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Fastener Hole Damage: Oversize, Reaming and Bushings

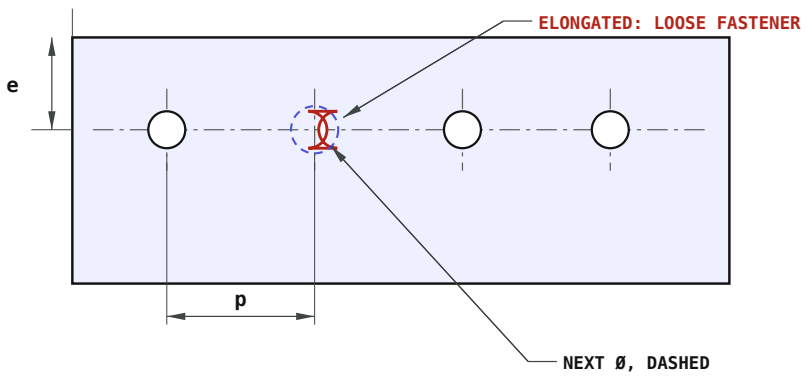
First oversize · second oversize · next diameter · ream · edge and pitch re-check

1 Identification

REFERENCE DRAWING — NOT APPROVED DATA · THE SRM ALWAYS GOVERNS

VIEW A

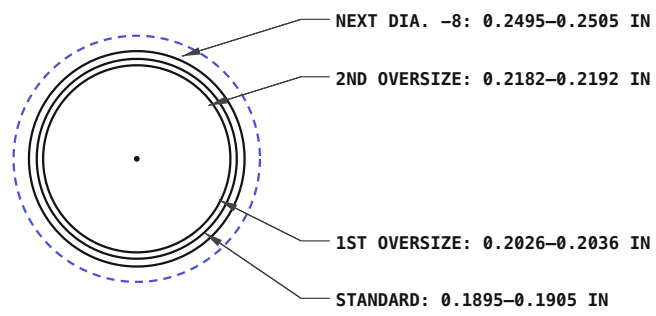
PLAN · ROW OF HOLES, ONE ELONGATED



e: EDGE DISTANCE · p: PITCH · BOTH GROW WITH THE DIAMETER

VIEW B

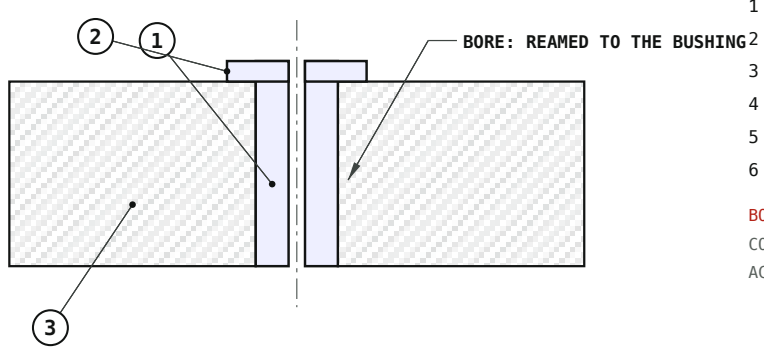
HOLE LADDER · 3/16 IN HI-LOK, TO SCALE



HOLE CENTERS FIXED: EACH STEP EATS EDGE DISTANCE AND PITCH

SECTION C

FLANGED BUSHING · GENERIC



FIT, WALL AND FLANGE: THE SRM OR APPROVED DATA

ORDER OF WORK

PUBLIC SOURCES

1 MEASURE THE HOLE, EDGE DISTANCE AND PITCH
2 IS THE REPAIR ALLOWED? SRM, DRAWING, ENGINEERING
3 FASTENER RANGE: 1/64, 1/32, THEN NEXT Ø
4 PILOT 0.015 IN UNDER, THEN REAM
5 RECHECK EDGE DISTANCE AND PITCH
6 TREAT AND PRIME; INSTALL; CHECK THE SEAT

BOLT HOLES: SRM BEFORE REAMING A CRITICAL MEMBER
COLD-WORKED HOLE: OVERSIZE ONLY IF ENGINEERING ALLOWS
AC 43.13-1B 4-57, 4-60, 7-39 · TO 1-1A-1 C.3, C.8

LIMITS

RIVET REPAIR, MIL-R-47196A (CANCELED; READ AS A GUIDE)

OVERSIZE REPAIRS: AT MOST 20 % OF THE RIVETS OR 10 IN A PATTERN, WHICHEVER IS LESS
NEVER MORE THAN TWO ADJACENT OVERSIZE RIVETS
NEVER MORE THAN HALF THE RIVETS OVERSIZE IN ANY 10 IN OF PATTERN
NEXT SIZE: STEPS OF 1/32 IN UP TO 1/4 IN, 1/16 IN ABOVE
EDGE DISTANCE AND PITCH STAY ABOVE THE MINIMUMS FOR THE NEW Ø

PARTS LIST

#	ITEM	RULE	SOURCE
1	Elongated hole	Loose fastener, oval bore; the rivet no longer fills it	FAA-H-8083-31B 4-40
2	Bushing	Press-fit or flanged sleeve in an oversize bore; fit and wall: SRM	AC 43.13-1B fig. 4-25
3	Reamed hole	Pilot 0.015 in under; 63 µin Ra or less; ±3° to the seat	TO 1-1A-1 C.3d, C.8.1
4	Next diameter	Rivet one size up: 1/8 to 5/32, drill #30 to #21	FAA-H-8083-31B fig. 4-90
5	Edge distance e	At least 2 D (AC); 2 D + 0.06 in (TO 1-1A-1)	AC 4-57c · TO 3.4.12.1
6	Pitch p	At least 3 D single row (AC); 3.5 D protruding (TO)	AC 4-57c · TO 3.4.12.2

NOTES

1. Dimensions in inches. Do not scale: the SRM sets the values.
2. For reference. The applicable manual always governs.
3. Based on AC 43.13-1B · TO 1-1A-1.

REVISIONS

REV	DESCRIPTION	YEAR
A	First issue	2026

The Aviation Point.	Structural repair reference		
TITLE Fastener hole damage			
DRAWING NO. TAP-DWG-132	REV A · 2026	SCALE NTS	SHEET 1 OF 1
APPLIES TO Sheet metal, fittings			
DO NOT SCALE DRAWING			

After AC 43.13-1B pars. 4-57, 4-60, 7-39 and fig.

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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2 Allowable damage

What the public documents allow

Case	Rule	Source
Bolt holes, military practice	Bolt holes should not be oversized or elongated; the first drill size above nominal is used up to 1/2 in, same-size drill above	TO 1-1A-1 par. 5.2.2.2
Bolt holes, FAA practice	Oversized or elongated holes in structural members: reaming or drilling to the next larger bolt size may be permissible, if edge distance, clearance and structural integrity are kept. Consult the SRM, the manufacturer's engineering department or the FAA before drilling or reaming any bolt hole in a critical structural member	AC 43.13-1B par. 7-39
Fitting designed without bushings	Elongated or worn bolt holes are not reamed oversize. Replace the fitting, unless the method is approved by the FAA. Do not fill holes with welding rod	AC 43.13-1B par. 4-60a(4)
Aluminum fitting, casting	Replace with the same material specification; repair only to the maker's data or FAA-approved data. Castings are replaced, not repaired, unless the maker or approved data allows it	AC 43.13-1B pars. 4-60b, 4-61
Rivet hole enlarged or damaged	Drill or ream for the next larger rivet, if edge distance and spacing stay at or above the minimums. Never replace with a lower-strength rivet unless size or number compensates	AC 43.13-1B par. 4-57b
Oversize repairs in one pattern	At most 20 % of the rivets or 10 rivets in a single pattern, whichever is less, counting oversize holes and countersinks together. No more than two adjacent oversize rivets. No more than half the rivets oversize in any 10 in of pattern. Anything more needs written approval	MIL-R-47196A pars. 3.4, 3.4.3 (canceled, superseded by NASM47196)
Next size	Next larger diameter listed in the drawing's standard, in steps of 1/32 in up to 1/4 in and 1/16 in above	MIL-R-47196A par. 3.4.2
Margin built in at layout	Add 1/16 in to the minimum edge distance and pitch, or take the edge from the next rivet size, so the hole can be oversized without breaking the minimums	FAA-H-8083-31B p. 4-34
Cold-worked hole	Oversize only if the engineering document allows it. Post-sizing removes at most 16 to 21 % of the starting diameter or 0.065 in, whichever is less. Sheet at least 1/5 of the hole diameter thick	TO 1-1A-1 pars. C.19, C.20, C.23
Interference of a Hi-Lok in aluminum	Hole prepared so the maximum interference does not exceed 0.002 in	FAA-H-8083-31B p. 4-50

3 Repair

Oversize pins and blind rivets: first, second, then next

Fastener	Standard hole	1st oversize, 1/64 in	2nd oversize, 1/32 in	Next diameter
Hi-Lok -6, 3/16 in	0.1895–0.1905 (col. A)	0.2026–0.2036 (col. J), pin HL62	0.2182–0.2192 (col. R), pin HL218	-8: 0.2495–0.2505
Hi-Lok -8, 1/4 in	0.2495–0.2505	0.2651–0.2661	0.2807–0.2817	-10: 0.312–0.313
Hi-Lok -5, 5/32 in	0.1635–0.1645	None: use the -6 standard pin	None: use the -6 1/64 oversize	-6
CherryMAX -4, 1/8 in	#30, 0.129–0.132	#27, 0.143–0.146	None published	-5
CherryMAX -5, 5/32 in	#20, 0.160–0.164	#16, 0.176–0.180	None published	-6
CherryMAX -6, 3/16 in	#10, 0.192–0.196	#5, 0.205–0.209	None published	-8
CherryMAX -8, 1/4 in	F, 0.256–0.261	I, 0.271–0.275	None published	—
NAS6200 bolt	Close-tolerance	X: grip portion 1/64 in larger (NAS6204-6X)	Second oversize exists; the AC gives no figure	—

1. Measure hole, edge, pitch.
2. Confirm it is allowed.
3. Next fastener in the range.
4. Pilot 0.015 in under, ream.
5. Treat, prime, install.
6. Recheck and record.

Key points

- **Authority first:** SRM, drawing or approved data.
- **Never ream** a fitting designed without bushings.
- **Edge and pitch** grow with the diameter: recheck.
- **Cap:** 20 % or 10 rivets, none more than two adjacent.

MAIN SOURCES · AC 43.13-1B CHG 1, Acceptable Methods, Techniques, and Practices: Aircraft Inspection and Repair · FAA-H-8083-31B, Aviation Maintenance Technician Handbook: Airframe, chapter 4 · TO 1-1A-1 / NAVAIR 01-1A-1, General Manual for Structural Repair · MIL-R-47196A, 6 Sep 1977 · NAS618, sheets 3, 4, 6, 7 · The Aviation Point data

SCAN · OPEN THIS GUIDE
theaviationpoint.com/sheet-metal/fastener-hole-damage/

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