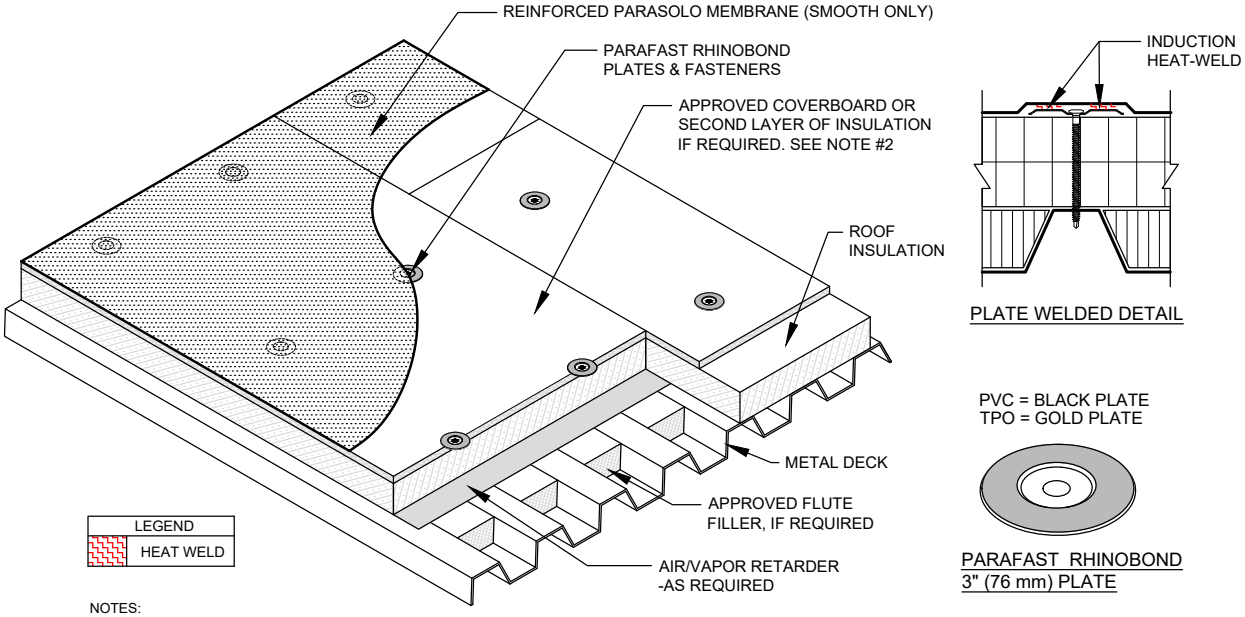
Supplemental fastening of insulation using Parafast fasteners and insulation plates either plastic or a different shape to differentiate from PVC/TPO coated plates may be required.

This fastening frequency is based on the frequency listed in current Florida Approvals for Siplast Parasolo Thermoplastic Induction Welding Systems.

XI. Attachment Drawings

Parafast® Rhinobond® Asssembly Detail

Parasolo Roof Membrane – Insulated (Heat Induction System)

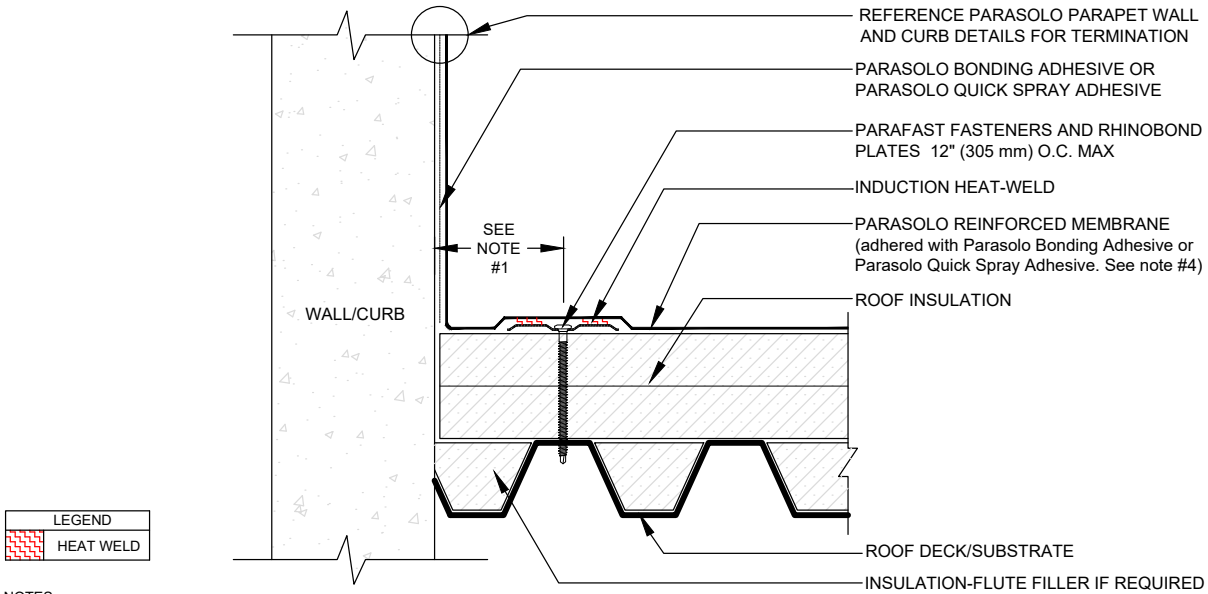


NOTES:
1. REFER TO THE PARAFAST RHINBOND ATTACHMENT TABLES FOR DETAILED INSTALLATION REQUIREMENTS REGARDING DECK TYPE, PLATE & FASTENER TYPE, AND MIN. EMBEDMENT.
2. TOP LAYER OF INSULATION DOES NOT HAVE TO BE STAGGERED IF BASE LAYER IS STAGGERED.

Scale: NTS

Parafast Rhinobond Base Tie-In at Angle Change

Parasolo Roof Membrane – Insulated (Heat Induction System)

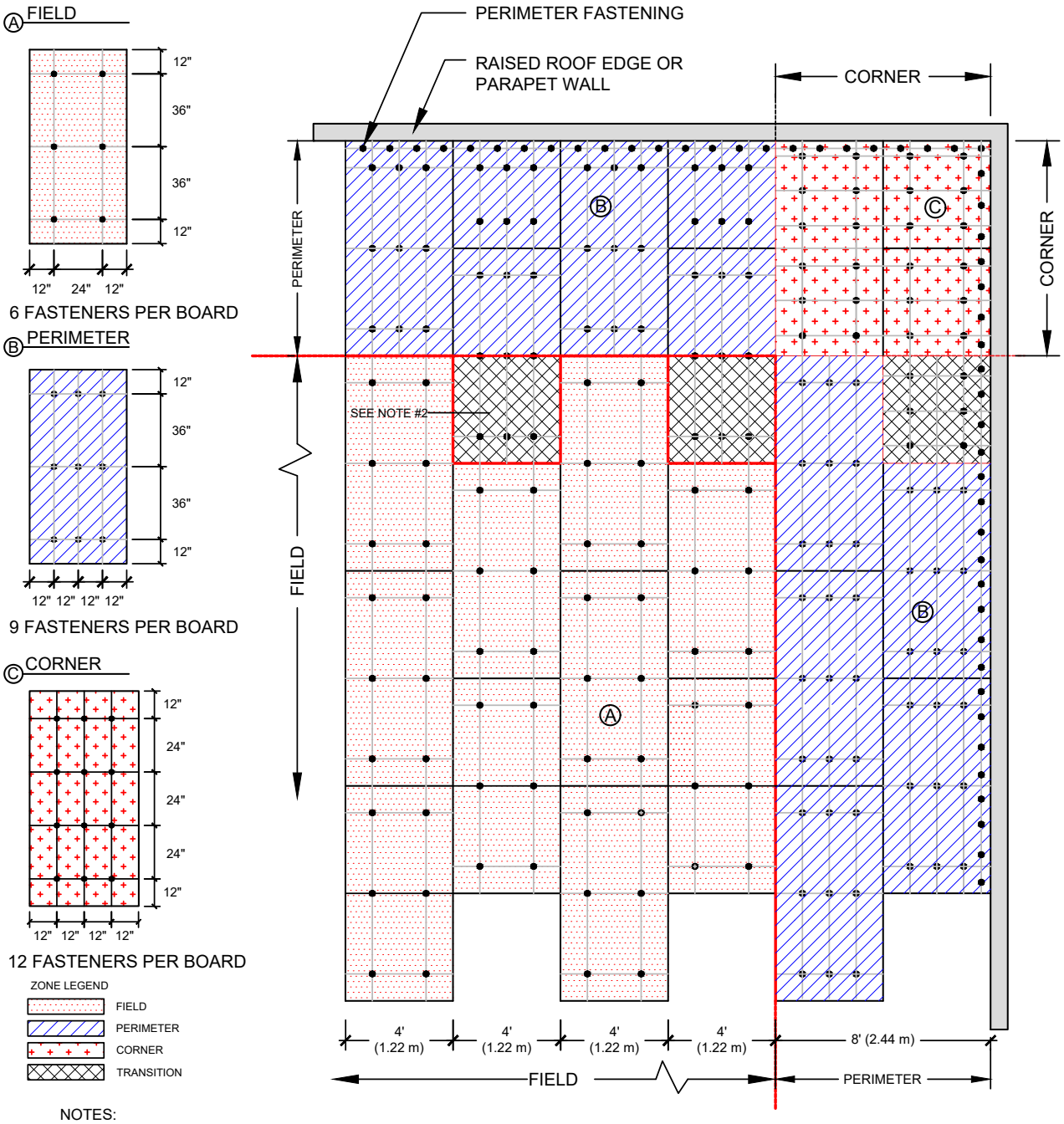


NOTES:
1. PARAFAST FASTENER & RHINOBOND PLATE MUST BE INSTALLED A MAXIMUM OF 6" (152 MM) FROM THE ANGLE CHANGE.
2. REFER TO THE PARAFAST ATTACHMENT TABLES FOR DETAILED INSTALLATION REQUIREMENTS REGARDING DECK TYPE, PLATE & FASTENER TYPE, AND MIN. EMBEDMENT.
3. REQUIREMENTS AND RECOMMENDATIONS DETAILED IN CURRENT SIPLAST SPECIFICATIONS SHALL APPLY IN ADDITION TO THE ABOVE DRAWING.
4. PARASOLO BONDING ADHESIVE CAN BE USED UP TO A MAXIMUM FLASHING HEIGHT OF 54 INCHES. ADDITIONAL TERMINATION IS REQUIRED FOR FLASHING HEIGHTS ABOVE 54 INCHES WHEN PARASOLO BONDING ADHESIVE IS USED. CONTACT THE SIPLAST TECHNICAL DEPARTMENT FOR ADDITIONAL INFORMATION.

Scale: NTS

Parafast Rhinobond Insulation Fastening

Zones/Locations Approved Steel, Concrete or Wood Decks
Parasolo Roof Membrane – (Heat Induction System)



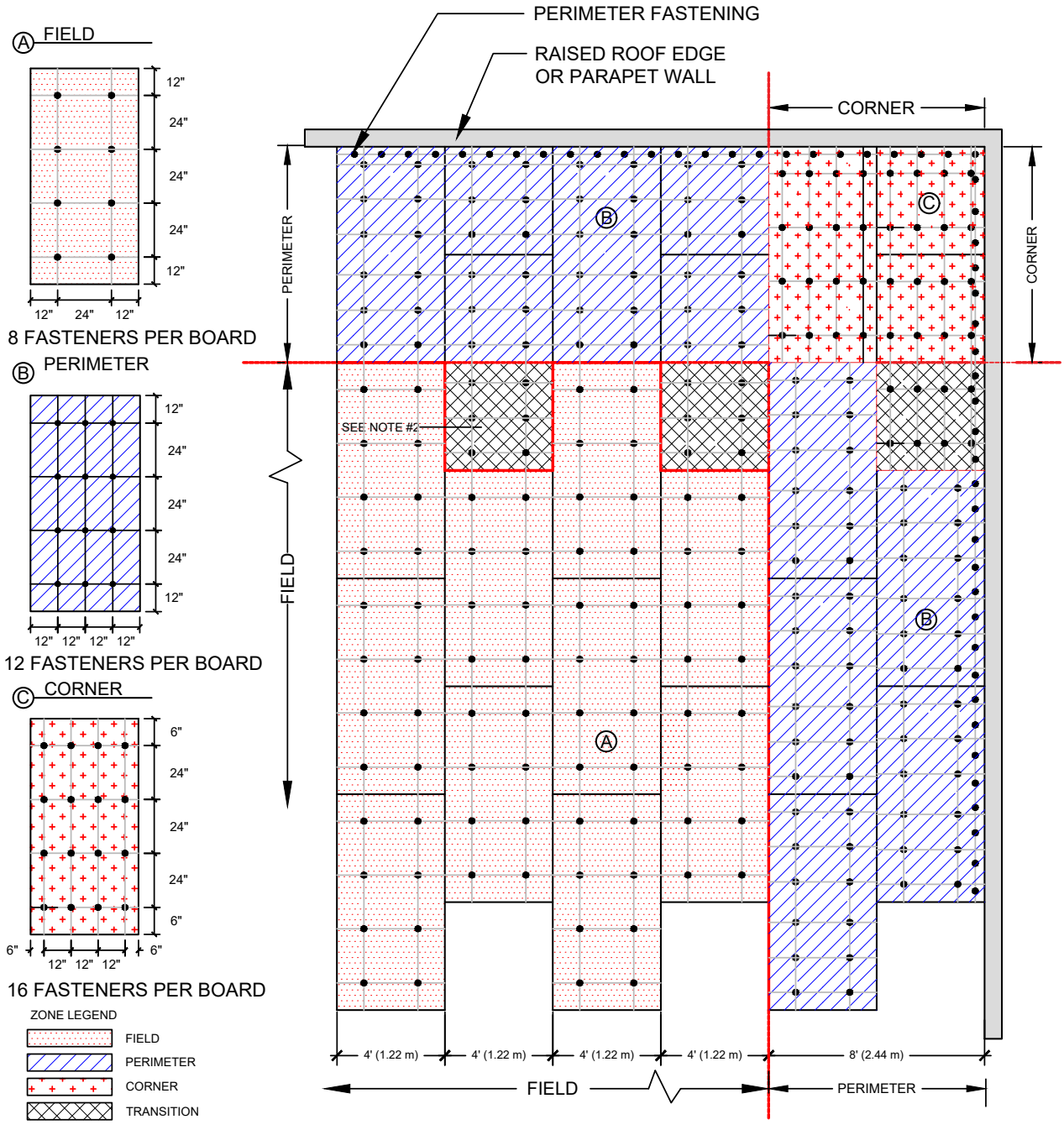
NOTES:

1. SEE PARASOLO SYSTEM GUIDELINES IN SPECIFICATIONS TO DETERMINE FIELD PERIMETER, AND CORNER FASTENER PLACEMENT FOR VARIOUS DECK TYPES AND WIND UPLIFT REQUIREMENTS.
2. IF A PORTION OF A BOARD EXTENDS INTO ANOTHER ZONE, IT MUST BE ATTACHED ACCORDING TO THE ZONE WITH THE GREATER FASTENING PATTERN.

Scale: NTS

Parafast Rhinobond Insulation Fastening

Zones/Locations Approved Steel, Concrete or Wood Decks
Parasolo Roof Membrane – (Heat Induction System)



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Scale: NTS

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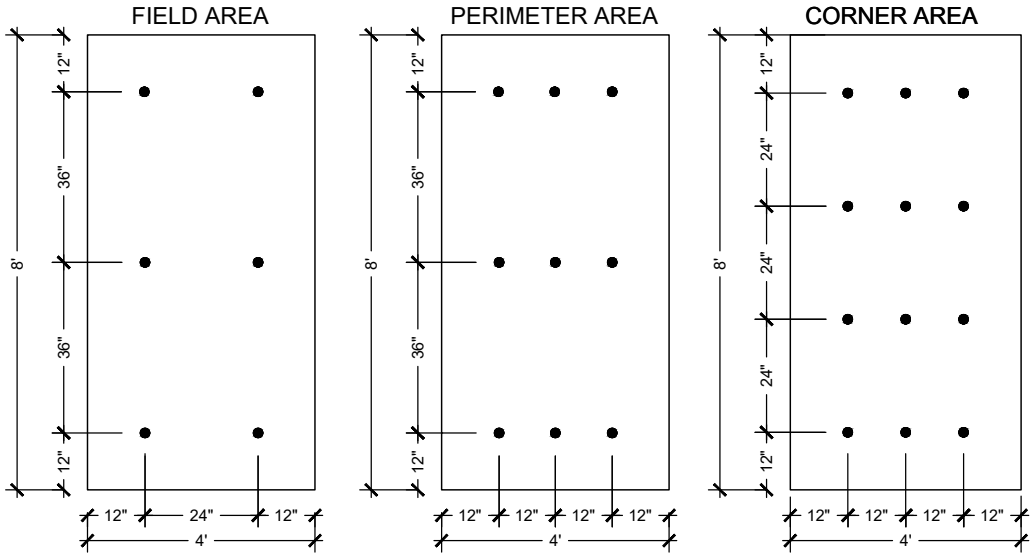
Parafast Rhinobond Standard Fastening Pattern

Parasolo Roof Membrane – Insulation (Heat Induction System)

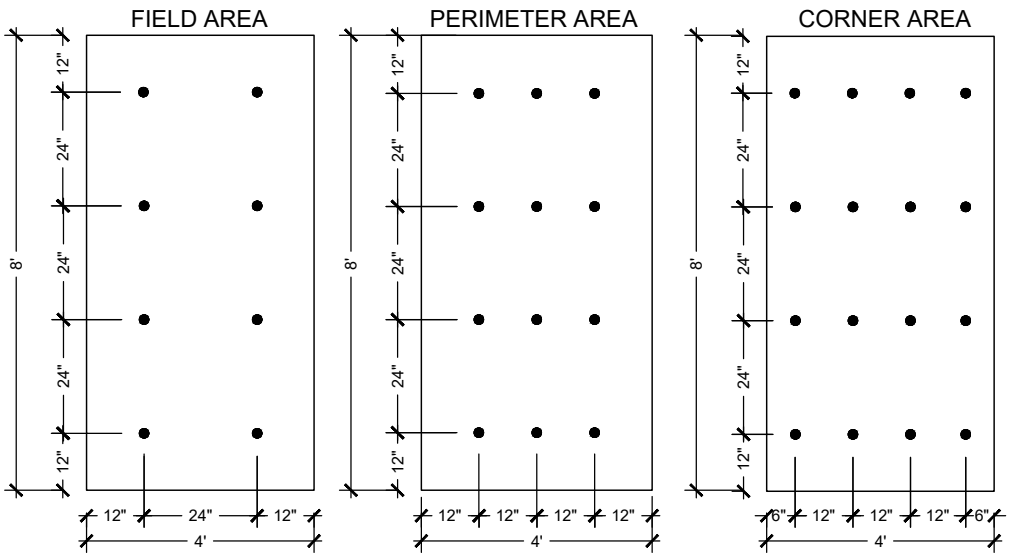


NOTES:
1. REFERENCE SPECIFIC SYSTEM/INSULATION TYPE AND THICKNESS REQUIREMENTS.
2. REFER TO THE PARAFAST RHINOBOND APPLICATION AND SPECIFICATION MANUAL FOR FASTENER AND DECK REQUIREMENTS.
3. CONTACT SIPLAST FOR RECOMMENDED FASTENING FREQUENCIES TO MEET SPECIFIC TESTING, CODE AGENCY OR GUARANTEE REQUIREMENTS.

Scale: NTS

Parafast Rhinobond Standard Fastening Pattern

Parasolo Roof Membrane – Insulation (Heat Induction System)



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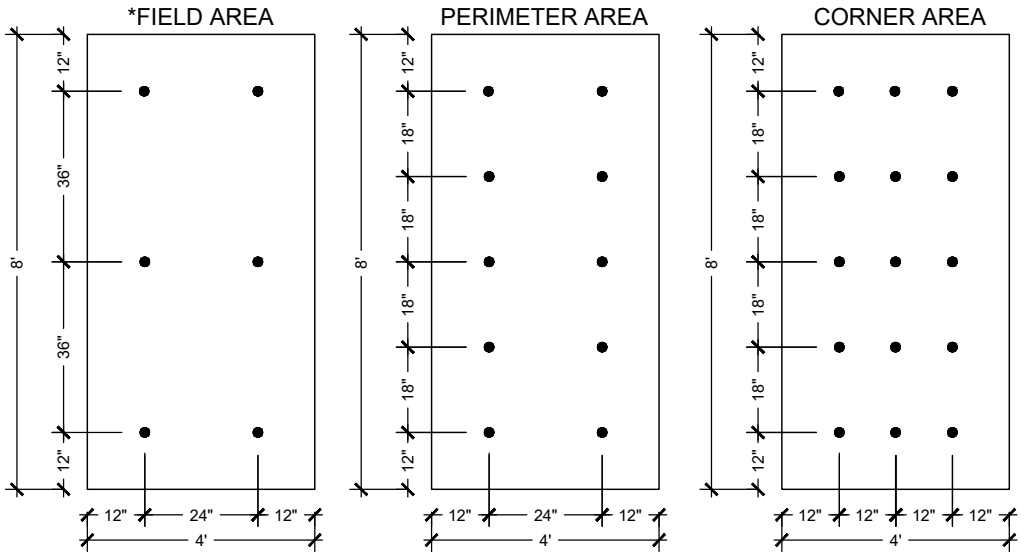

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1. REFERENCE SPECIFIC SYSTEM/INSULATION TYPE AND THICKNESS REQUIREMENTS.
2. PARAFAST RHINOBOND PLATE-WELDED SYSTEM IS NOT ACCEPTABLE FOR GYPSUM, CEMENTITIOUS WOOD FIBER OR OSB.
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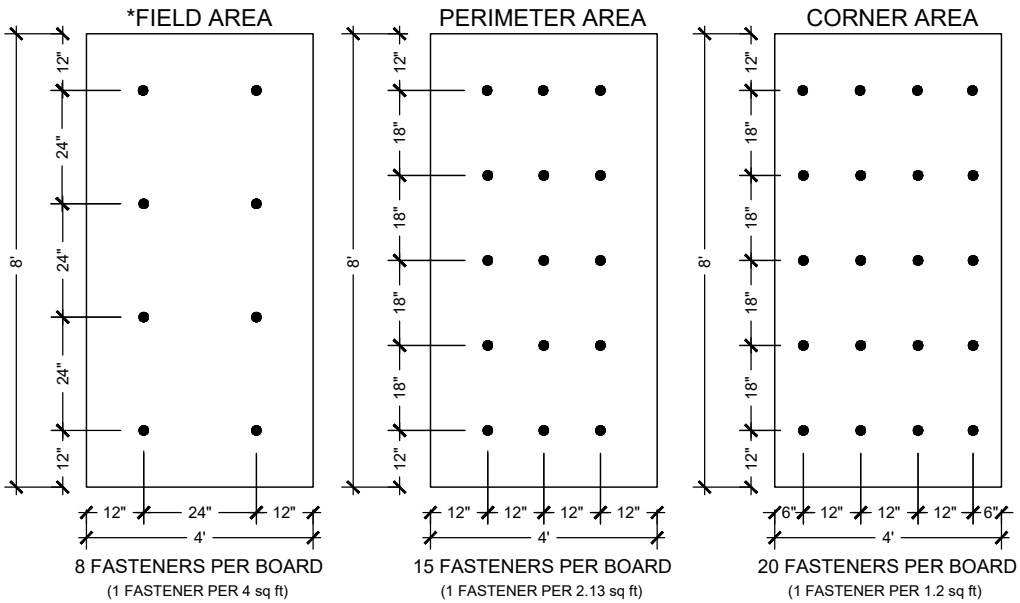

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