



CARLISLE'S  
**SURE-WELD®**

## G U I D E - S P E C

# Sure-Weld® TPO MECHANICALLY-FASTENED ROOFING SYSTEM

April 2006

This GUIDE-SPEC is a brief outline of Carlisle's Sure-Weld Mechanically-Fastened Roofing System requirements and is intended for use as a submittal with a bid package. Specifiers and the Carlisle Authorized Roofing Applicator must comply with the "Design Criteria" and "Application" sections of Carlisle's Specifications prior to design or bid.

### PART I GENERAL

#### 1.01 DESCRIPTION

The Sure-Weld Mechanically-Fastened Roofing System incorporates 12', 10' or 8' wide, white, gray or tan 45, 60, 72 or 80-mil thick scrim-reinforced Sure-Weld Thermoplastic Polyolefin (TPO) membrane. Insulation is mechanically fastened to an acceptable roof deck. Sure-Weld perimeter sheets (6', 5' or 4' wide respectively) are installed along the building edges and field membrane sheets are mechanically fastened to the roof deck with the appropriate Carlisle Fasteners and Fastening Plates. Adjoining sheets of Sure-Weld membrane are overlapped and joined together with a minimum 1-1/2" wide hot air weld. Refer to the "Design Criteria" section for the required number of perimeter membrane sheets and the required fastener spacing.

#### 1.02 QUALITY ASSURANCE

- A. This roofing system must be installed by a Carlisle Authorized Roofing Applicator in compliance with shop drawings as approved by Carlisle. There must be no deviations made without the **PRIOR WRITTEN APPROVAL** of Carlisle.
- B. Upon completion of the installation, an inspection will be conducted by a Field Service Representative of Carlisle to ascertain that the membrane roofing system has been installed according to Carlisle's published specifications and details applicable at the time of bid.
- C. This roofing system meets **Underwriters Laboratories (UL)** and **Factory Mutual (FM)** requirements. For specific code approvals achieved with this roofing system, refer to the Sure-Weld Code Approval Guide, Factory Mutual Approval Guide or Underwriters Fire Resistance and Roofing Materials and Systems Directories.

#### 1.03 SUBMITTALS

- A. To ensure compliance with Carlisle's warranty requirements, the following projects should be forwarded to Carlisle for review prior to installation, preferably prior to bid.
  1. Projects where a wind speed warranty coverage greater than 55 MPH peak gusts is specified.
  2. Projects where the building height exceeds 50'.
  3. Projects with fasteners specified to exceed 12".
  4. Air pressurized buildings, canopies and buildings with large openings where the total wall opening exceeds 10% of the total wall area where openings are located.
  5. Cold storage buildings and freezer facilities.
  6. Projects where the membrane is expected to come in direct contact with petroleum-based products or other chemicals.

- B. Along with the project submittals (shop drawing and Request for Warranty), when fastener pullout values do not meet the requirements listed in the Carlisle specification, test results with the appropriate Carlisle fastener must be submitted by the roofing contractor for review.
- C. For all projects (prior to project inspection by Carlisle) a final shop drawing must be approved by Carlisle.

#### 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the job site in the original, unopened containers labeled with the manufacturer's name, brand name and installation instructions.
- B. Store Sure-Weld membrane in the original undisturbed plastic wrap.
- C. Job site storage temperatures in excess of 90° F may affect shelf life of curable materials (i.e., adhesives and sealants).
- D. When liquid adhesives and sealants are exposed to lower temperatures, restore to a minimum of 60° Fahrenheit before use.
- E. Do not store adhesive containers with opened lids due to the loss of solvent, which will occur from flash off.
- F. Insulation and underlay-ment must be stored so it is kept dry and is protected from the elements. Store insulation on a skid and completely cover with a breathable material such as tarp or canvas. If the insulation is lightweight, it should be weighted to prevent possible wind damage.

#### 1.05 JOB CONDITIONS

- A. This system **must not be applied** on projects where the **slope exceeds 18"** in one horizontal foot. When the roof slope exceeds 5"

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per horizontal foot, use of an automatic welding machine may be more difficult. A hand held welder should be specified.

- B. Existing roofing material must be investigated by the specifier and all wet material must be removed.
- C. Existing phenolic insulation and sprayed-in-place urethane roofs must be removed prior to installation of this system.
- D. The use of a vapor retarder to protect insulation and reduce moisture accumulation within an insulated assembly should be investigated by the specifier. Consult the publications by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.) and NRCA (National Roofing Contractors Association) for specific information.
- E. Coordination between trades is essential to avoid unnecessary traffic over sections of the roof and to prevent damage to the membrane roofing system.

## 1.06 WARRANTY

All warranties are available for commercial projects only.

- A. A **5 or 10 year Membrane System Warranty**, with a wind speed coverage of up to 55 mph is available for a charge.
- B. A **10 or 15-year Golden Seal™ Total System Warranty** is available for a charge on projects which utilize all components manufactured or marketed by Carlisle. These projects will receive a standard maximum peak gust wind speed coverage up to 55 miles per hour.

Roofing systems may be eligible for a Total System Warranty with a peak gust wind speed coverage greater than 55 mph. For criteria required to obtain such coverage, refer to the 10 or 15-year Extended Wind Speed Criteria Attachment in the Sure-Seal/Sure-White EPDM Roofing System “Design Criteria” Specification.

- C. A **20-year Total System Warranty** is available for a charge for projects utilizing minimum 60-mil thick Sure-Weld membrane and incorporating additional design enhancements as outlined in “Attachment IV”, 20-Year Warranty Design Enhancements, in the Sure-Weld Design Criteria Specification.

## PART II PRODUCTS

### 2.01 GENERAL

The components of this roofing system are to be products of Carlisle or accepted by Carlisle as compatible. The installation, performance or integrity of products by others, **when selected by the specifier and accepted by Carlisle**, is not the responsibility of Carlisle and is **expressly disclaimed** by the Carlisle Warranty.

### 2.02 MEMBRANE

Sure-Weld white, gray or tan 45, 60, 72, 80-mil thick reinforced Thermoplastic Polyolefin (TPO) membrane is used for this system. Field membrane sheets are 12', 10' or 8' wide by 100' long based on project conditions. Perimeter sheets are 6' wide (used with 12' field sheets), 5' wide (used with 10' field sheets) or 4' wide (used with 8' field sheets). For physical properties of membrane, refer to page 4.

## 2.03 RELATED MATERIALS

Sure-Weld Non-Reinforced or Reinforced Flashing, Bonding Adhesive, Cut Edge Sealant, Water Cut-Off Mastic, PT 304 Sealant, EP-95 Spicing Cement, Weathered Membrane Cleaner, Molded Pocket Sealant, Heat Weldable Walkway Pads, Pre-Molded Inside/Outside Corners, Pipe Flashings, Curb Wraps and Sealant Pockets.

## PART III EXECUTION

### 3.01 GENERAL

- A. When feasible, begin the application at the highest point of the highest roof level and work to the lowest point to prevent moisture infiltration and to minimize construction traffic on completed sections. This will include completion of all flashings, terminations and daily seals.
- B. Follow criteria outlined in the "Design Criteria" section to prepare the roof deck or the existing substrate prior to the application of the new roofing system.

### 3.02 ROOF DECK CRITERIA

- A. Proper substrate shall be provided by the building owner. The structure shall be sufficient to withstand normal construction loads and live loads.
- B. Defects in the roof deck must be reported and documented to the specifier, general contractor and building owner for assessment. The Carlisle Authorized Applicator shall not proceed with installation unless defects are corrected.
- C. Acceptable decks and the applicable Carlisle Fasteners:
  1. **Steel, 22 gauge or heavier** - Carlisle HP-X Fasteners/Piranha Plates or HP-Xtra Fasteners/Piranha Xtra Plates are required with a minimum pullout of 500 pounds per fastener.
  2. **Lightweight Insulating Concrete over steel** - Carlisle HP-X Fasteners/Piranha Plates are required with a minimum pullout of 360 pounds per fastener (into steel deck below the lightweight concrete).
  3. **Structural Concrete, rated 3,000 psi or greater** – Carlisle CD-10 or HD 14-10 Fasteners (with Piranha Plates) are required with a minimum pullout of 800 pounds per fastener.
  4. **Wood Plank, minimum 15/32 thick Plywood** - Carlisle HP-X Fasteners/Piranha Plates are required
  5. On oriented strand board (OSB) decks, HP-X Fasteners and Piranha Plates may be used providing a pullout of 360 pounds can be obtained. Please contact Carlisle's Systems Design and Review Group sheet sizing and fastener spacing.
  6. **Cementitious Wood Fiber and Gypsum** - The Carlisle HP-NTB Fastener is required with a minimum pullout of 300 pounds.

### 3.03 SUBSTRATE PREPARATION

- A. On retrofit-recover projects, cut and remove wet insulation, as identified by specifier, and fill all voids with new insulation so it is relatively flush with existing surface.
- B. For all projects, substrate must be even without noticeable high spots or depressions, and must be free of accumulated water, ice or snow.
- C. Clear the substrate of debris and foreign material. Fresh bitumen based roof cement must be removed or concealed.

### 3.04 INSTALLATION

Refer to the applicable Material Safety Data Sheets and Technical Data Bulletins for applicable cautions and warnings.

#### A. Insulation Attachment

- 1. Carlisle Insulation shall be mechanically fastened to the roof deck as follows:
    - a. For HP Recovery Board or minimum 1-1/2" thick Polyisocyanurate, a minimum of 5 fasteners and plates per 4' x 8' board are required.
    - b. For Polyisocyanurate less than 1-1/2" thick or Foamular or DOW Extruded Polystyrene, any thickness, a minimum of 6 fasteners and plates per 4' x 8' board are required.
- Note:** Extruded polystyrene insulation is for use directly under white Sure-Weld membrane only.
- c. Insulation boards 4' x 4', regardless of thickness, must be fastened at the minimum rate of 1 fastener and plate every 4 square feet.
2. Carlisle Piranha Plates, Seam Fastening Plates (2" diameter) or Insulation Fastening Plates (3" diameter) must be used with appropriate Carlisle Fastener for insulation attachment.

#### B. Membrane Placement, Attachment and Hot Air Welding

- 1. A minimum of one perimeter sheet shall be installed at edges of each roof level and 12', 10' or 8' wide membrane shall be installed in the field of the roof.
- 2. Membrane sheets shall be mechanically fastened with the appropriate Carlisle Fastener/Fastening Plate spaced 6" to 12" on center, depending on project criteria, within the membrane splice. Refer to the "Design Criteria" section for required number of perimeter membrane sheets and fastener spacing.
- 3. Overlap adjacent membrane sheets approximately 5-1/2" at those locations where Fastening Plates are located (along length of the membrane) and a minimum of 2" at end roll sections (width of the membrane).
- 4. Hot air weld the membrane sheets a minimum of 1-1/2" with an Automatic Hot Air Welding Machine.

- 5. Membrane that has been exposed to the elements for approximately 7 days must be prepared with Weathered Membrane Cleaner. Wipe the surface where Weathered Membrane Cleaner has been applied with a clean, dry HP Splice Wipe or other white rag to remove cleaner residue prior to hot air welding.

#### C. Additional Membrane Securement

The membrane must be secured at the perimeter of each roof level, roof section, expansion joint, curb, skylight, interior wall, penthouse, etc., at any angle change which exceeds 2" in one horizontal foot and at all other penetrations in accordance with Carlisle's Details published with Carlisle's Specifications.

#### D. Membrane Flashing

- 1. Flash all walls and curbs with Sure-Weld reinforced membrane. Non-Reinforced membrane shall be limited to inside and outside corners, field fabricated pipe seals, scuppers and Sealant Pockets where the use of pre-molded accessories are not practical. Terminate the flashing in accordance with an appropriate Carlisle SW-9 Termination Detail.
- 2. On vertical surfaces, such as walls, curbs and pipes, Bonding Adhesive is not required when the flashing height is 12" or less and the membrane is terminated under a metal counterflashing (nailed). When a coping or termination bar is used for vertical terminations, Bonding Adhesive may be eliminated for flashing heights 18" or less.

#### E. Other Related Work

- 1. **Walkways** are required for all traffic concentration points (i.e., roof hatches, access doors, rooftop ladders, etc.), regardless of traffic frequency. Walkways are also required if regular maintenance (once a month or more) is necessary to service rooftop equipment. Walkways are considered a maintenance item and are excluded from the Carlisle Warranty.
- 2. Sure-Weld Heat Weldable Walkway Rolls are required when walkway pads are specified and are heat welded to the Sure-Weld Membrane.

When concrete pavers are used, they shall be loose laid and installed in conjunction with a slip sheet of reinforced membrane or two layers of HP Protective Mat. Concrete pavers are not recommended when the roof slope is greater than 2" per 1 horizontal foot.

Carlisle Interlocking Pavers™, 24" X 24" X 2", weighing approximately 6 pounds per square foot may be loose laid directly over the membrane. Installation instruction sheets are available from Carlisle.

- 3. **Copings, counterflashing and other metal work**, not supplied by Carlisle, shall be fastened to prevent metal from pulling free or buckling and sealed to prevent moisture from entering the roofing system or building.

Attach copies of the applicable Carlisle Details that pertain to the individual project to complete a bid package submittal.

### Membrane Physical Properties

Property (Metric-SI Units)	Test Method	Property of Unaged Sheet 45 or 60-mil		Property After Aging (1) 28 days @ 240° F 45 or 60-mil	
Tolerance on Nominal Thickness, %	ASTM D 751	±10			
Thickness Over Scrim, min, in. (mm)	ASTM D 4637 Optical Method	45-mil 0.015 (0.381) ±10	60-mil 0.020 (0.508) ±10		
Solar Reflectance (albedo X 100), % (Min. for ENERGY STAR® approval is 65%)	Solar Spectrum Reflectometer	White - 87 Typ. Tan - 68 Typ.			
Emittance, infrared	ASTM E 408	0.92 Typ.			
Breaking Strength, min, lbf (kN)	ASTM D 751 Grab Method	45-mil 225 (1.0) Min. 320 (1.4) Typ.	60-mil 250 (1.1) Min. 360 (1.6) Typ.	45-mil 225 (1.0) Min. 320 (1.4) Typ.	60-mil 250 (1.1) Min. 360 (1.6) Typ.
Elongation at Break of Fabric, min, %	ASTM D 751	25 Typ.		25 Typ.	
Tearing Strength, min, lbf (N) 8" by 8" specimen	ASTM D 751 B Tongue Tear	55 (245) Min. 130 (578) Typ.		55 (245) Min. 130 (578) Typ.	
Brittleness Point, max, °F (°C)	ASTM D 2137	-40 (-40) Min. -50 (-46) Typ.			
Linear Dimensional Change (shrinkage), %	ASTM D 1204	+/- .05 max. -0.2 Typ.			
Ozone Resistance, 100 pp hm, 168 hours	ASTM D 1149	No Cracks		No Cracks	
Resistance to Water Absorption After 7 days immersion @ 158°F (70°C) Change in mass, max, %	ASTM D 471	4.0 Max. 2.0 Typ.			
Resistance to microbial surface growth, rating (1 is very poor, 10 is no growth)	ASTM D 3274 2 yr. S. Florida	9 – 10 Typ.			
Field seam strength, lbf/in. (kN/m) Seam tested in peel	ASTM D1876	25 (4.4) Min. 60 (10.5) Typ.			
Water vapor permeance, Perms	ASTM E 96	0.10 Max. 0.05 Typ.			
Puncture resistance, lbf (N)	FTM 101C Method 2031	45-mil 250 (1.1) Min. 325 (1.4) Typ.	60-mil 300(1.3) Min. 350 (1.6) Typ.		
Resistance to xenon-arc Weathering (2) Xenon-Arc, 10,080 kJ/m <sup>2</sup> total radiant exposure, Visual condition at 10X	ASTM G 155 0.70 W/m <sup>2</sup> 80°C B.P.T.	No Cracks No loss of breaking or tearing strength			
(1) Aging conditions are 28 days at 240° F (116° C) equivalent to 400 days at 176° F (80° C) for breaking strength, elongation, tearing strength, linear dimensional change, ozone and puncture resistance.					
(2) Approximately equivalent to 8000 hours exposure at 0.35W/m <sup>2</sup> .					

**Note:** For Physical Properties of the 72 and 80-mil Sure-Weld membrane, refer to the Sure-Weld Design Criteria Specification, Attachment I.

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