BEAVERTON SCHOOL DISTRICT

Business Services
Procurement and Contracting
16550 SW Merlo Road
Beaverton, OR 97003
(503) 356-4324

December 2, 2020

SOLICITATION ADDENDUM NO. 1
ITB 20-0010
2021 Roofs Projects

THE FOLLOWING CHANGES/ADDITIONS TO THE ABOVE CITED SOLICITATION ARE ANNOUNCED:

This Addendum modifies the Invitation to Bid (ITB) document(s) only to the extent indicated herein. All other areas not changed or otherwise modified by this Addendum shall remain in full force and effect. This Addendum is hereby made an integral part of the ITB document. Bidder must be responsive to any requirements of this Addendum as if the requirements were set forth in the ITB. Failure to do so may result in Bid rejection. See the ITB regarding requests for clarification or change and protests of this Addendum, and the deadlines for the foregoing.

This addendum is to be acknowledged in the space provided on the Bidder Certification form supplied in the solicitation document. Failure to acknowledge receipt of this addendum may be cause to reject your offer.

The closing date **REMAINS UNCHANGED: December 8, 2020 at 2:00 PM Pacific Time**

CHANGES:

1) **The attached Revised Specifications hereby replace the pages in ATTACHMENT K Specifications respecitive to the pages included in this Addendum 1. The Revised Specifications also add Closeout Log Templates.**

SUBSTITUTION REQUEST RESPONSES:

Project(s)	Spec Section	Spec Section	Spec Section	Spec Section	Requested Substitution	Status
Elmonica & Errol Hassell	07 54 23	8 54 23	9 54 23	10 54 23	Shop Broke Expansion Cover	Approved with the following condition: Use of sheet metal for the this detail in lieu of TPO manufacture's component is acceptable, but the detail submitted will have to be modified during submittals to align more closely to existing expansion joint detail, in order to eliminate the proposed horizontal cantilever
Hiteon	07 54 23	8 54 23	9 54 23	10 54 23	Carlisle Sure-Weld 80mil TPO	Approved

CLARIFICATONS:

Question: The following errors/omissions were identified regarding Attachment K Specifications:

i. Missing the Closeout Log Template for Section 017700 for all Schools.
ii. Elmonica Elementary School Table of Contents has (2) Section numbers. In the list it shows Section 000110 and at the footer it shows 00010.
iii. Montclair Elementary School has Section 061000 duplicated. (pages 819-825) Shows at date in the upper right corner of 10.07.2020 (pages 719-725) Shows a date in the upper right corner of 10.28.2020.

Answer: **Please see CHANGES 1), which changes applicable spec sheets and adds missing logs. A summary of the changes are noted below (in blue parenthetical text):**

1) Missing the Closeout Log Template for Section 017700 for all Schools. (The Closeout log template for section 017700 has been added for each school.)
2) Elmonica Elementary School Table of Contents has (2) Section numbers. In the list it shows Section 000110 and at the footer it shows 00010. (The footer for the Table of Contents has been updated to read the correct section for Elmonica.)
3) Montclair Elementary School has Section 061000 duplicated. (pages 819-825) Shows at date in the upper right corner of 10.07.2020 (pages 719-725) Shows a date in the upper right corner of 10.28.2020. (When we were collating the sets we didn't see section 061000 so we added it but it had the wrong date, not knowing the section with the right date was in the set, just not in the correct location. Please move section 061000 with the 10.28.2020 date to replace the 061000 section with the 10.07.2020 date.)

Question: In the ITB document there is a "Bid Schedule" listed for each Project. There is a section for total base bid and then unit price sections below. For example on the Elmonica bid schedule the first unit price requested is the 24ga gutter and downspouts. Are we to exclude the unit price options (downspouts and gutters in this case) from the base bid and let the costs for the unit price options be extrapolated by the District at time of Bid review? Or do we include the costs for the unit price items in our base bid and provide the unit price rate in case of any alterations, deductions, or additions in quantities after the time of the bid?

Answer: **The Total Base Bid amount should encompass the price for all work included in the Solicitation Documents except for the work specifically described as Unit Pricing(es) or Alternate(s). The requested Unit Prices must be included on the Bid Schedule(s) submitted with Bids. The Unit Price amounts will be multiplied by the supplied estimated quantities, and the sum of those products ("extended prices") will be added to the Total Base Bid for Bid Evaluation purposes. Therefore, Unit Pricing Costs shall not be included in the Total Base Bid amount on the Bid Schedules. Also, the cost of Alternate work must be included on the Bid Schedule(s) as required on the Bid Schedule(s). The cost of any Alternates shall not be included in the Total Base Bid amounts. If the District accepts any Alternates, their costs will be added to the Total Base Bid (and extended Unit Pricing Amounts if applicable) to calculate the total bid amount for Bid evaluation purposes. The foregoing Answer is for clarification purposes only, and does not change any language, processes, or requirements in the Solicitation documents (e.g., SECTION IV – INSTRUCTIONS TO BIDDERS:, 14. BID EVALUATION CRITERIA, etc.).**

Question: We would like any as-builts that apply to both projects. In Addition, can we get a copy of any applicable Oregon Energy Trust Studies?.

Answer: **HVAC and controls as-builts are incomplete and will not help clarify scope. Please carefully review the solicitation documents to determine scope. The awarded contractor will need to field verify conditions prior to uninstalling and reinstalling equipment.**

With regards to the ETO study, these projects are not eligible for ETO funds for the HVAC work. Montclair maybe eligible for ETO funds for the roofing insulation if it is found to be damaged upon removal. The award contractor shall document the damaged insulation if it exists.

Question: The 25 year full system warranty has sheet metal flashings included. Spec section 075423 – 2.9/A. Is this the intent or is locally sourced shop fabricated sheet metal flashing acceptable?

Answer: **Yes, locally fabricated sheet metal is acceptable. Refer to the applicable Substitution Request Response. The referenced warranty in the specification is to be provide if the component is provided by the roof manufacture.**

Question: Please clarify whether Contractor is responsible for fall protection engineering (deferred submittal).

Answer: **Yes, the Contractor is responsible for deferred submittal engineering.**

Question: We are in the Process of Bidding Errol Hassel Elementary school and would like to know the manufacturer and model number of the existing units.

Answer: **The existing units are Carrier 48HJE004.**

Question: Specs for the Hiteon schools call out a tear off, the plans say existing roofing system to remain. Which should we price?

Answer: **Please carefully review the plans and specifications. Pay special attention to the hatches on A1.1 and A1.2 There are sections of the roof to remain and sections of the roof to be completely removed and replaced.**

AIA DOCUMENT A101-2017 *STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR*

- (INCORPORATED BY REFERENCE)

AIA DOCUMENT A201-2017 *GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION*

- (INCORPORATED BY REFERENCE)

BSD TECHNICAL STANDARDS STANDARDS FOR DESIGN AND CONSTRUCTION OF ALL DISTRICT FACILITES

- (INCORPORATED BY REFERENCE—PLEASE SEE WEBSITE)

https://www.beaverton.k12.or.us/departments/facilities-development/technical-standards

DIVISION 0 PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 1 GENERAL CONDITIONS

DIVISION 2 EXISTING CONDITIONS (See APPENDIX 'A': ROOF INSPECTION REPORT')

DIVISION 3 CONCRETE (NOT USED)

DIVISION 4 MASONRY (NOT USED)

DIVISION 5 METALS

055000 Metal Fabrications

DIVISION 6 WOOD, PLASTICS, AND COMPOSITES

061000 Rough Carpentry

DIVISION 7 THERMAL AND MOISTURE PROTECTION

075423 Themoplastic Polyolefin (TPO) Membrane Roofing

DIVISION 8 OPENINGS (NOT USED)

DIVISION 9 FINISHES (NOT USED)

APPENDIX A: ROOF INSPECTION REPORT
- By A-Tech Northwest, Inc. dated 03/26/2020

APPENDIX B: MOISTURE SURVEY REPORT
- By RDH Building Science dated 10/12/2020

END OF SECTION

CLOSEOUT LOG: BSD Elmonica- 2021 Re-Roof

	e-B Project number 8313		REQUIREMENTS PER SPECIFICATIONS (YES/NO)								
SPEC SECTION	SPECIFICATION DESCRIPTION	SUBCONTRACTOR	O&M	Recvd	WARRANTY	Recvd	EXTRA STOCK MATERIAL	Recvd	OWNER TRAINING	Recvd	AS-BUILT
DIVISION 05 - METALS											
DIVISION 06 - WOOD, PLASTICS AND COMPOSITES											
DIVISION 07 - THERMAL AND MOISTURE											

CLOSEOUT LOG: BSD Errol Hassell- 2021 Re-Roof

	e-B Project number 8313		REQUIREMENTS PER SPECIFICATIONS (YES/NO)								
SPEC SECTION	SPECIFICATION DESCRIPTION	SUBCONTRACTOR	O&M	Recvd	WARRANTY	Recvd	EXTRA STOCK MATERIAL	Recvd	OWNER TRAINING	Recvd	AS-BUILT
DIVISION 06 - WOOD, PLASTICS AND COMPOSITES											
DIVISION 07 - THERMAL AND MOISTURE											
DIVISION 23 - HVAC											

CLOSEOUT LOG: BSD Hiteon- 2021 Re-Roof

	e-B Project number 8313		REQUIREMENTS PER SPECIFICATIONS (YES/NO)								
SPEC SECTION	SPECIFICATION DESCRIPTION	SUBCONTRACTOR	O&M	Recvd	WARRANTY	Recvd	EXTRA STOCK MATERIAL	Recvd	OWNER TRAINING	Recvd	AS-BUILT
DIVISION 05 - METALS											
DIVISION 06 - WOOD, PLASTICS AND COMPOSITES											
DIVISION 07 - THERMAL AND MOISTURE											

CLOSEOUT LOG: BSD Jacob Wismer- 2021 Re-Roof

	e-B Project number 8313		REQUIREMENTS PER SPECIFICATIONS (YES/NO)								
SPEC SECTION	SPECIFICATION DESCRIPTION	SUBCONTRACTOR	O&M	Recvd	WARRANTY	Recvd	EXTRA STOCK MATERIAL	Recvd	OWNER TRAINING	Recvd	AS-BUILT
DIVISION 06 - WOOD, PLASTICS AND COMPOSITES											
DIVISION 07 - THERMAL AND MOISTURE											
DIVISION 23 - HVAC											

CLOSEOUT LOG: BSD Montclair- 2021 Re-Roof

	e-B Project number 8313		REQUIREMENTS PER SPECIFICATIONS (YES/NO)								
SPEC SECTION	SPECIFICATION DESCRIPTION	SUBCONTRACTOR	O&M	Recvd	WARRANTY	Recvd	EXTRA STOCK MATERIAL	Recvd	OWNER TRAINING	Recvd	AS-BUILT
DIVISION 06 - WOOD, PLASTICS AND COMPOSITES											
DIVISION 07 - THERMAL AND MOISTURE											
DIVISION 23 - HVAC											

Advancement of Construction Technology

SUBSTITUTION REQUEST
(During the Bidding Phase)

Project: Beaverton School Re-roofs 2021
Specifically Elmonica and Errol Hassel

To: Beaverton School District

Re: Expansion Joint Covers

Substitution Request Number:

From: TT&L Sheet Metal, Inc.

Date: 11/12/2020

A/E Project Number:

Contract For:

Specification Title: TPO Roofing and Related Sheet Metal

Description: Expansion Joint Components

Elmonica Section: 075423 Page: 9

Article/Paragraph: 2.9/A

Proposed Substitution: Shop broken sheet metal expansion
Manufacturer: TT&L Sheet Metal Address: Phone: 503.641.0552
Trade Name: Shop broken sheet metal expansion Model No.:

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: Bobby Brandt
Signed by:
Firm: TT&L Sheet Metal, Inc.
Address: 6585 SW Fallbrook Pl.
Beaverton OR 97008
Telephone: 503.568.0083

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01330.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

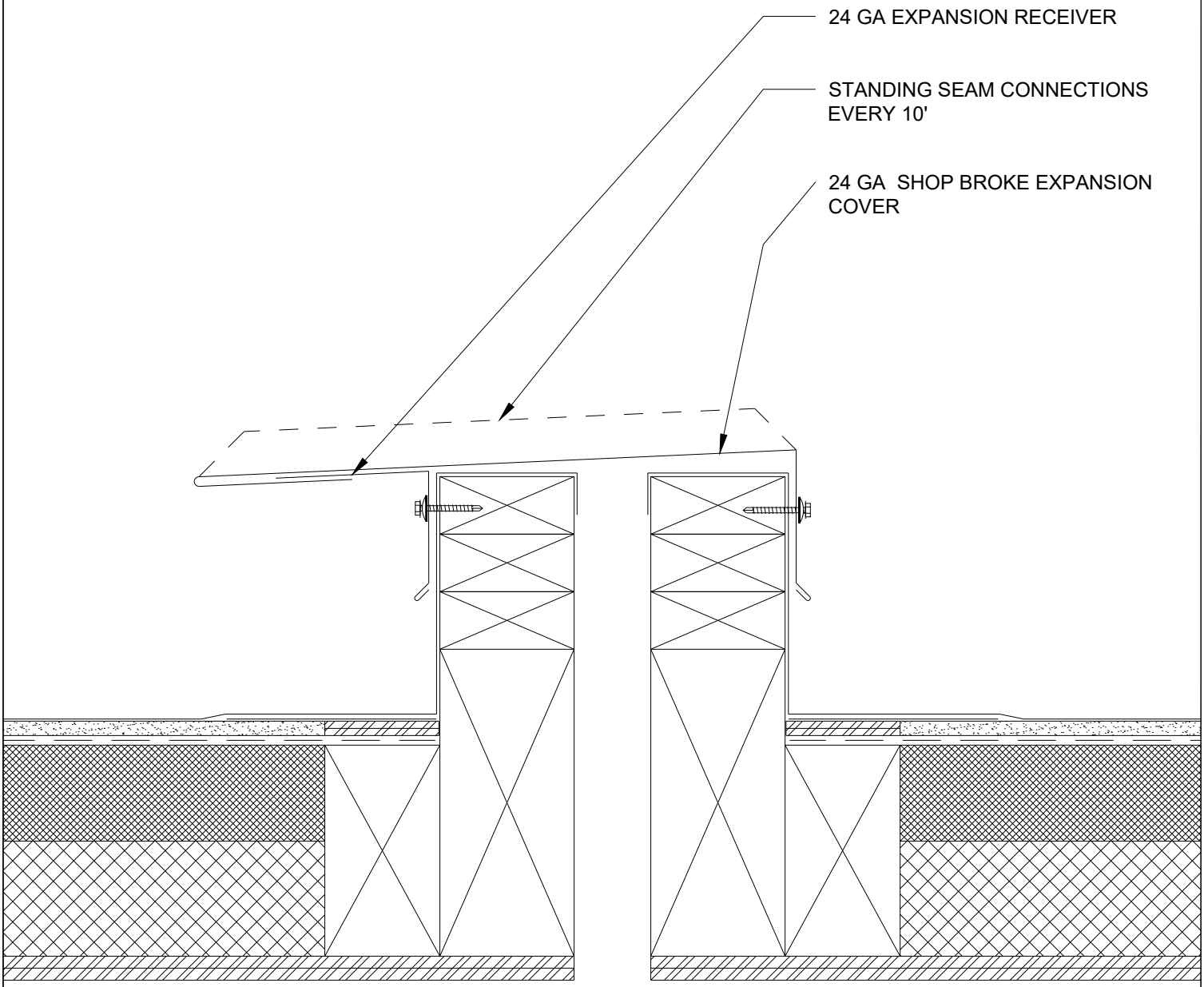
Signed by: Date:

Supporting Data Attached: ☑ Drawings X☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

SHEET TT&L METAL INC
6585 SW FALLBROOK PL
BEAVERTON, OR 97008
503.641.0552‖503.626.6248

SHOP BROKE EXPANSION COVER

DATE	11.13.2020
Job	BSD 2021 REROOFS
Author	BB



SUBSTITUTION REQUEST

(During the Bidding/Negotiating Stage)

Project: BSD 2021 Roof Project - Hiteon Elem. School

Substitution Request Number:

From: Cam Jack

To: CIDA Architects

Date: November 19, 2020

A/E Project Number: 20Y082.01

Re:

Contract For: Dustin Johnson

Specification Title: TPO MEMBRANE ROOFING

Description: TPO ROOFING MEMBRANE

Section: 075423

Page: 6

Article/Paragraph: 2.2 / Products

Proposed Substitution: Sure-Weld TPO 80 mil, White

Manufacturer: Carlisle Syntec Address: Carlisle, PA 17013 Phone: 800-479-6832

Trade Name: Carlisle Syntec Systems Model No.:

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: Cam K. Jack

Signed by: DocuSigned by: Cam K. Jack EBE232FFF993415...

Firm: Harper Winn, Inc.

Address: 2327 W Commodore Way, Seattle WA 98199

Telephone: (541)-543-7179

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

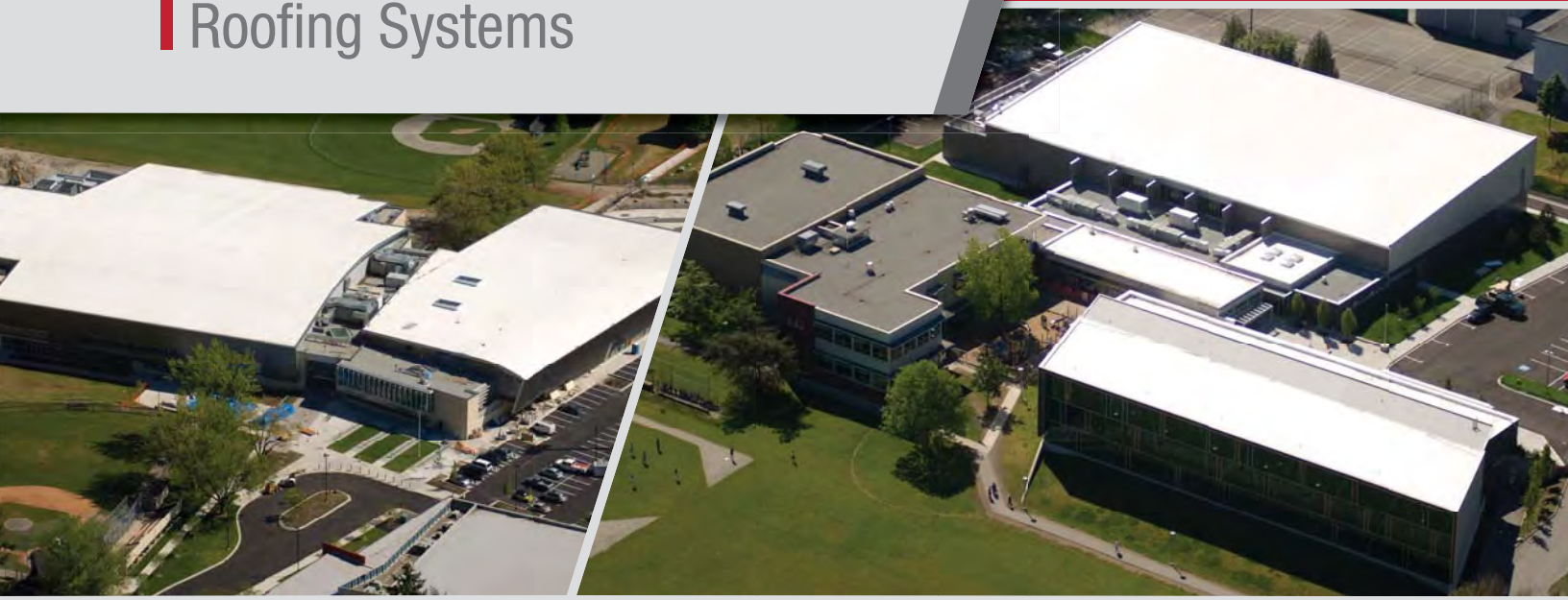
Supporting Data Attached: ☐ Drawings ☑ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

Supporting data is provided. Being that this is a BUR tear off, I've added optional information pertaining to the TPO APeel protective film. For more information, review this link: http://videos.carlislesyntec.com/watch/9c44i4u9ryw2s4UNZ1CCLV. Thanks for the opportunity!

Form Version: January 2013
CSI Form 1.5C

CARLISLE SYNTEC SYSTEMS

Sure-Weld® Extra TPO
Roofing Systems



Innovation • Exclusive Warranties • Long-term Performance

Sure-Weld Extra TPO is Carlisle's thickest, most durable, and longest-lasting TPO membrane. Available in standard and FleeceBACK® versions, Sure-Weld Extra TPO provides excellent long-term durability and exceptional resistance to hail and punctures. Sure-Weld Extra TPO also offers superb UV resistance due to the increased levels of weathering package that thicker membranes contain.

Carlisle's Sure-Weld Extra TPO products include:

- **80-mil Sure-Weld TPO**
- **80-mil Spectro-Weld™ TPO**
- **135-mil FleeceBACK TPO**
- **155-mil FleeceBACK TPO AFX**

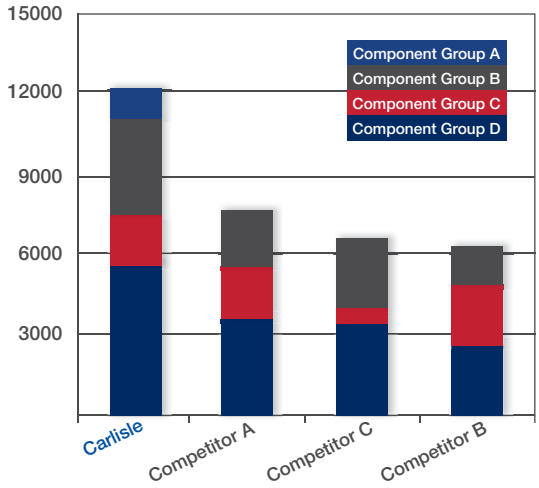
OCTAGUARD XT™ WEATHERING PACKAGE

Carlisle's OctaGuard XT weathering package is a blend of eight performance-enhancing ingredients designed to protect Sure-Weld Extra TPO membranes against damaging heat and UV exposure. Independent test results have demonstrated that Carlisle's Sure-Weld Extra TPO with the OctaGuard XT weathering package provides superior long-term protection against the elements.

- OctaGuard XT weathering package enables Sure-Weld TPO to withstand the most extreme heat and UV conditions.
- Combined with Carlisle's time-tested TPO formulation, the OctaGuard XT weathering package provides a longer-lasting and more energy-efficient TPO roofing system

OCTAGUARD XT
WEATHERING PACKAGE

WEATHERING PACKAGE
CHEMICAL ANALYSIS



EXPERIENCE

Carlisle SynTec Systems has been a pioneer in the single-ply roofing industry since the 1960s, and is recognized today as the provider of the most dependable, longest-lasting single-ply roof systems on the market. Over 15 billion square feet of Carlisle's roofing membrane – including 5 billion square feet of Sure-Weld TPO – have been installed on buildings all over the world. Carlisle's TPO track record far surpasses that of any other single-ply manufacturer: For the past 20 years, hospitals, schools, warehouses, and major retailers have protected their buildings with Carlisle's industry-leading Sure-Weld TPO membrane.

DEPENDABILITY

Each detail of a Sure-Weld Extra TPO roofing system is meticulously engineered by Carlisle to ensure its long-term performance. That quality assurance is backed by Carlisle's exclusive 25- and 30-year warranties, which can be supplemented with additional puncture, hail, and reflectivity coverage. Every square inch of Sure-Weld Extra TPO is enhanced with the most advanced weathering package on the market: Carlisle's OctaGuard XT.

Because thicker TPO membranes contain higher levels of the OctaGuard XT weathering package, Carlisle's 80-mil Sure-Weld Extra TPO provides longer-lasting protection against the negative effects of UV degradation and heat exposure. The additional protection provided by an upgrade to Sure-Weld Extra TPO often adds as little as 8% to the system's total installed costs, while increasing the lifespan of the roof by as much as 33%.

All of these dependable attributes lead to unmatched warranties for Sure-Weld Extra TPO roof systems.

Certified Fabricated Accessories

To promote ease of installation, Carlisle offers more than a dozen prefabricated accessories, as well as custom-made accessories to meet any and all roofing needs. These Certified Fabricated Accessories (CFAs) carry Carlisle's CFA stamp of approval, so it is easy to determine that the accessories on a roof are manufactured to the highest quality standards. CFAs are perfect for any job because:

- CFAs save time and money during installation.
- CFAs provide improved waterproofing performance around penetrations.
- CFAs can be custom-fabricated for any type of penetration.
- CFAs provide a consistent, professional look across the entire roof.

Certified Fabricated Accessory

INNOVATION

Carlisle is committed to providing contractors and building owners with the most innovative roofing products on the market through continuous research and development. Versatility, durability, and ease of installation are provided by Carlisle's growing line of cutting-edge TPO products, which include:

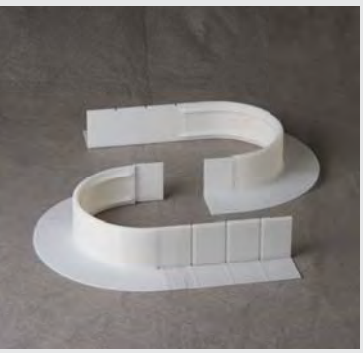
- Certified Fabricated Accessories (CFAs)
- Sure-Weld membranes containing the OctaGuard XT Weathering Package
- Spectro-Weld TPO membranes – the most reflective single-ply membrane on the market
- Sure-Weld TPO with APEEL™ Protective Film

ECO-FRIENDLY

Sure-Weld Extra TPO can help save energy in hot climates where buildings can benefit from long-term savings in cooling costs. White and tan Sure-Weld Extra TPO membranes are ENERGY STAR®*-qualified and Cool Roof Rating Council (CRRC) certified. These "cool" reflective membranes can greatly diminish a building's energy consumption by reducing the need for air conditioning throughout the year. Sure-Weld Extra TPO's environmentally friendly characteristics and energy-efficient advantages make it one of the most sustainable roof systems on the market today.

PV-READY

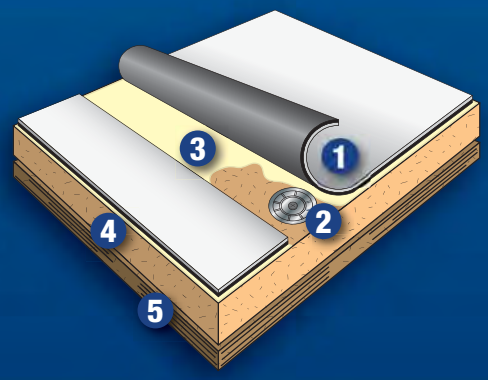
Sure-Weld Extra TPO is an excellent choice to support energy-producing rooftop photovoltaic (PV) systems. Because of the cost of a solar installation, it is common for building owners to wait several years after the purchase of a new roof before adding a PV system. Solar-ready Sure-Weld Extra TPO gives building owners a high-quality, durable roof that is ready for a future upgrade to PV. The additional protection provided by Sure-Weld Extra TPO membrane allows the roofing system to withstand abuse by the elements, including higher wind speeds, accidental punctures, water infiltration, and more. Installing Carlisle's Sure-Weld Extra TPO in conjunction with a 30-year Golden Seal™ Total Roofing System Warranty will provide exceptional protection under any PV investment.



*ENERGY STAR qualification is only valid in the U.S. ENERGY STAR recommends using the Roof Savings Calculator (rsc.ornl.gov), which factors in both heating and cooling costs to determine whether a cool roof will be an energy-efficient choice for your geographic climate and building type.

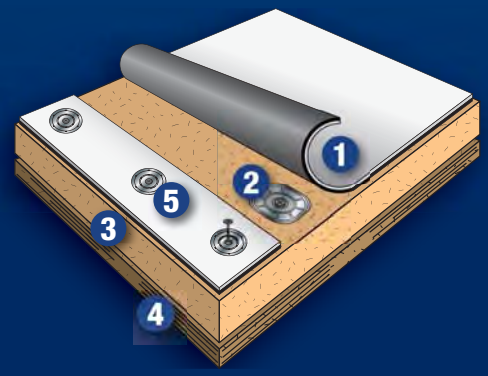
EXPERIENCE THE CARLISLE DIFFERENCE

FULLY ADHERED TPO ROOFING SYSTEM



1. Sure-Weld Extra TPO Membrane
2. Carlisle Insulation Fasteners and Plates
3. Approved TPO Bonding Adhesive
4. Acceptable Insulation
5. Approved Roof Deck

MECHANICALLY FASTENED TPO ROOFING SYSTEM



1. Sure-Weld Extra TPO Membrane
2. Carlisle Insulation Fasteners and Plates
3. Acceptable Insulation
4. Approved Roof Deck
5. Carlisle Membrane Fasteners and Plates

CARLISLE SYNTEC SYSTEMS

800-479-6832 | P.O. Box 7000 | Carlisle, PA 17013 | Fax: 717-245-7053 | **www.carlislesyntec.com**

CARLISLE SYNTEC SYSTEMS

Sure-Weld® TPO
Reinforced Membrane

Overview

Carlisle's Sure-Weld TPO reinforced membrane is a premium, heat-weldable, single-ply thermoplastic polyolefin (TPO) sheet designed for new roof construction and re-roofing applications. Sure-Weld High Slope (HS) membrane is formulated with additional flame retardant for higher-slope fire code approvals. Sure-Weld EXTRA is 80 mils thick for significantly higher strength and weatherability.

Sure-Weld TPO membranes use advanced polymerization technology that combines the flexibility of ethylene-propylene (EP) rubber with the heat weldability of polypropylene. All Sure-Weld TPO membranes include OctaGuard XT™, an industry-leading, state-of-the-art weathering package. OctaGuard XT technology enables Sure-Weld TPO to withstand the extreme weatherability testing that is intended to simulate exposure to severe climates.

Physical properties of the membrane are enhanced by a strong polyester fabric that is encapsulated between the TPO-based top and bottom plies. The combination of the fabric and TPO plies provides high breaking and tearing strength, as well as excellent puncture resistance. The relatively smooth surface of the membrane produces a total surface fusion weld that results in a consistent, watertight, monolithic roof assembly. The membrane is environmentally friendly and safe to install.

Carlisle's standard and HS TPO membranes are available in highly reflective white, tan, and gray, in both 45-mil and 60-mil thicknesses. 80-mil Sure-Weld EXTRA (including HS) is also offered in white, gray, and tan colors. Sixteen special colors are also available (see Carlisle's TPO Color Palette brochure). Carlisle's TPO is offered in 4-, and 6-ft perimeter sheets and 8-, 10-, and 12-ft Sure-Weld sheets. Sure-Weld HS and special color TPO membranes are available in limited sizes.

Carlisle's tan and white TPO membranes are ENERGY STAR®*-qualified and California Title 24 compliant and can contribute toward LEED® (Leadership in Energy and Environmental Design) credits.

Optional APEEL™ Protective Film

Carlisle's Sure-Weld TPO reinforced membrane is available with an optional APEEL Protective Film, saving time and labor by eliminating the need for roof cleaning upon project completion. Carlisle's innovative APEEL Protective Film can be left in place for up to 90 days without affecting the integrity of the film, guarding the TPO membrane's surface from scuffs and dirt accumulation during installation. Durable and easy to remove, APEEL Protective Film improves aesthetics and long-term reflectivity and is ideal for re-roofing, re-cover, and new construction projects.

OCTAGUARD XT WEATHERING PACKAGE

APEEL PROTECTIVE FILM

Features and Benefits

- Outstanding puncture resistance
- Chlorine-free with no halogenated flame retardants
- Plasticizer-free; does not contain liquid or polymeric plasticizers
- Excellent resistance to impact and low temperatures
- Excellent chemical resistance to acids, bases and restaurant exhaust emissions
- UL 2218 Class 4 hail rating
- Exceptional resistance to heat, solar UV, ozone and oxidation
- Manufactured using a hot-melt extrusion process for complete scrim encapsulation
- 100% recyclable (see Carlisle's Recyclability Statement)
- Enhanced with the OctaGuard XT weathering package
- APEEL Protective Film application guards the TPO membrane's surface from scuffs and dirt accumulation during installation, improving the roof system's appearance and long-term performance
- APEEL Protective Film can be left in place for up to 90 days without degrading due to its excellent heat- and UV-resistance

Sure-Weld TPO
Reinforced Membrane

Installation

1. Sure-Weld TPO roofing systems are quick to install, as minimal labor and few components are required. TPO systems are installed using an Automatic Heat Welder, making sheet welding fast, clean, consistent, and easy to learn, while reducing strain on the roofing technician.
2. APEEL Protective Film should be removed from within areas that are to be heat-welded together. In areas that do not require heat-welding, the APEEL Protective Film can be left in place for up to 90 days. When the installation of the entire TPO roofing system is complete, remove and discard the APEEL Protective Film.
3. **The Carlisle Mechanically Fastened Roof System** installation starts by fastening the insulation with a minimum of 4 fasteners per 4' by 8' board. The membrane is mechanically fastened to the deck using HP-X™ Fasteners and Piranha Plates™ or HP-XTRA Fasteners and Piranha XTRA Plates. Adjoining sheets of membrane are overlapped over the fasteners and plates and joined together with a minimum 1½"-wide (4 cm) hot-air weld.

Typical Properties and Characteristics

Physical Property	ASTM D6878 Requirement	45-mil	60-mil	80-mil EXTRA
Tolerance on Nominal Thickness, % ASTM D751 test method	+15, -10	± 10	± 10	± 10
Thickness Over Scrim, in. (mm) ASTM D7635 optical method, average of 3 areas	0.015 min (0.380)	0.018 typical (0.457)	0.024 typical (0.610)	0.034 typical (0.864)
Breaking Strength, lbf (kN) ASTM D751 grab	220 (976 N) min	225 (1.0) min 320 (1.4) typical	250 (1.1) min 360 (1.6) typical	350 (1.6) min 425 (1.9) typical
Elongation Break of Reinforcement, % ASTM D751 grab method	15 min	15 min 25 typical	15 min 25 typical	15 min 25 typical
Tearing Strength, lbf (N) ASTM D751 proc. B 8 in. x 8 in.	55 (245) min	55 (245) min 130 (578) typical	55 (245) min 130 (578) typical	55 (245) min 130 (578) typical
Brittleness Point, °F (°C) ASTM D2137	-40 (-40) max	-40 (-40) max -50 (-46) typical	-40 (-40) max -50 (-46) typical	-40 (-40) max -50 (-46) typical
Linear Dimensional Change, % ASTM D1204, 6 hours at 158°F	± 1 max	± 1 max -0.2 typical	± 1 max -0.2 typical	± 1 max -0.2 typical
Ozone Resistance, no cracks 7X ASTM D1149, 100 pphm, 168 hrs	PASS	PASS	PASS	PASS
Water Absorption Resistance, mass % ASTM D471 top surface only 166 hours at 158°F water	± 3.0 max	± 3.0 max 0.90 typical	± 3.0 max 0.90 typical	± 3.0 max 0.90 typical
Factory Seam Strength, lbf/in (kN/m) ASTM D751 grab method	66 (290) min	66 (290) min	66 (290) min	66 (290) min
Field Seam Strength, lbf/in (kN/m) ASTM D1876 tested in peel	No requirement	25 (4.4) min 50 (8.8) typical	25 (4.4) min 60 (10.5) typical	40 (7.0) min 70 (12.3) typical
Water Vapor Permeance, Perms ASTM E96 proc. B	No requirement	0.10 max 0.05 typical	0.10 max 0.05 typical	0.10 max 0.05 typical
Puncture Resistance, lbf (kN) FTM 101C, method 2031 (see supplemental section)	No requirement	250 (1.1) min 325 (1.4) typical	300 (1.3) min 350 (1.6) typical	400 (1.8) min 450 (2.0) typical
Properties After Heat Aging ASTM D573, 5376 hours @ 240°F Breaking strength Elongation Reinf. Tearing Strength Weight Change, %	 198 (881) 90% min 13.5 (90%) min 33 (60%) min ± 1.0 max	 205 (912) min 13.5 min 33 min 1.0 max	 225 (1000) min 13.5 min 33 min 1.0 max	 315 (1400) min 13.5 min 33 min 1.0 max
Typical Weights lb/ft² (kg/m²)		0.23 (1.1)	0.29 (1.4)	0.40 (2.0)

Typical properties and characteristics are based on samples tested and are not guaranteed for all samples of this product. This data and information is intended as a guide and does not reflect the specification range for any particular property of this product.

Sure-Weld TPO
Reinforced Membrane

4. **The Carlisle Fully Adhered Roofing System** installation begins by fastening the insulation at the required density necessary to meet the appropriate warranty or wind load requirement. The substrate and membrane are then coated with an appropriate Sure-Weld TPO bonding adhesive and the membrane is rolled into place.

Review Carlisle specifications and details for complete installation information.

Precautions

- Sunglasses that filter out ultraviolet light are strongly recommended, as tan and white surfaces are highly reflective. Roofing technicians should dress appropriately and wear sunscreen.
- Surfaces may become slippery due to frost and ice buildup. Exercise caution during cold conditions to prevent falls.
- Care must be exercised when working close to a roof edge when the surrounding area is snow-covered, as the roof edge may not be clearly visible.
- Use proper stacking procedures to ensure sufficient stability of the rolls.
- Exercise caution when walking on wet membrane. Membranes may be slippery when wet.
- Store membrane in the original undisturbed plastic wrap in a cool, shaded area and cover with light-colored, breathable, waterproof tarpaulins. Membrane that has been exposed to the weather must be prepared with Weathered Membrane Cleaner prior to hot-air welding.
- Take care not to stand or place heavy objects on the edge of folded-over membrane, as this could cause a hard crease in the membrane.
- Maximum sustained temperature not to exceed 160°F (71°C) for TPO membrane.
- Do not use razor blades or other sharp tools to cut the APEEL Protective Film while it is still adhered to the TPO membrane as damage to the underlying membrane may occure. Pull the protective film away from the membrane prior to cutting.
- Remove APEEL Protective Film by pulling towards the center of the roof. Do not remove the film by pulling towards the roof edge.
- A static electric charge may develop when removing APEEL Protective Film from the surface of the membrane sheet. To avoid the possibility of ignition, lids must be closed on any flammable products and a fire extinguisher should be readily available.
- Color membranes will 'fade' over time mainly due to the ultraviolet portion of sunlight. Since most roof surfaces are exposed to variable sunlight, some areas will be more susceptible to color changes caused by UV fading. Warranties for color membranes do not cover fading of colors.

EXTREME Testing for Severe Climates

ASTM Standard D6878 is the material specification for Thermoplastic Polyolefin-Based Sheet Roofing. It covers material property requirements for TPO roof sheeting and includes initial and aged properties after heat and xenon-arc exposure. As stated in the scope of the standard, "the tests and property limits used to characterize the sheet are values intended to ensure minimum quality for the intended purpose." Carlisle's goal is to produce TPO that delivers maximum performance for the intended purpose of roofing membranes. Maximum performance requires the membrane to far exceed the requirements of ASTM D6878.

Heat Aging accelerates the oxidation rate that roughly doubles for each 18°F (10°C) increase in roof membrane temperature. Oxidation (reaction with oxygen) is one of the primary chemical degradation mechanisms of roofing materials.

Carlisle Testing – Heat Aging

	ASTM Requirement	Sure-Weld Requirement
ASTM TEST 240°F	32 weeks**	52 weeks

**Comparable to 1,024 weeks (20 years) at 185°F for 6 hours/day.

- Test specimen is a 1" by 4" piece of 45-mil membrane unbacked, placed in circulating hot-air oven.
- Criterion – no visible cracks after bending aged test specimen around 0.25"-diameter mandrel.

Xenon-arc exposes the membrane samples to the combined effect of UV, visible and infrared radiation as well as ozone, heat and water spray to greatly accelerate the effects of outdoor weathering. The radiation dose is measured in kilojoules per square meter (kJ/m^2) at 340 nm machine UV wavelength. The irradiance power of the xenon-arc lamp is measured in watts per square meter (W/m^2).

Carlisle Testing – Xenon-Arc

	Sure-Weld Results			
ASTM TEST	**ASTM D6878 Requirement**	**45-mil**	**60-mil**	**80-mil**
kJ/m^2 at 340 nm	10,080	17,640	20,160	27,720

- Test specimen is a 2.75" by 5.5" piece of membrane, unbacked, weathering side facing arc lamp.
- Criterion – no visible cracks when viewed under 10x magnification while wrapped around 3"-diameter mandrel.

CARLISLE SYNTEC SYSTEMS

Sure-Weld TPO
Reinforced Membrane

Environmental Cycling subjects the membrane to repeated cycles of heat aging, hot-water immersion, and xenon-arc exposure.

» ASTM requirement – none

» Carlisle EXTREME test*:

- 10 days heat aging at 240°F (116°C) followed by
- 5 days water immersion at 158°F (70°C) followed by
- 5,040 kJ/m² (2000 hours at 0.70 W/m² irradiance) xenon-arc exposure

*Test specimen is 2.75" by 5.5" piece of membrane with edges sealed.

*Criterion – after 3 complete cycles, test specimens shall remain flexible and not have any cracking under 10x magnification while wrapped around a 3"-diameter mandrel.

Supplemental Approvals, Statements and Characteristics:

1. Sure-Weld TPO meets or exceeds the requirements of ASTM D6878 Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing.
2. Radiative Properties for ENERGY STAR, Cool Roof Rating Council (CRRC) and LEED.
3. Sure-Weld TPO membranes conform to requirements of the US E.P.A. Toxic Leachate Test (40 CFR part 136) performed by an independent analytical laboratory.
4. Sure-Weld TPO was tested for dynamic puncture resistance per ASTM D5635-04 using the most recently modified impact head. 45-mil was watertight after an impact energy of 12.5 J (9.2 ft-lbf) and 60-mil was watertight after 22.5 J (16.6 ft-lbf). 80-mil EXTRA was watertight after an impact energy of 30.0 J (22.1 ft-lbf).

Radiative Properties for ENERGY STAR*, and LEED

	Test Method	White TPO	Tan TPO	Gray TPO
ENERGY STAR – Initial solar reflectance	Solar Spectrum Reflectometer	0.79	0.71	N/A
ENERGY STAR – Initial solar reflectance after 3 years	Solar Spectrum Reflectometer (uncleaned)	0.70	0.64	N/A
CRRC – Initial solar reflectance	ASTM C1549	0.79	0.71	0.46
CRRC – Solar reflectance after 3 years	ASTM C1549 (uncleaned)	0.70	0.64	0.43
CRRC – Initial thermal emittance	ASTM C1371	0.90	0.86	0.89
CRRC – Thermal emittance after 3 years	ASTM C1371 (uncleaned)	0.86	0.87	0.88
LEED – Thermal emittance	PASS	0.90	0.86	0.85
SRI - Initial (Solar Reflectance Index)		99	86	53
SRI - 3 year aged (Solar Reflectance Index)		85	77	48

Solar Reflectance Index (SRI) is calculated per ASTM E1980. The SRI is a measure of the roof's ability to reject solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. Materials with the highest SRI values are the coolest choices for roofing. Due to the way SRI is defined, particularly hot materials can even take slightly negative values and particularly cool materials can even exceed 100.

*ENERGY STAR recommends that using the Roof Savings Calculator (rsc.ornl.gov), which factors in both heating and cooling costs, to determine whether a cool roof will be an energy efficient choice for your geographic climate and building type.

LEED Information

Pre-consumer Recycled Content	10%
Post-consumer Recycled Content	0%
Manufacturing Location	Senatobia, MS Tooele, UT Carlisle, PA
Solar Reflectance Index (SRI)	99 (white) 86 (tan)

800-479-6832 | P.O. Box 7000 | Carlisle, PA 17013 | Fax: 717-245-7053 | **www.carlislesyntec.com**

CARLISLE SYNTEC SYSTEMS

Sure-Weld® TPO
Roofing Systems

TPO Competitive Test Programs

Summary of Results

Architectural Testing

All testing was conducted by an independent laboratory.

Carlisle chose to utilize an independent laboratory to conduct all testing to add credibility to the study. Membrane was purchased from various sources but was always acquired through the same channel a roofing contractor would use. One roll of each competitor's membrane was selected and various samples were cut from these rolls.

The Tests

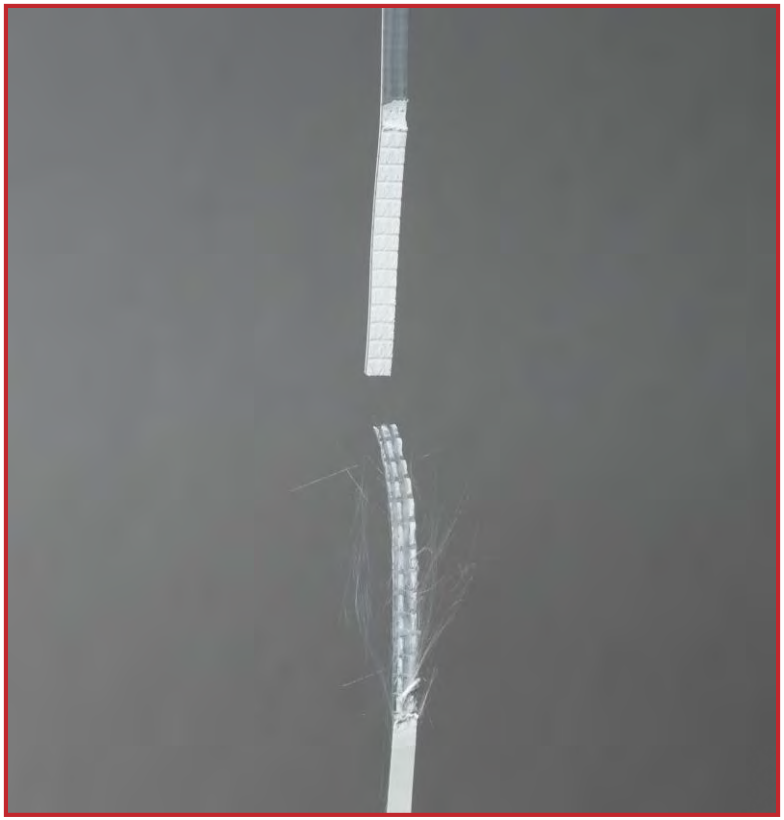
- Seam Strength
- Flexibility
- Weldability
- Breaking Strength
- Tearing Strength
- Thickness Over Scrim
- Puncture Resistance
- Chemical Analysis
- Heat Aging @ 240°F

This list represents the actual physical properties that were evaluated. Each of these physical properties affects the service life of the roofing system in some way.

Seam Strength

Seam Peel Strength Test

Seam Strength



Desired Mode of Failure
During Seam Peel Strength
Test – Ply-to-Ply Separation

Seam Strength

Simulated Wind Uplift Test - The stronger the seam, the greater the uplift resistance.

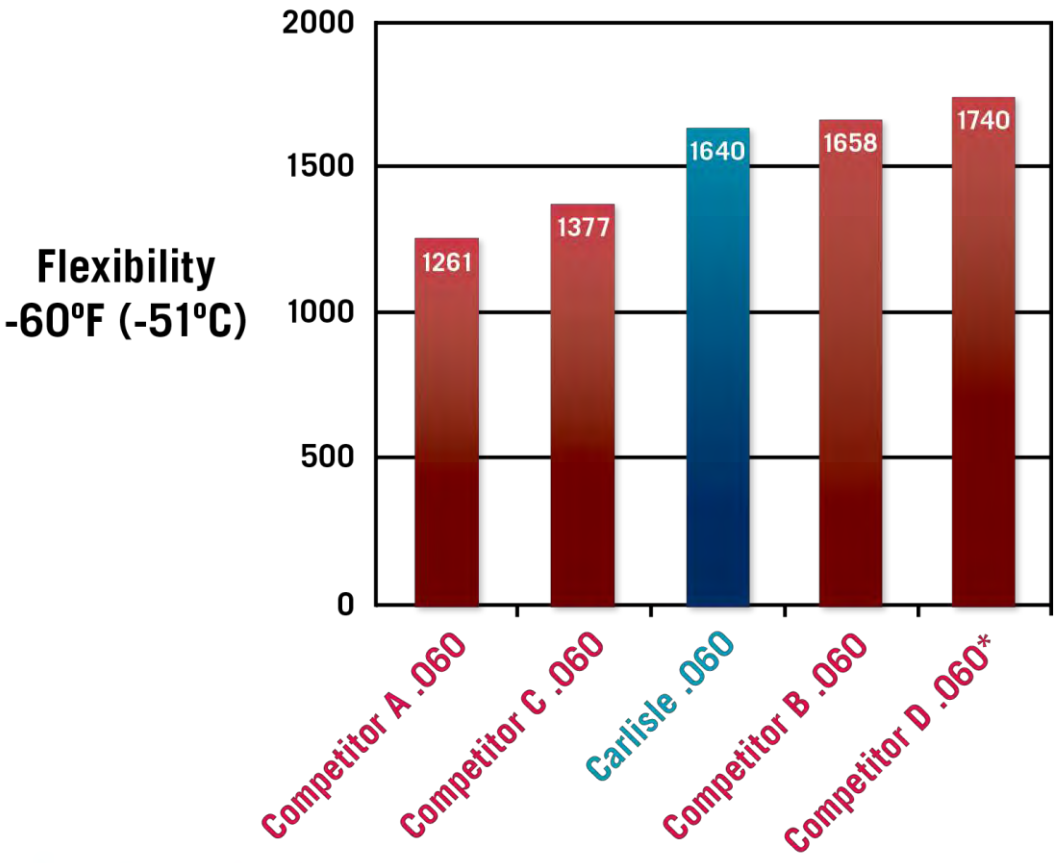
Seam Strength

SEAM STRENGTH MEASURED IN LBF/IN

	Carlisle				Competitor A				Competitor B			
Speed Ft/M	7.9	10.5	13.5	16.1	7.9	10.5	13.5	16.1	7.9	10.5	13.5	16.1
806°F	61	65	64	65	35	40	38	43	57	60	57	58
1004°F	62	64	68	62	39	44	39	38	60	60	58	58
1148°F	65	64	68	66	41	39	38	43	65	61	56	57

A chain is only as strong as its weakest link. It is extremely important that the seam of a TPO roofing system does not become that weak link. If welded properly the seam areas should be stronger than the sheet itself. A wide range of weldability will help ensure a solid seam at various temperatures and conditions without adjusting speeds and temperatures of the welder.

Flexibility



In a recent survey contractors listed ease of installation as the physical characteristic that they use most often to determine which membrane they prefer to install. Ease of installation is defined in part by flexibility. The more flexible the membrane, the easier it is to complete details and install the membrane.

*Competitor D is a premium-priced product compared to the other 4 samples.

Window of Weldability

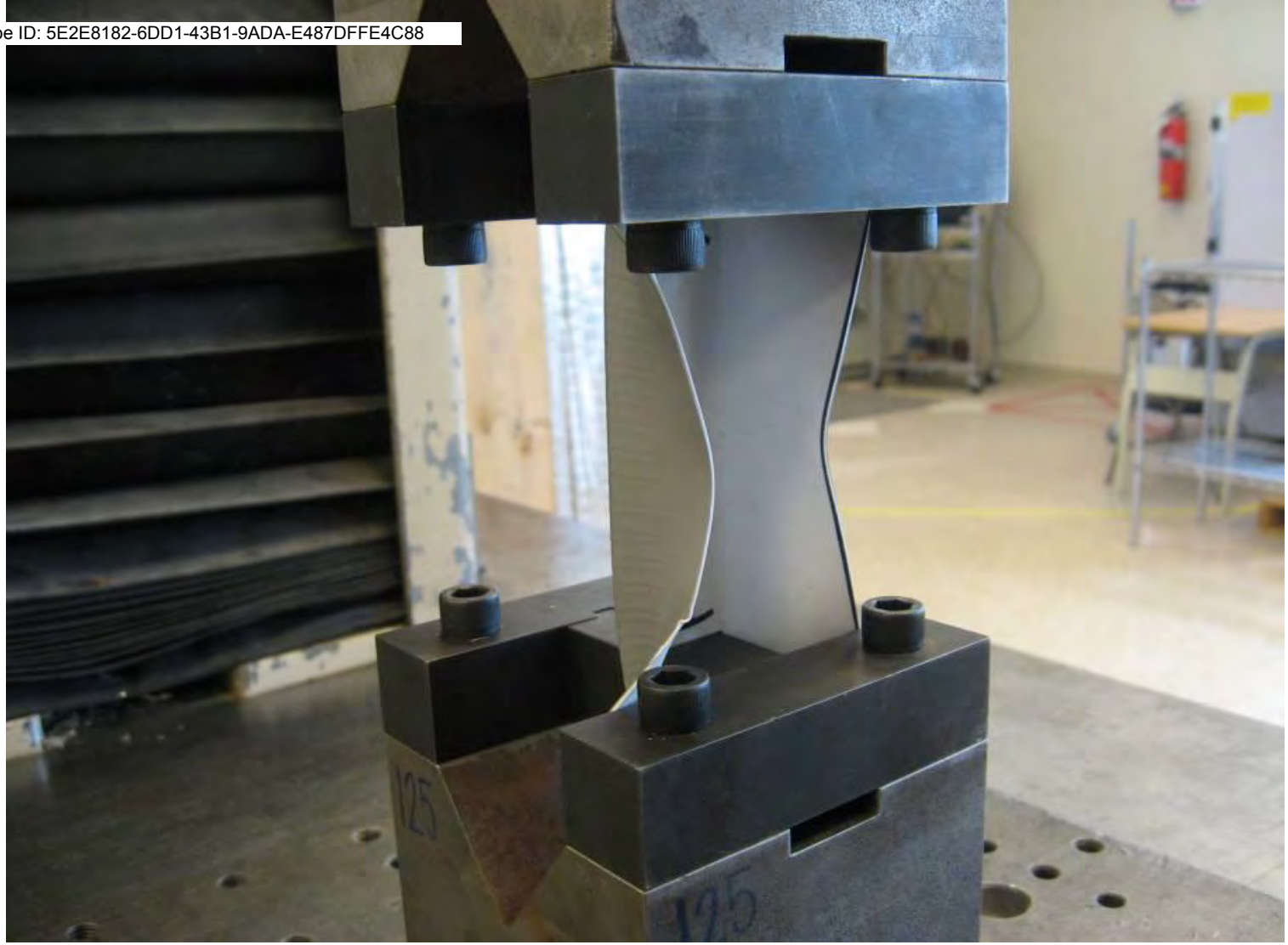
SEAM STRENGTH MEASURED IN LBF/IN

	Carlisle				Competitor A				Competitor B			
Speed Ft/M	7.9	10.5	13.5	16.1	7.9	10.5	13.5	16.1	7.9	10.5	13.5	16.1
806°F	61	65	64	65	35	40	38	43	57	60	57	58
1004°F	62	64	68	62	39	44	39	38	60	60	58	58
1148°F	65	64	68	66	41	39	38	43	65	61	56	57

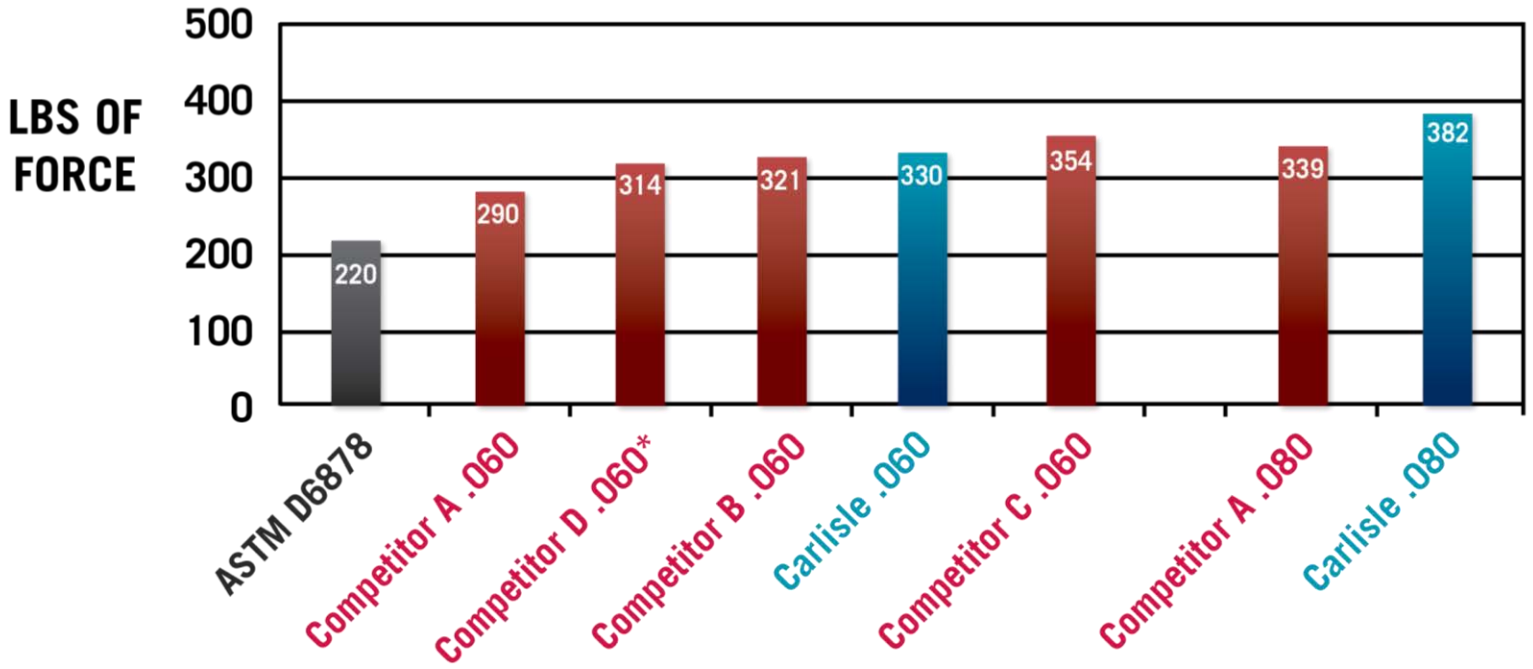
A wide window of weldability will help ensure a solid seam is created at various ambient temperatures and weather conditions without adjusting speeds and temperatures of the welder. In addition to more consistent seaming, a wide window of weldability provides labor savings and an easier to install roofing system

Breaking Strength

Breaking Strength Test



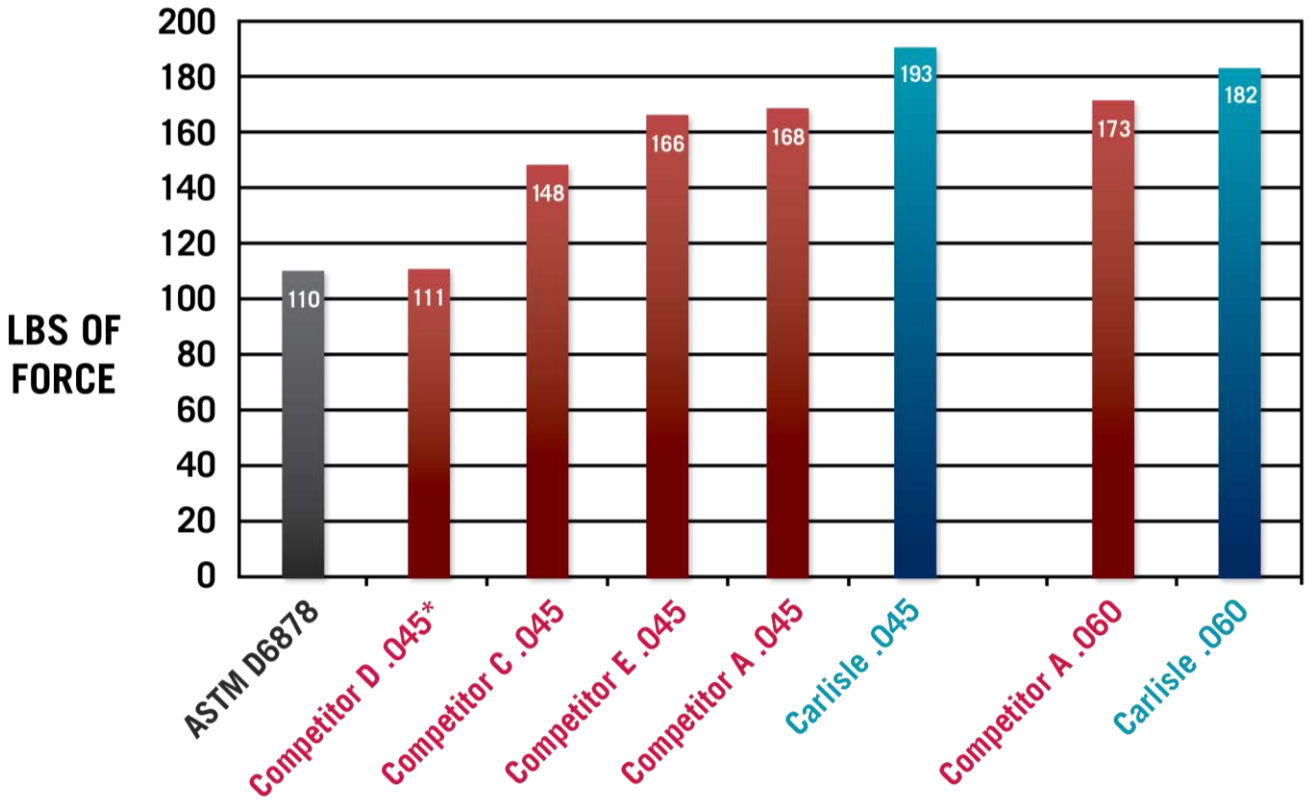
Average Breaking Strength



A majority of TPO roofing systems that are installed are mechanically fastened to the roof deck. Breaking strength is a critical measurement of a sheet's strength if the membrane is ever subjected to extreme forces, such as excessive wind, against the fasteners that hold it in place. The ASTM breaking strength test consists of a machine pulling the membrane in opposite directions and recording the amount of force necessary to create membrane failure. This test is performed both across the sheet (cross direction) and lengthwise (machine direction). The numbers above represent the average of the machine and cross direction results.

*Competitor D is a premium-priced product compared to the other 4 samples.

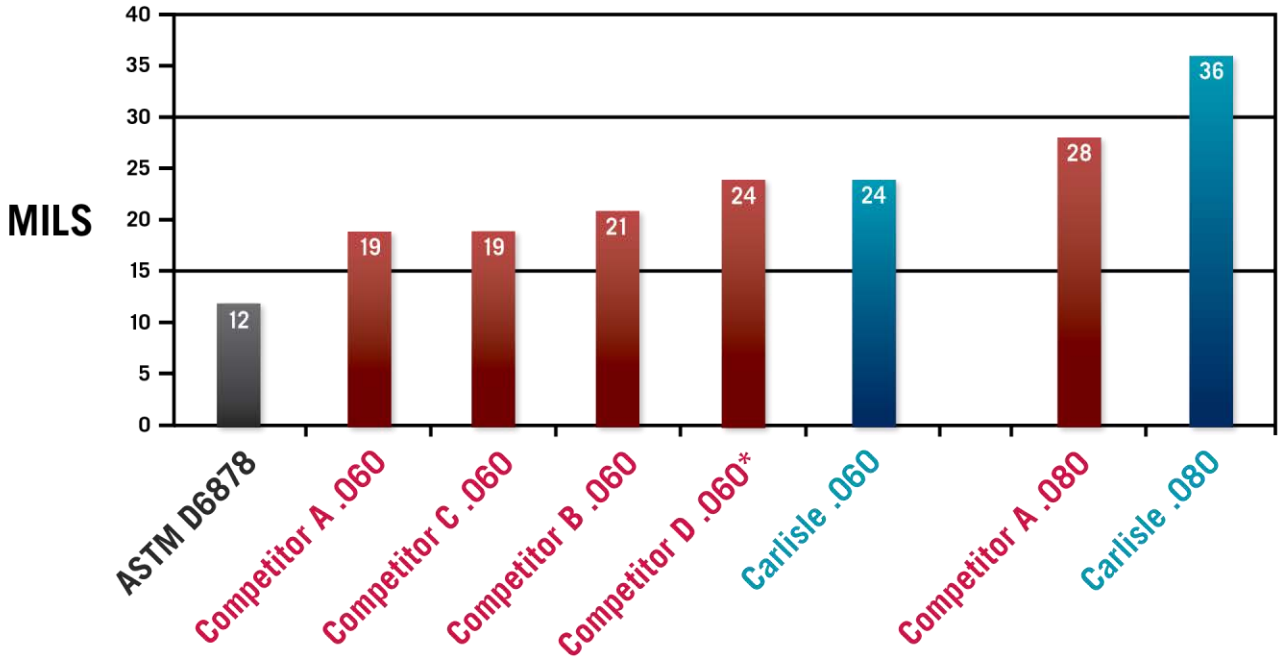
Tearing Strength



Tearing strength is very similar to breaking strength and its importance is just as critical. Tearing strength is a measurement of how much force is required to rip the membrane from the edge, as opposed to breaking strength which involves pulling opposite ends of the sheet in different directions. Tearing strength results are also measured by adding the results of the force required to tear the sheet both across and down the sheet. The main benefit to a high tearing strength value is experienced when a small cut in the membrane occurs. By having high tearing strength a small cut is less likely to become a large tear, which can lead to excessive damage.

*Competitor D is a premium-priced product compared to the other 4 samples.

Thickness Over Scrim

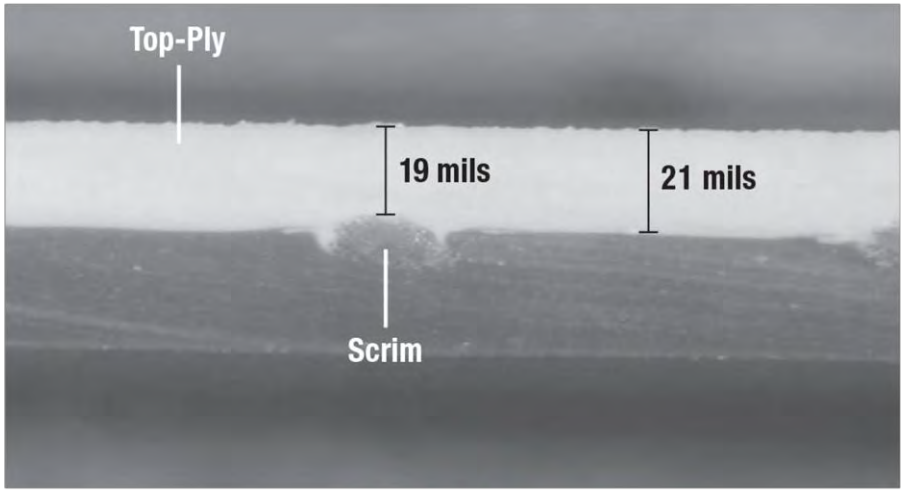


While it's important to have a thick sheet, which is measured in the "Thickness Overall" test, "Thickness Over Scrim" measures the top-ply of the TPO membrane. TPO consists of a top-ply, scrim in the middle and a bottom ply. The top-ply is the front line of defense against the elements and the usable life of the membrane is compromised when the scrim is exposed. Thickness over scrim is a critical measurement when evaluating the potential longevity of a TPO roofing system.

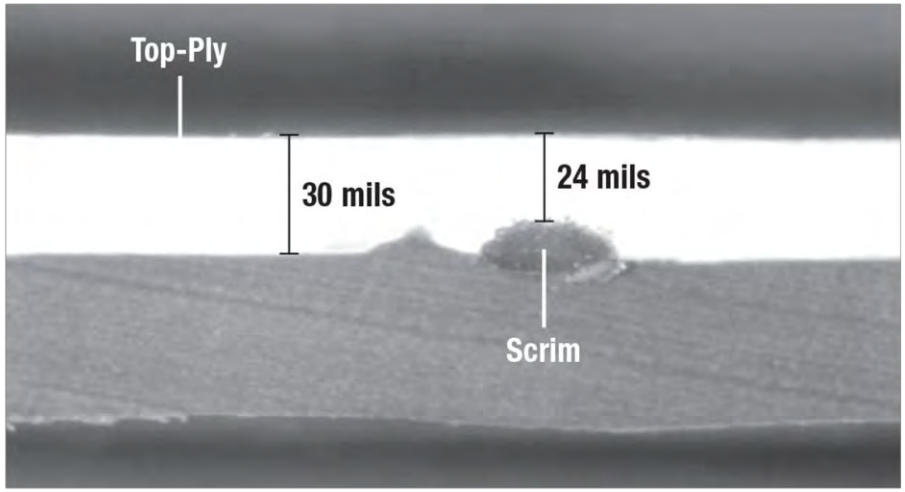
*Competitor D is a premium-priced product compared to the other 4 samples.

Thickness Over Scrim

CROSS-SECTION OF TPO MEMBRANE



Competitor B



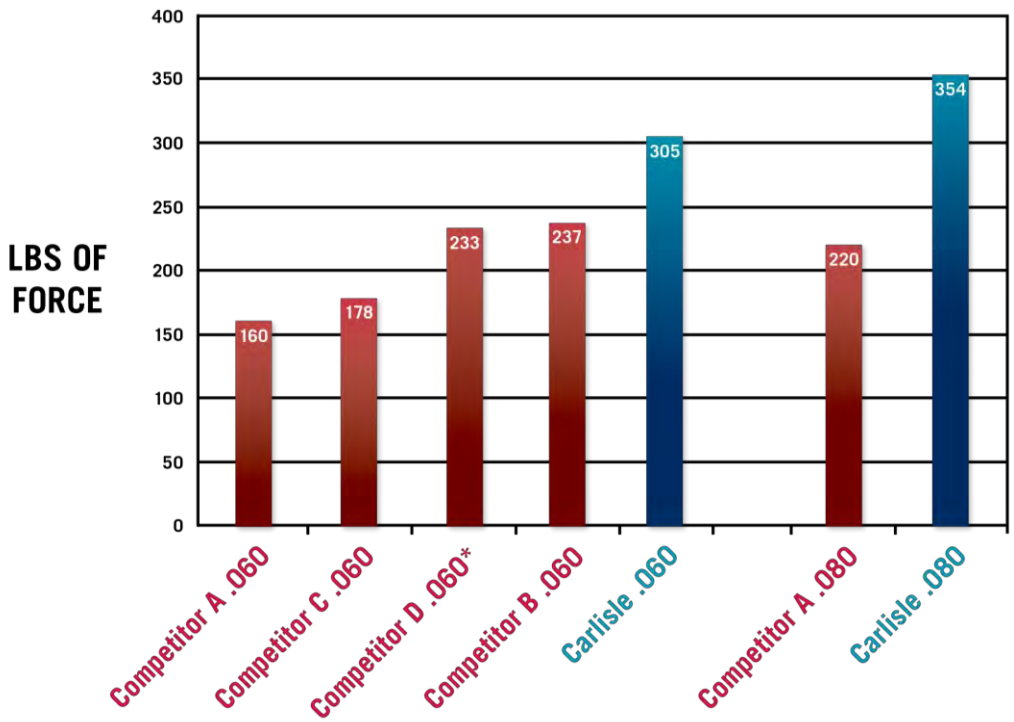
Carlisle Sure-Weld TPO

The top-ply of your TPO membrane is the first line of defense your building has against harmful weather. Thickness over scrim measurements can be misleading if the scrim is not properly embedded in the top and bottom ply.

Puncture Resistance

There are many reasons to have a membrane with high puncture resistance.

Puncture Resistance



On a properly installed TPO roofing system a common way for leaks to occur is through punctures in the membrane. By ensuring that the membrane installed has high puncture resistance and the manufacturer has the ability to provide an accidental puncture warranty, leaks due to punctures in the membrane can be mitigated and handled in a timely manner.

*Competitor D is a premium-priced product compared to the other 4 samples.

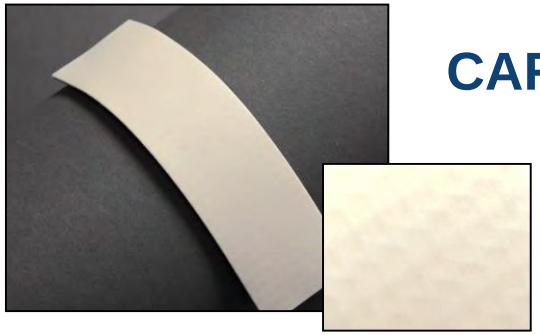
Carlisle Offers a Superior Weathering Package in Every TPO Membrane it Offers

OCTAGUARD XT™
WEATHERING PACKAGE

OctaGuard XT is comprised of 8 Heat and UV stabilizers as well as antioxidents.

ASTM Has Increased The Requirement For Heat Aging

- ASTM 2009 minimum 4 weeks @ 240°F
- ASTM 2012 minimum 32 weeks @ 240°F

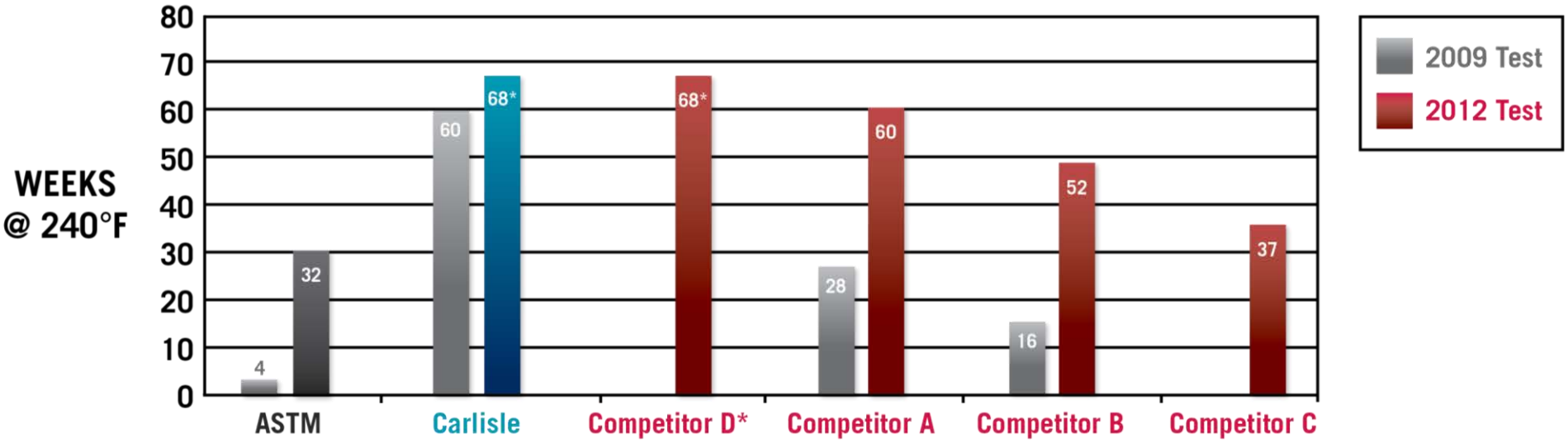


CARLISLE - 68 WEEKS No Failure

OCTAGUARD XT™
WEATHERING PACKAGE

*32 weeks @ 240° F = 20 years @ 185° F for 6 hours per day

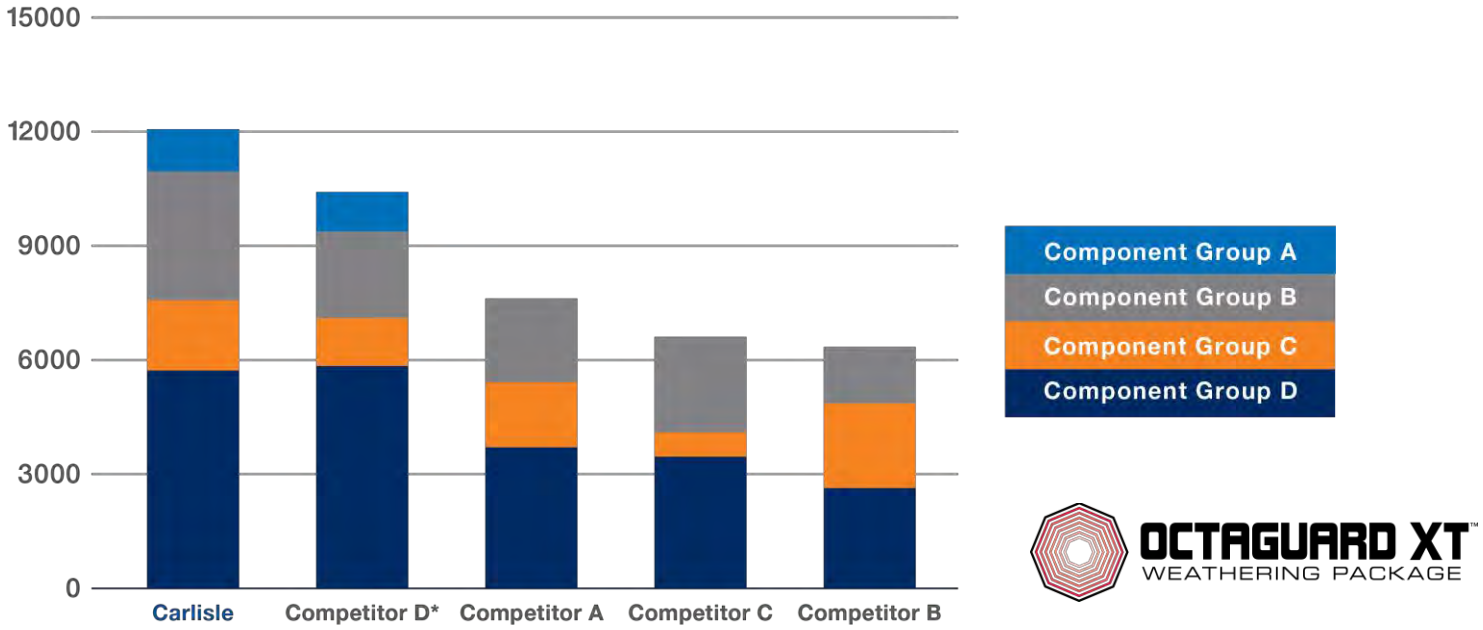
Heat Aging 240°F



Heat aging has been directly tied to the long-term performance of TPO. In 2011 ASTM increased the heat aging requirement for D6788 (Standard Specification for Thermplastic Polyolefin Based Sheet Roofing) from 4 weeks at 240°F to 32 weeks at 240°F, an 800% increase. Carlisle has been at the forefront of the movement to increase heat aging requirements for TPO. Carlisle's Sure-Weld was able to nearly double the heat aging requirement of the improved standard long before it went into effect.

*Competitor D is a premium-priced product compared to the other 4 samples.

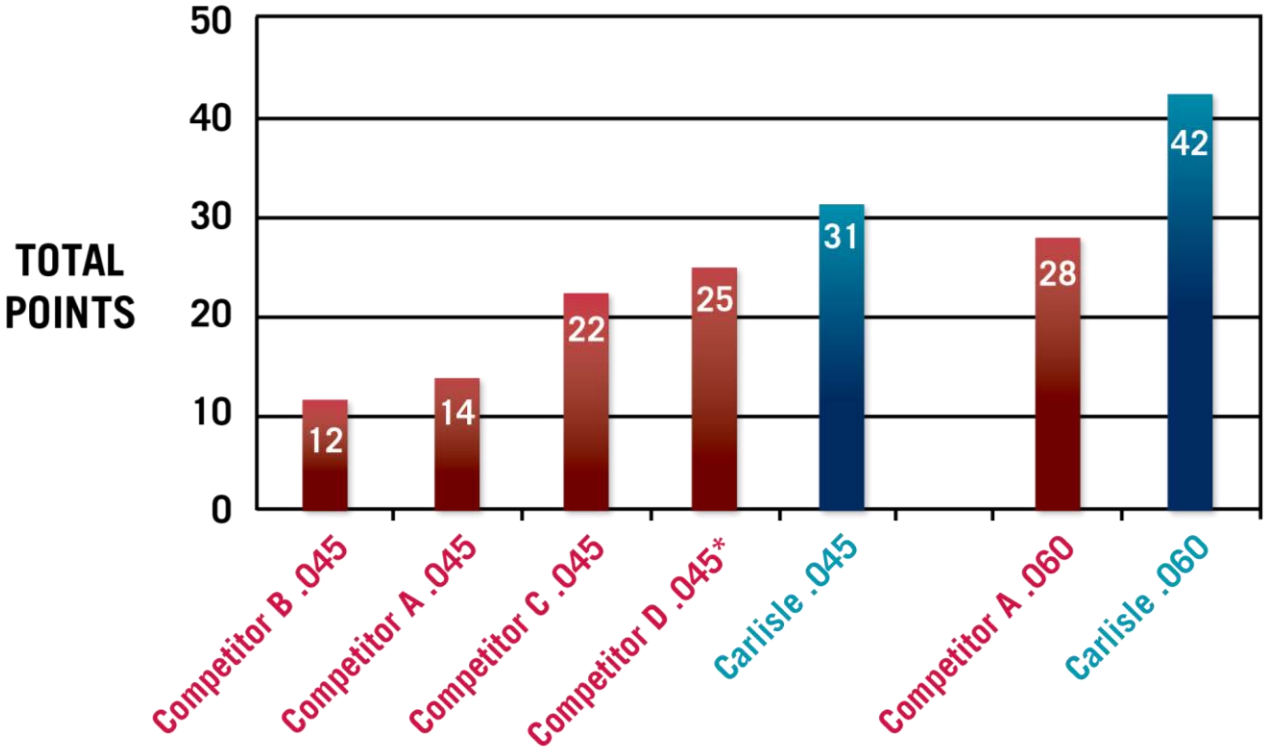
Weathering Package



Carlisle has been at the forefront of TPO development for nearly 20 years and continues to lead the industry with its high-performance OctaGuard XT weathering package that is incorporated into all Sure-Weld membrane and accessories. OctaGuard XT weathering package technology is comprised of eight performance-enhancing ingredients, including three heat-stabilizing antioxidants and three UV light stabilizers as well as organic and inorganic UV absorbers. When combined, these eight ingredients provide a weathering package second to none in the TPO industry.

*Competitor D is a premium-priced product compared to the other 4 samples.

Rank by Properties



After compiling all of the test data, a ranking system was applied to each of the TPO membranes. Each test was given the same weight in terms of importance. For each of the tests, the sample that performed the worst was given a score of 1, and the sample that performed the best was given a score of 7. Therefore this table reflects the cumulative score of all the tests.

*Competitor D is a premium-priced product compared to the other 4 samples.

EXPERIENCE THE CARLISLE DIFFERENCE

CARLISLE SYNTEC SYSTEMS

Sure-Weld® TPO Roofing Systems

CASE STUDY

Carlisle & CSU: Caring for the Community

JOB PROFILE

PROJECT LOCATION:
Fort Collins, CO

SQUARE FOOTAGE:
44,300

ROOFING CONTRACTOR:
Front Range Roofing Systems, LLC

PROJECT DURATION:
9 Months

GENERAL CONTRACTOR:
Adolfson & Peterson Construction

ROOFING SYSTEM:
60-mil Sure-Weld TPO membrane fully adhered with TPO Bonding Adhesive

As the flagship campus of Colorado State University, CSU Fort Collins is a hub for academic research in a variety of fields, and strives to not only challenge its faculty and students but also provide for their physical and mental well-being. In fact, earlier this year, CSU Fort Collins opened a state-of-the-art health facility on its campus that rivals some of the most renowned universities in the service it provides not only to students and faculty but also the surrounding community.

Prior to 2016, the health system on campus provided excellent service but was split between three separate locations, limiting the efficiency of service and collaboration between service providers. In 2016, the university broke ground for a brand-new health care facility, which would house all of the CSU Health Network services under one roof.

When CSU began designing the new Health and Medical Center, they knew it would be a complex project and partnered with Adolfson & Peterson Construction to manage all of the moving pieces and make sure that the project was completed up to standard, on budget, and within schedule. A significant aspect to managing a project of this magnitude was choosing top-quality contractors and premium construction products. With more than 70 years of industry experience, Adolfson & Peterson Construction had the knowledge and expertise needed to meet and exceed CSU's expectations.

COLORADO STATE UNIVERSITY FORT COLLINS

CASE STUDY

COLORADO STATE UNIVERSITY FORT COLLINS

In a northern climate like Colorado, the rooftop of a building is of essential importance for both design and construction. The roof is often a building's first barrier against inclement weather—for example, snow and ice, which CSU Fort Collins experiences on a regular basis during the winter months. Choosing a roofing system that would withstand temperature fluctuations and snowstorms, provide optimal energy savings, and reduce the university's carbon footprint was a priority for the design team. That is why they chose a thermoplastic polyolefin (TPO) roofing membrane system manufactured by Carlisle SynTec Systems.

Carlisle SynTec's Sure-Weld TPO roofing membranes are extremely durable and are the industry's most highly reflective membrane, utilizing every solar ray for optimum energy efficiency. As such, Carlisle's white TPO membrane is ENERGY STAR® qualified and Cool Roof Rating Council (CRRC) certified.

In addition to enhanced energy efficiency, Carlisle's TPO is manufactured with the Octaguard XT™ weathering package. Comprised of eight performance-enhancing ingredients, including heat-stabilizing antioxidants, UV absorbers, and UV light stabilizers, Carlisle's unique weathering package offers long-term durability and performance.

The installation of the CSU Health and Medical Center roof began in August 2016 and was managed by Front Range Roofing Systems, LLC, a full-service roofing contractor based in Greeley, Colorado. With more than thirty years of experience installing Carlisle SynTec roofing systems, the team at Front Range Roofing Systems was ready to roll.

The installation crew began by installing a metal deck over the 44,300-square-foot facility, followed by two layers of Carlisle's two-and-a-half-inch polyiso insulation. A second layer of tapered polyiso insulation was added to increase the thermal efficiency of the building and avoid the potential for ponding water on an otherwise flat rooftop.

Next, a half-inch layer of DensDeck® Prime roof board was placed on top of the insulation and mechanically attached using Carlisle's plates and fasteners. The next steps were to apply TPO Bonding Adhesive to the roof board and roll out the 60-mil-thick TPO membrane on top. Last but not least, the installation crew installed Carlisle's TPO prefabricated accessories around pipes and drip edges to ensure premium, watertight performance and enhance the aesthetic appeal of the rooftop. As a finishing touch, Carlisle donated the materials necessary for printing the CSU ram logo directly onto the center of the TPO rooftop, making this stellar medical facility difficult to miss.

The entire rooftop installation was completed by May of 2017, and CSU celebrated the opening of its new Health and Medical Center with a ribbon-cutting ceremony in August. With all of their health services now under one roof, CSU is providing top-of-the-line healthcare not only to its students and faculty but also to members of the surrounding community. The four-story medical facility offers family medicine and counseling, occupational medicine and rehabilitation services, digital X-ray imaging, and health education, to name a few of its services. This is one $59 million project that will more than pay for itself in the love and care that CSU staff will now be able to provide each person who walks through their doors.

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