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SHAPING WHAT'S NEXT
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CAFA
Coated Abrasive Fabricators Association

Splicing of Abrasive Belts

Eric Johnson – Product Engineer
Robb Boros – Global Business Director

March 21, 2024

Agenda

- Purpose
- Introductions
- Splicing of Abrasive Belts
  - Splicing Tape Basics
  - Selecting a Splicing Tape Configuration
  - Selecting An Adhesive and Curative
- Product Testing
- Questions

Purpose

- Share Process and Product Options for Splicing Abrasive Belts.
- Group Discussion Around Product Applications and Innovation Needs.

Introductions

Sheldahl Team

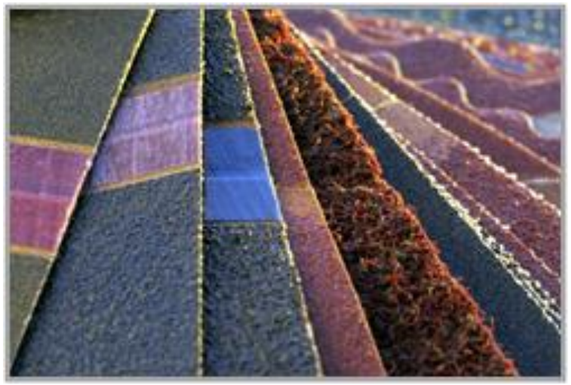
Robb Boros – Global Business Director

Eric Johnson – Product Engineering

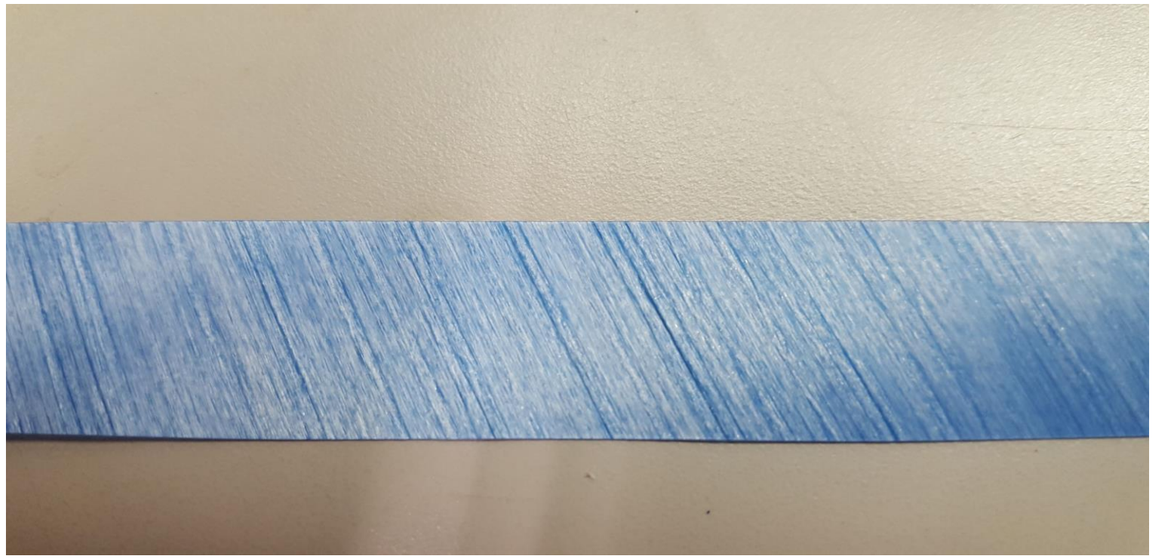
Unidirectional Abrasive Belt Splicing Tapes

- Used for splicing of coated abrasive and nonwoven abrasive belts
- Consists of high tenacity polyester yarns laminated to polyester film
- Tape is **biased** so that reinforcing yarn filaments run parallel to the belt direction for maximum strength

- **Uncoated Splicing Tapes**
  - Yarn surface is pre-primed to obtain maximum bond strength when used with customer applied thermosetting adhesive
- **Coated Splicing Tapes**
  - An exact thickness of dry, thermosetting adhesive is pre-applied to the yarn surface of the tape
- **Abrasive Belt Adhesives**
  - Polyurethane adhesives specifically designed for the splicing of abrasive belts; used in conjunction with an isocyanate curing agent as a two-component system



EXAMPLE OF UNIDIRECTIONAL SPLICING TAPE



SHELDAHL T1884 BLUE UNCOATED TAPE

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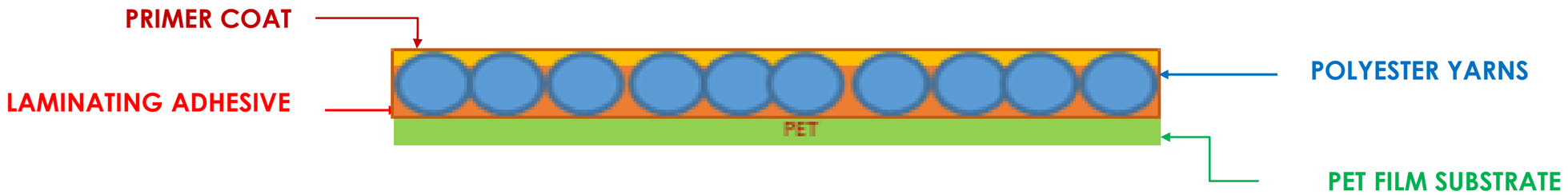
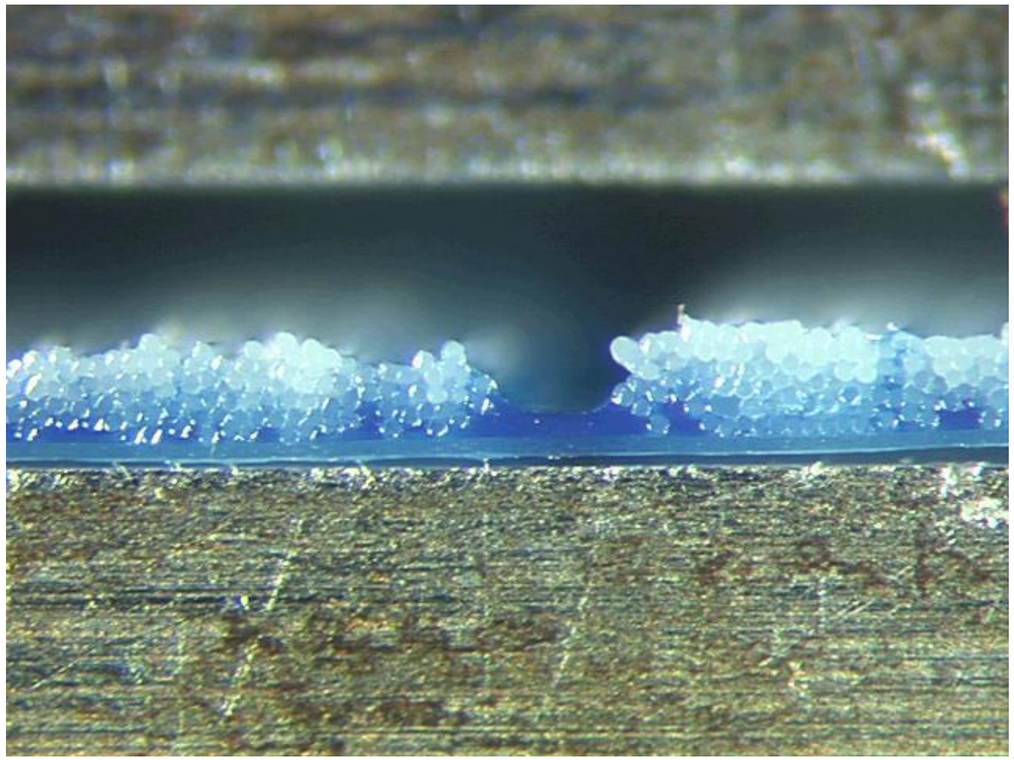
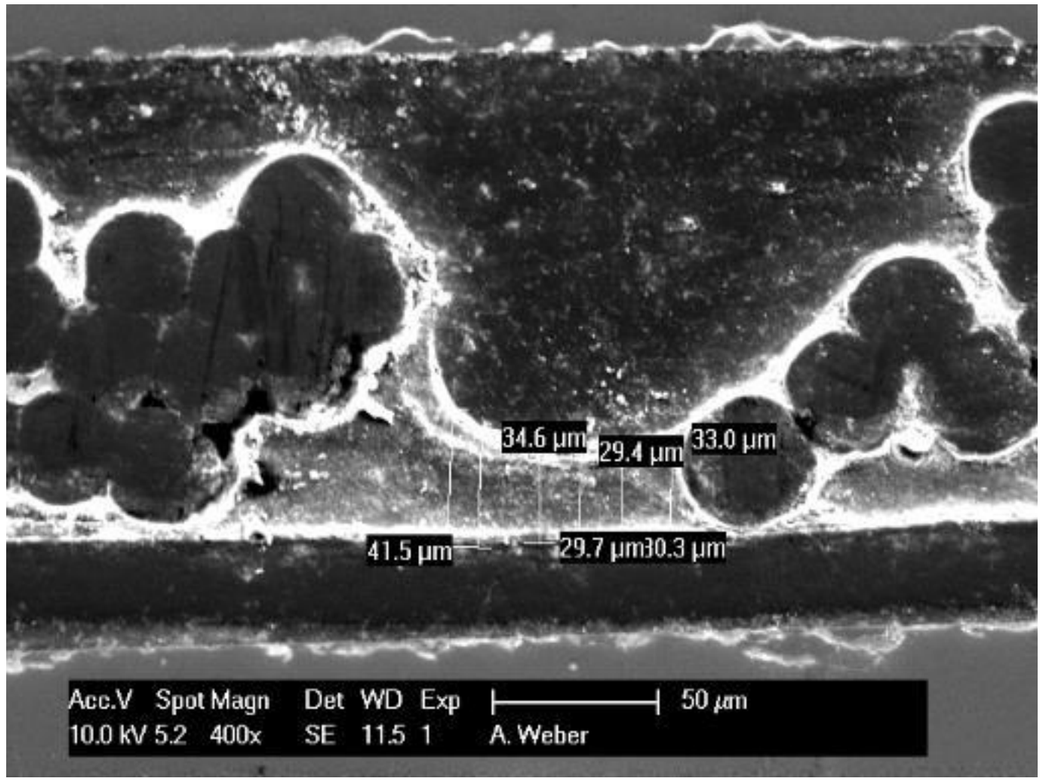
UNI TAPE CROSS SECTION







Selecting a Splicing Tape

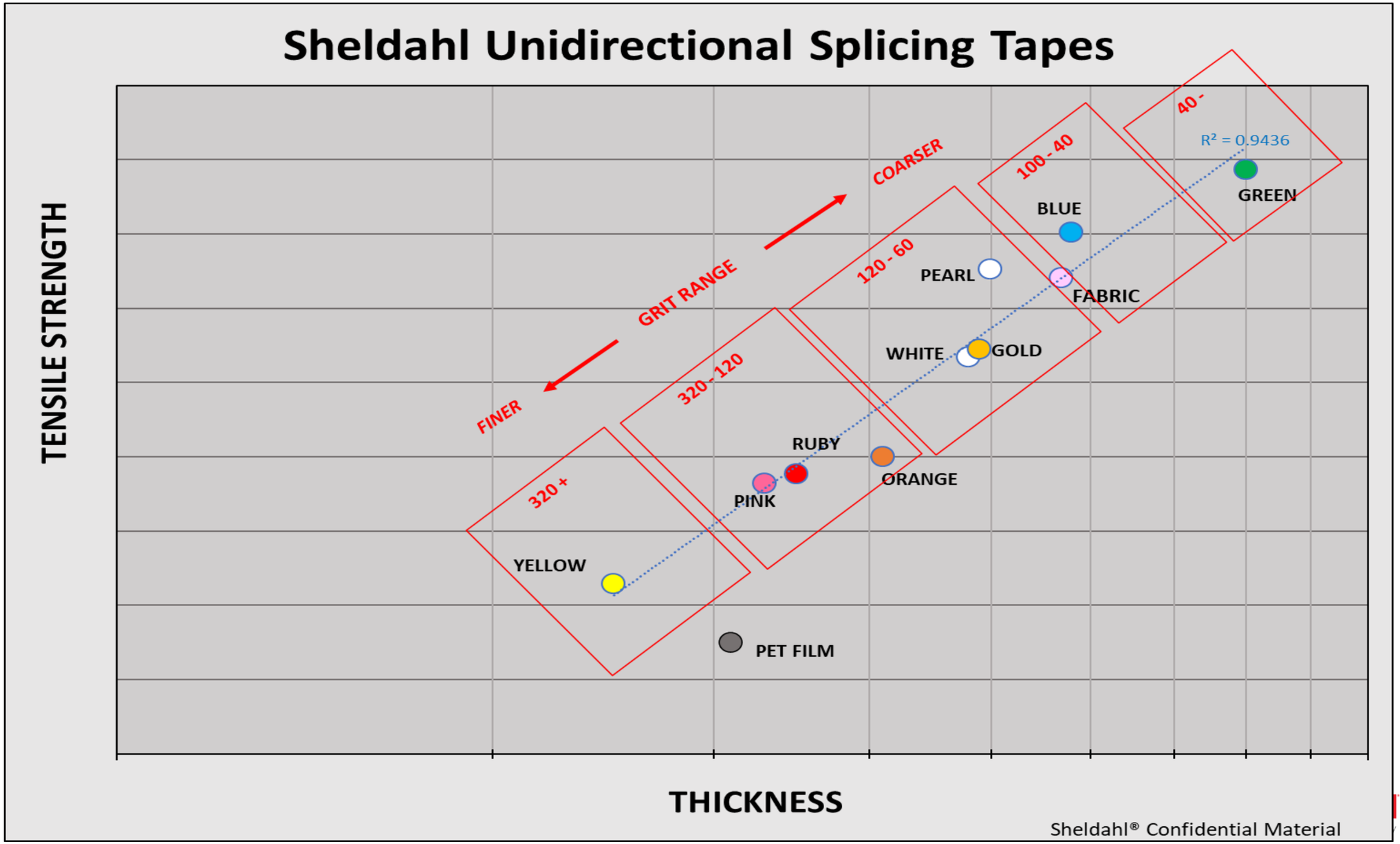
What Type of Belt Am I Trying to Splice?

- Grit Size
- Belt Substrate Material
- Belt Width

What Type of Tape Do I Need?

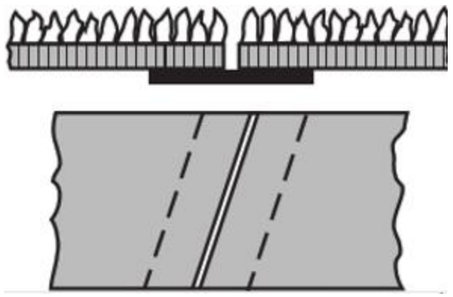
- Tensile Strength vs. Thickness

Tensile Strength vs. Thickness

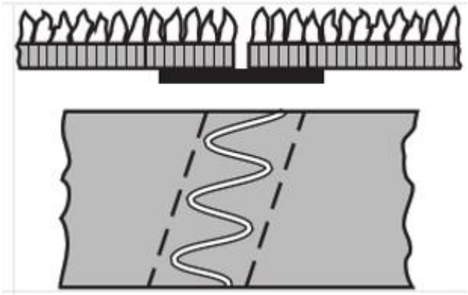


What Type of Splice Am I Going to Use?

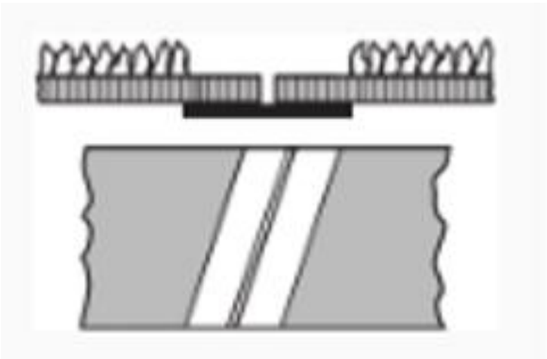
BASIC JOINT TYPES USING SPLICING TAPE



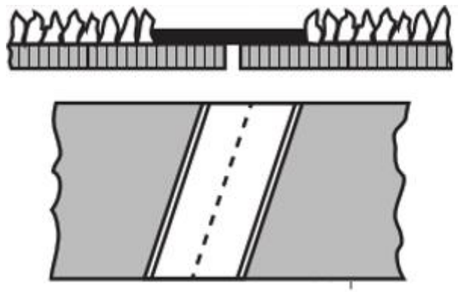
BUTT SPLICE



SINE-LOCK SPLICE



TOP SKIVE



TAPE ON TOP

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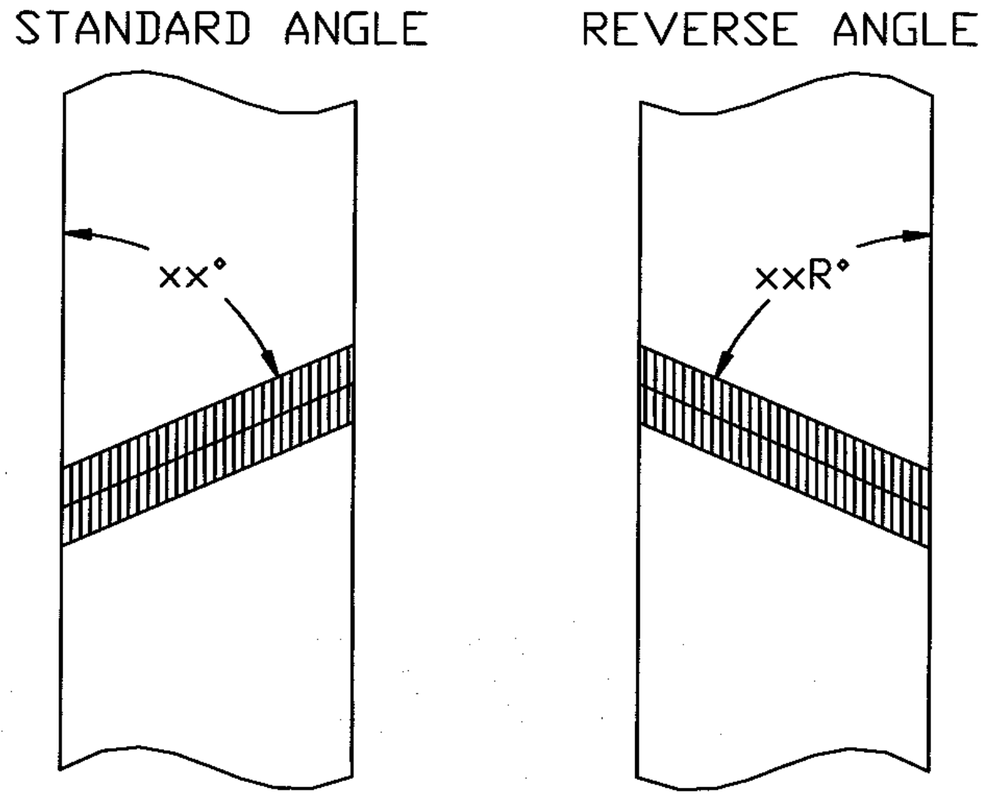
What Bias Angle Do I Want?

- 45 to 90 degrees
- 55, 67, 75 most common
- Standard or Reverse Angle?



What Width Tape Do I Need?

- 10mm to 38mm (0.4" to 1.5")
- Most common: 19mm / 22mm / 25.4mm (3/4"; 7/8"; 1.0")

When Would I Choose a Specialty Splicing Tape?

- High Temperature Durability / Abrasion Resistance
- Higher Tensile Strength / Durability
- Greater Flexibility

What Volume of Belts Am I Going To Process?

- Small or large scale production?
- Manual or automated processes?

Where Am I Going To Run This Operation?

Do I Use Coated Tape or Uncoated Tape?

COATED (FREEZER) TAPES

PROS
- EASE OF APPLICATION
    - NO COATING OF ADHESIVE ONTO TAPE
- INCREASED EFFICIENCY
- PRECISELY CONTROLLED ADHESIVE WEIGHT
- HIGHER GREEN STRENGTH

CONS
- HIGHER COST
- MUST BE KEPT AT -20 ^{0}F (-28 ^{0}C)
    - TRANSPORT AND STORAGE COST
- STORAGE TIME OF 90 DAYS MAX
- NEED HEATED PRESS
- WORKING TIME OF 6 HOURS

UNCOATED TAPES

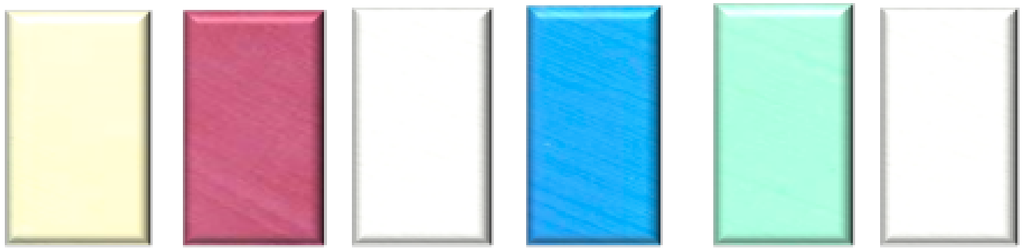
PROS
- LOWER COST
- CAN BE STORED AT AMBIENT TEMPERATURE
    - EASY TO STORE AND TRANSPORT
- SHELF LIFE OF AT LEAST 1 YEAR OR MORE
- CAN USE COLD PRESS

CONS
- MUST APPLY ADHESIVE TO TAPE IN HOUSE
    - TAPE COATING PROCESS
- ADHESIVE COST
- NEED LARGER ADHESIVE MIX OPERATION
- LOWER GREEN STRENGTH

Standard Uncoated Abrasive Belt Splicing Tapes

Uncoated tapes are pre-primed to obtain maximum bond strength when using a thermosetting adhesive. The standard products consist of polyester film reinforced with polyester yarns. Below is listed our standard product line with suggested applications.

T1930	T1880	T1882	T1884	T1886	T1878
Yellow	Pink	White	Blue	Green	Fabric
320 grit and finer	320 – 120 grit	120 – 60 grit	100 – 40 grit	40 grit and coarser	All grits



SPECIFICATION

Model Number	Tape Thickness (Max.)		Tensile Strength (Min.)		Application Notes
	Metric	English	Metric	English	
T1930	0.069 mm	0.0027"	175 N/cm	100 lbs./in.	Ultra thin; for finest grit applications; paper / cloth backed
T1880	0.094 mm	0.0037"	290 N/cm	165 lbs./in.	Very thin; versatile; high flex
T1882	0.145 mm	0.0057"	402 N/cm	230 lbs./in.	Most versatile combination of tensile strength & flex
T1884	0.185 mm	0.0073"	542 N/cm	310 lbs./in.	High tensile strength plus flex performance
T1886	0.239 mm	0.0094"	595 N/cm	340 lbs./in.	Stiff; highest tensile; strong abrasion and hinge resistance
T1878	0.178 mm	0.0070"	420 N/cm	240 lbs./in.	Extremely flexible; for air tools, surface conditioning, non-wovens

Standard Bias Angle: 55°, 67°, 75° (reverse angles indicated by the letter "R"
Standard Roll Widths: 19 mm (¾") and 25.4 mm (1")
Standard Roll Lengths: 100 meter (200 meter available)

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Specialty Uncoated Abrasive Belt Splicing Tapes

Uncoated tapes are pre-primed to obtain maximum bond strength when using a thermosetting adhesive. Below is our Specialty product line with suggested applications.

T900800*	T1881	T1883	T9062	T9071
Clear Film	Orange	Gold	Ruby	Pearl White
Paper or Polishing Belts, No yarn profile	120 grit or finer	120 grit to 60 grit	120 grit or finer	120 grit to 60 grit

SPECIFICATION

Model Number	Tape Thickness (Max.)		Tensile Strength (Min.)		Application Notes
	Metric	English	Metric	English	
T900800*	0.080 mm	0.0031"	130 N/cm	75 lbs./in.	Paper or polishing belts, no yarn profile
T1881	0.107 mm	0.0042"	290 N/cm	165 lbs./in.	Ultimate abrasion and heat resistance
T1883	0.145 mm	0.0057"	402 N/cm	230 lbs./in.	Ultimate abrasion and heat resistance
T9062	0.102 mm	0.0040"	290 N/cm	165 lbs./in.	Thin, highest flex & rougher surface
T9071	0.152 mm	0.0060"	490 N/cm	280 lbs./in.	Most versatile, superior strength & rougher surface

Standard Bias Angle: 55°, 67°, 75° (reverse angles indicated by the letter "R"
Standard Roll Widths: 19 mm (¾") and 25.4 mm (1")
Standard Roll Lengths: 100 meter (200 meter available)

Standard Coated Abrasive Belt Splicing Tapes

Coated Tape has an exact thickness of dry, thermosetting adhesive applied to the yarn surface of the tape. The expected results when using this tape are reduced splice thickness, increased joint consistency, reduced labor and decrease solvent usage.

T1931	T1787	T1789	T1641	T1727
Yellow	Pink	White	Blue	Green
320 grit and finer	320 - 120 grit	120 - 60 grit	100 - 40 grit	40 grit and coarser

SPECIFICATION

	Tape Thickness (Max.)		Tensile Strength (Min.)		Application Notes
Model Number	Metric	English	Metric	English	
T1931	0.069 mm	0.0027"	175 N/cm	100 lbs./in.	Ultra thin; for finest grit applications; paper / cloth backed
T1787	0.094 mm	0.0037"	290 N/cm	165 lbs./in.	Thin; versatile; highest flex
T1789	0.145 mm	0.0057"	402 N/cm	230 lbs./in.	Most versatile combination of tensile strength & flex
T1641	0.185 mm	0.0073"	542 N/cm	310 lbs./in.	High tensile strength plus flex performance
T1727	0.239 mm	0.0094"	595 N/cm	340 lbs./in.	Stiff; highest tensile; strong abrasion and hinge resistance

Standard Bias Angle: 55°, 67°, 74° and 80° (reverse angles indicated by the letter "R" afte
Standard Roll Widths: 19 mm (¾") and 25.4 mm (1")
Standard Roll Lengths: 76 meters (152 meters available)

NOTE:
Tape Storage and Shipment: Coated tapes are shipped in insulated cartons with dry ice.
Rolls are individually packaged, with a desiccant, in a sealed plastic bag.
To assure a shelf life of 90 days tape, must be stored at -29°C (-20°F) or lower.
Please consult Customer Support for complete details about our products.

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Specialty Coated Abrasive Belt Splicing Tapes

Coated Tape has an exact thickness of dry, thermosetting adhesive applied to the yarn surface of the tape. The expected results when using this tape are reduced splice thickness, increased joint consistency, reduced labor and decrease solvent usage.

T900800*	T9021	T9022	T9105
Clear Film	Orange	Gold	Pearl
All grits	320 -120 grit	120 – 60 grit	120 – 60 grit

SPECIFICATION

	Tape Thickness (Max.)		Tensile Strength (Min.)		Application Notes
Model Number	Metric	English	Metric	English	
T900800*	0.080 mm	0.0031"	130 N/cm	75 lbs./in.	Special PET film (no yarns); for paper or polishing belts
T9021	0.107 mm	0.0042"	290 N/cm	165 lbs./in.	Thin; highest flex; high abrasion and heat resistance
T9022	0.145 mm	0.0057"	402 N/cm	230 lbs./in.	Combination of strength and flex; high abrasion and heat resistance
T9105	0.152 mm	0.0060"	490 N/cm	280 lbs./in.	Superior combination of strength and flex; more robust than white

Standard Bias Angle: 55°, 67°, 74° and 80° (reverse angles indicated by the letter "R" afte
Standard Roll Widths: 19 mm (¾") and 25.4 mm (1")
Standard Roll Lengths: 76 meters (152 meters available)

NOTE:
Tape Storage and Shipment: Coated tapes are shipped in insulated cartons with dry ice.
Rolls are individually packaged, with a desiccant, in a sealed plastic bag.
To assure a shelf life of 90 days tape, must be stored at -29°C (-20°F) or lower.
Please consult Customer Support for complete details about our products.

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NEW PRODUCT
T9105 COATED PEARL TAPE

INCREASED TENSILE STRENGTH: 300 lb/in (67^0 splice)

Substrate thickness:	No change
Flexural endurance:	No change
Adhesive coat weight:	No change
Splicing tape color:	No change
Processability:	No change

Choosing an Adhesive and a Curative

Sheldahl® Abrasive Belt Polyurethane Adhesives

- **What Solvent Carrier Would I Prefer?**
  - MEK (methyl ethyl ketone)
  - Ethyl Acetate/Acetone
- **How Will I Be Applying the Adhesive?**
  - 15 wt% for spraying
  - 20 wt% for Roller/Knife/Brush Coating
- **Do I Need Better Adhesive Coating Visibility?**
  - UV
  - Red
- **What Curative Should I Use?**
  - Sheldahl® NE-S Isocyanate
  - Desmodur® RFE Isocyanate

Sheldahl® Abrasive Belt Polyurethane Adhesives

Product Description

Sheldahl® Brand Polyurethane Adhesive is designed to be used in conjunction with an isocyanate curing agent as a two-component system. These systems produce a tough, flexible, temperature and chemical resistant bond.

Applications

Sheldahl® Brand Adhesives are specifically designed for splicing abrasive belts and may be used as a general adhesive for plastics, rubber, fabrics, leather, wood and paper.

General Properties

- Composition - Linear polyester urethane
- Form - Light syrup
- Color - Pearl gray/straw (A651 and A667 also available in **RED**)
- Recommended Isocyanate Curative – Sheldahl® NE-S
- Pot Life - 4-6 Hours after Curative addition, depending on ambient conditions

Typical Formula Properties

	A651-20*	A651-15*	A455-20	A455-15	A667-20*	A667-15*
Solvent	Ethyl Acetate / Acetone	Ethyl Acetate / Acetone	MEK	MEK	Ethyl Acetate / Acetone	Ethyl Acetate / Acetone
Solids %	20	15	20	15	20	15
Viscosity cps @ 22°C	2200-4800	600-1300	1800-3800	350-600	1500-3500	300-500
Weight per gallon pounds (Kg)	7.7 (3.5)	7.5 (3.4)	7.3 (3.3)	7.0 (3.2)	7.6 (3.5)	7.4 (3.4)

* available in **RED**

Curative Addition – parts Sheldahl® NE-S to parts Adhesive

to: 1 Volume of Curative	12 volumes	16 Volumes	12 volumes	16 Volumes	12 volumes	16 Volumes
to: 1 Gram of Curative	10 grams	14 grams	10 grams	14 grams	10 grams	14 grams

Application

Sheldahl® Brand Adhesives are used in abrasive belt manufacturing in three ways:

1. Applying adhesive to the belt ends, forming an overlap and bonding using heat and pressure.
2. Applying adhesive to the belt ends and to Uncoated Splicing Tape (IMPB-1002) then adhering the butted ends of the belt with the tape and bonding using heat and pressure.
3. Applying adhesive to the belt ends, then adhering the butted ends using Coated Splicing Tape (IMPB - 1001) and bonding using heat and pressure.

Sheldahl® Brand Adhesive may be applied using a brush, roller, knife, or by spraying. A045500 is particularly well suited for spraying because it maintains a low viscosity at higher solids. A065100 is recommended for roller and tape coating. A066700 is lower viscosity adhesive without the aroma of MEK.

Storage And Use

Sheldahl® Brand Adhesives are flammable liquids. Use only in well-ventilated areas. Extinguish all flames, including pilot lights. Avoid any spark producing equipment. Make a special effort to keep adhesives contained while processing. Store adhesives tightly sealed in cool, dry, well-ventilated area.

Properly stored adhesive may be used for up to 6 months before retesting. Gelling and separation is a common behavior of this high performance resin, especially when exposed to the cold during transport and storage.

Isocyanate Curative Options

SHELDAHL® NE-S URETHANE HARDENER; C136014

Sheldahl® NE-S is an aromatic polyisocyanate dissolved in ethyl acetate. It is used as a hardener or curative for Sheldahl Urethane Adhesives to improve properties such as chemical and heat resistance.

SPECIFICATION

SOLIDS	37 +/- 1 % by weight
NCO CONTENT	9.3 +/- 0.2 %
SP. GRAVITY	1.02 +/- 0.02 g/cc
FLASH POINT	-4 °C
COLOUR	Clear to yellowish
ITEM ORDER NO.	176493-001

USAGE

Shake container thorough to evenly disperse any solid/sediment in can. Add 90-110g of NE-S to 1000g of Urethane Adhesive (20% solids) and mix well.

POT LIFE

Expect 8 hours of pot life (working time) for mixed adhesive, depending on ambient conditions. High temperatures and/or high humidity (moisture) will shorten Pot Life.

SAFETY

Hardener contains isocyanate in flammable solvent. Follow precautions in Safety Data Sheet when handling.

SHELF LIFE

Good for 1 year in unopened container stored at 5-25 °C. Upon opening, re-seal container quickly and firmly. After opening, useful life time depends on ambient conditions.

APPLICATION

See specific Sheldahl Abrasive Belt Adhesives product bulletin (IMPB-1000) for adhesive recommendation.

DESMODUR® RFE

Characterization	Desmodur RFE is a solution of tris(p-isocyanatophenyl) thiophosphate in ethyl acetate. Desmodur RFE is a crosslinker with very universal suitability for adhesives based on Desmocoll®, natural or synthetic rubber with special adhesion on rubber materials.
Form supplied	Form supplied is approximately 27% in ethyl acetate.

Characteristic data

Property	Value	Unit of measurement	Method
NCO content	7.2 ± 0.2	%	

Other data*

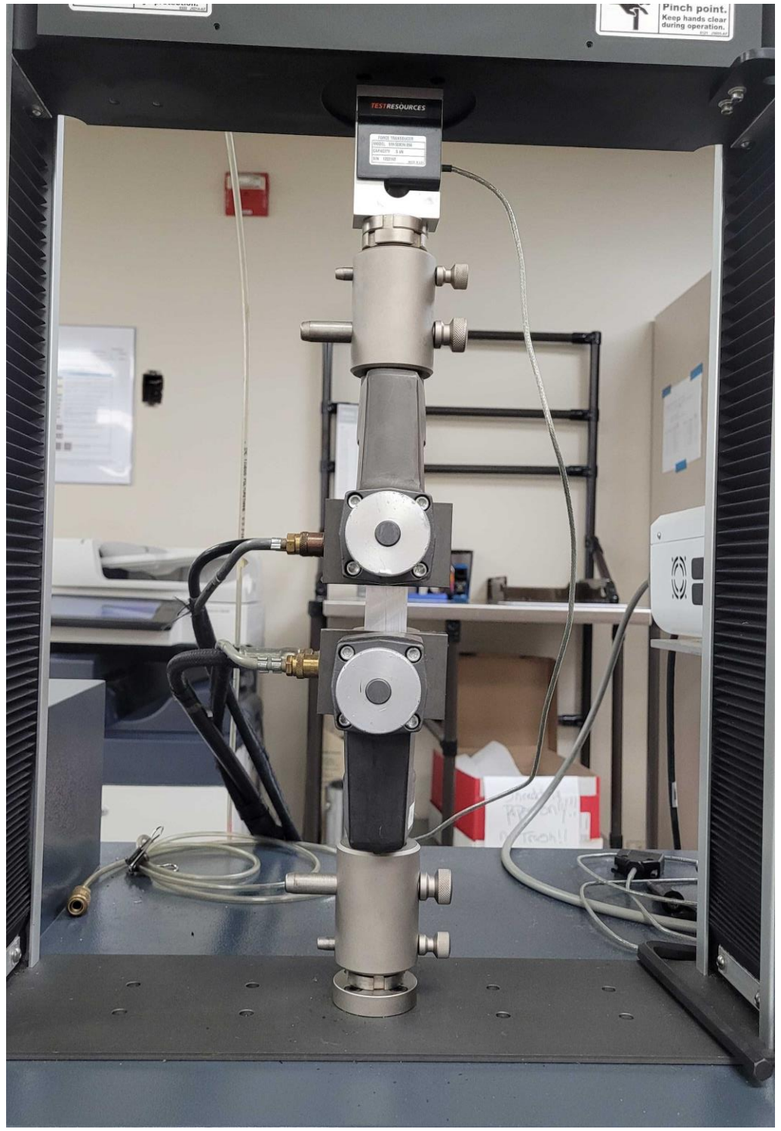
Property	Value	Unit of measurement	Method
Non-volatile content	approx. 27	%	
Density at 20°C	approx. 1.0	g/cm^3	
Viscosity at 20°C	approx. 3	mPa•s	
Solvent	Ethyl acetate		
Flash point	-4	°C	

*These values provide general information and are not part of the product specification.

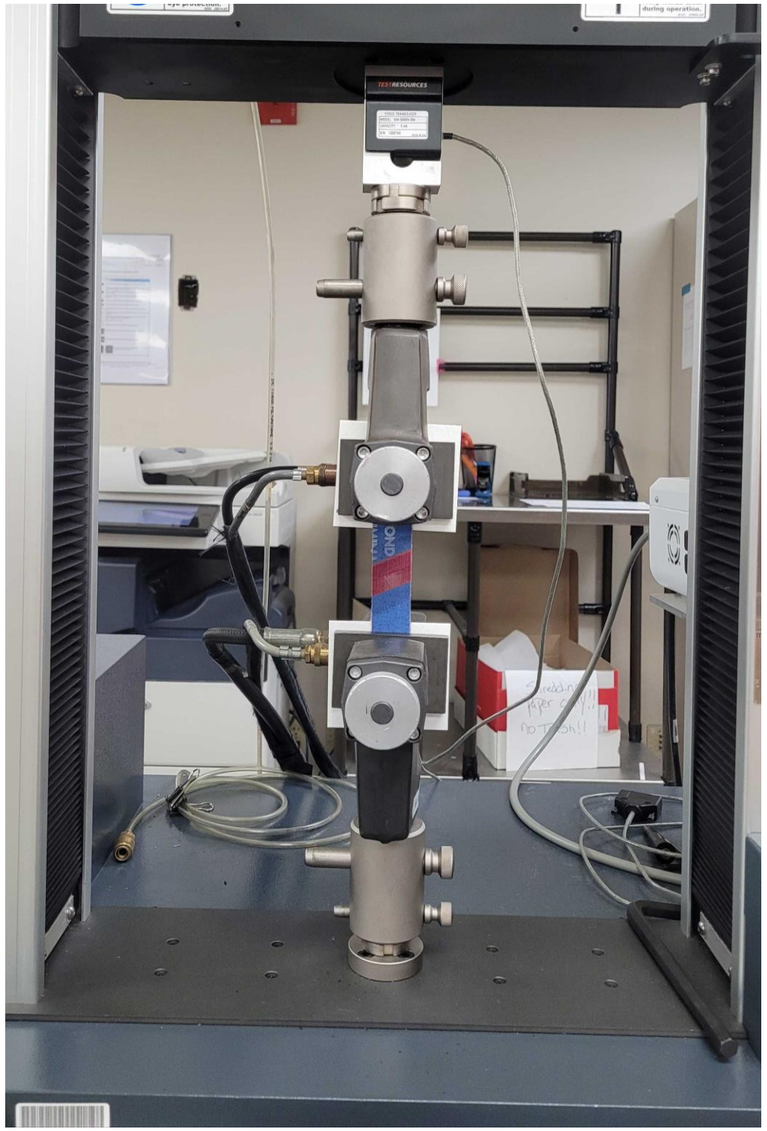
PRODUCT TESTING

BIKO FLEX TEST

STRIP (TAPE) TENSILE



SPLICE (JOINT) TENSILE



ADHESIVE MELTPOINT (COATED TAPES)

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Questions / Comments ?

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Thank you.