

ENDUROSHARP™ TORLON® AIRCRAFT MAINTENANCE TOOLS



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The processes, techniques and instructions contained within this manual were developed by the Air Force Research Laboratory, Materials and Manufacturing Directorate, Systems Support Division (AFRL/RXS) and the University of Dayton Research Institute (UDRI).

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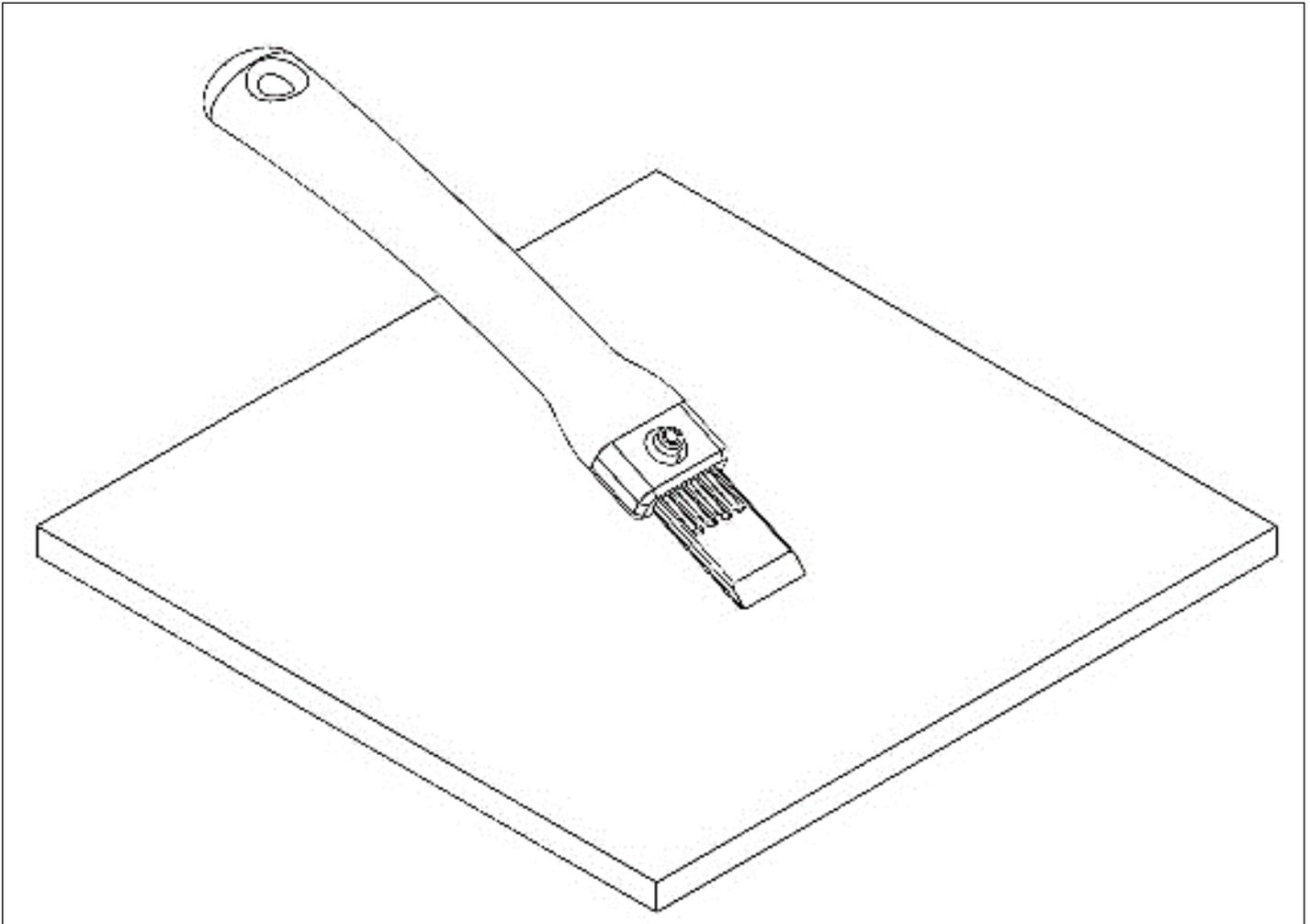
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Chapter 1:

Coating, Boot and Tape Material Removal Using EnduroSharp™ Torlon® Scraper Blades



1. PURPOSE

- 1.1. This process instruction is designed to provide technical information for removal of coating, boot and tape material from aerospace and nonaerospace equipment using nonmetallic EnduroSharp Torlon Scraper Blades with an EnduroSharp Standard Scraper Blade Holder (Handle) or EnduroSharp "Pocket" Scraper Blade Holder.

WARNING

EYE PERSONAL PROTECTION EQUIPMENT (PPE) IS REQUIRED DURING THIS PROCEDURE

2. TOOLS AND EQUIPMENT

- 2.1. EnduroSharp Torlon Scraper Blades (TSB). See Tool List.
- 2.2. EnduroSharp Standard Scraper Blade Holder (Part # ESHH003).
- 2.3. EnduroSharp "Pocket" Scraper Blade Holder (Part # ESSBH002).
- 2.4. Safety Glasses or Goggles.

3. PROCEDURES

3.1. Tool Set Up

- 3.1.1. Choose an appropriately sized TSB for the application or task being performed. See **Figure 1**.

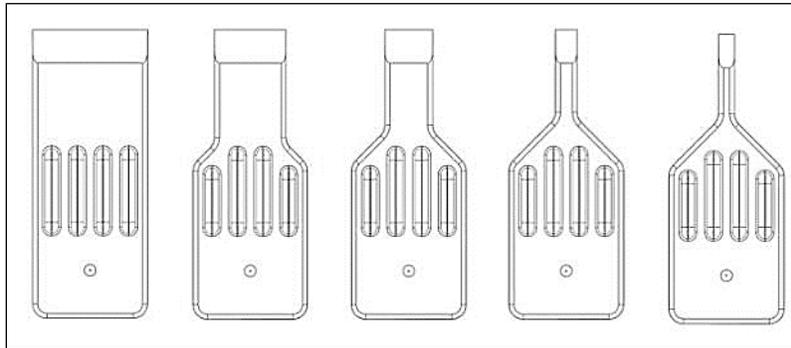


Figure 1. TSB Configurations

- 3.1.2. Ensure the TSB cutting edge is sharp prior to use and has its as-manufactured asymmetrical configuration with 25 degree cutting angle. A reference line is located on the long edge of the TSB to serve as a guide when sharpening to facilitate maintenance of the original configuration. See **Figure 2**.

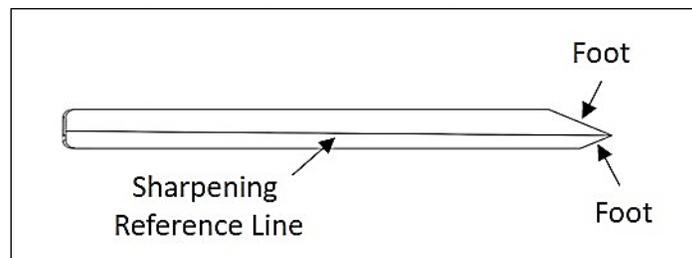


Figure 2. Sharpening Reference Line

- 3.1.3. Sharpen the TSB using 180-120 grit abrasive paper on a flat surface. Place a TSB foot (**Figure 2**) on the abrasive paper and move the blade back and forth on the abrasive paper. See **Figure 3**. Alternate between one TSB foot and the other when sharpening until the cutting edge has been restored to the reference line.

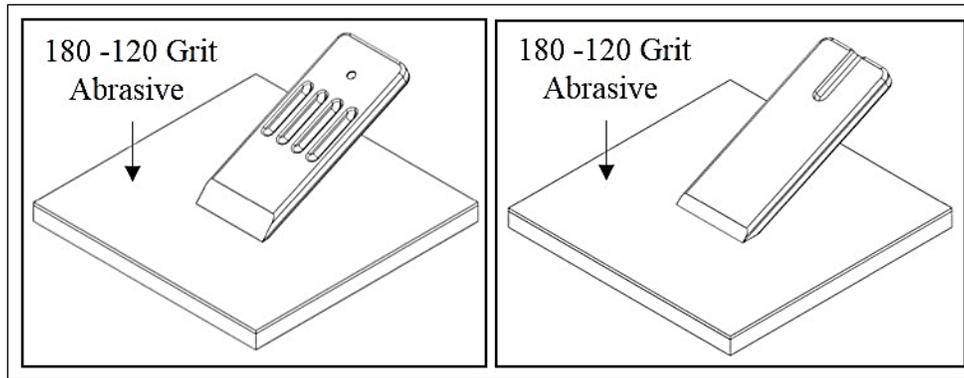


Figure 3. TSB Sharpening (both sides of blade)

WARNING

Care must be taken when using the TSB for removing material near the edge of part, gaps and fastener locations. Improper use of the blades may cause damage to the surrounding structure.

3.1.4. Ensure proper positioning of the TSB and proper direction of material removal when removing materials near edges of structures, gaps and fasteners. Care must be taken to avoid blade contact with composite structure edges during initial blade engagement with the coating, boot or tape and during removal. When near part edges, removal should proceed parallel to the edges. Blades should span gaps and fasteners. See **Figure 4**.

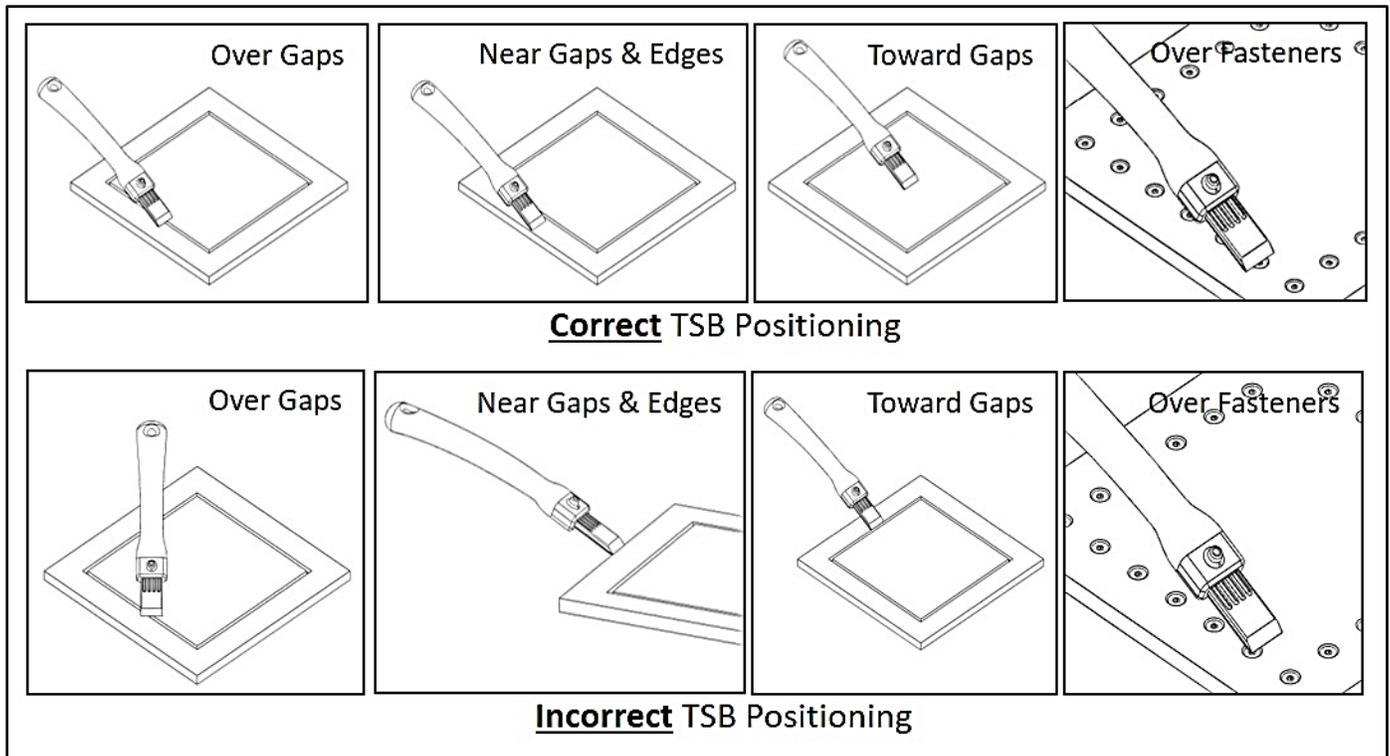


Figure 4. Material Removal Using TSB

3.1.5. Attach the appropriate TSB to the handle by inserting the TSB into the slot on the handle. When installed correctly, an audible “CLICK” should be heard when the blade engages the detent pin. See **Figure 5**.

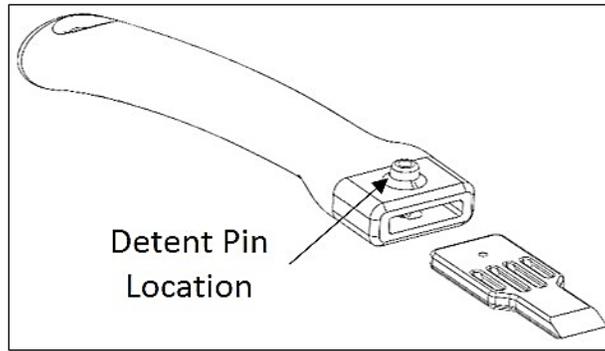


Figure 5. TSB Installation

CAUTION

Before each use, inspect the physical integrity of the handle and TSB. If the handle or TSB is worn or cracked, replace the component.

CAUTION

Ensure the TSB is properly secured in the handle prior to use.

3.2. Coating, Boot and Tape Material Removal

3.2.1. Place the TSB on the surface of the structure from which the material is being removed. See **Figure 6**.

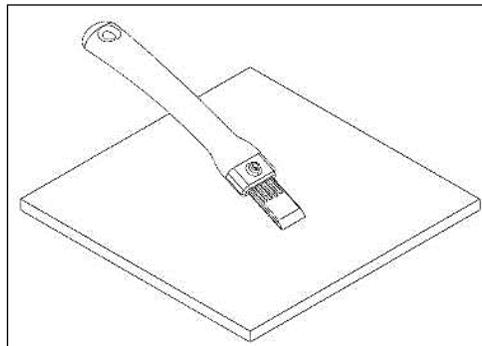


Figure 6. TSB Placement on Structure

3.2.2. With the cutting edge of the TSB at a 35-45 degree angle to structure surface, pierce the coating, boot or tape material so the cutting edge is embedded in the material. See **Figure 7**.

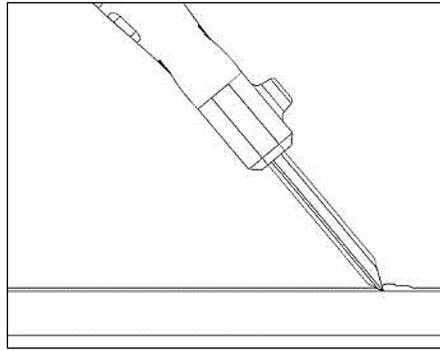


Figure 7. Initial Material Engagement

CAUTION

Ensure the TSB cutting edge is sharp. If not, sharpen or replace the TSB. Removing material with a dull or damaged TSB will increase the amount of time and effort required to complete the task and could potentially damage the structure.

NOTE

The as-manufactured cutting angle was designed to provide maximum efficiency for material removal. Changing the cutting angle through sharpening or by improper positioning of the tool in relation to the structure surface may result in decreased material removal efficiency.

- 3.2.3. With the cutting edge of the TSB engaged in the coating, tape or boot material, pivot the handle so the foot of the TSB near the cutting edge is parallel and in contact with the structure surface (25 degree blade angle). Maintain contact pressure on the TSB foot as opposed to its cutting edge so the cutting edge is engaged only in the material being removed. This will reduce wear of the cutting edge. See **Figure 8**.

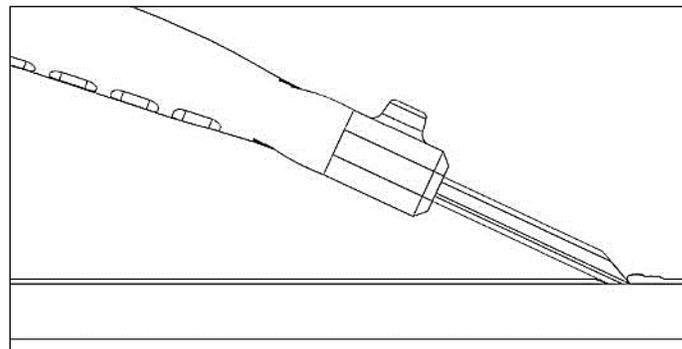


Figure 8. Correct TSB Alignment

WARNING

DO NOT USE a mallet or hammer to assist the TSB in the removal of the coating, boot or tape material. Failure to observe this warning may result in damage to the tool or structure.

WARNING

DO NOT USE the handle and TSB to pry the coating, boot or tape material from the structure. Failure to observe this warning may result in damage to the tool or structure.

3.2.4. Apply forward pressure and guide the TSB through the coating, boot or tape material. See **Figure 9**.

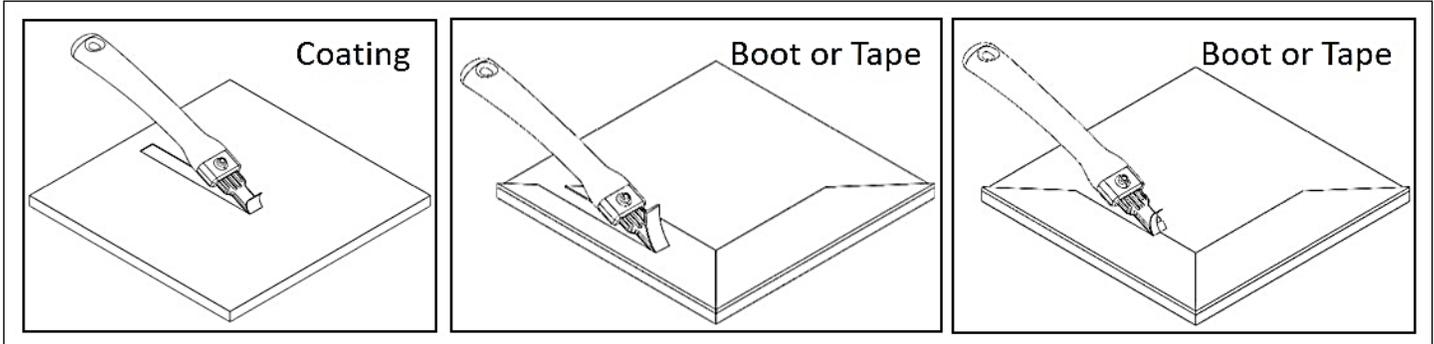


Figure 9. Material Removal

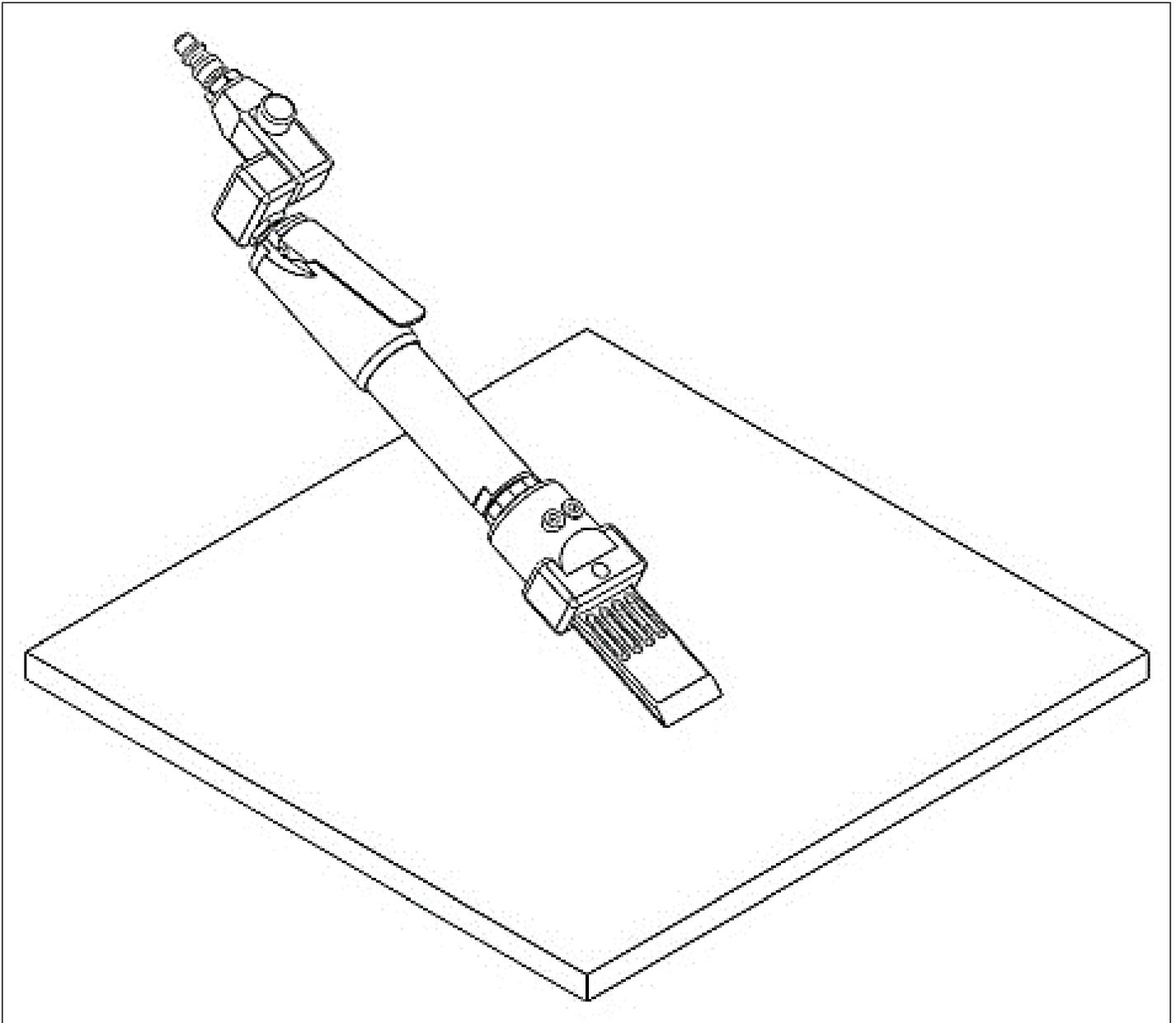
NOTE

Depending on material thickness and density, multiple techniques may be required (light pressure versus heavy pressure, multiple short strokes versus a continuous stroke) to maintain efficient material removal rates.

3.2.5. Repeat the process as required until material has been removed.

Chapter 2:

Coating, Boot and Tape Material Removal Using EnduroSharp™ Torlon® Scraper Blades with Pneumatic Tool



1. PURPOSE

- 1.1. This process instruction is designed to provide technical information for removal of coating, boot and tape material from aerospace and nonaerospace equipment using nonmetallic EnduroSharp Torlon Scraper Blades with an EnduroSharp Pneumatic Tool for Scraper Blades (Pneumatic Tool).

WARNING

EYE AND EAR PERSONAL PROTECTION EQUIPMENT (PPE) ARE REQUIRED DURING THIS PROCEDURE.

2. TOOLS AND EQUIPMENT

- 2.1. EnduroSharp Torlon Scraper Blades (TSB). See Tool List.
- 2.2. EnduroSharp Pneumatic Tool for Scraper Blades (Part # ESPT001).
- 2.3. Safety Glasses or Goggles.
- 2.4. Hearing Protection.

3. PROCEDURES

3.1. Tool Set Up

- 3.1.1. Choose an appropriately sized TSB for the application or task being performed. See **Figure 1**.

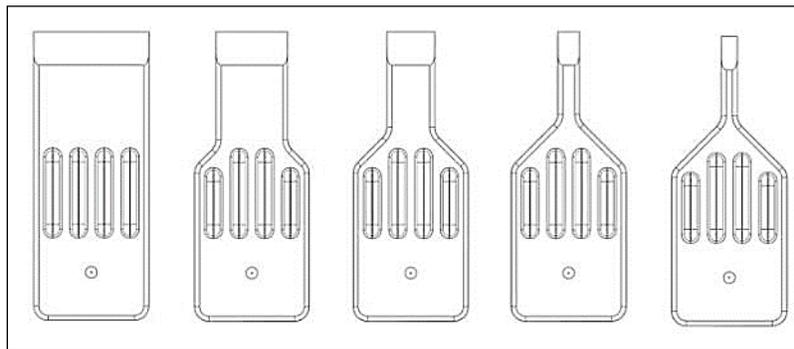


Figure 1. TSB Configurations

- 3.1.2. Ensure the TSB cutting edge is sharp prior to use and has its as-manufactured asymmetrical configuration with 25 degree cutting angle. A reference line is located on the long edge of the TSB to serve as a guide when sharpening to facilitate maintenance of the original configuration. See **Figure 2**.

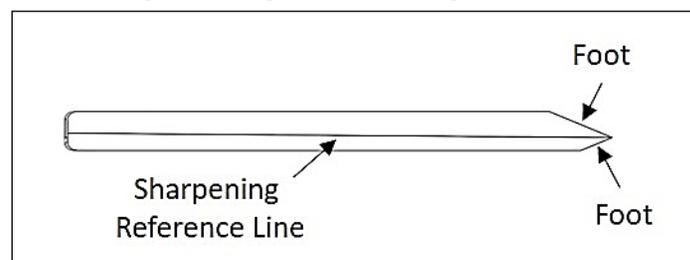


Figure 2. Sharpening Reference Line

- 3.1.3. Sharpen the TSB using 180-120 grit abrasive paper on a flat surface. Place a TSB foot (**Figure 2**) on the abrasive paper and move the blade back and forth on the abrasive paper. See **Figure 3**. Alternate between one TSB foot and the other when sharpening until the cutting edge has been restored to the reference line.

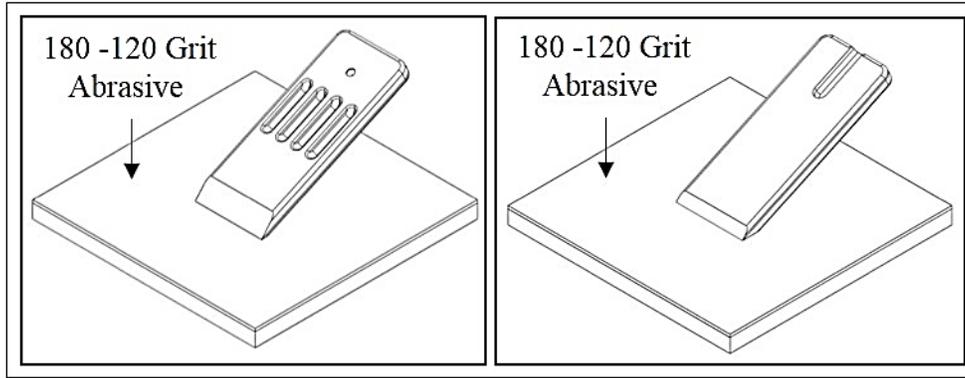


Figure 3. TSB Sharpening (both sides of blade)

WARNING

Care must be taken when using the TSB for removing material near the edge of part, gaps and fastener locations. Improper use of the blades may cause damage to the surrounding structure.

3.1.4. Ensure proper positioning of the TSB and proper direction of material removal when removing materials near edges of structures, gaps and fasteners. Care must be taken to avoid blade contact with composite structure edges during initial blade engagement with the coating, boot or tape and during removal. When near part edges, removal should precede parallel to the edges. Blades should span gaps and fasteners. See **Figure 4**.

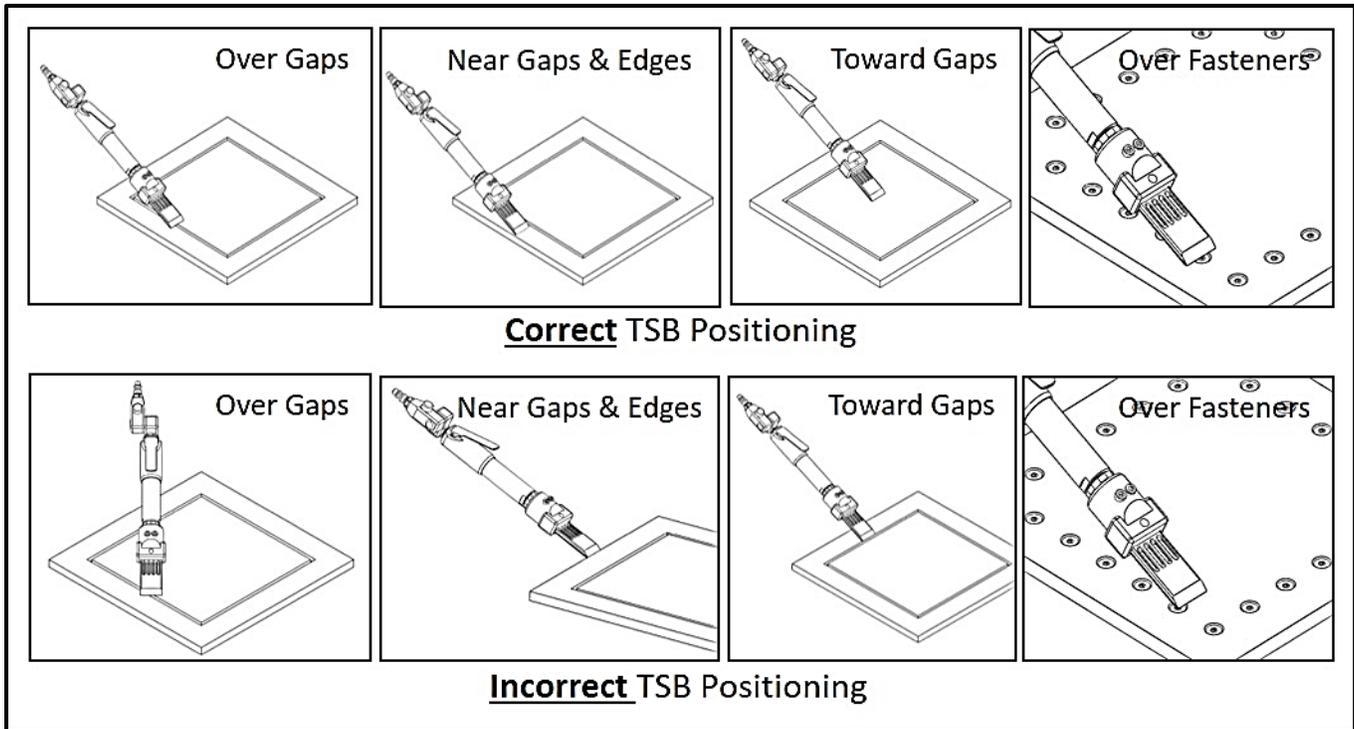


Figure 4. Material Removal Using TSB

WARNING

Any time the TSB is being attached to or removed from the pneumatic tool, disconnect the pneumatic tool from the compressed air source. Failure to observe this warning may result in injury to personnel.

- 3.1.5. Attach the appropriate TSB to the pneumatic tool by inserting the TSB into the slot on the pneumatic tool. When installed correctly, an audible “CLICK” should be heard when the blade engages the detent pin. See **Figure 5**.

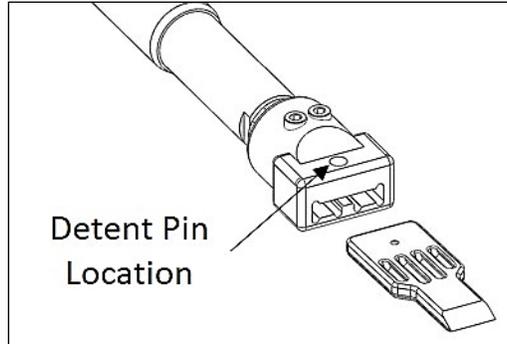


Figure 5. TSB Installation

CAUTION

Before each use, inspect the physical integrity of the pneumatic tool and TSB. If the pneumatic removal tool or TSB is worn or cracked, replace the component.

CAUTION

Ensure the TSB is properly secured in the pneumatic removal tool prior to use.

- 3.1.6. Adjust the air regulator to 95 psi \pm 5 psi.
3.1.7. Attach the pneumatic tool to the regulated compressed air source.

3.2. Coating, Tape and Boot Removal

- 3.2.1. Place the TSB on the surface of the structure from which the material is being removed. See **Figure 6**.

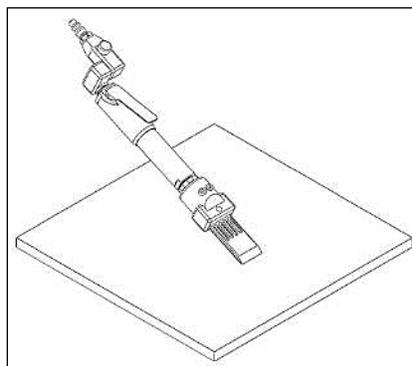


Figure 6. TSB Placement on Structure

- 3.2.2. With the cutting edge of the TSB at a 35-45 degree angle to structure surface, pierce the coating, boot or tape material so the cutting edge is embedded in the material. See **Figure 7**.

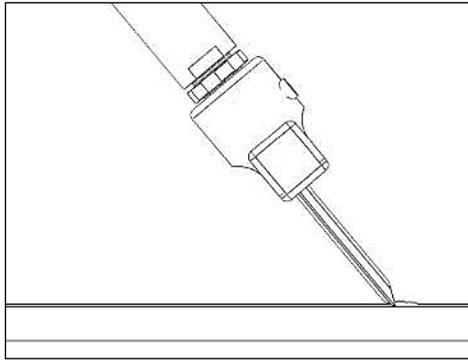


Figure 7. Initial Material Engagement

CAUTION

Ensure the TSB edge is sharp. If not, sharpen or replace the TSB. Removing material with a dull or damaged TSB will increase the amount of time and effort required to complete the task and could potentially damage the structure.

NOTE

The as-manufactured cutting angle was designed to provide maximum efficiency for material removal. Changing the cutting angle through sharpening or by improper positioning of the tool in relation to the structure surface may result in decreased material removal efficiency.

- 3.2.3. With the cutting edge of the TSB engaged in the coating, tape or boot material, pivot the pneumatic tool so the foot of the TSB near the cutting edge is parallel and in contact with the structure surface (25 degree blade angle). Maintain contact pressure on the TSB foot as opposed to its cutting edge so the cutting edge is engaged only in the material being removed. This will reduce wear of the cutting edge. See **Figure 8**.

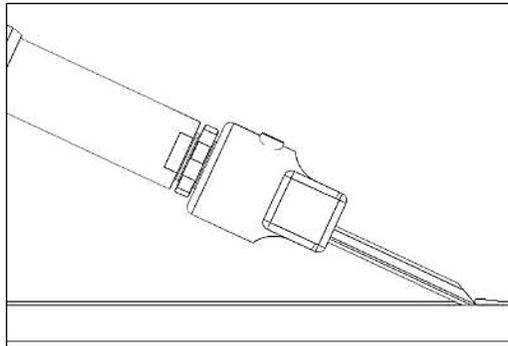


Figure 8. Correct TSB Alignment

WARNING

DO NOT USE the pneumatic removal tool and TSB to pry the coating, boot or tape from the structure. Failure to observe this warning may result in damage to the tool or structure.

- 3.2.4. Fully depress the lever on the pneumatic tool, apply forward pressure and guide the TSB through the coating, boot or tape material. See **Figure 9**.

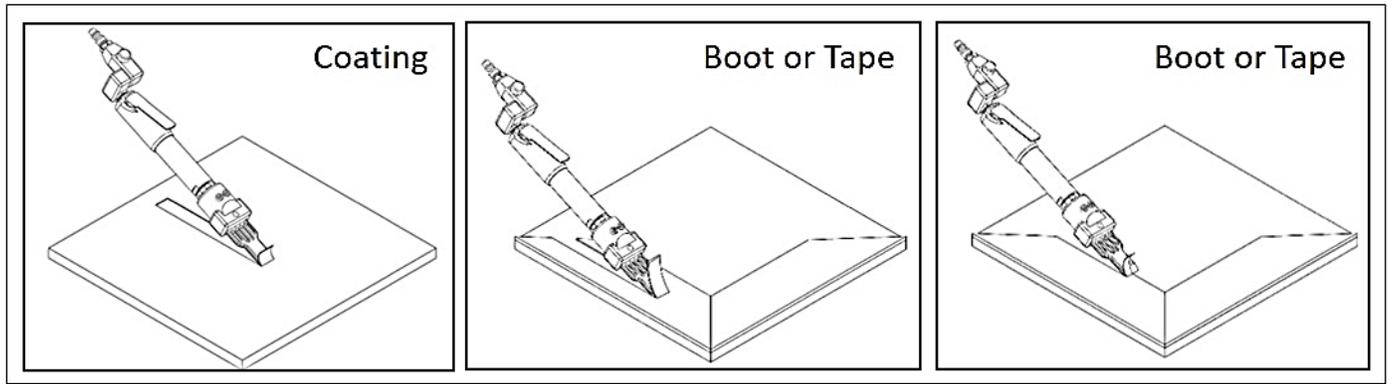


Figure 9. Material Removal

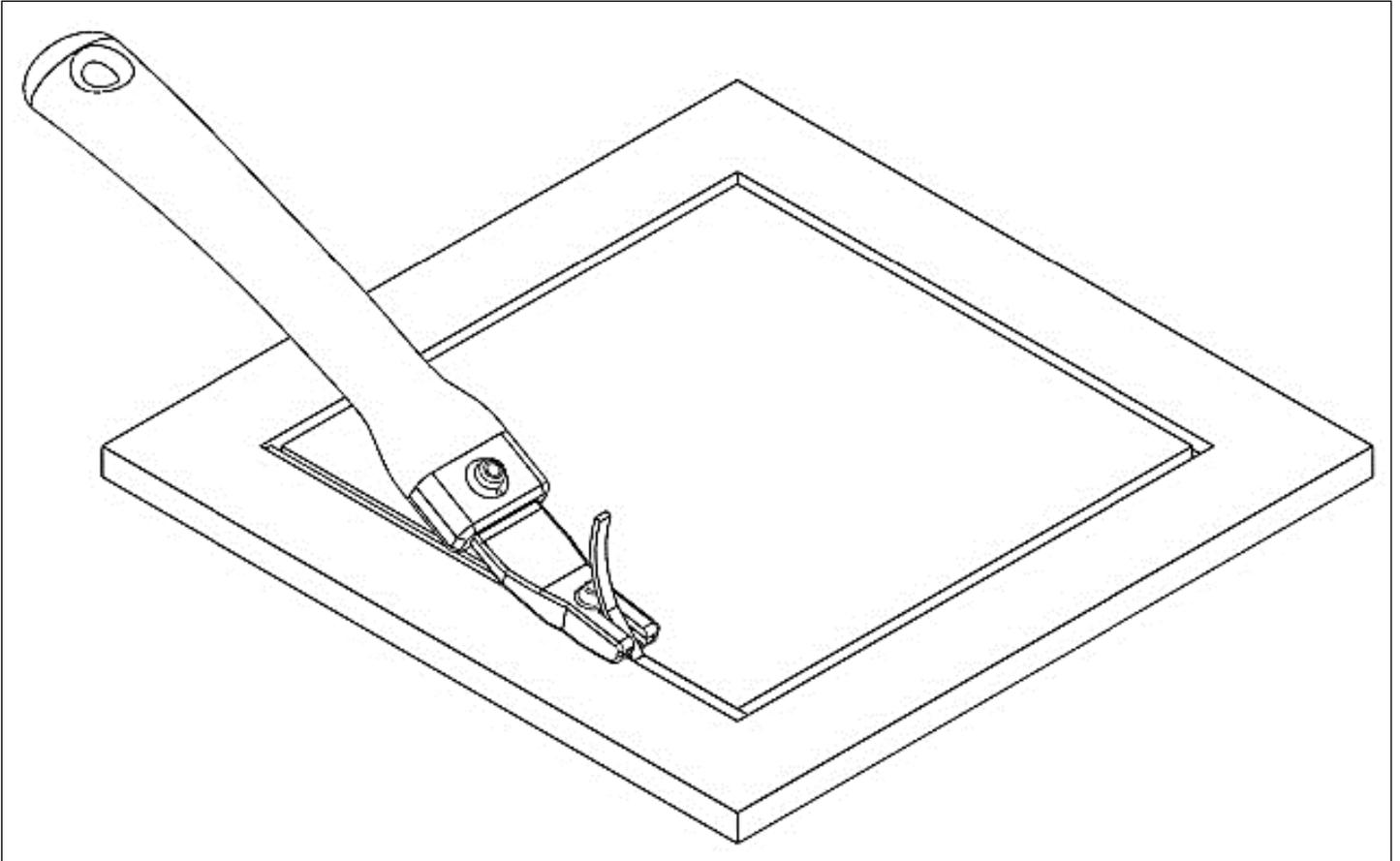
NOTE

Depending on material thickness and density, multiple techniques may be required (light pressure versus heavy pressure, multiple short strokes versus a continuous stroke) to maintain efficient material removal rates.

3.2.5. Repeat the process as required until material has been removed.

Chapter 3:

Incremental Gap Filler Material Removal Using EnduroSharp™ Torlon® Gap Blades



1. PURPOSE

- 1.1. This process instruction is designed to provide technical information for removal of gap filler from aerospace and nonaerospace equipment using nonmetallic EnduroSharp Torlon Gap Blades with EnduroSharp Holder Adapter for Gap Blades (Gap Blade Adapter) and EnduroSharp Standard Scraper Blade Holder (Handle) or EnduroSharp "Pocket" Blade Holder.

WARNING

EYE PERSONAL PROTECTION EQUIPMENT (PPE) IS REQUIRED DURING THIS PROCEDURE.

2. TOOLS AND EQUIPMENT

- 2.1. EnduroSharp Torlon Gap Blades (TGB). See Tool List.
- 2.2. EnduroSharp Holder Adapter for Gap Blades (Part # TGBA-001).
- 2.3. EnduroSharp Standard Scraper Blade Holder (Part # ESHH003).
- 2.4. EnduroSharp "Pocket" Scraper Blade Holder (Part # ESSBH002).
- 2.5. Safety Glasses or Goggles.
- 2.6. Hearing Protection.

3. PROCEDURES

3.1. Tool Set Up

- 3.1.1. Select an appropriately sized (depth and width) TGB for the application or task being performed. See **Figure 1**.

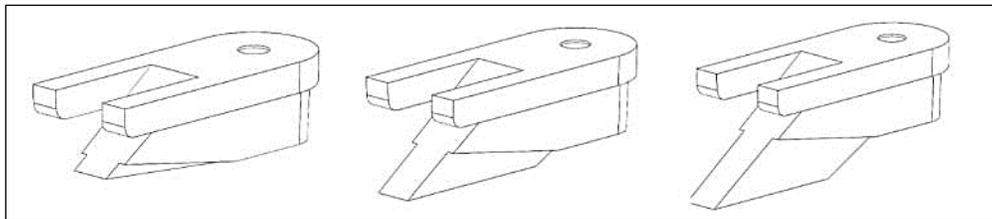


Figure 1. TGB Configurations (three depths available for each width)

- 3.1.2. TGB cutting depth and width is defined as the portion of the TGB extending beyond the gap blade adapter when installed correctly. See **Figure 2**.

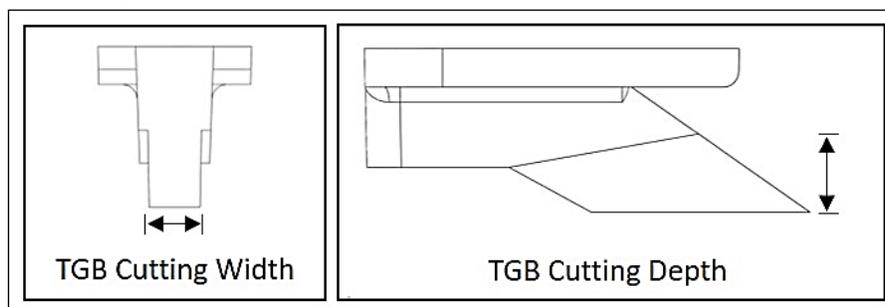


Figure 2. TGB Cutting Width and Depth

- 3.1.3. Ensure the TGB has sharp cutting edges prior to use. See **Figure 3**.

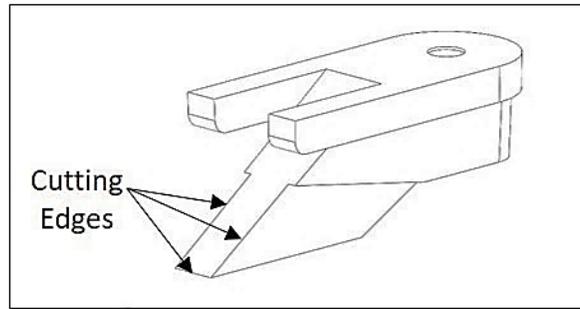


Figure 3. TGB Cutting Edges

3.1.4. To sharpen the TGB, use 180-120 grit abrasive paper on a flat hardback. Place the cutting surface of the TGB on the abrasive paper and move it back and forth on the abrasive paper until the TGB cutting edges have been restored. See **Figure 4**.

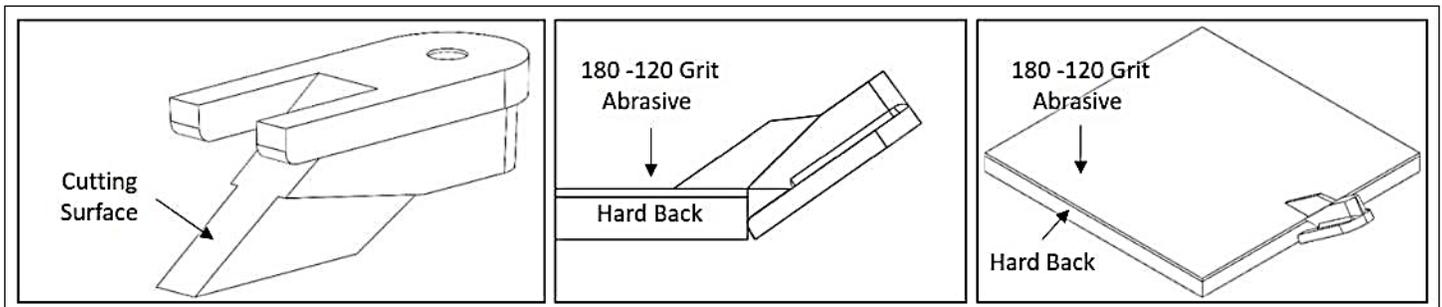


Figure 4. TGB Sharpening

WARNING

TGB width must be narrower than the gap containing the material to be removed. Failure to observe this warning may result in damage to the tool or structure.

3.1.5. Ensure the selected TGB width is narrower than the gap from which filler is being removed. See **Figure 5**.

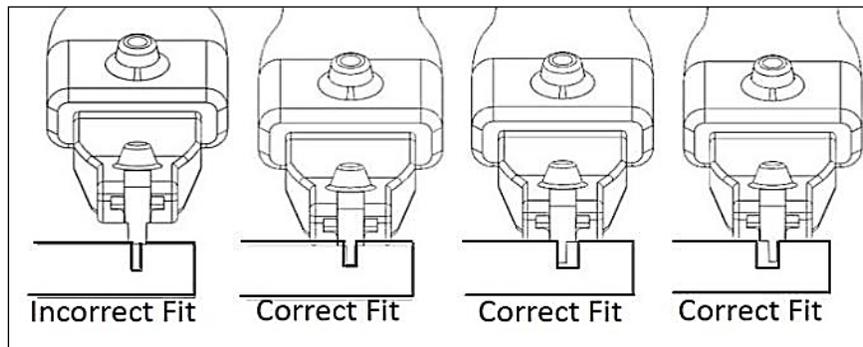


Figure 5. Determining Proper TGB Fit

NOTE

A TGB can be used to remove gap filler material from gaps several times wider than the width of the TGB.

- 3.1.6. Attach the gap blade adapter to the handle by inserting the adapter into the slot on the handle and insert the TGB into the slot on the adapter. When installed correctly, an audible “CLICK” should be heard when the gap blade adapter engages the handle detent pin and when the TGB engages the adapter detent pin. See **Figure 6**.

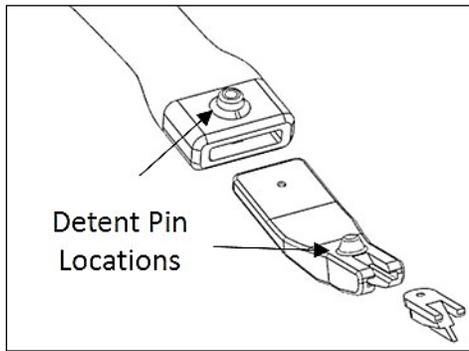


Figure 6. Adapter and TGB Installation

CAUTION

Before each use, inspect the physical integrity of the handle, gap blade adapter and TGB. If worn or cracked, replace the component.

CAUTION

Ensure the TGB is properly secured in the gap blade adapter prior to use.

CAUTION

Ensure that the gap blade adapter is properly secured in the handle prior to use.

3.2. Gap Filler Material Removal

- 3.2.1. Line up the TGB with the gap containing filler to be removed. See **Figure 7**.

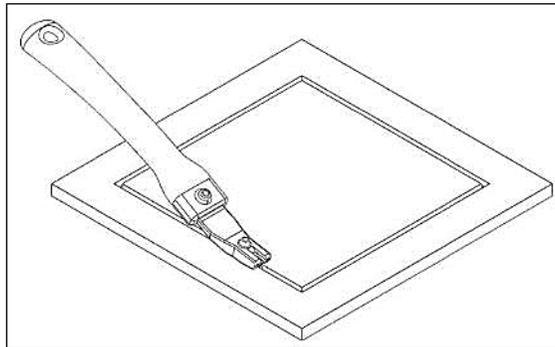


Figure 7. Tool and Gap Alignment

- 3.2.2. With the forward cutting edge of the TGB at a 25-30 degree angle to the surface of the gap filler, pierce the gap filler so the cutting edge is embedded in the gap filler. See **Figure 8**.

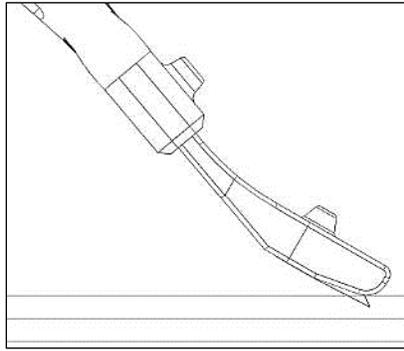


Figure 8. Initial Gap Filler Engagement

CAUTION

Care should be taken when using the TGB to remove gap filler. Improper use of the TGB may cause damage to the surrounding structure.

CAUTION

Ensure the TGB cutting edges are sharp. If not, sharpen or replace the TGB. Removing material with a dull or damaged TGB will increase the amount of time and effort required to complete the task and could potentially damage the structure.

NOTE

The as-manufactured cutting angle was designed to provide maximum efficiency for material removal. Changing the cutting angle through sharpening or by improper positioning of the tool in relation to the structure surface may result in decreased in material removal efficiency.

- 3.2.3. With the forward cutting edge of the TGB engaged in the gap filler, pivot the handle so the flat on the gap blade adapter (closest to the nose) is parallel and in contact with the structure on both sides of the gap. See **Figure 9**.

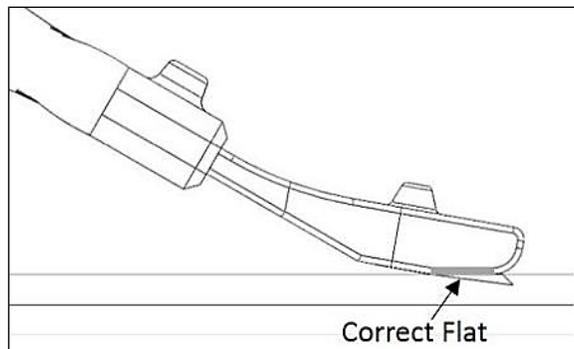


Figure 9. Correct Tool Alignment

WARNING

DO NOT USE a mallet or hammer to assist TGB in the removal of gap filler. Failure to observe this warning may result in damage to the tool or structure.

3.2.4. With the shallowest TGB installed (0.075"), apply forward pressure and guide the TGB through the gap filler. See **Figure 10**.

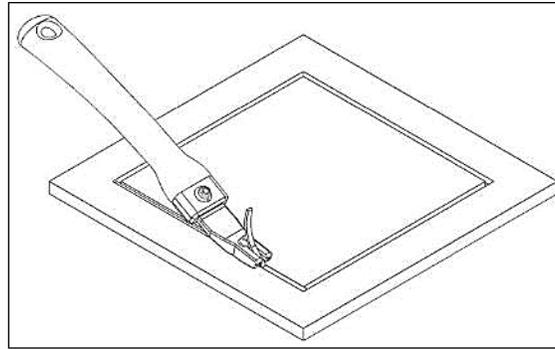


Figure 10. Gap Filler Removal

3.2.5. Repeat the gap filler removal process using 0.160" and 0.250" depth TGBs, as required, until the desired amount of material has been removed. The design of the TGB requires removal of gap filler in incremental steps with multiple passes (using each depth blade, shallowest to the deepest required). See **Figure 11**.

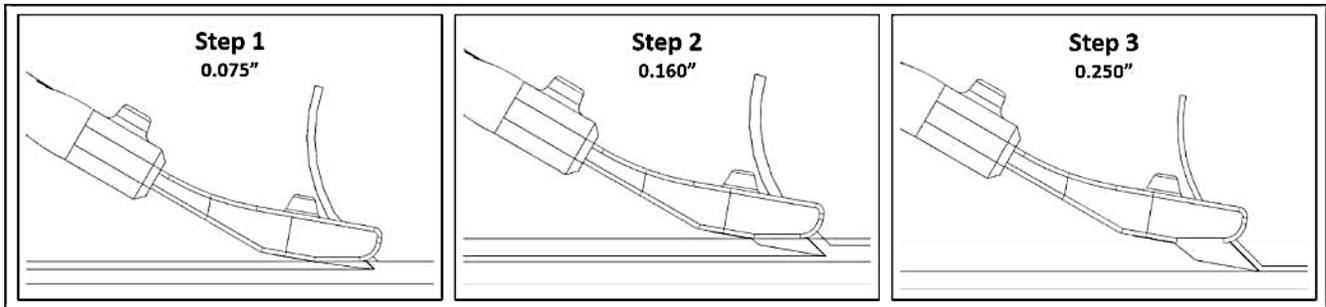


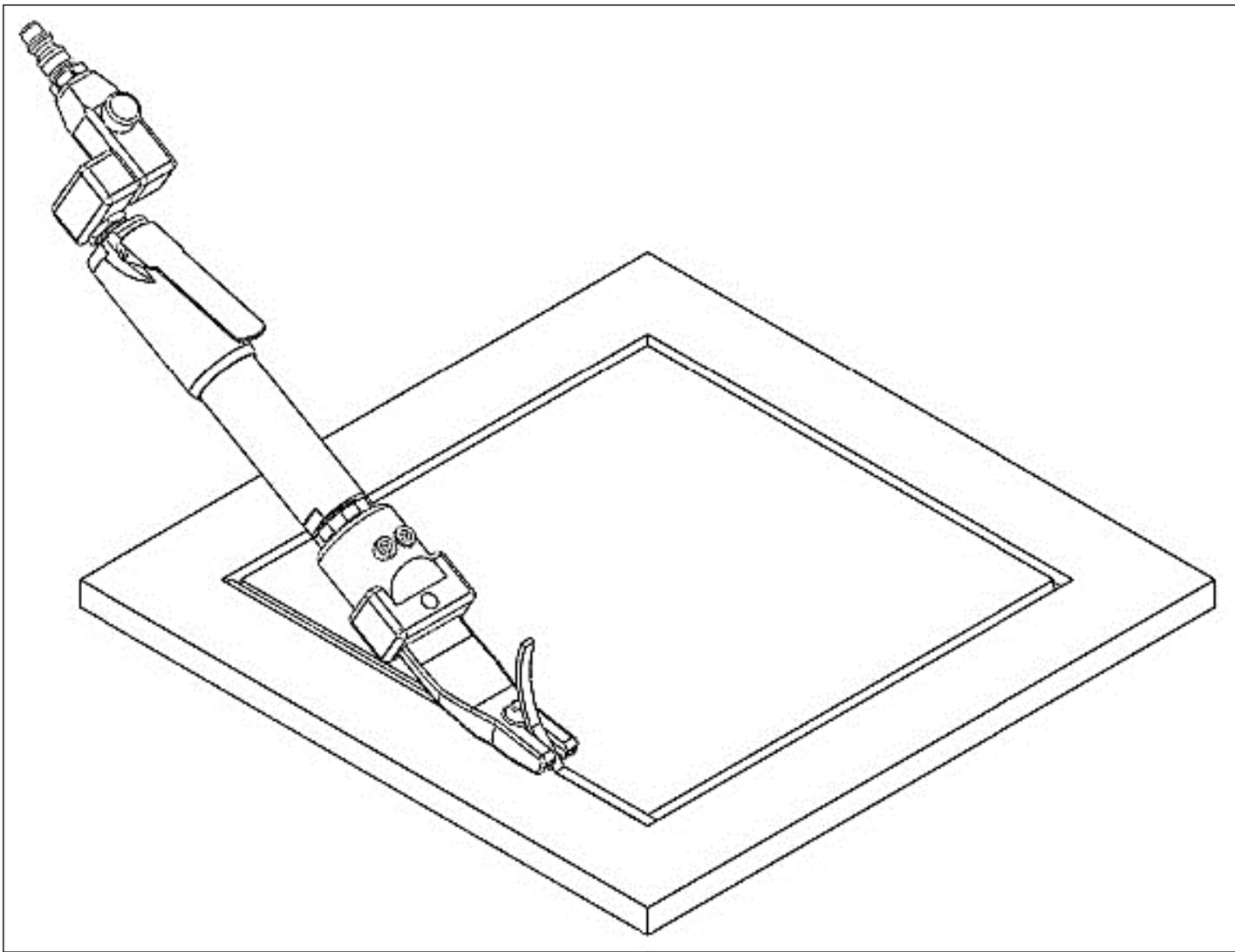
Figure 11. Incremental Gap Filler Removal Steps

NOTE

Depending on material thickness and density, multiple techniques may be required (light pressure versus heavy pressure, multiple short strokes versus a continuous stroke) to maintain efficient material removal rates.

3.2.6. Using the final depth TGB, repeat the process until the gap filler has been removed from the gap.

Chapter 4:
Incremental Gap Filler Removal Using
EnduroSharp™ Torlon® Gap Blades with
Pneumatic Tool



1. PURPOSE

- 1.1. This process instruction is designed to provide technical information for removal of gap filler from aerospace and nonaerospace equipment using nonmetallic EnduroSharp Torlon Gap Blades with an EnduroSharp Holder Adapter for Gap Blades (Gap Blade Adapter) and an EnduroSharp Pneumatic Tool (Pneumatic Tool) for Scraper Blades.

WARNING

EYE AND EAR PERSONAL PROTECTION EQUIPMENT (PPE) ARE REQUIRED DURING THIS PROCEDURE.

2. TOOLS AND EQUIPMENT

- 2.1. EnduroSharp Torlon Gap Blades (TGB). See Tool List.
- 2.2. EnduroSharp Holder Adapter for Gap Blades (Part # TGBA-001).
- 2.3. EnduroSharp Pneumatic Tool for Scraper Blades (Part # ESPT001).
- 2.4. Safety Glasses or Goggles.
- 2.5. Hearing Protection.

3. PROCEDURES

3.1. Tool set up

- 3.1.1. Select an appropriately sized (depth and width) TGB for the application or task being performed. See **Figure 1**.

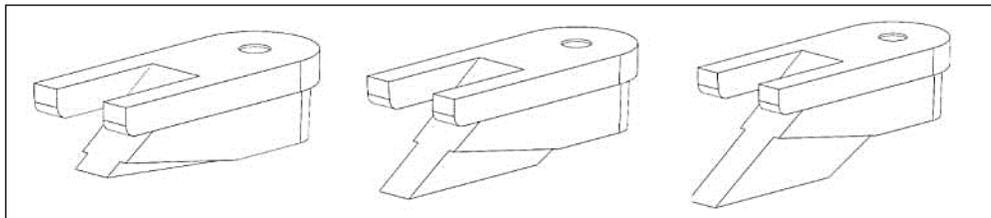


Figure 1. TGB Configurations (three depths available for each width)

- 3.1.2. TGB cutting depth and width are defined as the portions of the TGB extending beyond the gap blade adapter when installed correctly. See **Figure 2**.

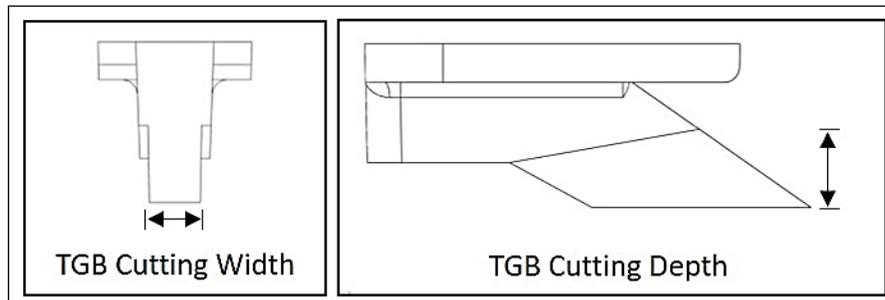


Figure 2. TGB Cutting Width and Depth

- 3.1.3. Ensure the TGB has sharp cutting edges prior to use. See **Figure 3**.

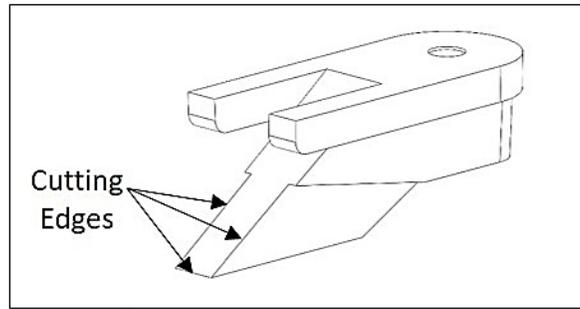


Figure 3. TGB Cutting Edges

3.1.4. To sharpen the TGB, use 180-120 grit abrasive paper on a flat hardback. Place the cutting surface of the TGB on the abrasive paper and move it back and forth on the abrasive paper until the TGB cutting edges have been restored. See **Figure 4**.

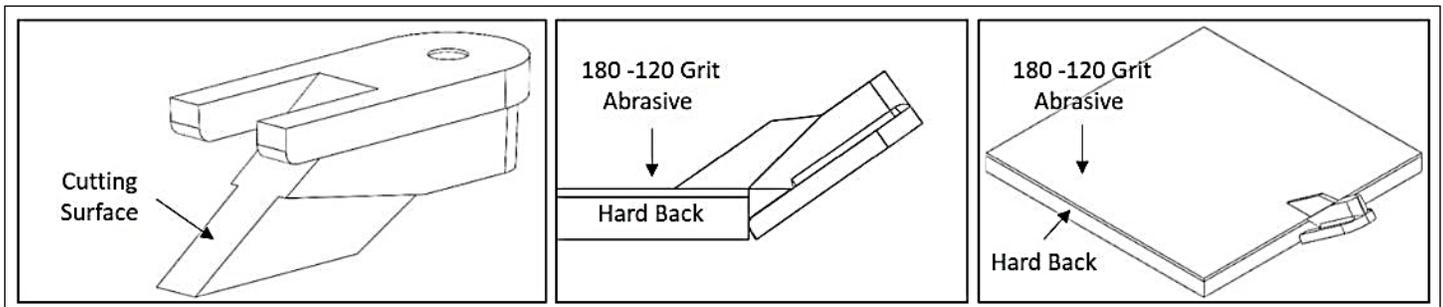


Figure 4. TGB Sharpening

WARNING

TGB width must be narrower than the gap containing the material to be removed. Failure to observe this warning may result in damage to the tool or structure.

3.1.5. Ensure the selected TGB width is narrower than the gap from which filler is being removed. See **Figure 5**.

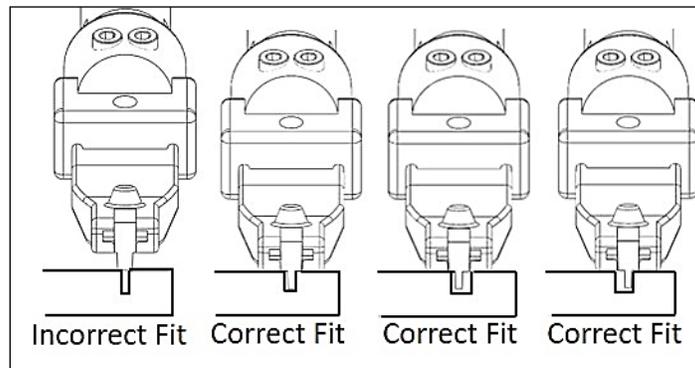


Figure 5. Determining Proper TGB Fit

NOTE

A TGB can be used to remove gap filler from gaps several times wider than the width of the TGB.

WARNING

Any time the gap blade adapter and TGB are being attached to or removed from the pneumatic removal tool, disconnect the pneumatic tool from the compressed air source. Failure to observe this warning may result in injury to personnel.

- 3.1.6. Attach the gap blade adapter to the pneumatic tool by inserting the adapter into the slot on the pneumatic tool and insert the TGB into the slot on the adapter. When installed correctly, an audible “CLICK” should be heard when the gap blade adapter engages the pneumatic tool detent pin and when the TGB engages the adapter detent pin. See **Figure 6**.

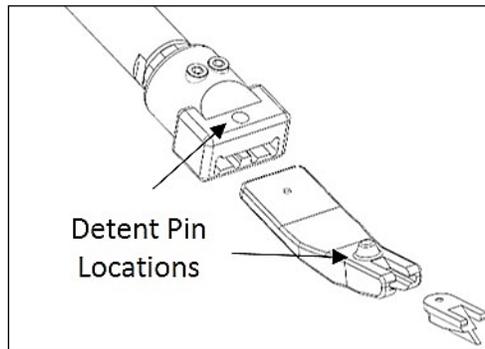


Figure 6. Adapter and TGB Installation

CAUTION

Before each use, inspect the physical integrity of the pneumatic tool, gap blade adapter and TGB. If worn or cracked, replace the components.

CAUTION

Ensure the TGB is properly secured in the gap blade adapter prior to use.

CAUTION

Ensure the gap blade adapter is properly secured in the pneumatic tool prior to use.

- 3.1.7. Adjust the air regulator to 95 psi \pm 5 psi.
3.1.8. Attach the pneumatic tool to the regulated compressed air source.

3.2. Gap Filler Removal

- 3.2.1. Line up the TGB with the gap containing the filler to be removed. See **Figure 7**.

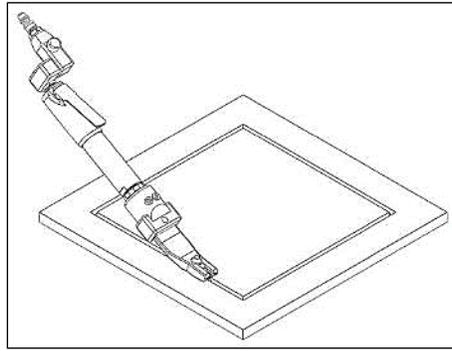


Figure 7. Tool and Gap Alignment

- 3.2.2. With the forward cutting edge of the TGB at a 25-30 degree angle to the surface of the gap filler, pierce the gap filler so the forward cutting edge is embedded in the gap filler. See **Figure 8**.

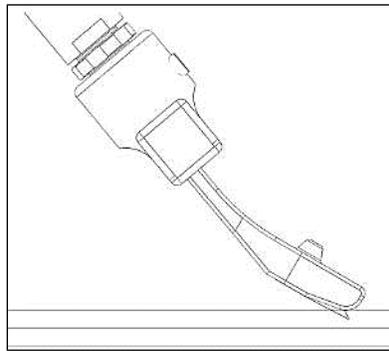


Figure 8. Initial Gap Filler Engagement

CAUTION

Care should be taken when using the TGB to remove gap filler. Improper use of the TGB may cause damage to the surrounding structure.

CAUTION

Ensure the TGB cutting edges are sharp. If not, sharpen or replace the TGB. Removing material with a dull or damaged TGB will increase the amount of time and effort required to complete the task and could potentially damage the structure.

NOTE

The as-manufactured cutting angle was designed to provide maximum efficiency for material removal. Changing the cutting angle through sharpening or by improper positioning of the tool in relation to the structure surface may result in decreased material removal efficiency.

- 3.2.3. With the forward cutting edge of the TGB engaged in the gap filler, pivot the pneumatic tool so the flat on the gap blade adapter (closest to the nose) is parallel and in contact with the structure on both sides of the gap. See **Figure 9**.

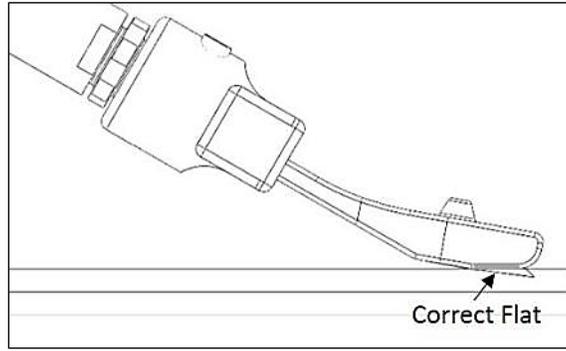


Figure 9. Correct Tool Alignment

3.2.4. With the shallowest TGB installed (0.075"), fully depress the lever on the pneumatic tool and apply forward pressure and guide the TGB through the gap filler. See **Figure 10**.

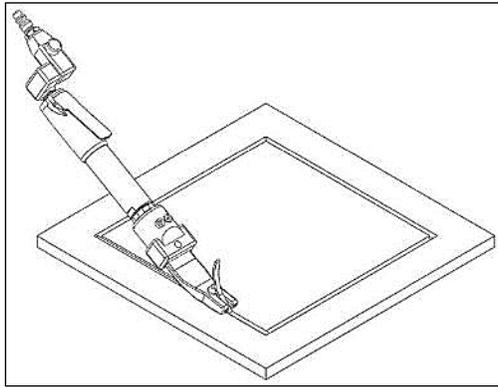


Figure 10. Gap Filler Removal

3.2.5. Repeat the gap filler removal process using 0.160" and 0.250" depth TGBs, as required, until the desired amount of material has been removed. The design of the TGB requires removal of gap filler in incremental steps with multiple passes (using each depth blade, shallowest to the deepest required). See **Figure 11**.

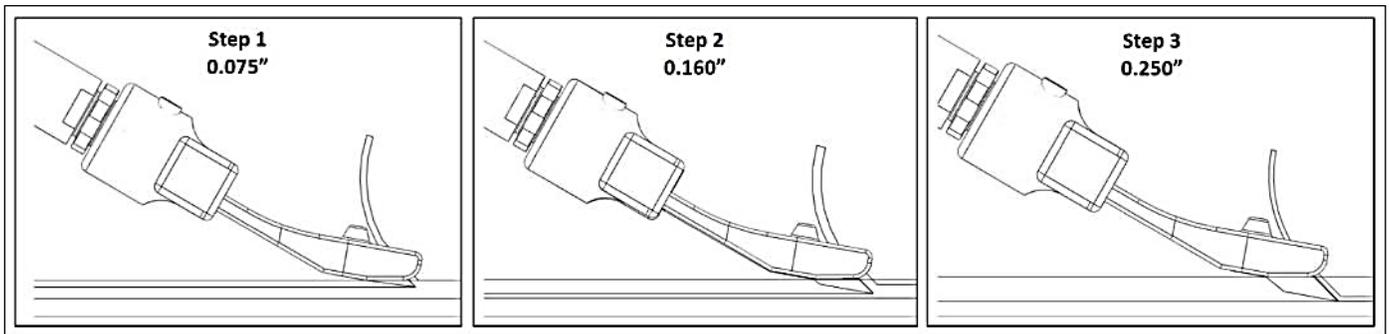


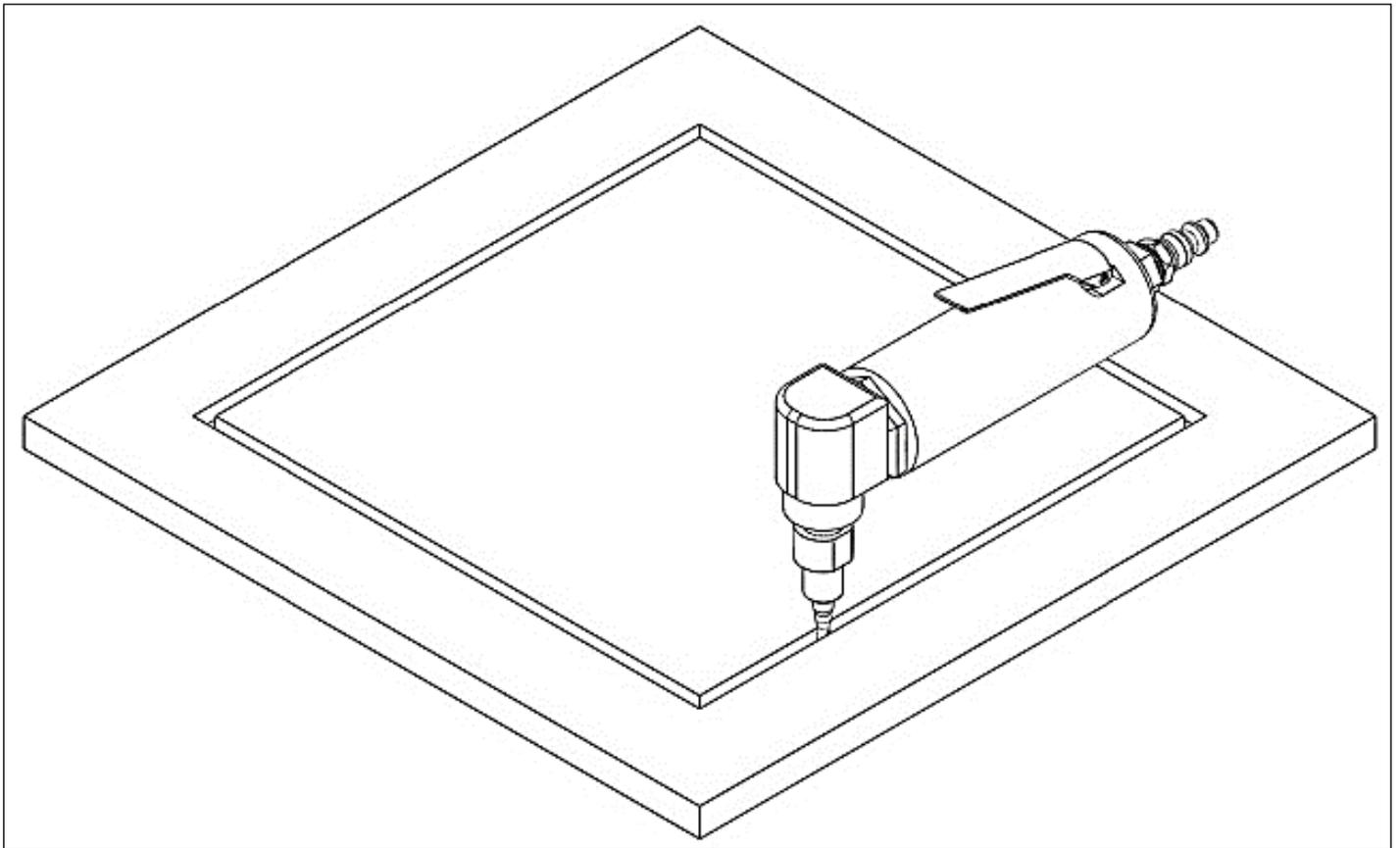
Figure 11. Incremental Gap Filler Removal Steps

NOTE

Depending on material thickness and density, multiple techniques may be required (light pressure versus heavy pressure, multiple short strokes versus a continuous stroke) to maintain efficient material removal rates.

3.2.6. Using the final depth TGB, repeat the process until the gap filler has been removed from the gap.

Chapter 5:
Gap Filler Material Removal Using
EnduroSharp™ Torlon® Gap Filler Removal
Bits With Pneumatic Tool



1. PURPOSE

- 1.1. This process instruction is designed to provide technical information for removal of gap filler from aerospace and nonaerospace equipment using nonmetallic EnduroSharp Torlon Gap Filler Removal Bits with a DOTCO Pneumatic 90 Degree Grinder.

WARNING

EYE, EAR AND RESPIRATOR BREATHING PROTECTION EQUIPMENT (PPE) ARE REQUIRED DURING THIS PROCEDURE.

2. TOOLS AND EQUIPMENT

- 2.1. EnduroSharp Torlon Gap Filler Removal (GFR)-Bits. See Tool List.
- 2.2. DOTCO Pneumatic 90 Degree Grinder (Part # 12LF280-36).
 - 2.2.1. 12,000 RPM maximum tool, regulated to a maximum of 6,000 RPM.
- 2.3. Nonadjustable air regulator preset to 45 psi (Part # R14-200-R45A).
- 2.4. Safety Glasses or Goggles.
- 2.5. Hearing Protection.
- 2.6. Respiratory Protection.

3. PROCEDURES

3.1. Tool Set Up

- 3.1.1. Obtain the GFR-Bits required for the application or task being performed. See **Figure 1**.

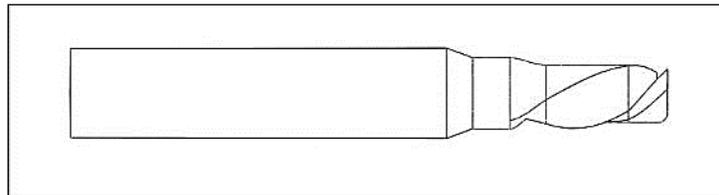


Figure 1. GFR-Bit

WARNING

GFR-Bit diameter must be narrower than the gap containing the material to be removed. Failure to observe this warning may result in damage to the tool or structure.

- 3.1.2. Ensure the selected GFR-Bit diameter is a narrower than the gap from which filler is being removed. See **Figure 2**.

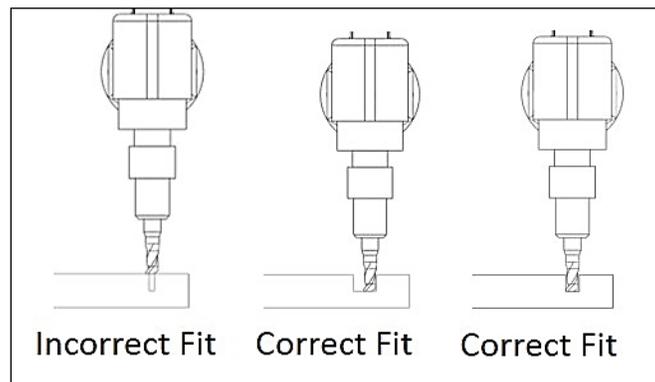


Figure 2. Determining Proper GFR-Bit Fit

NOTE

GFR-Bits can be used to remove gap filler from gap widths several times wider than the diameter of the GFR-Bit.

WARNING

Ensure the GFR-Bit is properly secured in the pneumatic 90 degree grinder prior to use.

WARNING

Any time the GFR-Bit is being attached to or removed from the pneumatic 90 degree grinder, disconnect the grinder from the compressed air source. Failure to observe this warning may result in injury to personnel.

- 3.1.3. Attach the GFR-Bit to the pneumatic 90 degree grinder by inserting the bit into the collet until it stops. Ensure the GFR-Bit is properly secured in the collet. See **Figure 3**.

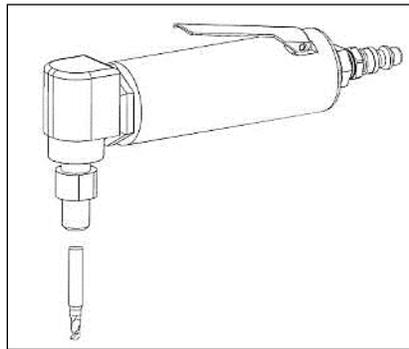


Figure 3. GFR-Bit Installation

CAUTION

Before each use, inspect the physical integrity of the pneumatic 90 degree grinder and GFR-Bit. If the grinder or GFR-Bit is worn or cracked, replace the component.

- 3.1.4. Ensure air pressure is at 45 psi \pm 5 psi.
3.1.5. Attach the pneumatic 90 degree grinder to the regulated compressed air source.
- 3.2. **Gap Filler Material Removal.**

WARNING

DO NOT allow the GFR-Bit to dwell in one area of the gap filler or on the surrounding structure. Keep the tool in motion. Failure to observe this warning may result in damage to the GFR-Bit and surrounding structure.

WARNING

Using a pneumatic 90 degree grinder at greater than 6,000 RPM may cause damage to the GFR-Bit and/or structure as well as increase removal time.

- 3.2.1. Place the cutting end of the GFR-Bit above gap filler to be removed. Fully depress the lever on the pneumatic 90 degree grinder. After the pneumatic grinder reaches full speed (approximately 6,000 RPM), slowly plunge the GFR-Bit into the gap filler until the GFR-Bit makes contact with the bottom of the gap. See **Figure 4**.

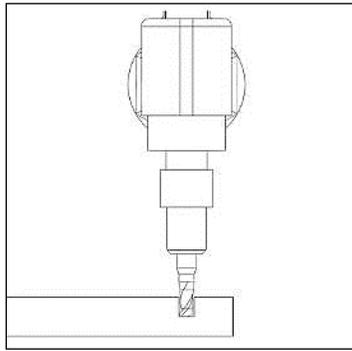


Figure 4. Initial Material Engagement

- 3.2.2. With the body of the pneumatic 90 degree grinder in line with the gap filler to be removed, begin to remove the material by pushing or pulling the pneumatic 90 degree grinder along the gap at a slow, steady rate. See **Figure 5**.

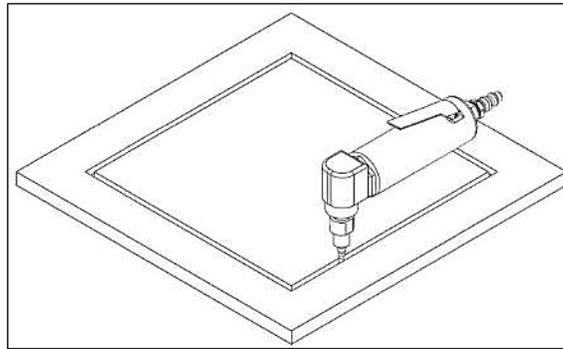


Figure 5. Tool and Gap Alignment

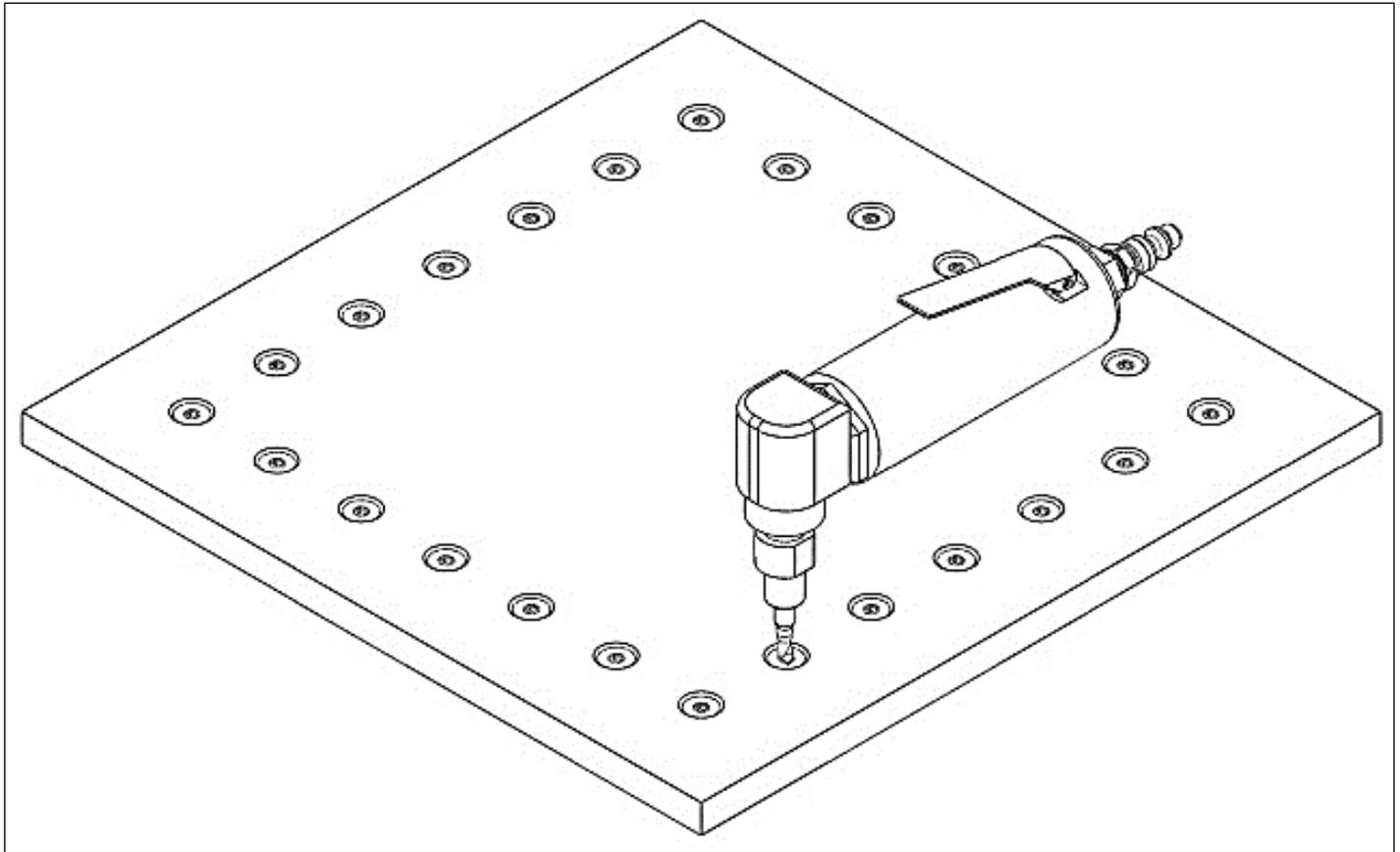
CAUTION

It may take multiple passes to completely remove the gap filler from the gap. Do not attempt to remove all material in one pass. Doing so may overheat the GFR-Bit, causing excessive wear and/or premature failure of the GFR-Bit and decrease in material removal efficiency.

- 3.2.3. Repeat the process until the gap filler has been removed from the gap.

Chapter 6:

Epoxy and Urethane Fastener Filler Material Removal Using EnduroSharp™ Torlon® Gap Filler Removal Bits With Pneumatic Tool



1. PURPOSE

- 1.1. This process instruction is designed to provide technical information for removal of epoxy and urethane fastener filler for aerospace and nonaerospace equipment using nonmetallic EnduroSharp Torlon Gap Filler Removal Bits with a DOTCO Pneumatic 90 Degree Grinder.

WARNING

EYE, EAR AND RESPIRATOR BREATHING PERSONAL PROTECTION EQUIPMENT (PPE) ARE REQUIRED DURING THIS PROCEDURE.

2. TOOLS AND EQUIPMENT

- 2.1. EnduroSharp Torlon Gap Filler Removal (GFR)-Bits. See Tool List.
- 2.2. DOTCO Pneumatic 90 Degree (Part # 12LF280-36).
 - 2.2.1. 12,000 RPM maximum tool, regulated to a maximum of 6,000 RPM.
- 2.3. Nonadjustable air regulator preset to 45 psi (Part # R14-200-R45A).
- 2.4. Safety Glasses or Goggles.
- 2.5. Hearing Protection.
- 2.6. Respiratory Protection.

3. PROCEDURES

3.1. Tool Set Up

- 3.1.1. Obtain the GFR-Bits required for the application or task being performed. See **Figure 1**.

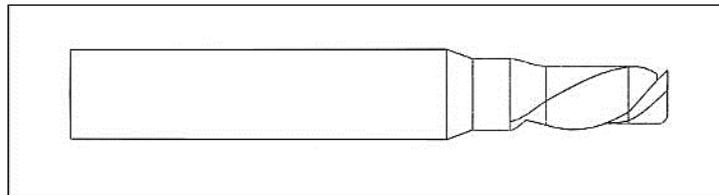


Figure 1. GFR-Bit

WARNING

GFR-Bit diameter must be narrower than the fastener head containing the material to be removed. Failure to observe this warning may result in damage to the tool or structure.

- 3.1.2. Ensure the GFR-Bit diameter is a narrower than the fastener head from which filler is being removed. See **Figure 2**.

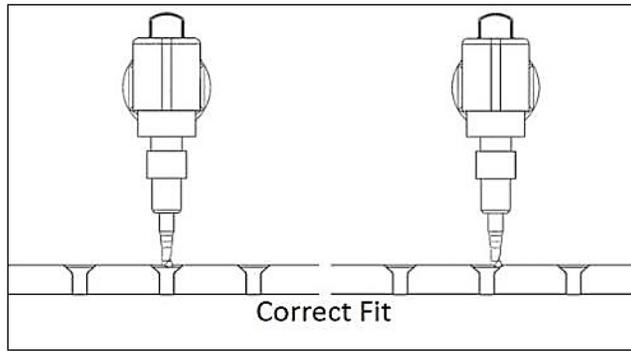


Figure 2. Proper GFR-Bit Fit

NOTE

GFR-Bits can be used to remove fastener filler from fastener head diameters several times larger than the diameter of the GFR-Bit.

WARNING

Ensure the GFR-Bit is properly secured in the pneumatic 90 degree grinder prior to use.

WARNING

Any time the GFR-Bit is being attached to or removed from the pneumatic 90 degree grinder, disconnect the grinder from the compressed air source. Failure to observe this warning may result in injury to personnel.

- 3.1.3. Attach the GFR-Bit to the pneumatic 90 degree grinder by inserting the bit into the collet until it stops. Ensure the GFR-Bit is properly secured in the collet. See **Figure 3**.

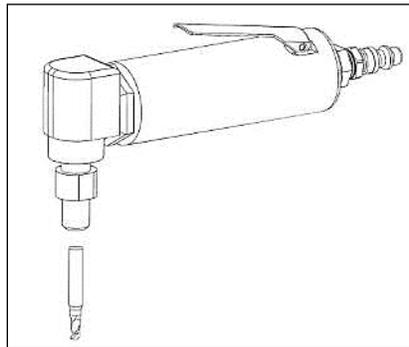


Figure 3. GFR-Bit Installation

CAUTION

Before each use, inspect the physical integrity of the pneumatic 90 degree grinder and GFR-Bit. If the grinder or GFR-Bit is worn or cracked, replace the component.

- 3.1.4. Ensure air pressure is at 45 psi \pm 5 psi.
3.1.5. Attach the pneumatic 90 degree grinder to the regulated compressed air source.

3.2. Fastener Filler Material Removal

WARNING

DO NOT allow the GFR-Bit to dwell in one area of the fastener filler or on the surrounding structure. Keep the tool in motion. Failure to observe this warning may result in damage to the GFR-Bit and surrounding structure.

WARNING

Using a pneumatic 90 degree grinder at greater than 6,000 RPM may cause damage to the GFR-Bit and/or structure as well as increase removal time.

- 3.2.1. Place the cutting end of the GFR-Bit above fastener filler to be removed. Fully depress the lever on the pneumatic 90 degree grinder. After the pneumatic grinder reaches full speed (approximately 6,000 RPM), slowly plunge the GFR-Bit into the fastener filler until the GFR-Bit makes contact with the fastener head. See **Figure 4**.

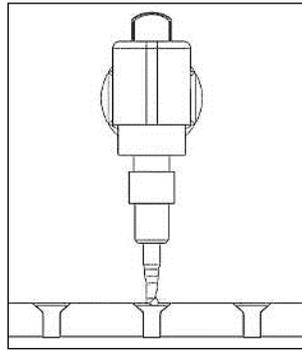


Figure 4. Initial Material Engagement

- 3.2.2. Begin to remove the fastener filler by moving the pneumatic 90 degree grinder in circular motion above the fastener head at a slow, steady rate. See **Figure 5**.

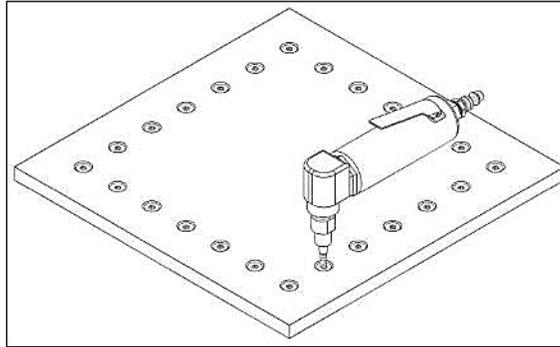


Figure 5. Tool and Fastener Head Alignment

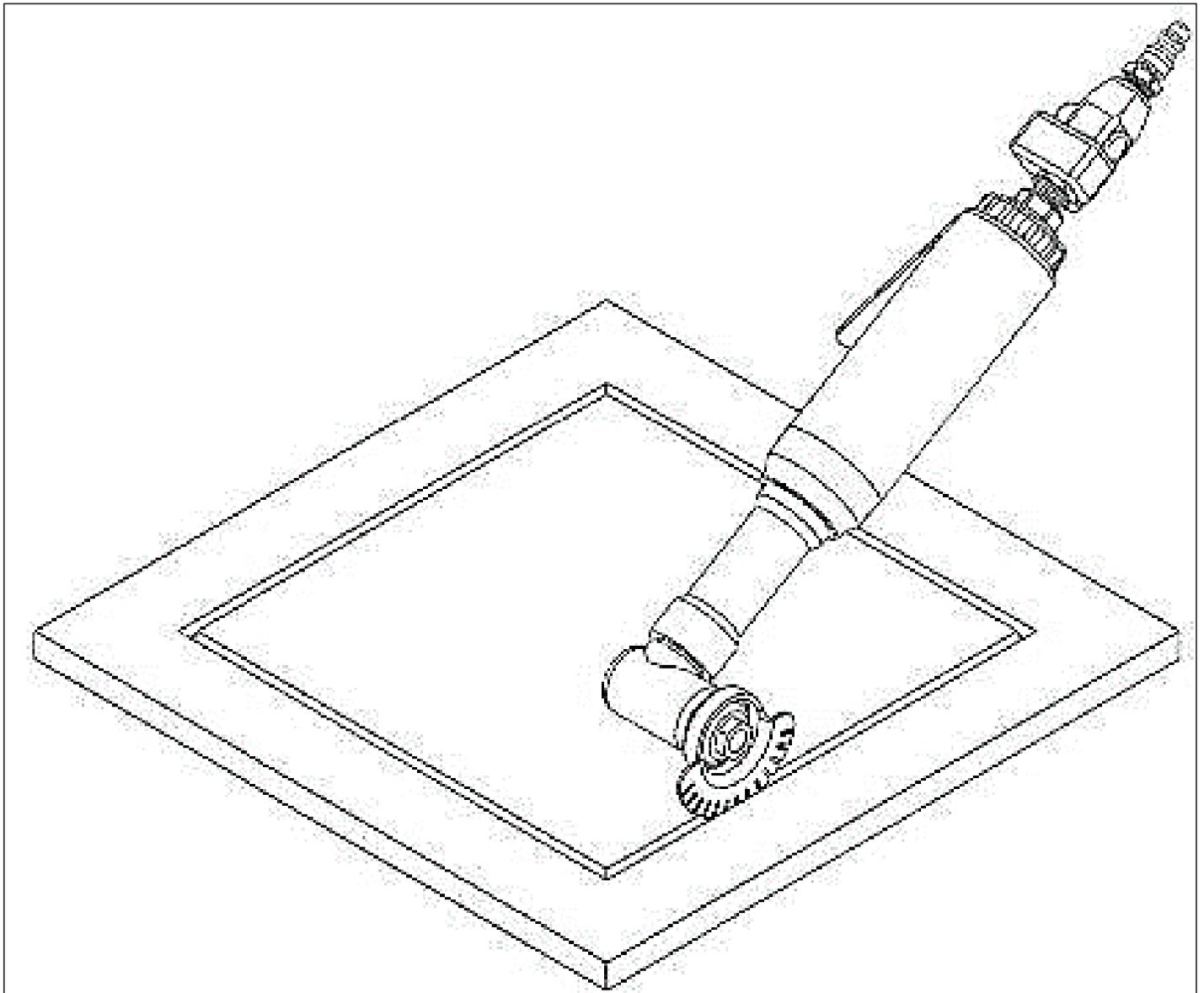
CAUTION

It may take multiple passes to completely remove the fastener filler from the fastener head. Do not attempt to remove all material in one pass. Doing so may overheat the GFR-Bit, causing excessive wear and/or premature failure of the GFR-Bit and decrease in material removal efficiency.

- 3.2.3. Repeat the process until the fastener filler has been removed from the fastener head.

Chapter 7:

Epoxy and Urethane Gap Filler Removal Using EnduroSharp™ Torlon® GFR-Discs/Blades with Oscillating Pneumatic Tools



1. PURPOSE

- 1.1. This process instruction is designed to provide technical information for removal of gap filler material removal from aerospace and nonaerospace equipment using nonmetallic EnduroSharp Torlon GFR-Discs/Blades with DOTCO oscillating pneumatic tools.

WARNING

EYE, EAR AND RESPIRATOR BREATHING PERSONAL PROTECTION EQUIPMENT (PPE) ARE REQUIRED DURING THIS PROCEDURE.

2. TOOLS AND EQUIPMENT

- 2.1. EnduroSharp Gap Filler Removal (GFR)-Discs/Blades. See Tool List.
- 2.2. DOTCO Pneumatic straight oscillating saw (Part # 12L2065-90).
 - 2.2.1. 14,000 RPM maximum tool attached to a swivel air regulator.
- 2.3. DOTCO Pneumatic right angle oscillating saw (Part # 12L2240-90).
 - 2.3.1. 14,000 RPM maximum tool attached to a swivel air regulator.
- 2.4. Safety Glasses or Goggles.
- 2.5. Hearing Protection.
- 2.6. Respiratory Protection.

3. PROCEDURES

3.1. Tool Set Up

- 3.1.1. Select an appropriate size/configuration GFR-Disc/Blade for the removal application being performed. See **Figure 1**.

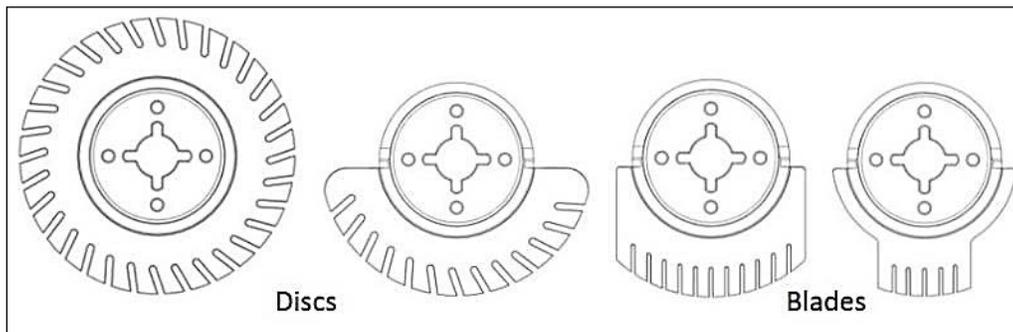


Figure 1. GFR-Disc/Blade Configurations

WARNING

GFR-Disc/Blade thickness must be narrower than the gap containing the material to be removed. Failure to observe this warning may result in damage to the tool or structure.

- 3.1.2. Ensure the selected GFR-Disc/Blade thickness is narrower than the gap from which the filler is being removed. See **Figure 2**.

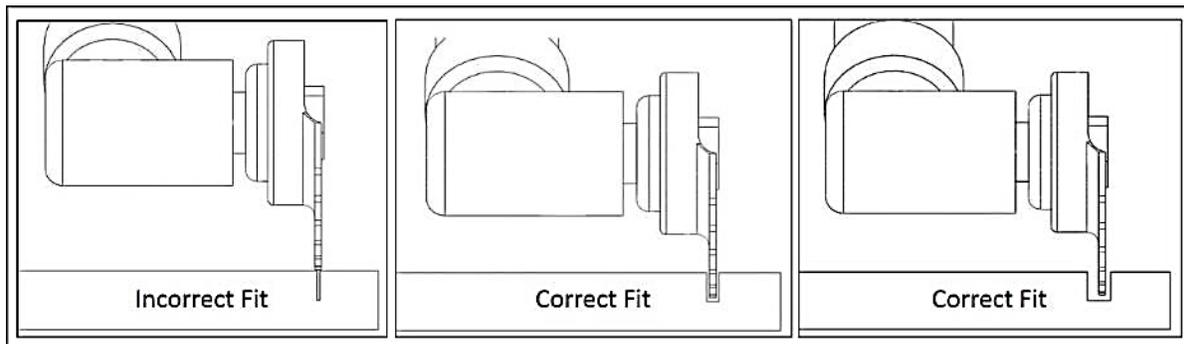


Figure 2. Determining Proper GFR-Disc/Blade Fit

WARNING

Any time a GFR-Disc/Blade is attached to or removed from the pneumatic tool, disconnect the tool from the compressed air source. Failure to observe this warning may result in injury to personnel.

- 3.1.3. Attach the appropriate GFR-Disc/Blade to the pneumatic oscillating saw by inserting the threaded spindle of the oscillating saw through the mounting hole in the GFR-Disc/Blade until it seats against the inner flange. Secure the GFR-Disc/Blade to the tool using the threaded outer flange nut. See **Figure 3**.

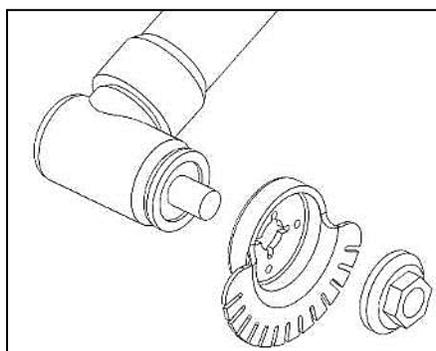


Figure 3. GFR-Disc/Blade Installation

NOTE

Before each use, inspect the physical integrity of the pneumatic oscillating saw and GFR-Disc/Blade. If the pneumatic saw is damaged or the GFR-Disc/Blade is cracked, worn or has any missing teeth, replace the component.

CAUTION

Ensure the GFR-Disc/Blade is properly secured in the pneumatic oscillating saw prior to use.

- 3.1.4. Adjust the air regulator to 95 psi \pm 5 psi.
 3.1.5. Attach the pneumatic oscillating saw to the regulated compressed air source.

3.2. Gap Filler Removal

WARNING

DO NOT allow the GFR-Disc/Blade to dwell in one area of the gap filler or on the surrounding structure. Keep the tool in motion. Failure to observe this warning may result in damage to the GFR-Disc/Blade and surrounding structure.

- 3.2.1. Place the cutting edge of the GFR-Disc/Blade above gap filler to be removed. Fully depress the lever on the pneumatic oscillating saw. Once the saw reaches operating speed, slowly plunge the GFR-Disc/Blade into the gap filler until approximately one quarter of the depth of the teeth on the GFR-Disc/Blade is engaged in the gap filler to be removed. See **Figure 4**.

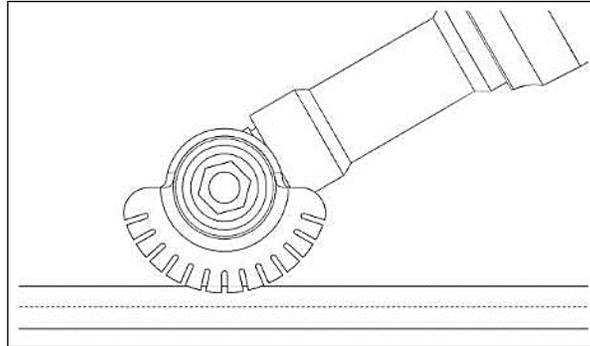


Figure 4. Initial Gap Filler Engagement

NOTE

Only use the GFR-Disc/Blade in gaps wider than the thickness of the cutting edge of GFR-Disc/Blade edge.

WARNING

DO NOT allow the GFR-Disc/Blade to dwell in one area of the gap filler or on the surrounding structure. Keep the tool in motion. Failure to observe this warning may result in damage to the GFR-Disc/Blade and surrounding structure.

- 3.2.2. With the GFR-Disc/Blade in line with the gap and engaged in the gap filler (**Figure 5**), begin to remove the gap filler by moving the pneumatic saw and GFR-Disc/Blade along the gap at a slow, steady rate.

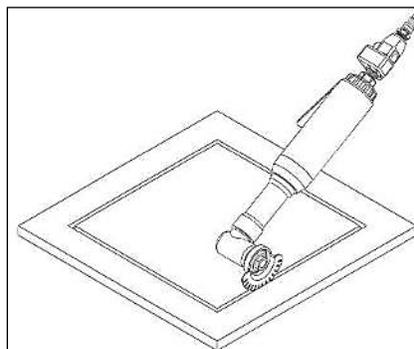


Figure 5: Tool and Gap Alignment

- 3.2.3. Remove gap filler in incremental steps using multiple passes and depth adjustments.
- 3.2.4. When making additional passes in areas from which gap filler has been removed, plunge the GFR-Disc/Blade further into the gap filler.

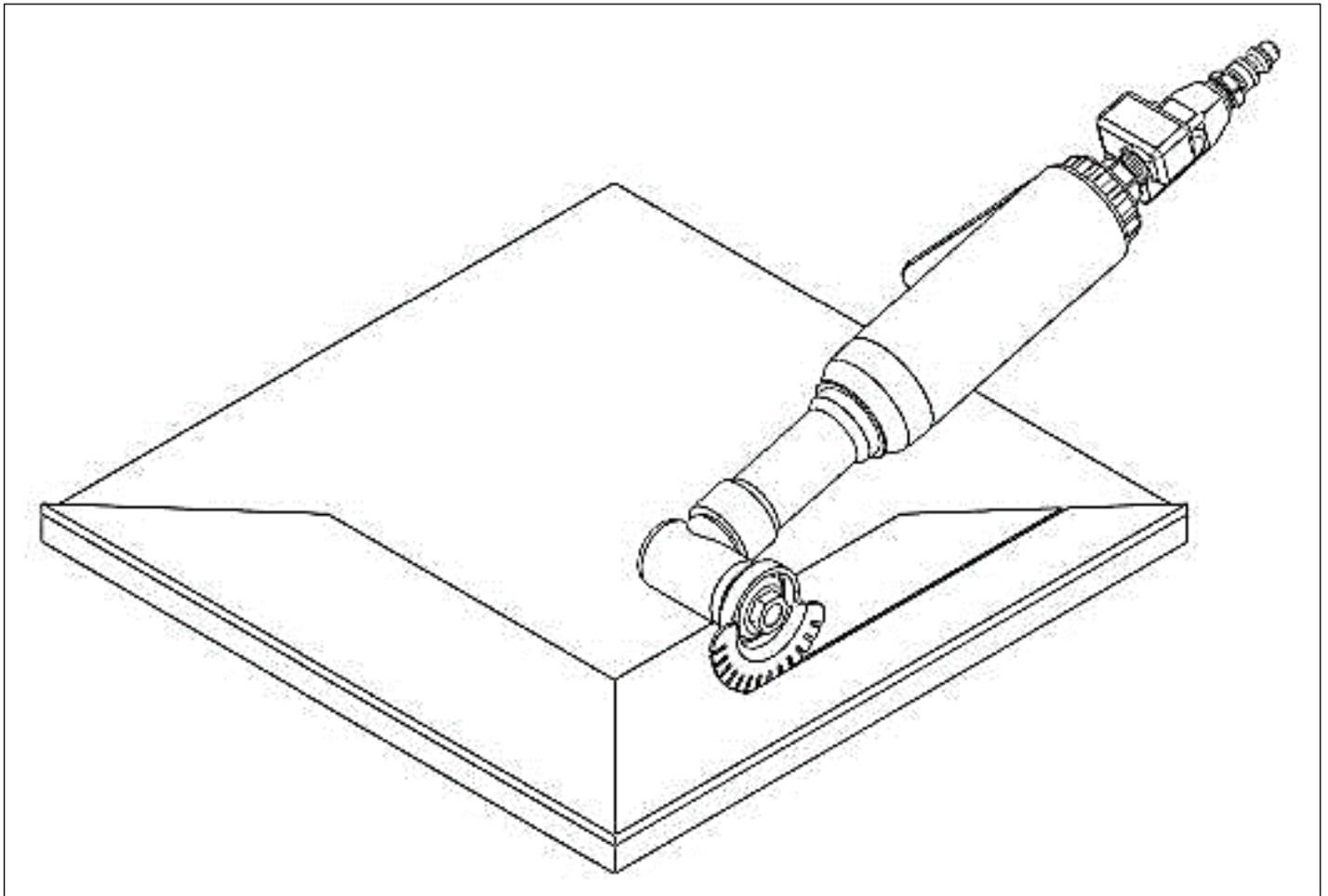
CAUTION

Do not attempt to remove all material in one pass. Doing so may overheat the GFR-Disc/Blade and/or the gap filler, causing excessive wear and/or premature failure of the GFR-Disc/Blade and potentially causing the gap filler to melt.

- 3.2.5. Repeat the process until the gap filler has been removed from the gap.

Chapter 8:

Thick Elastomeric Coating Cutting/Scoring Using EnduroSharp™ Torlon® GFR- Discs/Blades with Oscillating Pneumatic Tools



1. PURPOSE

- 1.1. This process instruction is designed to provide technical information for cutting or scoring thick elastomeric coatings from aerospace and nonaerospace equipment using nonmetallic Torlon GFR-Discs/Blades with DOTCO oscillating pneumatic tools.

WARNING

EYE AND EAR PERSONAL PROTECTION EQUIPMENT (PPE) ARE REQUIRED DURING THIS PROCEDURE.

2. TOOLS AND EQUIPMENT

- 2.1. EnduroSharp Gap Filler Removal (GFR)-Discs/Blades. See Tool List.
- 2.2. DOTCO Pneumatic straight oscillating saw (Part # 12L2065-90).
 - 2.2.1. 14,000 RPM maximum tool attached to a swivel air regulator.
- 2.3. DOTCO Pneumatic right angle oscillating saw (Part # 12L2240-90).
 - 2.3.1. 14,000 RPM maximum tool attached to a swivel air regulator.
- 2.4. Safety Glasses or Goggles.
- 2.5. Hearing Protection.
- 2.6. Respiratory Protection.

3. PROCEDURES

3.1. Tool Set Up

- 3.1.1. Choose an appropriate size/configuration GFR-Disc/Blade for the application or task being performed. See **Figure 1**.

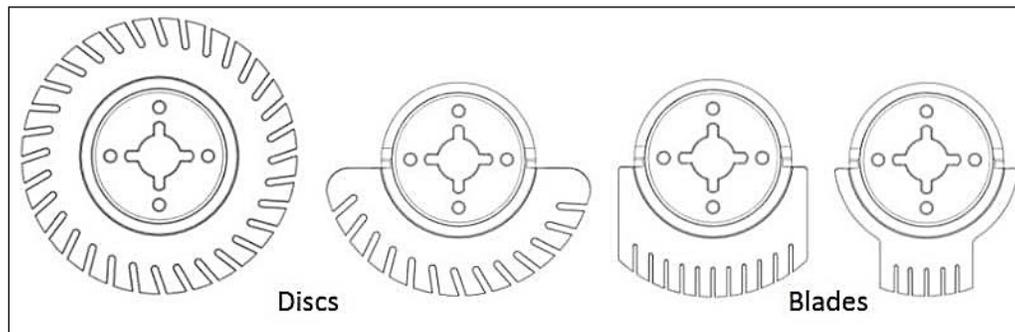


Figure 1. GFR-Disc/Blade Configurations

NOTE

GFR-Discs/Blades, while primarily designed for gap filler removal, are suitable for cutting through and/or scoring thick elastomeric coatings.

WARNING

Any time a GFR-Disc/Blades is attached to or removed from the pneumatic tool, disconnect the tool from the compressed air source. Failure to observe this warning may result in injury to personnel.

- 3.1.2. Attach the appropriate GFR-Disc/Blade to the pneumatic oscillating saw by inserting the threaded spindle of the oscillating saw through the mounting hole in the GFR-Disc/Blade until it seats against the inner flange. Secure the GFR-Disc/Blade to the tool using the threaded outer flange nut. See **Figure 2**.

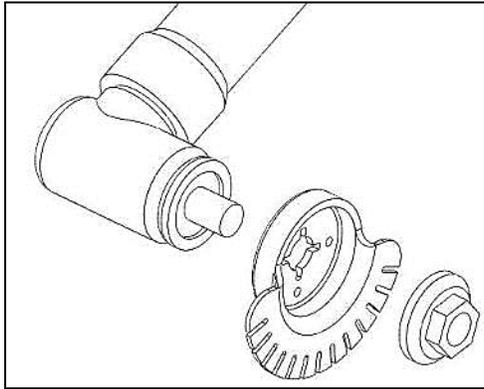


Figure 2. GFR-Disc/Blade Installation

CAUTION

Before each use, inspect the physical integrity of the pneumatic oscillating saw and GFR-Disc/Blade. If the pneumatic saw is damaged or the GFR-Disc/Blade is cracked, worn or has any missing teeth, replace the component.

CAUTION

Ensure the GFR-Disc/Blade is properly secured in the pneumatic oscillating saw prior to use.

- 3.1.3. Adjust the air regulator to 95 psi \pm 5 psi.
- 3.1.4. Attach the pneumatic oscillating saw to the regulated compressed air source.

3.2. Elastomeric Coating Cutting/Scoring

WARNING

DO NOT allow the GFR-Disc/Blade to dwell in one area of the thick elastomeric coating or on the surrounding structure. Keep the tool in motion. Failure to observe this warning may result in damage to the GFR-Disc/Blade and surrounding structure.

- 3.2.1. Place the cutting edge of the GFR-Disc/Blade above the area of the thick elastomeric coating to be cut/scored. Fully depress the lever on the pneumatic oscillating saw. Once the saw reaches operating speed, slowly plunge the GFR-Disc/Blade into the thick coating until approximately one quarter of the depth of the teeth on the GFR-Disc/Blade is engaged in the material to cut/scored. See **Figure 3**.

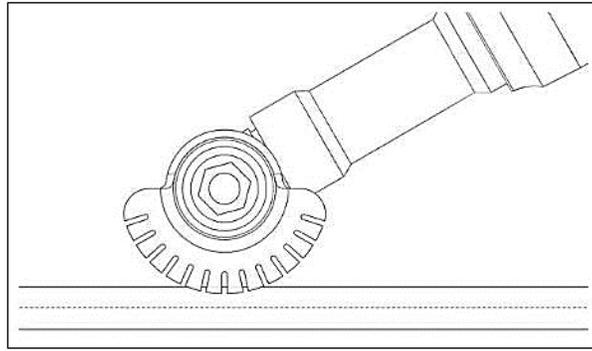


Figure 3. Initial Thick Coating Engagement

WARNING

DO NOT allow the GFR-Disc/Blade to dwell in one area of the thick elastomeric coating or on the surrounding structure. Keep the tool in motion. Failure to observe this warning may result in damage to the GFR-Disc/Blade and surrounding structure.

- 3.2.2. With the GFR-Disc/Blade in line with the direction of cut and engaged in the thick elastomeric coating (**Figure 4**), begin to remove material by moving the pneumatic saw and GRF-Disc/Blade along the direction of cut at a slow, steady rate.

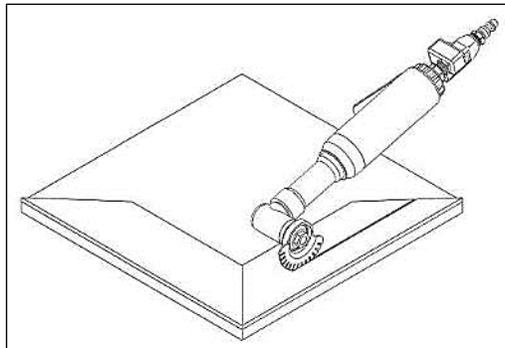


Figure 4. Typical Tool and Material Alignment

- 3.2.3. Cut/score the thick elastomeric coating in incremental steps using multiple passes and depth adjustments. See **Figure 5**.

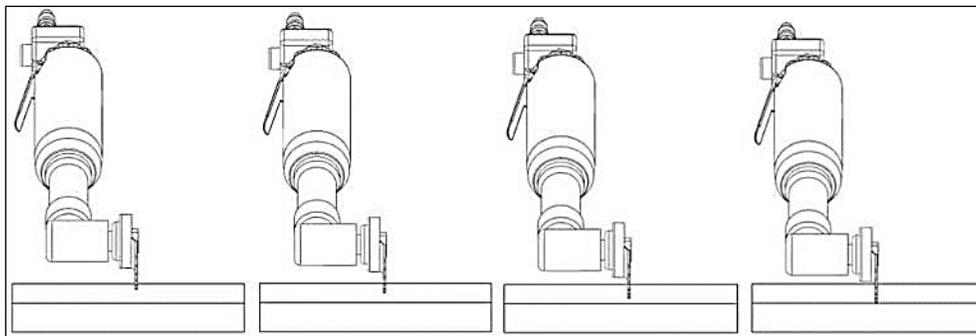


Figure 5. Incremental Material Removal Steps

CAUTION

Do not attempt to remove the full thickness of the elastomeric coating in one pass. Doing so may overheat the GFR- Discs/Blades and/or the coating, causing excessive wear and/or premature failure of the GFR-Disc/Blade and potentially causing the coating to melt.

- 3.2.4. When making additional passes in areas from which thick elastomeric coating has been removed, plunge the GFR-Disc/Blade further into the material.
- 3.2.5. Repeat until the desired depth is reached.

TOOL LIST

Item ID	Item Description	P/N	Manufacturer	Cage Code	Address	Contact	Notes
1	Grinder, 90 Degree (12,000 RPM)	12LF280-36 (DOTCO P/N)	DOTCO	15826	Apex Tool Group, LLC 1000 Lufkin Road Apex, NC 27539	919-387-0099	For use with Item ID 2. Must be use with a 45 psi pressure regulator, Item ID 3.
2	Gap Filler Removal Bit	GFRB-T5030-SF-162 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	For use with standard (12,000 rpm regulated down to 6,000 rpm "MAX") right angle grinder Item ID 1, Must use with 45 psi pressure regulator, Item ID 3.
3	1/4 MINI REGULATOR	R14-200-R45A	IMI Norgren Inc.		5400 South Delaware Street Littleton, CO 80120	303-794-2611	For use with Item ID 1.
4	Deluxe EnduroSharp Scraper Blade & Holder Kit w/ Pneumatic Tool	DES004 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Kit contains 10 EnduroSharp Torlon Scraper Blades (2 of each size), 1 "Pocket" Scraper Blade Holder, 1 Standard Scraper Blade Holder, and 1 Pneumatic Tool.
5	EnduroSharp Scraper Blade & Holder Kit (w/o Pneumatic Tool)	ESSHK005 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Kit contains 10 EnduroSharp Torlon Scraper Blades (2 each of each size), 1 EnduroSharp "Pocket" Scraper Blade Holder, and 1 Standard Scraper Blade Holder.

Item ID	Item Description	P/N	Manufacturer	Cage Code	Address	Contact	Notes
6	Deluxe EnduroSharp Gap Blade & Holder Kit w/ Pneumatic Tool	DEG007 (Performance Plastics P/N)	Performance Plastics LTD	OJ1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@Performance Plastics.com	513-321-8404	Kit contains 15 EnduroSharp Torlon Gap Blades (1 of each width and depth), 1 EnduroSharp Torlon Gap Blade Adapter, 1 EnduroSharp "Pocket" Scraper Blade Holder, 1 Standard Scraper Blade Holder, and 1 Pneumatic Tool.
7	EnduroSharp Gap Blade & Holder Kit (w/o Pneumatic Tool)	ESGHK006 (Performance Plastics P/N)	Performance Plastics LTD	OJ1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@Performance Plastics.com	513-321-8404	Kit contains 15 EnduroSharp Torlon Gap Blades (1 of each width and depth), 1 EnduroSharp Torlon Gap Blade Adapter, 1 EnduroSharp "Pocket" Scraper Blade Holder, and 1 Standard Scraper Blade Holder.
8	EnduroSharp Pneumatic Tool For Scraper Blades (and Gap Blades)	ESPT001 (Performance Plastics P/N)	Performance Plastics LTD	OJ1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@Performance Plastics.com	513-321-8404	Pneumatic Removal Tool operates at a pressure of 90 psi (Max). For use w/ EnduroSharp Torlon Scraper Blades (Item ID 12-16) and EnduroSharp Torlon Gap Blade Adapter (Item ID 17). Use with Swivel Air Regulator fitting to prevent quick disconnect fitting galling and provide dial adjustment air flow regulation.
9	EnduroSharp "Pocket" Scraper Blade Holder	ESSBH002 (Performance Plastics P/N)	Performance Plastics LTD	OJ1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@Performance Plastics.com	513-321-8404	For use w/ EnduroSharp Torlon Scraper Blades (Item ID 12-16) and EnduroSharp Torlon Gap Blade Adapter (Item ID 17).

Item ID	Item Description	P/N	Manufacturer	Cage Code	Address	Contact	Notes
10	EnduroSharp Standard Scraper Blade Holder (Standard Handle)	ESHH003 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	For use with EnduroSharp Torlon Scraper Blades (Item ID 12-16) and EnduroSharp Torlon Gap Blade Adapter (Item ID 17).
11	EnduroSharp Scraper Blade Sharpener	ESSBS001 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	For use w/ EnduroSharp Torlon Scraper Blades (Item ID 12-16).
12	EnduroSharp Torlon Scraper Blade (TSB) (0.170")	TSB-170 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	For use with Item ID 8, 9, 10, and 11
13	EnduroSharp Torlon Scraper Blade (TSB) (0.230")	TSB-230 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	For use with Item ID 8, 9, 10, and 11
14	EnduroSharp Torlon Scraper Blade (TSB) (0.500")	TSB-500 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	For use with Item ID 8, 9, 10, and 11
15	EnduroSharp Torlon Scraper Blade (TSB) (0.750")	TSB-750 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	For use with Item ID 8, 9, 10, and 11
16	EnduroSharp Torlon Scraper Blade (TSB) (1.200")	TSB-1200 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	For use with Item ID 8, 9, 10, and 11

Item ID	Item Description	P/N	Manufacturer	Cage Code	Address	Contact	Notes
17	EnduroSharp Holder Adapter for Gap Blades (Gap Blade Adapter)	TGBA-001 (Performance Plastics P/N)	Performance Plastics LTD	OJ1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@Performance Plastics.com	513-321-8404	Adapter for use with EnduroSharp Pneumatic Tool For Scraper Blades (Item ID 8), EnduroSharp "Pocket" Blade Holder (Item ID 9), and EnduroSharp Standard Scraper Blade Holder (Item ID 10), and EnduroSharp Torlon Gap Blades (Item ID 18-32)
18	EnduroSharp Torlon Gap Blade (0.075" x 0.075")	TGB-75-75 (Performance Plastics P/N)	Performance Plastics LTD	OJ1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@Performance Plastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.075" blade width by 0.075" cutting depth. For use with EnduroSharp Gap Blade Adapter (Item ID 17).
19	EnduroSharp Torlon Gap Blade (0.075" x 0.160")	TGB-75-16 Performance Plastics P/N)	Performance Plastics LTD	OJ1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@Performance Plastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.075" blade width by 0.160" cutting depth. For use with EnduroSharp Gap Blade Adapter (Item ID 17).
20	EnduroSharp Torlon Gap Blade (0.075" x 0.250")	TGB-75-25 Performance Plastics P/N)	Performance Plastics LTD	OJ1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@Performance Plastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.075" blade width by 0.250" cutting depth. For use with EnduroSharp Gap Blade Adapter (Item ID 17).
21	EnduroSharp Torlon Gap Blade (0.100" x 0.075")	TGB-10-75 (Performance Plastics P/N)	Performance Plastics LTD	OJ1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@Performance Plastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.100" blade width by 0.075" cutting depth. For use with EnduroSharp Gap Blade Adapter (Item ID 17).
22	EnduroSharp Torlon Gap Blade (0.100" x 0.160")	TGB-10-16 (Performance Plastics P/N)	Performance Plastics LTD	OJ1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@Performance Plastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.100" blade width by 0.160" cutting depth. For use with

Item ID	Item Description	P/N	Manufacturer	Cage Code	Address	Contact	Notes
							EnduroSharp Gap Blade Adapter (Item ID 17).
23	EnduroSharp Torlon Gap Blade (0.100" x 0.250")	TGB-10-25 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.100" blade width by 0.250" cutting depth. For use with EnduroSharp Gap Blade Adapter (Item ID 17).
24	EnduroSharp Torlon Gap Blade (0.125" x 0.075")	TGB-12-75 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.125" blade width by 0.075" cutting depth. For use with EnduroSharp Gap Blade Adapter (Item ID 17).
25	EnduroSharp Torlon Gap Blade (0.125" x 0.160")	TGB-12-16 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.125" blade width by 0.160" cutting depth. For use with EnduroSharp Gap Blade Adapter (Item ID 17).
26	EnduroSharp Torlon Gap Blade (0.125" x 0.250")	TGB-12-25 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.125" blade width by 0.250" cutting depth. For use with EnduroSharp Gap Blade Adapter (Item ID 17).
27	EnduroSharp Torlon Gap Blade (0.170" x 0.075")	TGB-17-75 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.170" blade width by 0.075" cutting depth. For use with EnduroSharp Gap Blade Adapter (Item ID 17).
28	EnduroSharp Torlon Gap Blade (0.170" x 0.160")	TGB-17-16 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.170" blade width by 0.160" cutting depth. For use with EnduroSharp Gap Blade Adapter (Item ID 17).

Item ID	Item Description	P/N	Manufacturer	Cage Code	Address	Contact	Notes
29	EnduroSharp Torlon Gap Blade (0.170" x 0.250")	TGB-17-25 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.170" blade width by 0.250" cutting depth. For use with EnduroSharp Gap Blade Adapter (Item ID 17).
30	EnduroSharp Torlon Gap Blade (0.230" x 0.075")	TGB-23-75 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.230" blade width by 0.075" cutting depth. For use with EnduroSharp Gap Blade Adapter (Item ID 17).
31	EnduroSharp Torlon Gap Blade (0.230" x 0.160")	TGB-23-16 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.230" blade width by 0.160" cutting depth. For use with EnduroSharp Gap Blade Adapter (Item ID 17).
32	EnduroSharp Torlon Gap Blade (0.230" x 0.250")	TGB-23-25 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Gap Blade, 35° cutting angle, 0.230" blade width by 0.250" cutting depth. For use with EnduroSharp Gap Blade Adapter (Item ID 17).
33	Oscillating – Right Angle (14,000 RPM)	Model # 12L2240-90 (DOTCO P/N)	DOTCO	15826	Apex Tool Group, LLC 1000 Lufkin Road Apex, NC 27539	919-387-0099	Use with Swivel Air Regulator fitting to prevent quick disconnect fitting galling and provide dial adjustment air flow regulation. For use with Item ID 35-42

Item ID	Item Description	P/N	Manufacturer	Cage Code	Address	Contact	Notes
34	Oscillating – Inline (14,000 RPM)	Model # 12L2065-90 (DOTCO P/N)	DOTCO	15826	Apex Tool Group, LLC 1000 Lufkin Road Apex, NC 27539	919-387-0099	Use with Swivel Air Regulator fitting to prevent quick disconnect fitting galling and provide dial adjustment air flow regulation. For use with Item ID 35-42
35	EnduroSharp Gap Filler Removal (GFR) Circle Disc (Angled Teeth)	GFRD-25FDA55 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Use with Item ID 33 and 34 ONLY (Oscillating)
36	EnduroSharp Gap Filler Removal (GFR) Circle Disc (Straight Teeth)	GFRD-25FDS55 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Use with Item ID 33 and 34 ONLY (Oscillating)
37	EnduroSharp Gap Filler Removal (GFR) Semicircle Disc (Angled Teeth)	GFRD-25HDA55 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Use with Item ID 33 and 34 ONLY (Oscillating)
38	EnduroSharp Gap Filler Removal (GFR) Semicircle Disc (Straight Teeth)	GFRD-25HDS55 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@PerformancePlastics.com	513-321-8404	Use with Item ID 33 and 34 ONLY (Oscillating)

Item ID	Item Description	P/N	Manufacturer	Cage Code	Address	Contact	Notes
39	EnduroSharp Gap Filler Removal (GFR) Radiused Plunge Cut Blade (Straight Teeth) 1.700 x 0.055	GFRD- 2517R55 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@Performance Plastics.com	513- 321-8404	Use with Item ID 33 and 34 ONLY (Oscillating)
40	EnduroSharp Gap Filler Removal (GFR) Radiused Plunge Cut Blade (Straight Teeth) 0.850 x 0.055	GFRD- 2585R55 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@Performance Plastics.com	513- 321-8404	Use with Item ID 33 and 34 ONLY (Oscillating)
41	EnduroSharp Gap Filler Removal (GFR) Flat Plunge Cut Blade (Straight Teeth) 1.700 x 0.055	GFRD- 2517S55 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@Performance Plastics.com	513- 321-8404	Use with Item ID 33 and 34 ONLY (Oscillating)
42	EnduroSharp Gap Filler Removal (GFR) Flat Plunge Cut Blade (Straight Teeth) 0.850 x 0.055	GFRD- 2585S55 (Performance Plastics P/N)	Performance Plastics LTD	0J1C6	4435 Brownway Ave Cincinnati, Ohio 45209 Orders@Performance Plastics.com	513- 321-8404	Use with Item ID 33 and 34 ONLY (Oscillating)