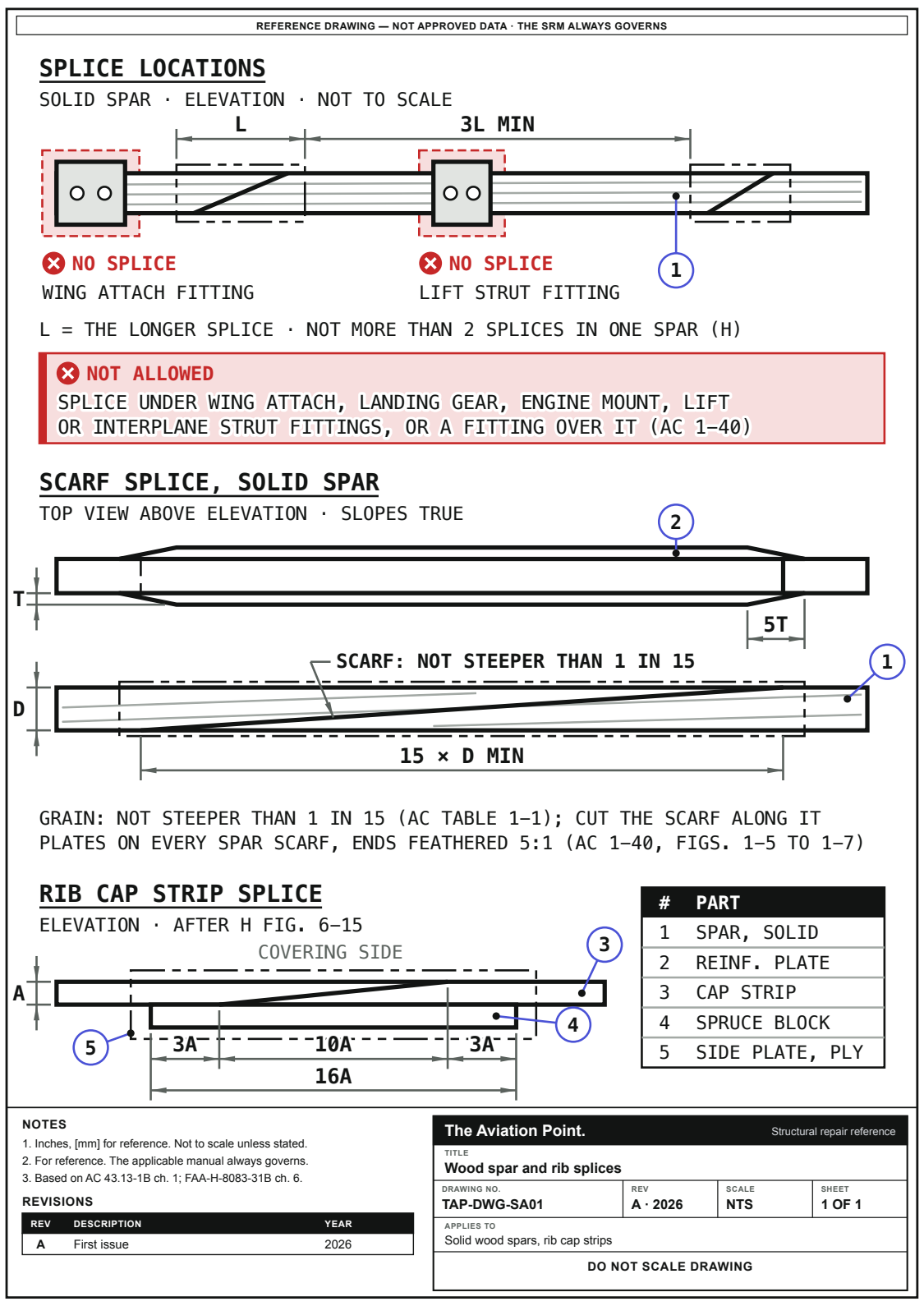
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Wood Aircraft Structures: Species, Defects, Inspection and Repair

Aircraft wood · defects · moisture and decay · spar, rib and plywood repairs

1 Identification



Splice locations and the spar scarf after AC 43.13-1B pars. 1-39 and 1-40 (Figs. 1-4 to 1-7) and FAA-H-8083-31B Figs. 6-18 and 6-23; rib cap strip after FAA-H-8083-31B Fig. 6-15 and AC Fig. 1-11.

Numbers at a glance

Item	Value, in (mm)
Grain slope, maximum (all species of Table 1-1)	1 in 15
Hard knot, sound, center third of the beam	3/8 in (9.5) max; over 1/4 in (6.4) with caution
Distance between 3/8 in knots or other defects	20 in (508) min
Pitch pocket, center of the beam	1-1/2 × 1/8 × 1/8 in (38 × 3.2 × 3.2) max, 14 in (356) apart in one ring
Moisture content at inspection	8 to 16 %, preferably 10 to 12 %
Moisture that sustains fungus	20 % or more
Moisture before bonding	6 to 8 % in arid regions, 10 to 12 % elsewhere
Repair stock from another climate, seasoning	2 weeks min, in the same storage area as the part
Clamping pressure, resorcinol (typical)	125 to 150 psi (0.86 to 1.03 MPa) softwood; 150 to 200 psi (1.03 to 1.38 MPa) hardwood
Glue line, close-contact adhesive	0.005 in (0.13) max
Bonding temperature	Above 70 °F (21 °C); the adhesive's minimum governs
Nail strips: pitch, row spacing, stagger, penetration	1 in (25) apart, rows 1/2 in (13), no nail over 3/4 in (19) from the nearest, 3/8 in (9.5) into the lower member
Clamping block thickness	2 × the thinner member, min
Scarf slope, plywood skin	1 in 12 at the steepest
Scarf slope, stressed solid member (spar)	Not steeper than 1 in 15
Reinforcement plate ends	Feathered at 5 : 1
Spacing between splices, or splice and plate	3 × the longer splice, min
Drain holes in a repaired portion	Same as the originals, usually 1/4 in (6.4)
Heated bending form for plywood	300 °F (149 °C) max surface

2 Allowable damage

Crack, decay and damage limits for a given part: the manufacturer's data; no generic limit is published.

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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3 Repair

Plywood skin patches: which one, and its limits

Patch	Use when	Key dimensions, in (mm)
Fabric (doped on)	Hole up to 1 in (25) after trimming; not within 1 in (25) of a frame member; not on a leading edge or the fuselage front	Edges of the hole sealed; patch overlaps the skin 1 in (25) min, pinked edges
Splayed (flush, tapered)	Hole up to 15 T, skin not over 1/10 in (2.5)	Taper 5 T (5 : 1); 1/10 in skin: hole 1-1/2 in (38) max, repair circle 2-1/2 in (64)
Surface (overlay)	Between or along framing members, entirely aft of the 10 % chord line or wrapped round the leading edge to end aft of it. The Handbook limits it to skins not over 1/8 in (3.2)	Perimeter up to 50 in (1,270), one frame or rib space; corner radius 5 T min; forward edge bevel 4 T; fabric over it lapping 2 in (51); H: doublers 1/4 in (6.4) min
Scarf (the preferred repair)	Radius of curvature over 100 T at every point of the trimmed opening	Slope 1 in 12 at the steepest; backing-block method for damage up to 25 T across and 15 T or more from a framing member
Plug, round or oval	Skin damage only, structure underneath sound	Round: hole radius 2 in (51) or 3 in (76); doubler radius 2-5/8 and 1-3/8 in (67 and 35), or 3-7/8 and 2-1/8 in (98 and 54). Oval: 7 × 5 in (178 × 127) max. Doubler 1/4 in (6.4) soft plywood, preformed when the rise exceeds 1/8 in in 6 in (3.2 in 152); No. 4 round-head screws

1. Dry the structure; moisture meter, tap, probe, pry, smell, look.
2. Get the limits: manufacturer's data, then AC 43.13-1B.
3. Cut back to sound wood; machine the bond faces.
4. Bond inside the adhesive's times; clamp evenly.
5. Break a sample joint from the same batch.
6. Seal and refinish, end grain and bolt holes included.
7. Record; Form 337 for a major repair.

Key points

- **Grain slope** not steeper than 1 in 15 for every species of AC Table 1-1.
- **Reject** compression wood, decay, checks, shakes, splits and spike knots.
- **Moisture** of 20 % or more sustains fungi; inspect at 8 to 16 %, best 10 to 12 %.
- **Resorcinol** is the adhesive AC 43.13-1B recommends; an epoxy only if it meets par. 1-4 a.
- **Plywood scarf** 1 in 12 at the steepest; reinforcement plates feathered 5 : 1.
- **Spar and main-rib repairs** are major repairs (14 CFR 43 App. A).

MAIN SOURCES · AC 43.13-1B with Change 1, Acceptable Methods, Techniques, and Practices: Aircraft Inspection and Repair · FAA-H-8083-31B, Aviation Maintenance Technician Handbook: Airframe, Volume 1, Chapter 6, Aircraft Wood and Structural Repair · ANC-19, Wood Aircraft Inspection and Fabrication, Army-Navy-Civil Committee · 14 CFR Part 43, Appendix A, Major Alterations, Major Repairs, and Preventive Maintenance

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