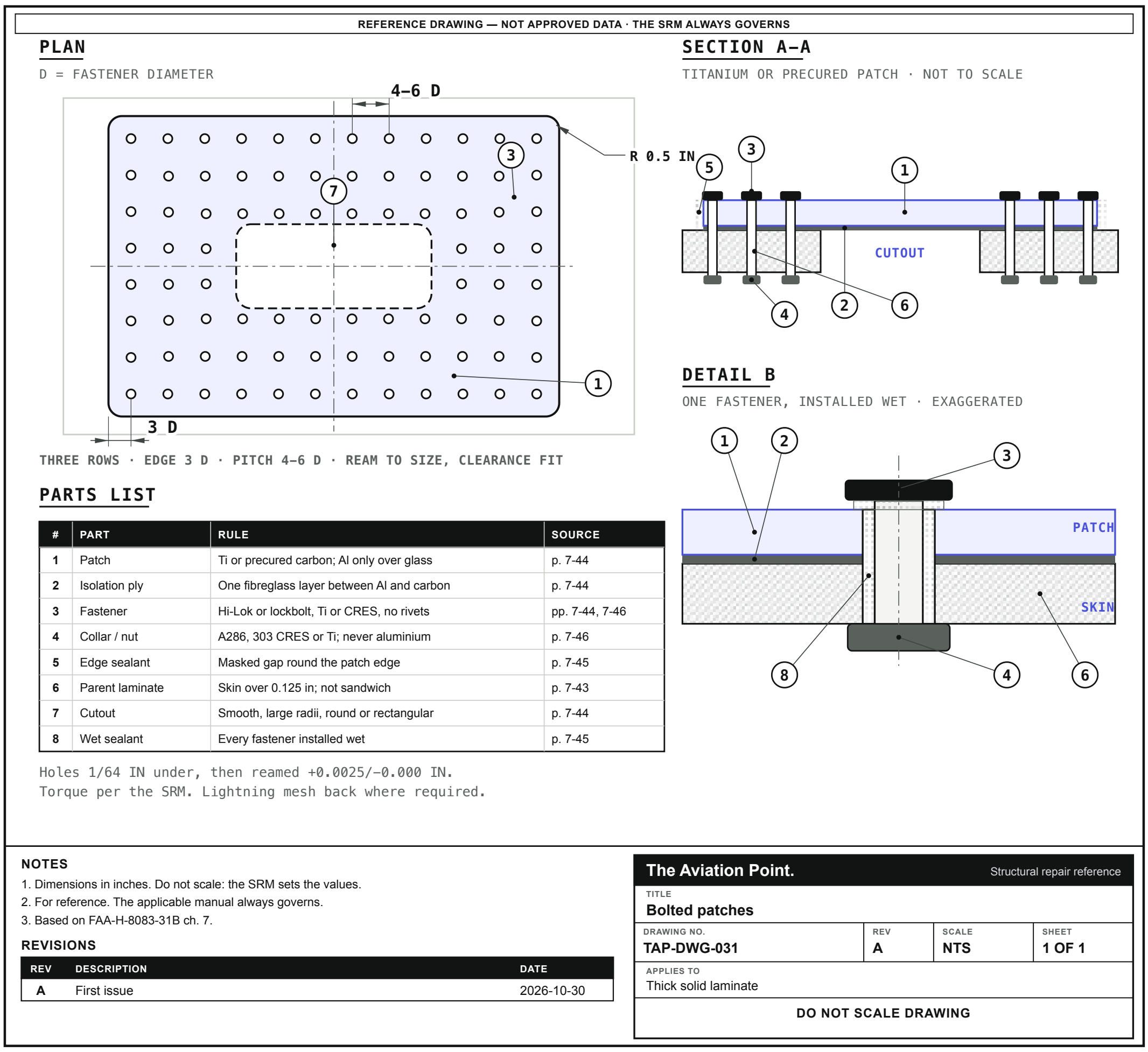
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Bolted Patches on Composites: Where They Fit and How to Lay Them Out

Bolted or bonded · patch and fastener materials · hole layout · seal and finish



Plan, section, fastener detail and parts list, after FAA-H-8083-31B pp. 7-44 to 7-46 and figure 7-75.

Bolted or bonded?

Question	Bolted patch	Bonded patch
Laminate thickness	Normally skins thicker than 0.125 in, so the fasteners have enough bearing area	Thin laminates and lightly loaded parts
Honeycomb sandwich	Prohibited: holes let moisture in and the core degrades	Scarf or external step patch
Weight	Heavier than a bonded repair; a problem on flight control surfaces	Lighter
Materials	Patch and fasteners only; no freezer, no cure	Prepreg and film adhesive need cold storage and a cure
Stress concentration	Every hole adds one	None from fastener holes

Patch and fastener: what goes with carbon

Item	Use	Avoid
Patch, highly loaded part	Titanium or precured carbon/epoxy (same strength and stiffness as the parent when cured alike)	Aluminium on its own
Patch, aluminium on carbon	Allowed, with one layer of fibreglass cloth between patch and carbon	Aluminium touching carbon: galvanic corrosion
Fasteners in carbon	Titanium (Ti-6Al-4V is the most common) or stainless steel; A286 and MP35N also compatible	Aluminium fasteners, cadmium plating
Hi-Lok collars	A286, 303 stainless or titanium	Aluminium collars
Lockbolts	Hat-shaped collar with a flange; pin with six grooves for composite (five for metal)	Standard metal-structure collar
Rivets	None	A rivet gun damages the hole and the rivet expands, which can delaminate the laminate

Educational reference only, not approved data. Always consult the applicable SRM, AMM, or AC 43.13-1B and your certifying authority.

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Key points

- **Thick solid laminates only**: normally skins over 0.125 in. Never in honeycomb sandwich.
- **No rivets.** Hi-Lok or lockbolts with titanium or stainless; no aluminium fasteners on carbon.
- **Aluminium patch on carbon** needs one layer of fibreglass cloth between them.
- **Holes**: 4 D from other fasteners, 3 D from the edge, 4 to 6 D pitch, three rows.
- **Drill** 1/64 in under, ream to size, back the exit; clearance fit only.
- **Install wet** with sealant; seal the patch edge; paint and restore lightning mesh.

SOURCES · FAA-H-8083-31B, AMT Handbook — Airframe, Volume 1, Chapter 7

Step by step

1. Inspect: ultrasonic for thick laminates, the tap test misses deep damage.
2. Trim the damage to a smooth shape with large radii.
3. Cut the patch a little oversize; drill pilots in the patch.
4. Mark centrelines, clecos, transfer pilots to the parent.
5. Back the skin, drill 1/64 under, ream.
6. Measure grips, install fasteners wet, torque.
7. Seal the edge, prime and paint; lightning mesh where required.

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