

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

TABLE OF CONTENTS

1.0	CertainTeed LLC Commercial Roofing Policy
2.0	Limited Warranties
3.0	Roof Decks
4.0	Roof Insulation
5.0	Re-cover
6.0	Materials: Storage, Handling and Safety Data Sheets
7.0	Flintglas® & Flintlastic® Hot Asphalt Mopping Application
8.0	Flintlastic® Torching Application
9.0	Flintlastic® Cold Process Application
10.0	Flintlastic® Self-Adhering (SA) Application
11.0	Application Safety and Equipment Policy
12.0	Temporary Roofs
13.0	Cold Weather Precautions
14.0	Coatings and Surfacing
15.0	Nailable Substrate Fastener Data

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

1.0 CERTAINTEED LLC COMMERCIAL ROOFING POLICY

1.1 Recommendations

These recommendations contain the latest and best information we have relating to the application of CertainTeed Commercial Roofing Products manufactured by CertainTeed LLC (hereinafter referred to as CT). The roof systems described herein are based on our many years of experience in the built-up and modified bitumen roofing field. These recommendations have been prepared, and are offered as a guide, to assist architects, roof consultants, engineers, roofing contractors, and/or building owners (hereinafter referred to as designer/owner) who are responsible for the design and application of low-slope roof systems. Because CT does not practice engineering, design or architecture, neither the issuance of these guidelines, nor the review of any building construction, roof plans or installation details by CT representatives shall constitute any warranty by CT of such plans, specifications, details or construction, nor in any way constitute any acceptance by CT of same except for the purposes of determining the appropriateness of issuing a warranty for the roof assembly. Since good workmanship in applying any roof system is essential in the long-term performance of the roof assembly, a skilled contractor should provide a safe working environment, skilled and knowledgeable supervision and skilled trade workers to carry out the roof installation. The roofing contractor is solely responsible for the quality of the application of the roof system. The recommendations contained herein are provided for the consideration of the designer/owner. These recommendations should not be construed as being all-inclusive, nor should they be considered as a substitute for good application practices or recognized installation standards. The CT General Recommendations Section of the CertainTeed Commercial Roof Systems Specifications (hereinafter referred to as CT Specs) shall be considered part of, and used in conjunction with, all CT system specifications, Technical Bulletins and Technical Data Sheets, which shall be issued from time to time by CT and published on the CT website.

These recommendations are specific to the membranes and related materials manufactured and sold by CT.

When other products are incorporated into the assembly, which are not manufactured or sold by CT, please refer to the installation recommendations published by the respective manufacturers. Where there are conflicts in the recommendations, contact a CT representative or Tech Services for clarification.

The roofing contractor should be aware of all environmental restrictions limiting application in cold and wet weather. Every roofing project should have a safety and fall protection plan in place, which should include the proper handling and storing of materials.

CT materials are installed over a wide geographic area within North America. Local practices have been developed by roofing contractors to meet local conditions. CT cannot be knowledgeable of all local practices and conventions and does not endorse practices other than recognized industry standards.

For technical support, please contact the local Commercial Territory Manager or Tech Services at 1-800-396-8134 ext. 2.

CT reserves the right to change or modify, at its discretion and without prior notice, any of the information, recommendations, specifications, warranty terms or policies contained herein. This manual supersedes and replaces all catalogs and previous manuals. Refer to the CT website for all current publications.

Applicable local building code may require more stringent installation requirements such as, but not limited to, increased fastener or adhesive densities to meet required wind uplift pressures. Consult local building code and uplift requirements prior to any application of CertainTeed roofing materials. CertainTeed is not responsible for failure to install roofing products per applicable local building codes.

2.0 LIMITED WARRANTIES

2.1 Limited Warranty on Materials

All CT roll good products are eligible for a CT Limited Warranty on Materials. These warranties can extend in duration of 10 or 12 years. There is no warranty fee

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

associated with a CT Limited Warranty on Materials. In the event that there is a failure of the CT product during the warranty period CT, at its sole discretion, shall provide the appropriate replacement materials or refund the prorated original cost of materials determined by CT to be defective.

Leaks or other membrane defects that result from the failure of the roofing contractor to follow CT's published application instructions and/or specifications, or from any other roofing contractor error, are not covered by this warranty, and this limitation shall apply even if the failure to comply with published CT requirements is the result of a designer/owner imposing a condition on the roofing contractor which causes or requires a violation of these requirements. See a specimen copy of the CT Limited Warranty on Materials in the Warranties Section of this manual for additional details and conditions.

2.2 Limited Warranty on Systems

Subject to conditions enumerated in Section 2.5, all published CT roof systems are eligible for a CT Limited Warranty on Systems. These warranties can extend in duration of 10, 12, 15, 20 or 25 years depending upon the plies and component materials as outlined in CT published specifications. There is no warranty fee associated with a CT Limited Warranty on Systems. Please see actual warranty for specific coverages. Leaks or other membrane defects that result from the failure of the roofing contractor to follow CT's published application instructions and/or specifications, or from any other roofing contractor error, are not covered by this warranty, and this limitation shall apply even if the failure to comply with published CT requirements is the result of a designer/owner imposing a condition on the roofing contractor which causes or requires a violation of these requirements. At its sole discretion, CT reserves the right to refuse issuance of its CT Limited Warranty on Systems on projects when an owner, architect, engineer or consultant imposes any condition upon the roofing contractor which results in roof application procedures that fail to comply with published CT requirements. See a specimen copy of the CT Limited Warranty on Systems in the Warranties Section of this manual for additional details and conditions.

2.3 NDL Limited & Full System NDL Limited Warranties

CT offers a selection of No Dollar Limit (NDL) Limited Warranties. These warranties can be obtained for a duration of 10, 12, 15, 20 or 25 years depending on the configuration of the roof assembly. It is within CT's sole discretion to determine whether a roof or roof assembly is suitable for issuance of NDL Limited Warranties upon project completion.

Fees vary depending on a variety of factors including, but not limited to duration of warranty, size of the roof, products used, etc., and are subject to change at the sole discretion of CT. Should a leak occur in the roof assembly, or should the watertight integrity of the membrane be compromised, the roofing contractor is responsible for all workmanship issues contributing to leaks during the first two (2) years of the warranty. After the two-year anniversary of the warranty issuance, CT will authorize repairs at its own expense in order to restore the roof membrane to a watertight condition, subject to the applicable warranty's terms and conditions. Products manufactured, sold or approved by CT can be incorporated into the NDL Limited Warranty. CT can also accept products manufactured by third parties that are incorporated into the roof assembly; however, these products will not be incorporated into the NDL Limited Warranty.

NDL Limited Warranties, at the sole discretion of CT, may be voided at any time should it be found the roof assembly has not been installed in compliance with the CT installation recommendations published at the time of installation.

In order for CT to consider the issuance of an NDL Limited Warranty the following process must occur:

The roofing contractor shall apply for the issuance of an NDL Limited Warranty by logging onto www.ctndl.com and completing the project registration form. All information requested must be completed in full for the consideration of the project. Applications for NDL Limited Warranties must be received not later than five (5) business days prior to a job start, and formally approved by CT prior to commencement of the installation of the roof system. Warranty fee deposits must be received prior to the issuance of warranty approval. CT Silver and Gold Star contractors have a unique login process that expedites the application process. Alternatively,

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

a contractor may contact the CT Commercial Territory Manager (“CTM”) or Tech Services to obtain warranty information. Contractors who log onto the system for the first time, or have not visited the site for an extended time will be prompted to update their information. Non-Star designated contractors can apply for a “one-time” account and submit a brief description of the upcoming project for review and consideration by the CTM. If approved, the contractor may then move forward with the NDL Limited Warranty Application.

Login to the online warranty registration website, www.ctndl.com; select the “Create New NDL Warranty Application” link in the fields found on the left side of the screen. The following screen provides one option for NDL: Select an NDL/Full System Roofing Spec. CT will determine whether or not the project is eligible for a Full System NDL or a standard NDL Limited Warranty. After completing the requested information, select “Submit” and the application will generate a Job Registration and Warranty Request Form on the following web page.

The Job Registration and Warranty Request Form will automatically be forwarded to the CTM for review and, in turn, forwarded to the Manager, Commercial Roofing Systems for final review and processing. Once an application and warranty fee deposit has been received and approved by CT, and roof installation work has begun, the warranty deposit is nonrefundable. NDL Limited Warranties for roof systems less than 100 squares in size shall be subject to a minimum warranty fee, as published in the CT Warranty Fee Schedule and published on the CT website.

If approved, the warranty application shall be forwarded to Tech Services for processing. Upon registration and Approval, the roofing contractor shall notify the CTM of the intended commencement date. A pre-job inspection may be requested to review the project conditions for conformance with the NDL Warranty Application and the selected roof specification.

Inspections, which are for the sole benefit of CT, may occur prior to, during or after the roofing application, or as determined appropriate by CT.

Upon receipt of the Notice of Completion, CT may choose to conduct a final inspection to document conformance with the specification and the general recommendations required for the issuance of an NDL Limited Warranty. An inspection report and roof plan shall be submitted by the CTM for final review by Tech Services. After payment of all warranty fees and completion of all other requirements, the requested warranty will be issued in PDF format to the roofing contractor. The contractor will be notified via email at the time of warranty issuance. It is the responsibility of the roofing contractor to deliver the warranty to the building owner.

Specimen copies of the NDL Limited Warranties and the Roof Maintenance Program are available in the Warranties Section of this manual. Additional warranty information can be found in this section.

2.4 THE OBLIGATIONS OF CT CONTAINED IN THE WARRANTIES ARE EXPRESSLY IN LIEU OF ANY OTHER LIABILITIES, OBLIGATIONS, GUARANTEES AND WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL CT BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY KIND. SOME STATES DO NOT ALLOW EXCLUSIONS OR LIMITATIONS OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY.

2.5 Conditions pertaining to the issuance of an NDL Limited Warranty

- A) Applications for NDL Limited Warranties must be received in a timely manner and approved by CT prior to commencement of roofing.
- B) The warranty fee must be received prior to the installation of the roof membrane assembly.
- C) CT reserves the right to determine at the completion of a project the suitability of the installation and project conditions for the issuance of the requested warranty. CT further reserves the right to offer an alternate warranty should there be any change or modification from the submitted NDL Warranty Application. If no warranty is offered, any unused portion of the warranty fee deposit shall be returned to the roofing contractor.

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

- D) NDL Limited Warranties may be voided during the warranty period should it be discovered that any portion of the warranted roof assembly has not been installed in general compliance with the CT published installation recommendations current at the time of original installation.
- E) Once an NDL Warranty Application and warranty fee have been received and approved by CT, and roof installation work has begun, the fee is nonrefundable except as noted in section C.
- F) NDL Limited Warranties on roof systems less than 100 squares shall be subject to minimum warranty fees as published in the CT Warranty Fee Schedule.

2.6 No NDL Limited Warranty of any type shall be issued for any low-sloped roof system installed on or over the following structures, without the prior express written Approval by Tech Services:

- Cold storage buildings;
- Private residences;
- Condominiums or co-ops;
- Storage silos;
- Heated tanks;
- Structures located outside the United States and Canada;
- Structures with conduit or piping installed above the roof deck and under the roof membrane;
- Membrane installations over thermal insulation or coverboards not approved by CT;
- Roofs without positive drainage (See Section 3.3);
- Lightweight Insulating Concrete ("LWIC"), unless the substrate is vented in accordance with CT installation recommendations;
- Installation over an existing roofing/insulation system containing moisture and/or improperly prepared surfaces;
- Any surface that is not readily accessible for inspection;
- Plywood decks less than 15/32" in thickness or without adequate edge support on all four sides; or
- Structures with high interior humidity uses such as swimming pools, car washes, pulp and paper plants, food processing plants, etc.

CT will not issue, in lieu of a warranty, any written approval or acceptance of plans, specifications, details, applications or roofer performance, or otherwise accept

any responsibility for any roof system as a substitute for a roof membrane limited warranty.

3.0 ROOF DECKS

3.1 CT Technical Personnel

CT technical personnel may be consulted to determine if a roof deck is suitable for the installation of a warranted membrane assembly. The consultation is solely for the suitability of the deck for the installation of a warranted system and shall not be a substitute for a complete roof design. The selection of the proper roof assembly, the suitability of an existing substrate, the appropriateness of adding insulation and the design of vapor retarders, expansion and control joints and the detailing of roof transitions are design considerations that remain solely with the designer of record.

3.2 Roof Decks

Roof decks shall be constructed in accordance with the deck manufacturer's specifications, generally accepted engineering principles, the recommendations of the roof deck industry association and the applicable codes at the time of construction. The roof deck shall be designed to properly support and secure the new roof assembly. The deck system shall be sufficiently rigid to support the roof assembly. The decking design shall be a minimum of L/180 or the minimum deflection required by local code at the time of construction. Care should be taken when temporary loads are applied to avoid any permanent deflection. All roof deck surfaces shall be dry, smooth, clean and free of sharp projections and depressions. All openings in the deck shall be fully supported on all sides. All projections through the deck shall be completed prior to starting the application of the roof system. Installation of conduits or piping above the deck and under the roof membrane is not acceptable and shall not be warranted by CT.

3.3 Roof Drainage

The roof surface that is to receive the roof membrane shall have slope to water-collection devices. A drainage calculation determining the quantity of water that will fall on the roof and how it is to be taken off the roof is a part of good roof design. Model building codes and good roofing

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

practice have established a minimum slope for low-sloped roofs at 1/4":12 running inches. Codes also recognize the challenges to meet this criterion in re-roofing of existing buildings. All roof areas shall be designed and installed to drain without holding water on the roof surface. Water collection on the roof surface can be detrimental to the roof membrane and may void an existing warranty. Water should not pond in drain sumps or any other collection area that is covered in roof membrane. CT may accept limited and minor areas of ponding under the terms of the warranty; however, sacrificial surfacing may be required to maintain the warranty.

All roofs shall have an overflow system adjacent to drains or scuppers to collect and direct water off the roof should one or more water collection device fail. Overflows are required by most local building codes and should be incorporated into any roof design.

3.4 Expansion and Control Joints

Expansion joints are designed into structures to allow the structure to move during thermal changes and to control the potential for damage during a seismic event. These joints extend through the structure from the exterior to the interior. The structural engineer of record shall design expansion and seismic joints. The roof assembly shall provide a closure to the joints but may not include the insulation, air barrier or secondary containment that may be required to create a complete expansion or seismic joint assembly.

Typically expansion and/or seismic joints are designed into structures at changes in direction at "L" or "U" shaped buildings, changes in decking types, changes in decking direction, transitions with building additions and the break up of large structures. Expansion joints are typically designed to run the entire length of the building. The joint must be watertight at its transition with the exterior wall or perimeter edge. Joints may be formed from pre-fabricated metal and EPDM assemblies with pre-formed corners and transitions. Sheet metal covers with membrane closures, as detailed in SMACNA¹, or in-line expansion joints formed from polymeric and bitumen membranes that integrate into the new roof

assembly are all acceptable alternatives. Contact the CT Technical Department for job specific recommendations.

Control joints may be raised or in-line joints that extend only into the roof membrane and do not extend into the building structure. These may be referred to as control joints or roof dividers. These types of joints are typically only installed on very large roofs where few or no expansion joints have been designed into the structure. Typically, if the roof membrane has not been broken over an area of 300 feet, a control joint or roof divider should be installed. As noted, the designer should always consider the effects of expansion or control joints on roof drainage and provide for positive drainage and adequate water collection devices.

Expansion and seismic joints are designed to run the full length of the roof and terminate at the building perimeters where a transition is made to a vertical joint. The two types of joints must be designed to connect and form a watertight seal. All joints shall be fully supported with woodblocking or pre-formed metal supports. These elements must be adequately secured to the deck or structure and must provide a suitable attachment surface for the joints. Raised joints must be a minimum of 8" above the roof membrane surface and should be protected from the potential of snow build-up in Northern regions.

3.5 Steel Decks

Steel decks shall be designed to provide the structural support requirements mandated by local codes. Steel decks shall be designed and attached in compliance with the recommendations of the Steel Deck Institute. Maximum deflection between spans shall be no greater than L/180 or the criteria established by the local building code. Where the roof assembly is to comply with FM Global criteria, the steel deck must meet the requirements of FM Global and must comply with the requirements published in the current Loss Prevention Data Sheets.

All roof assemblies installed over steel decks shall be mechanically attached. Insulation, or at a minimum, a thermal barrier board, must be installed prior to the installation of the new roof assembly. Roof insulation or a thermal barrier board must be secured with a sufficient number of mechanical anchors to resist the uplift pressures

¹ Sheet Metal and Air Conditioning Contractors' National Association – <http://www.smacna.org/>

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

established by the local building code, the project insurance requirements or uplift pressures established by the designer of record.

All mechanical fasteners and stress plates shall be corrosion resistant and meet the corrosion resistance criteria published in FM Global Test Standards 4450, Section 5.4², and 4470, Section 4.7³. Refer to appropriate sections of the CT Specs for attachment of insulation, thermal barrier boards and roof membrane. Steel deck side laps shall be mechanically fastened with #10 diameter self-drilling fasteners. Refer to the FM Global Loss Prevention Data Sheets or the Steel Deck Institute for spacing at the required uplift pressures.

Fasteners may require enhancement during a re-roof where they were not installed during the original installation. Woodblocking shall be installed at all perimeters to match the height of any insulation and coverboard or any thermal barrier board. All membrane and flashings shall be secured to the blocking in compliance with the CT construction details. Woodblocking shall be attached in compliance with the requirements set forth in Section 4.6.

3.6 Poured Structural Concrete Decks

Poured structural concrete shall have a minimum compressive strength of 2,500 psi. All cast-in-place concrete roof decks shall be constructed in compliance with ACI 523.2R⁴. Surfaces shall be smooth and dry, free of any substances including curing compounds, admixtures or surface contaminants that could inhibit the bond of asphalt or adhesives used to bond insulation or membrane to the roof deck surface. Woodblocking shall be either incorporated into or attached to the deck during construction to provide for the securing of the roofing membrane and flashings at perimeter edges, penetrations, and other deck openings. Woodblocking shall be attached in compliance with the requirements set forth in Section 4.6.

All concrete deck surfaces shall be primed with ASTM D41⁵ primer, and allowed to fully dry prior to the application of asphalt. Any alternate primer shall be submitted to Tech Services for approval prior to use. When a roof membrane is to be directly applied to the deck care should be taken to ensure the deck is adequately dry to install the roof membrane. There are multiple published methods to determine the moisture levels within the concrete slab. CT recommends the test method established in ASTM F2170⁶, which measures moisture within the deck slab prior to the application of any roof membrane.

Notwithstanding any testing, a test area of asphalt should be applied after the application of primer to the deck surface. The asphalt should remain fully bonded to the deck with no frothing at the point of initial application. See Section 9.0 for application of a coated base sheet or membrane in a cold process. Where self-adhered base sheets are applied refer to Section 10.0 for application recommendations.

3.7 Pre-Cast Concrete or Gypsum Decking Units

These proprietary deck systems shall be installed in strict compliance with the manufacturer's installation recommendations and in compliance with local code. The attachment rails or bulb T's shall be fully secured to the underlying structure to meet the uplift requirements of the code. Joints shall be fully grouted, where required, and panel transitions shall be planar. Misaligned joints and non-planar conditions are not acceptable for the application of roofing.

Prior to the application of any roof membrane, the bonding surface must be smooth and flat. This can be achieved with asphalt based filler or other materials only after confirmation of an adequate bond to the substrate and for the materials to be applied over the filler. Surface conditions and test data shall be provided to Tech Services prior to the use of any fillers.

² FM Global 4450: Approval Standard for Class I Insulated Steel Deck Roofs, 2002

³ FM Global 4470: Approval Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Assemblies for use in Class I and Noncombustible Roof Deck Construction, 2012

⁴ ACI 523.2R: Guide for Precast Cellular Concrete Floor, Roof, and Wall Units, 1996

⁵ ASTM D41: Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing

⁶ ASTM F2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

All poured gypsum decks shall have a mechanically attached base sheet prior to the application of membrane or insulation. For alternate attachment methods, contact Tech Services for project specific alternatives.

All concrete panels and gypsum planks shall be fully primed with ASTM D41 primer. Woodblocking shall be attached to the deck during construction to provide for the securement of the roofing membrane and flashings at perimeter edges, penetrations, and other deck openings. Woodblocking shall be attached in compliance with the requirements set forth in Section 4.6.

3.8 Pre-cast and Pre-stressed Concrete Elements

Pre-cast and pre-stressed concrete elements are typically long, and designed to span long distances. To adequately support the dead load and the calculated live load, the elements are designed with a camber that is reduced once the element is set into place. Due to the variability in the camber there can be variation of the elevations of each of the elements. This creates a non-planar deck that is not suitable for the application of the roof membrane. In some cases a reinforced concrete topping slab is cast over the pre-cast to create a smooth surface for the application of the roof. In others, the joints are filled and the variations are tapered and feathered in an attempt to create an acceptable surface for the application of the roof assembly. The latter creates surface variations that will not allow for the application of adhered, rigid insulation.

CT will not warrant any roof membrane assembly installed directly over pre-cast or pre-stressed concrete elements without the installation of a reinforced topping slab or an insulating layer that is fully bonded to the deck surface with no voids or bridging of the insulation panels. Where applied in hot asphalt, all concrete surfaces shall be fully primed with ASTM D41 primer. Woodblocking shall be attached to the deck during construction to provide for the securing of the roofing membrane and flashings at perimeter edges, penetrations, and other deck openings. Woodblocking shall be attached in compliance with the requirements set forth in Section 4.6.

3.9 Lightweight Insulating Concrete Decks (LWIC)

Lightweight poured-in-place insulating concrete can be either aggregate or cellular based, and shall have test data to confirm the type of pan for the casting of the deck; the minimum casting criteria for thickness of the LWIC over the top surface of the polystyrene insulation and the design pressures for the decking assembly when tested with multiply built-up roofs and modified bitumen roof assemblies. All LWIC decks shall be constructed in compliance with manufacturer's installation recommendations and the requirements of the local building code. The test data shall include the type and density of base ply fasteners to secure the coated base sheet. LWIC decks always have residual moisture; therefore, all roof assemblies shall be vented. See Pressure Relief Vent Section below for venting criteria.

Decks of a density less than 22 pounds per cubic foot (pcf) and a minimum compressive strength of 125 pounds per square inch (psi), are not eligible for any warranty and will not be supported by CT. LWIC decks of any type shall have a minimum top surfacing fill of not less than 2" over the polystyrene insulation or the deck. Fastener type and density shall be determined by the test data submitted with the Job Registration; however, all fasteners must demonstrate minimum withdrawal resistance performance of 40 lbf (minimum characteristic force) in test cylinders cast during the deck pour or in the actual deck.

LWIC decks must not be subjected to temperatures below 40° F during either application or curing. Decks, which have frozen, shall be replaced prior to the application of a roof membrane. Cast surfaces shall be smooth, dry to an industry recognized standard, clean and free of sharp projections and depressions. Prior to application of roofing, the roof deck manufacturer shall provide a letter to Tech Services stating the roof deck meets the criteria of the test data submitted for warranty approval and is suitable for the application of the roof assembly. approval of the roof installation will not be provided until the certification has been provided.

Caution: Additional moisture may accumulate in the roof deck as a result of construction moisture. Measures should be taken to minimize additional moisture within the roof. The roofing contractor may consider measuring moisture levels to confirm moisture levels are remaining static or are decreasing after the installation of the roof.

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

All roof assemblies over LWIC shall include a nailed base sheet such as Yosemite® Venting Base Sheet or a fully coated base sheet. The base sheet shall be attached with sufficient fasteners of a type and density to meet the uplift criteria of the local code or the intended roof design. The practice of installing pre-formed insulation boards directly over lightweight insulating concrete is not recommended and will not be warranted.

Pressure Release Vents: Install a minimum 4" diameter "one-way" pressure relief vent fitted with minimum 4" flanges and a weather-resistant hood, 20 ft. from perimeter edges and 40 ft. o.c. thereafter, located directly over 4" diameter openings cut through the roof system and into the insulating fill not less than 2".

NOTE: Lightweight concrete decks installed over non-vented decking systems must be designed specifically for the purpose. Perimeter venting of the assembly shall only be approved after the decking manufacturer has provided evidence of adequate drying techniques and historical drying performance. Pressure relief vents with a minimum diameter of 4" shall be installed at a minimum density of one every ten squares in addition to any perimeter venting. CT shall not be responsible for damage or failure of the roofing system caused by the lightweight insulating concrete deck or fill, or failure to follow deck installation or venting recommendations.

3.10 Wood Plank Decks:

Wood deck planks shall have a minimum thickness of 1", shall be integrated to the adjoining plank with a tongue and groove or ship lapped configuration, and shall be secured to the underlying structure with sufficient screws and/or nails to resist the code-required uplift pressures. Wood decking shall be fully seasoned and shall have a moisture content below 20% by weight. The decking shall have no protruding fasteners or other elements that could damage the roofing membrane. End cuts shall be fully supported and shall have minimal gaps. All broken or damaged decking shall be replaced prior to the application of any roofing or insulation. Wood decks shall be adequately supported to meet the local code-required loads and shall not deflect greater than L/180 or the maximum deflection requirements established under the local code.

Where decking has been installed over steel joists, fastener heads shall be countersunk below the deck surface. Prior to application of any roofing installed with hot asphalt or cold adhesive, such as FlintBond Brush Grade, a dry sheathing paper, such as red rosin, shall be installed over the deck to prevent asphalt from dripping through deck. Knotholes or other voids in the deck should be covered with sheet metal prior to the application of the red rosin. All roof assemblies over wood plank decks shall include a nailed or self-adhered base sheet as the base layer of the roof assembly.

When self-adhering a base layer over wood plank decks, priming is required. Self-adhering over wood plank decks is not permitted by code in Miami-Dade County; check your local building code. At the end of the roofing membrane's life, roofing membranes self-adhered over wood plank decks will require replacement of the deck.

Self-adhering to resinous wood, such as pine, is prohibited.

3.11 Plywood and OSB Decks

All plywood and Oriented Strand Board (OSB) decks shall have a minimum thickness of 15/32" panels, shall be installed in compliance with the recommendations published by the Engineered Wood Association (formerly the American Plywood Association, 'APA') and the requirements of local code. Plywood and OSB panels shall be adequately gapped to allow for anticipated movement and expansion. Panels shall be nailed or fastened to meet the uplift requirements of the project and the minimum requirements published by the APA. When pressure- or fire-treated materials are used, stainless steel or other non-ferrous fasteners should be used, as recommended by the treating manufacturer. All edges of the panels shall be supported or clipped to avoid deflection greater than L/180 or the maximum deflection allowed by local code.

Some code jurisdictions require continuous edge blocking while others allow the use of "H" clips or other connecting devices. To avoid any bond of the roof assembly to the panels a dry sheathing paper, such as red rosin, may be applied to the substrate prior to the application of a nailed coated base sheet. Nailing of the base sheet shall be of sufficient type and quantity to meet the uplift resistance requirements of the project, but shall not be spaced more

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

than 9" o.c. on the 2" lap and two rows staggered placed 18" o.c. in the field of the sheet. Perimeter and corner areas shall have an increase of 50% and 100% respectively as a minimum criterion.

Flintglas® Type 4 or Type 6 ply sheets shall not be installed as a first layer over plywood or OSB decks. Internal roof drains shall be adequately sumped into the decking to collect water at the drains. Scuppers shall be installed to allow for flow of water through the water collection device without damming or reduced water flow. OSB or plywood may be used as perimeter wall sheathing in accordance with local building code and the most recent CertainTeed published application instructions.

When self-adhering a base layer over plywood or OSB decks, priming is required. Self-adhering over plywood or OSB decks is not permitted by code in Miami-Dade County; check your local building code. At the end of the roofing membrane's life, roofing membranes self-adhered over plywood or OSB decks will require replacement of the deck.

3.12 Poured Gypsum Decks

Poured gypsum decks shall be constructed in compliance with local code and The Gypsum Association.

Caution: Gypsum decks are typically cast with minimum or no slope; therefore, slope to create drainage must be accomplished by alternate means.

Gypsum roof decks shall have a minimum thickness of 2". Decks shall be designed to meet the combined live and dead load requirements of the code. The deck surface shall be smooth, dry, clean and free of sharp projections and depressions. Any cracks, soft spots, damaged reinforcing wire or other defects shall be repaired prior to the application of any roofing. Prior to the application of any roofing or insulation, a nailed, coated base sheet shall be applied to the deck with mechanical fasteners. Sufficient type and density of fasteners shall be used to meet the uplift requirements of the local building code and the design criteria of the project.

Where required, the fasteners shall have additional stress plates to spread the load over the surface of the base sheet. Nailing of the base sheet shall be of sufficient type and quantity to meet the uplift resistance requirements of the project, but shall not be less than 9" o.c. on the 2" lap and

two rows staggered placed 18" o.c. in the field of the sheet. Perimeter and corner areas shall have an increase of 50% and 100% respectively as a minimum criterion. If there is moisture in the deck, a vented base sheet such as Yosemite® Venting Base Sheet, in combination with perimeter venting, would be a prudent addition to the roof assembly. Where woodblocking is added to create a nailing substrate at perimeters and penetrations, the woodblocking should be secured to the underlying substrate and not the gypsum fill.

3.13 Structural Wood Fiber Decks

Structural wood fiber decks (SWFD) are typically individual panels or composite panels with insulation that are secured to the structure with rails or bulb Ts. Some panels are pre-coated with a base sheet while others have no surfacing. The underside of the panels is typically the ceiling of the interior space and should be protected from damage. Panel joints are integrated to provide support. Structural wood fiber panels shall be installed in compliance with the manufacturer's installation recommendations and in compliance with local building codes. SWFD must be protected from the elements once installed to avoid cupping, bowing and deformation of the panels. Before the application of the roof system, the deck shall be in proper condition for roofing. Where heights of deck joints vary, the deck erector shall level these with screed coat material as recommended by the deck manufacturer. The deck erector shall furnish written certification that the deck meets job specifications and deck manufacturer's requirements. The certification shall be forwarded to CertainTeed for inclusion in the warranty file. Notwithstanding the application of a base sheet on the panel surfaces, a nailed, coated base sheet is recommended prior to the installation of any roofing or insulation. A nailed, coated base sheet shall be applied to the deck with mechanical fasteners. Sufficient type and density of fasteners shall be used to meet the uplift requirements of the local building code and the design criteria of the project. Where required, the fasteners shall have additional stress plates to spread the load over the surface of the base sheet. Nailing of the base sheet shall be of sufficient type and quantity to meet the uplift resistance requirements of the project, but shall not be spaced more than 9" o.c. on the 2" lap and two rows staggered placed 18" o.c. in the field of the sheet. Perimeter and corner areas shall have an increase of 50% and 100% respectively as a minimum criterion.

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

CT shall not be responsible for damage or failure of the roofing system caused in any way by the structural wood fiber deck or failure to follow instructions set forth herein.

4.0 ROOF INSULATION

4.1 Roof Insulation

Roof insulation is a common component added to the roof assembly to add thermal value to the building enclosure. Roof insulation can, depending on the deck type, be either mechanically attached or adhered to the roof deck with a variety of materials such as hot asphalt, foam, or cold adhesives. Non-foam insulations, such as perlite, wood fiberboard, water-resistant gypsum, high density polyisocyanurate and rockwool are suitable substrates and can be used either as insulation or a coverboard creating a suitable surface for fully bonding or spot-mopping roof assemblies. Coated base sheets and some ply sheets may be spot-mopped to the faced surfaces of polyisocyanurate but **MAY NOT** be spot-mopped to expanded or extruded polystyrene. Polystyrene insulation of all types is not a suitable substrate for the application of fully adhered roofing assemblies and must have a coverboard. Contact Tech Services for job specific application information.

Extreme care must be taken to keep hot asphalt from coming into contact with some types of insulation such as polystyrene. The function of a coverboard or certain roof insulations in spot mopped applications is to provide a smooth, dry, clean and firmly attached substrate to receive the roofing membrane. If insulation is furnished by CT, or has been approved by CT, the product may be an eligible component of the warranty. Where the insulation has been accepted by CT for use in a CT roof assembly, the insulation will not be a warranted component. All insulation shall be installed in compliance with CT's published installation recommendations.

CT reserves the right to accept or reject any roof insulation as an acceptable substrate for attachment or bonding of a CT roof system. Performance of an insulation or coverboard product that is not sold by CT shall not be warranted as a part of the roof assembly and CT shall not be responsible for damage or failure of the roof membrane caused by the insulation or coverboard.

CT will, at its sole discretion, approve, on a project-by-project basis, the use of third-party manufacturers' roof insulation in conjunction with warranted roof systems. The use of third-party insulation shall be approved prior to the commencement of the roof installation.

4.2 Insulation Storage, Handling and Cautions

Always follow instructions published by the manufacturer. Read handling and storage instructions prior to site storage and use. All insulation shall be properly protected from weather. Covering shall be breathable to avoid the build-up of condensation. Delivery wraps shall not be adequate protection without the addition of additional tarping. Tarps shall be adequately secured to resist wind. Store all insulation and related accessories off the ground on pallets or dunnage, completely protected against weather. Wet or damaged insulation shall not be installed and should be removed from site.

Prior to installation of insulation, inspect the substrate for suitability of application. Correct all unsuitable conditions prior to application. All insulation installed shall be fully covered and protected with roofing the same day. Water cut-offs shall be installed at exposed edges by close of each day and shall be removed prior to continuation of application. Some insulation coverboard and accessory materials, such as cant strips, are **FLAMMABLE**. If open flame or temperatures sufficient to ignite the materials are used in the application, a fire watch of not less than two hours shall be a part of any safety plan. Any flammable material shall not be directly exposed to flame or ignition sources. Where the roof deck is sloped greater than 1":12", insulation stops should be installed. At a minimum, insulation stops shall be installed every 16' to a slope of 3":12" and every 8' for slopes greater than 3":12".

4.3 Multi-layer Insulation Applications

To reduce thermal stress to the roof membrane, multi-layer insulation applications are strongly recommended. Joints in the insulation layers shall be staggered a minimum of 6" and joints shall be tightly butted. Where mechanical fasteners are used, only the base layer should be mechanically attached. Subsequent layers should be installed in asphalt or adhesive. The insulation or coverboard surface used for the installation of the membrane shall be planar and free from debris.

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

Any gaps shall be corrected prior to application of the membrane. No insulation or coverboard panels should be less than 12" square when adhered or 24" square when mechanically attached.

4.4 Mechanical Attachment

All base insulation layers over steel decks shall be mechanically attached with sufficient fasteners and stress plates to meet the uplift requirements for the project. Fastener density shall be increased at perimeters and corners as required by code and the project requirements. At a minimum, fastener density shall be increased by 50% at the perimeters and 100% at the corners, providing there is no parapet with a height less than 36". Fasteners shall penetrate the top flange of the deck a minimum of 3/4". To ensure securement to the deck, fasteners shall be sized to penetrate the bottom flute by 3/4". Fasteners shall be fully seated but shall not be over-driven to damage the insulation or coverboard surface. Fasteners and stress plates shall be installed in compliance with the recommendations of both the fastener and insulation manufacturers. Where holes must be pre-drilled, such as gypsum and concrete, deck debris must be cleaned from the insulation surface prior to application of the roofing membrane. When projects are insured by or specified under the requirements of FM Global the requirements under the relevant RoofNav⁷ number and the related Loss Prevention Data Sheet shall be followed. For more information, visit www.roofnav.fmglobal.com. See Appendix I, Insulation Fastening Guide.

⁷ visit www.roofnav.fmglobal.com/

4.5 Coverboards

Coverboards are certain types of insulation or materials specifically designed for use as a bonding surface for roof assemblies. Foam insulations such as polyisocyanurate or polystyrene publish a dimensional change of as much as 2%. The National Roofing Contractors Association published Bulletin #9 in September 1988 recommending the use of coverboards to minimize blistering, enhance adhesion and to provide a stronger surface for the application of built-up membranes. While foam insulations produce higher R-values, surfacing materials such as wood fiberboard, perlite, rockwool, water-resistant gypsum, and high-density polyisocyanurates provide more suitable surfaces for the application of built-up membranes. A highly dimensional and

stable surface creates less stress on the membrane, reduces impact damage and typically enhances the bond of the roofing to the substrate layer.

4.6 Woodblocking

Woodblocking creates an attachment surface for the roof membrane, sheet metal and flashings. They are the first defense against wind damage to a roof. According to FM Global one of the most recurrent losses to roofs is failure of the perimeter elements⁸. Woodblocking must be properly secured to resist wind uplift exerted on both the roof membrane and the sheet metal flashings. Woodblocking should be attached to the structure wherever possible. See CertainTeed Technical Bulletin on Woodblocking attachment for further information and recommendations. Woodblocking shall be the height of the combined height of the insulation and coverboard and shall be a minimum 3 1/2" in width. Where woodblocking is stacked more than 4 1/2" in height, the minimum width shall be 5 1/2". Joints in multiple layers shall be staggered a minimum of 6" and butted to gap no more than 3/8". Woodblocking shall be pressure treated, #2 or better lumber with minimal deformation. Lumber shall be dry (<20% by weight) and protected from the elements when stored prior to application. Storage shall be under breathable tarps.

Due to the corrosive nature of pressure treatments, fasteners shall be stainless steel or protected from corrosion in compliance with the wood treater's recommendations for long-term, unexposed applications. Where tapered insulation is installed, woodblocking shall taper with the insulation to create a planar condition. All cant strips shall be fully supported by woodblocking.

4.7 Vapor Retarder

Vapor retarders are installed directly on the deck or, in the case of metal decks, over a thermal barrier board. Vapor retarders block water vapor rising from the building interior into the roof membrane layer where they can accumulate and condense. Water in the insulation can be damaging to both the insulation and the roof membrane. While minimal moisture accumulation within a roof assembly during cold months can dissipate during warmer months, an asphalt

⁸ FM Global Loss Prevention Data Sheet 1-49: Roof Perimeter Flashing

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

membrane has no perming capabilities; therefore, moisture will become trapped if the membrane is not vented. Vapor retarders can be formed by a variety of products, all of which have perming capabilities of less than one perm. Vapor barriers are similar materials that have a perming capability of less than 0.1 perm.

For a listing of materials used as vapor retarders, review the FM Global list of approved vapor retarders or the ASHRAE Handbook Fundamentals, Chapter 25.

CT materials, such as two layers of Flintglas® Ply 4 or Flintglas Premium Ply 6, applied in asphalt or a single layer of Flintlastic® modified bitumen torch-bonded or self-adhered, or Black Diamond® Base Sheet to a primed deck can form an effective vapor retarder. When the roof assembly is fully bonded, the uplift resistance of the roof assembly is dependent on the quality of the bond of the vapor retarder. Prior to the application of the insulation and roof membrane the quality of the bond should be carefully reviewed.

As a guide, vapor retarders are generally used where average January outside temperatures are 40°F or below, and winter season expected interior relative humidity is >45%. These conditions will generally create sufficient condensation to wet the insulation and reduce the R-value of the assembly. By installing a vapor retarder, rising moisture will be blocked; therefore, no condensation at the dew point level can occur. When the insulation is installed below the deck care should be taken to minimize condensation below the deck. The insulation should be protected with a vapor retarder on the warm side and a vented air space between the insulation and wood based decks is needed, and in many jurisdictions required by code. When a vapor retarder is incorporated into a roof system, one-way pressure release vents should be installed at the rate of not less than one vent per 10 squares of roof area to enhance venting of any moisture vapor that may become entrapped as a result of construction moisture built into the system and minor moisture migration that breaches the vapor retarder. Insulation shall be removed from the area directly under the vent opening and refilled with loose insulation, such as fiberglass, prior to vent placement.

Vapor retarders must be compatible with the roof assembly. Where insulation is to be mechanically attached the vapor retarder should create some type of seal around the fastener penetrations. Vapor retarders must be sealed to penetrations and should terminate on the top surface of the insulation, extending not less than 6" onto the insulation surface. Multi-ply systems should be feathered on the top surface of the insulation to avoid ridging.

When the roof assembly is FM Global insured or is specified to meet FM Global requirements, only those vapor retarders listed in the FM Global Roof Guide or listed on RoofNav will be acceptable. Unless the vapor retarder is formed from CT materials, CT is not responsible for damage to or failure of the roofing system caused by the use or absence of a vapor retarder

The need for a vapor retarder should be evaluated by a design professional that has knowledge of the structure and the local environment.

4.8 Base Ply Application

The base ply of selected CT roof assemblies may be mechanically attached, spot-mopped, or fully adhered to the insulated substrate. Carefully review the specification for the appropriate method over the installed insulation or coverboard. Mechanical attachment must be in compliance with the CT specifications and the general fastener recommendations in Section 15.4.1. Spot mopping must be in compliance with the CT specification and the asphalt recommendations in Section 7.0. When a coated base sheet is bonded in a full mopping of asphalt, the asphalt should be applied at the temperature at which the asphalt's apparent viscosity is 125 centipoise. The asphalt temperature should be +/- 25 degrees of the equiviscous temperature printed on the asphalt carton. Moppings shall be 25 lbs. per square, +/- 15%. When a ply sheet forms the base layer the ply sheet should be fully saturated with asphalt.

CT roof systems shall be installed over insulated assemblies in accordance with these guidelines:

⁹ ASTM E907: Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems.

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

Foam and polyisocyanurate roof insulation require a divorcing layer of rockwool, mineral wool, wood fiberboard, perlite, high-density polyisocyanurate or fiberglass roof insulation prior to application of base ply, or spot-mop attachment of an approved coated base sheet prior to application of plies from the selected roof system.

Rockwool, mineral wool, wood fiberboard, perlite, high-density polyisocyanurate or fiberglass roof insulations of selected systems shall be set in a solid mopping of asphalt. Fiberglass insulation joints shall be taped prior to application of base ply.

Expanded/Extruded Polystyrene requires a divorcing layer of wood fiber or perlite roof insulation with all joints taped prior to application of roof system. Base ply shall be set in a solid mopping of asphalt to the overlay. Consult insulation manufacturer for restrictions and limitations on product usage.

5.0 RE-COVER

5.1 Re-Covering an Existing Roof

A re-cover is the application of a new roof over an existing roof assembly. If a roof installation is a re-cover, the existing roof assembly must be a suitable substrate for the application. Most codes limit re-covers to one additional roof. An evaluation of the combined live and dead loads should be carried out by a structural engineer prior to any application over an existing roof. Loading requirements may have changed since the original roof application increasing the live load requirements due to historical snow loading data.

The existing roof must be evaluated for moisture and for adhesion to the underlying substrate. Adhesion can be evaluated with either a vacuum test or bonded pull test as detailed in the FM Global Loss Prevention Data Sheet 1-52 or the vacuum test detailed in ASTM E907⁹. Moisture analysis can be either nuclear, capacitance or infrared. All wet roofing materials must be removed prior to any re-cover.

Should the existing roof be used as a bonding substrate, the surface must be properly prepared for the application of the new roof or insulating layer. Loose and large gravel shall be removed; blisters and splits shall be repaired and existing flashings should be removed to create a clean

bonding surface for new elements. Where the new roof is mechanically attached to the underlying substrate, withdrawal resistance testing should be carried out to confirm the attachment values for each fastening point. Testing should be carried out in compliance with ANSI/SPRI FX-1-2006 or TAS 105. Copies of the test protocols are available from Tech Services. Fastener values should meet or exceed 325 lbf or the fastener density should be increased. The test data shall be evaluated by the roof designer of record for the evaluation of the fastening pattern. Tech Services can provide test data for a wide variety of systems to assist in the evaluation.

Areas of ponding shall be corrected prior to the installation of a re-cover roof. Fillers designed to fill low spots should be used to correct these conditions. For a list of available products, please contact Tech Services.

It is the responsibility of the designer of record, and/or building owner to determine whether an existing roof is structurally sound, firmly attached, dry and suitable for re-cover. Tech Services can provide additional warranty information for specific re-cover projects.

5.2 Preparation and Field Conditions

The following requirements shall be used in conjunction with good roofing practices to qualify a new assembly for the Limited Warranty on Systems, NDL Limited Warranty or Full System NDL Limited Warranty:

- 1) Decks shall be dry, structurally sound and suitable for the application of the roof assembly.
- 2) Parapet walls, perimeter edges, equipment and load bearing supports, platforms, curbs, etc., shall be structurally sound and suitable for the application of new flashings and terminations.
- 3) Existing roof assemblies shall be evaluated to determine if additional expansion or control joints are needed. Visual observations of wall cracks, membrane splits and materials out of plane are indicators of such conditions.
- 4) The designer of record should evaluate combined live and dead loads to insure the re-cover roof assembly meets current code criteria and sound engineering practice.

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

- 5) Existing plywood decking shall have adequate bearing or support of edge joints. In re-cover applications, remediation of the joints can only be achieved from the underside of the deck.
- 6) All re-cover roofs shall have positive drainage as defined in Section 3.3.
- 7) Existing roof insulation shall be dry and firmly attached. Where existing insulation is found to have insufficient attachment, attachment of the existing system shall be enhanced.
- 8) Existing roof system shall be compatible with the new roof system.
- 9) Existing membrane shall be dry and clean with all surface defects corrected.
- 10) Existing roof surfacing with 1/2" or larger aggregate surfacing shall be torn off or spudded to provide a smooth surface. Notwithstanding the gravel sizing, all loose gravel shall be swept from the existing roof surface.
- 11) Remove existing metal gravel stops and other termination flashings and replace with new metal to meet current code requirements. Flashing metals shall be corrosion resistant and shall not be thinner than 24 ga.
- 12) Existing counterflashings, copings, dunnage protectors, protective caps and other flashing metals designed to protect the roof shall be replaced where unsuitable for reuse. New metals shall be corrosion resistant and shall not be less than 24 ga.
- 13) Remove all clamping rings from drains and clean to bare metal. Damaged drain components shall be discarded and replaced with new. When in good condition, clamping rings may be saved for reuse. All bolts shall be replaced with new, preferably formed from non-ferrous materials. Stripped boltholes shall be drilled and tapped. All drains shall be fully secured to the deck with under deck clamps or other factory supplied clamping systems.
- 14) All abandoned and non-functioning equipment shall be removed. Any resulting deck opening shall be blocked and closed with appropriate decking.
- 15) Flashing heights shall be a minimum of 8" from the surface of the roof membrane. Where flashing terminations may be subjected to snow cover, the flashing shall be sealed.
- 16) Base and wall flashing shall be removed to create a sound surface for the installation of new flashings.
- 17) All roof penetrations require all new flashings in compliance with current CT detailing.
- 18) Equipment vibration shall be corrected.
- 19) Masonry surfaces above flashings shall be tuck-pointed and sealed. All horizontal masonry surfaces above the roof membrane shall be adequately protected from weather.
- 20) All pipes and condensation line supports shall be properly supported with factory supplied pipe supports or pressure-treated woodblocking. All supports shall have a protection layer of not less than one layer of Flintlastic® modified bitumen membrane. The support shall be designed to allow for pipe movement and shall not be secured through the roof membrane.
- 21) Condensation lines shall be formed from ultraviolet light-resistant materials and shall terminate at drains or scuppers. Condensate shall not run on the roof surface.
- 22) The practice of installing only a part of a total roof assembly, known as phasing, can be harmful to the finished roof assembly. CT will not warrant phased applications without prior approval.

NOTE: Substrates with two or more existing membranes are not eligible for a CT warranty. Extended warranties require new construction and/or complete tear-off.

5.3 Application Over an Existing Membrane:

After preparing and priming the existing membrane surface, spot mop with Type III or Type IV asphalt, forming 12" circles spaced 24" o.c., and install a Yosemite® Venting Base Sheet with side laps of 2" and end laps of 6". Asphalt quantity shall be 15 lbs. per square, or greater, depending on the roughness of the existing membrane surface. Granules and grooves shall be facing down. Alternatively, mechanically attach a Yosemite® Venting Base Sheet with minimum #12 diameter roofing fasteners and 3" stress plates to meet the design uplift criteria. At a minimum, mechanical attachment shall be placed 12" o.c. on a 3" lap and two staggered rows in the center of the sheet spaced 18" o.c. Insulation shall be solid mopped to buffer sheet. Alternate base sheets may be approved on a job-by-job basis. Contact Tech Services with project data for consideration of alternate base sheets.

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

Rigid insulation may be applied directly to an existing built-up membrane providing the surface has been properly prepared, there is adequate attachment of the existing roof assembly to resist design and/or code required loads and the deck has been adequately leveled to provide full adhesion of the maximum 4' x 4' insulation boards. An initial glaze coat of asphalt can fill minor variations in the deck surface and provide a more suitable surface for the application of rigid insulation board.

6.0 MATERIALS: STORAGE, HANDLING AND SAFETY DATA SHEETS

6.1 Practices

Roofing and related materials must be clean, dry, and adequately protected prior to installation. Good roofing practices and industry standards shall be followed. Follow published storage and handling procedures published by the material manufacturers. All damaged and/or wet materials shall not be incorporated into the finished work. Materials shall be removed from site and disposed of in a legal manner.

Rooftop mechanical equipment, which requires periodic servicing, necessitates protection of the completed roof system against physical damage. Mechanical equipment should be installed prior to application of the roof membrane.

In new construction applications, it shall be the responsibility of the general contractor to prevent other construction trades from damaging the roof system during all phases of project construction.

6.2 Roll Roofing:

Roll goods shall stand on end with selvage edge up. Roll roofing products require careful storage and handling to prevent punctures, tears, and damage to edges. Wet or damaged roll roofing materials shall not be used.

Smooth-surfaced roll roofing products exceeding 35 lb. in weight per 100 square feet shall be rolled out, cut in lengths not to exceed 18 ft. and allowed to flatten prior to installation, except when rolled or machined and broomed into place. Mineral-surfaced roll roofing products shall be rolled out, cut in lengths not to exceed 18 ft. and allowed to flatten prior to installation (machine application not permitted).

Insulation and coverboards shall be stored on raised dunnage or pallets not less than 4" above the deck. Materials shall be covered with breathable tarps and adequately secured to resist wind and weather.

Asphalt and adhesives shall be stored in strict compliance with manufacturer's storage and handling recommendations. Refer to ARMA Technical Bulletin, "Recommendations Regarding Built-Up Roofing Asphalt"¹⁰ for additional storage recommendations. Cold adhesives shall be stored within the temperature limitations and properly protected from the weather and sunlight.

All accessories shall be protected from weather and sunlight in compliance with manufacturer's published recommendations and industry standards.

6.3 Safety Data Sheets (SDS)

The contractor shall maintain Safety Data Sheets (SDS) for all materials on the project site. The building owner should be provided with copies of all SDS documents prior to the project commencement. All SDS sheets are available in PDF format at www.certainteed.com/lowslopetechinfo.

6.4 Completed Roofing

Completed roofing shall be protected by the roofing contractor unless alternate arrangements have been made with the owner or general contractor. Protection of roof surfaces shall not impede water flow to the water-collection devices. Care should be taken to keep drains and scuppers free from debris.

6.5 Temporary Load

The contractor shall consult the Engineer of Record to determine temporary loads for stored materials on the roof deck.

¹⁰ http://www.asphaltroofing.org/pdf/tb_105.pdf

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

7.0 FLINTGLAS® AND FLINTLASTIC® HOT ASPHALT MOPPING APPLICATION

7.1 Certification

All grades of asphalt shall meet ASTM D312¹¹ certification. The asphalt producer shall provide certification upon request. Asphalt shall be homogenous, free from water and any foreign debris. A safety program shall be developed to address the storage, heating, pumping, and transport to the point of application. The contractor shall convey the safety plan to all members of the roofing crew.

Store all roofing asphalt in such a manner to prevent leakage, carton deterioration and moisture contamination.

7.2 Equiviscous Temperature

Temperature measurement equipment shall be installed on all kettles and heating equipment. The contractor shall monitor the temperature measurement equipment and maintain recommended temperatures as noted below.

ASTM D 312 TYPE	MOPPING TEMPERATURE	HEATING TEMPERATURE	MAX SLOPE IN./FT.
TYPE III	400°F +/-25°	500°F*	≤ 1"
TYPE IV	425°F +/-25°	500°F*	≤ 3"

* Type III and IV asphalt may be heated to 500°F in a re-circulating kettle

Asphalt should not be heated above the flashpoint. Asphalt should never be heated above 525°F and should not be held at 500°F or above for more than 4 hours.

CT supports the use of Equiviscous Temperature (EVT) as a guide for proper mopping temperature. Use of this concept will facilitate proper interply asphalt weights, adhesion and uniformity. The roofing contractor shall consult the asphalt manufacturer for information regarding EVT and flash point.

7.3 Hot Asphalt Application

Asphalt shall be heated to the EVT, as published by the asphalt producer. The EVT is the temperature at which the proper viscosity¹² for application has been attained.

(The apparent viscosity is 125 centipoise) as measured in compliance with ASTM D4402¹³. Mechanical spreader viscosity shall be 75 centipoise.

7.4 Heating

Asphalt shall be heated to +/-25 degrees of the published EVT as measured at the mop cart or mechanical spreader. Where there is simultaneous mop and mechanical applications, the EVT for mechanical spreader application shall be used for both application methods.

All asphalt shall be labeled with product "Type," EVT for both mop and mechanical spreader applications, and flash-point as determined by ASTM D92¹⁴.

7.5 Recommendations

CT recommends solid interply asphalt mopping at a rate of 25 lbs. per 100 square feet, applied uniformly with an acceptable variation of 5%, providing there is uniform mopping. For membrane applications, the mopping may be reduced to 22 lbs. per 100 square feet, +/-15%.

Spot mopping, when specified, shall be applied in 12" diameter circles 24" o.c. in all directions. Asphalt shall be applied at 15 lbs. per 100 square feet, +/-15%.

Mopping asphalt shall conform to ASTM D 312 Type III for applications on slopes up to 1" in 12" and Type IV for slopes up to 3" in 12". During application, a small amount of asphalt should extend beyond all side and end laps to ensure full-lap adherence.

7.6 SBS Membranes

CT recommends the use of Type IV asphalt notwithstanding the slope. The asphalt application temperature should not fall below 425°F.

7.7 APP Membranes

APP Membranes shall not be applied in hot asphalt or cold adhesive.

¹¹ ASTM D312: Standard Specification for Asphalt Used in Roofing

¹² Viscosity is a measure of the resistance to flow of a liquid. Centipoise is a unit of a liquid's apparent viscosity

¹³ ASTM D4402: Standard Test Method for Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer

¹⁴ ASTM D92: Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

7.8 Suitability

The suitability of the deck for application of asphalt shall be carefully evaluated by the contractor. The suitability shall be at the sole discretion of the contractor.

8.0 FLINTLASTIC® TORCHING APPLICATION

8.1 Application

Only membranes designated for torch application shall be applied with an open flame or hot air welder designed for modified bitumen applications. Welders designed for thermoplastic membranes shall not be used for modified bitumen applications.

8.2 Flintlastic membranes designed and designated for torch application shall be applied as follows:

- 1) Completely unroll the entire roll and align for application.
- 2) Tightly re-roll one end of the roll approximately halfway holding the membrane in alignment.
- 3) Apply heat to the backside of the roll with even motion across the full width of the roll while applying uniform pressure to the deck. Initially, the weight of the roll will provide adequate pressure. As the weight of the roll is reduced, additional weight is required. The flame should be positioned at a point approximately halfway between the top of the roll and the substrate surface until the bitumen back coating reaches sufficient temperature to create surface melting and flow. The burn-off sheet will melt with the back coating becoming glossy and the surface will flow.
- 4) Proper torching and pressure will result in a ½" of bleed-out at the roll edges. All side and end laps shall be "walked-in" during roll application while there is still bitumen flow. If sufficient heat has been applied, the walk-in will result in the ½" bleed out. Proper torch application will result in complete adhesion of the membrane to the underlying substrate. Extra care should be taken to ensure full adhesion of side and end laps. Probe all laps after the membrane has cooled. Any voids can be treated with a heated trowel and the membrane pressed into place.
- 5) Rewind the balance of the roll to the point where it is fully bonded to the underlying surface and torch weld the remaining membrane as described above.
- 6) Succeeding rolls and courses shall be installed in a similar manner. Side laps shall be aligned for a 3" overlap and end laps shall have a minimum 6" lap.
- 7) During end-lap application, trim the corner of the underlying sheet removing a triangular section. Follow with the overlapping sheet, trimming the upper outside corner in a similar manner. Corners shall be trimmed on an angle from end of roll to outside edge. Trimmed corners shall be completely covered by application of succeeding courses. Apply trimmed rolls to provide a full 6" end lap. See CT construction details for additional information. All end laps require the use of CT-21 — Endlap Detail.
- 8) Use of a mechanical torching wagon for membrane application requires careful monitoring of flame positioning to ensure uniform flame application across entire width of the roll as well as roll alignment. Rolls shall rest fully upon the roof deck to provide adequate pressure for bonding. Laps shall be walked-in during application. The use of torching wagons during windy conditions is not recommended. It is strongly recommended that a test section of membrane be applied each day to ensure proper placement of flames and application of pressure on the entire roll.
- 9) Side and end laps should be checked during application with a probe. Probing should be carried out under a quality assurance program. Open laps and areas without bitumen bleed-out should be corrected with a heated trowel and repair torch. DO NOT attempt to repair laps by torching the top surface of the membrane.

NOTE: Proper torching during roll application is critical. Overheating or under-heating is detrimental to the performance of the system and may damage the membrane. Flow properties of APP and SBS modified bitumen membranes are different. Test applications prior to actual applications are recommended to ensure proper torching technique for each type of membrane. For further information on torch applications contact Tech Services.

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

9.0 FLINTLASTIC® COLD PROCESS APPLICATION

Cold process adhesives have been designed to provide an alternate to hot and torched applied membrane systems. Brush, spray and roller-grade adhesives have been designed for use only with SBS modified bitumen membranes, Flintglas Cap Sheets and coated base sheets. Cold adhesives shall not be used with Flintlastic APP or SBS modified bitumen membranes designed for torch applications. In addition, cold adhesives shall not be used with Flintglas BUR Ply Sheets or saturated felts. Cold adhesives shall be applied only at application rates specified in the Technical Data Sheets. Insufficient or excessive quantities may cause roof membrane failure or poor performance of the roof assembly. FlintBond® Brush or Spray Grades are designed to adhesively bond interplies and cap sheets to one another. Carefully read the various application recommendations to ensure proper application quantities and application methods. The side and end laps of Flintlastic and Flintglas cap sheets shall be fully coated with adhesive and, after alignment and placement, rolled with a 4" steel roller. Lap edges should have a small bleed-out of adhesive to confirm there is adequate adhesive at the laps. Base flashings, wall coverings and vertical details shall be adhered with FlintBond Trowel Grade adhesive and mechanically attached similar to CertainTeed's published construction details for hot asphalt applied systems. Initial interply bonding occurs typically in about three days but can vary depending on weather conditions. Full adhesive cure time is typically 45 days. Multiple layers of cold process adhesive will take longer periods to fully cure out. Refer to the Technical Data Sheets for FlintBond Brush and Trowel Grade adhesive application including application quantities and application restrictions. CertainTeed cold process systems are designed as a sole system and should not be mixed with hot asphalt or torch-welded applications.

10.0 FLINTLASTIC® SELF-ADHERING MODIFIED ROOFING APPLICATION

10.1 Flintlastic SA

Flintlastic SA self-adhered membranes are modified bitumen membranes designed for field installation without bonding adhesives or hot asphalt application. The base and interply sheets are manufactured with a proprietary permanent blue film on the topside, designed to provide a smooth, clean surface to enhance adhesion for successive plies of material. The interply sheets and cap sheets have split-release films on the underside that are removed to expose the specially formulated SBS adhesive during the application process. Flintlastic SA cap sheets feature an additional selvage release film. Flintlastic SA NailBase is fastened in the same manner as all CertainTeed base sheets. Flintlastic SA PlyBase and Flintlastic SA MidPly are interply sheets that are also acceptable as base plies on certain non-nailable substrates, cover boards and polyisocyanurate roof insulations. Accessory materials include FlintPrime® and FlintPrime SA primers, FlintBond® SBS Modified Adhesives, Trowel Grade and Caulk Grade. An 18" wide, 2" to 4", industrial steel roller is required to roll installed sheets. The materials are thermo-activated and application is recommended at ambient temperatures of 50°F or better. When ambient temperatures are between 20°F and 49°F, cold weather application instructions are to be followed, utilizing a hot air welder for side laps, end laps and details. Contact Tech Services for details.

Flintlastic SA membranes shall be cut in manageable lengths, and positioned and aligned in place. The material is folded lengthwise, first from the downslope side, to remove the lower split release film. Once pressed into place, repeat for the upper-slope side. Clear release film is factory-applied to Flintlastic SA Cap selvage edges; remove release film to adhere overlapping cap sheet courses.

All end laps require the CT-21 End Lap Detail cut. When ambient temperatures are 50°F and warming, end laps of Flintlastic SA cap sheets are set in a solid application of FlintBond Trowel Grade as are all construction details, such as base flashings or wall coverings when applied over granule surfaces. All materials shall be installed in

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

a continuous application. Stop work if poor adherence is observed. The blue film on the topside surfaces of the Flintlastic NailBase, Flintlastic PlyBase and Flintlastic MidPly sheets is permanent and should not be removed. Do not leave SA NailBase, SA PlyBase or SA MidPly exposed overnight; install cap or cover with tarp to avoid degradation of permanent blue film. Smooth and secure fully adhered SA base, interply and cap sheets with a weighted industrial roller after each ply is installed from the center of the sheet outward in the cross direction; **DO NOT ROLL ALONG THE LENGTH OR IN THE MACHINE DIRECTION OF THE ROLL.**

10.2 Self-Adhered Modified Bitumen Base Sheets

CertainTeed offers self-adhered base sheets for use with non-self-adhered cap sheets. These materials are manufactured with sand or mineral surfaces on the top side designed to accept successive moppings of hot asphalt or torch-welded applications. Split-release films are featured on the undersides that are removed to expose the specially formulated SBS adhesive during the application process. Flintlastic Ultra Glass SA and Black Diamond® Base Sheet may be utilized as base sheets on certain non-nailable substrates, coverboards, polyisocyanurate insulations or as interply sheets in hot asphalt applied or torch-welded roofing assemblies. Flintlastic Ultra Glass SA may also be used as the base ply in Flintlastic cold-process applications.

CertainTeed self-adhered modified bitumen base sheets shall be cut in manageable lengths, and positioned and aligned in place. Successive asphalt moppings or torch welding applications provide the heat necessary to activate the specially formulated adhesive to insure full bonding in normal and cold-weather applications. These materials, when used as vapor retarders in non-hot asphalt applied insulated assemblies, may require torch heating to provide full bonding. Flintlastic Ultra Glass SA, when used in cold process assemblies, relies on thermo activation and application is recommended at ambient temperatures of 50°F or better. The special precautions outlined in Section 13.4 should be followed for this product in cold-weather.

These materials are not designed nor intended for use with Flintlastic SA self-adhered modified membranes.

11.0 APPLICATION SAFETY AND EQUIPMENT POLICY

11.1 Application

Application of CT Flintlastic® and/or Flintglas® may require the use of hot asphalt and/or an open flame torch. Improper

application practices may cause physical injury to the applicator or damage to property. Safe torching and hot asphalt applications require constant safety supervision on the part of the applicator. The applicator shall develop a safety plan, which shall be communicated to the crew. The applicator is solely responsible for ensuring safe application, utilizing properly constructed and maintained torching and mopping equipment employing only qualified personnel. Particular care must be taken when working around combustible materials. When conducting a re-roof, proper preparation of the existing surface is required. Some substrate materials may be combustible and must be monitored after application if an open flame is used. The recommendations provided herein are intended as general guidelines and are not all-inclusive. Roofing applicators should establish a complete safety and fall protection program, and ensure that all personnel are fully trained and qualified for the duties they are hired to perform. Consult your local LP dealer, National LP Gas Association, National Fire Protection Association, the National Roofing Contractors Association, and the Asphalt Roofing Manufacturers Association for further information and safety recommendations. All installers should be familiar with OSHA, state and local safety requirements before the commencement of any project.

CT requires the installation of a base sheet as an appropriate base layer for the roof application. Consult CT specifications or consult Tech Services for recommended base sheets. Base sheets may be fully adhered in hot asphalt using conventional mopping techniques. Roofing applicator should not come in contact with the hot asphalt during application. CT does not endorse “flying-in” or “mop and flop” methods of application and is not responsible for bitumen dripping over or through roof deck.

CT recommends torch application only to noncombustible materials and substrates. **DO NOT** apply open flame to wood, plywood, fiber cants, combustible insulation (including existing roofing materials) or other combustible substrates and materials. CT recommends at least one fire extinguisher (type ABC or halon) be provided for each torch operator. The fire extinguishers should be regularly checked and located within easy reach of the torch operators. In addition

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

to the above, CT recommends the following safety precautions be observed:

- 1) Inspect all torching equipment daily before operation. Inspection should include torches, LP gas cylinders, valve regulators, hoses, all connections, and fittings for damage and leaks. Leak inspection should be performed with soapy water only. Refer to torch manufacturer's published safety recommendations. Maintain equipment manuals on the roof.
- 2) Secure cylinders in an upright position on a level surface. Do not invert or lay cylinders on their side. Cylinders shall be kept well away from torching area and shall not be exposed to open flame or other sources of ignition.
- 3) Do not apply flame to LP gas cylinders to increase pressure.
- 4) Do not leave lighted torches unattended. Torch unit should contain support stand to hold the torch in an upright position with flame directed upward and away from deck surface when set aside.
- 5) Use torches only in well-ventilated areas. Improper use of torching equipment or leaking gas could cause unburned LP gas to accumulate in low areas. Ventilation should be provided in low, confined areas.
- 6) Particular care must be exercised around gas lines supplying HVAC equipment and other rooftop equipment. Do not use torching equipment around cutback or solvent-based materials unless thoroughly cured.
- 7) A metal collar should protect cylinder valves. Do not lift LP gas cylinders by the valve.
- 8) Torch operators and roofing applicators should always wear gloves, long sleeves, pants, boots, eye protection and protective clothing. Other crewmembers should maintain a distance of five feet from open flame. Refer to all federal, state and local safety requirements which shall supersede these recommendations.
- 9) Torch operators shall have a direct line of sight to observe the area or surface to which the flame is applied. Confined areas may require heating of the bottom surface of the material and pressing the material into position. Do not apply flame directly around roof top penetrations.
- 10) CT strongly recommends the use of infrared thermometers, inspection of return air ducts and crawl spaces, and a minimum four-hour fire watch. Workers shall thoroughly inspect roof areas where torching operations have been ongoing prior to leaving the job site. It is the

obligation of the contractor to carefully and fully inspect all areas of application to confirm the possibilities of a fire have been eliminated.

CT EXPRESSLY DENIES ANY AND ALL RESPONSIBILITY AND SHALL NOT BE LIABLE FOR FIRE DAMAGE TO PERSONS OR PROPERTY DUE TO IMPROPER OR UNSAFE APPLICATION METHODS.

11.2 Torching Equipment

Use of properly designed, constructed and well-maintained torching equipment is essential to achieving maximum safety and performance levels. It is important for the total torching assembly to comply with all federal, state, and local material and safety regulations. The equipment shall be designed for the intended purpose.

- **LP GAS CYLINDERS:** Shall be a type approved by the appropriate regulating agency for LP gas usage, equipped with an approved vapor withdrawal valve and pressure gauge. Valves should be protected by a metal collar or hood.
- **REGULATOR:** Shall be UL listed for LP gas usage with an adjustable pressure range of 60 psi. When replacement is necessary, roofing contractor should ensure the replacement regulator operates within the same pressure range.
- **HOSE:** Shall be UL listed for LP gas usage, with a minimum working pressure rating of 350 psi. Burst strength should be 1750 psi. Hoses shall be checked regularly for damage and wear. Hose lengths shall not exceed 50 feet.
- **TORCH:** Shall be equipped with a shutoff valve, pressure-release trigger, and support stand or legs. Equipment shall be compatible with the LP gas withdrawal system and shall be maintained in good operating condition.

The following recommendations are intended as a general guideline only. Contractor shall consult equipment manufacturer for specific recommendation on specifications and usage.

TORCH TYPE	REGULAR PRESSURE	CYLINDER SIZE
Detail Torch	Approx. 15-20 psi	20 lb. or larger
Field Torch (single or twin head)	Approx. 40-45 psi	40 lb. or larger
Torch Wagon	Approx. 40-60 psi	100 lb. or larger

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

All equipment shall be checked daily for damage, wear and leaks. Never use equipment which has been damaged or is leaking. All personnel utilizing torch equipment should be experienced and knowledgeable in its use, safety precautions and applicable safety regulations. Consult your local LP Dealer, National LP Gas Association and current National Fire Protection Association Pamphlet and equipment manufacturer for further recommendations.

12.0 TEMPORARY ROOFS

12.1 Recommendations

CT does not recommend or endorse phased applications of roof systems. However, when weather or field conditions prohibit total roofing system installation, the designer, general contractor, building owner and roofing contractor should consider the use of a temporary roof. CT reserves the right to accept or reject the use of temporary roof as a vapor retarder in the permanent system. Temporary roofs shall be a minimum of two plies of Flintglas® Ply 4 set in hot asphalt. Where possible, the surface shall be glazed with asphalt. The type and number of plies shall depend on the length of time involved before the permanent system will be installed. Consult Tech Services for project-specific requirements.

13.0 COLD WEATHER PRECAUTIONS

13.1 General

When roof systems are installed in temperatures below 50°F precautionary measures must be taken. If the ambient temperature is below 50°F unroll membrane and allow the roll to relax; re-roll prior to application. Do not heat asphalt above maximum temperature to compensate for rapid cooling during rooftop transportation. Always use insulated mop carts and luggers. Provide heated storage for all rolls and coatings when 50°F or colder.

13.2 Atactic Polypropylene Polymers (APP):

As temperatures drop, APP modified asphalt becomes increasingly stiff and eventually reaches a “glass transition” temperature. At these temperatures the APP membrane will crack or shatter when impacted. CT APP products have a formulation making the glass transition temperature as low as possible while retaining the positive qualities of APP. The following precautions are necessary:

- Do not load roof with excess material, allowing stored materials to be exposed to cold temperatures. Keep rolls warm and dry.
- Do not drop, throw, or toss rolls. Care should be taken to minimize impact to the rolls during transportation and loading.

13.3 Styrene Butadiene Styrene (SBS)

Since the SBS modifier is a synthetic rubber and not a plastic polymer, cracking is rarely a problem. The following factors must be considered when ambient temperature is below 50°F:

- Store rolls in warm, dry location.
- Keep mopping asphalt above at the high side of EVT at point of application and within safety constraints. Hot asphalt, once applied to the substrate, cools rapidly.
- Mopping technique is critical. Begin mop strokes away from the roll, but close enough to maintain proper asphalt temperature. Bring the mop back to the roll across the width of membrane and finally along the selvage edge. Note: It is important that the selvage edge be mopped last. Mop asphalt no more than six feet ahead of the roll.

13.4 Flintlastic® SA Self-Adhered Modified Membranes

Flintlastic SA membranes are temperature-activated and require sufficient surface temperatures to fully adhere. The following steps can be of assistance in application when ambient temperature is between 20°F and 49°F:

- Store materials in a heated location and draw materials as needed. If the materials have been exposed to cold temperatures, allow a sufficient period of time in a heated environment for them to warm up.
- A hot air welder, in combination with a hand-held silicone roller, should be utilized to heat and seal side laps, end laps and details provided the materials are well-rolled and free of entrapped air. Do not overheat or attempt to weld laps with a torch.

These methods are precautions and the applicator should stop work if the materials are not properly adhering. Contact Tech Services for additional cold weather application support for Flintlastic SA roof systems.

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

The following recommendations are intended as a general guideline only. Contractor shall consult equipment manufacturer for specific recommendation on specifications and usage.

DETAIL	HOT AIR WELDER SETTING	HOT AIR WELDER TEMPERATURE
Side Lap	2-3	300°F - 500°F
End Lap	8-10	900°F - 1,100°F

14.0 COATINGS AND SURFACING

14.1 Asphalt Emulsions

Asphalt emulsion coatings contain a mineral colloid suspended in a water carrier and are used as a preparatory surfacing over factory-coated sheets. Asphalt emulsions, when dry, will not flow or alligator. Emulsions provide a much longer weathering surface than other types of asphalt surfacings. Care must be taken to ensure asphalt emulsion is thoroughly dry before subjected to rainfall. Avoid freezing during both storage and application. Applied asphalt emulsion, subjected to freezing prior to drying, has a surface appearance of jackstraw fissures (crystalline pattern). The damaged application can be corrected with a brush application of non-fibrated asphalt emulsion. The same corrective measure should be used when “mud cracking” occurs as a result of an excessive application.

14.2 Decorative and Reflective Coatings

Decorative and reflective coatings are intended to provide a pleasing aesthetic appearance and reflect heat to lower membrane surface temperatures. Coatings listed by CRRC¹⁵ or Energy Star¹⁶ will reduce the surface temperature of the roof membrane, creating a “cool roof.” A cool roof reflects and emits the sun’s heat back to the sky instead of transferring it to the building below. “Coolness” is measured by two properties, solar reflectance and thermal emittance. Both properties are measured from 0 to 1 and the higher the value, the “cooler” the roof. Refer to the CRRC and Energy Star websites, or the U.S. Department of Energy¹⁷ for more information. Please refer to the LEED¹⁸ documentation for information on “heat islands” and LEED requirements to obtain LEED points for roof applications.

¹⁵ Cool Roof Roofing Council, www.coolroof.org

¹⁶ Energy Star, U.S. Department of Energy, www.energystar.gov

¹⁷ United States Department of Energy, <http://energy.gov/>

¹⁸ LEED, Leadership in Energy and Environmental Design, www.usgbc.org and www.leed.net

14.3 Applications

All roof and flashing coatings are maintenance items, and are the owner’s responsibility to maintain or replace during the service life of the roof. All cutbacks contain solvents. Do not heat or expose coatings to open flame or excessive heat. Use only in well ventilated areas. Carefully read information on labels. Emulsions contain water. All emulsion must be kept from freezing. Emulsions shall not be subjected to ambient temperatures below 40°F, either during application or during cure. Reflective coatings are either water or solvent based. CT decorative and reflective coatings shall be applied only to roof surfaces that have been properly prepared and are smooth, clean and dry. Some membranes require exposure to the elements for at least 30 days before the application of any coating. Read carefully all information on labels. CT does not warrant performance of another manufacturer’s coating or its ability to bond to a membrane surface.

When design requirements call for additional surfacing to satisfy particular aesthetic or fire-resistance properties, CT offers the following general guidelines:

- **ASPHALT EMULSIONS:** Surfaces to receive emulsion coating shall be clean, dry and free of debris. CT recommends application after a minimum of 30 days exposure of the membrane to the elements. Following surface preparation, apply one coat to the entire roof membrane and vertical flashing surfaces at the rate of three gallons per 100 square feet. Emulsion may be applied with a soft fiber brush, roller or spray equipment, brushing or spraying toward laps. Consult product manufacturer for application and specifications.
- **ALUMINUM COATINGS:** Surfaces to receive aluminum coating shall be clean, dry and free of debris. Both solvent-based and water-based aluminized surfacings are acceptable when aluminum coating is required. Consult product manufacturer for specifications and application rates as they may vary according to requirements. Carefully review deck surfacing requirements prior to application.
- **ACRYLIC COATINGS:** Surfaces to receive acrylic coating shall be clean, dry and free of debris. CT recommends application after a minimum of 30 days exposure of the membrane to the elements. Acrylic coatings may be applied over an asphalt emulsion coating or, in some

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

cases, directly to a membrane surface. Consult product manufacturer for application and specifications.

- **ASPHALT GLAZE COATINGS:** Surface to receive hot asphalt must be clean and dry. Hot asphalt may be applied by squeegee or mop at a rate not to exceed 15 lbs. per 100 square feet.
- **GRAVEL OR SLAG:** Surfacing shall be opaque and clean. Moisture content shall not exceed 2% by weight, and shall conform to ASTM D1863¹⁹. Gravel or slag shall be 1/4" to 5/8" in size installed in a flood coat of Type III/Type IV asphalt. Flood coat shall be applied in a uniform manner at the rate of 60 lbs. per 100 square feet. Gravel or slag shall be applied at the rate of 400 lbs. per 100 square feet with a minimum of 50% embedment into the flood coat.

15.0 NAILABLE SUBSTRATE FASTENER DATA

15.1 Considerations

It shall be the responsibility of the designer of record, or the owner, to consider wind uplift conditions and provide adequate securement of the roof assembly to prevent damage or blow-off. CT provides minimum attachment patterns for attachment of base sheets, insulation and coverboards. The structural section of the building code provides the required formulas to calculate uplift pressures for all roof types. CT has tested a wide variety of roof systems to document uplift resistance performance. For additional information contact Tech Services for job specific information. If the roof assembly is insured by FM Global or is specified to meet FM Global requirements, refer to system approved by FM Global and listed in the Products Directory or posted on RoofNav. Refer to the FM Global Loss Prevention Data Sheets available in the RoofNav website for additional roof and perimeter attachment information.

Nails can be secured to the deck either with integral heads or through tin caps. The uplift performance for each type may vary. It is the responsibility of the designer of record or the building owner to establish the appropriate attachment pattern to meet local code or property insurance requirements. CT can provide test data to assist in the evaluation of specific systems. Refer to the current fastener sections published by both the NRCA and ARMA for suitable

fasteners typically used for base sheet, insulation and coverboard attachment. Note it is strongly recommended by CT that coverboards be fully bonded to insulate the fasteners from exterior conditions.

15.2 Job Site Testing

CT strongly suggests job site testing to determine the most effective fastener for the attachment of any component on the roof. Two test standards are available for testing; ANSI/SPRI FX-1-2001 and State of Florida TAS-105. It is strongly recommended that one of these test standards be followed to calculate fastener performance²⁰. CT will not accept responsibility for damage to or failure of the roofing system caused by either non-performance of the fasteners or failure of deck materials. CT will not assume any responsibility for their performance. The following list of suggested fasteners is intended to be used only as a guide and shall not be considered as a guaranteed method of mechanical attachment by CT.

15.3 Nailing Requirements Section

Built-up and SBS-modified membranes (including self-adhering) applied on slopes exceeding 1":12" or APP modified membranes applied on slopes exceeding 2":12" shall be nailed as follows:

- **NAILABLE SUBSTRATES:** Base ply shall be mechanically attached, at a minimum, as specified in the selected roof system specification. Install subsequent plies in shingle fashion. Lap ply sheets to form a two- three- or four- ply assembly. Nail each ply 1" in from top edge, 12" o.c. through tin caps and annular ring shank nails. Nails shall penetrate through the plywood or OSB substrate a minimum of 1/4" or shall penetrate wood plank a minimum of 3/4". Flintglas® MS Cap Sheet and Flintlastic® modified bitumen roll roofing, when applied parallel to the slope, shall be back-nailed at end laps 2" in from top edge, 6" o.c. through tin discs with annular ring shank nails.

¹⁹ ASTM D1863: Standard Specification for Mineral Aggregate Used on Built-Up Roofs

²⁰ Copies of Protocols and Calculation Sheets are available from Tech Services

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS

- **INSULATED SUBSTRATES:** Roof membrane shall be applied parallel to slope. Base ply shall be adhered to the insulation, at a minimum, as specified in selected insulation application specification. Nail base ply and each subsequent ply through tin discs to woodblocking, 1" in from leading edge, 8' o.c. for slopes above 3":12" and 16' o.c. for slopes below 3":12". Flintglas Cap Sheet and Flintlastic modified bitumen roll roofing, when applied parallel to the slope, shall be back-nailed at end laps 2" in from top edge, 6" o.c. through tin discs with annular ring shank nails into woodblocking.
- **NON-INSULATED, NON-NAILABLE SUBSTRATES:** Install minimum 3½" wide woodblocking set flush to surface of deck at all eaves, ridges, rakes and base of curbs. Woodblocking shall be spaced 8' or 16' apart as noted above to create insulation stops. The roof membrane shall be applied parallel to slope. Base ply shall be installed, at a minimum, as specified in selected roof membrane specification. Nail base ply and each subsequent ply to woodblocking and insulation stops, 1" in from leading edge through tin caps with annular ring shank nails. Flintglas® MS Cap Sheet and Flintlastic modified bitumen roll roofing, when applied parallel to the slope, shall be back-nailed at all end laps 2" in from top edge, 6" o.c. through tin caps into the woodblocking with annular ring shank nails.

15.4 MECHANICAL FASTENING

15.4.1 Insulation Fasteners

Mechanical attachment of insulation and/or coverboards has become the preferred method of attachment over steel, wood, and some engineered lightweight decks. Hot asphalt application over steel has been eliminated from the industry due to fire resistivity issues. Direct bonding to wood or engineered wood is not supported due to dimensional changes of the deck, asphalt drippage and moisture issues, which can impact the performance of bonding.

Mechanical fasteners and stress plates are designed to secure rigid insulation to resist windload and lateral movement of the insulation boards. The density of the fastening pattern will determine the uplift resistance of the assembly.

All roofs are divided into three distinct attachment areas; the field, perimeter and corners. Typically, fastener density will increase in perimeter and corner areas. Uplift resistance of the roof assembly is calculated based on local code requirements. The foundation design document adopted by most codes is ASCE-7²¹ that is revised and updated every several years. FM Global requires all base insulation layers to be mechanically attached. The design criteria for FM Global insured or specified projects can be located in the FM Global Loss Prevention Data Sheet ("LPDS") 1-28²².

Insulation manufacturers publish fastening patterns for specific board dimensions to meet uplift resistance requirements. Note densities may be different depending on the roof cover. Fasteners shall be installed in strict compliance with fastener and insulation manufacturers' installation recommendations. The General Recommendations incorporated into LPDS 1-28 are a helpful guide to mechanical attachment.

Mechanical fastening creates "thermal shorts"²³ when the fastener head and stress plate are directly under the roof cover. Whenever practical, insulation should be installed in two staggered layers, the second layer bonded in asphalt or adhesive. Coverboards should always be bonded to the underlying insulation layer(s).

CT has tested hundreds of assemblies over most deck types to document uplift resistance. Ratings of the tested systems can be reviewed in the CT Wind Uplift Resistance Database²⁴ and in FM Global RoofNav²⁵. Building officials may require confirmation of performance of the assembly prior to issue of a permit.

²¹ American Society of Civil Engineers "Minimum Design Loads for Buildings and Other Structures"

²² Factory Mutual Global Property Loss Prevention Data Sheets 1-28: Wind Design

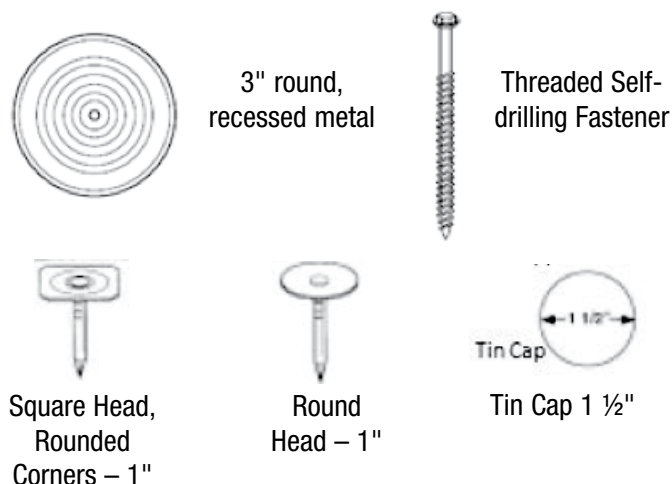
²³ Thermal short is an area where excess heat is transferred from the interior to the exterior or the exterior to the interior by way of a component bridging the two sides of the assembly

²⁴ Contact Tech Services

²⁵ visit www.roofnav.fmglobal.com/

GENERAL RECOMMENDATIONS

COMMERCIAL ROOFING SYSTEMS



For assistance in determining appropriate fasteners and stress plates, or to calculate uplift pressures for job specific conditions, please contact Tech Services or the Designer of Record. See Appendix I, Insulation Fastening Guide.

15.4.2 Base Ply Fasteners

Base sheets are mechanically attached with either fasteners and stress plates, nails and tin caps, or metal head cap nails with integrated heads.

The base sheet forms the foundation of the roof. The fastener or nail provides the connection to the deck and the stress plate, tin cap or cap nail head, combined with the base sheet and asphalt or adhesive, provides the connection to the roof cover.

Wind uplift pressures are calculated by using the formula in the local building code. The density of the fasteners or nails is dependent on the calculated pressures in the field, perimeter and corner areas of the roof.

CT has a database²⁶ of wind uplift testing of systems utilizing mechanically attached base sheets. The type and density of the fasteners or nails are detailed in each listed assembly. Contact Tech Services for additional data.

Calculating base sheet attachment requires the evaluation of the deck and the rupture value of the stress plate, tin

cap, or cap nail head when bonded into the roof assembly. Data is generated by both fastener/nail manufacturers and CertainTeed. Contact Tech Services for job specific data.

CT publishes minimum attachment criteria assuming the use of a 1" cap nail with annular ring shank installed into ¹⁵/₃₂" thick plywood. The minimum attachment pattern of 9" o.c. at the 2" side lap and two staggered rows at 18" o.c. will provide a minimum uplift resistance of 30 psf after a 2:1 margin of safety is applied (minimum attachment pattern of 12" o.c. at 4" side laps and two staggered rows at 18" o.c. with screws and plates for steel decking).

The attachment pattern shall be increased by 50% in the perimeters and 100% in the corners to meet higher pressures in these areas. The use of tin caps or stress plates will increase the rupture values; therefore, the fastener density can be reduced providing the withdrawal resistance for the deck is greater than the rupture value. These alternate patterns may be located in the attachment CertaBase database.

To calculate fastener density from a combination of withdrawal resistance data and rupture values, the calculation sheets are available from Tech Services. Withdrawal resistance of the nail or fastener from the deck should be calculated using either TAS 105 of the South Florida Building Code²⁸ or SPRI FX1-2006.29. Each document details the calculations required to identify the fastener density. The Protocols and Calculation Sheets may be obtained from Tech Services.

Note that only cap nails with metal integrated heads are approved for use with CertainTeed base sheets. It is strongly recommended either annular ring shank or spiral shank nails be used. Ring barbed or smooth shank nails will have the lowest withdrawal resistance.

15.4.3 CertaFast Systems

CertainTeed CertaFast systems offer a unique, FM Global approved, base ply attachment method for use over a number of approved substrates. Insulation board stock is pre-secured through approved cover boards using two fasteners per 4' X 4' board and four fasteners per 4' X 8'

²⁶ CT CertaBase database

GENERAL RECOMMENDATIONS

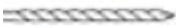
COMMERCIAL ROOFING SYSTEMS

board. Flintlastic Ultra Poly SMS is secured through minimum 4" laps that are subsequently torch-welded. Fastening patterns are typically 12" o.c. with approved fasteners at maximum 35¹/₃" row spacing. The selected Flintlastic field membrane is then either torch welded or hot asphalt adhered in place. Refer to FM Global and FM Global RoofNav for selected system details and perimeter securements.

Approved Shank Styles



Ring Shank
Nail



Spiral Shank
Nail



Ring Barbed
Nail

Approved Cap Styles



Square Head,
Rounded
Corners – 1"



Round
Head – 1"



Tin Cap
Tin Cap 1 1/2"

Refer to manufacturer's literature for field test data for values in specific deck type.