



EZ TPO InvisiWeld™ Roofing System Application Guide

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1.01 GENERAL

The following application guide provides the instructions for the installation of GenFlex Roofing Systems TPO membranes using GenFlex EZ TPO InvisiWeld™ system technology. Technical Information Sheets, RhinoBond™ Tool Instruction manual (from OMG, Inc.) and other sections of the GenFlex Technical Specifications is necessary to ensure that the finished roof system is installed in compliance with GenFlex requirements and, therefore, eligible to receive a GenFlex Warranty.

The GenFlex EZ TPO InvisiWeld roof system refers to an alternate attachment method (other than fully adhered and mechanically attached) to affix GenFlex TPO membranes to various approved substrates. Following the installation of the approved roof insulation using a special TPO coated InvisiWeld metal insulation plate, the membrane system is attached using a non-penetrating, induction welding technology, whereby the TPO membrane is welded to the plates using an induction welding tool provided by others. In doing so, the insulation plate acts as the point of attachment for both the membrane and the insulation.

NOTE: If a proposed application falls outside this specification, contact Quality Building Services Technical Department for additional information.

1.02 JOB SITE CONSIDERATIONS (CAUTION AND WARNINGS)

A. Safety

1. Keep all adhesives, sealants and cleaning materials away from all ignition sources (i.e., flames, fire, sparks, etc.). Do not smoke while using these materials.
2. Consult container labels, Safety Data Sheets and Technical Information Sheets for specific safety instructions for all products used on the project.

B. Cautions

1. Care must be used when installing fasteners to avoid possible conduits and other piping, both in and under the deck.
2. Store GenFlex TPO membrane in the original undisturbed plastic wrap in a manner to protect it from damage.
3. Do not use oil-based or bituminous-based roof cement, mastics or caulks in direct contact with GenFlex EZ TPO membranes.
4. Insulation must be properly stored and protected from ignition sources, moisture, and damage.
5. Follow all Occupational Safety and Health Administration (OSHA), National Roofing Contractors Association (NRCA) and other industry recommendations for fire and fall protection.

1.03 ROOF SUBSTRATE PREPARATION

A. Correct Substrate Defects

1. Defects in the substrate that require corrective action before work can commence should be brought to the attention of the General Contractor or Owner in writing, and addressed by them.
2. For re-roofing applications, remove existing roof system components as specified by the project designer and documents. Components or conditions that are discovered during installation that could be detrimental to the performance of the new roof system should be

brought to the attention of the project designer for corrective action.

3. Good roofing practice requires a complete removal of the existing roof to the structural deck if soundness and integrity of the existing roof system cannot be verified. Recovering an existing roof system with a new roof is an alternative to removing existing roof components. Nondestructive testing, however, in conjunction with examination of core cuts, must be performed to determine the condition of the existing roof system and decking.
4. The building owner or project designer is responsible for assuring that all wet or damaged insulation and/or substrates are removed and replaced in re-roofing applications. A reliable diagnostic technique is taking and evaluating a series of roof core cuts. There are three other techniques available to make this determination by indirect means: nuclear moisture detection, infrared thermography, and electric capacitance. These techniques provide measurement of factors that can be associated with the presence of moisture, which can then be correlated to the roofing cuts to verify the results of the nondestructive testing.

B. Rooftop Moisture

1. Ponded water, snow, frost, dew, and ice must be removed from the substrates/work surfaces before installing the GenFlex EZ TPO InvisiWeld system.

C. Prepare Surfaces

1. Acceptable substrates to receive the EZ TPO InvisiWeld system must be properly prepared before membrane installation. The surface(s) must be relatively even, clean, dry, smooth, and free of sharp edges, fins, loose or foreign materials, oil, grease, and other materials that may damage the membrane. Rough surfaces that could damage the membrane must be overlaid with acceptable insulation.

D. Fill Voids

1. All surface voids of the immediate substrate to receive EZ TPO InvisiWeld system greater than ¼" (6 mm) wide must be filled with insulation or other approved filler.

E. Vapor Retarder

1. Install vapor retarder as specified by the project designer.

1.04 WOOD NAILER LOCATION AND INSTALLATION

Wood nailers shall be installed as specified by the project designer or as noted in GenFlex details and the system design guide. Install wood nailers as follows:

A. Chemical Treated Wood Nailers

1. Chemical treating for fire resistance or other purposes (other than pressure treating for rot resistance, i.e. CCA, ACZA, CBA, ACQ or other copper treatments) may affect the performance of the Firestone membrane and accessories. Submit MSDS sheets with active ingredients listed for any chemically treated lumber not listed that will contact the membrane. Contact your Quality Building Service Technical Department to evaluate compatibility.

B. Position Wood Nailer

1. Total wood nailer height must match the total thickness of roof insulation installed, with a ⅛" (3 mm) gap between each nailer length and at each nailer intersection.

C. Secure Wood Nailer

1. Wood nailers shall be firmly fastened to the deck or building. Mechanically fasten wood nailers to resist a minimum 200 lb (890 N) force in any direction typically 12" (305 mm) on center. Refer to attachment requirements as specified by the project designer.

D. Taper Wood Nailer

1. The wood nailer shall be tapered (as required) so the top surface of the wood nailer abutting the insulation matches the height of the insulation.

E. Size of Wood Nailer

1. All wood nailers shall extend into the field of the roof a minimum of ½" (13 mm) beyond any metal edged detail.

F. Wood Nailer by Others

1. Make these specifications and details available when others will install nailers. Work that compromises the integrity of the system may jeopardize the warranty.

NOTE: Because of recent EPA regulations regarding treated wood, new treatments for lumber may be highly corrosive to fasteners. Contact the fastener manufacturer for recommendations on fasteners if attaching nailers that have been treated with corrosive materials.

1.05 INSULATION ATTACHMENT

A. Install Insulation

1. Install only as much GenFlex insulation as can be covered with roofing membrane and completed/made watertight before the end of the day's work and before the onset of inclement weather.

B. Fit Insulation

1. Neatly fit insulation at all penetrations, projections, and nailers. Insulation should fit loosely; filling any gaps greater than ¼" (6 mm) with acceptable insulation or filler. Edges of insulation boards running parallel with the deck should be fully supported by the deck's top flange. Under no circumstance should the membrane be left unsupported over a space greater than ¼" (6 mm). Tapered insulation with acceptable facer for bonding must be installed around roof drains to provide proper slope for drainage as shown in GenFlex details.

C. Stagger Insulation Joints

1. When installing multiple layers of insulation, all joints should be staggered. Staggering of insulation joints is not required to receive a Firestone warranty.

1.06 MECHANICAL ATTACHMENT OF INSULATION

A. Insulation Installation

1. The insulation shall be attached to decking before installation of EZ TPO InvisiWeld Membrane System. This can be accomplished by the mechanical attachment of the insulation using an approved GenFlex fastener and the InvisiWeld insulation attachment plate (as shown in Detail UT-IW-1). Refer to GenFlex's Technical Information Sheet #1111

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for product data and application data on the InvisiWeld plate. The fastener type and density is dependant on the deck type, wind uplift design requirements and the manufacturer's recommendations.

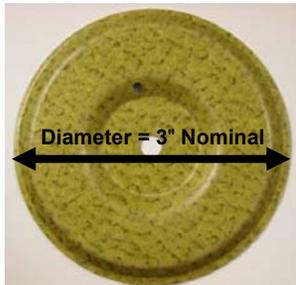


Figure 2.
GenFlex EZ TPO
InvisiWeld Plate

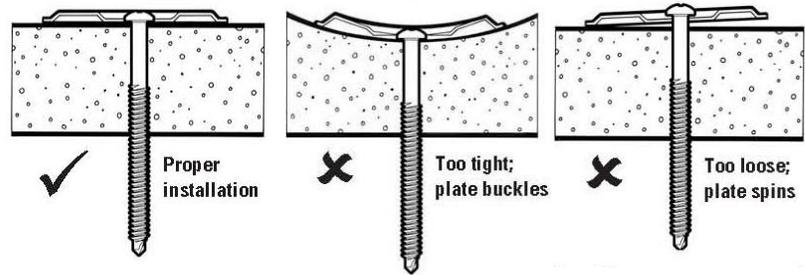


Figure 3. Proper Installation of Plate

B. Caution

1. Special care should be taken when fastening plates, so as not to overdrive or under-drive the fasteners into the structural deck (as illustrated in Figure 3). 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. Under-driving 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.

C. Mechanical Attachment

1. Attach GenFlex approved insulation using GenFlex EZ InvisiWeld Insulation plates and GenFlex approved fasteners as follows:
 - a) Refer to InvisiWeld Insulation attachment patterns, for the specific attachment pattern and fastening rates. Refer also to specific code requirement for project fastening requirements.
 - b) Refer to Technical Information Sheet of fastener selected for attachment to determine deck penetration requirements as shown in the cross section on Detail T – 42.02dw.
 - c) When installing a multilayer insulation assembly, the fastening pattern is determined by the type and thickness of the top layer of insulation.
 - d) Ensure that the fasteners are fully seated, but not overdriven. Overdriven fasteners will “cup” insulation plates, reducing their effectiveness.
 - e) Multiple layers of insulation may be installed using a common fastener. Fasteners should be sized to accommodate the total thickness of insulation plus any require substrate penetration.

NOTE: When attaching insulation or cover board using the InvisiWeld plates and approved fasteners, follow a straight line, linear pattern or grid pattern for the specified fastening pattern. This allows the plates below the membrane to be located easily, making for an easier and faster installation. Also, with a grid pattern, it is much easier to inspect the condition of the welded plate and account for the number of plates welded.

1.07 FACTORY MUTUAL (FM) REQUIREMENTS FOR INSULATION ATTACHMENT

- A. For specific reference to the FM requirements for the EZ TPO InvisiWeld system, refer to FM Global Property Loss Prevention Data Sheets 1-29, Section 2.2.7.2.1 for the prescriptive enhanced fastening rates for corner and perimeter areas, as required for the FM insured building.
- B. Generally, for a point attached system, increased fastening density is obtained by decreasing the spacing between fastener points in one or both directions. Ensure that the total tributary area to each fastener is no more than 60% and 40% in the perimeter and corners, respectively, of the FM Approved roof field spacing.
- C. Table 1 below illustrates the InvisiWeld fastener densities required to meet typical FM requirements for the field, perimeter and corner fastening of the roof system.

Table 1

Uplift Rating	Field	Perimeter	Corner	Assembly (See Notes)	RoofNav #
1-90	6	9	12	TPO, ISO, Steel Deck Field rate based on tested assembly.	250651-0-0
	5.33 Contributory Area (CA)	Reduce the field CA by no less than 67%	Reduce the field CA by no less than 50%		

NOTE:

1. Field/Zone 1 rating in any location does not exceed Class 1-90.
2. Building is in non-tropical cyclone-prone region and Field/Zone 1 rating does not exceed Class 1-105.
3. Validate all attachment rates against tested assemblies. See table below for example.
4. Rates above are based on contributory area rates.
5. 0.045" (1.14 mm) thick GenFlex EZ TPO approved for 15-year warranties.
6. 0.060" (1.52 mm) thick or greater required for 20-year or greater warranties.
7. 0.060" (1.52 mm) thick or greater required for any increased wind speed warranties.
8. 0.080" (2.03 mm) thick GenFlex EZ TPO required for 25 and 30-year warranties.
9. If RoofNav listing has linear rows listed instead of contributory area, decrease the spacing between rows by a minimum 67% for the perimeters and 50% for the corners. These assemblies may still require preliminary securement fasteners to be installed. See the RoofNav listing for details.

Table 2

Invisiweld Attached Membrane – Membrane Securement Enhancements	
Prescriptively enhance by reducing the distance between rows of roof cover fasteners and stress plates from the Zone 1 spacing using the following:	
Zone 2:	Decrease spacing between fastener points in one or both directions. Ensure the total tributary area to each fastener is not more than 67% of the FM approved spacing used for Zone 1
Zone 3:	Decrease spacing between fastener points in one or both directions. Ensure the total tributary area to each fastener is not more than 50% of the FM approved spacing used for Zone 1
Note: Pre-securement of the insulation may be required. See tested assembly for validation. When rows of fasteners are used Install all rows of roof cover fasteners perpendicular to the ribs of the roof deck to better distribute the wind load and prevent deck failure.	
Example:	
Zone 1: 24"x 24" pattern (6 fasteners per board or a tributary area of 4 sq. ft. per fastener)	
Zone 2: 16" x 24" pattern (12 fasteners per board or a tributary area of 2.68 sq. ft. per fastener)	
Due to rib spacing you may need:	
12" x 24" pattern (14 per board or tributary area of 2.28 sq. ft. per fastener)	
Zone 3: 12" x 24" pattern (tributary area of 2 sq. ft. per fastener)	

1.08 USE OF AIR OR VAPOR BARRIER WITH INVISIWELD SYSTEM

When an approved air or vapor barrier is used in conjunction with the GenFlex EZ TPO InvisiWeld system, give special attention to the number of fasteners used in the system to secure the insulation. At a minimum, the fastener density for attaching insulation boards in systems with an air/vapor barrier is 1 per 4 ft² (1 per 0.4 m²), or 8 per 4' x 8' board (8 per 1.2 x 2.4 m board). Since the wind load on the insulation board will be greater when an air/vapor barrier is used, the prescriptive perimeter and corner enhancements will follow those of fully adhered systems with the same number of fasteners per unit area, but arranged in straight linear fashion.

Table 3

Insulation Thickness	Attachment per 4' x 8' (1.2 m x 2.4 m) Insulation Board		
	Field	Perimeter	Corner
0.5" to 1.4" (13 to 36 mm)	16	16	16
1.5" to 1.9" (38 to 48 mm)	12	12	12
2" or greater (51 mm or greater)	8	8	8

NOTE:
Minimum Fastening Requirements for field, perimeter, and corner areas using the prescriptive enhancements for insulation attachment – Refer to FM Approvals LPDS 1-29 Section 2.2.2.2 for FM insured projects or project designed around FM specifications. The rates listed in the table above are for warranty purposes only. If specific uplifts are specified/required, then attachment rates should be validated by a tested assembly. When increased wind speed coverage is requested then the rates listed above may change. Consult with a GenFlex Representative or Building Systems Advisor for more information.

1.09 GenFlex EZ TPO MEMBRANE ATTACHMENT

- A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax for at least 30 minutes before attachment or splicing. In colder weather allow for longer relax time.
- B. Lay out the membrane panels so that field and flashing splices are positioned to shed water. Seam overlaps may be placed over InvisiWeld plate. Welding of the plate will not be affected. Seaming adhesion may be affected due to the robotic welded tracking over the plate.
- C. Install membrane without wrinkles and without gaps or fish-mouths in seams; bond and test seams and laps in accordance with GenFlex Roofing Systems instructions and details.
- D. Welding equipment shall be provided by others but approved for use by GenFlex Roofing Systems for use with the EZ TPO membrane. All roofing contractors intending to use the equipment shall have successfully completed a training course provided by a GenFlex Roofing Systems Technical Service Representative prior to welding.
- E. Perform a tool calibration with induction welding tool by making test welds with the EZ TPO membrane and InvisiWeld plate. Weld some spare membrane to the plates at various energy settings of the induction welder. Perform a peel test at the different energy settings. Then set the device at the lowest energy setting that creates a bond that covers 100% of the bonding area of the InvisiWeld plate.
- F. All membrane to be welded shall be clean and dry.

- G. Follow induction tool manufacturer's printed guidelines. Activate the weld between the EZ TPO membrane and InvisiWeld plate using the electromagnetic induction device as supplied by others. The induction coil, demarked by a red circle on the device, must be positioned over the center of the InvisiWeld plate, $\pm 1"$ (25 mm). Cycle time will be affected by available power. Use at least a 12 gauge, heavy gauge power cord, no more than 100' (30.5 m) in length.
- H. When the induction welding cycle is complete, immediately place a magnetic cooling clamp over the welded EZ TPO membrane and plate assembly. This will ensure that there is adequate clamping of the membrane to the plate during cooling, affecting a proper weld. The magnetic cooling clamp device must be left in place for at least 60 seconds while the weld cools and sets.
- I. Repeat steps G and H for every InvisiWeld plate in assembly.
- J. The bottom of the induction welder and the magnetic clamps must be kept clean to prevent scarring of the EZ TPO membrane. These surfaces should be wiped clean of debris frequently.
- K. Continuous welding operations will cause the temperature of the magnetic clamps to rise. Should the temperature build up to the point that surface melting of the TPO membrane becomes visually evident, cool the magnetic clamps by dipping them into a pail of clean water as often as required in order to avoid damaging the membrane.
- L. Secure membrane at all locations where membrane terminates at a roof edge using mechanically fastened reinforced perimeter fastening strips, InvisiWeld Plates, HD plates, or metal edging as indicated or as recommended by roofing manufacturer. **InvisiWeld plates may be used for base tie-in securement. Do not use InvisiWeld plates for roof edge securement.**

1.10 MEMBRANE SEAMING

- A. Clean the Lap Splice Area
 - 1. Wearing chemical resistant gloves and using a clean white cotton rag dampened with GenFlex Cleaner, thoroughly clean the selvage edge area of the top sheet and an area on bottom sheet at least 2 $\frac{3}{4}$ " (70 mm) wide if the seam area has become contaminated with dirt, debris, moisture or other contaminants. Membrane left exposed or unwrapped for more than 12 hours must be cleaned before any welding activity.
- B. Equipment and Test Splice Requirements
 - 1. The speed of the welding machine shall be adjusted to provide proper seam strength based on ambient conditions. Adjust the wheel guide by placing unit on top of the membrane with the outer edge of the Drive/Pressure wheel in contact with the membrane edge
 - 2. Ample power source shall be provided to heat welding equipment. A generator dedicated to the heat welding equipment shall be used on all installations. Refer to the welding and generator equipment requirements in the Technical Information Section of this manual for minimum requirements. For specifics, consult the welder manufacturer's data sheets.
 - 3. When weather conditions vary, adjustments to the welding machine must be made. It is recommended that this be done using spare or test material before starting welding of the finished roofing material. In addition, there shall be destructive tests performed daily and at the beginning of welding and after interruptions in the welding process (such as power failure, welder shut down, and job site condition change, after break or lunch). Periodically

check and correct the welder settings, including at the start of each work day welding will occur.

C. Hot Air Weld Lap Splices

1. Horizontal field splices should be welded first. Wherever possible, all field splices on the horizontal surface (including flashing) should be completed using an automatic heat welder that has been designed for hot air welding of thermoplastic membranes. Refer to the welding equipment requirements in the Technical Information Sheets for minimum requirements. For specifics, consult the welder manufacturer's data sheets.
2. Seams made with the automatic welder shall be a minimum of 1.5" (38 mm) wide. Seams made with hand welders shall be a minimum of 2.0" (50 mm) wide. Use silicone hand rollers to assure proper mating of surfaces as hand welding proceeds.
3. On vertical surface welds, or where an automatic welder is not practical, hand welders shall be used.

D. Seam Inspection

1. Probe all completed welds with a dull cotter pin puller type tool to verify seam integrity. Do not probe welds until they have cooled. Any welds found to be insufficiently fused need to be repaired on a daily basis.

E. T-Joint Covers

1. T-joint covers shall be installed at all intersections of field seams when membrane is greater than 0.045" (1.14 mm). Membrane to receive T-joint cover shall have the edged eased by heating and rolling to minimize any step-down. Refer to Lap Splice and T-Joint Detail Section of GenFlex's Technical Manual.

F. Cut Edge Sealant

1. All membrane lap edges with exposed scrim (cut edges) shall be sealed with GenFlex EZ TPO Cut Edge Sealant.

1.11 ADDITIONAL MEMBRANE SECUREMENT AND BASE TIE-IN FLASHING

A. Provide membrane securement

1. Secure the membrane at all locations where the membrane undergoes an angle change greater than 1" in 12" (25 mm in 305 mm). This typically occurs at roof edges, curbs, wall intersections, parapets, etc. InvisiWeld plates may be used as a mechanical base tie-in. The InvisiWeld plate outside edge must be 1" (25 mm) away from the transition and spaced 12" (305 mm) o.c. Base tie-in may also be achieved using GenFlex HD Seam Plates and GenFlex Fasteners applied either horizontally into the deck or vertically into the wall in accordance with GenFlex Base Tie-In Details. Refer to the GenFlex System Design Guide or GenFlex Technical Information Sheets to determine the applicable fastener and penetration requirements for specific substrate conditions.

1.12 FLASHING-PENETRATIONS

A. General

1. Remove all loose existing flashing (i.e., lead flashings, bituminous materials, mastics, etc.).

2. Flash all penetrations that pass through the EZ TPO membrane in accordance with GenFlex standard TPO details as indicated in the Technical Information Manual.
 3. The flashing seal must be made directly to the penetration.
- B. Pipes, Round Supports, Structural Steel Tubing, etc.
1. Flash pipes with GenFlex EZ TPO Pre-molded Pipe Flashing where practical.
 2. Refer to the GenFlex Technical Information Sheet for minimum and maximum pipe diameters that can be successfully flashed with GenFlex EZ TPO Pre-Molded Pipe Flashings.
 3. Flash inside and outside corners with GenFlex pre-molded products per GenFlex details
 4. GenFlex EZ TPO Unsupported Flashing is only to be used at non 90 degree inside and outside corners, "T" joints, and field wrapped pipe boots and other special conditions where allowed by GenFlex details.
- C. Roof Drains (cast iron only)
1. Remove all existing flashing (including lead flashing), roofing materials and cement from the existing drain in preparation for EZ TPO membrane and GenFlex Waterstop.
 2. Provide a clean, even finish on the mating surfaces between the clamping ring and the drain bowl.
 3. Install tapered insulation with acceptable bonding surfaces around the drain to provide a smooth transition from the roof surface to the drain. Slope into drain shall not exceed 1" in 12" (25 mm in 300 mm).
 4. Position the EZ TPO membrane, then cut a hole for the roof drain to allow a ½" (13 mm) minimum and ¾" (19 mm) maximum inside the clamping ring.
 5. Using a punch or other suitable device, make round holes (sized to receive clamping bolts) in the membrane to align with clamping bolts. Do not cut the membrane back to the bolt holes.
 6. Install GenFlex Waterstop on the clamping ring seat flange below the membrane. Use a minimum of one half of a 10-ounce (295 CC) tube for a 10" (250 mm) drain.
 7. Install the roof drain clamping ring and clamping bolts. Tighten the clamping bolts to achieve constant compression of the Waterstop.
- D. Pipe Clusters and Unusual Shaped Penetrations
1. Fabricate GenFlex EZ TPO Coated metal penetration pockets to allow a minimum clearance of 1" (25 mm) between the penetrations and all sides of the pocket.
 2. Secure GenFlex Peel & Stick or weldable penetration pockets, and flash per current GenFlex details.
 3. Fill penetration pockets with GenFlex Pourable Sealer to shed water from penetrations. GenFlex Pourable Sealer shall be poured to a depth of 2" (50 mm) minimum.
 4. GenFlex EZ TPO unsupported flashing may also be used for some details.
- E. "Hot" Pipes (Greater than 160 °F [60 °C])
1. Protect EZ TPO components from direct contact with steam or heat sources that exceed the in-service temperature of 160 °F (71 °C).
 2. Pipes and roof penetrations exceeding 160 °F (71 °C) shall be flashed to an intermediate, or separator, sleeve to protect EZ TPO components from these direct heat sources.

F. Flexible Penetrations

1. Flexible roof penetrations shall be flashed by means of a watertight “gooseneck”.
2. Watertight “gooseneck” shall be set in Waterstop, secured to deck, and flashed in accordance with GenFlex Details.

G. Scuppers

1. Remove any existing scuppers, and install a new scupper sleeve fabricated from GenFlex EZ TPO coated metal.
2. Secure new scupper to the structure.
3. Flash new scupper in accordance with GenFlex Details.

H. Expansion Joints

1. Install expansion joints in accordance with GenFlex details where specified by project designer.
2. Flash expansion joints in accordance with GenFlex details.

1.13 FLASHINGS: WALLS, PARAPETS, MECHANICAL EQUIPMENT CURBS, ETC.

A. General

1. Using the largest piece(s) of continuous GenFlex EZ TPO membrane practical, flash all walls, parapets, curbs, etc, to the height of an 8" (203 mm) minimum.

B. Evaluate bonding substrate. Add acceptable bonding substrate as required.

1. The following substrates require the installation of 5/8" (16 mm) exterior grade or “Wolmanized” plywood, anchored in accordance with project designer’s requirements: interior gypsum board, stucco, cobblestone, textured masonry, exterior gypsum panels, corrugated metal panels, and all other uneven or loose substrates.

C. Curb and Base Flashing with EZ TPO Membrane

1. Apply EZ TPO Bonding Adhesive, GenFlex Water-based Bonding Adhesive, or LVOC Bonding Adhesive at about the same time to both the membrane flashing and the surface to receive the flashing at about the same time to allow approximately the same drying time.
NOTE: When using EZ TPO Membrane as flashing and EZ TPO Bonding Adhesive or Water-Based Bonding Adhesive, the adhesive must be applied to both the flashing and the curb as a contact adhesive.
2. Apply GenFlex’s EZ TPO Bonding or Water-based Bonding Adhesive by rolling the adhesive on the mating surfaces evenly, avoiding puddles or globs, at the specified coverage rate. Refer to the Technical Information Sheets for the specific adhesive.
3. Allow flash off period for bonding adhesive.
4. Test bonding adhesive for readiness. Touch the bonding adhesive surface with a clean, dry finger to be certain that the adhesive does not stick or string. As you are touching the adhesive, push straight down to check for stringing, and push forward on the adhesive at an angle to ensure that the adhesive is ready throughout its thickness. If either motion exposes wet or stringy adhesive when the finger is lifted, then the adhesive is not ready for bonding. Flash off time will vary depending on ambient air conditions. This is especially true for water-based adhesives. GenFlex Water-based Bonding Adhesive will change appearance from opaque to nearly transparent, indicating it is ready for bonding. Coverage

- rate will differ with varying substrates and ambient conditions.
5. Once bonding adhesive has properly flashed off, evenly roll the membrane flashing up the vertical substrate, and take care to avoid wrinkles.
 6. Broom the membrane flashing after bonding, using a stiff push broom to ensure proper contact and bonding.
 7. Complete the splice between the membrane base flashing and the main roof EZ TPO membrane by hot air welding. Complete lap splices in accordance with GenFlex details.
 8. Install termination of base flashing in accordance with GenFlex details.
 9. Install intermediate attachment over membrane flashing 36" (914 mm) o.c. in accordance with GenFlex Details.
 - a) Intermediate attachment may be eliminated if:

Wall surface is smooth without noticeable high spots or depressions, such as plywood, poured or pre-cast concrete, hollow core block or masonry walls where mortar joints are flush with masonry surface.

And:

The termination of membrane flashing is a Termination Bar or membrane flashing extending completely under coping to the outside wall to the outside face edge.

1.14 FLASHING - GRAVEL STOPS OR ROOF EDGE METALS

Use GenFlex GF One Roof Edge System or other product as indicated. Install in accordance with GenFlex details.

- A. Use EZ TPO Coated Metal per GenFlex details.
 1. When using GenFlex TPO Coated Metal, a perimeter EZ TPO sheet must be placed parallel to metal edge with selvage edge positioned to weld to the edge metal.
 2. Coated metal edge detail must provide enough room to permit T-joint cover or strip-in of details with sufficient width wood nailer for support.
- B. Use other metals formed as needed for special conditions and flashed using TPO Peel & Stick Flashing.
 1. Install gravel stop metal as specified by project designer. Flange of gravel stop metal shall be flashed using EZ TPO Peel & Stick Flashing. Maximum warranty length for this detail is 20 years.
 2. Apply GenFlex EZ TPO Clear Primer to flange of gravel stop/edge metal with Scrub pad and handle with long back and forth strokes with heavy pressure on splicing area. Stir the EZ TPO Clear Primer before and during use. Dip the GenFlex Scrub pad into the EZ TPO Clear Primer, keeping the pad flat. Change pads every 200' (61 m) or when pad no longer holds the proper amount of EZ TPO Clear Primer.
 3. Allow a brief flash off time – usually less than 10 minutes – for the EZ TPO Clear Primer before applying EZ TPO Peel & Stick Flashing.
 4. Install EZ TPO Peel & Stick Flashing, centered over the flange edge of the gravel stop/edge metal. Using a silicone coated rubber roller, roll the EZ TPO Peel & Stick Flashing immediately after installation of EZ TPO Peel & Stick Flashing.

1.15 MEMBRANE REPAIR

- A. Repair punctures/cuts/damage to EZ TPO membrane.
 - 1. The repair material shall be heat welded EZ TPO membrane and extend 2" (50.8 mm) minimum past the damaged area in all directions. Round all corners of the repair piece. For example a pinhole will require a minimum 4" x 4" (102 mm x 102 mm) patch.
- B. Inspect the plates.
 - 1. At each InvisiWeld bonded plate location, the condition of the plate bonded or attached membrane should be inspected for membrane abrasion at the plate peripheral edges, and for any debris, or holes in the membrane over the plate. In the event that any abrasion or membrane damage is found, the entire area must be patched with a 4" x 4" (102 mm x 102 mm) T-Joint cover that covers the plate area completely. EZ TPO T-joint covers may also be used.

NOTE: For inspection purposes, GenFlex recommends the use of a bathroom plunger to inspect the individual InvisiWeld plate welds. By applying the rubber end of a plunger to the membrane adjacent to the welded InvisiWeld plate and pulling upwards, the condition of the weld can be assessed. This is a good tool to ensure that no InvisiWeld plate welds were missed during roofing.

- C. Clean the membrane
 - 1. When making a repair to EZ TPO membrane that has been in service for some time, it is necessary to remove accumulated field dirt. Scrub the membrane with a scrub brush and warm soapy water, followed by rinsing with clean water, and wipe with clean cotton rags. For membrane with significant accumulation of dirt, cleaning with acetone and clean cotton cloths may be required. GenFlex Cleaner may then be used.
- D. Install splice per splicing procedures.

1.16 TEMPORARY CLOSURE

- A. Temporary closures to ensure that moisture does not damage any completed section of the new roofing system are the responsibility of the roofing contractor. This is not covered under any GenFlex warranty.
- B. Completion of flashings, terminations, and temporary closures should be completed as required to provide a watertight condition.
- C. Any material contaminated by temporary closure shall be removed and discarded before resumption of installation.
- D. See GenFlex Vapor Shield™ Membrane Technical Information Sheet for further information.

1.17 ROOF WALKWAYS

- A. Install walkways in locations as specified by the project designer in accordance with GenFlex requirements.

- B. Walkways shall consist of 30" (762 mm) wide GenFlex TPO Walkway Pad.
- C. Heat weld the edges of the walkway material to the EZ TPO membrane using the proper welding procedures.

1.18 SHEET METAL WORK

- A. For specific installation instructions for the GenFlex prefabricated metal edge treatments: GF One Roof Edge System or UltraPly TPO Coated Metal, refer to the respective Technical Information Sheet.
- B. For all other sheet metal work not supplied by GenFlex, refer to fabrication and installation requirements established by the project designer.

1.19 CLEAN UP

- A. If cleaning is required, the EZ TPO membrane may be cleaned by gently scrubbing with soapy non-abrasive soap and water followed by rinsing the area completely with clean water.
- B. GenFlex membrane cleaner may also be used sparingly with clean cotton cloths to clean the membrane.

1.20 GenFlex EZ TPO INVISIWELD SYSTEM – METAL BUILDING RECOVER

A. Prepare Substrate

1. A dry, clean and smooth substrate shall be prepared to receive the GenFlex EZ TPO InvisiWeld system.
2. The applicator shall inspect the substrate for defects, such as excessive surface roughness, contamination, structural inadequacy, or any other condition that may adversely affect the quality of work.
3. The substrate shall be clean, smooth, dry, and free of flaws, sharp edges, loose and foreign material, oil and grease. Roofing shall not start until all defects have been corrected.
4. All roof surfaces shall be free of water, ice and snow.
5. Compressible fill material or spray, expanding urethane foam shall be used to minimize air infiltration under wood nailers for corrugated metal roof panels.
6. The GenFlex EZ TPO InvisiWeld system shall be applied over compatible or acceptable substrates only.

B. Install Insulation

1. Approved Insulation fill material, with a minimum compressive strength of 20 psi (140 kPa) must be inserted in the existing metal standing seam roof panel to provide a level substrate for installation of the approved cover board or insulation boards. The fill layer must be cut to fit inside the metal panel seam and secured in place to fit flush with the top of the standing seam. Note: For Factory Mutual insured buildings, polystyrene insulation may not be applied directly to steel deck.

2. Insulation shall be installed according to insulation manufacturer's instructions.
3. Top layer of insulation shall be the membrane underlayment or substrate, cover board or any other approved GenFlex insulation product. Edges shall be butted together with no gaps greater than ¼" (6 mm).
4. Insulation shall be neatly cut to fit around penetrations and projections with gaps not exceeding ¼" (6 mm).
5. If applicable, install tapered insulation around drains to create a drain sump.
6. Do not install more insulation board than can be covered with GenFlex EZ TPO membrane by the end of the day or the onset of inclement weather.
7. Use at least 2 layers of insulation when the total insulation thickness for the overlayment exceeds 2.5" (64 mm). Stagger joints at least 12" (300 mm) between layers.

C. Attach Insulation

1. Insulation shall be mechanically fastened to the purlins with GenFast Purlin fasteners or to the structural deck with approved GenFlex fasteners and InvisiWeld plates. Attachment rate shall be according to GenFlex Roofing Systems and FM (if insured by FM) recommendations for fastening rates and patterns for the InvisiWeld system into metal purlins (see table 3), but not less than 1 fastener per 6.4 ft² (0.6 m²) or 5 fasteners per 4' x 8' (1.2 x 2.4 m) board. The quantity and locations of the fasteners and plates shall also cause the insulation boards to rest evenly on the roof deck/substrate. Each insulation board shall be installed tightly against the adjacent boards on all sides. With purlin attached system, use the GenFast #12 or GenFast #14 fasteners and GenFlex 3" Insulation plate to ensure each board of insulation has at least 5 fasteners, one in each corner and one at the board mid center point. The grid attached systems are adequate for the insulation attachment. No additional insulation fastening is required.
2. Fasteners are to be installed consistently in accordance with fastener manufacturer's recommendations. Fasteners are to have minimum penetration of 1" (25 mm) through the structural deck.
3. Use fastener tools with a depth locator and torque-limiting attachment as recommended or supplied by fastener manufacturer to ensure proper installation.

D. Attachment to Purlins

1. Fasten the insulation so the InvisiWeld plate and GenFlex GenFast Purlin fastener will be centered over the structural purlin at a density according to Firestone's and the wind design requirements. Fasteners must be tight enough that the InvisiWeld plate does not turn, but not so tight as to deform the InvisiWeld plate.

Note: The minimum fastening requirement for the InvisiWeld metal roof recover system is at a purlin spacing of 10' (3 m) at a fastener spacing of 12" o.c. (300 mm) in the field of the roof. The minimum fastening for the perimeter and corner areas is at a purlin spacing of 5' (1.5 m) at a fastener spacing of 6" o.c. (150 mm).

2. Perimeter and Corner Areas

- a. The perimeter and corner area will be determined by building height and width and other conditions according to ASCE 7 guidelines, GenFlex Technical or FM LPDS 1-29 if insured by Factory Mutual.
- b. To meet the perimeter and corner uplift requirements, increase the fastening density by decreasing the spacing between fasteners along each fastener row in the perimeter and corner areas. The GenFast Purlin fastener spacing shall be a maximum of 60 percent of the field spacing for the perimeter and 40 percent of the field spacing for the corner, but never closer than 3" (76 mm).
- c. See Detail UT-IW-4 for more details.

NOTE: Perimeter area is defined as the outer boundary of the roof. If the roof is broken into different levels, each roof area shall be treated as an individual roof with its outer boundary being treated as a perimeter. Typically, internal expansion joints and firewalls are not considered to be full perimeters. Refer to Factory Mutual's Data Sheet 1-28 for more information.

NOTE: The ridge area is defined as the high point in the roof area formed by two intersecting planes. When the sum of the slopes is a minimum of 4" in 12" (30°), each side of the ridge shall be treated as a perimeter area.

E. Membrane Securement

1. Fastener pullout tests shall be conducted on the metal roofing deck with approved fasteners by the manufacturer of the fasteners, or the specifier/designer for the project. A minimum of 15 pullouts for up to 50,000 ft² (4,650 m²) of which 8 are to be in perimeter and corner zones; and, seven additional pullouts for each additional 50,000 ft² (4,650 m²) or portion thereof.
2. Fasten the insulation so the InvisiWeld plate and GenFast purlin fastener (depending on pullout value) are installed directly into the purlin through the insulation according to GenFlex's specifications and any other wind design requirements. Fasteners must be tight enough that the InvisiWeld plate does not turn, but not so tight as to deform the InvisiWeld plate.
3. InvisiWeld recover system over metal roof – typical ridge detail.
4. InvisiWeld recover system over metal roof – typical eave detail.
5. For any additional specific wind requirement questions for the InvisiWeld system over a metal building, please direct all questions to a Quality Building Services Technical Department.

1.21 WARRANTY COVERAGE

A. Acceptable Fasteners

The following fasteners are acceptable for use and eligible for warranty with the GenFlex EZ TPO InvisiWeld system:

- GenFast #14 Fasteners (Max 15 yr, New Construction)
- GenFast #15 WH Fasteners

GenFlex EZ TPO InvisiWeld™ Roofing System Application Guide
Interim Updates Available at www.genflex.com

- GenFast Purlin Fasteners

B. Acceptable Roof Deck Types

The following roof deck types are acceptable for use and eligible for warranty with the GenFlex EZ TPO InvisiWeld System:

- Steel Decks
- Wood Decks
- Structural Concrete Decks

C. Acceptable Roof Insulation

The following roof insulation types are acceptable for use as substrates and eligible for warranty with the GenFlex EZ TPO InvisiWeld System:

- ½" HD ISO
- GenFlex Coated Glass Facer Polyiso
- High Density wood fiberboard
- DensDeck® cover board
- SECUROCK®

NOTE: Induction welding should not be used to attach membrane (with plate and induction welding tool) directly over extruded polystyrene (XPS), expanded polystyrene (EPS) or foil faced insulation boards.

1.22 AVAILABLE ROOF WARRANTIES

- A. The following table shows the roof warranties, warranty duration, and system components available for the GenFlex EZ TPO InvisiWeld system for new construction or re-cover applications.
- B. For any specific warranty questions on the application of the GenFlex EZ TPO InvisiWeld system, please contact Quality Building Services Technical Department.

Table 4

GenFlex EZ TPO InvisiWeld™ System Attachment Requirements - Warranty Terms and Conditions								
GenFlex Warranty	GenFlex Fastener	Membrane / Insulation Attachment (per 4' x 8' board)			Additional Insulation Attachment When Vapor Barrier is Used			
		F	P	C	F	P	C	
10 or 15 Years, New Construction	GenFast #14	6	10	12	See Table 3. Varies by Insulation Top Layer Thickness			
15 Years, Re-cover (Note 1)	GenFast #15	6	10	12				
20 Years, (Note 1)	GenFast #15	6	10	12				
25 and 30 Year (Note 2)	GenFast #15	6	10	12				
72 mph Wind Speed Coverage	GenFast #15	6	10	12				
80 mph Wind Speed Coverage	GenFast #15	8	12	16				
For all Wind Speed Warranties above 80 mph, contact Quality Building Services Technical at 1-800-428-4511								

Metal Building Recover		F	P	C	F	P	C
10, 15, or 20 Years	Membrane - Purlin Fastener	12.0" o.c. (305 mm)	6.0" o.c. (152 mm)	6.0" o.c. (152 mm)	N/A		
	Insulation - GenFast #15	5	5	5	Contact your GenFlex Technical Services Advisor		
<p>NOTE: Membrane must be attached to InvisiWeld plates that are installed directly into purlins with GenFast purlin fasteners, at a maximum of 10' o.c. in the field and 5' o.c. for perimeter and corners purlin spacing.</p>							
<p>NOTE(S):</p> <ol style="list-style-type: none"> For 15 year warranties, membrane must be 0.045" or greater, and for 20 year warranties, membrane must be 0.060" or 0.080" (1.52 or 2.03 mm) thickness. 0.080" (2.03 mm) GenFlex EZ TPO Plus membrane must be used for 25 and 30 year warranties. Cover board selection may alter these attachment rates. Consult your Technical Services Advisor. F = Field; P = Perimeter; C = Corner 							