

Shaft Preparation Protocol for Bonding Vanes to Arrow Shafts

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This protocol was developed to ensure satisfactory bonding between arrow shafts and their vanes. It is assumed that the vanes have already been properly cleaned and prepared for bonding, and that a good quality adhesive (made specifically for this application) is being used.

Why adhesives sometimes don't stick...

Adhesives may fail to bond to a surface if the surface has not been properly prepared. Prior to bonding, surfaces must be free of contamination, including foreign particles (dirt), oils and greases, oxidation (including anodized layers), paint, surfactants (soaps and silicone lubricants), and water. Unless such contaminants are removed, the adhesive will bond to the contaminants instead of the molecules of the shaft. Greases, oils and surfactants are often used in the fabrication process of arrow shafts. Aluminum usually has a thin layer of oxidation on its surface. This layer occludes oxygen from reaching the rest of the metal, preventing further oxidation, so aluminum does not continue to corrode, as do most steels. The primary purpose of surface preparation is to remove surface contamination.

Materials:

- 100% denatured alcohol (not rubbing alcohol, which is usually only 70%, and may contain oils)
- 100% acetone (not finger nail polish remover, which usually contains oil)
- Arrow shaft
- Vane
- Clean utility knife
- Fletching adhesive
- Gauze pads or wipes (must be clean, free of contaminants)
- #400 or #600 grit emery paper (must be clean, free of contaminants)
- Powder-free gloves (must be clean, free of contaminants)
- Eye protection

Steps:

1. Wash your hands with soap and water to remove dirt, oils, and other contamination. Use eye protection and gloves to protect yourself during the entire cleaning process. Work in a well-ventilated area, because alcohol and acetone fumes are hazardous to health. Alcohol and acetone are extremely flammable, so the work area must be free of open flames and other possible ignition sources.
2. Thoroughly pre-clean each entire arrow with water, to prevent cross contamination as they are being handled. If the arrows are oily or heavily soiled, use soap, and rinse thoroughly afterward. Allow the arrows to dry completely.

3. Wipe-down the entire arrow with denatured alcohol on a gauze pad to pre-clean the arrow and prevent cross-contamination as it is being handled. Allow the arrow to dry completely.

Note: Be careful not to touch contaminated surfaces, especially your face, with your gloved hands once you begin the cleaning operation. Contaminants can easily be picked-up and transferred to the parts.

4. With a clean utility knife, carefully scrape off any residual adhesive that might be on the shaft.
5. With a clean gauze pad, perform a through scrubbing of the area to which the vane will be bonded, using the denatured alcohol. Finish with a quick scrub with acetone on a gauze pad. Do not soak existing vanes, nocks, or their glue lines with the acetone, as this may soften the material and/or adhesive. Be aware that acetone will remove many types of ink and paint. Allow to dry thoroughly.

Note: The scrubbing step above must be performed prior to the abrasive cleaning below; otherwise the abrasive cleaning may embed contaminants into the shaft.

6. Lightly abrade the entire bonding area with #400 or #600 emery paper.

Note: Do not use a polymer-based cleaning pad, such as Scotch-Brite. Such products leave a slight polymer residue that contaminates the surface.

7. Repeat the alcohol scrub in Step 5 above, after the surfaces have been abraded.
8. The shaft and vanes must be gently warmed above air temperature before the bonding operation. Cold surfaces attract a layer of water condensation, which prevents effective bonding. The shafts and vanes may be warmed by placing them in direct sunlight for a few minutes, or heating them gently with a hairdryer or incandescent lamp.
9. Before the shaft and vanes cool, apply a small, even bead (approx.. 1 mm in diameter) of adhesive to the base of the vane, and then clamp the vane on the shaft in the correct location using a fletching jig. There should be sufficient adhesive so that a small amount squeezes out from the base around the entire vane. For air-drying adhesives, wait at least 10 minutes, or until the adhesive is cured, before removing the arrow from the jig. For cyano-acrylate "instant" glues, the arrow may be removed from the jig after 30 seconds. If using a cyano-acrylate adhesive, be sure it is the thicker, toughened, impact resistant variety. Wait 24 hours before shooting the arrow, to allow the adhesive to cure.

Note: Bonding must be done immediately after the shafts have been prepared, otherwise oxidation will start to reform on the surface, or contaminants will start to redeposit on the surfaces.

10. After removing the arrow from the jig, place a small drop of adhesive on the leading and trailing ends of the vane at its base. This will prevent failure initiation at those points.