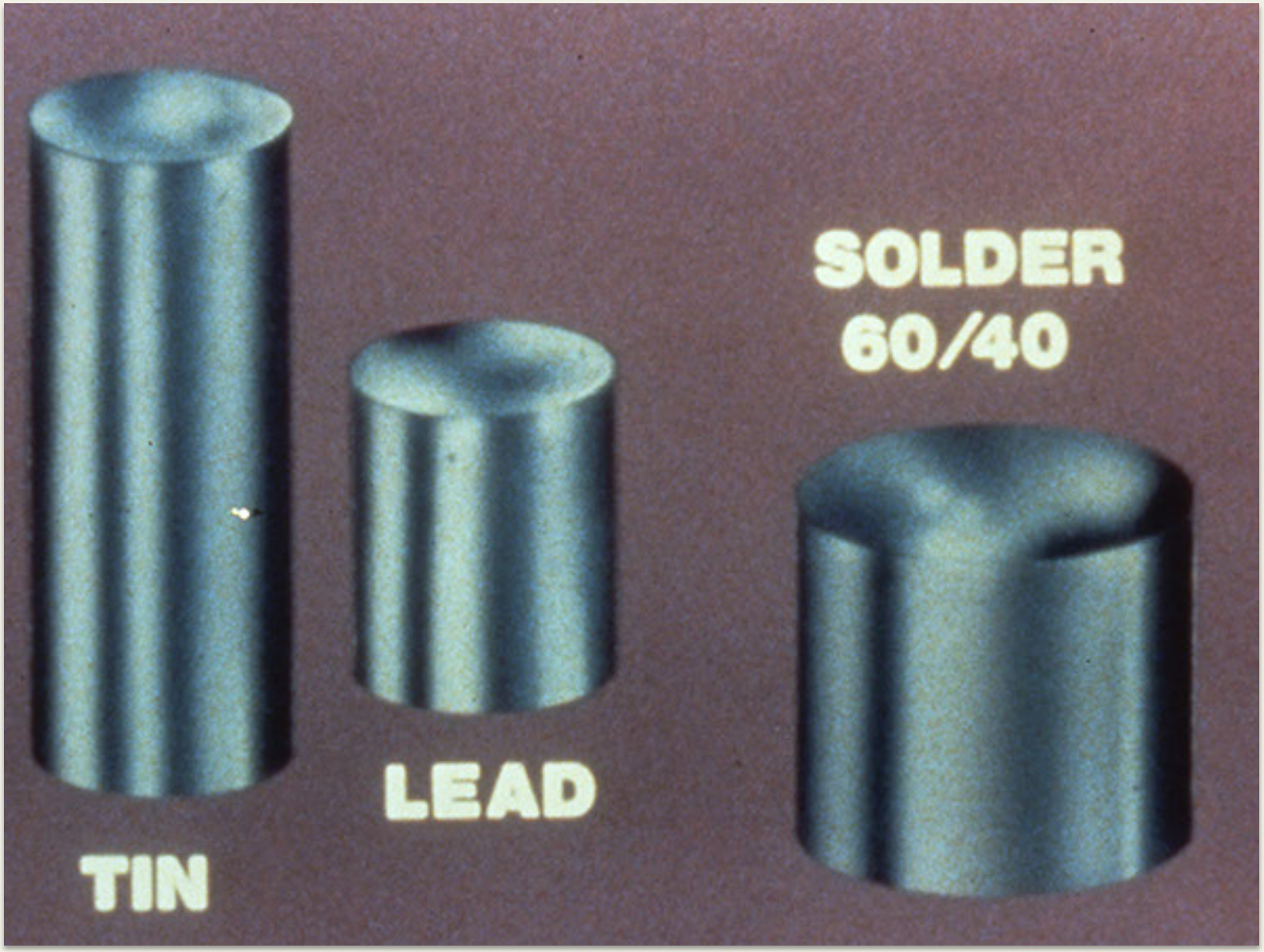
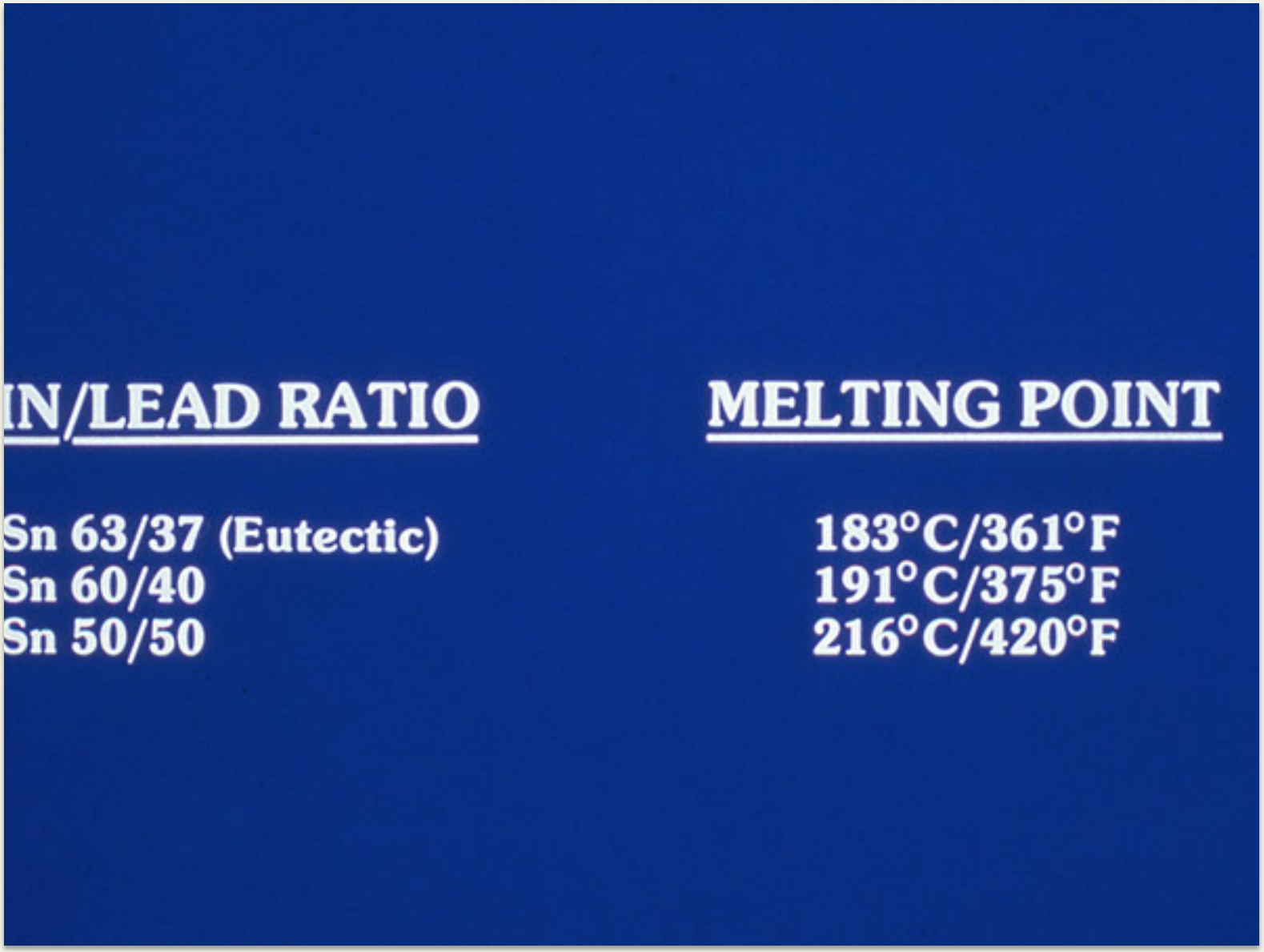
NASA soldering

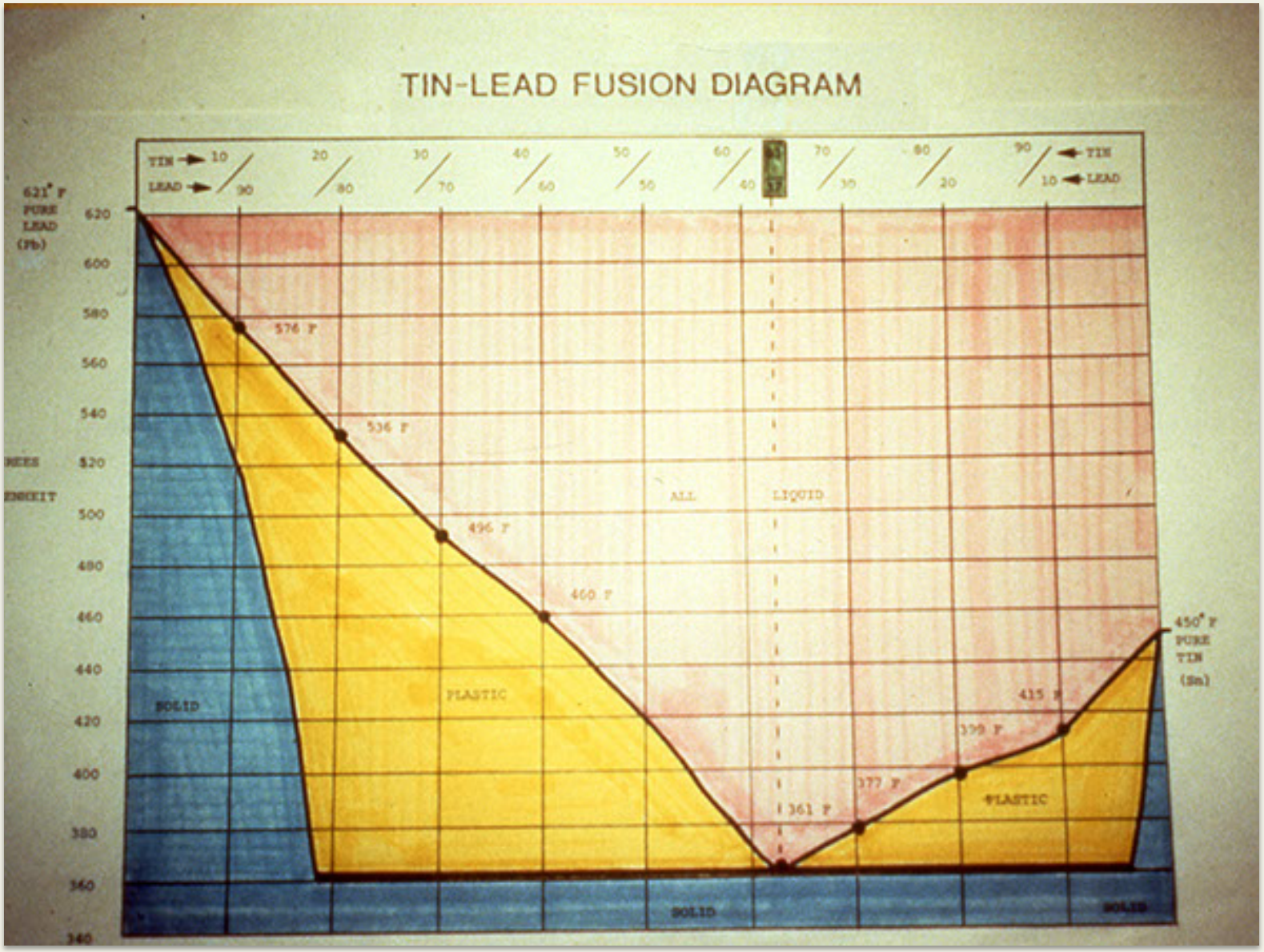
SOLDERING THEORY



Tin and Lead = 60/40 solder

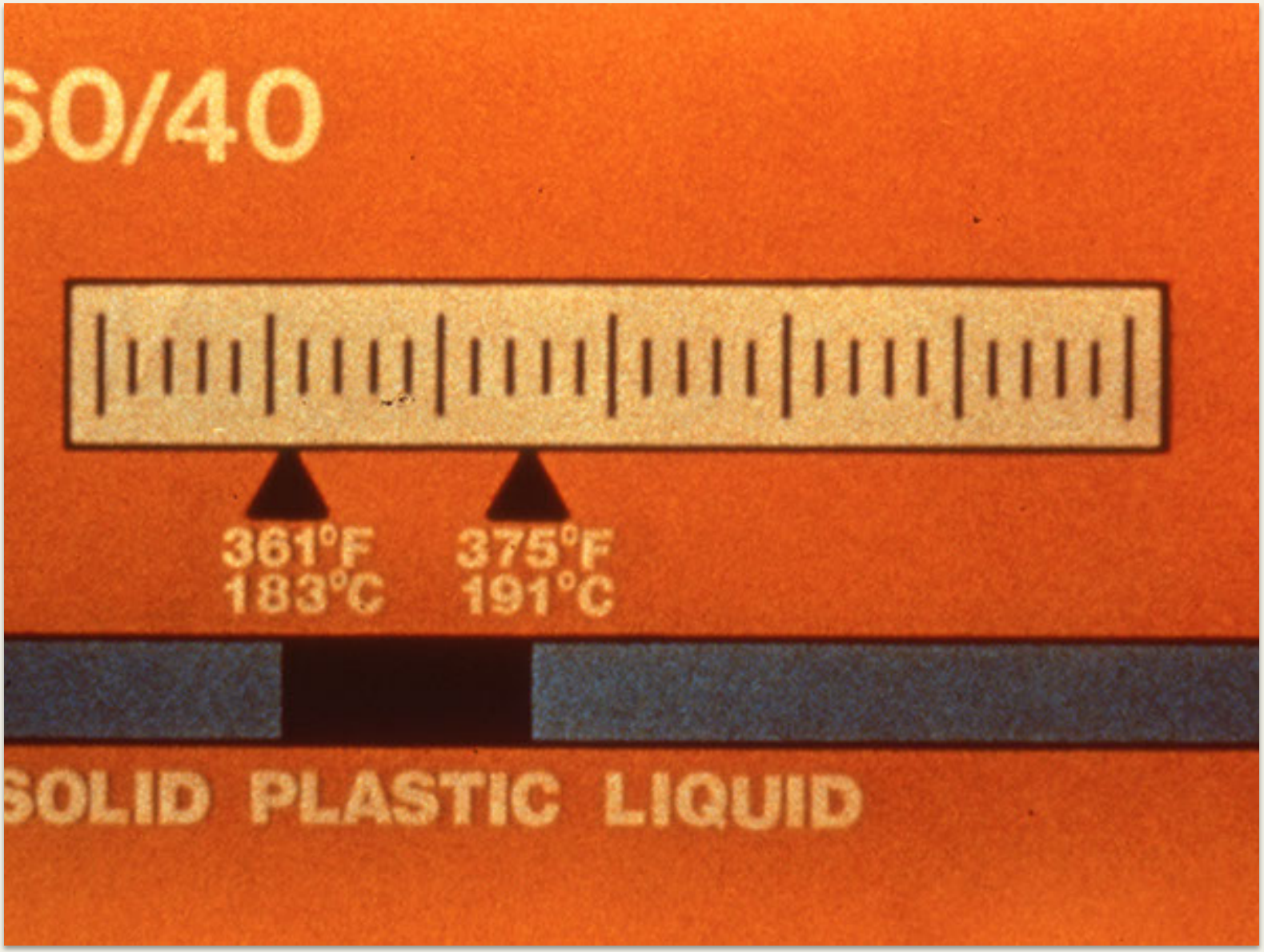


Tin/Lead ratio/melting point

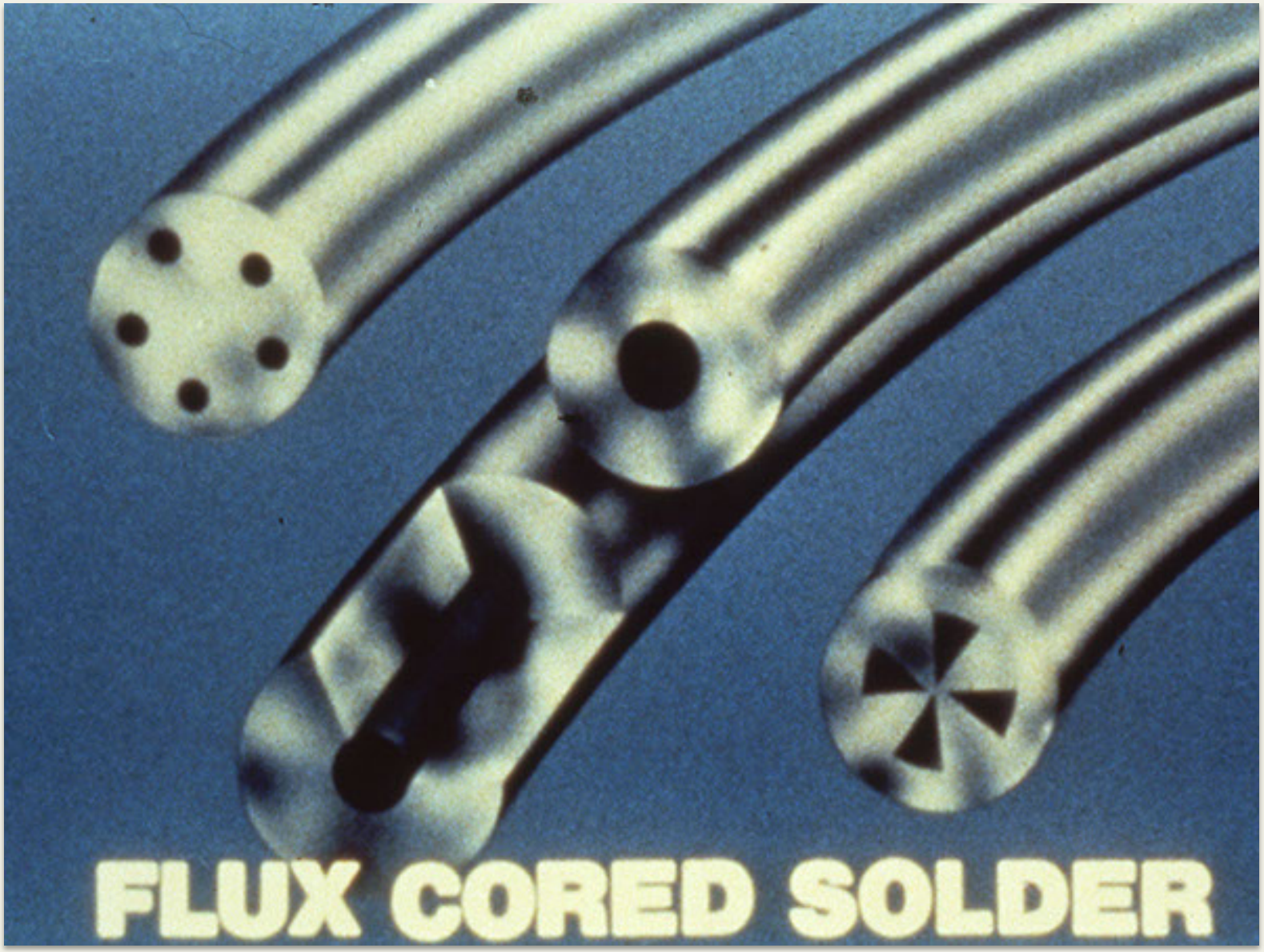


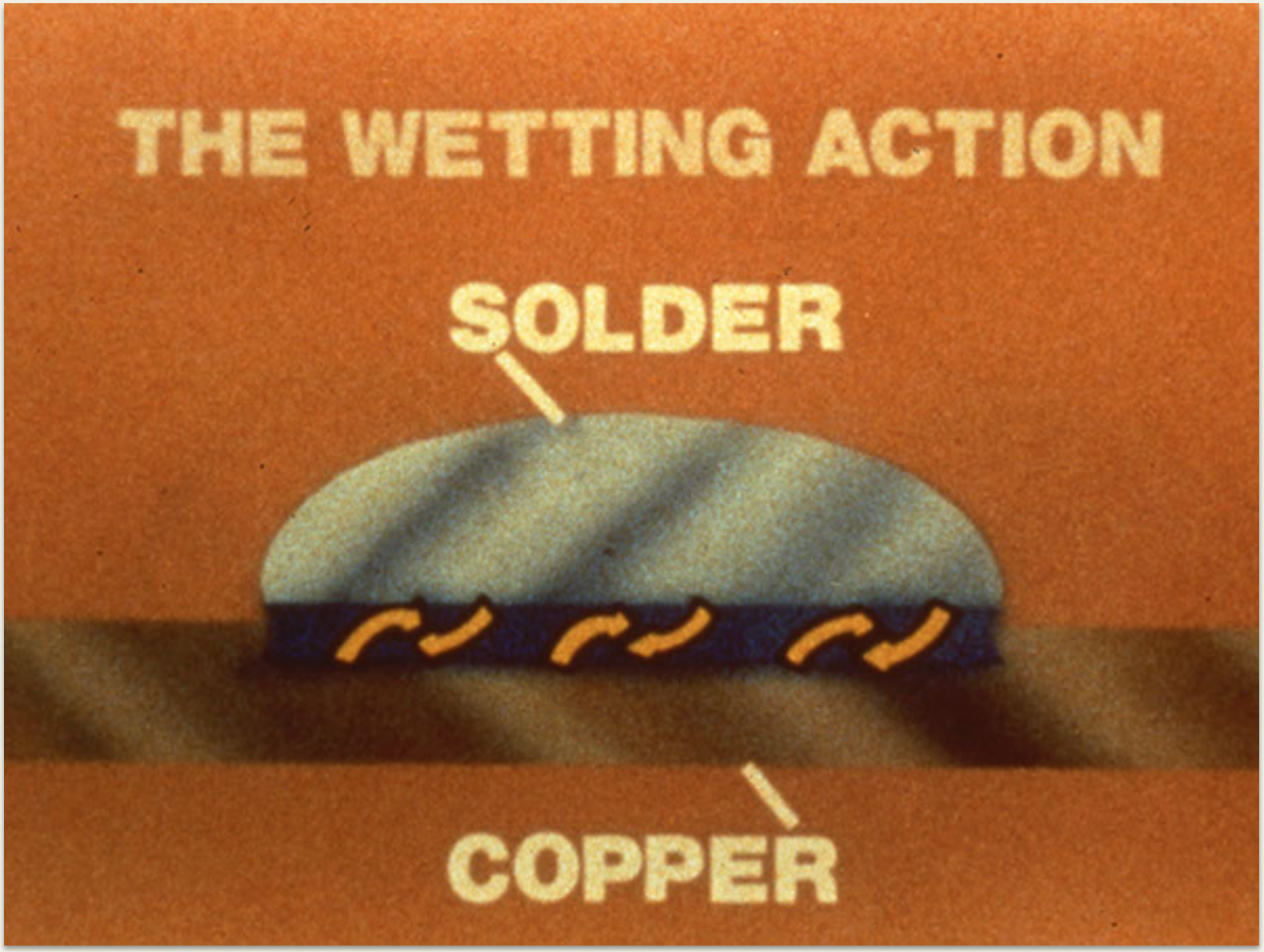
Tin/Lead Fusion

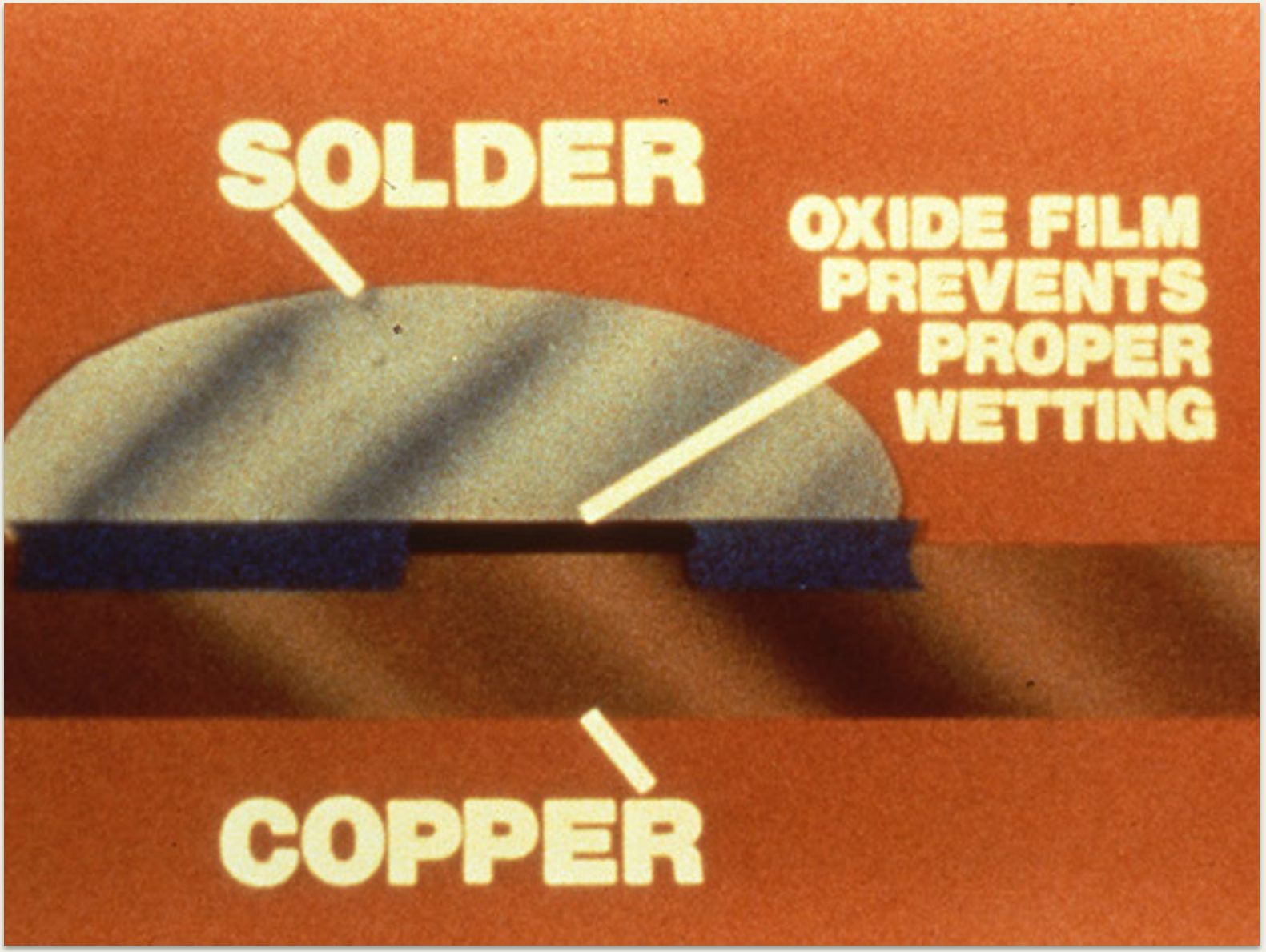
63/37 Eutectic solder liquid temperature

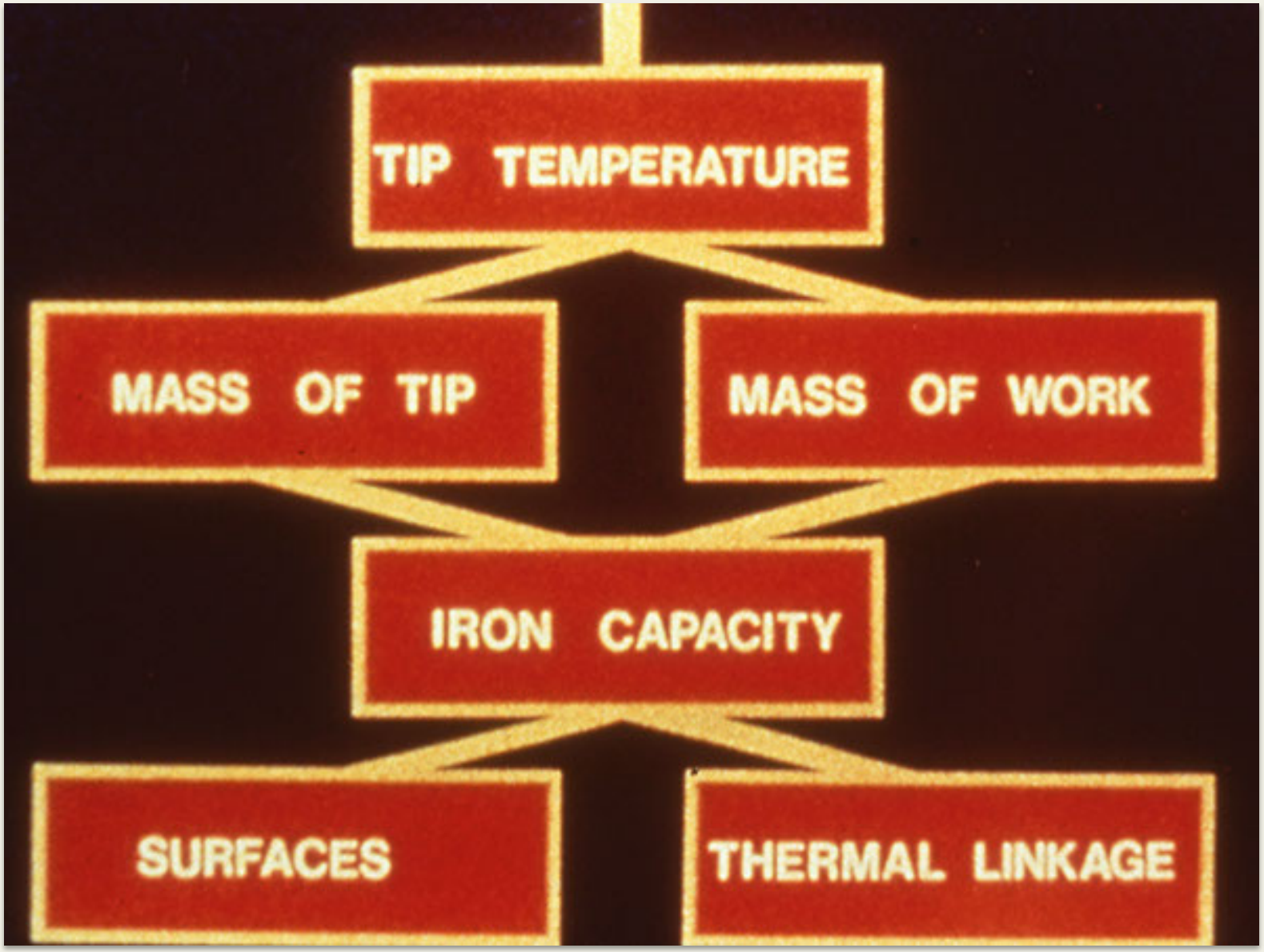


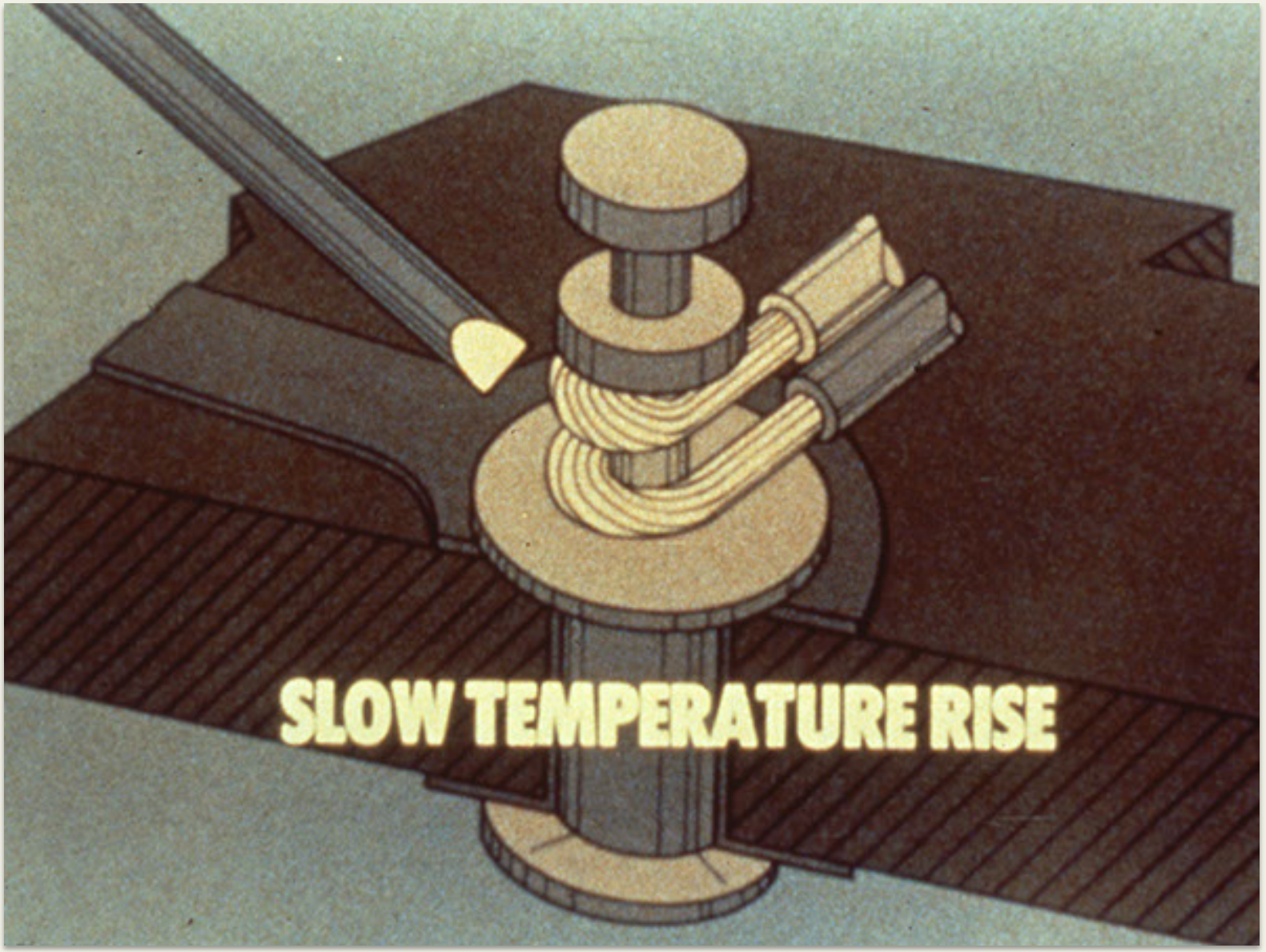
60/40 solder with solid/plastic/liquid temperatures


FLUX CORED SOLDER

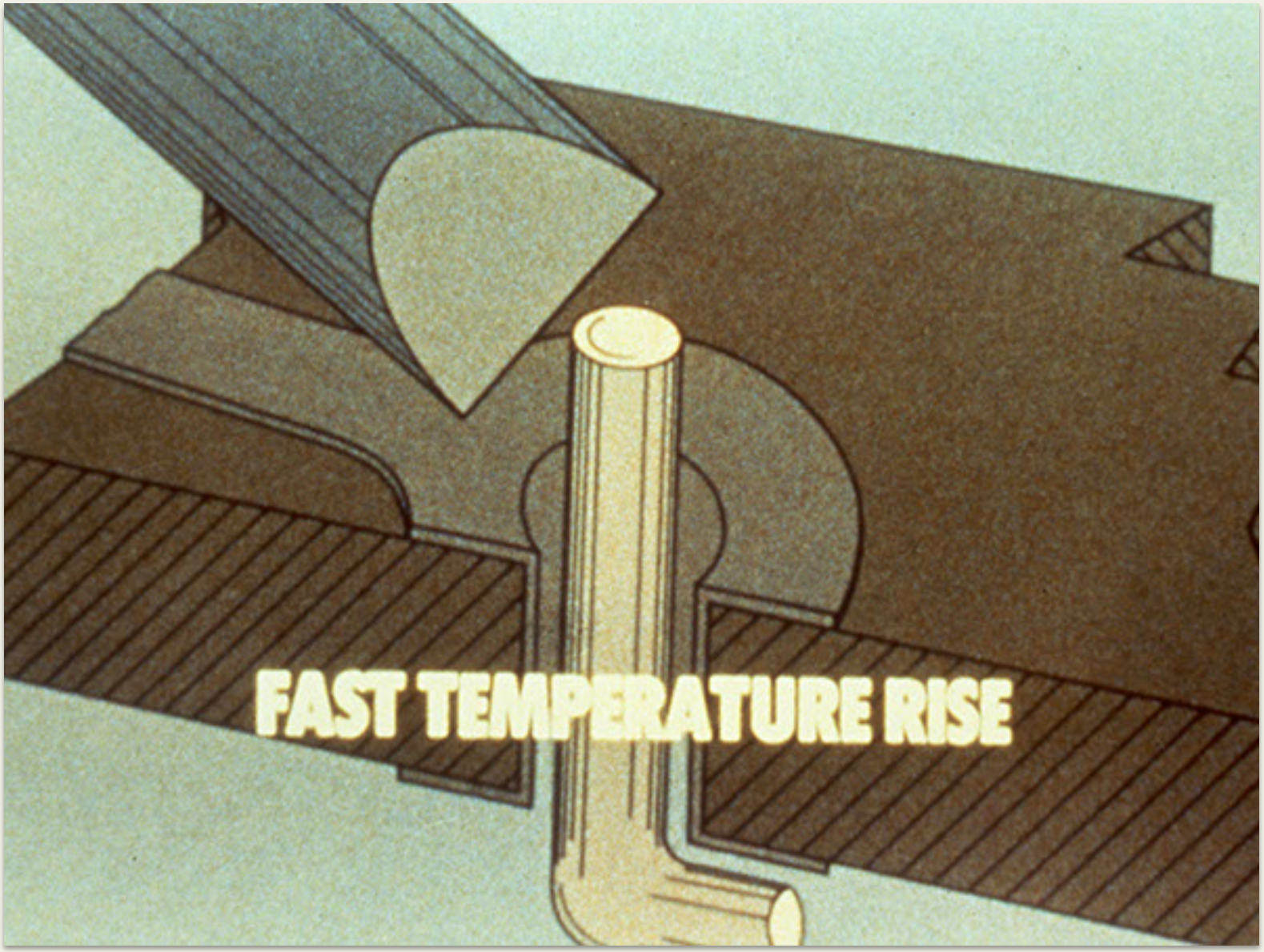

THE WETTING ACTION
SOLDER
COPPER


SOLDER
OXIDE FILM
PREVENTS
PROPER
WETTING
COPPER

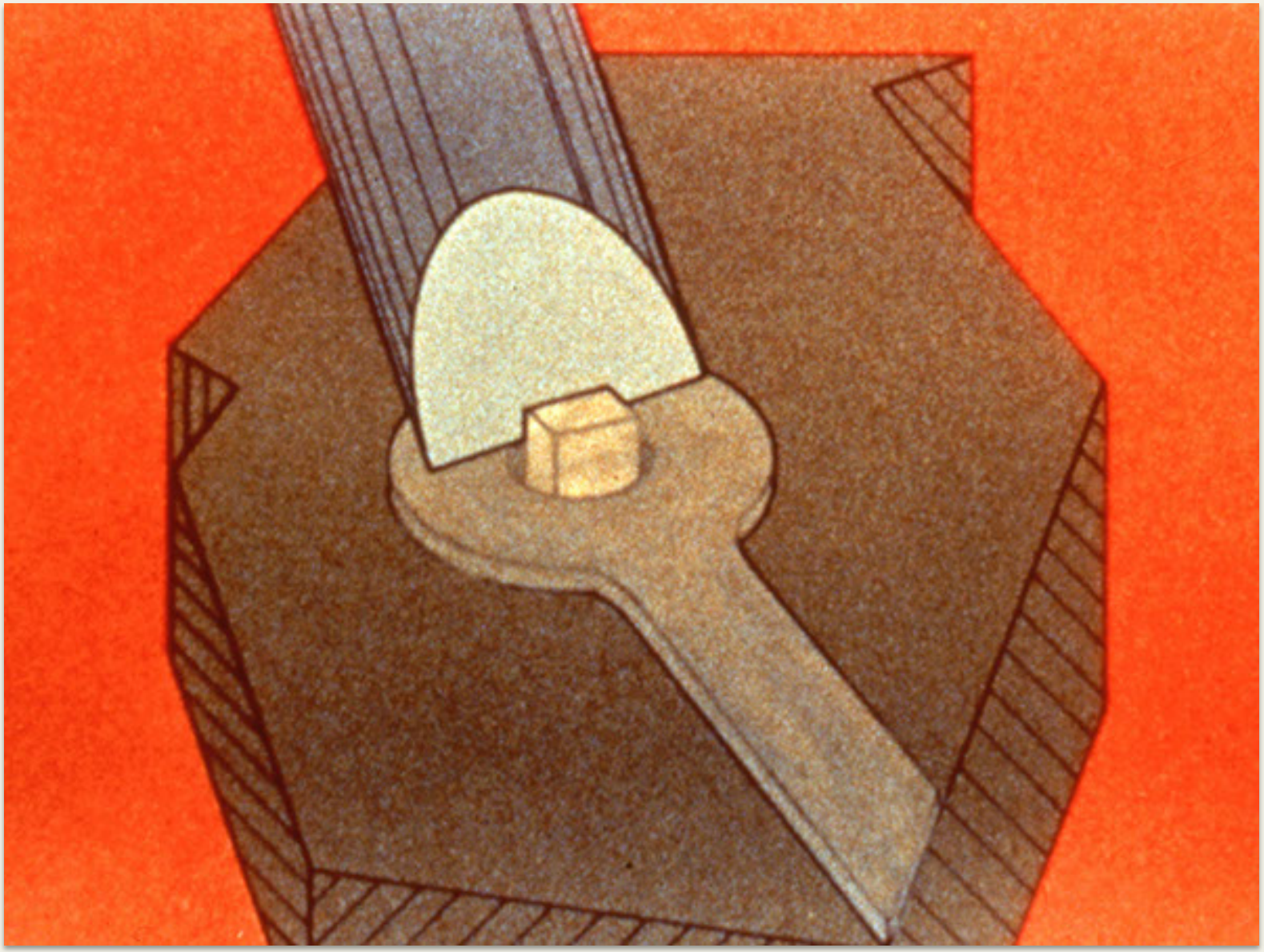

TIP TEMPERATURE
MASS OF TIP
MASS OF WORK
IRON CAPACITY
SURFACES
THERMAL LINKAGE



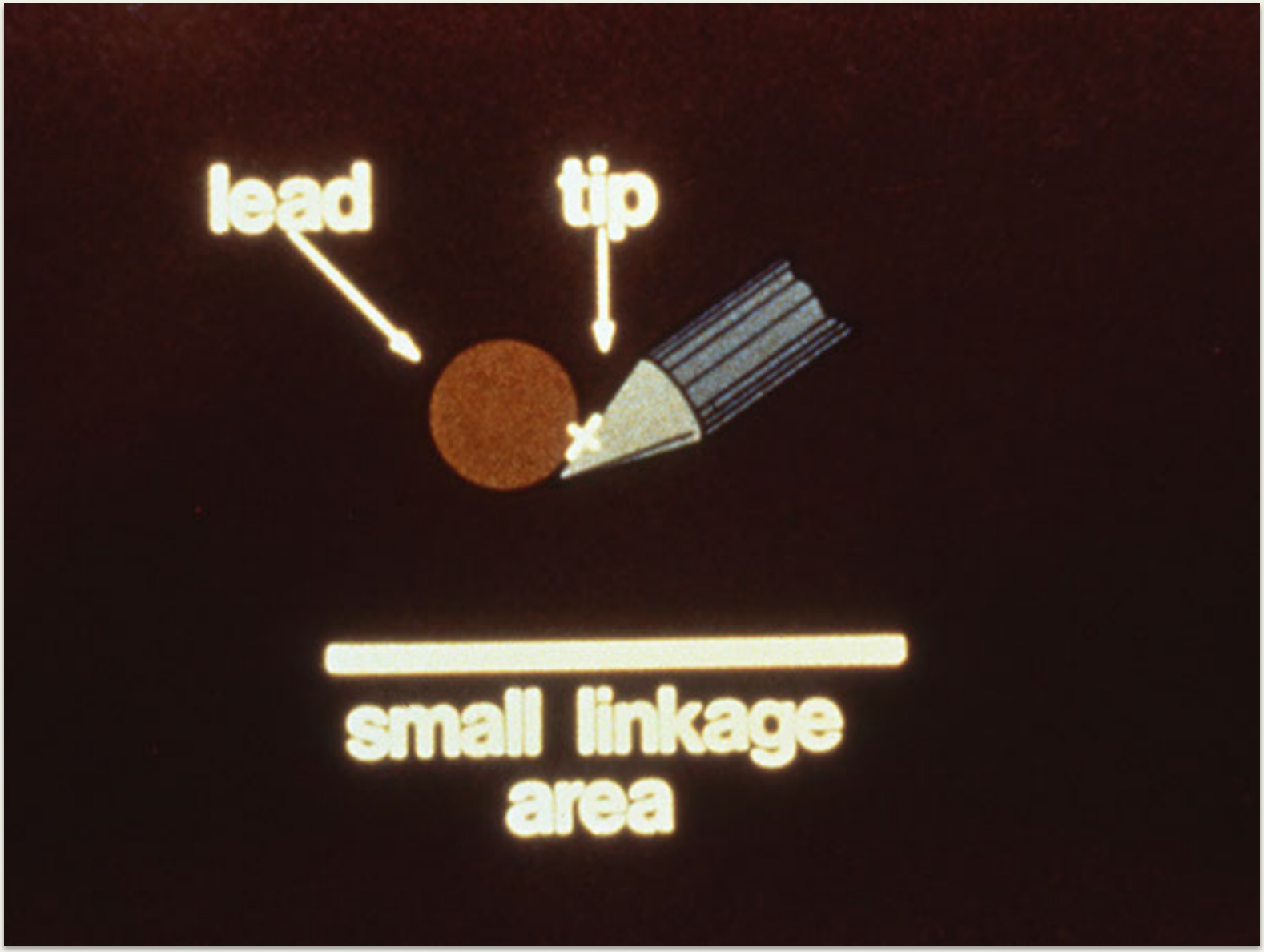
Small tip takes longer to heat the parts to the melting temperature



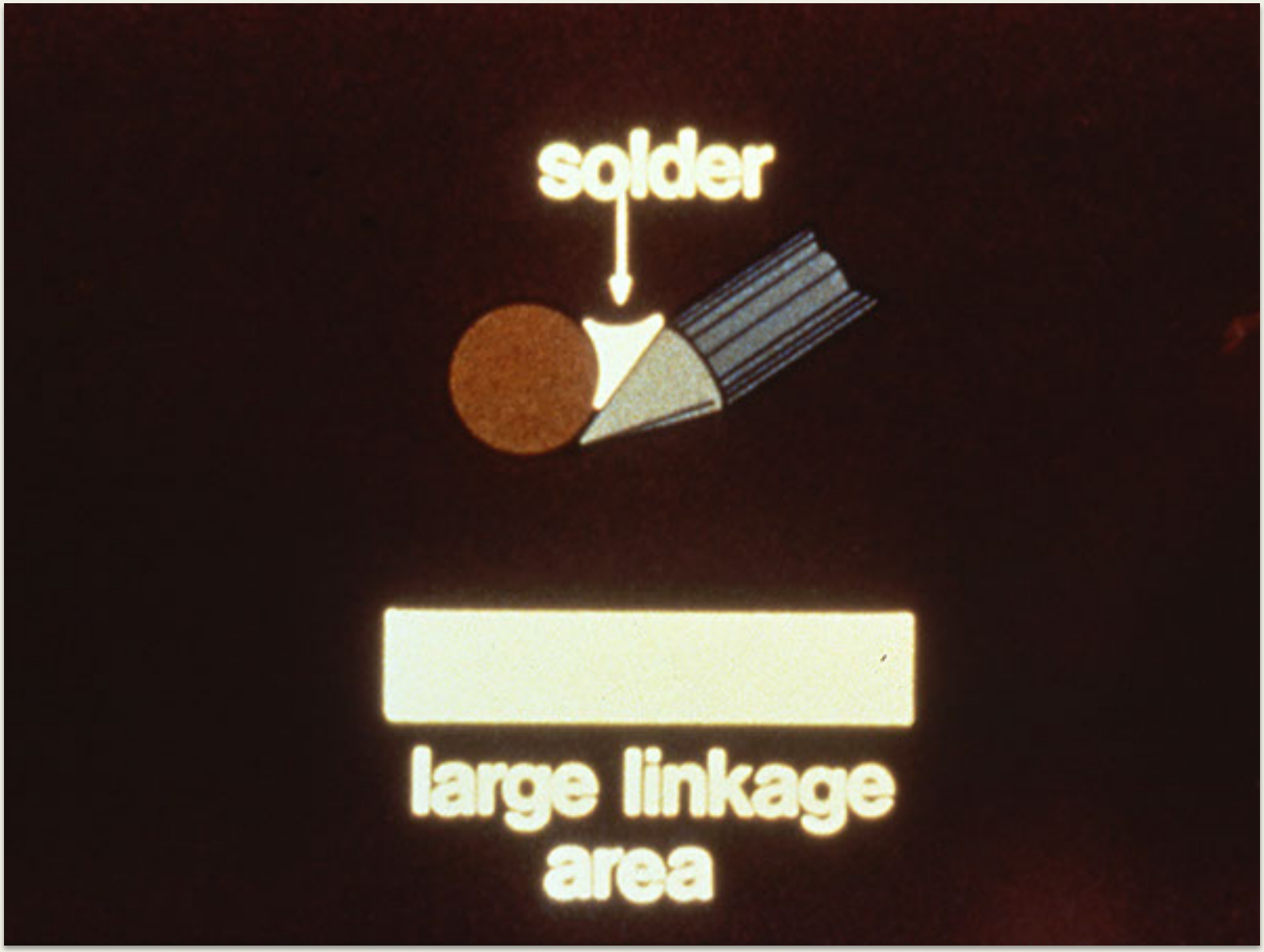
Larger tip takes less time to heat the same part to the melting temperature



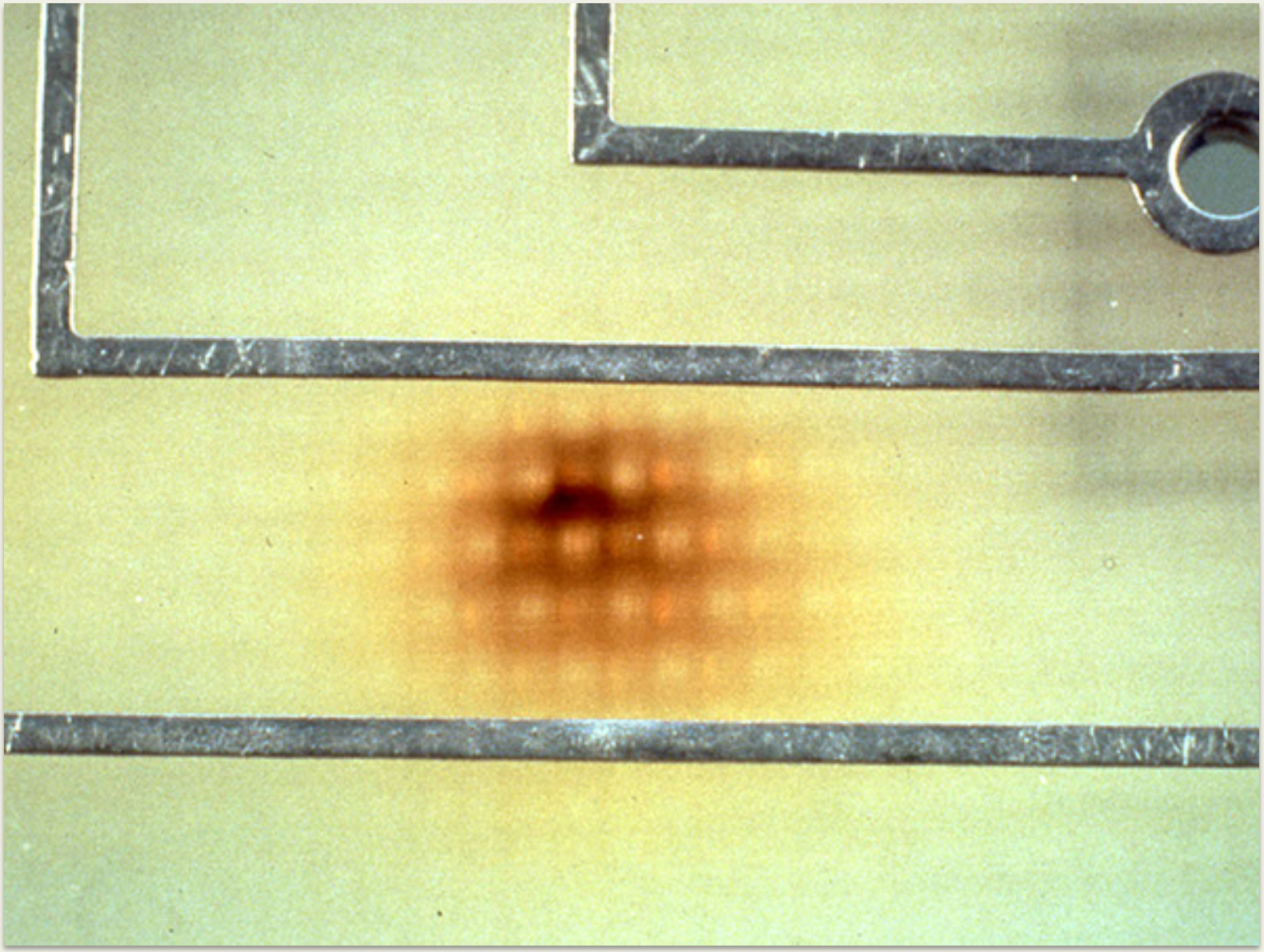
Proper sized tip



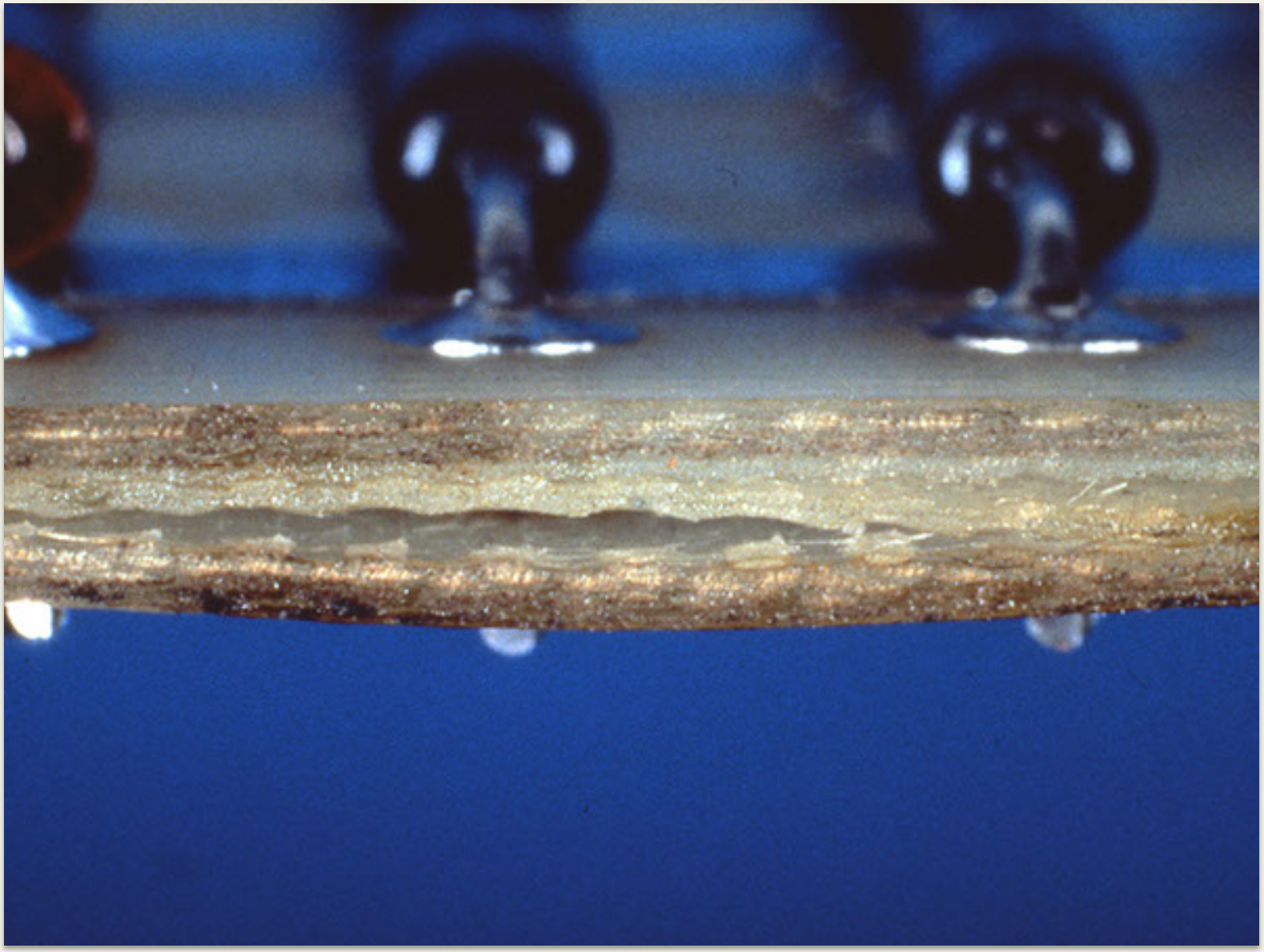
Small linkage



Large linkage

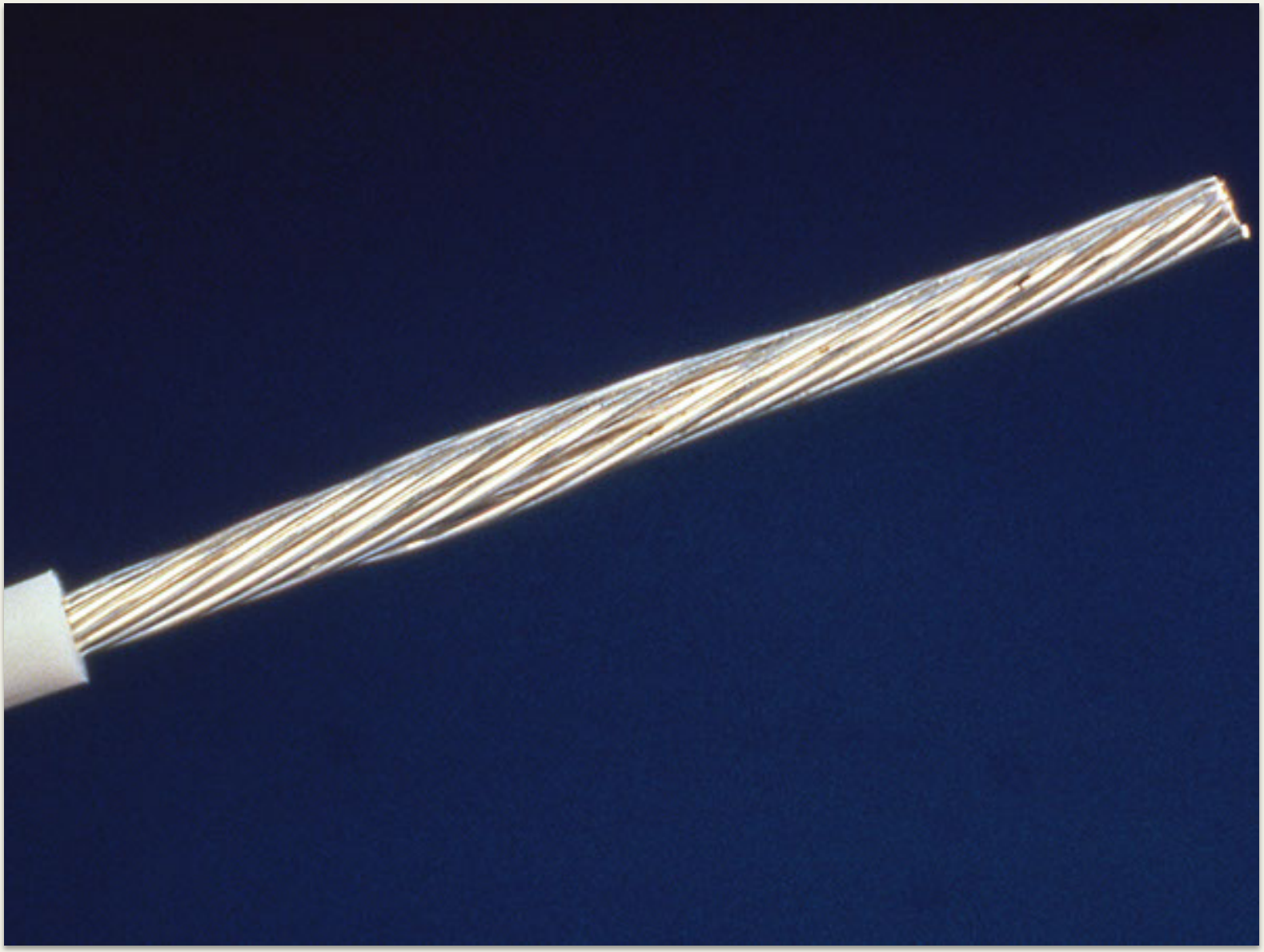


Burned printed circuit board

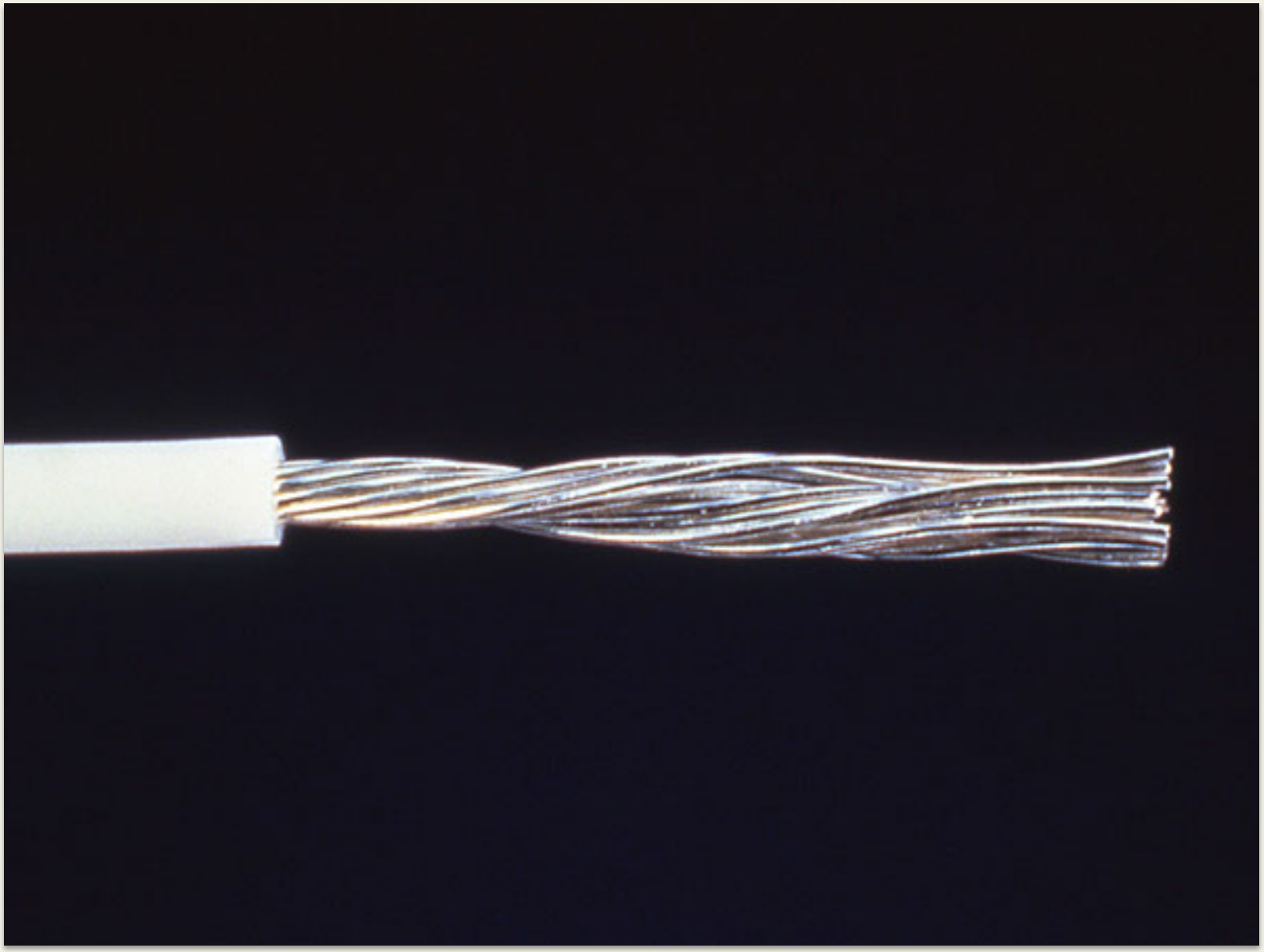


Delaminated printed circuit board

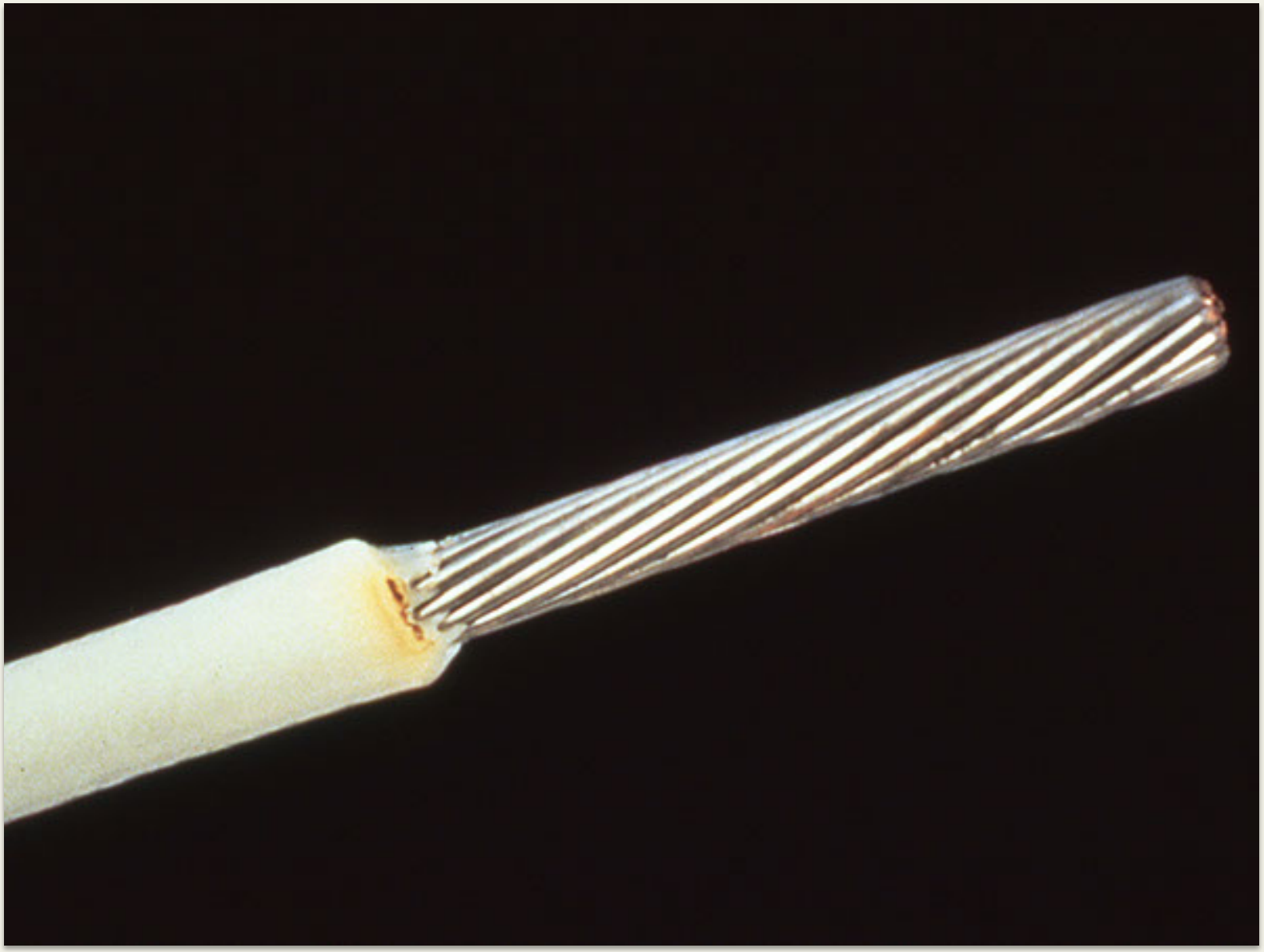

WIRE
STRIPPING



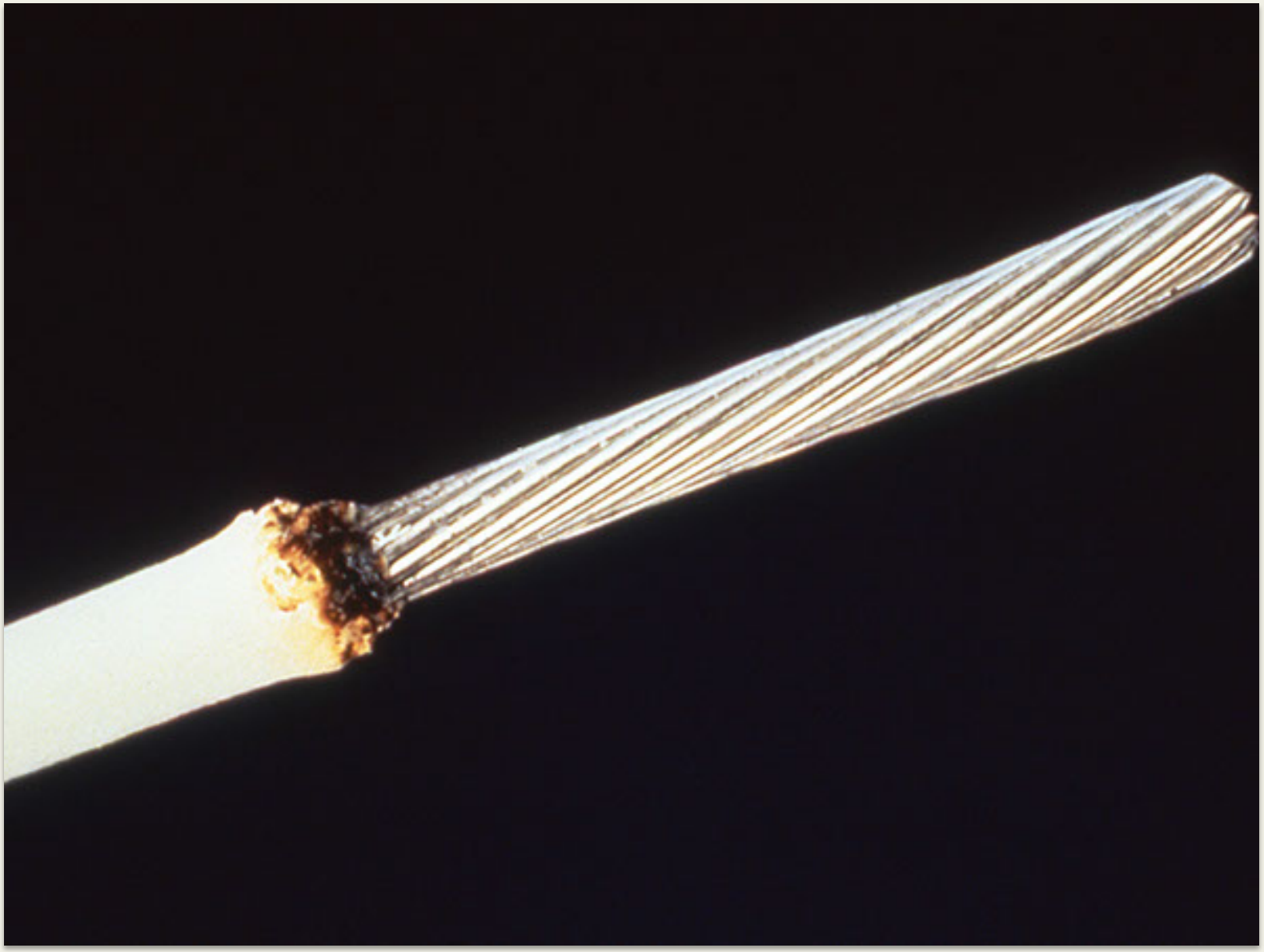
Disturbed lay of stranded wire - Reject



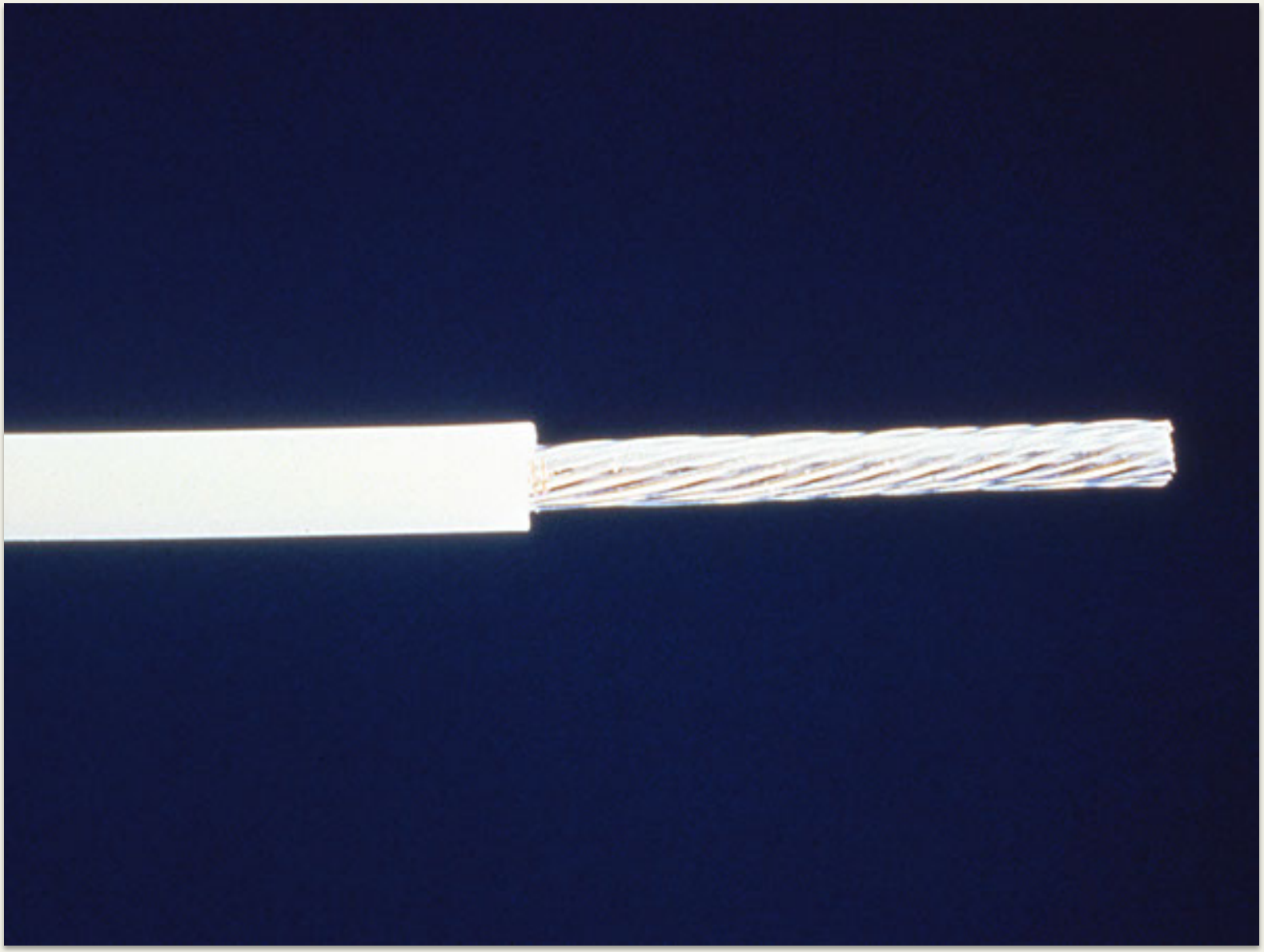
Disturbed lay of stranded wire - Reject



Discoloration burn to insulation - Accept



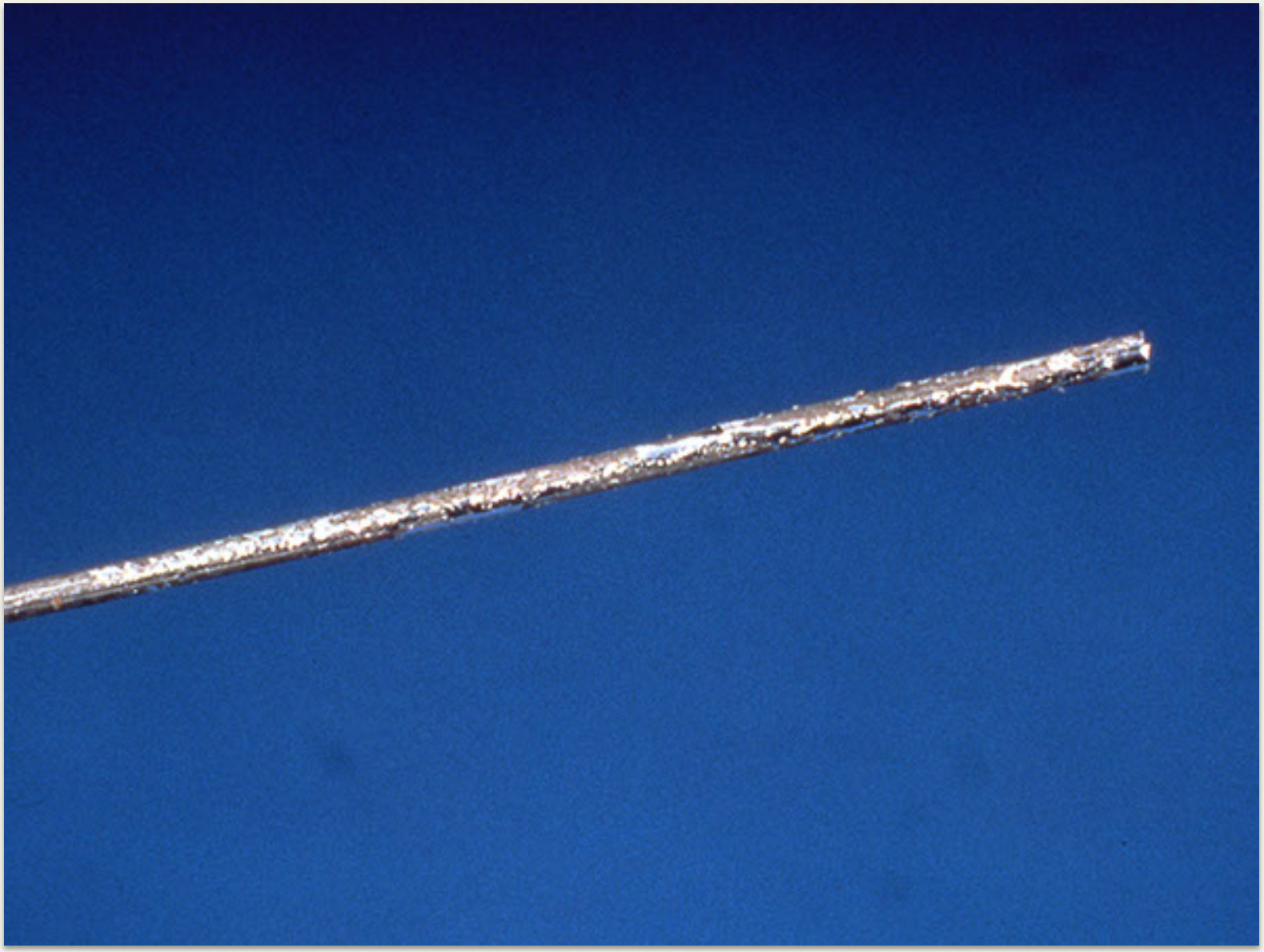
Charring: burning or damage to insulation - Reject



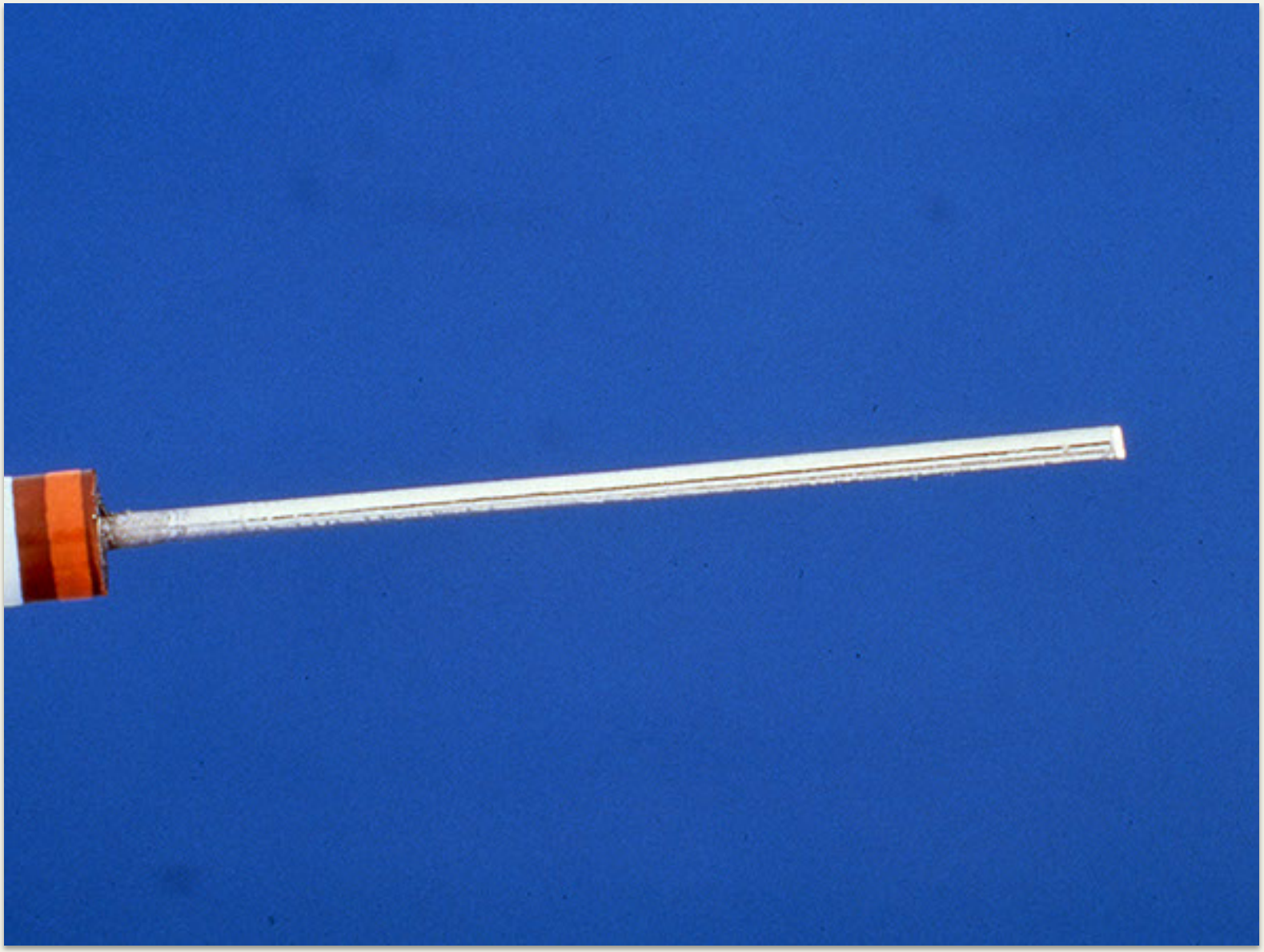
Cut or nicked leads or wires - Reject


WIRE
TINNING

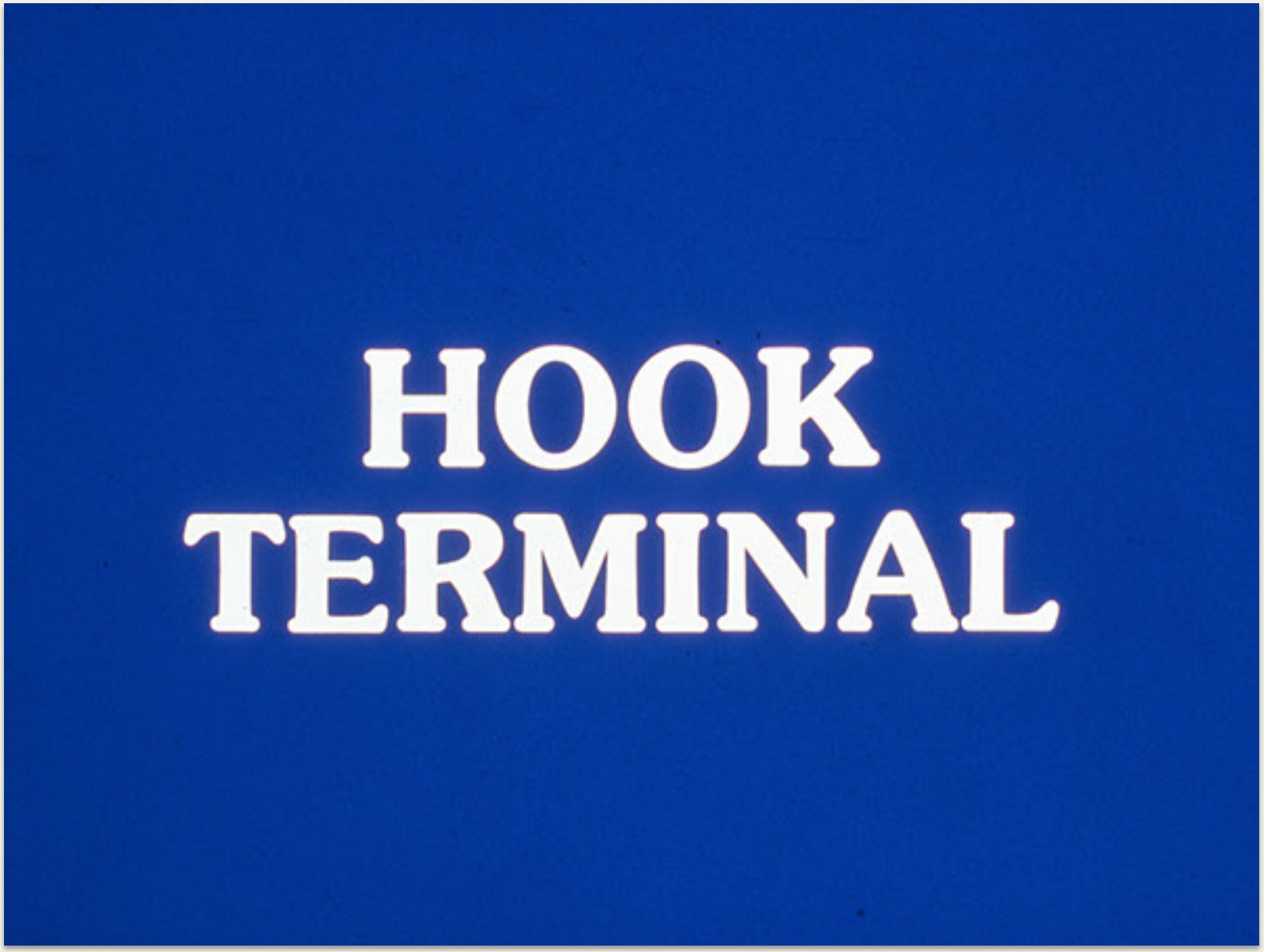
Preferred tinning of stranded wire with heat sink - Accept

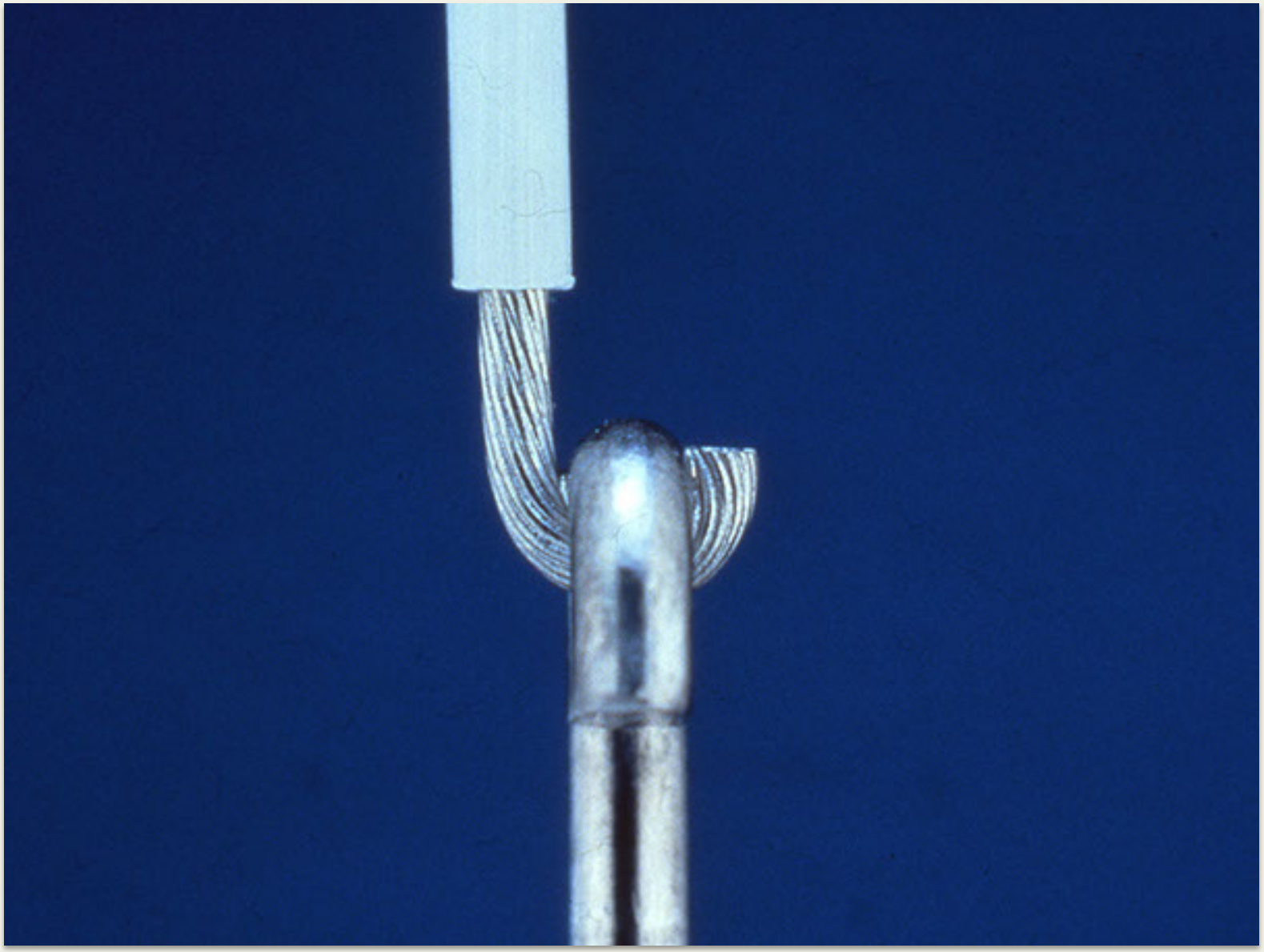


Poor tinning, no wetting - Reject

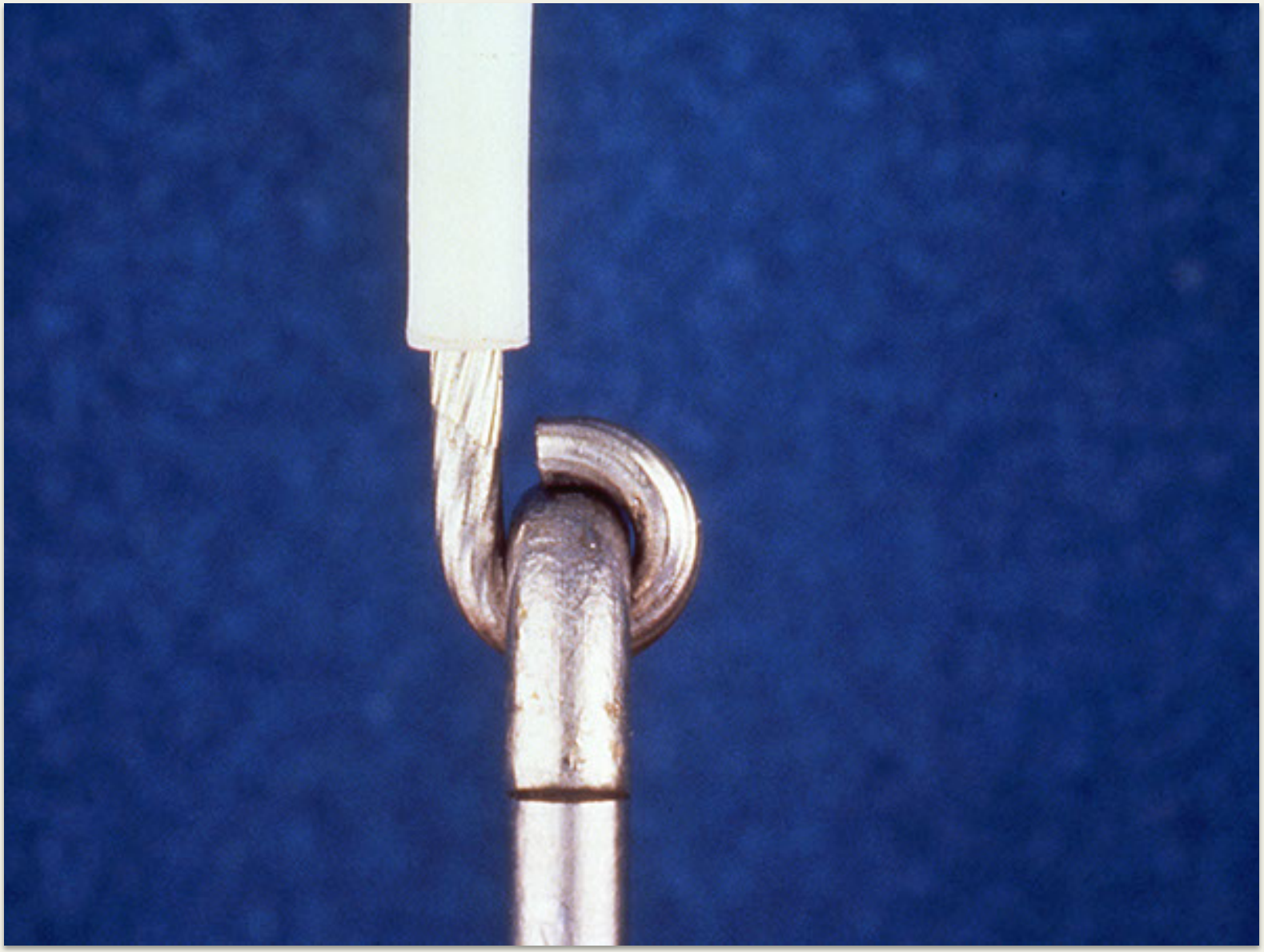


Tinning, good wetting - Accept


HOOK
TERMINAL



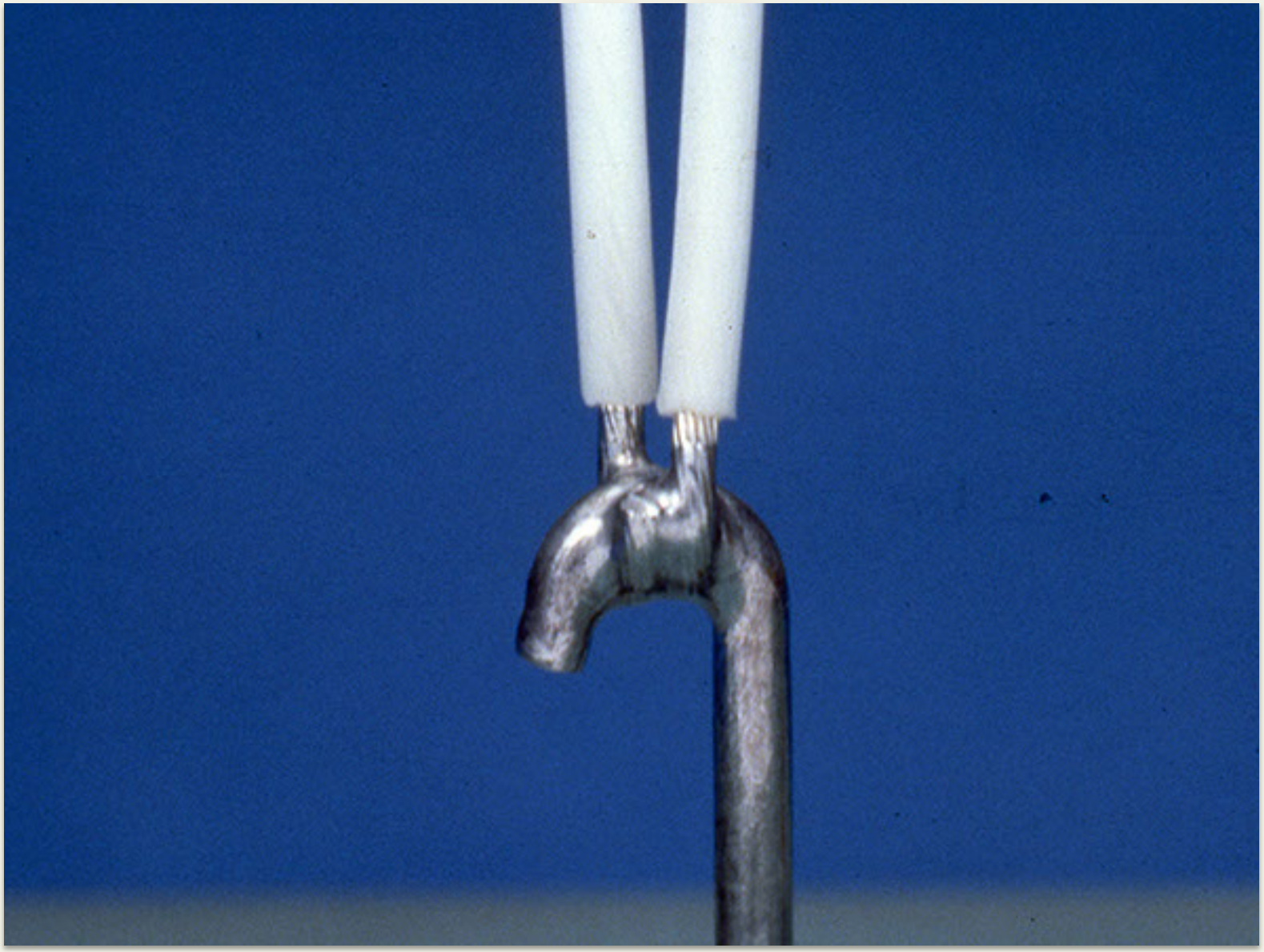
Preferred wrap, 180 degrees - Accept



Maximum wrap, 270 degrees - Accept

Preferred solder - Accept

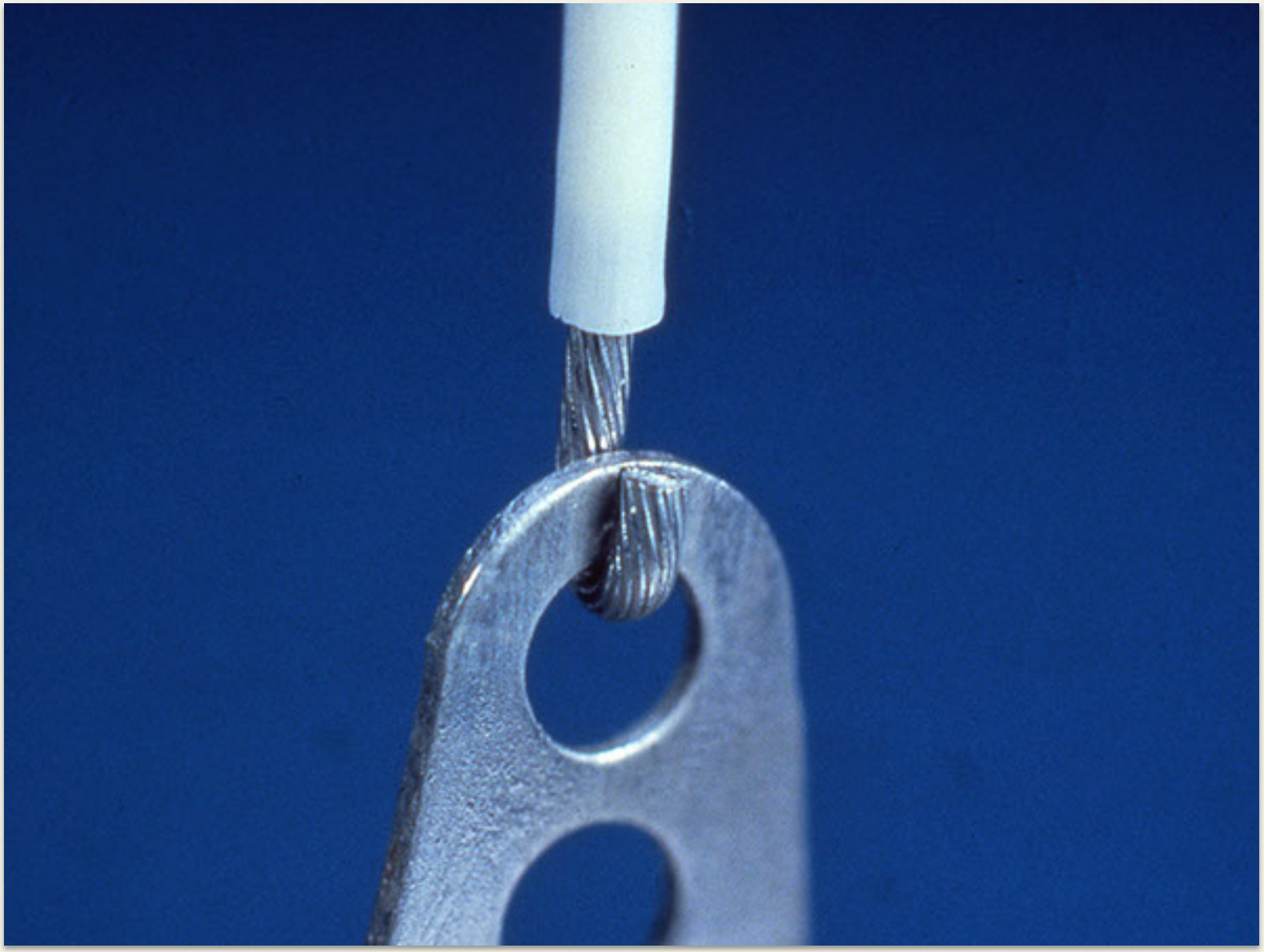
Minimum solder - Accept



Double wrap - Accept

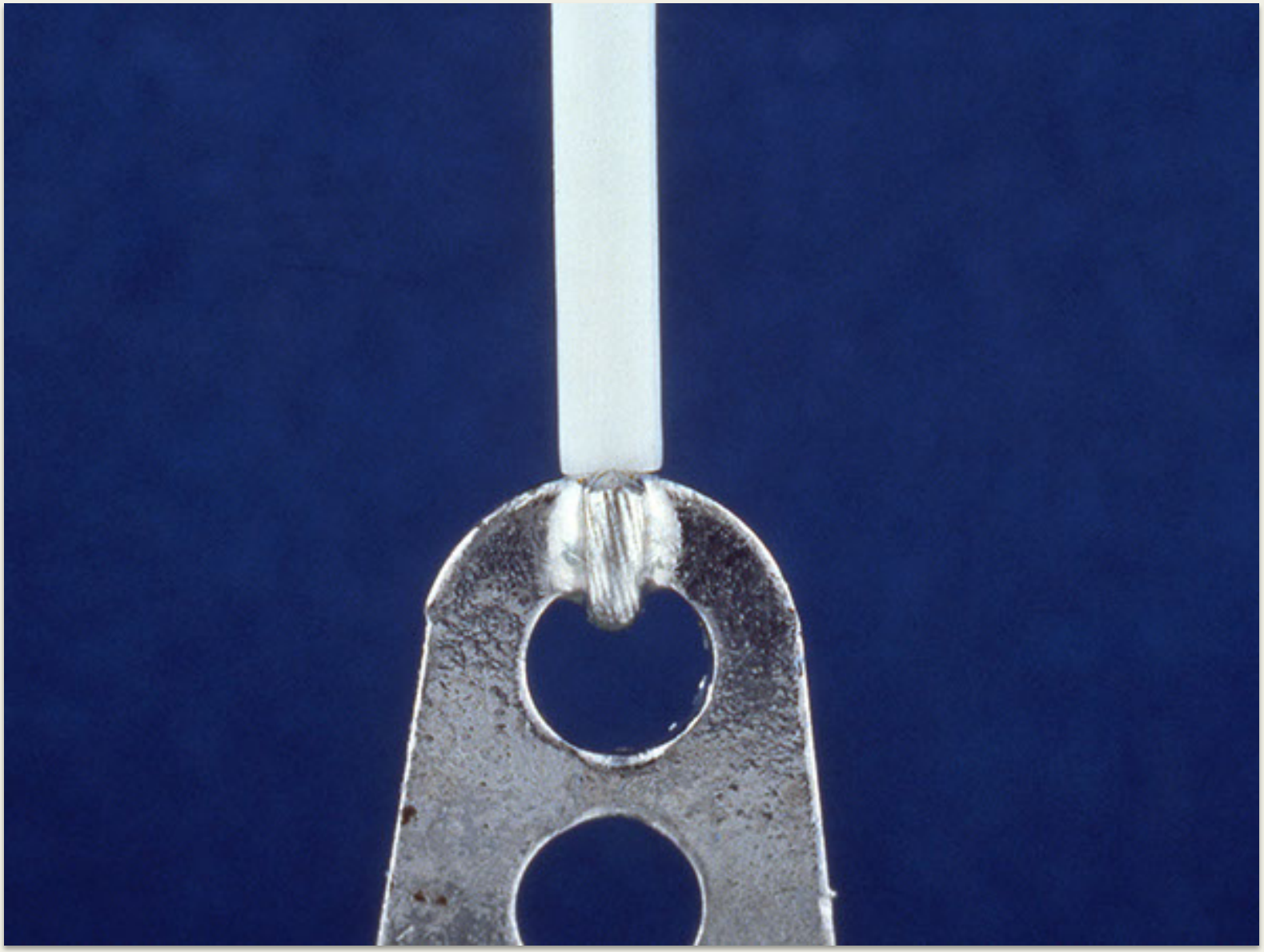
Rosin connection – Reject


PIERCED
TERMINAL

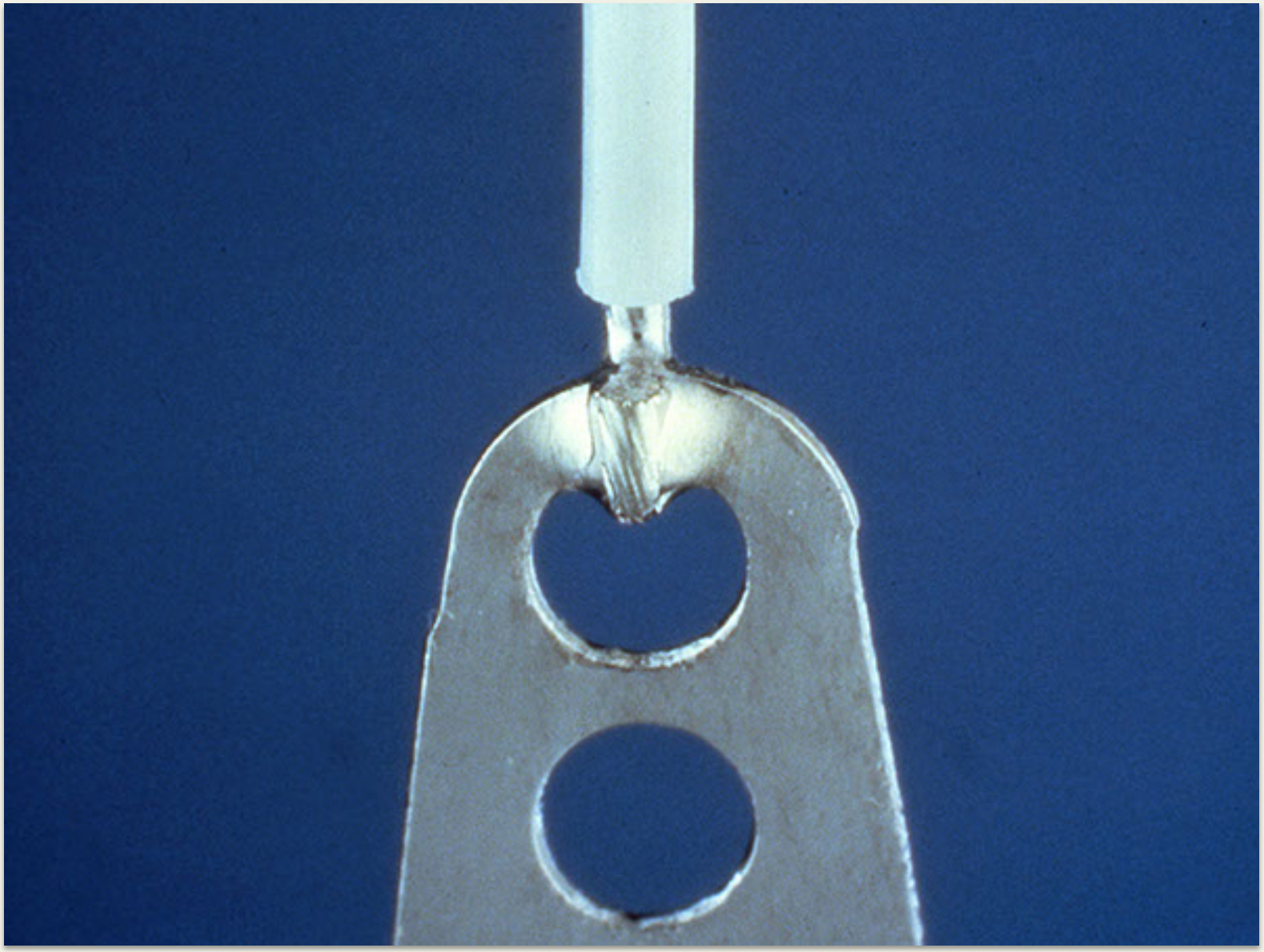


Preferred wrap - Accept

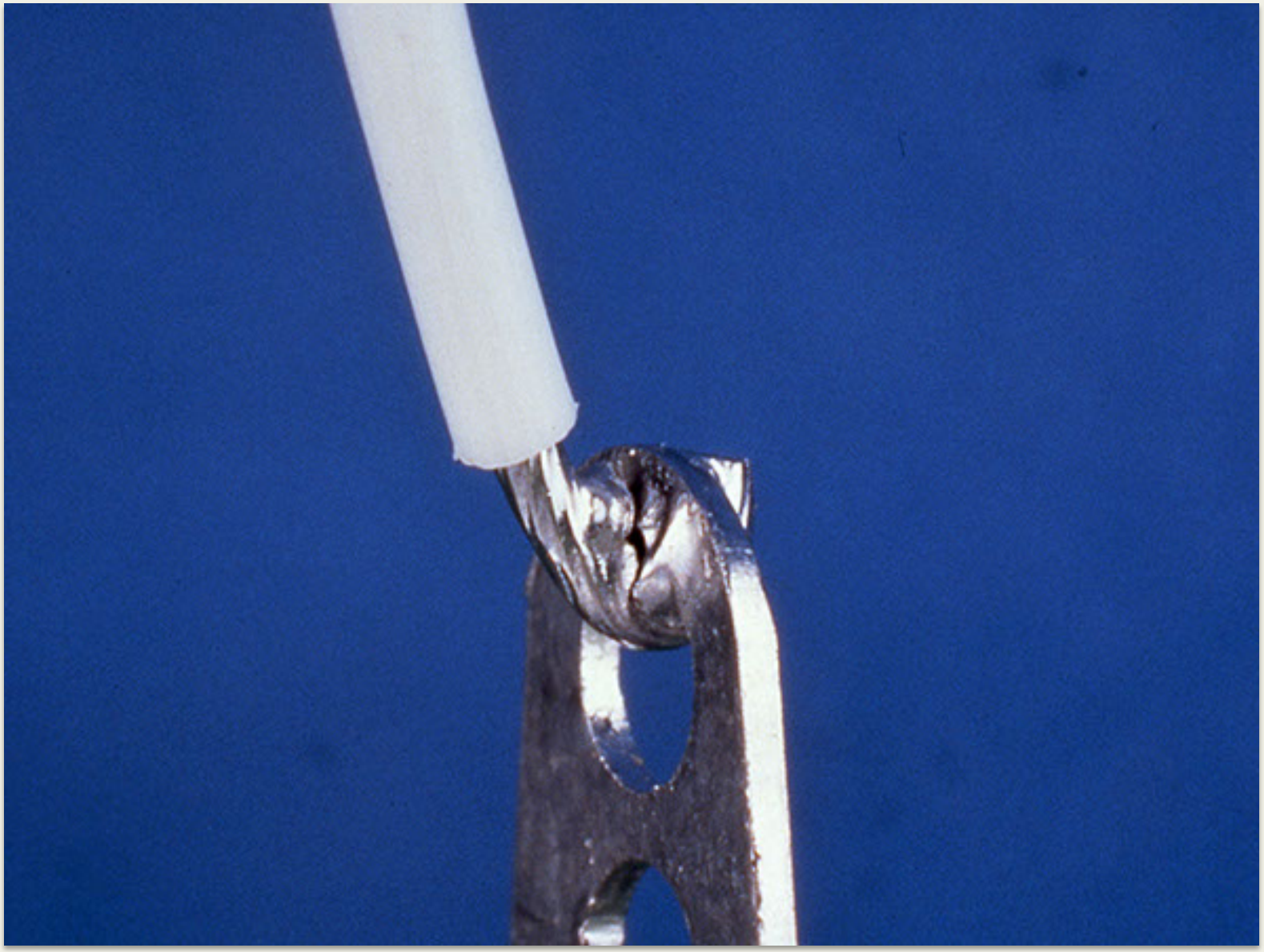
Preferred wrap “Z bend” - Accept



Minimum insulation clearance - Accept



Preferred insulation clearance - Accept

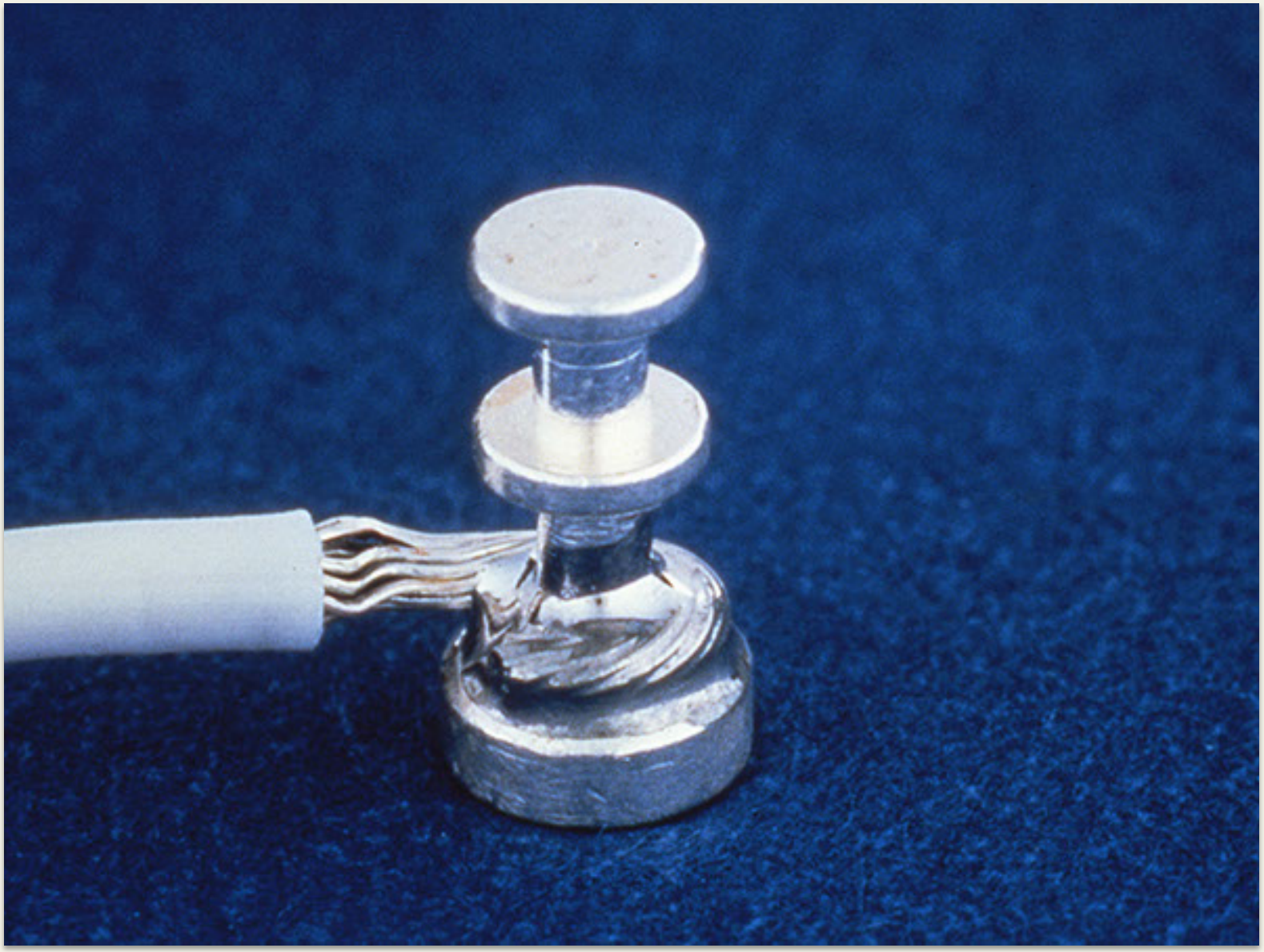


Disturbed/Fractured connection - Reject

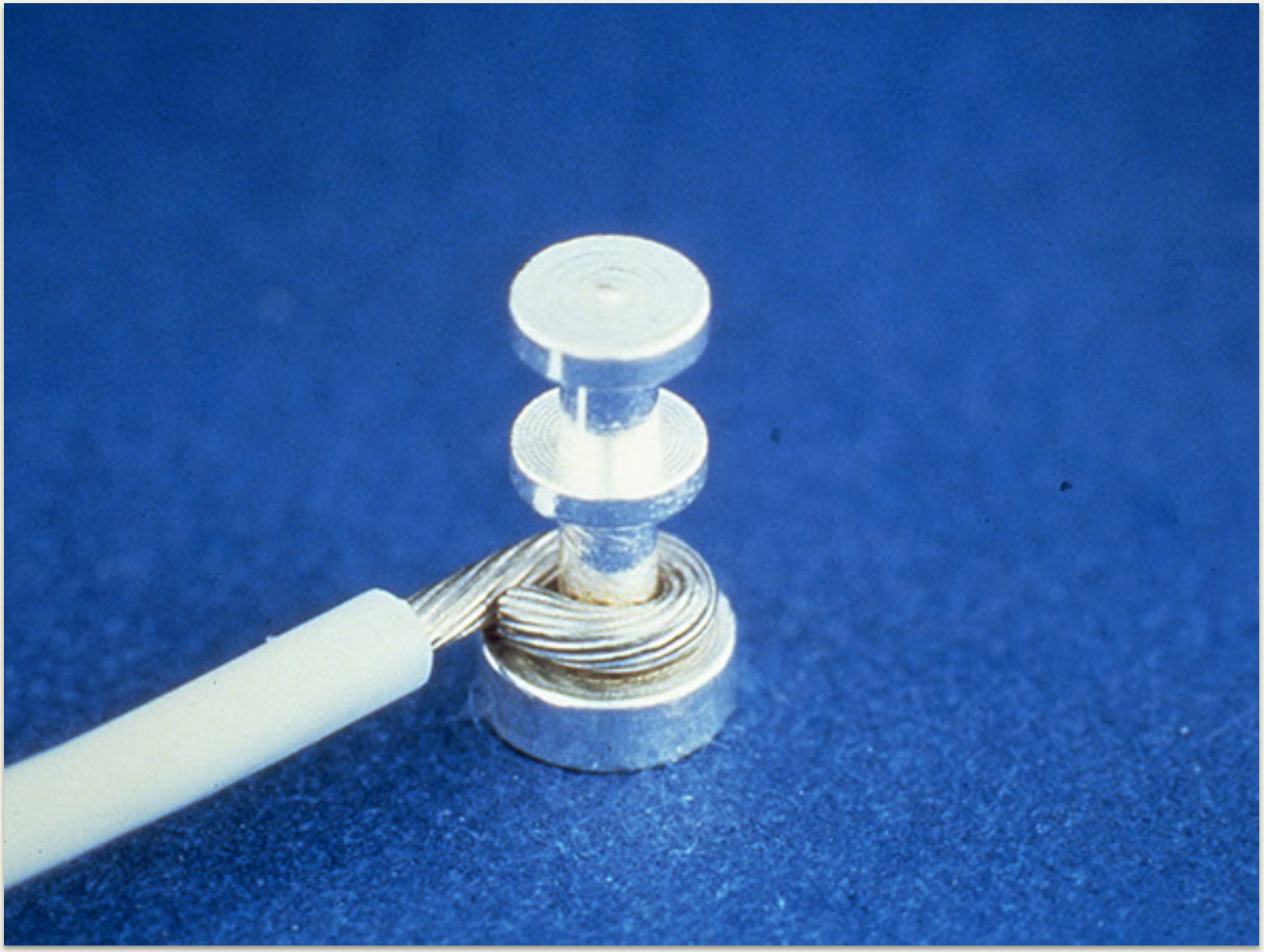
Dewetting - Reject


TURRET
TERMINAL

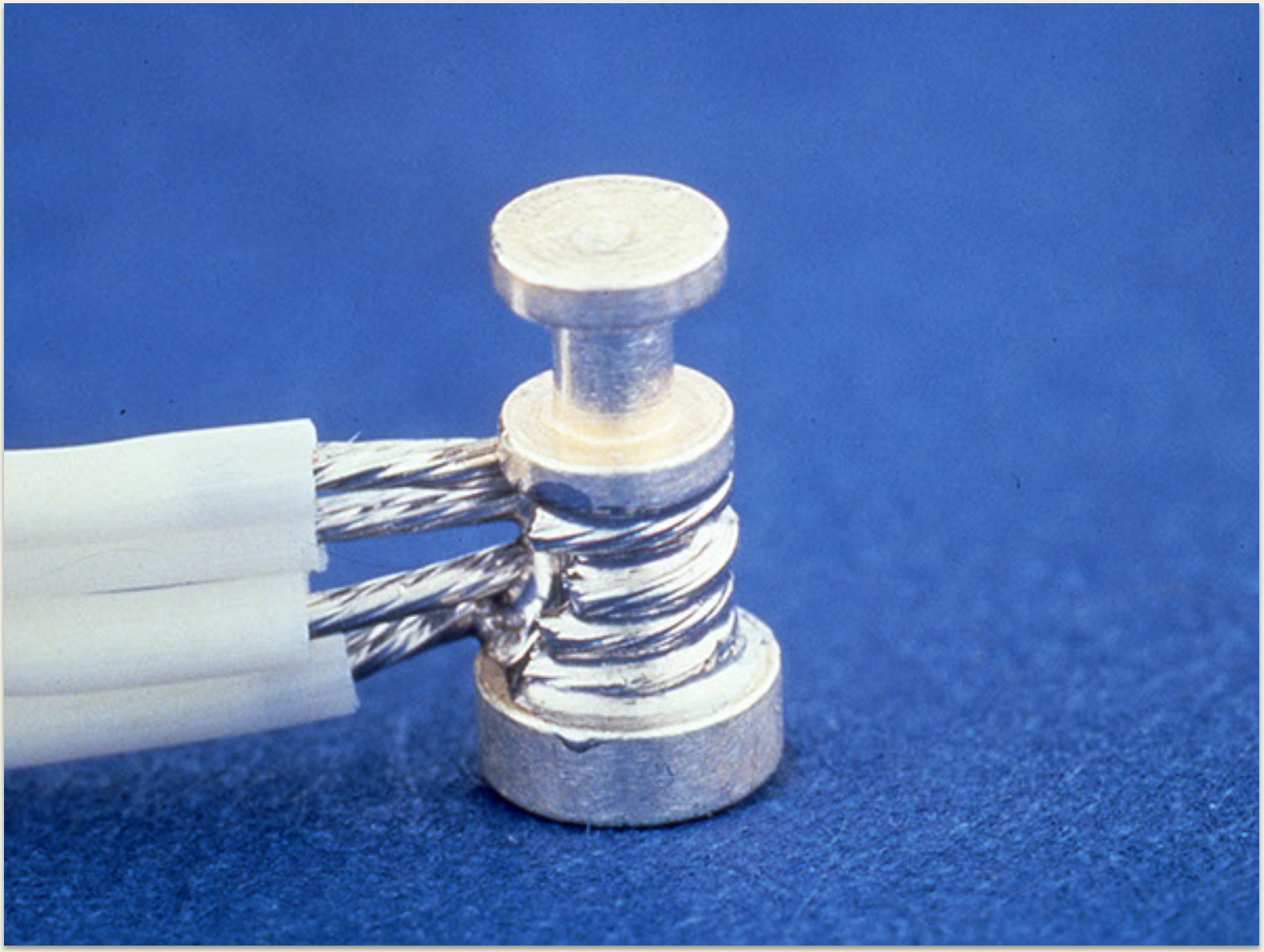
Insufficient wrap, less than 180 degrees - Reject



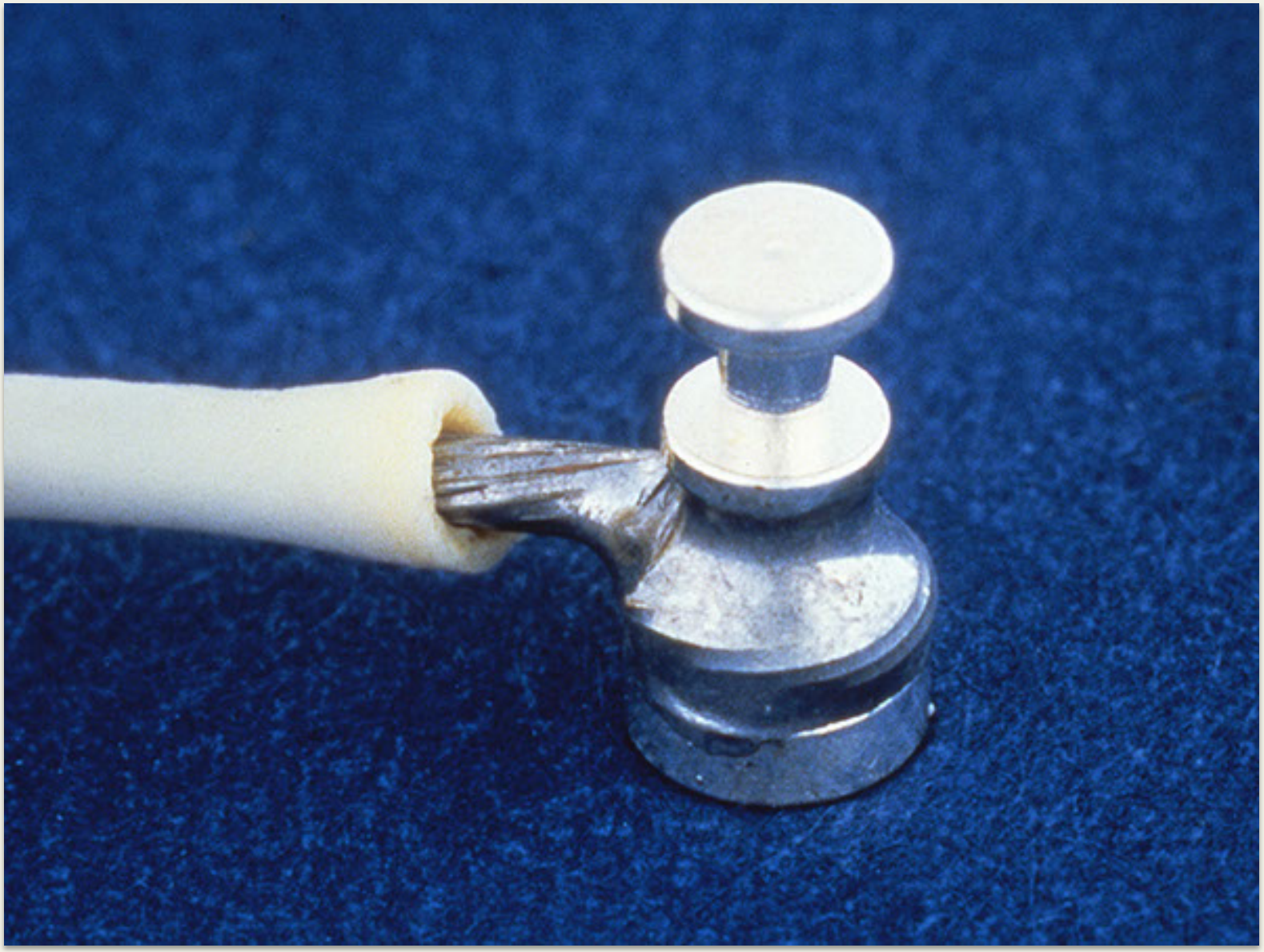
Birdcaged wire strands - Reject



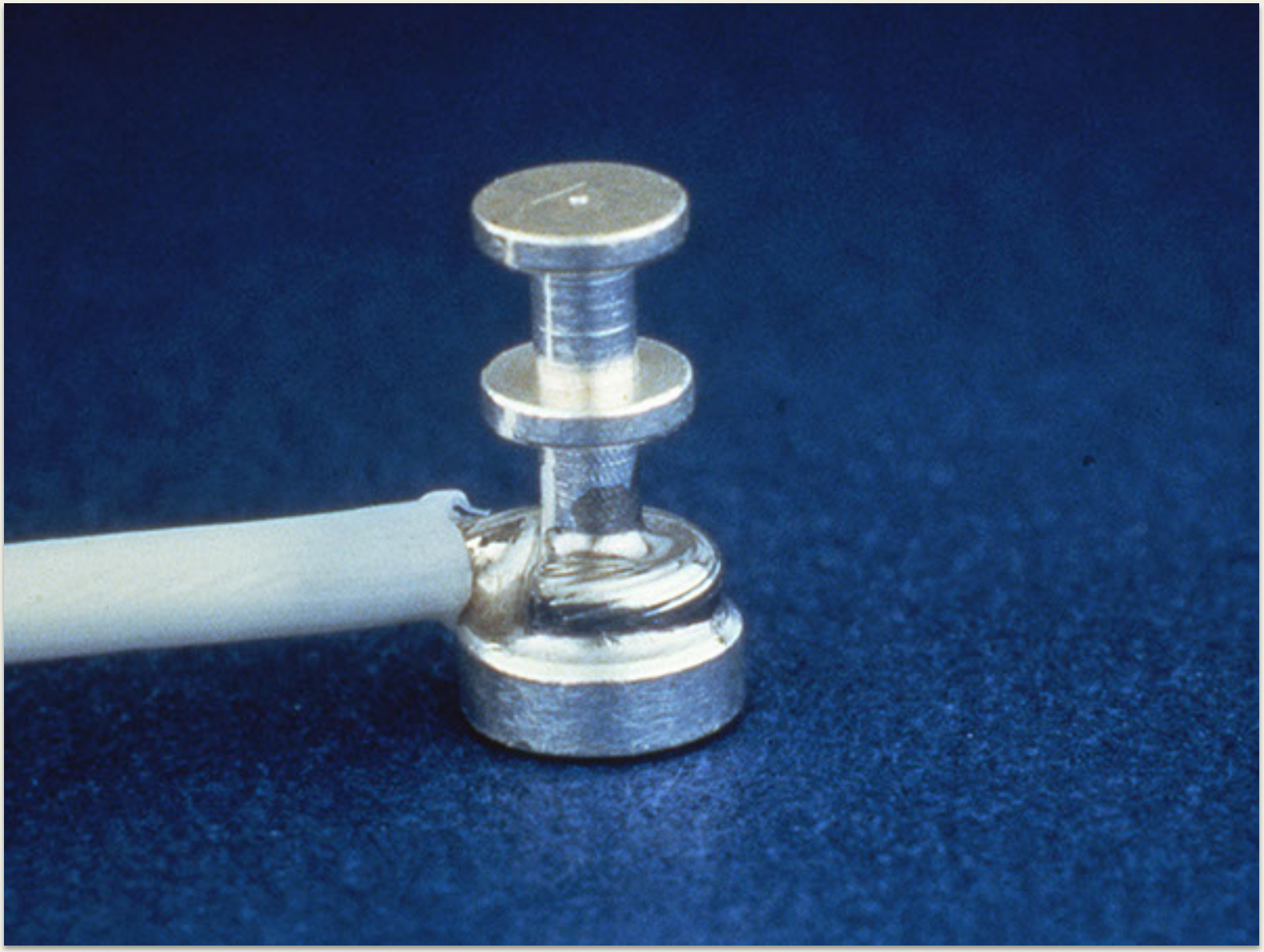
Loose/Excessive lead wrap - Reject



Terminal fill, all wires touching post - Accept

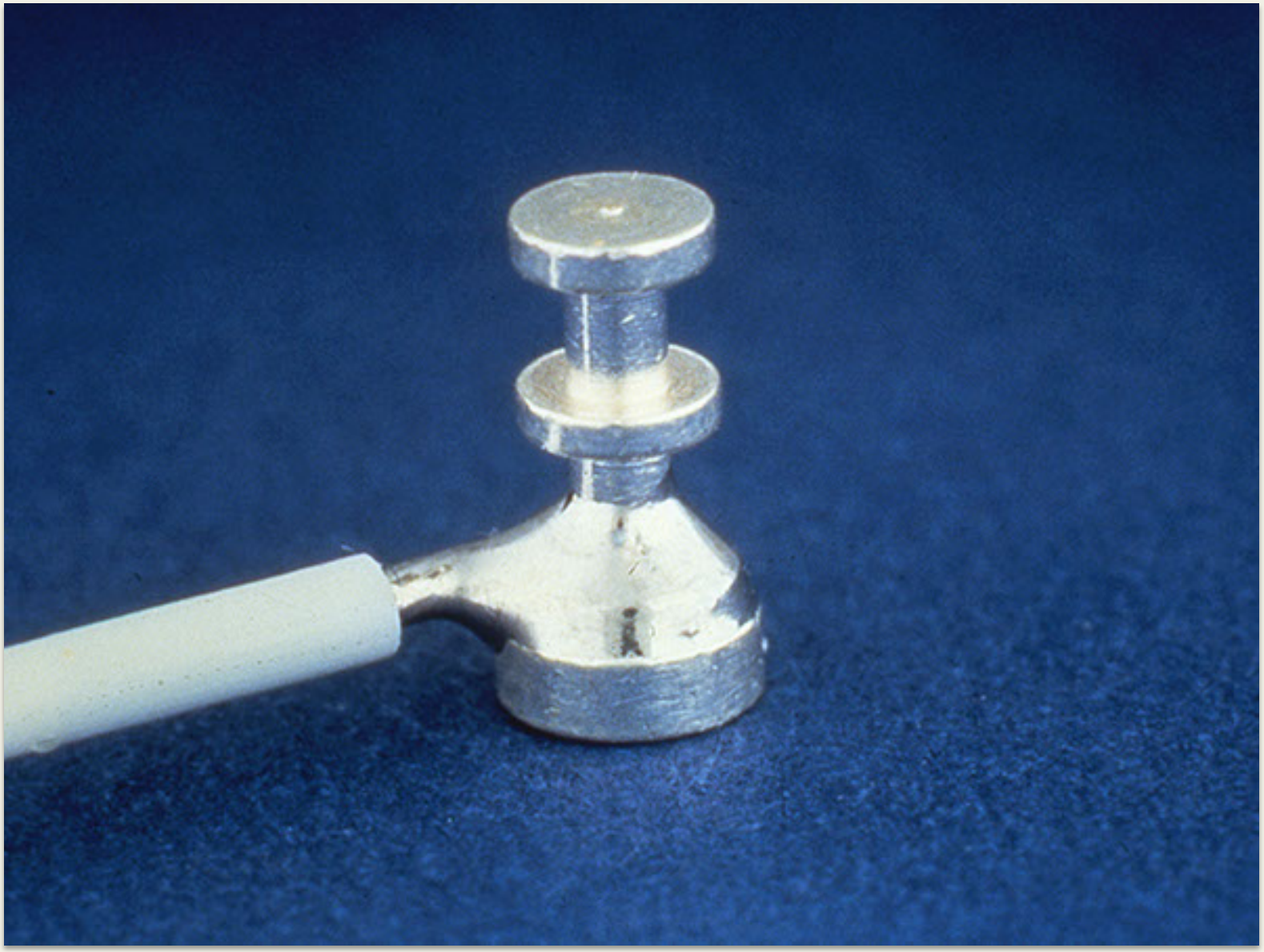


Excessive wicking - Reject



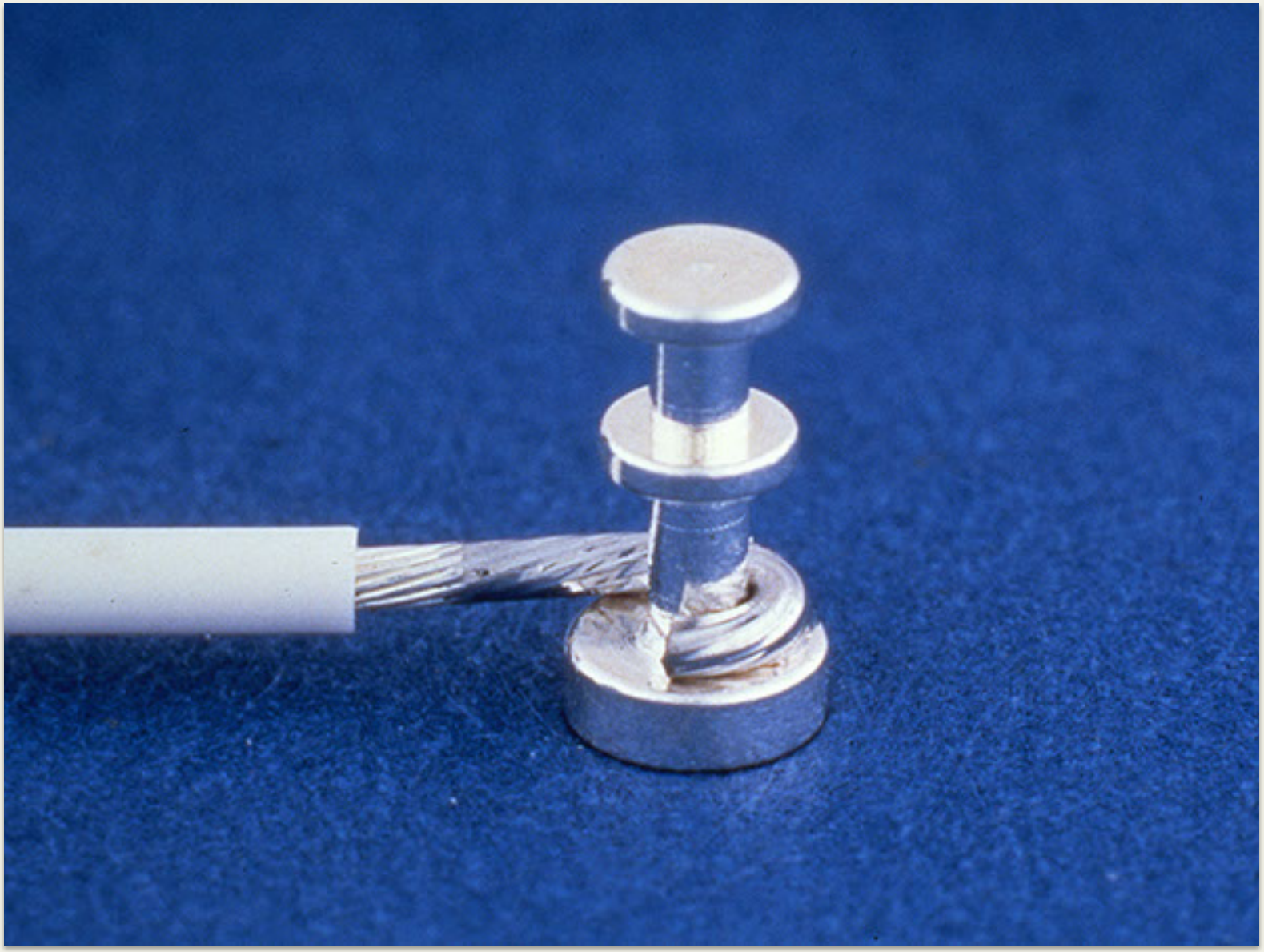
Minimum insulation clearance, possible contamination

Reject



Excessive solder - Reject

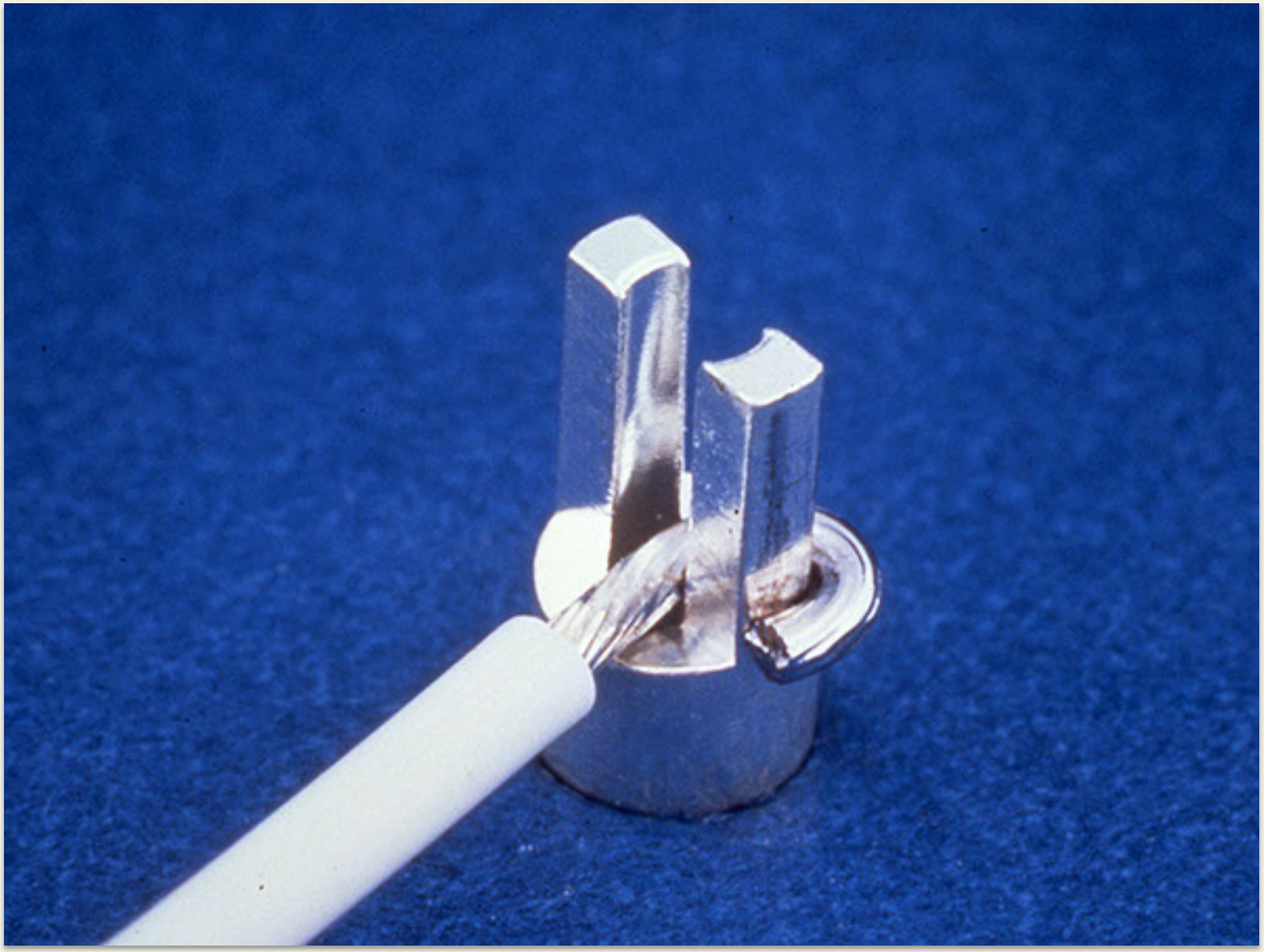
Grainy/Overheated - Reject



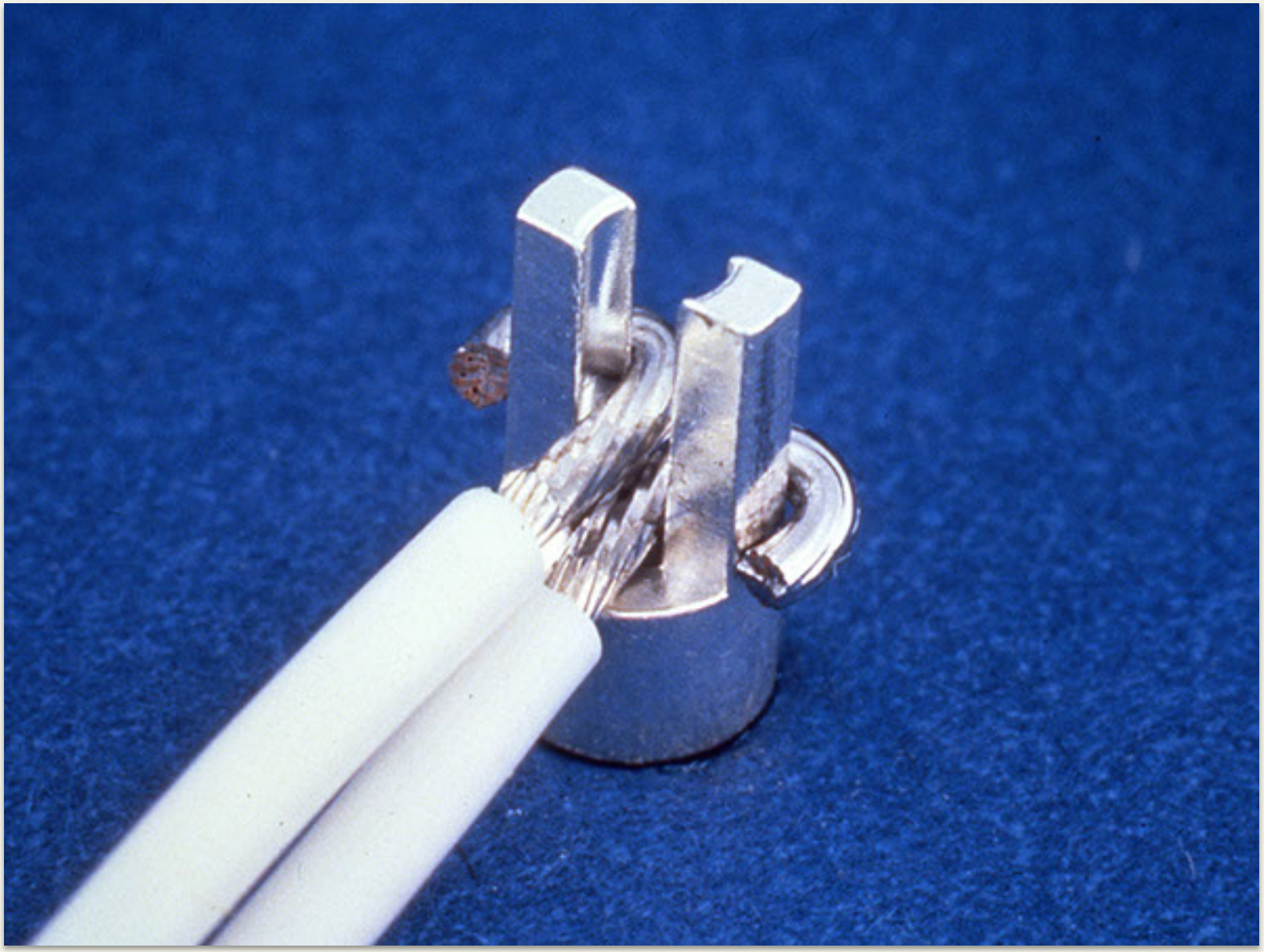
Dewetted - Reject

Dewetted - Reject

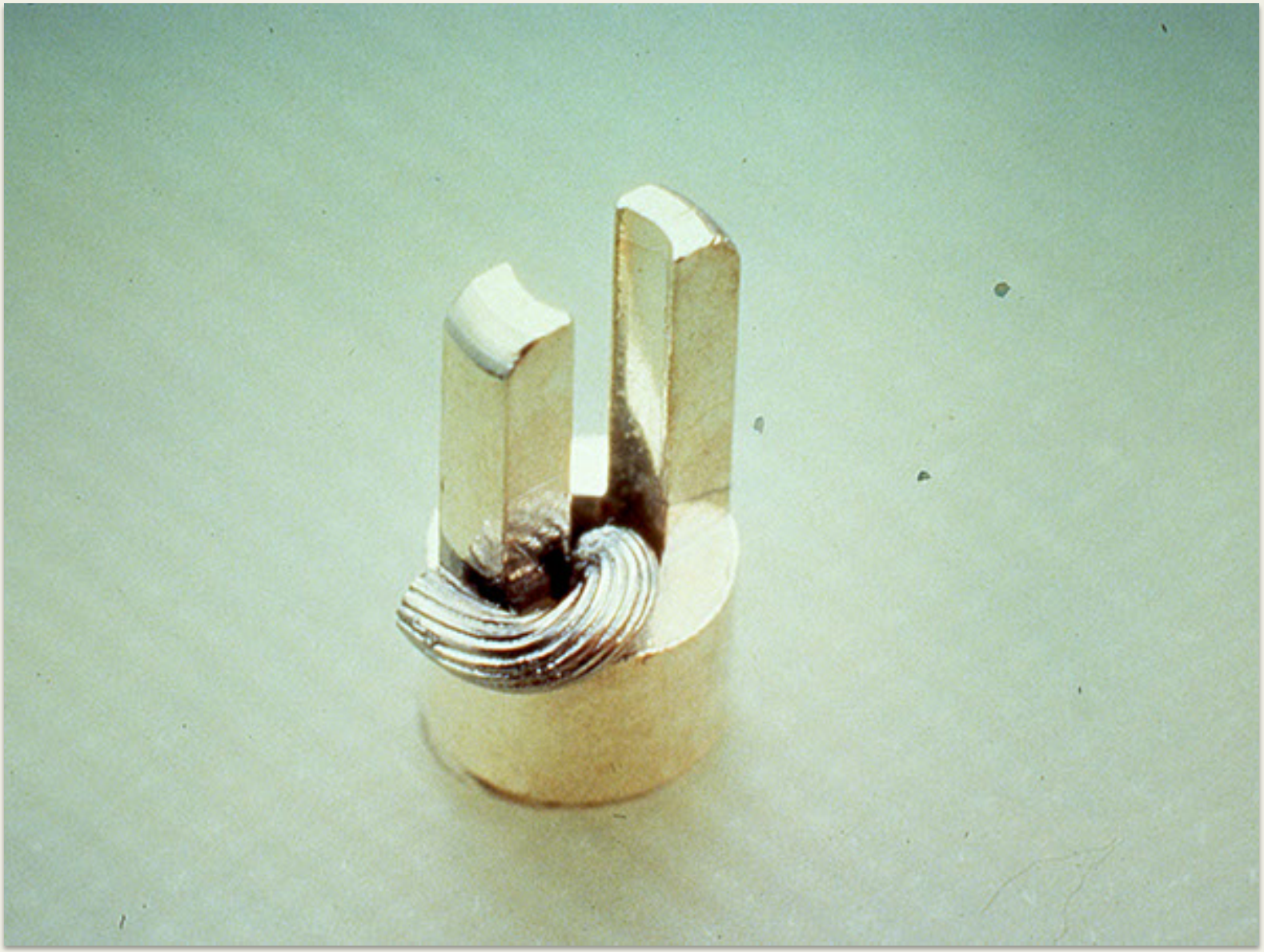

BIFURCATED
TERMINAL



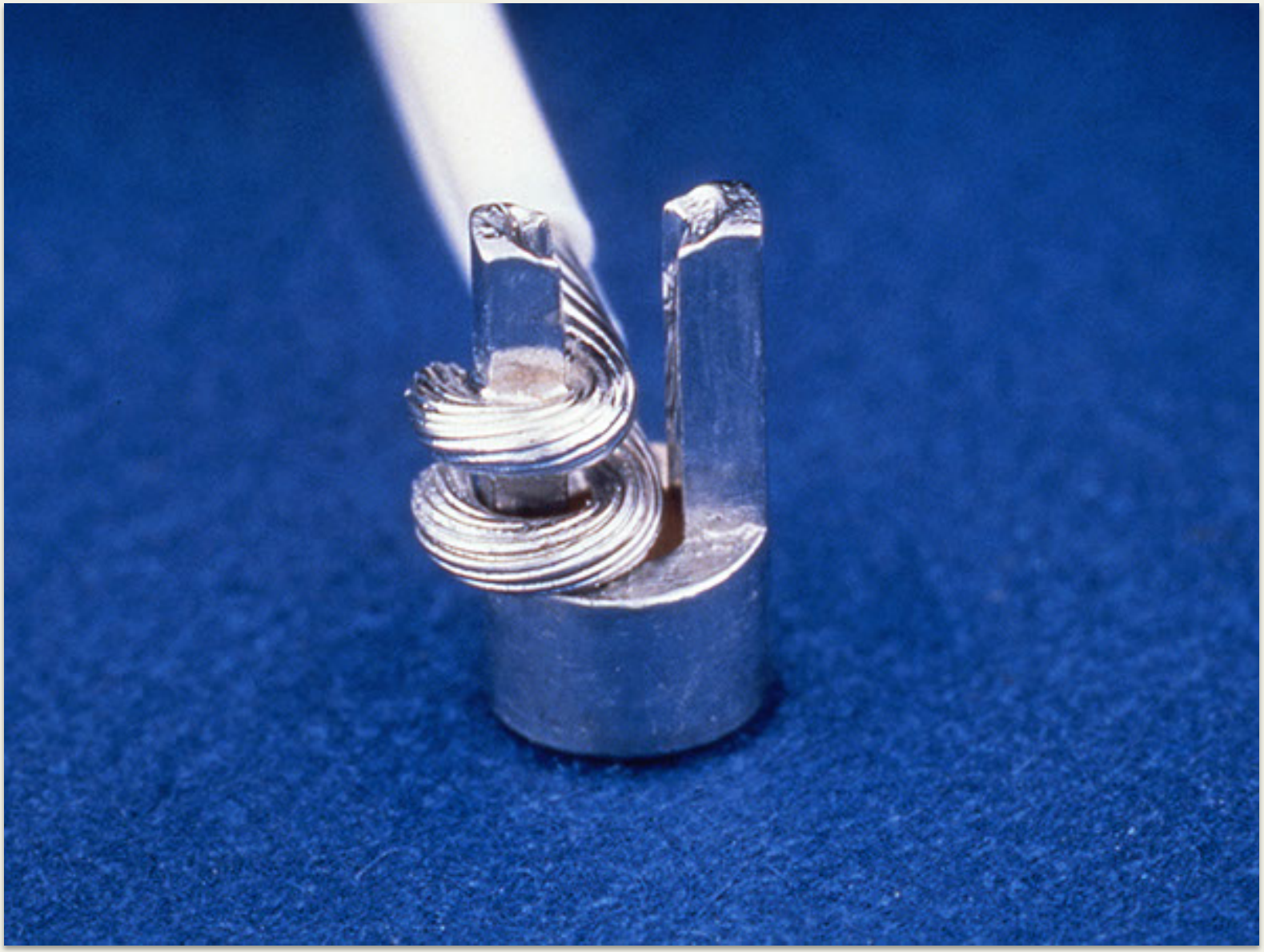
Preferred wrap (single) - Accept



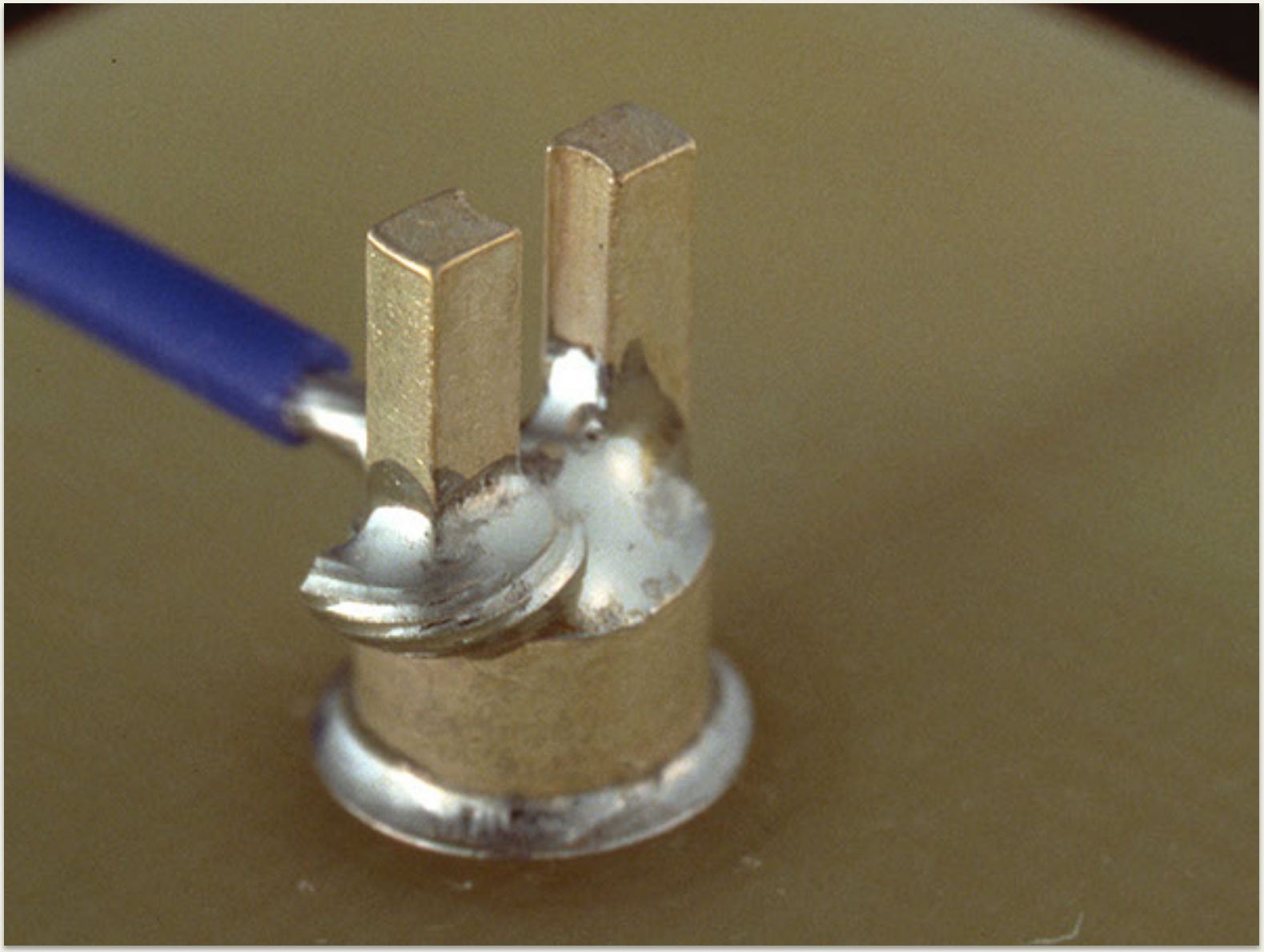
Preferred Wrap (double) - Accept



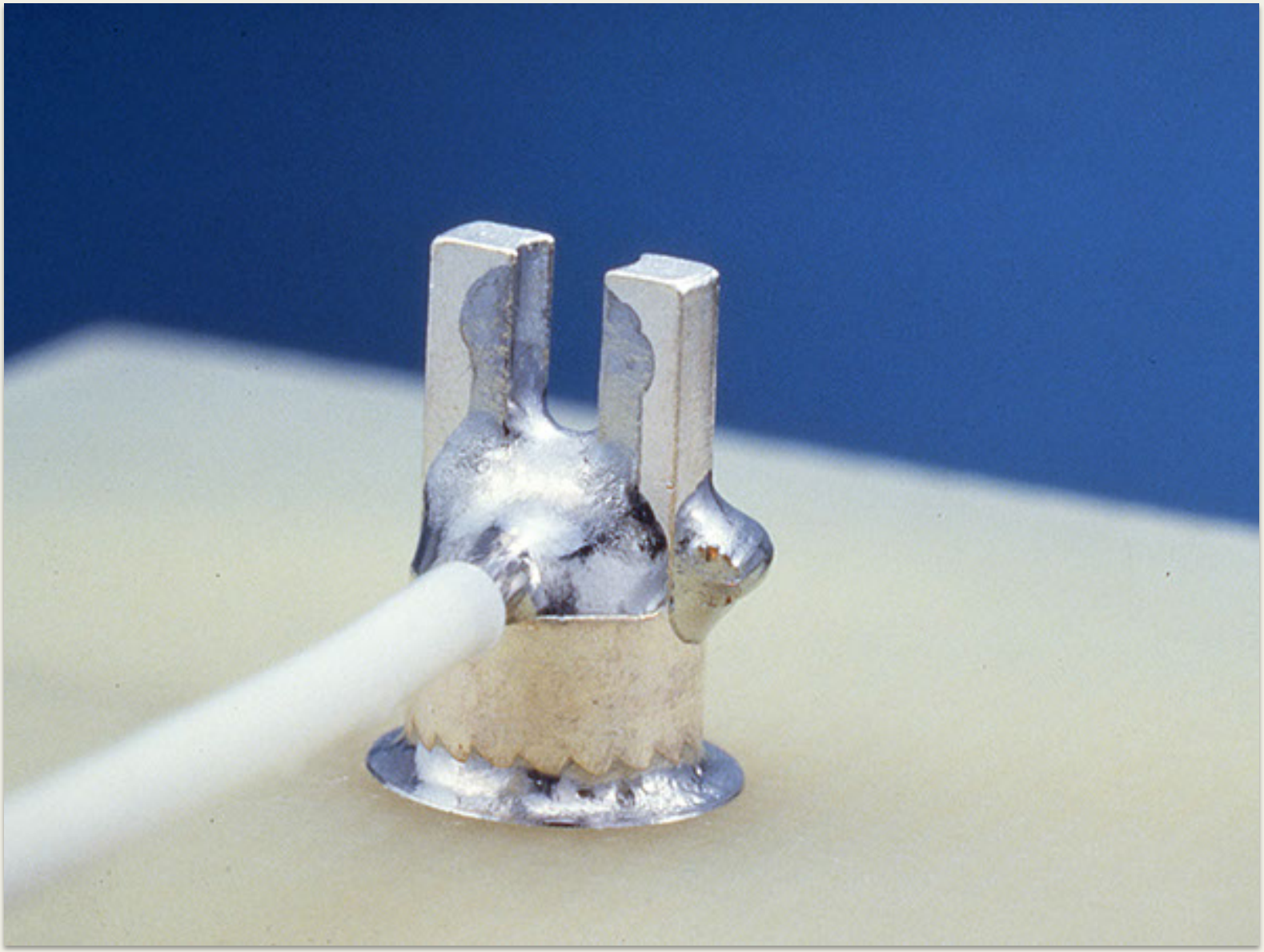
Preferred wrap (bottom route) - Accept



Improper mechanical wrap - Reject

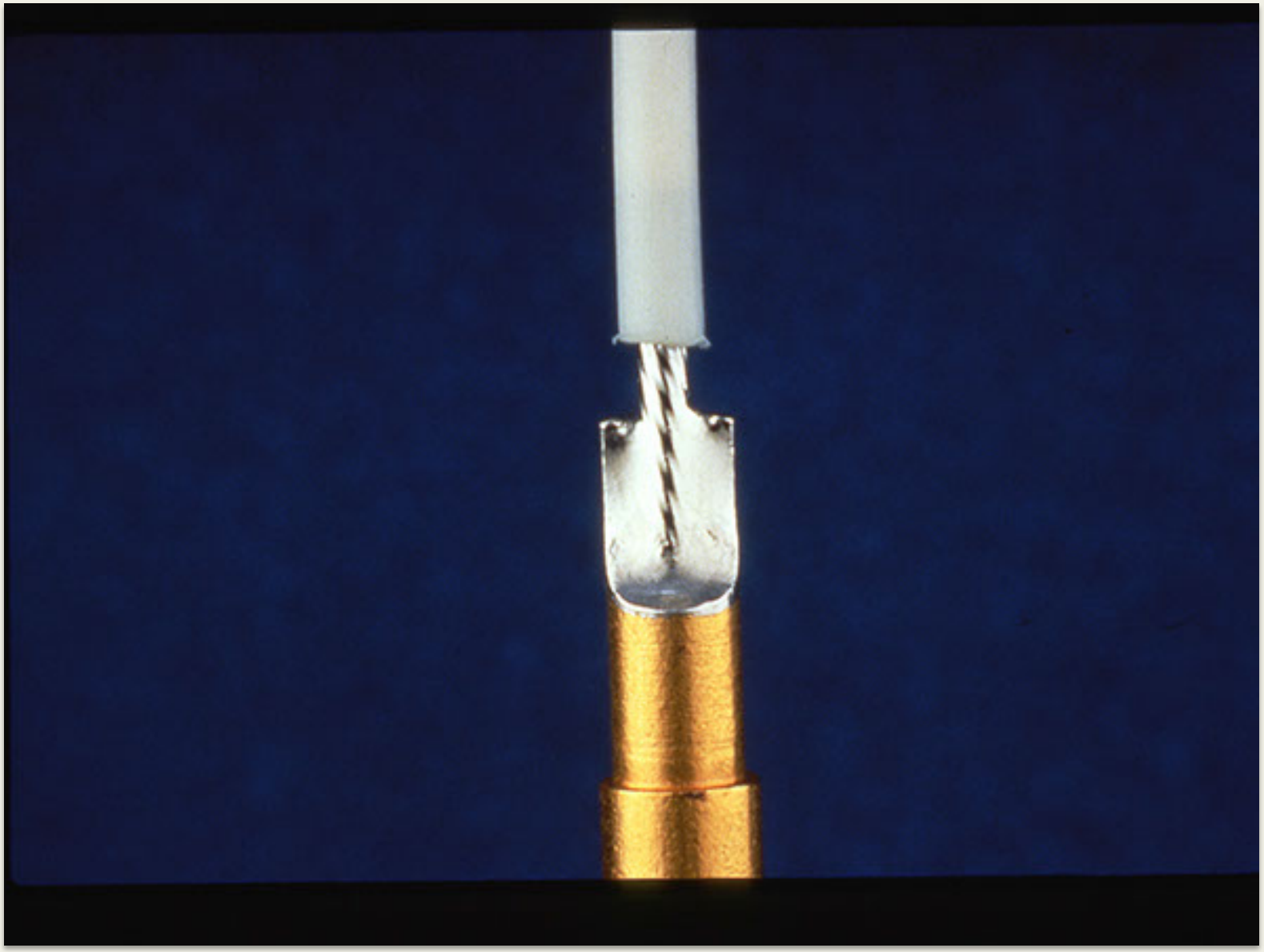


Excessive solder (should see strand contour) - Reject

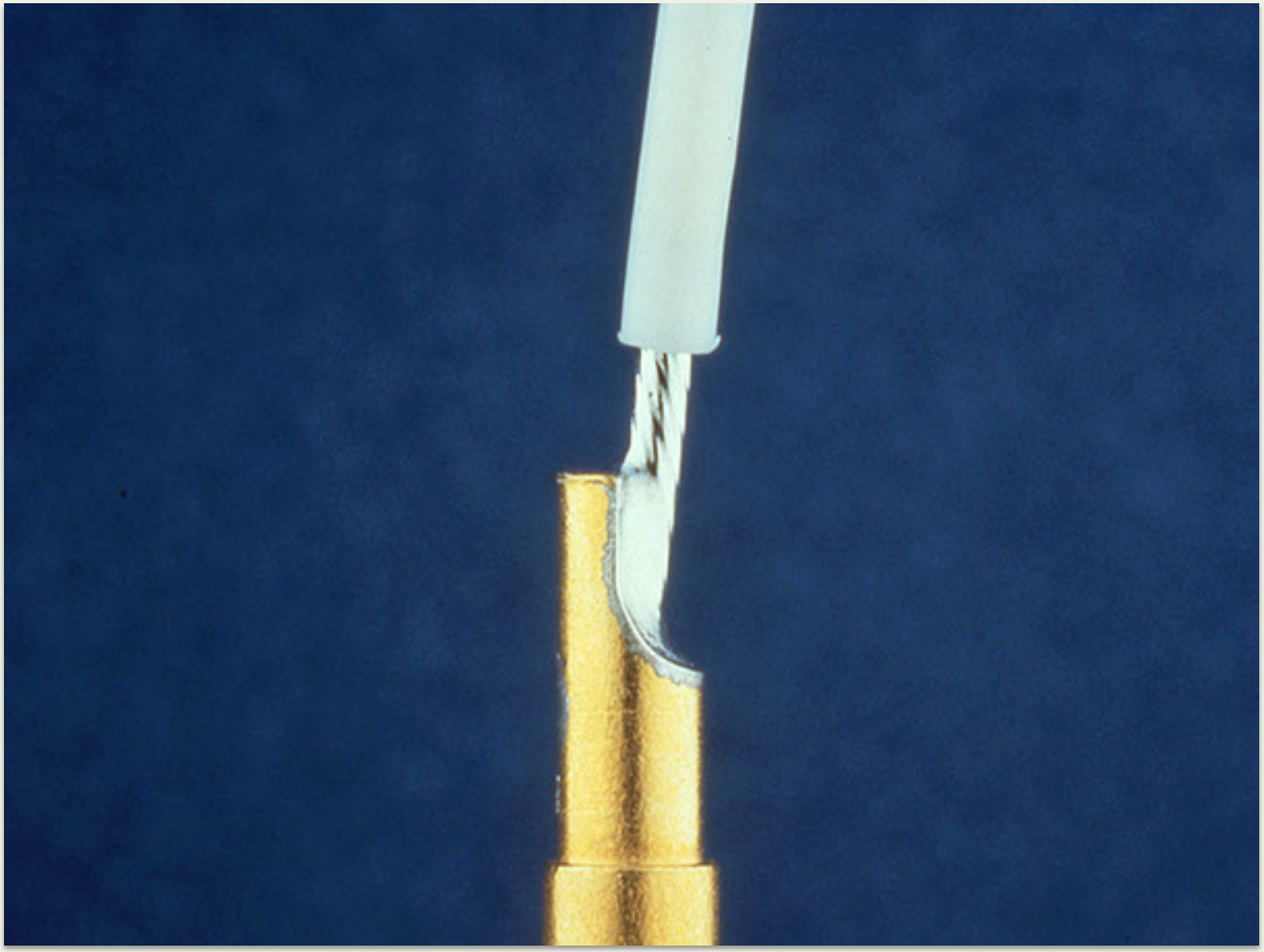


Excessive solder - Reject

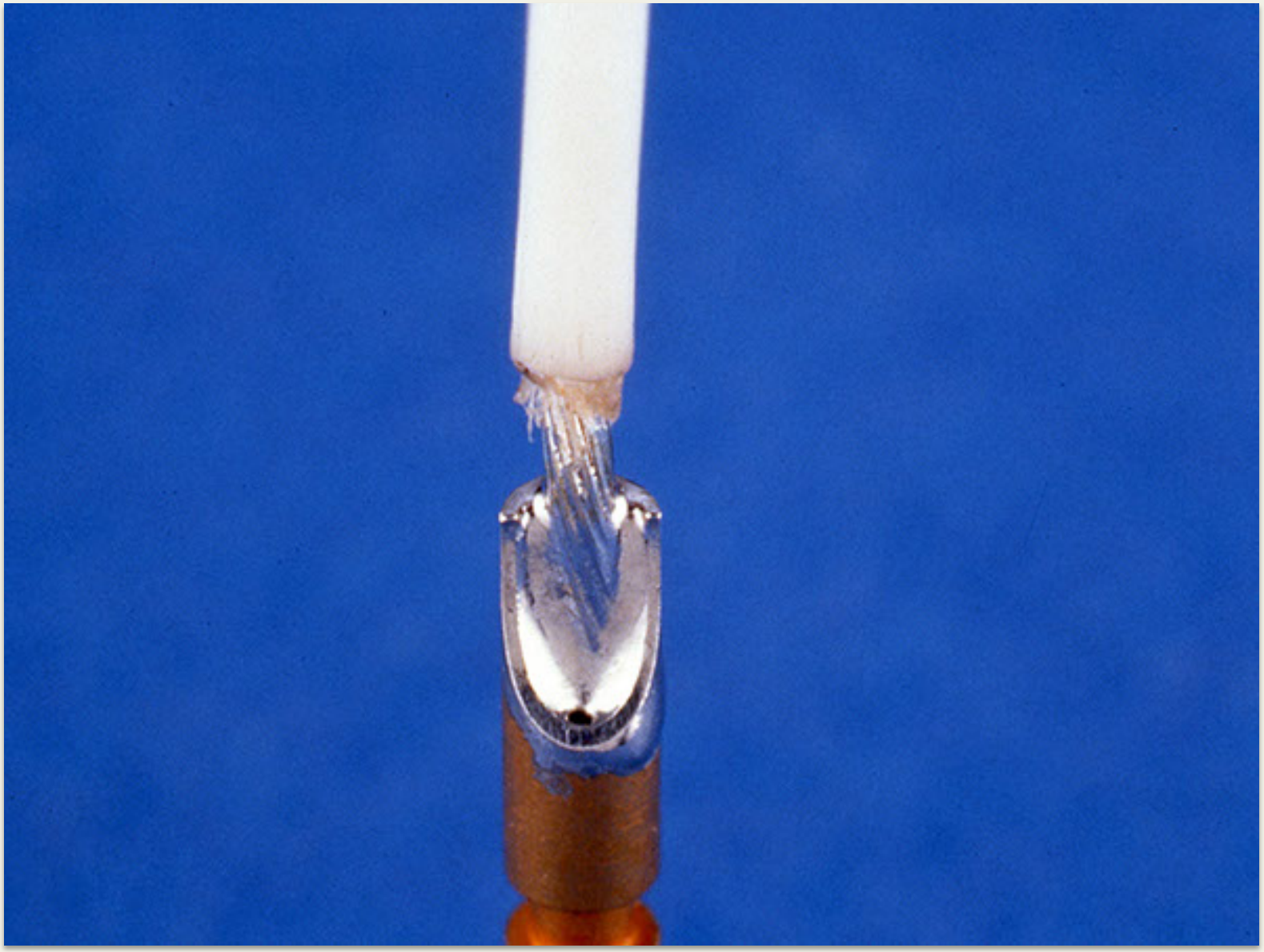

SOLDER CUP
TERMINAL



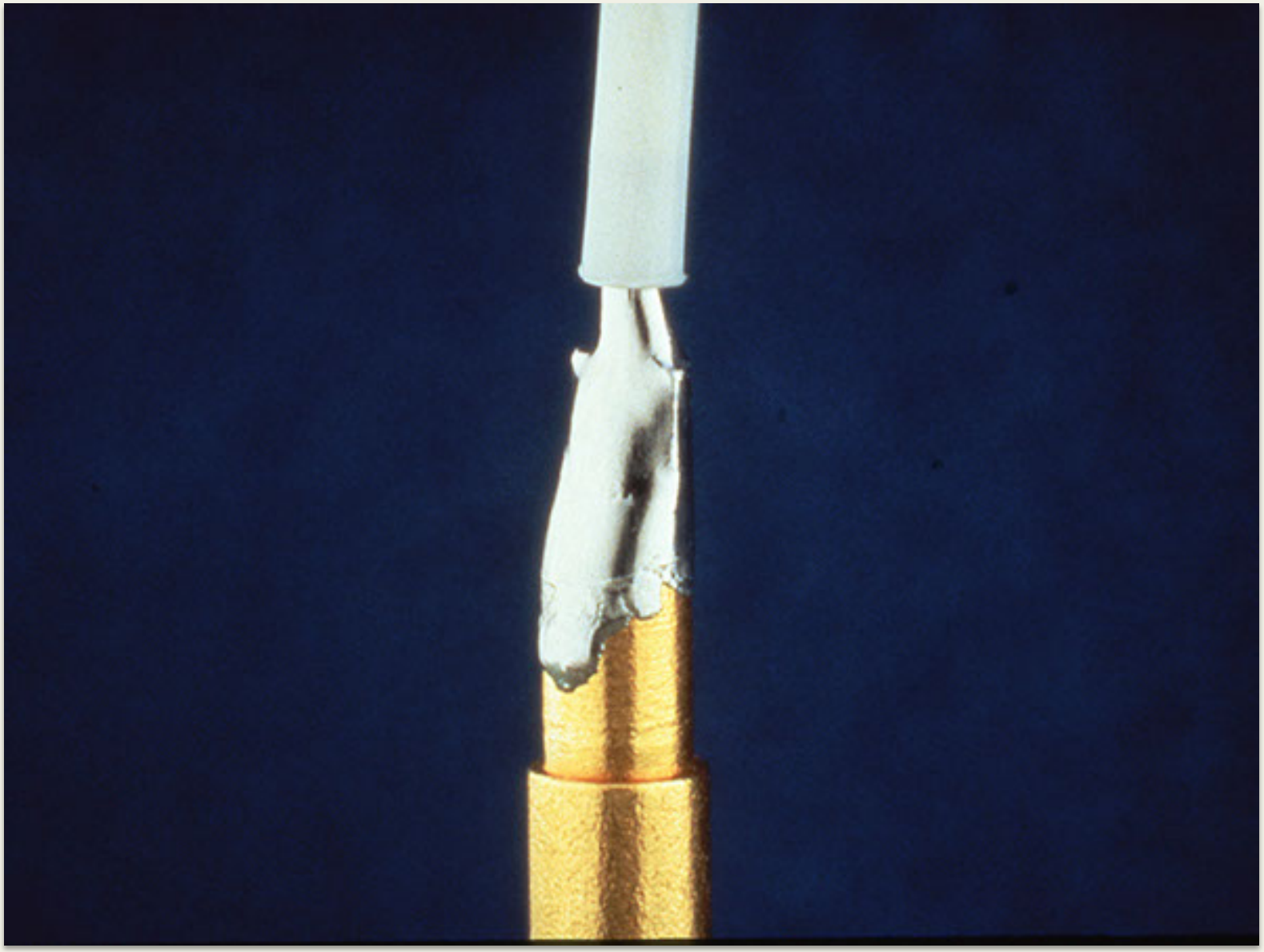
Preferred solder - Accept



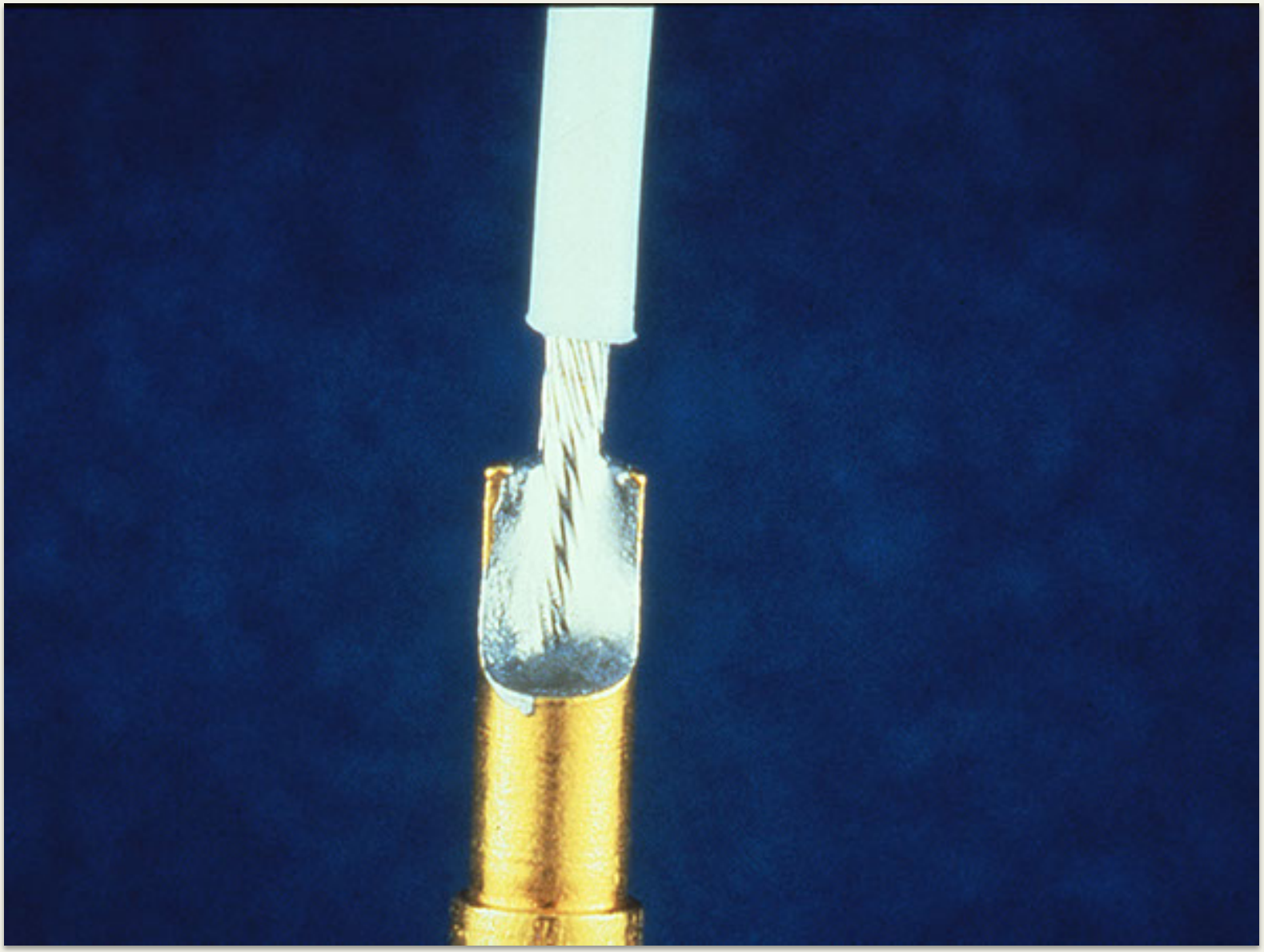
Improper seating to back of cup - Reject



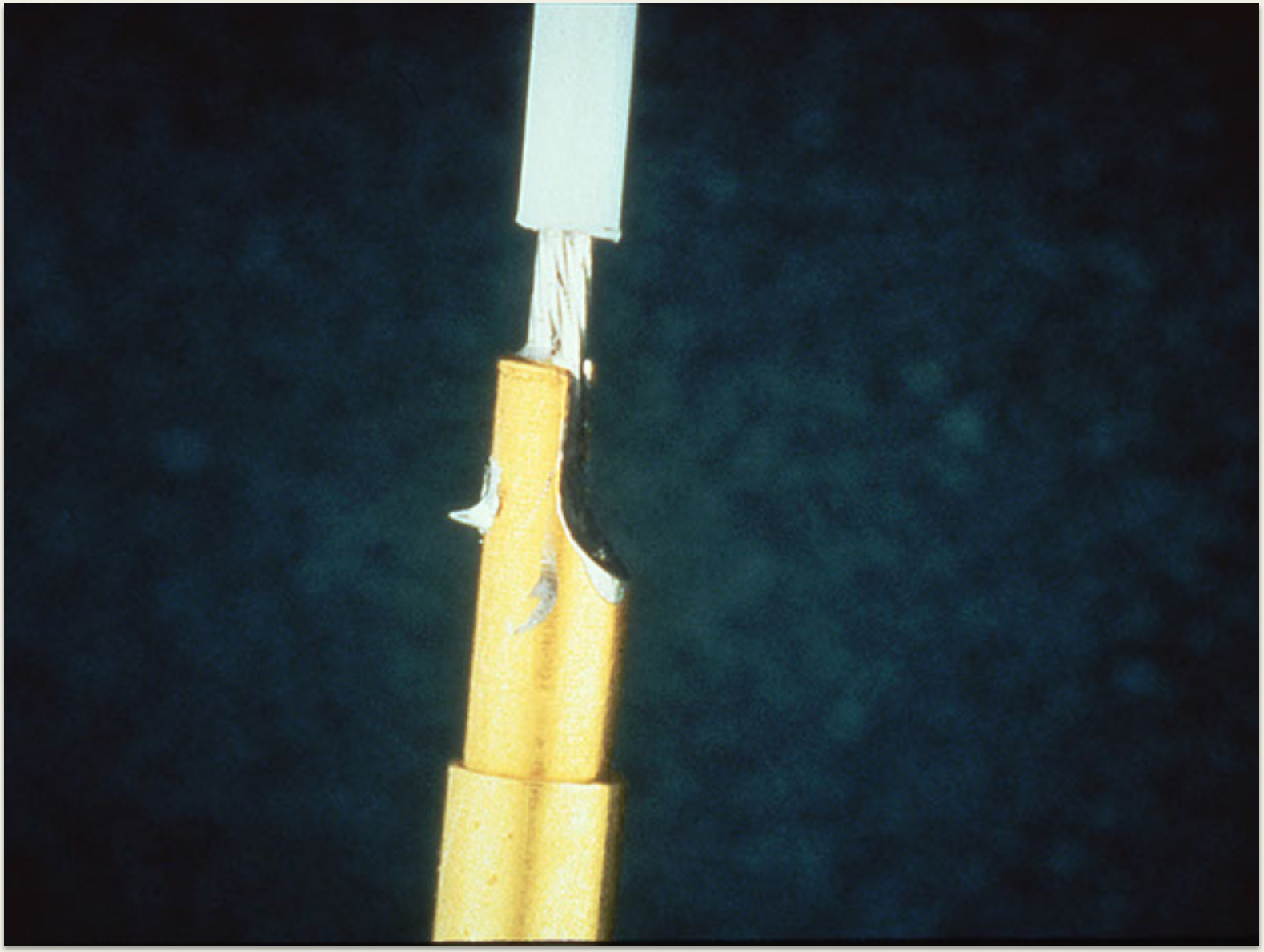
Void, pin hole - Reject



Excessive solder/spillage - Reject



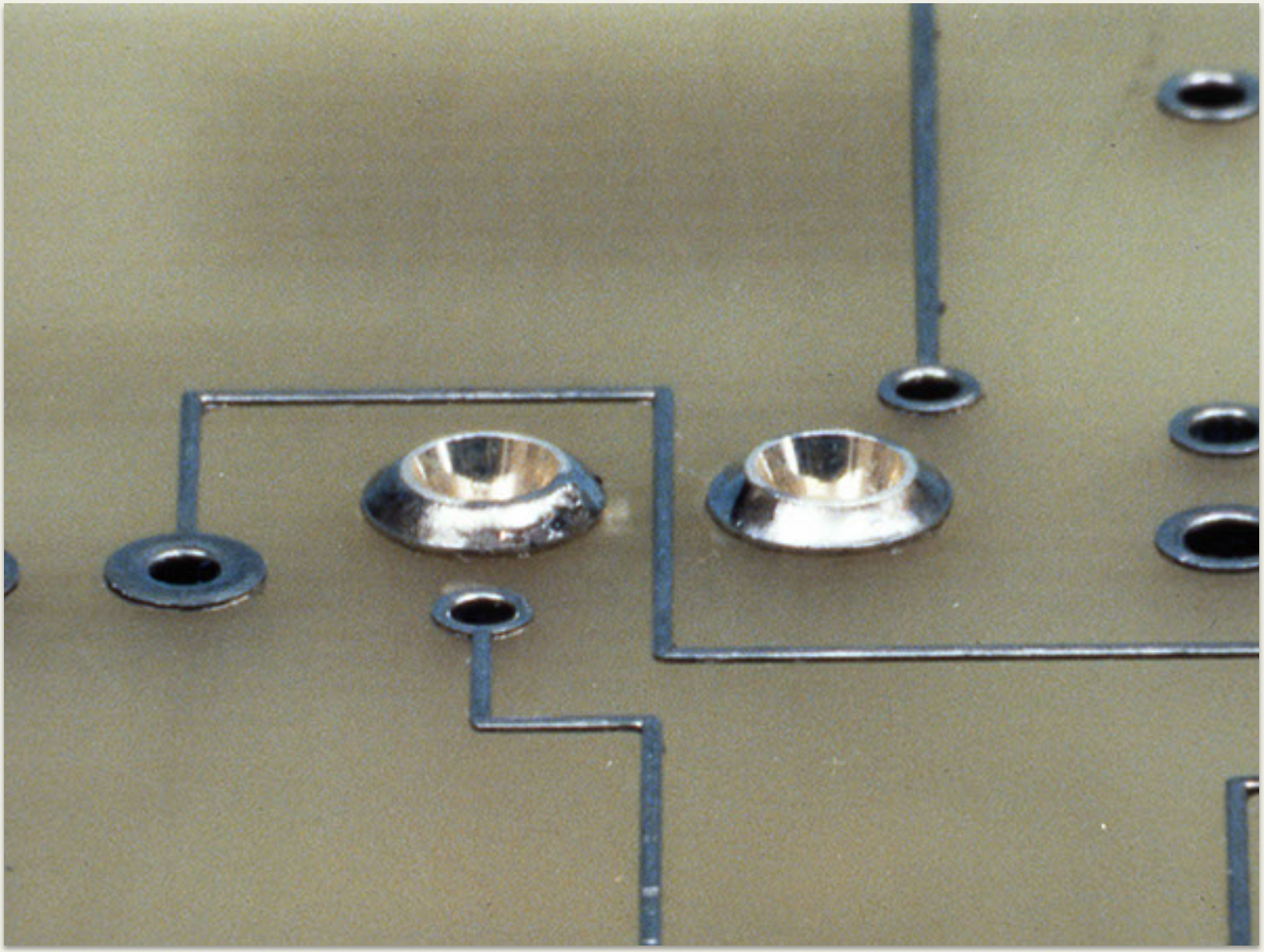
Gold embrittlement (amalgamation) - Reject



Solder spike - Reject

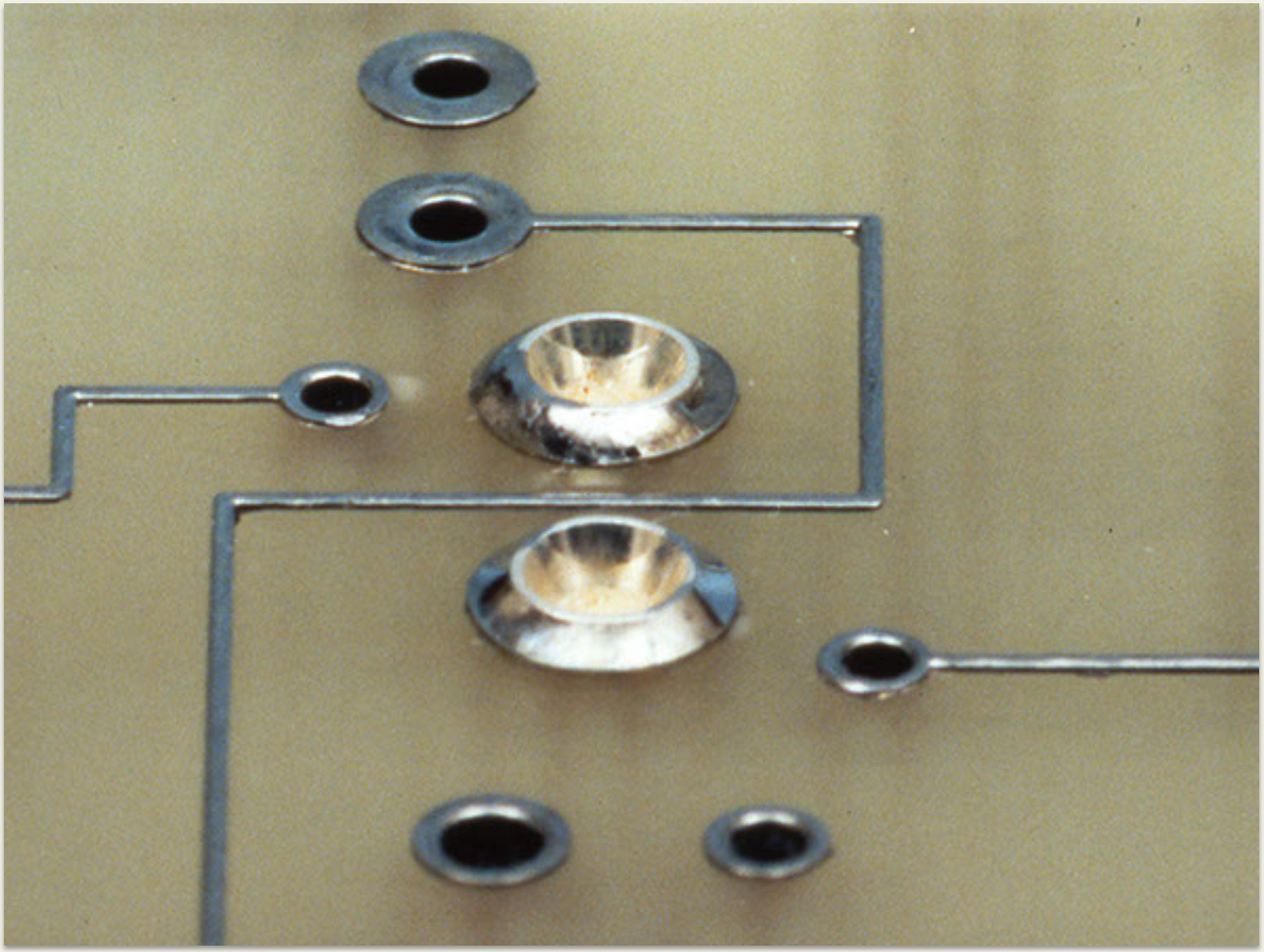

PRINTED
WIRING BOARD


TERMINAL
SWAGING



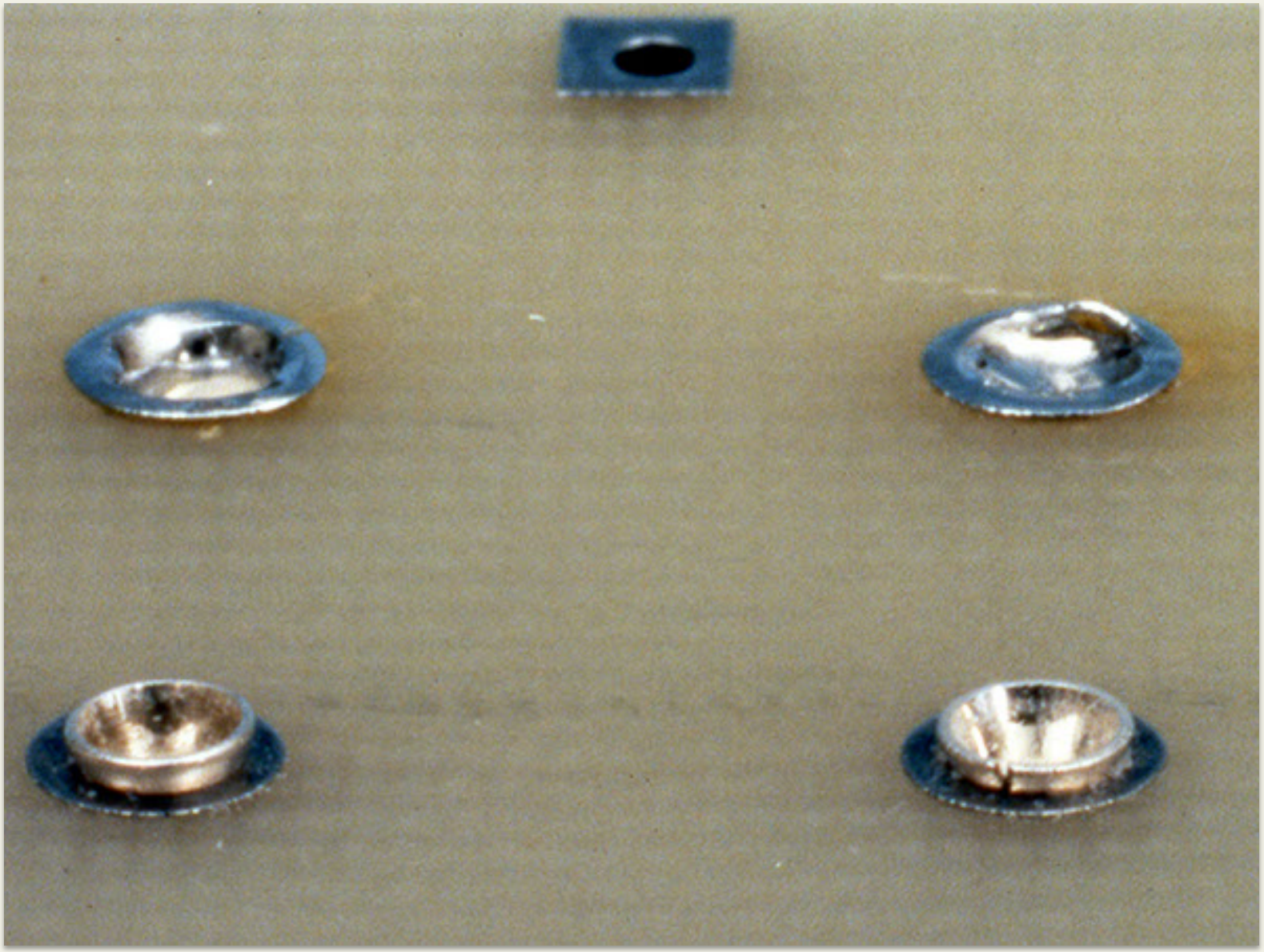
Left side, excessive solder/void/measle – Reject

Right side, preferred solder - Accept



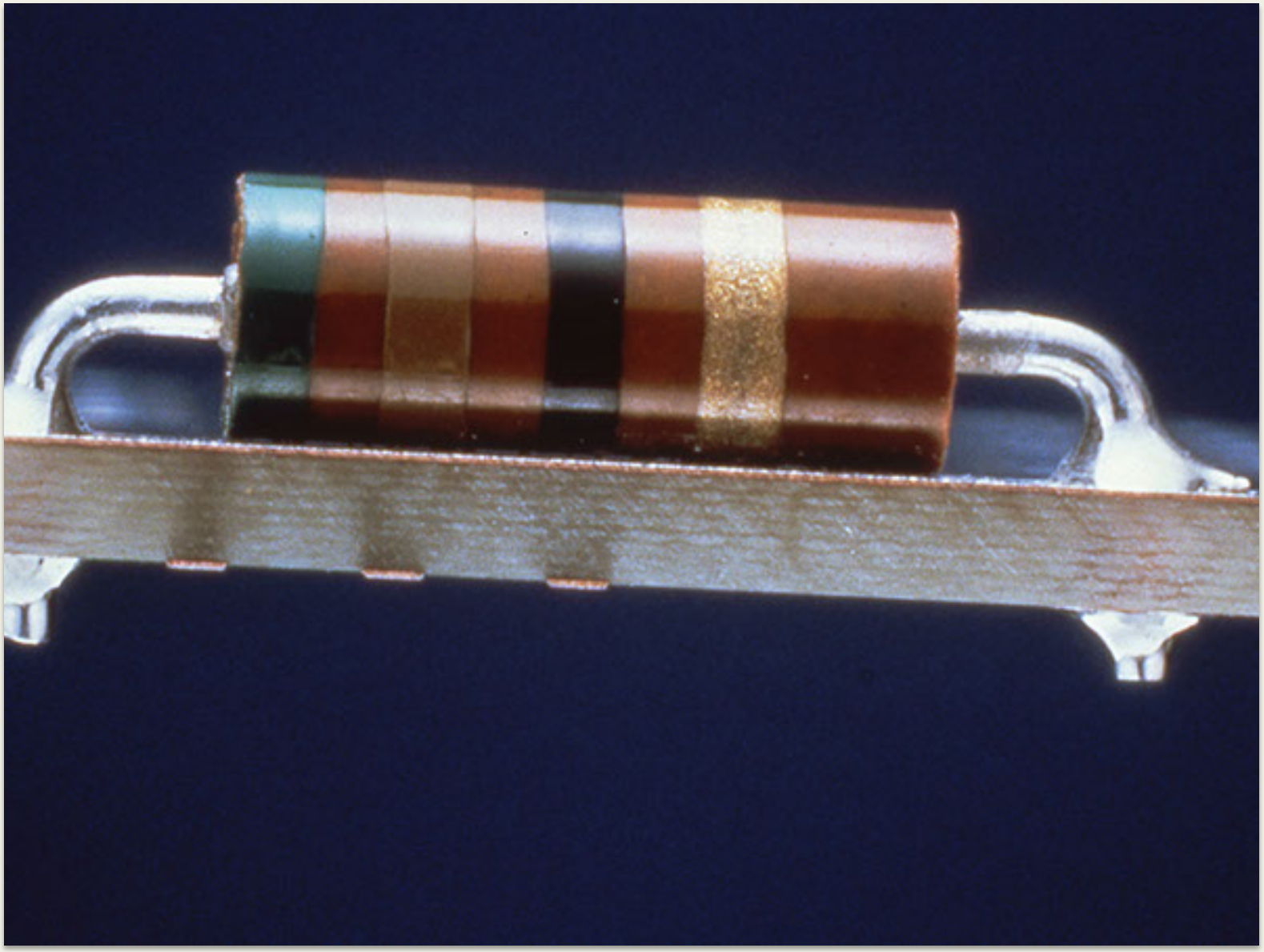
Top, excessive solder/measle – Reject

Bottom, preferred solder - Accept

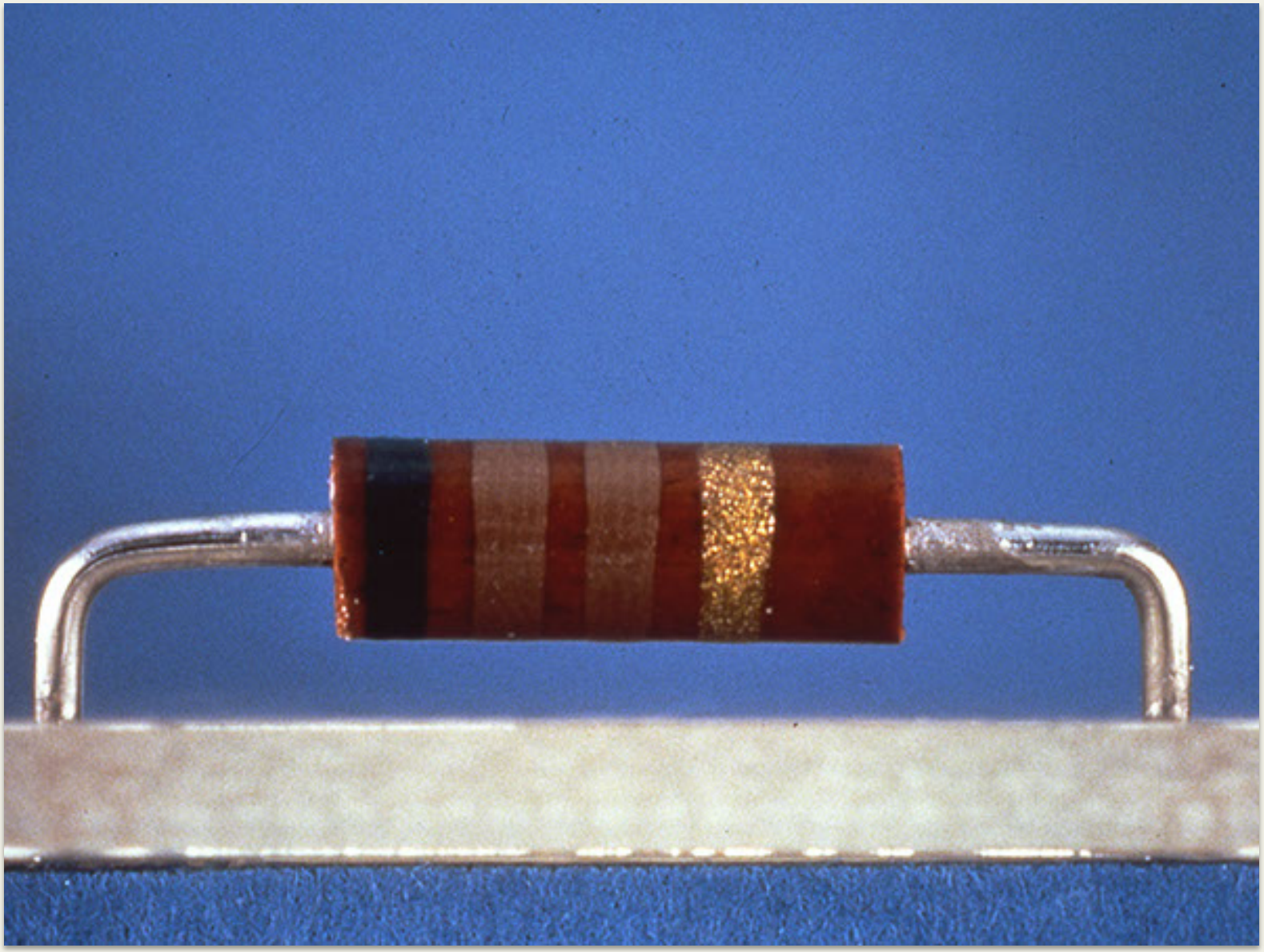


Top left, bad swage, top right, bad swage, burned – Reject
Bottom left, good swage, bottom right, radial split - Accept

AXIAL LEAD MOUNTING

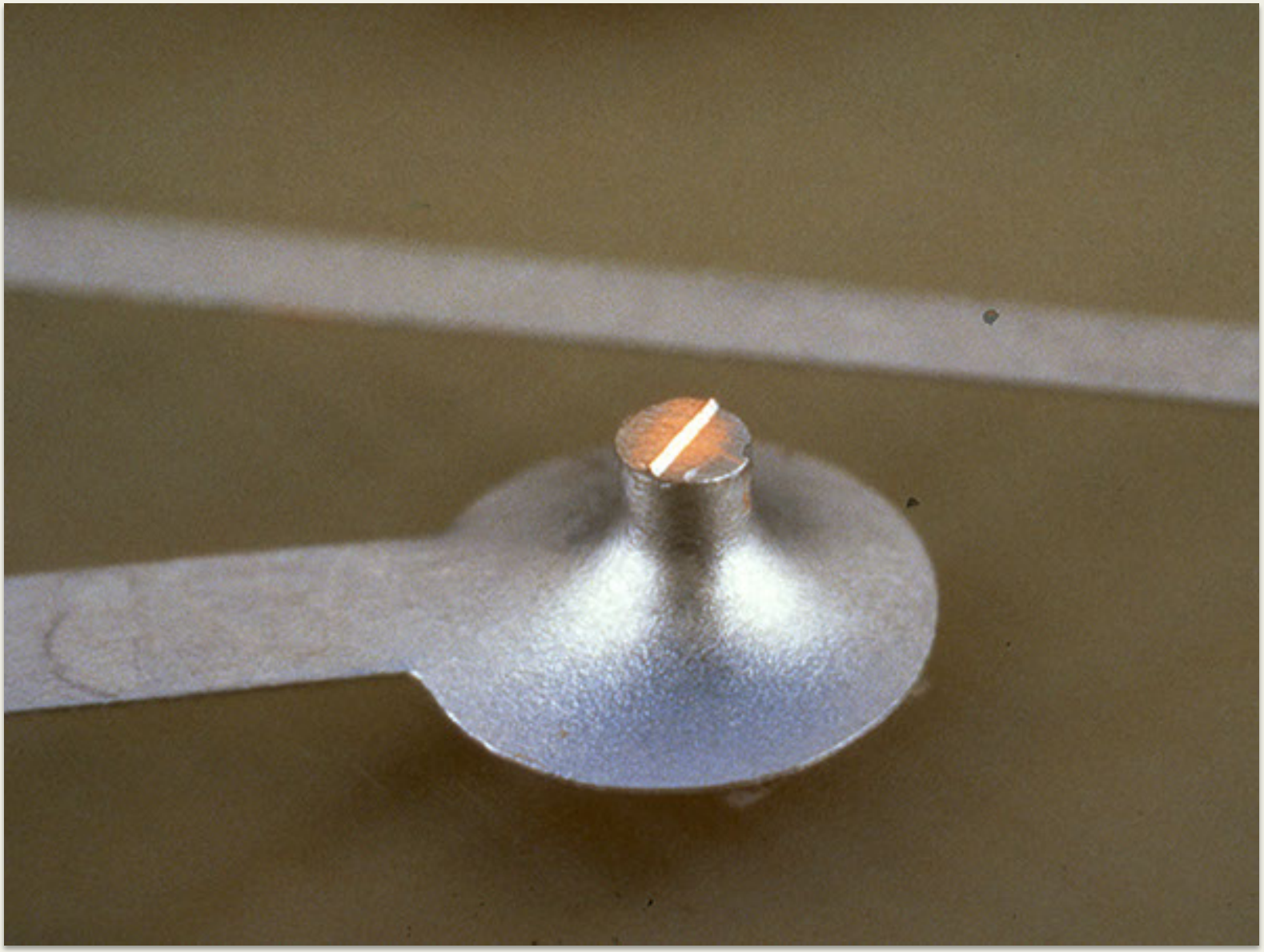


Axial component mounting - Accept



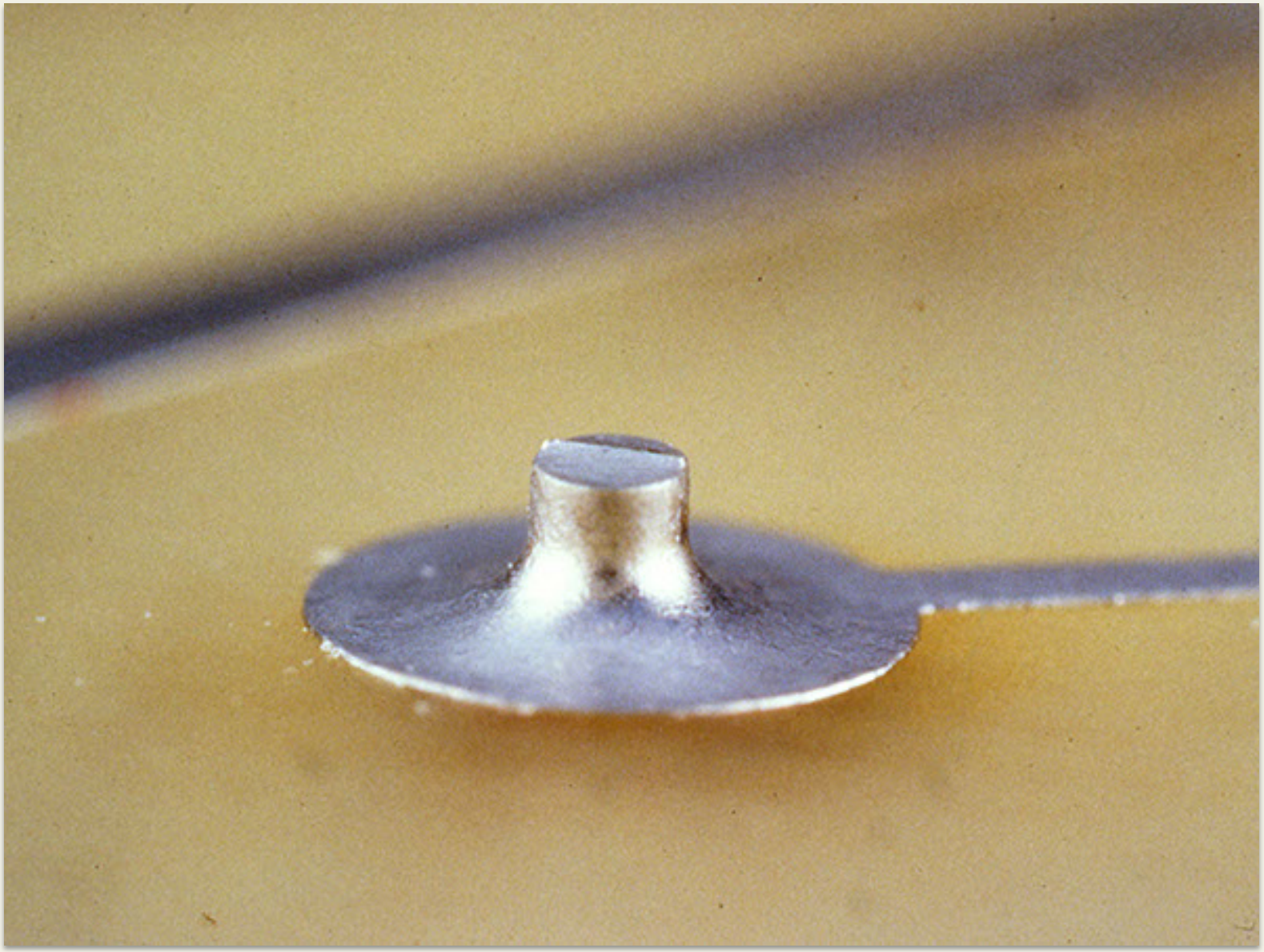
Axial component not seated against board - Reject


STUD
TERMINATION

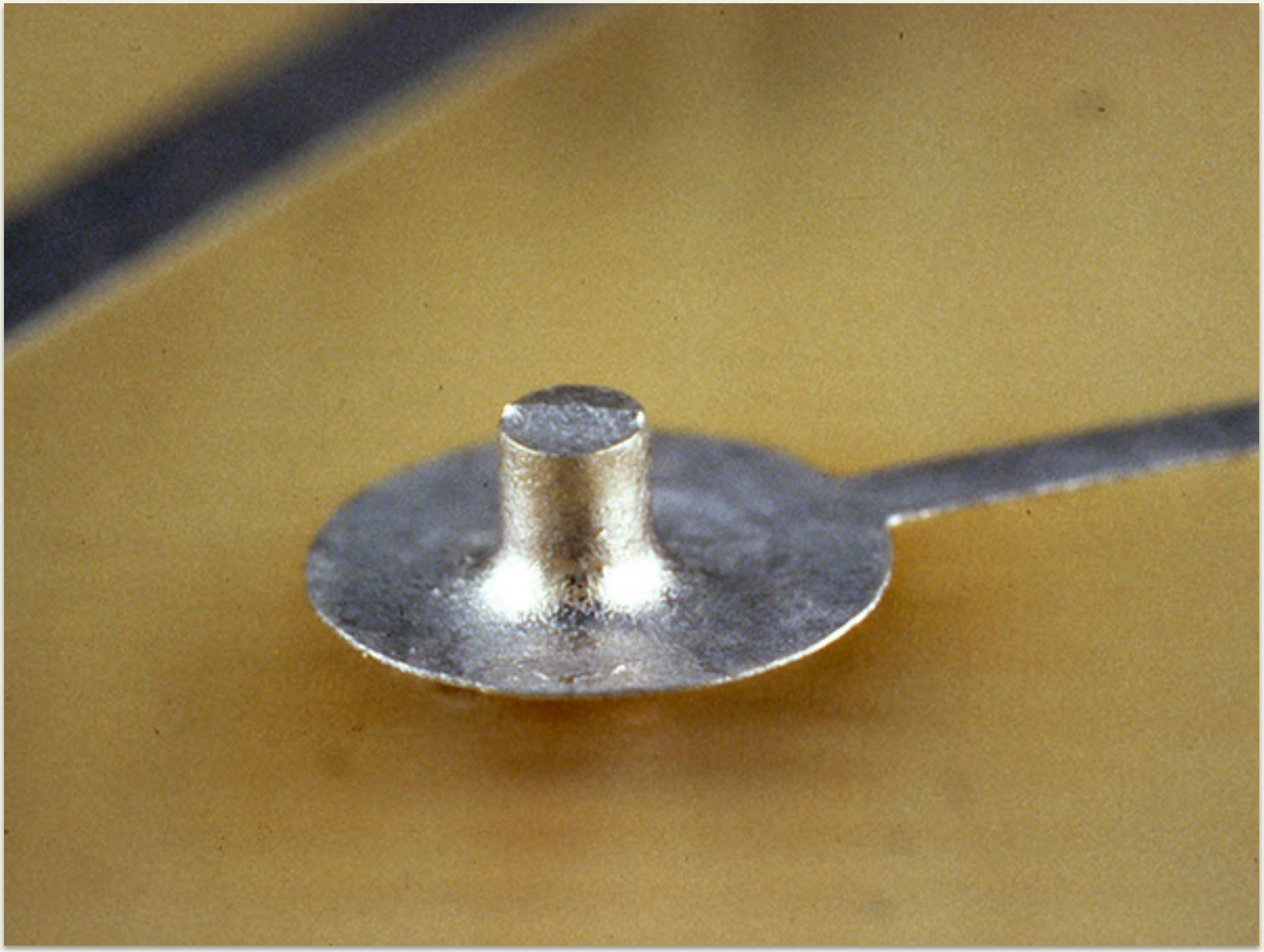


Exposed bare copper - Reject

Blowhole - Reject



Preferred solder - Accept



Minimum solder - Accept

Excessive solder - Reject

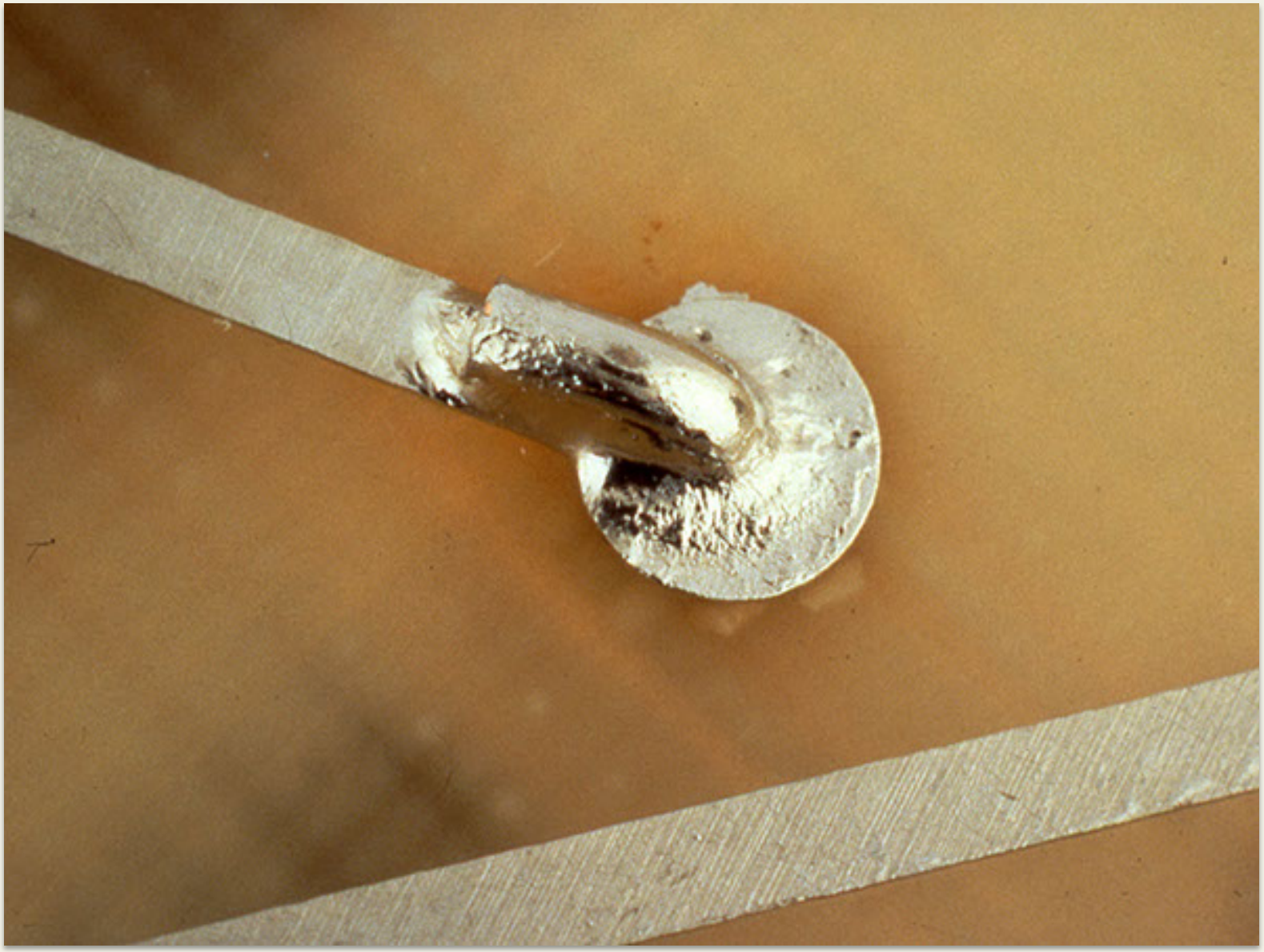
Lifted pad - Reject


CLINCHED
TERMINATION

Clinched lead - Accept

Cold solder, non wetting - Reject

Minimum solder (should cover pad) - Accept



Grainy - Reject

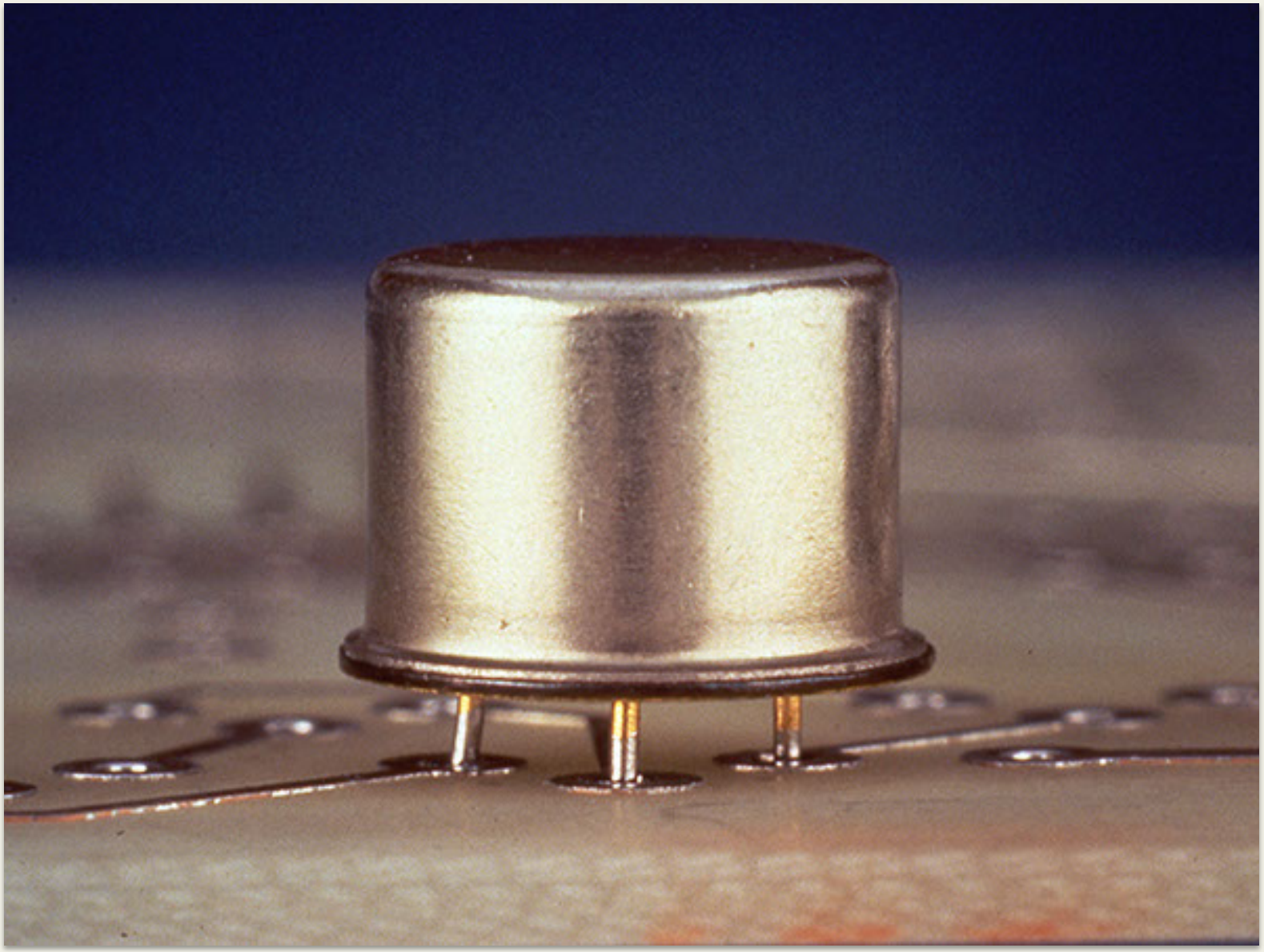
Disturbed solder - Reject

Overheated - Reject

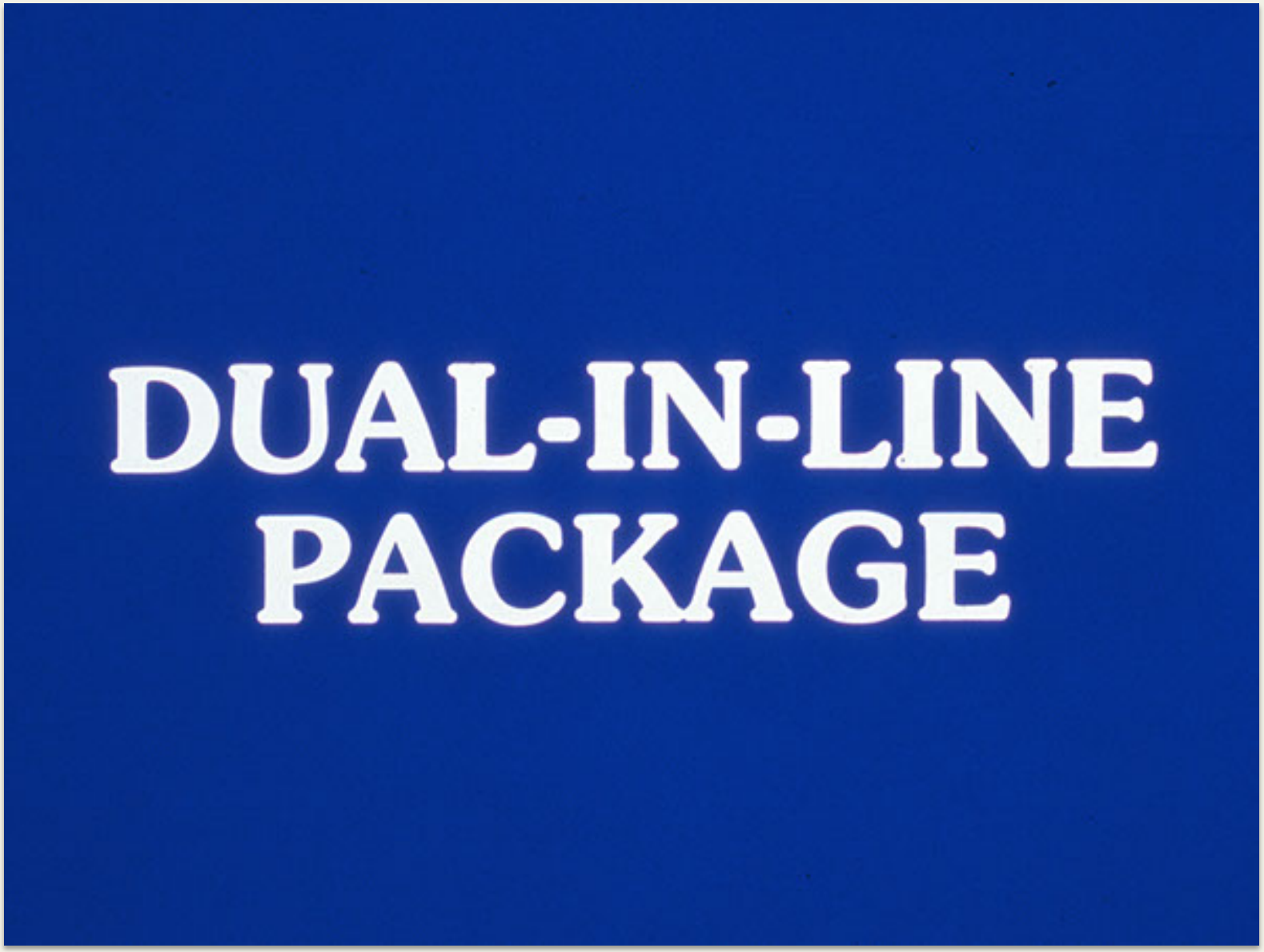
Rosin - Reject

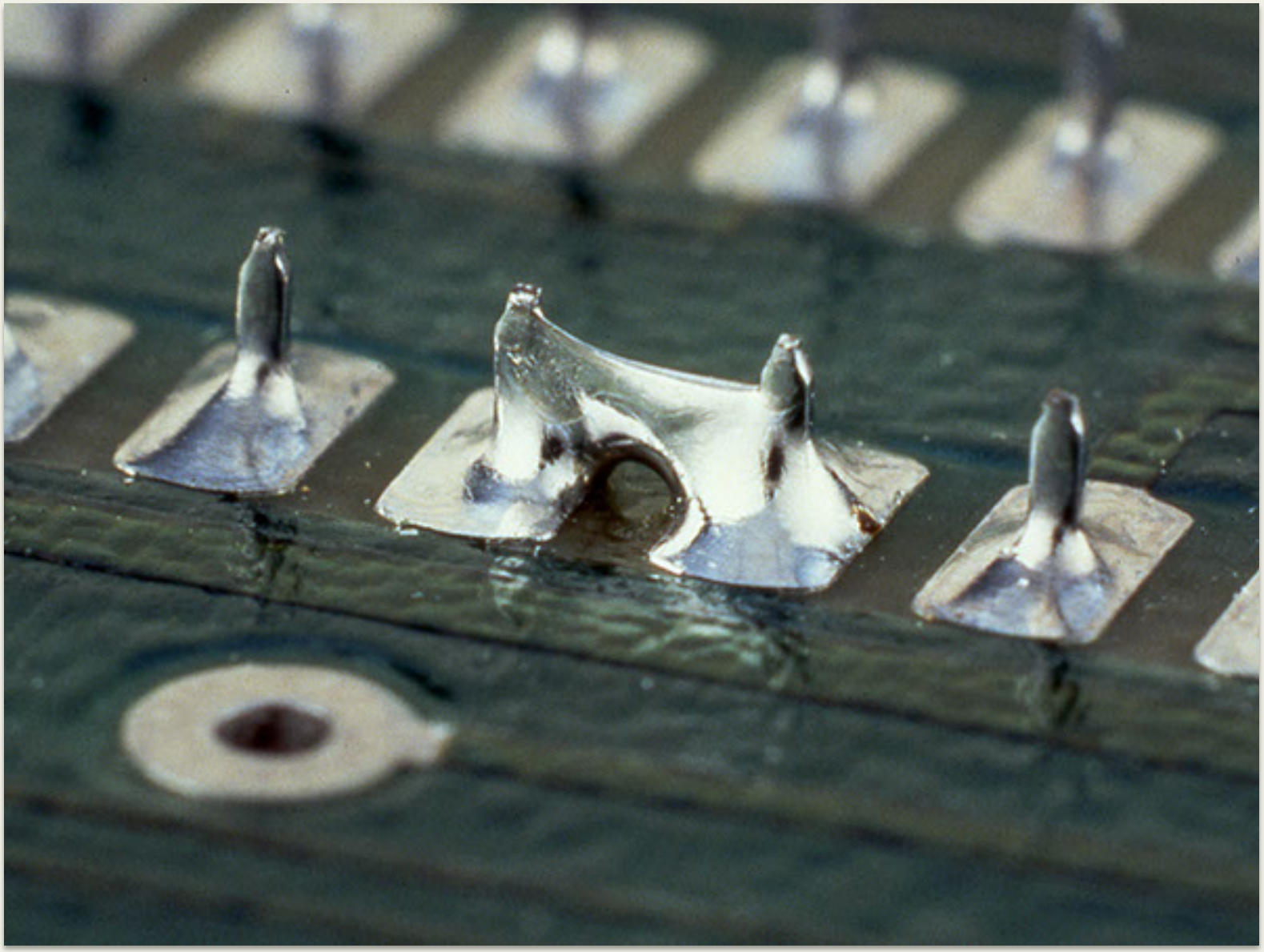
Lifted pad - Reject


VERTICAL
MOUNTING

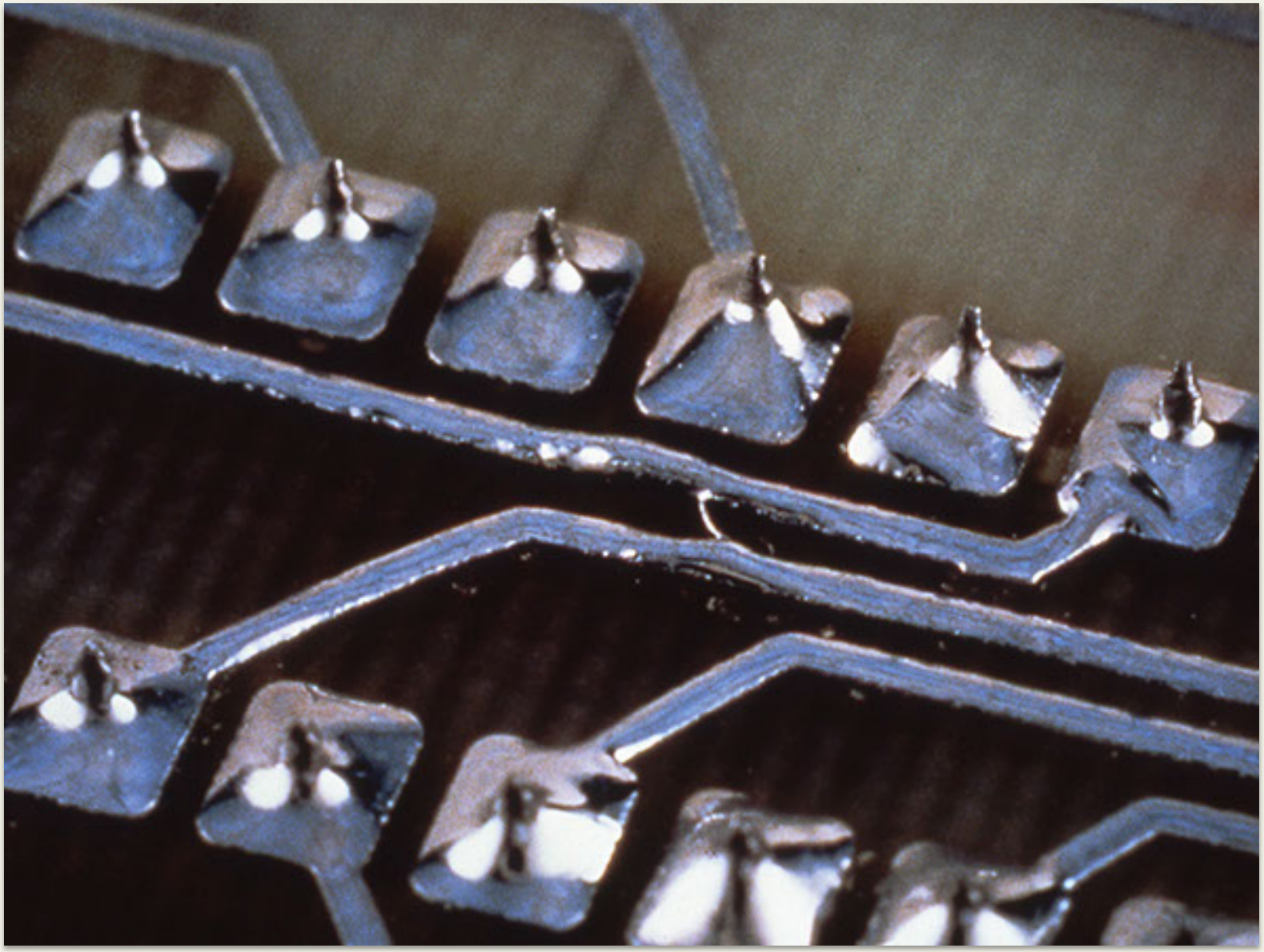


T05 transistor component mounting - Accept

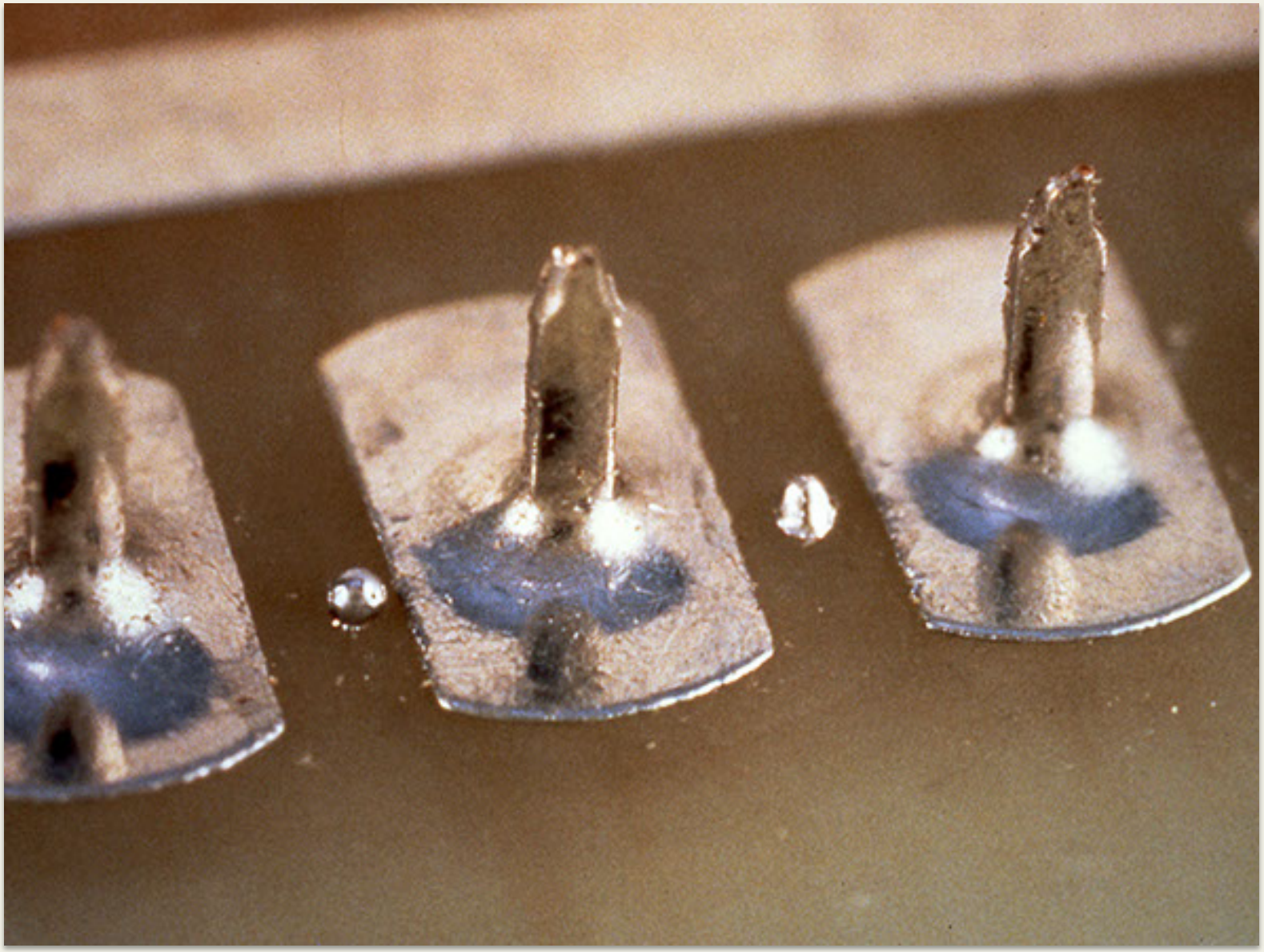

DUAL-IN-LINE
PACKAGE



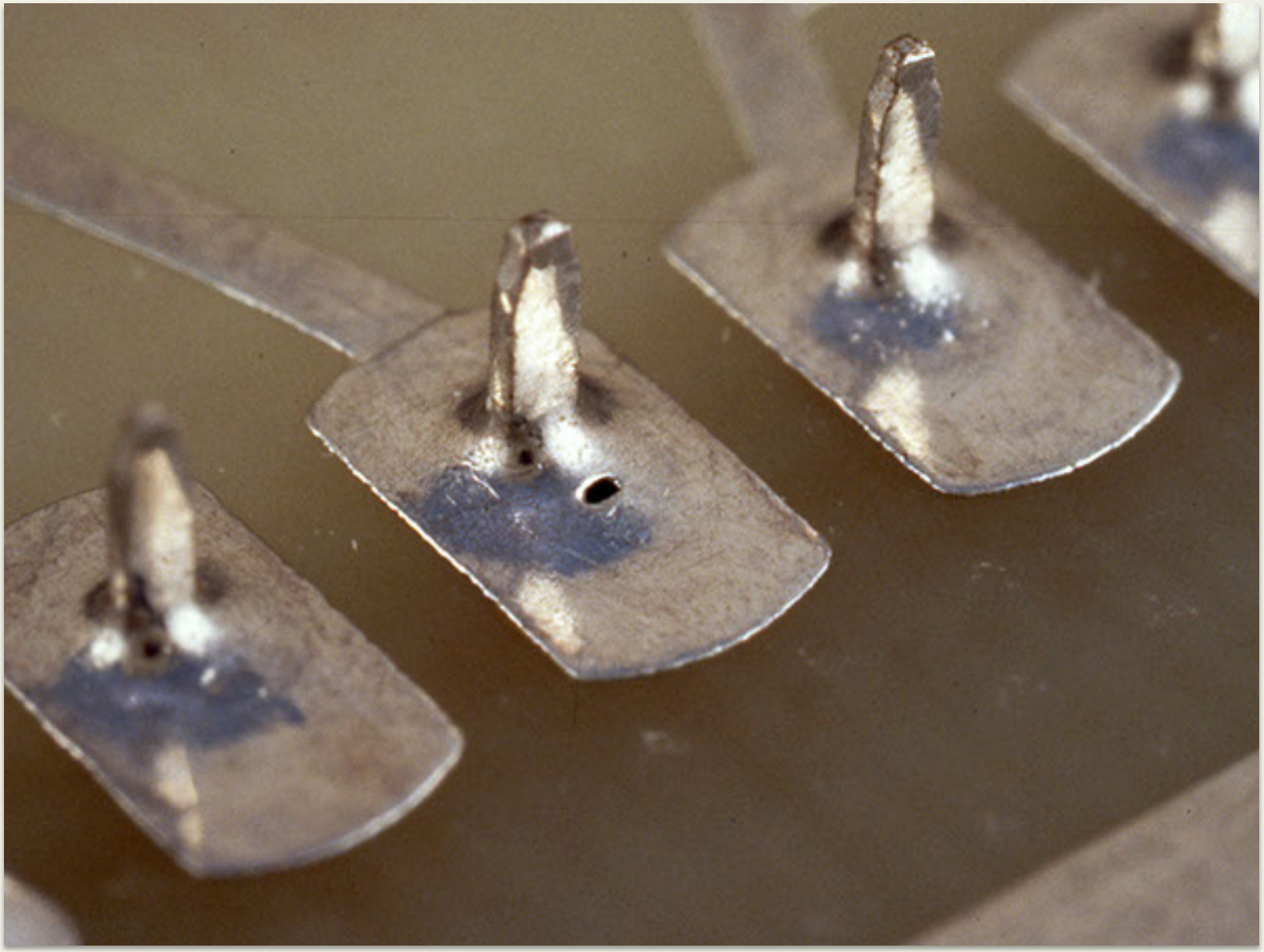
Solder bridge between leads - Reject



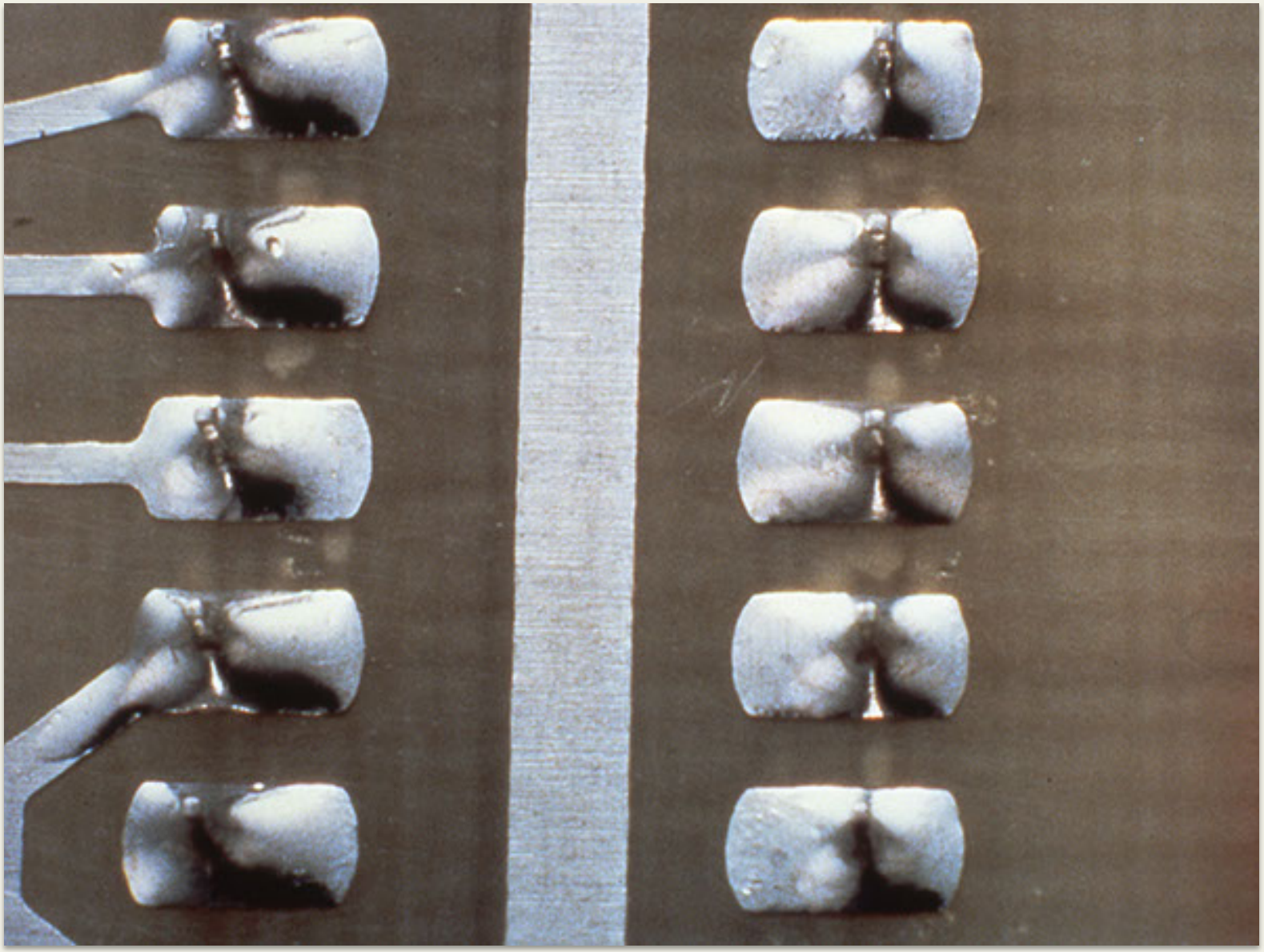
Solder bridge between leads - Reject



Solder splashes/splatters/balls - Reject

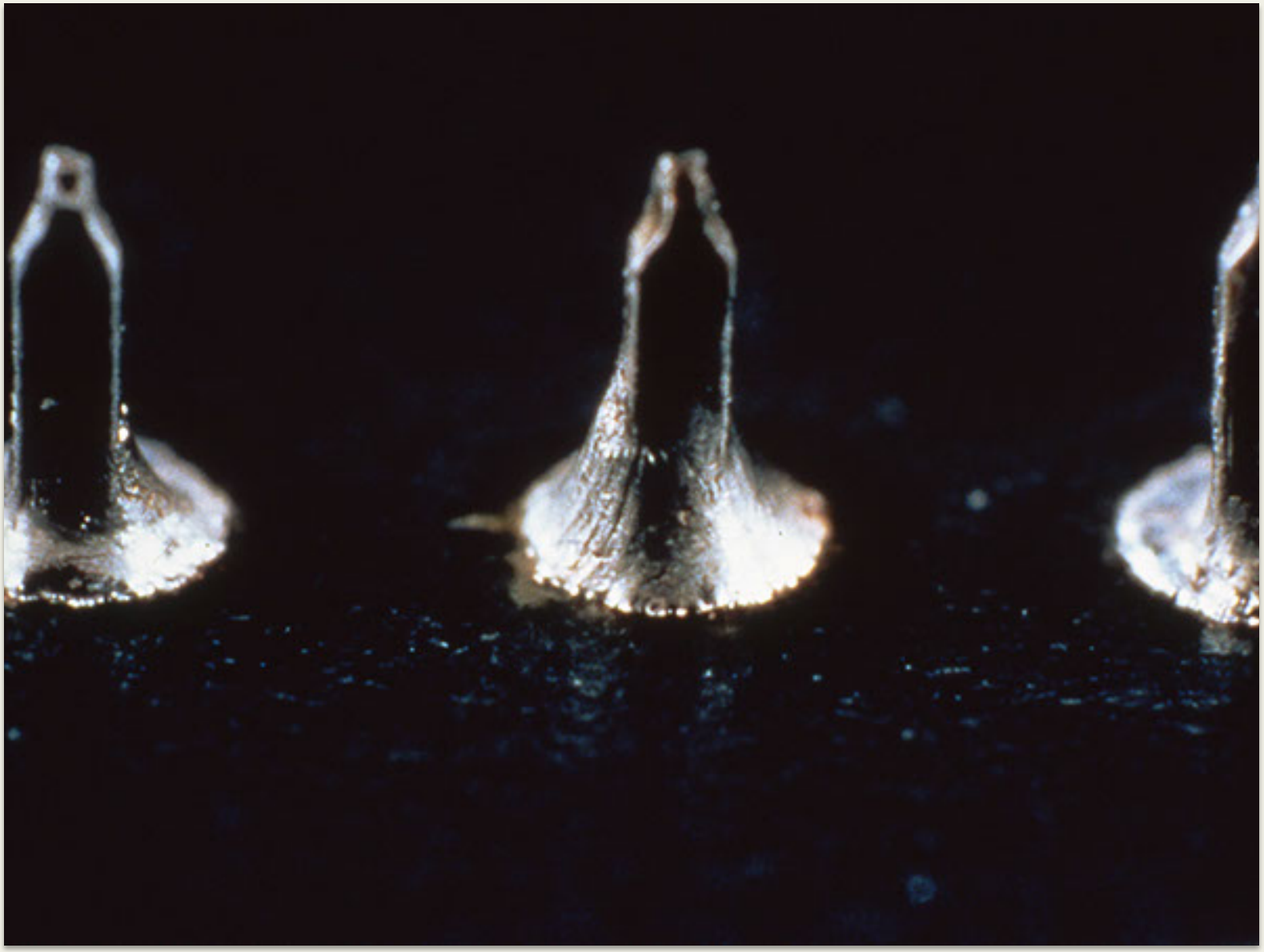


Pin hole - Reject



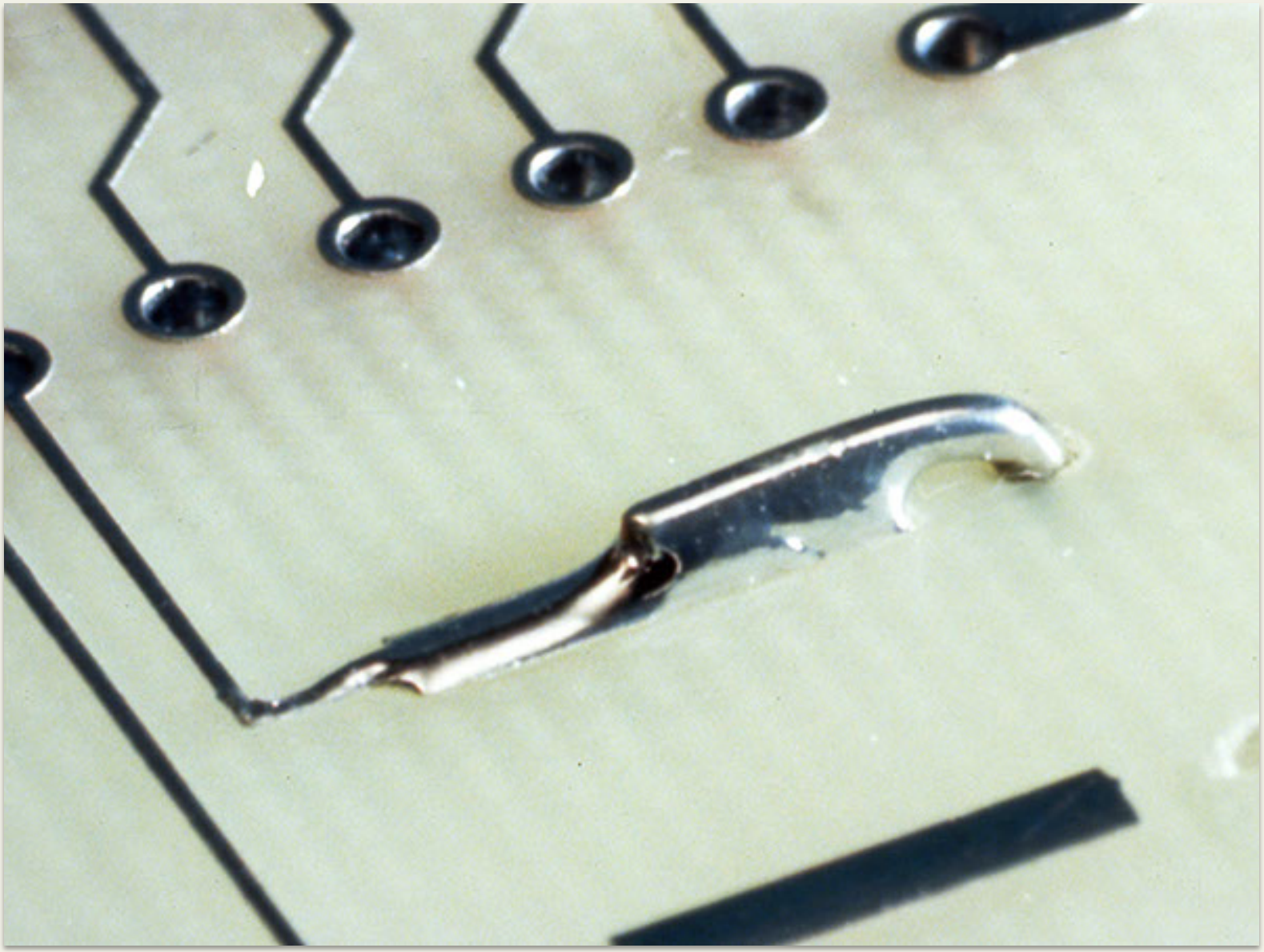
Measling - Reject

Solder spikes, peaks and icicles - Reject

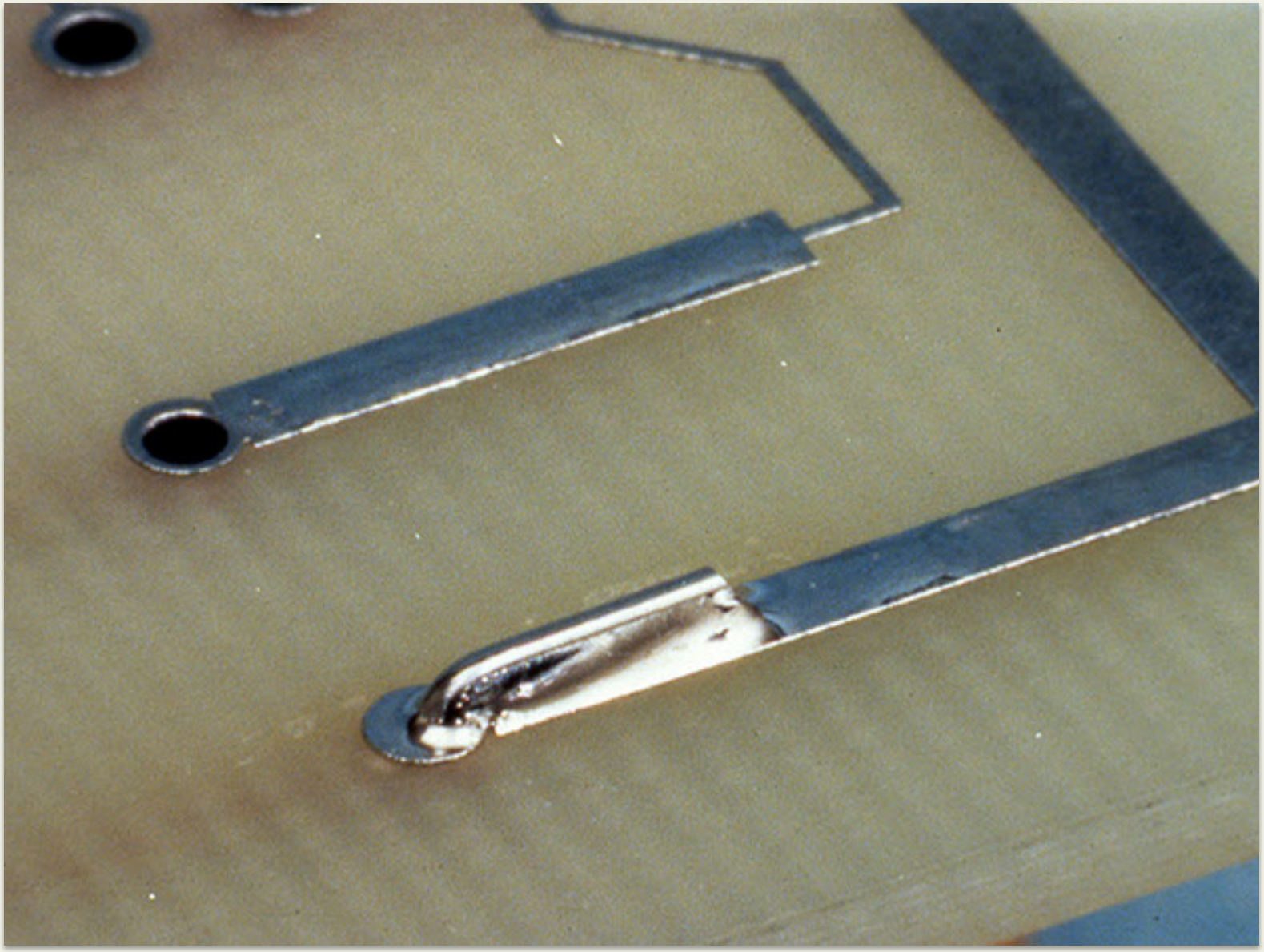


Non wetting/stress lines - Reject

INTERFACIAL CONNECTIONS

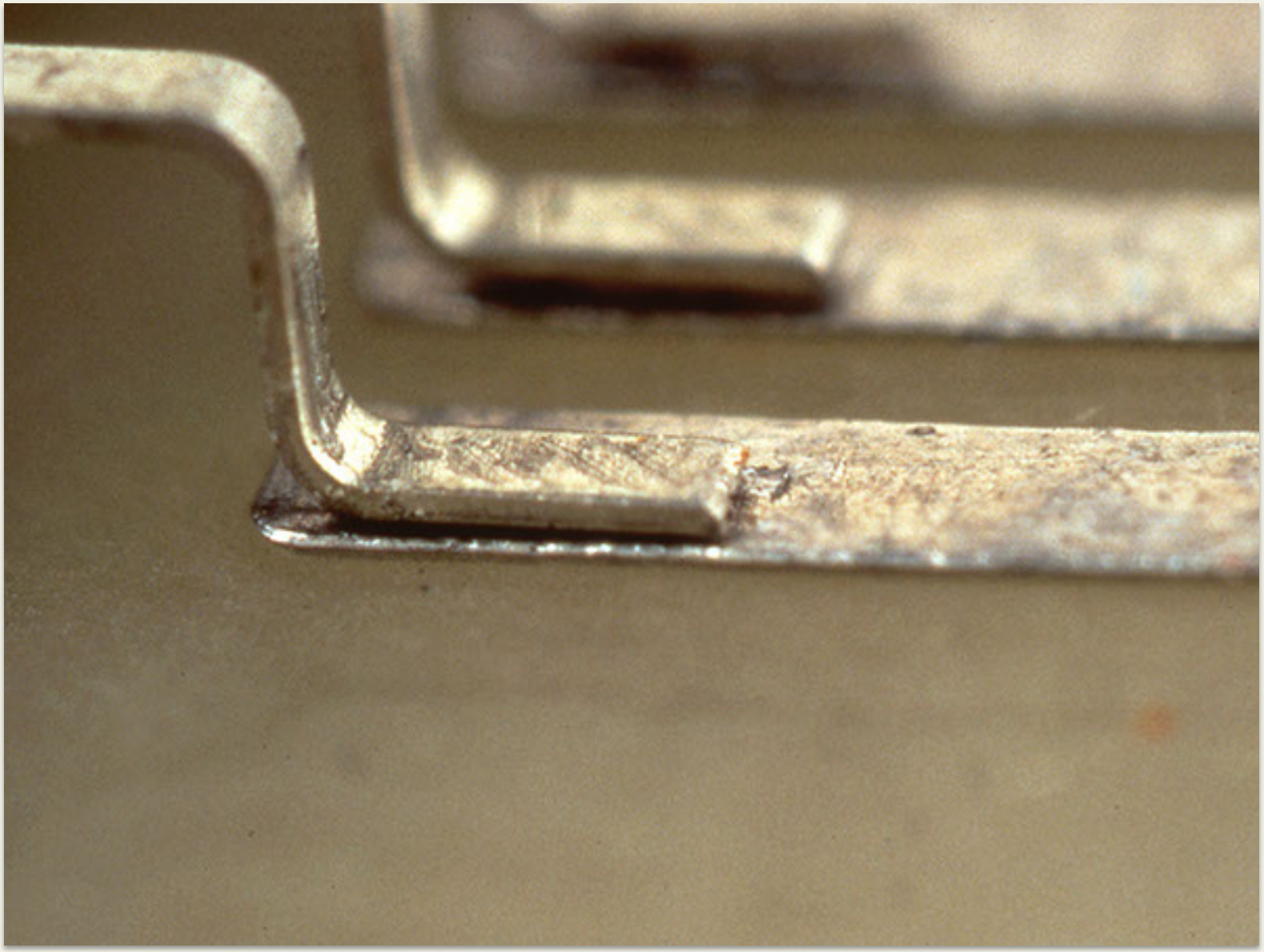


Void under end of wire - Reject



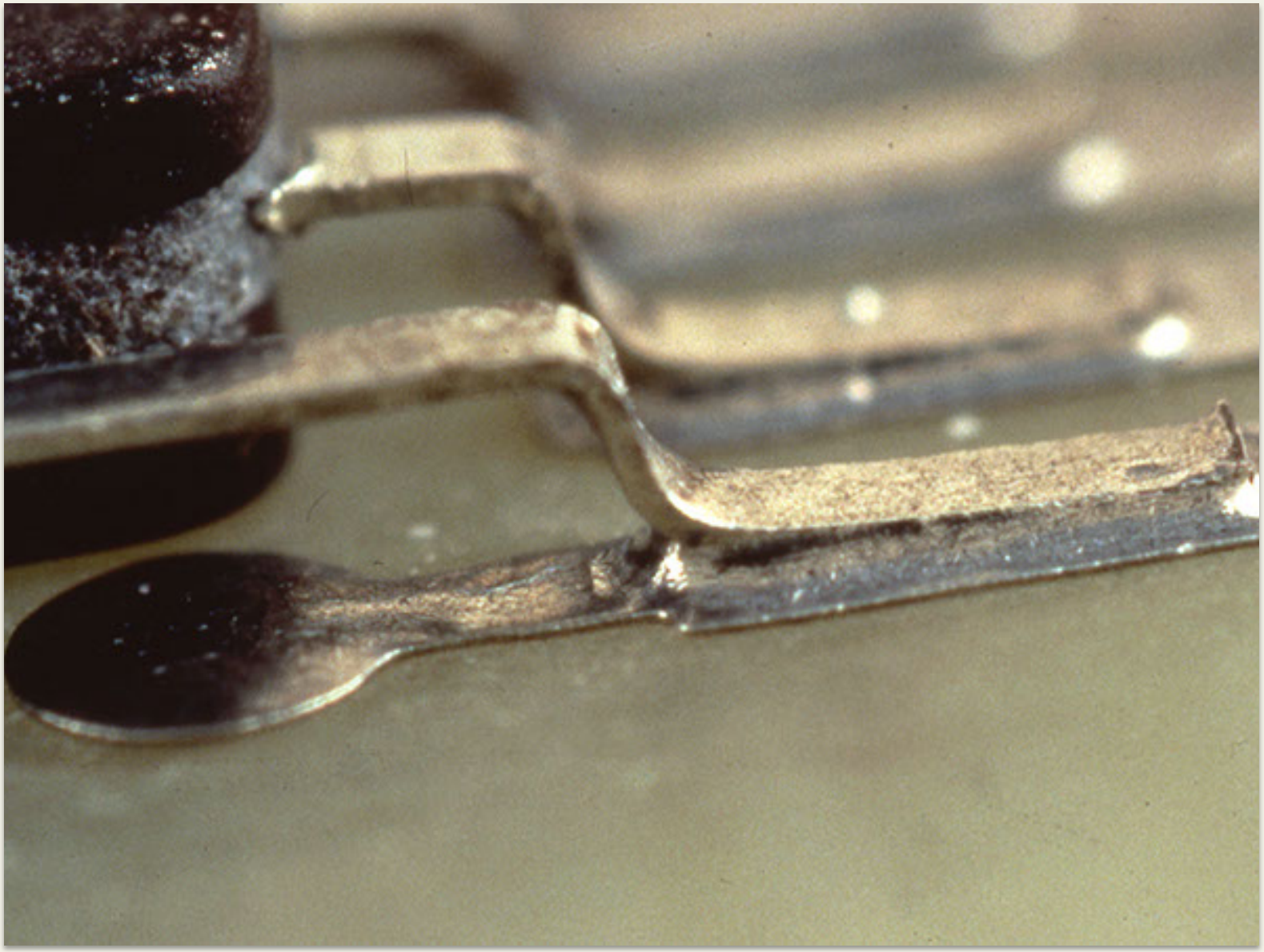
Insufficient solder - Reject


FLAT
PACK

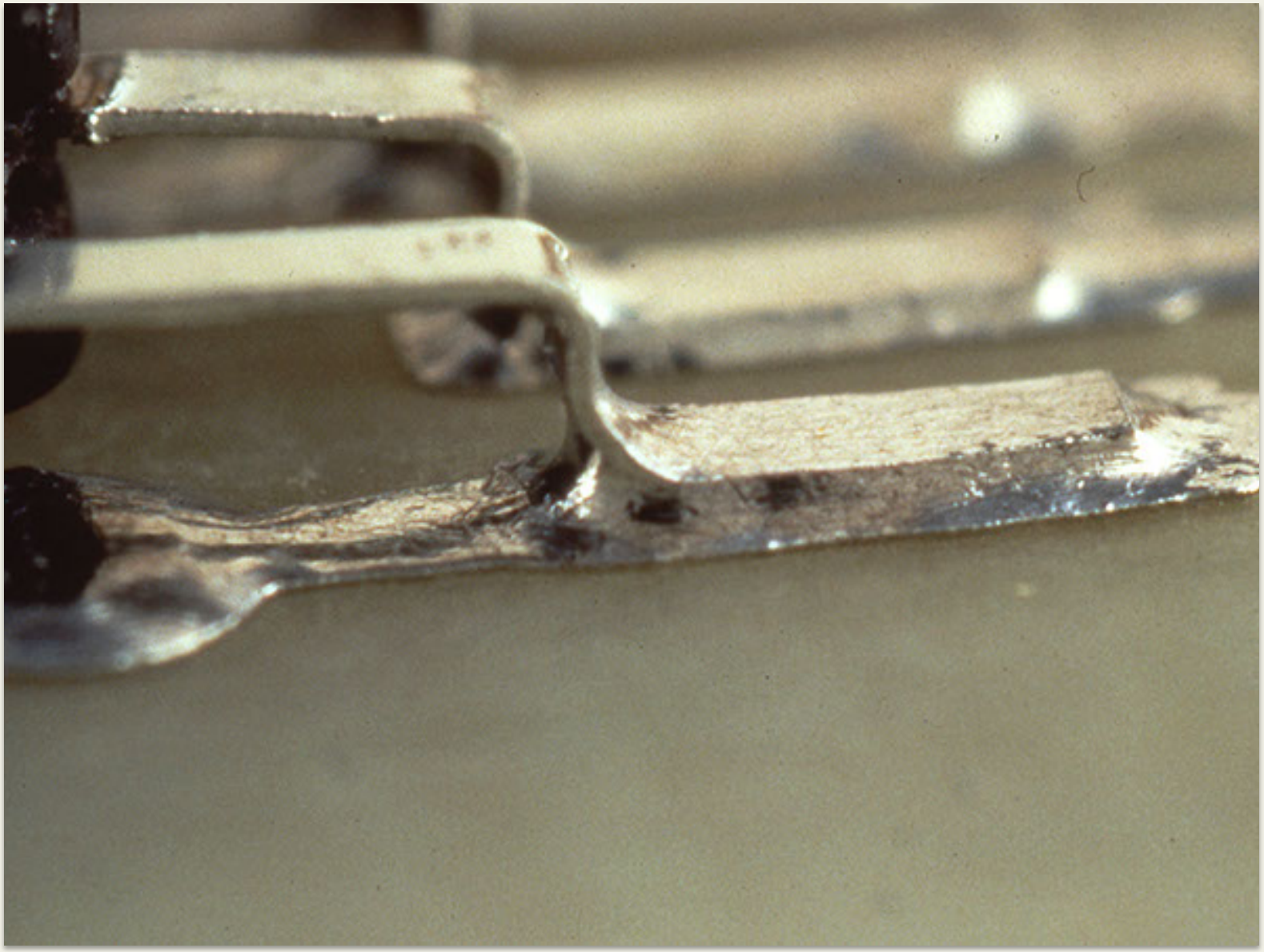


Preferred mounting - Accept

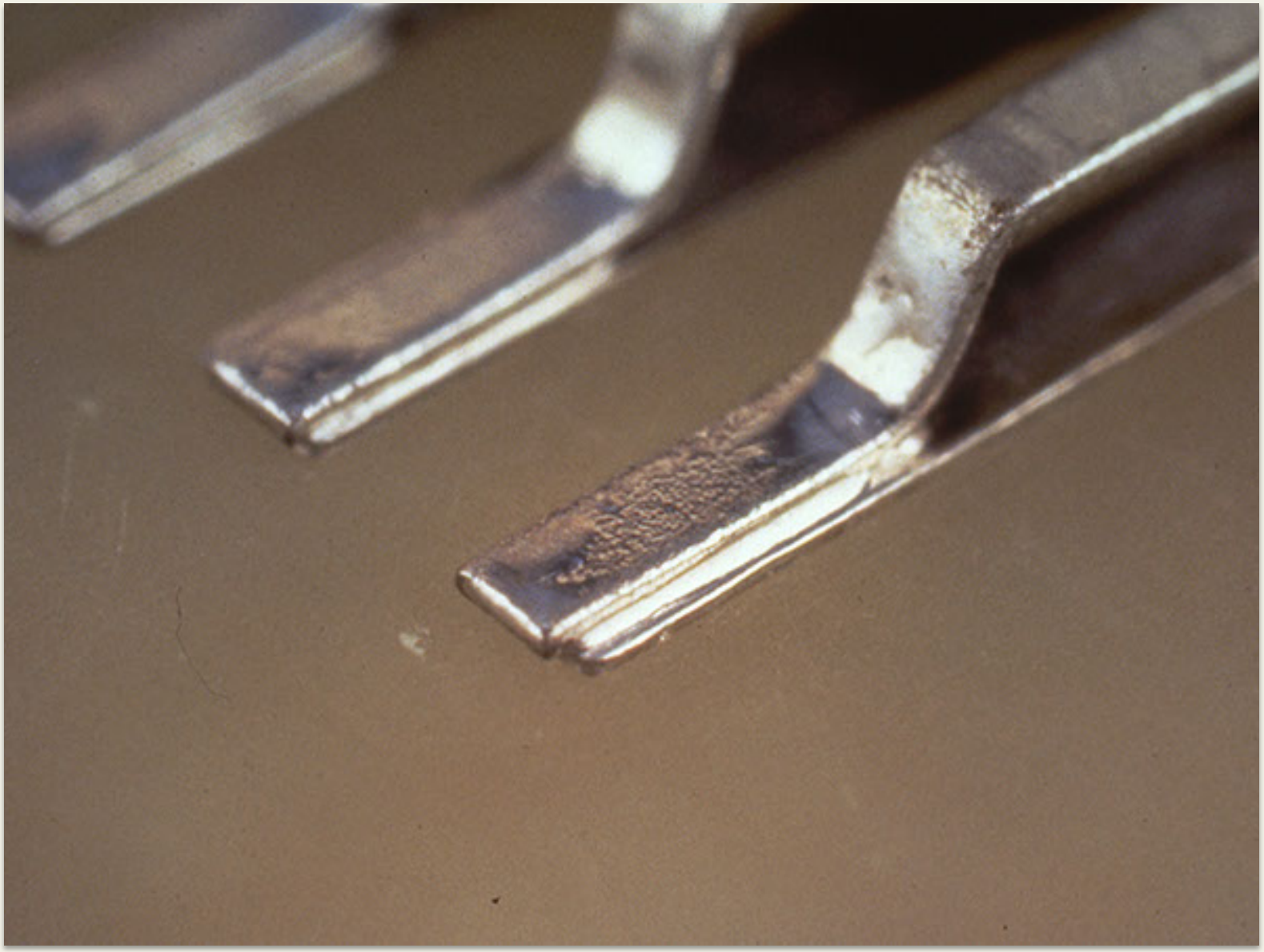
Toe up/curl - Reject



Heel fillet, lack of solder - Reject

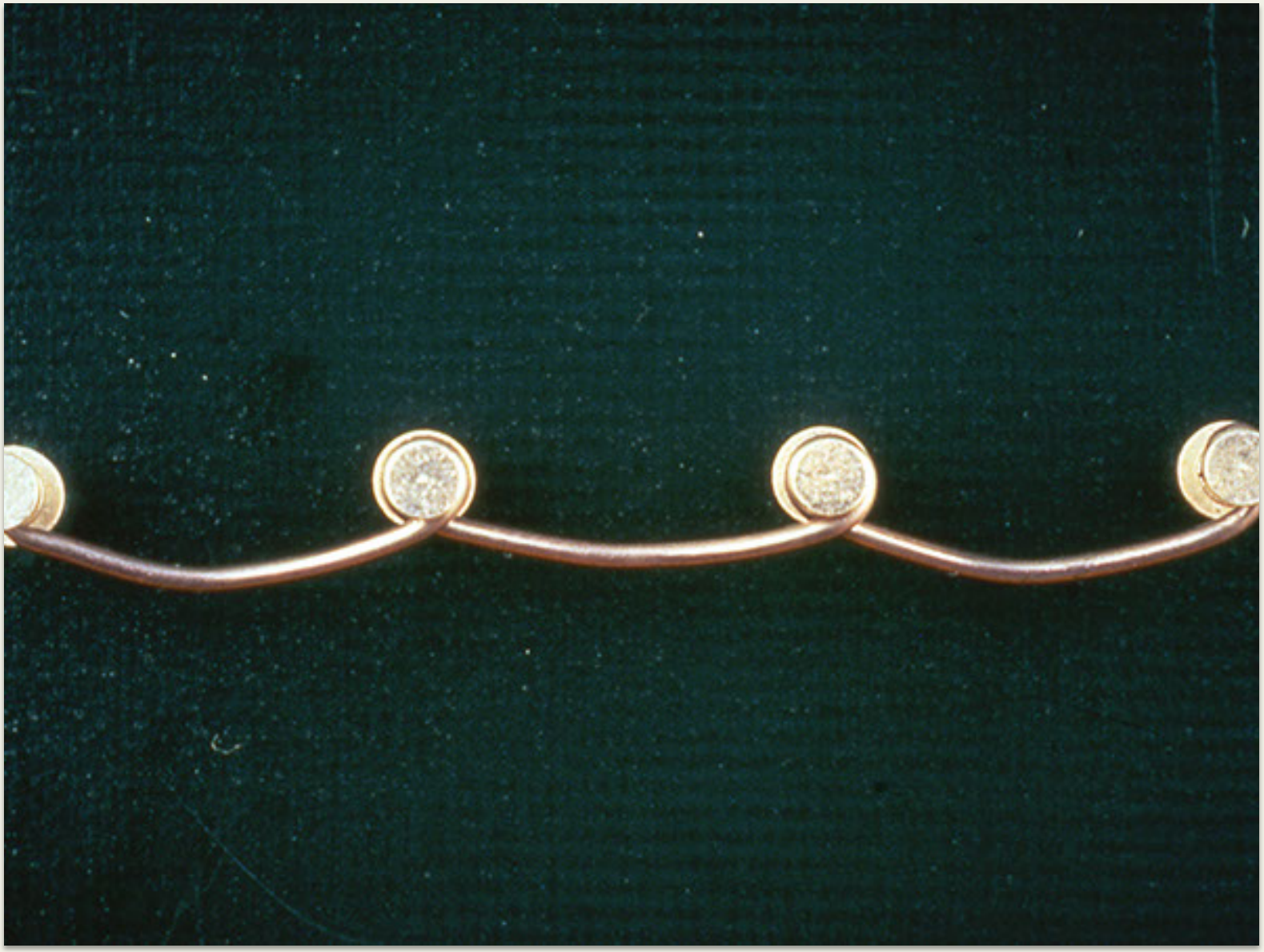


Heel fillet, not smooth - Reject

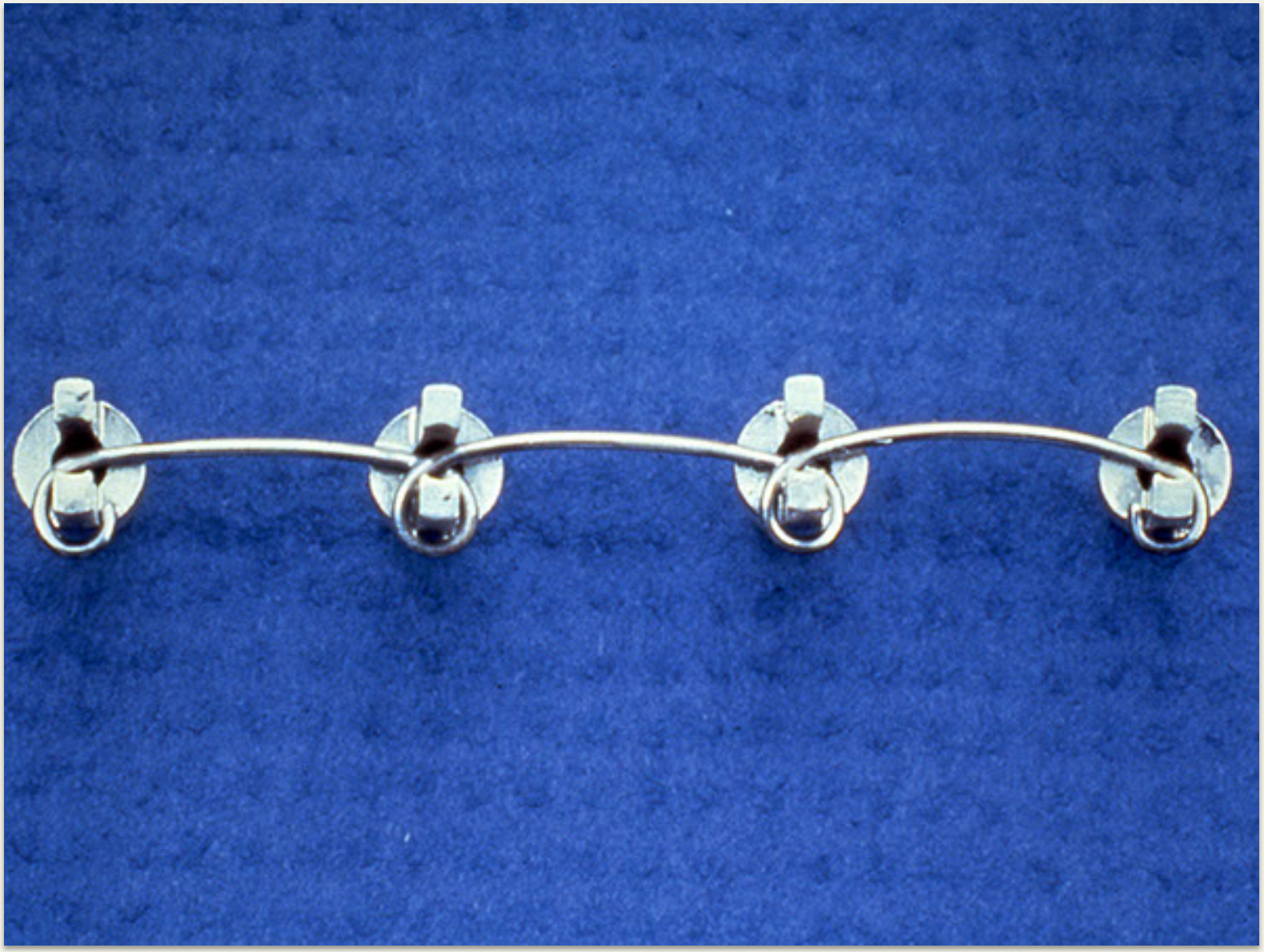


Toe overhang, excessive - Reject


CONTINUOUS
WRAP

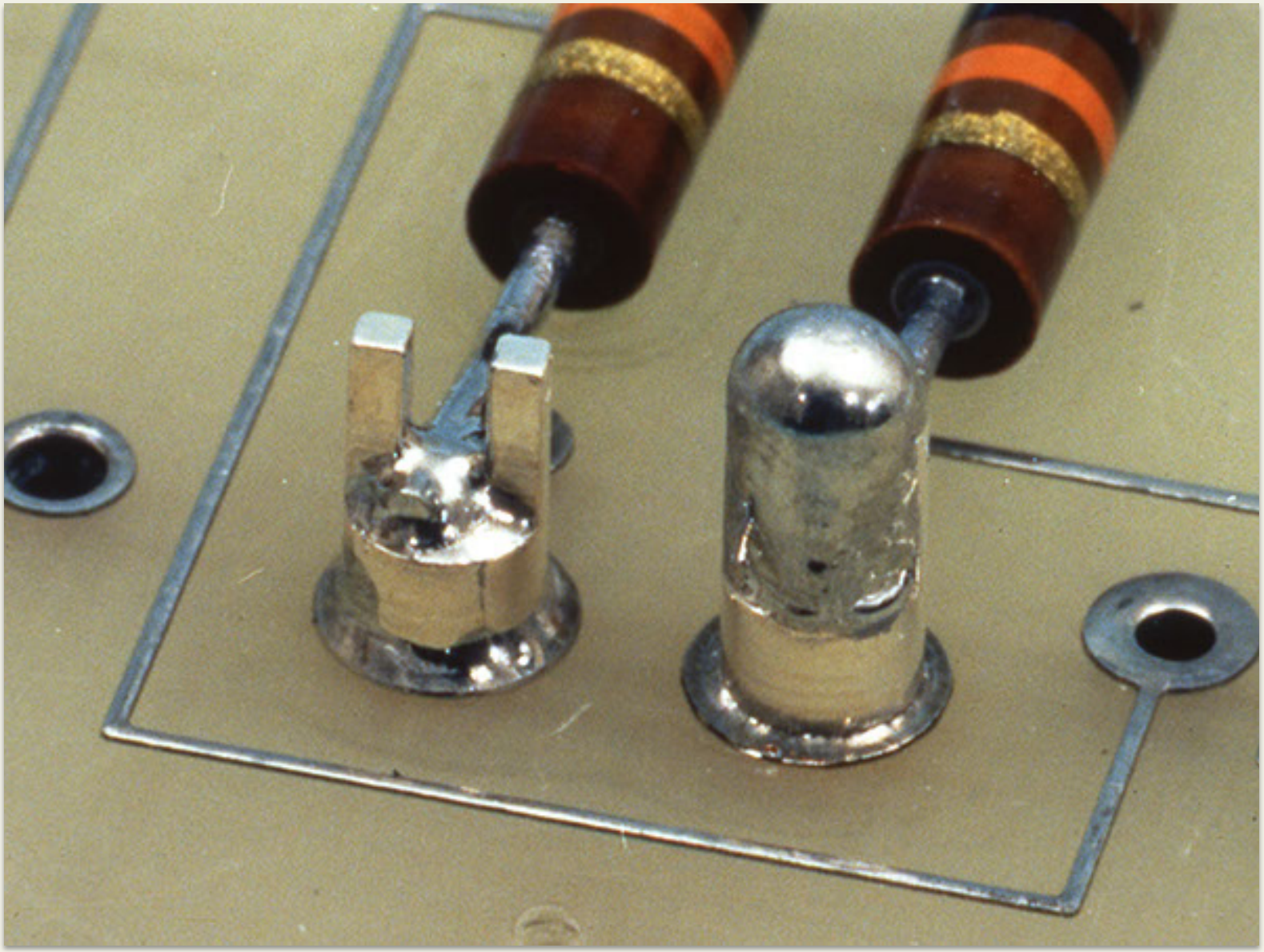


Turret terminals - Accept



Loose wrap/greater than 180 degrees end wraps - Reject

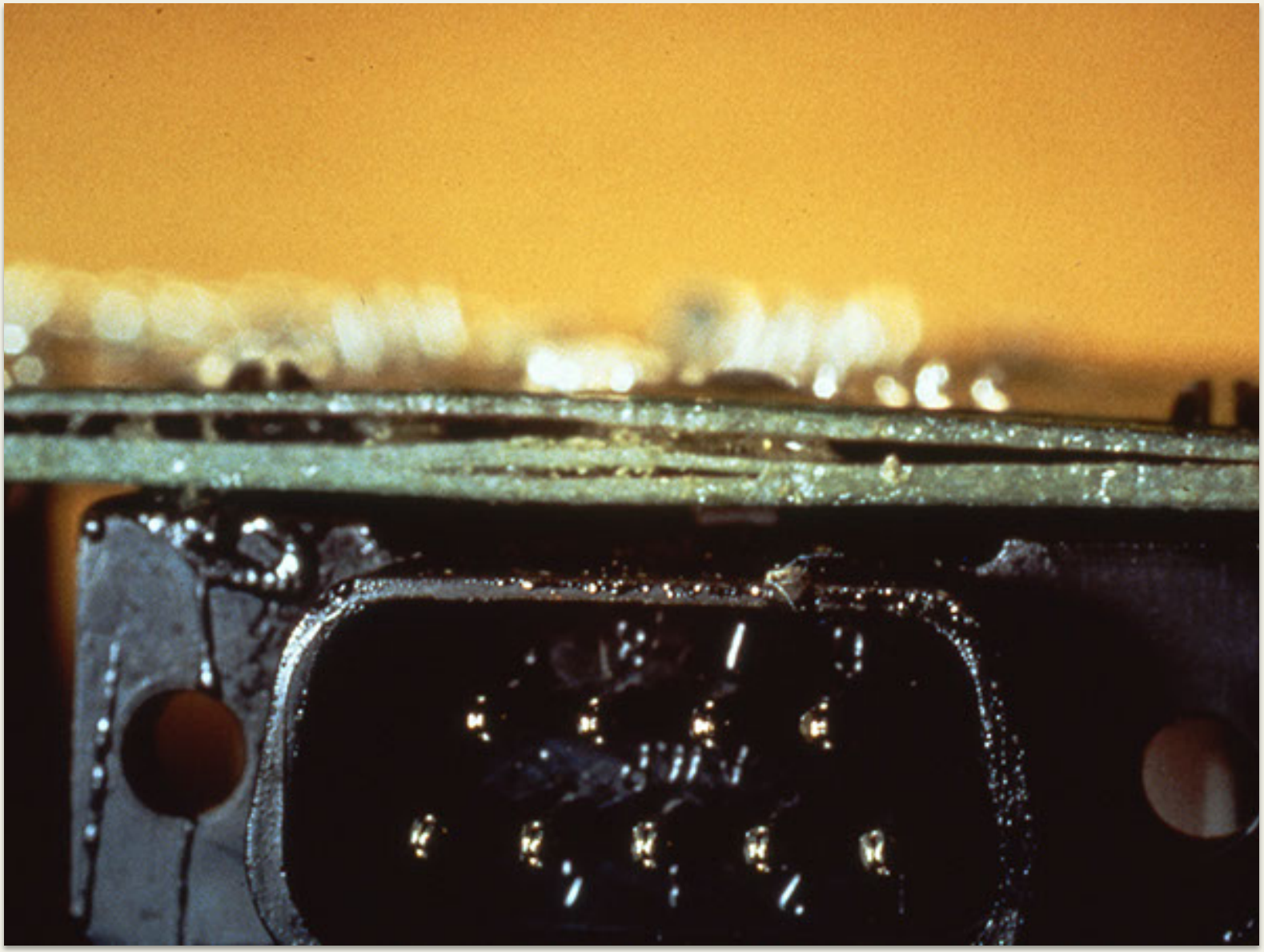

HIGH VOLTAGE
TERMINATION



Left, solder lead/contamination – Reject

Right, projection, voids - Reject

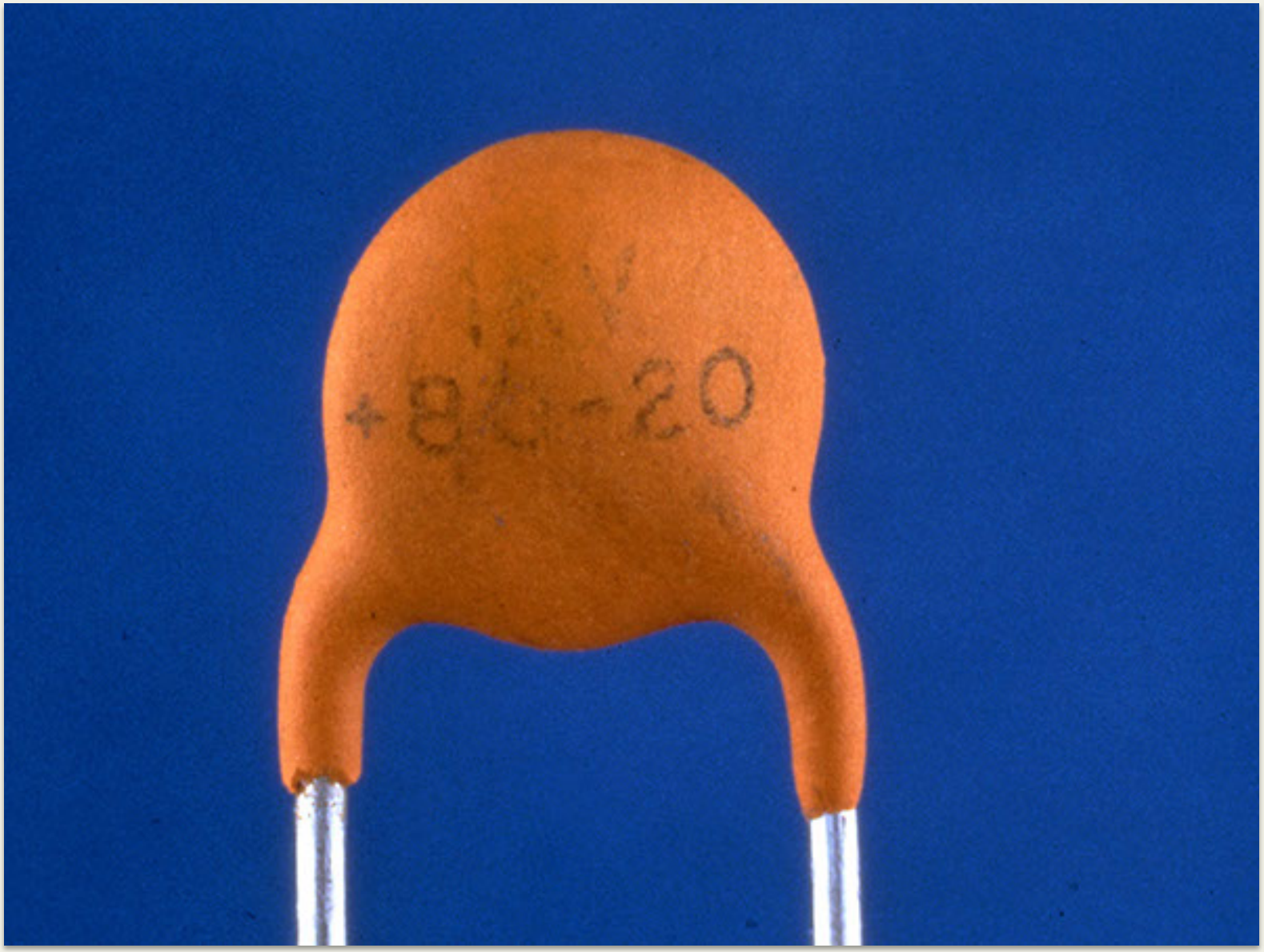

INSPECTION



Delamination, base material - Reject

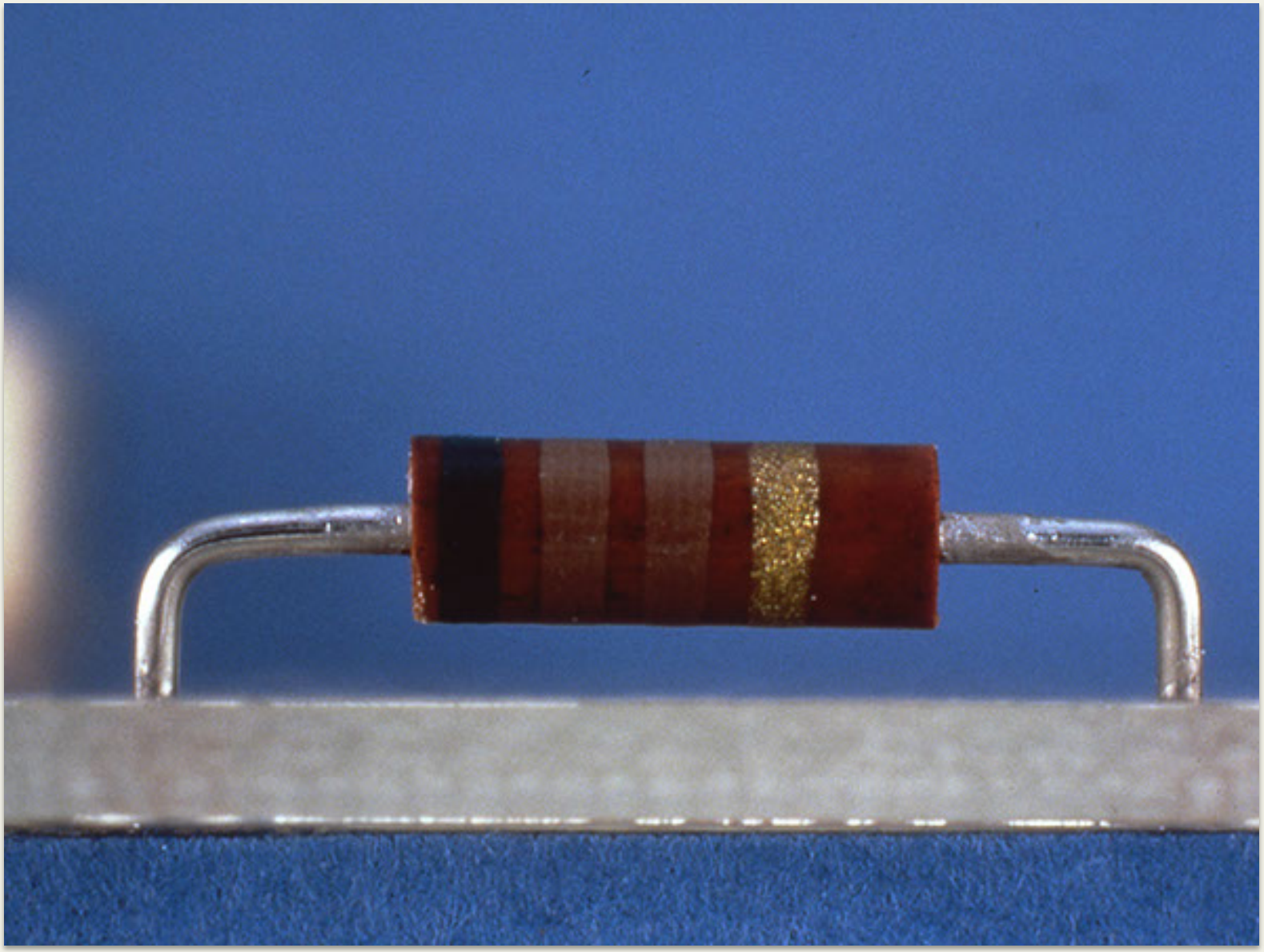
Flux residue - Reject

Metal encased component mounted over circuitry - Reject

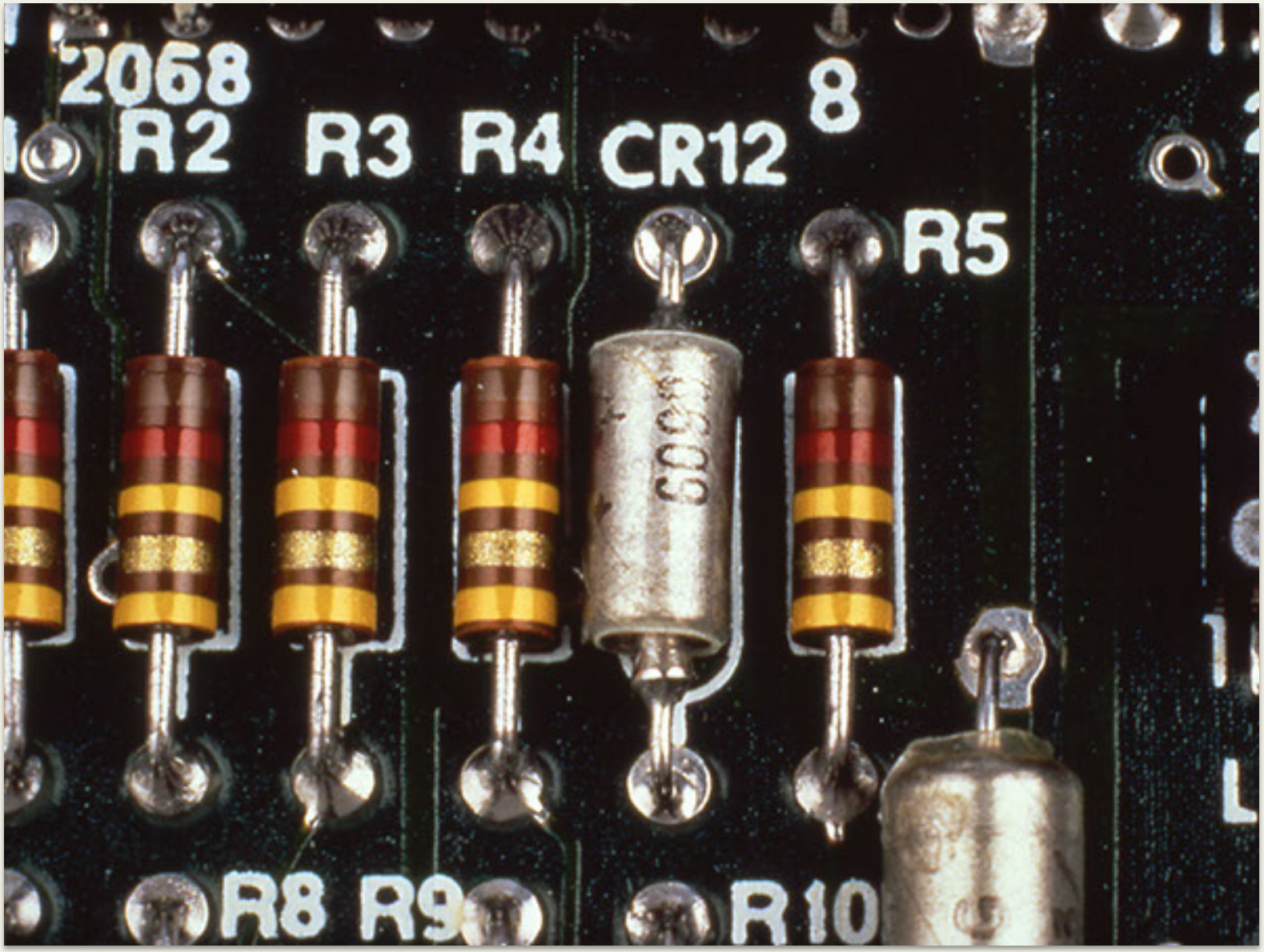


Markings not discernible - Reject

Damaged part - Reject

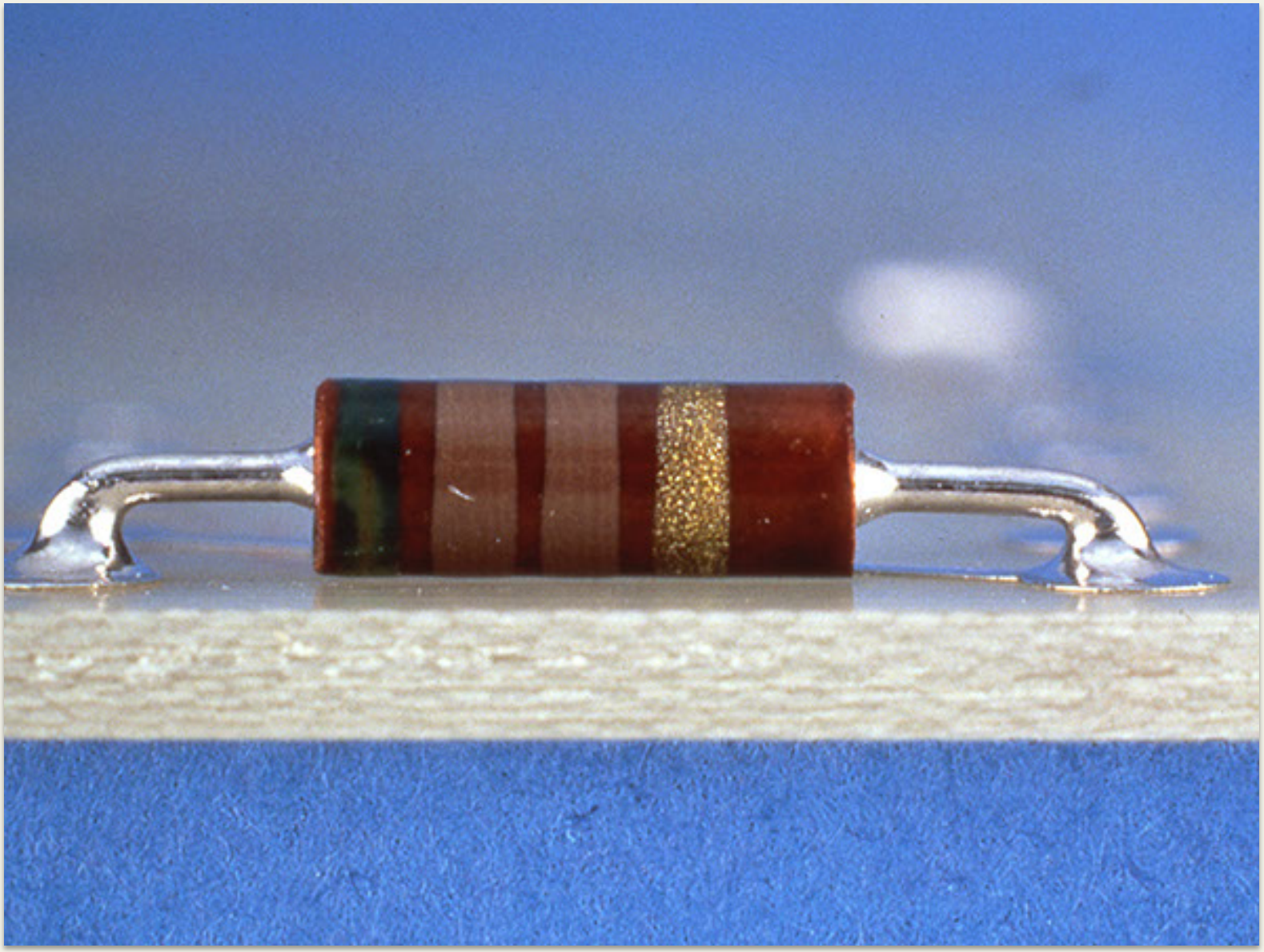


Component mounting - Reject

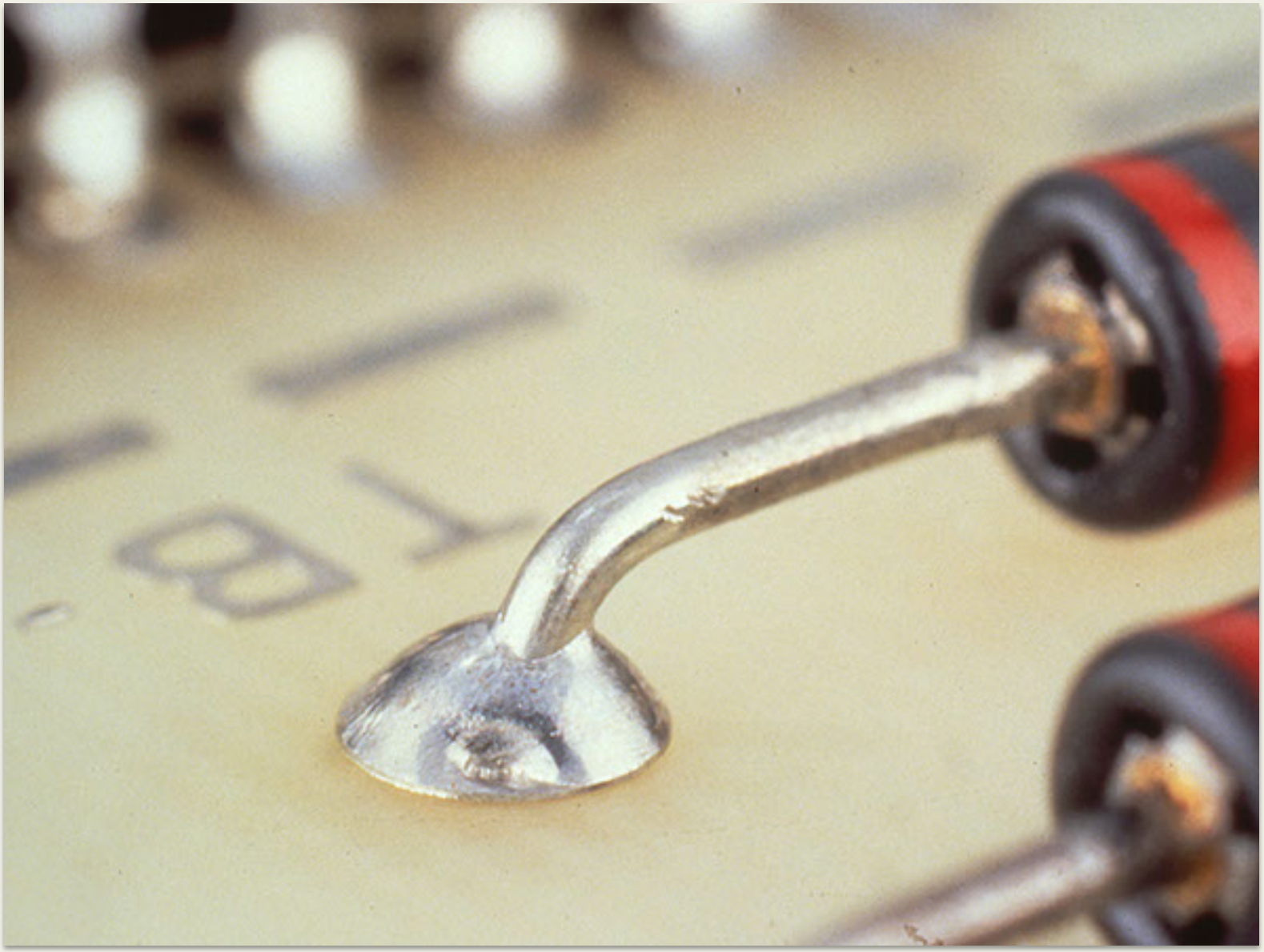


Incorrect component - Reject

Reversed polarity - Reject

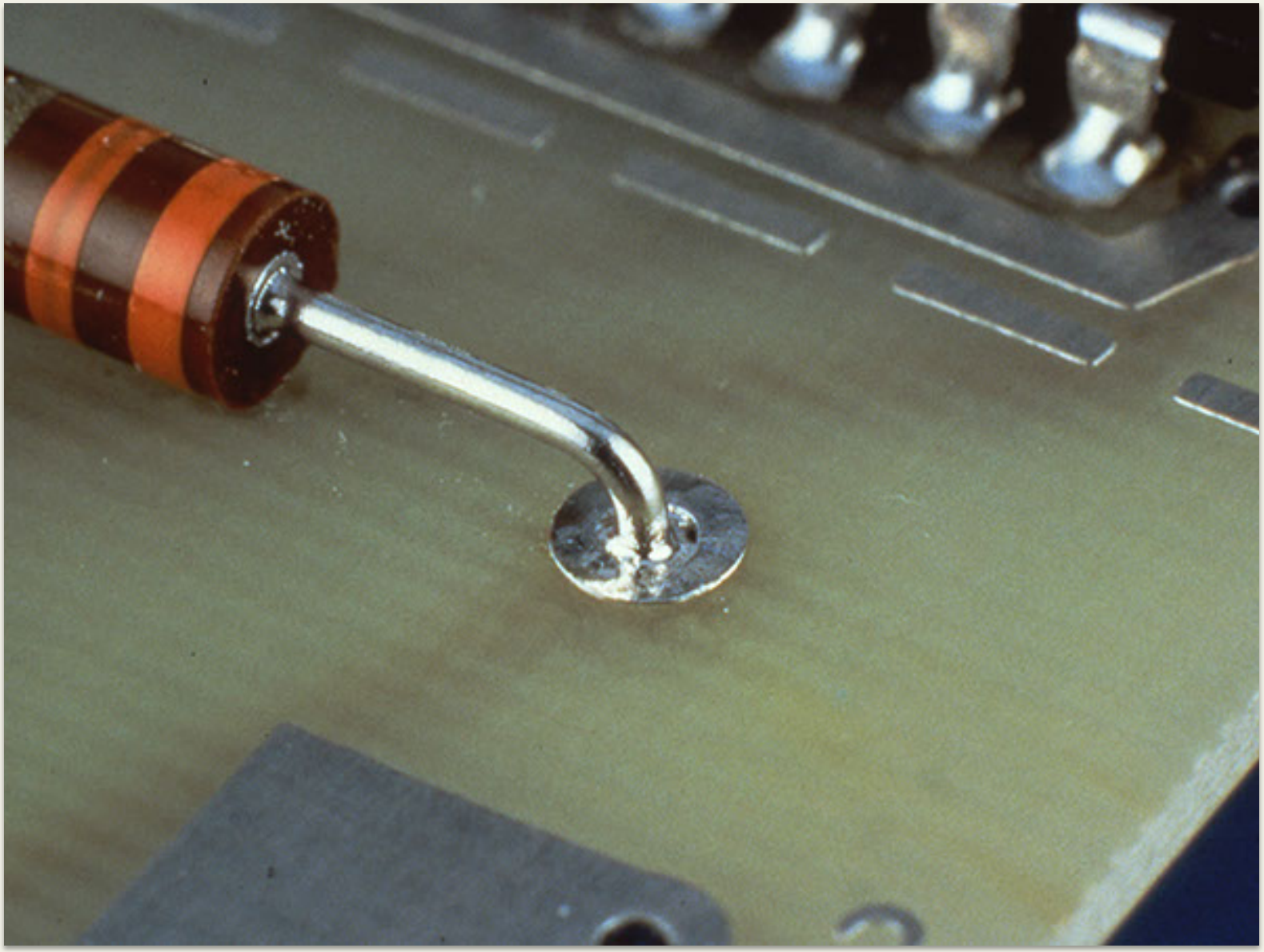


Solder in bend radii – ‘’’Reject

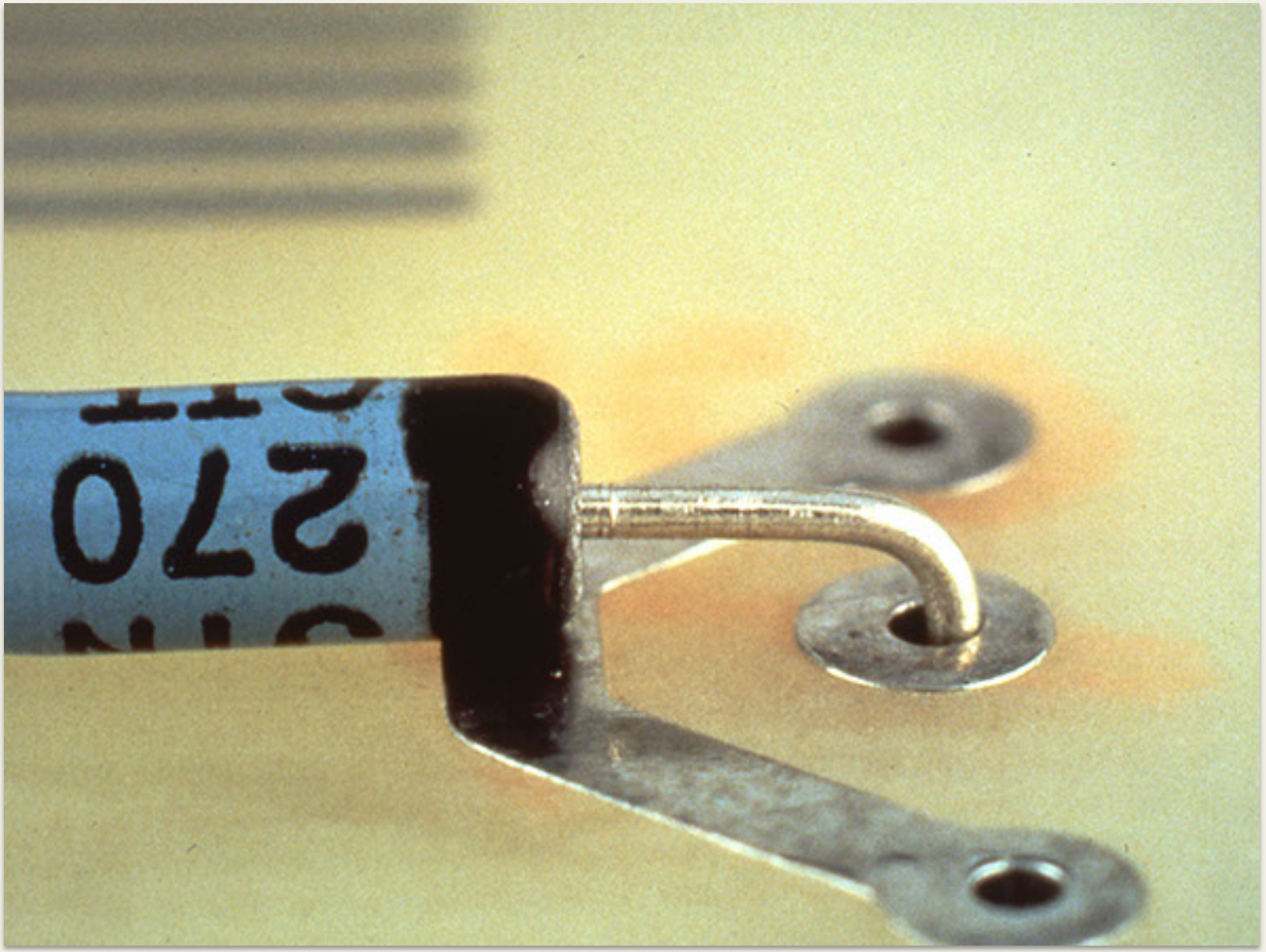


Poor wetting/reflow stress lines - Reject

Vertical mounted axial lead component - Accept



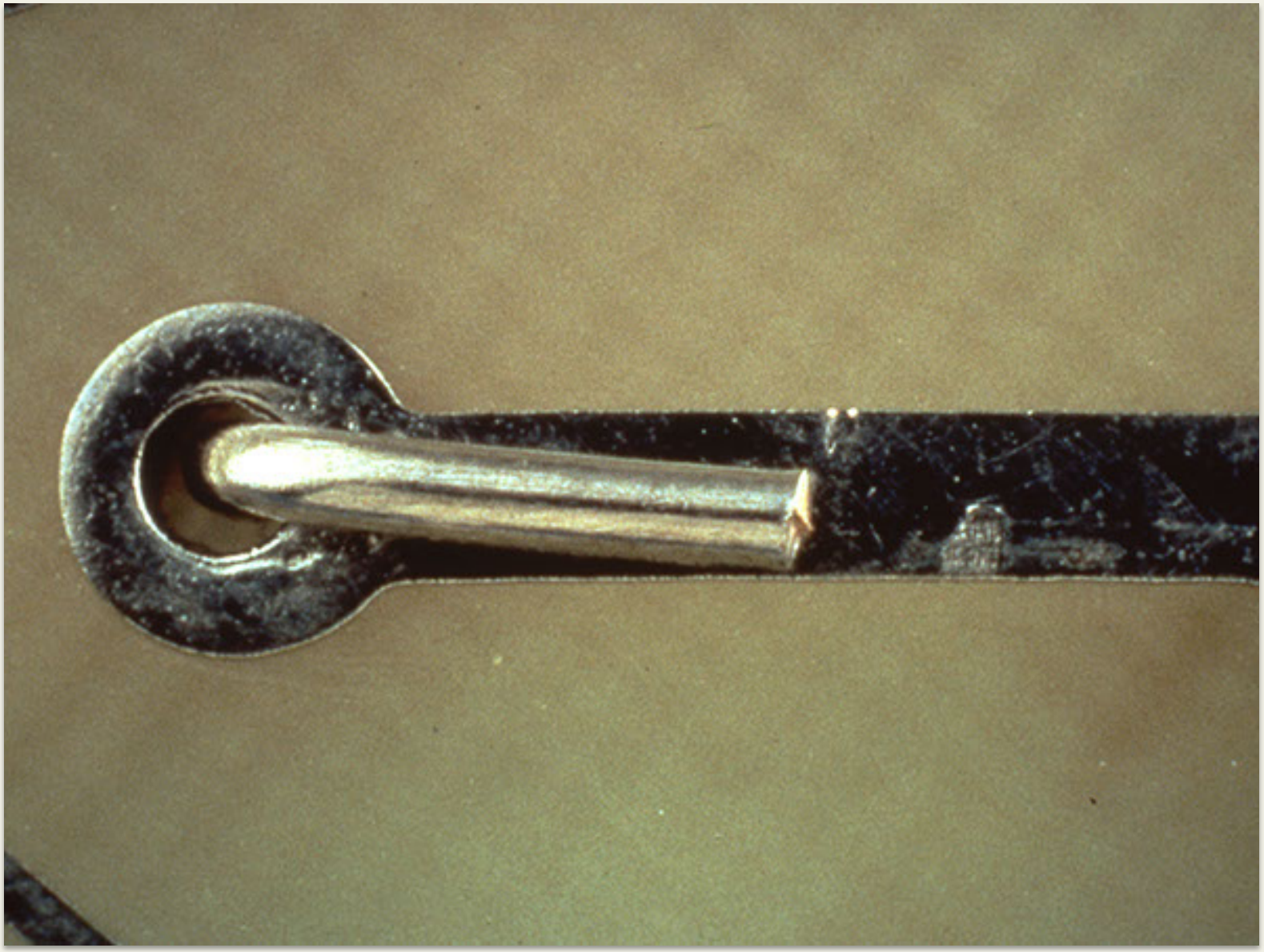
Poor solder flow through plated through hole - Reject



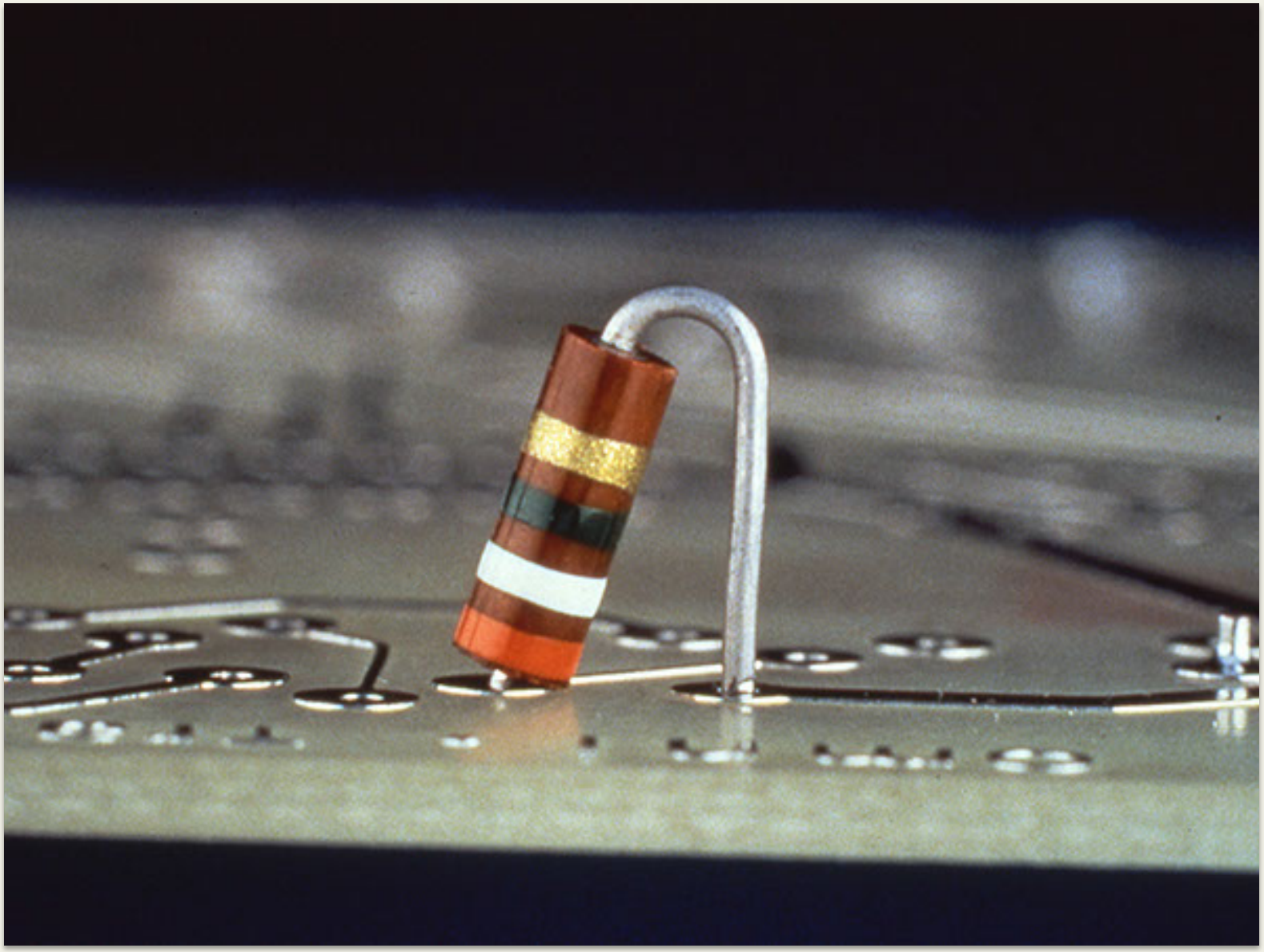
Glass body component not sleeved - Reject

Rosin - Reject

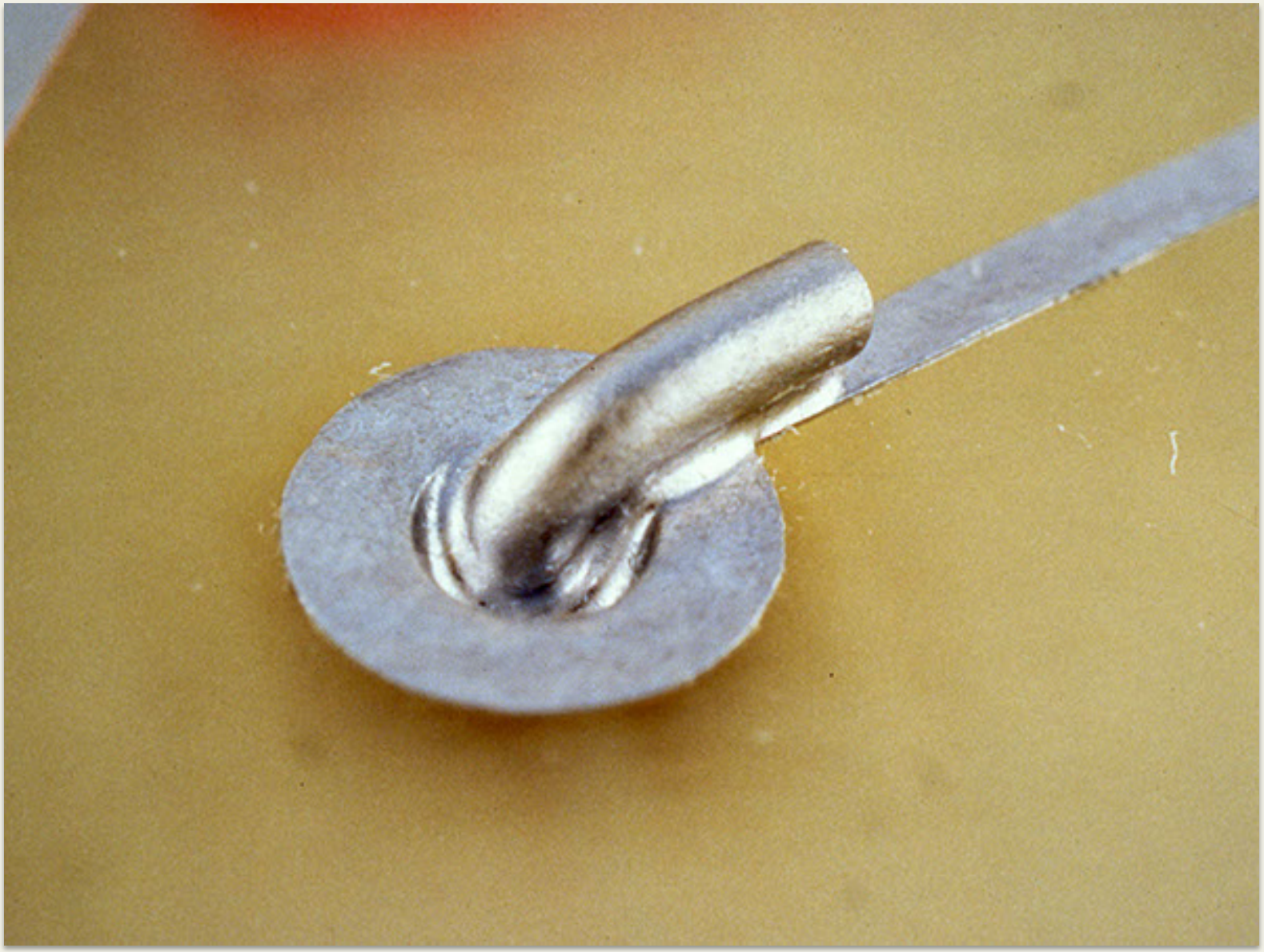
Pit - Reject



Excessive lead length, damaged trace - Reject

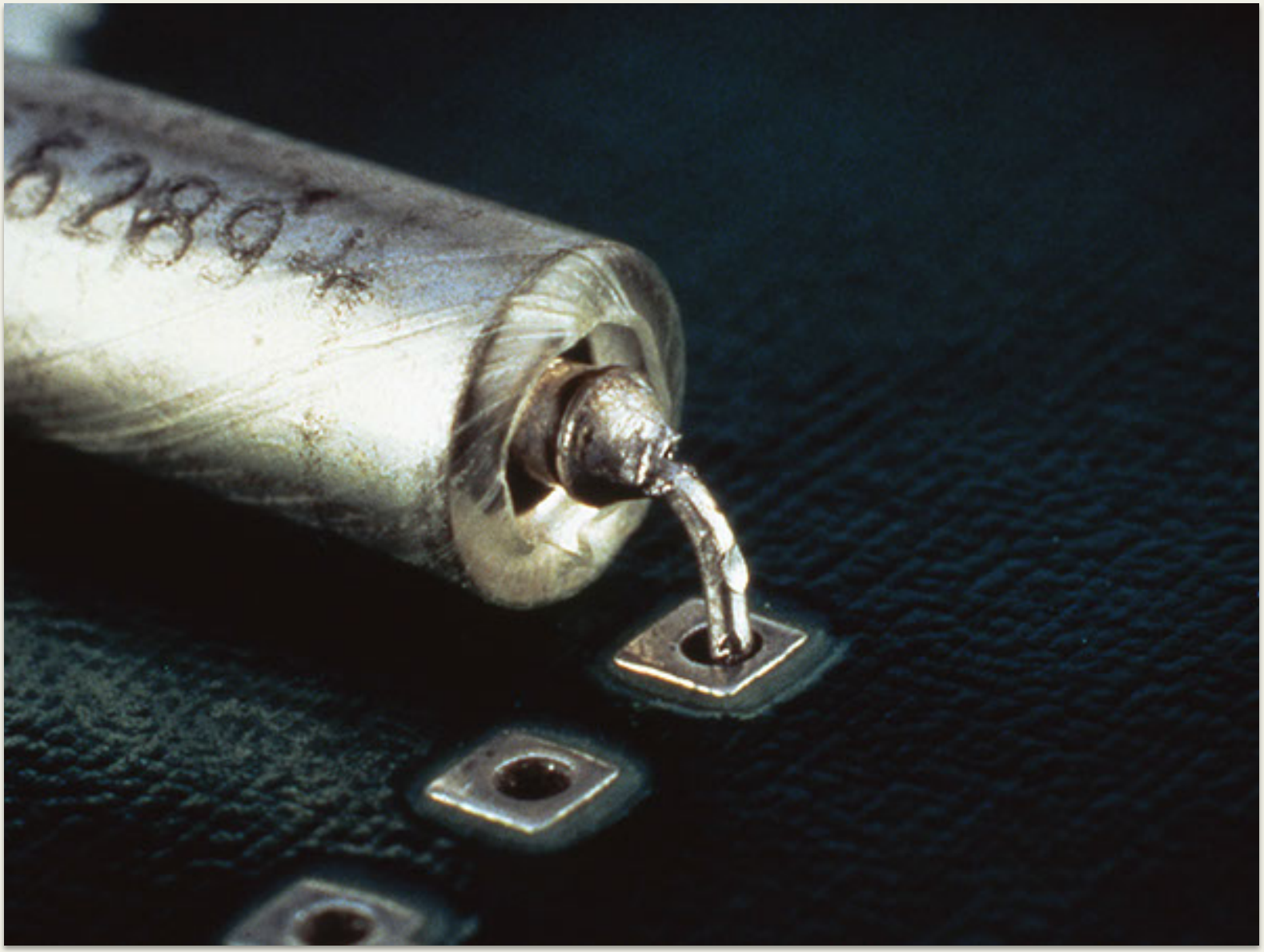


Improper component mounting - Reject

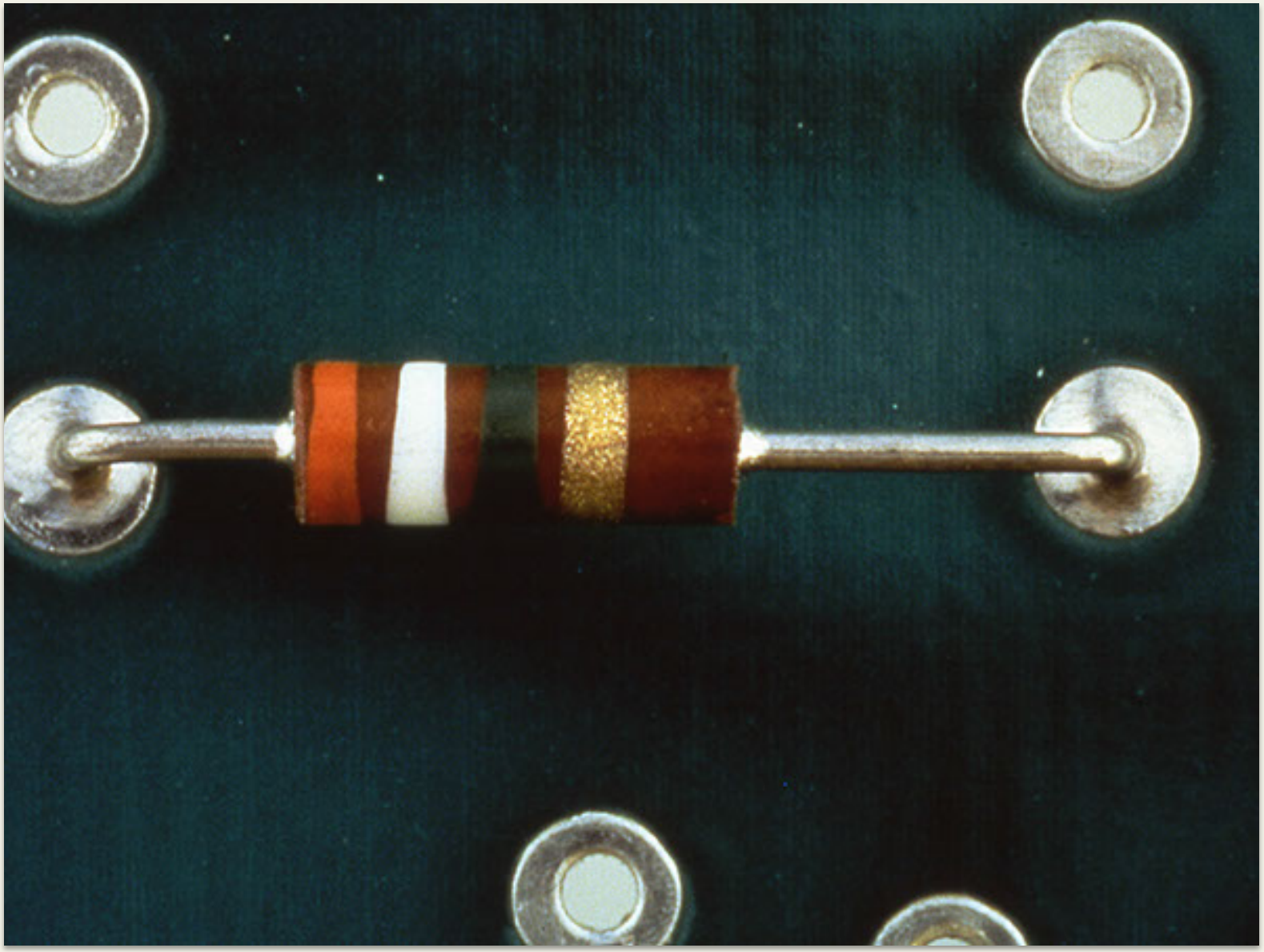


Insufficient solder - Reject

Correct lead bend radius - Accept

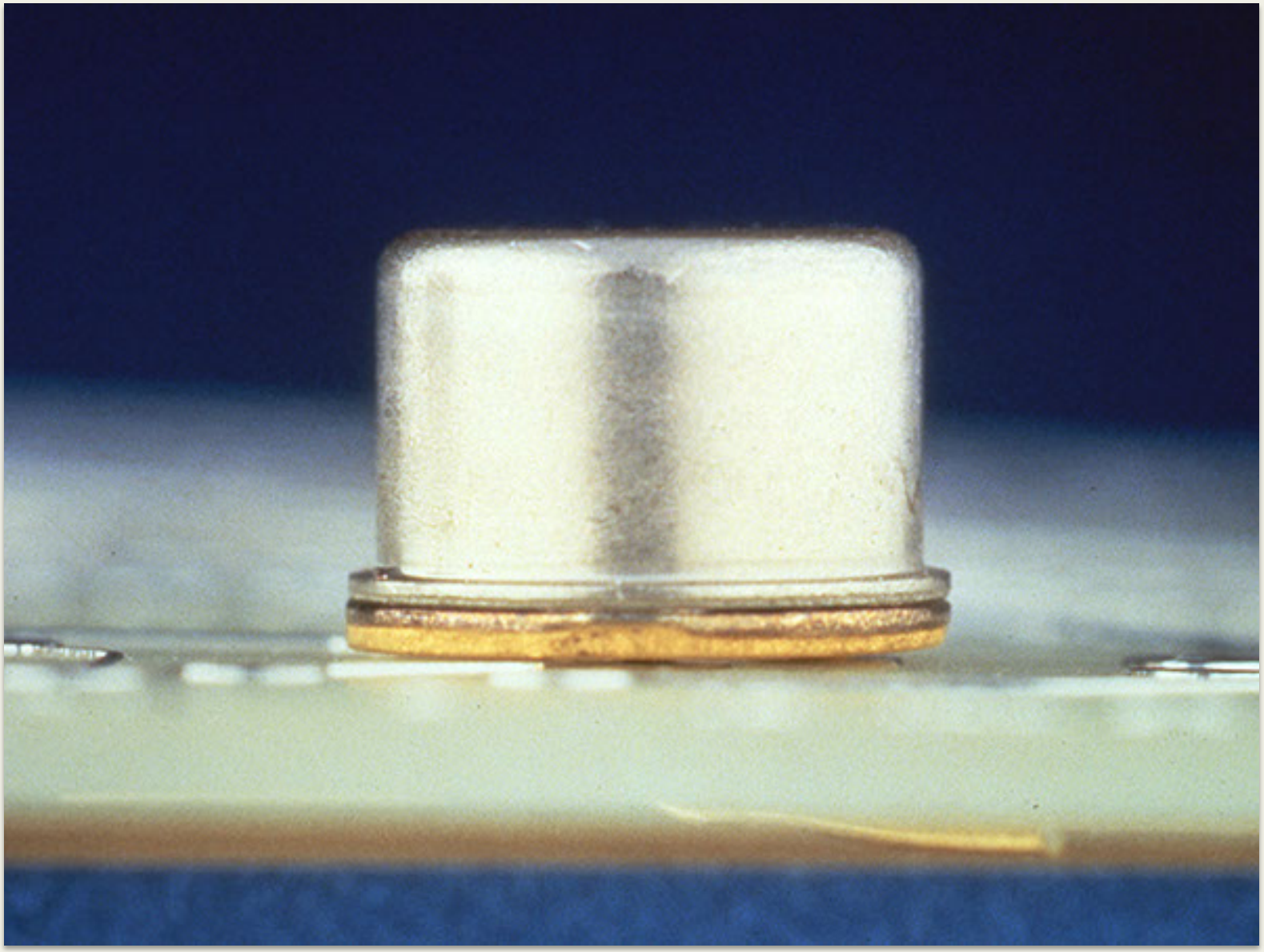


Distance from weld bead to bend - Reject

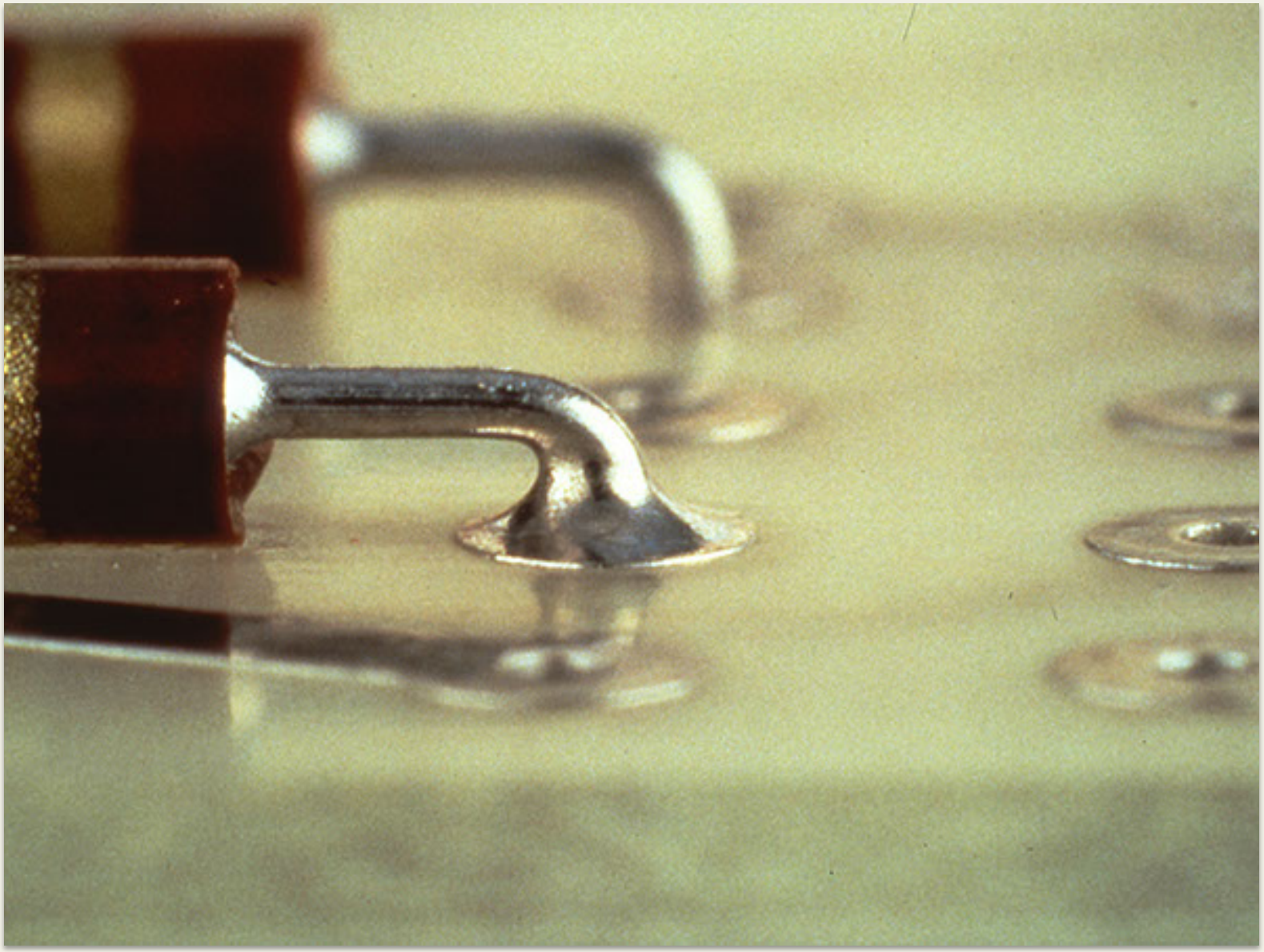


Component not centered - Reject

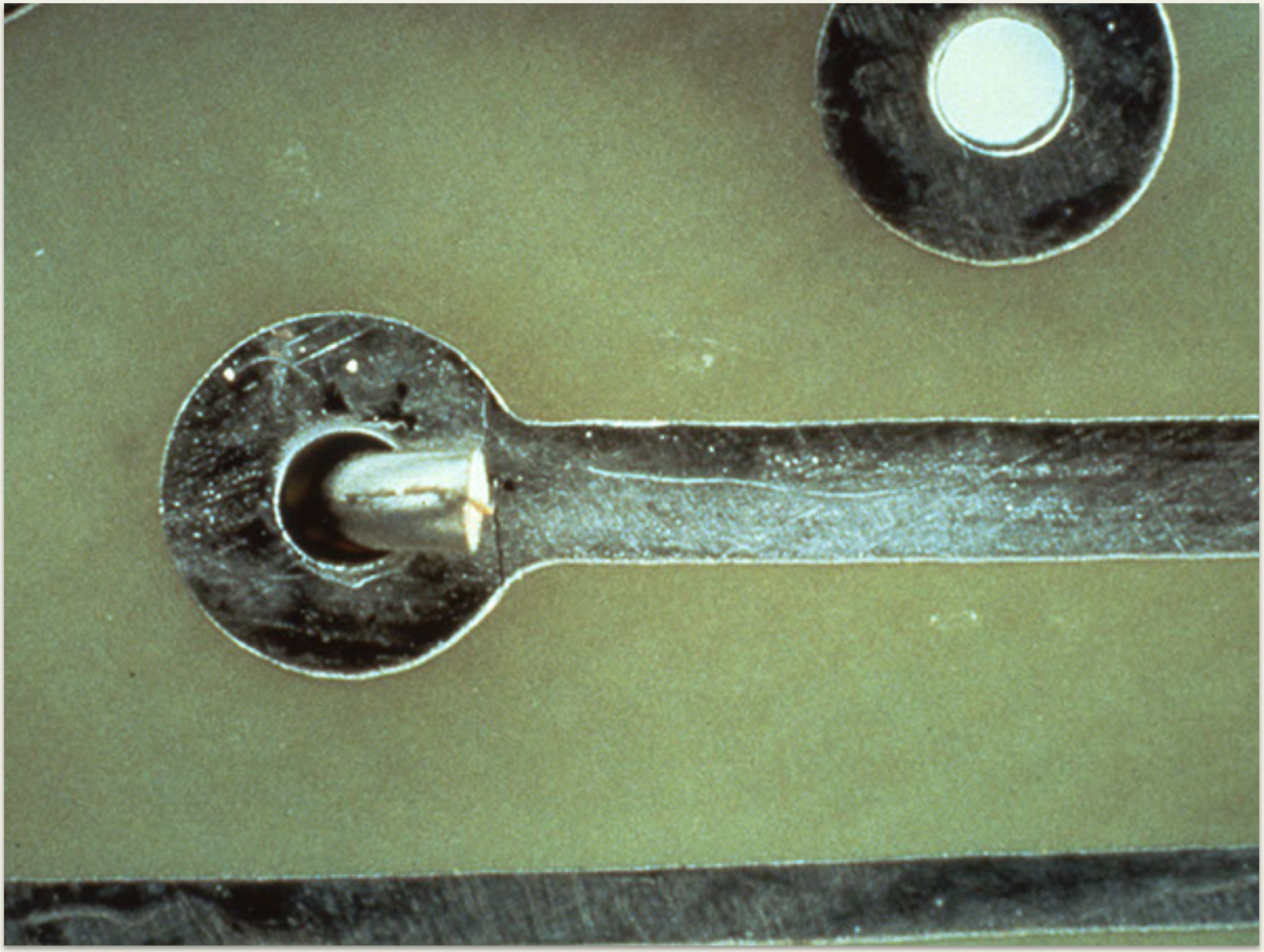
Scratches on pads - Reject



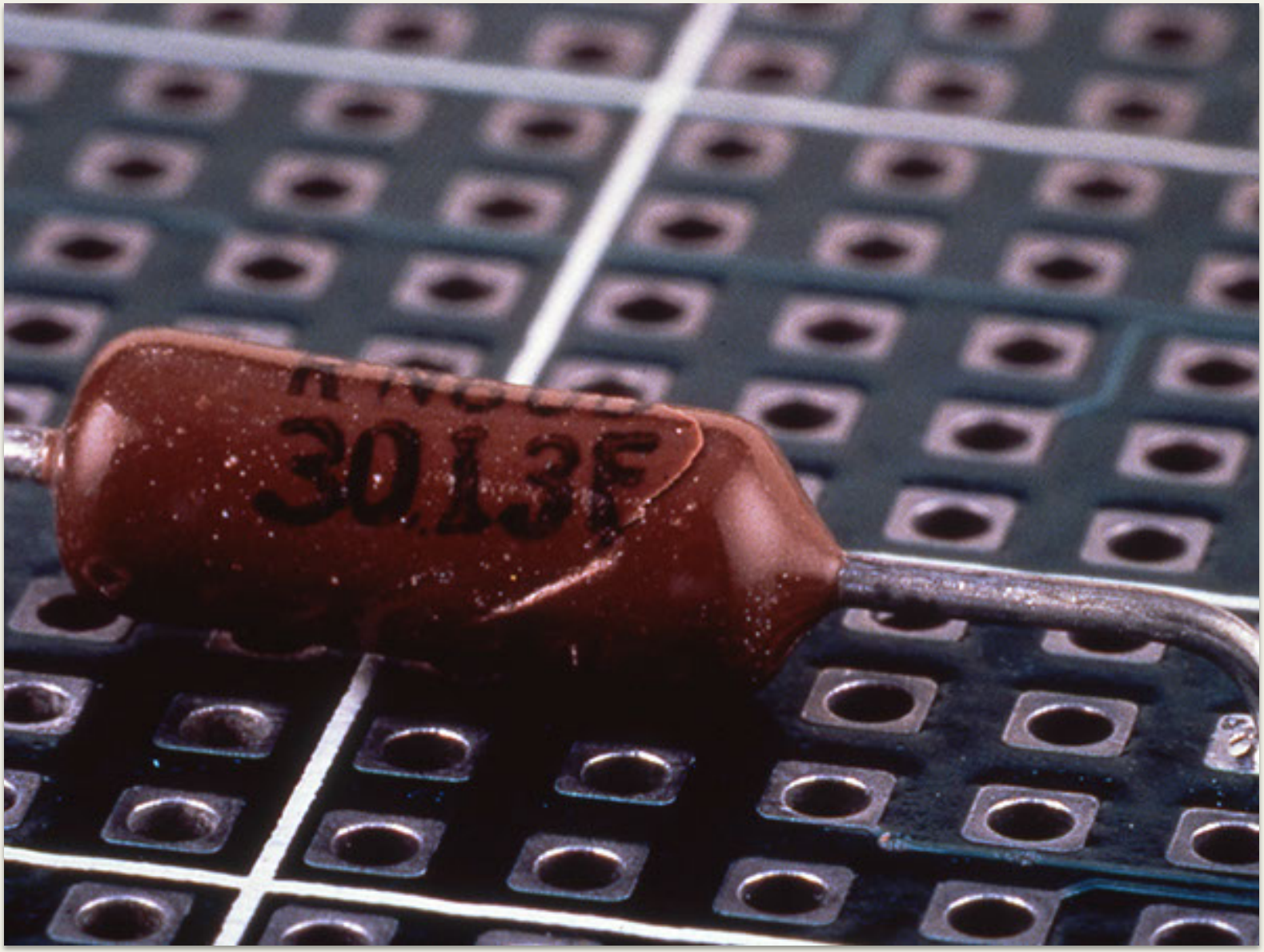
Component mounting - Reject



Solder in bend radius, minimum - Accept



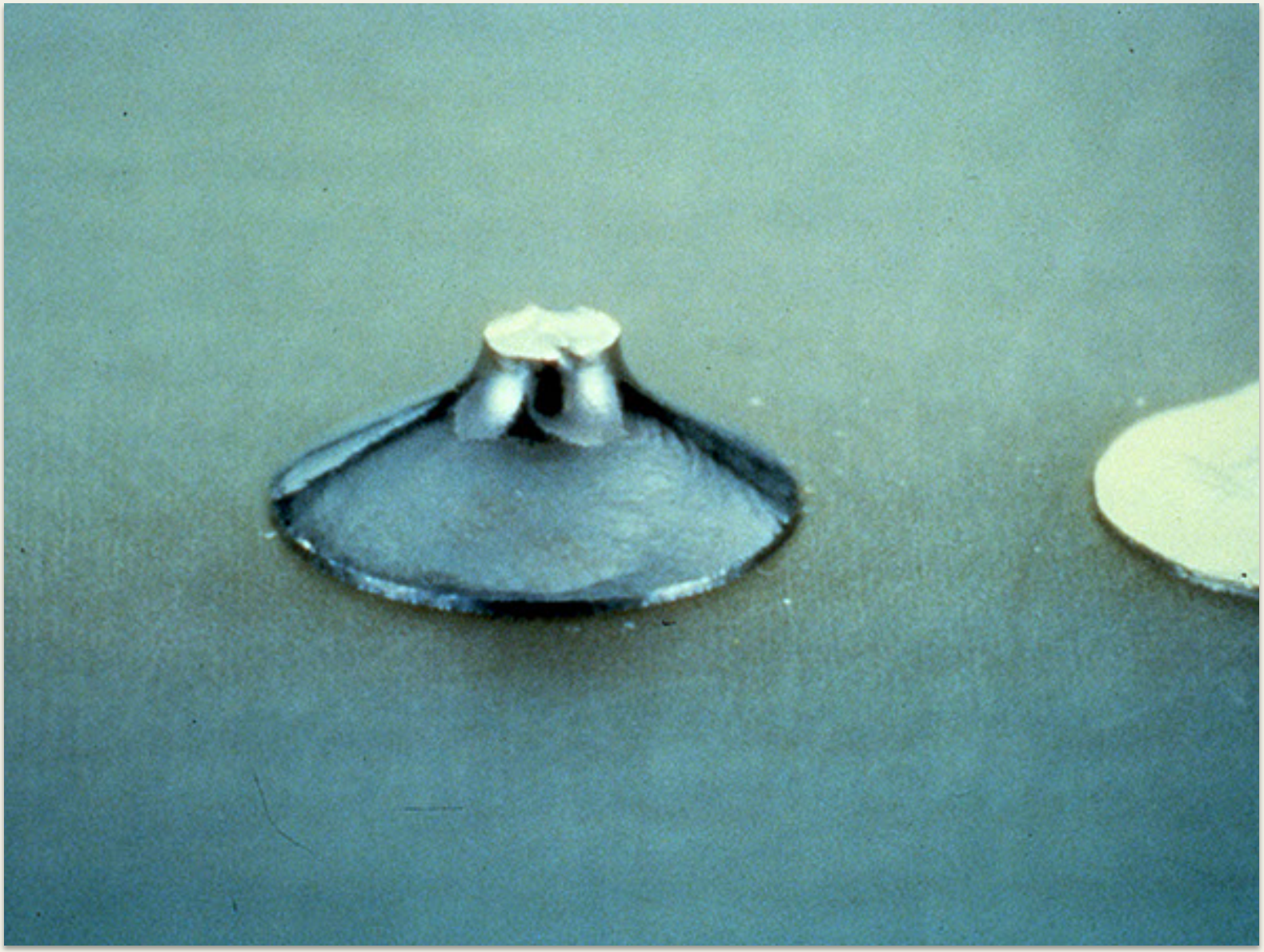
Lead length, insufficient - Reject



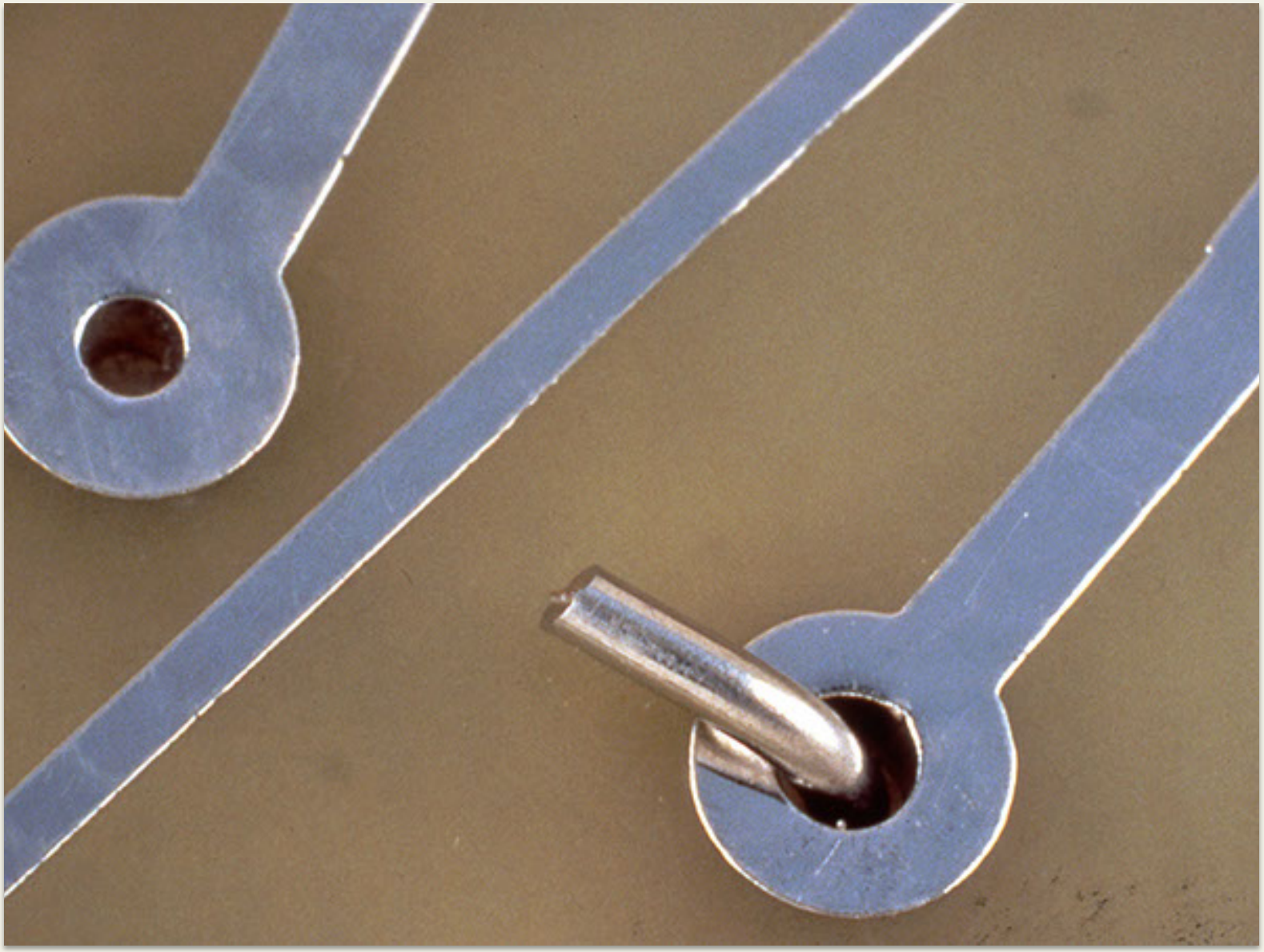
Broken, damaged part - Reject

Pit, void - Reject

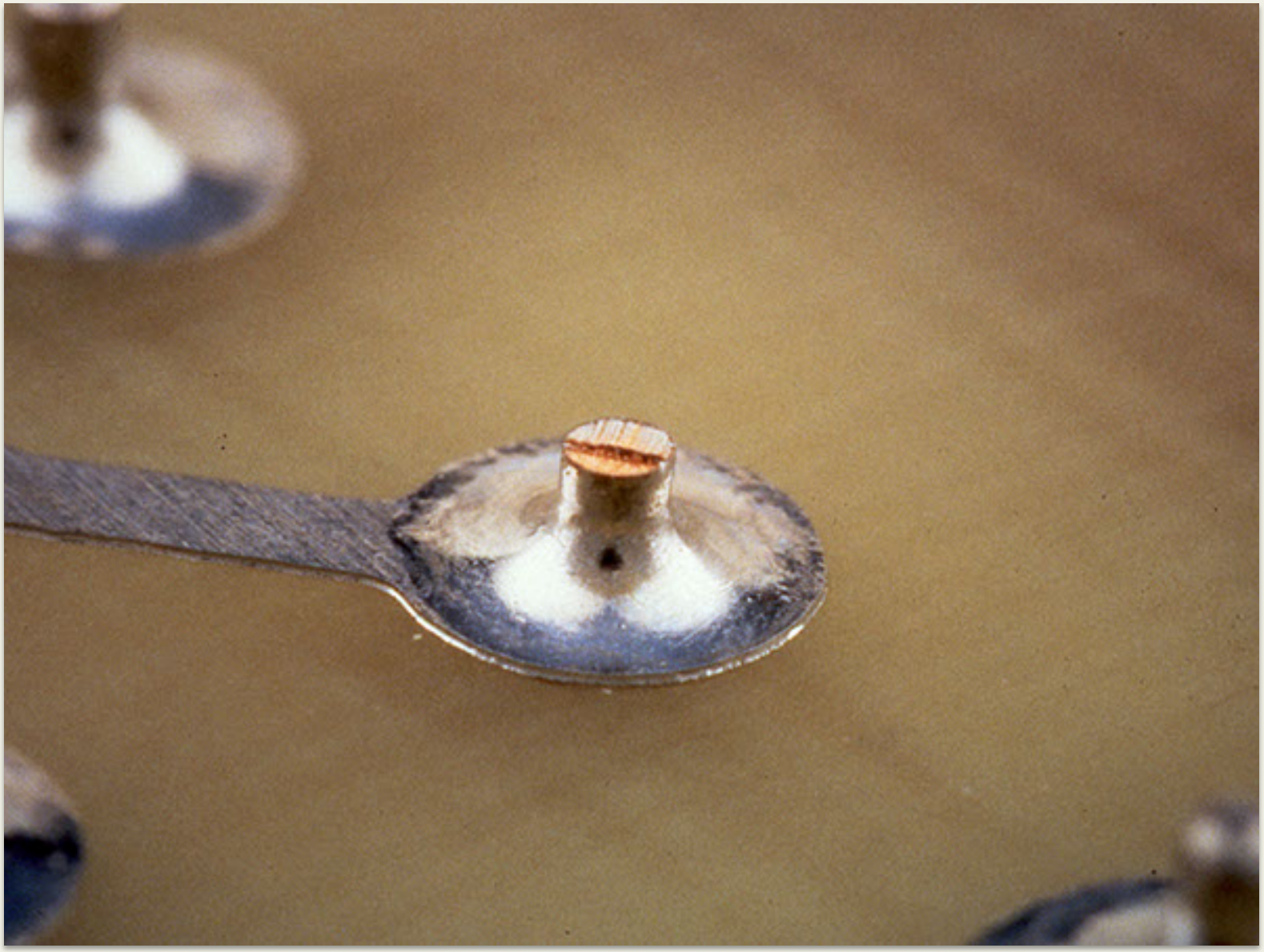
Large component obscures termination of another Part - Reject



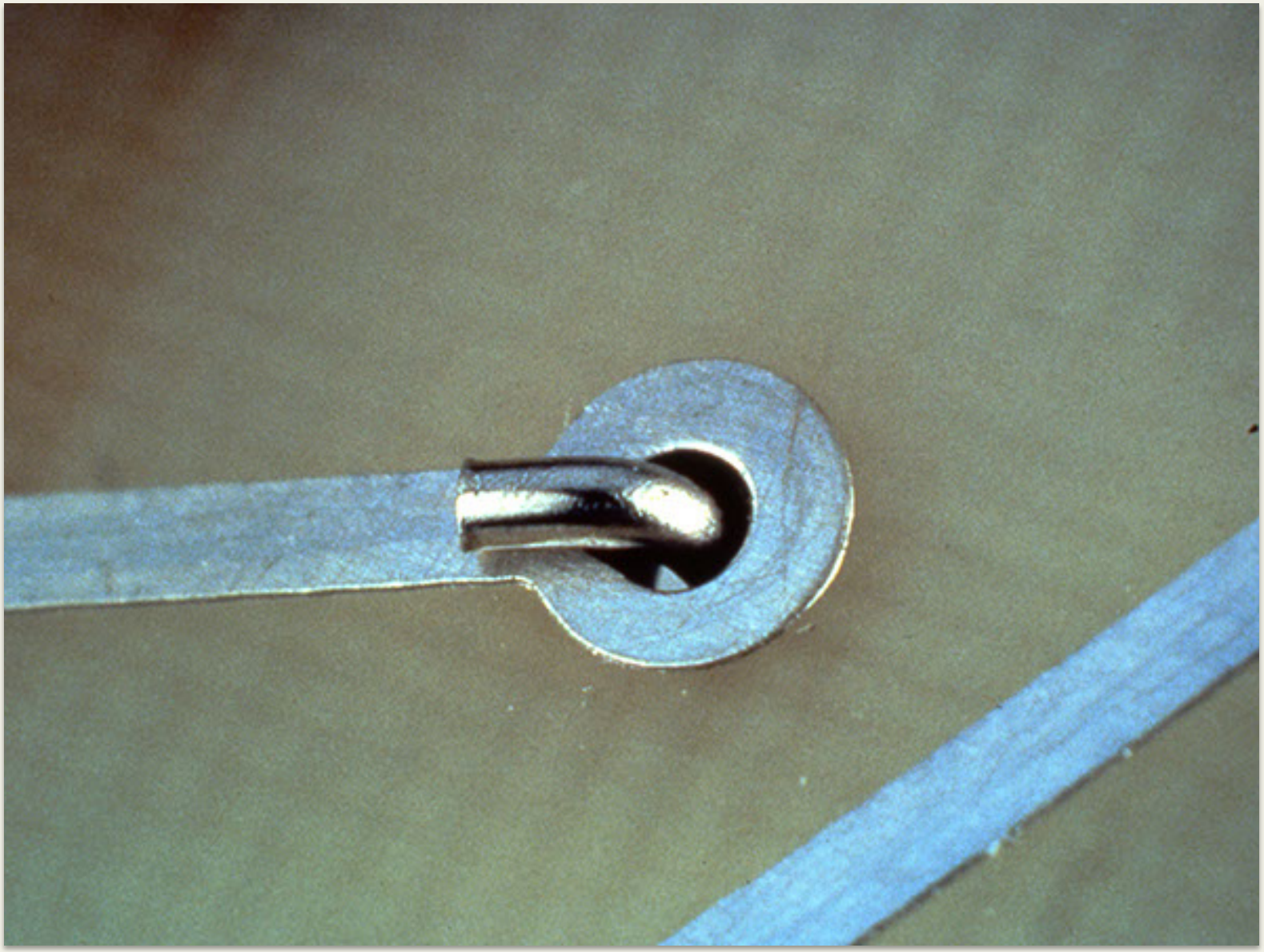
Maximum solder (stud) - Accept



Improper lead clinched - Reject

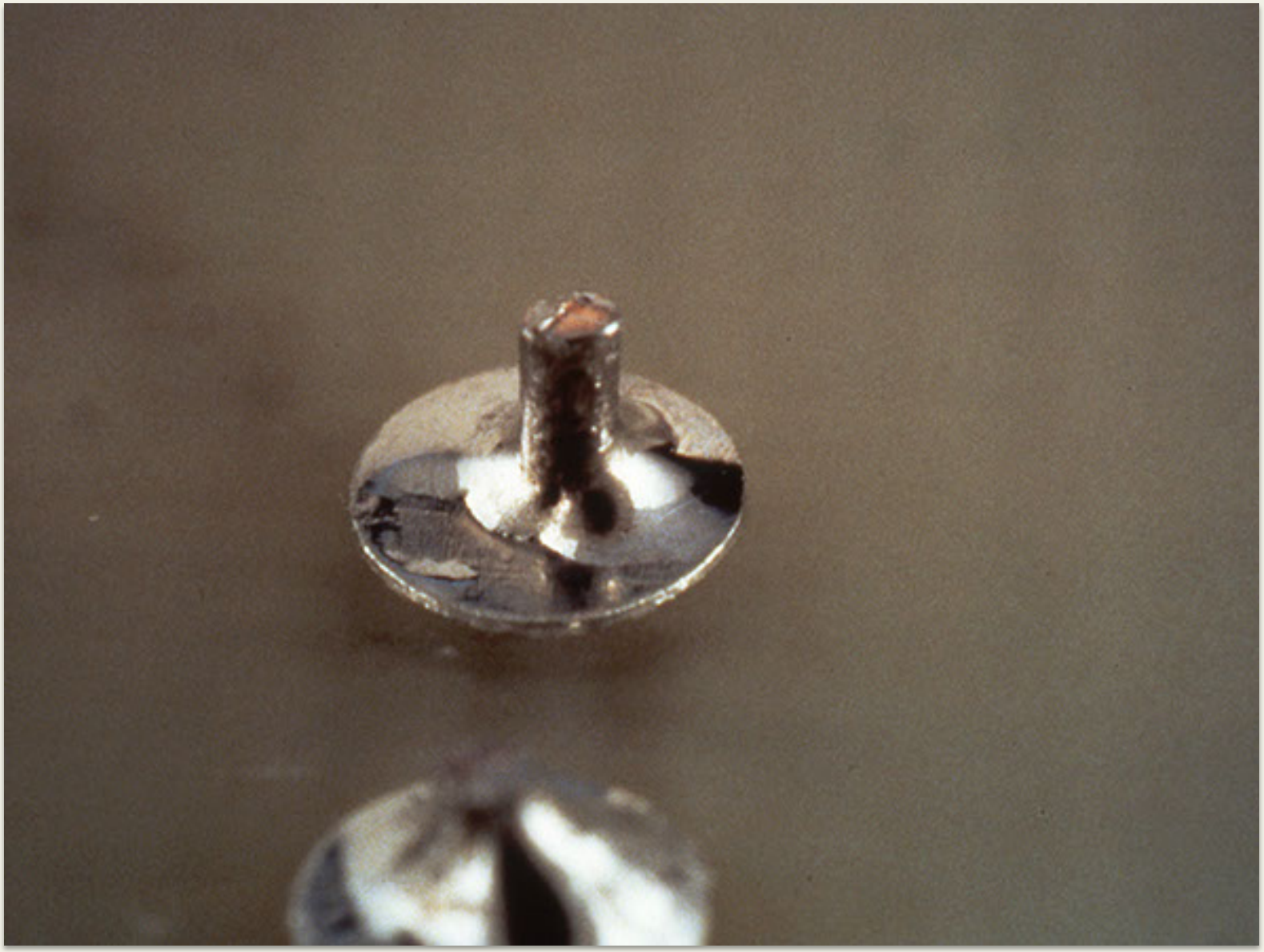


Exposed copper - Reject



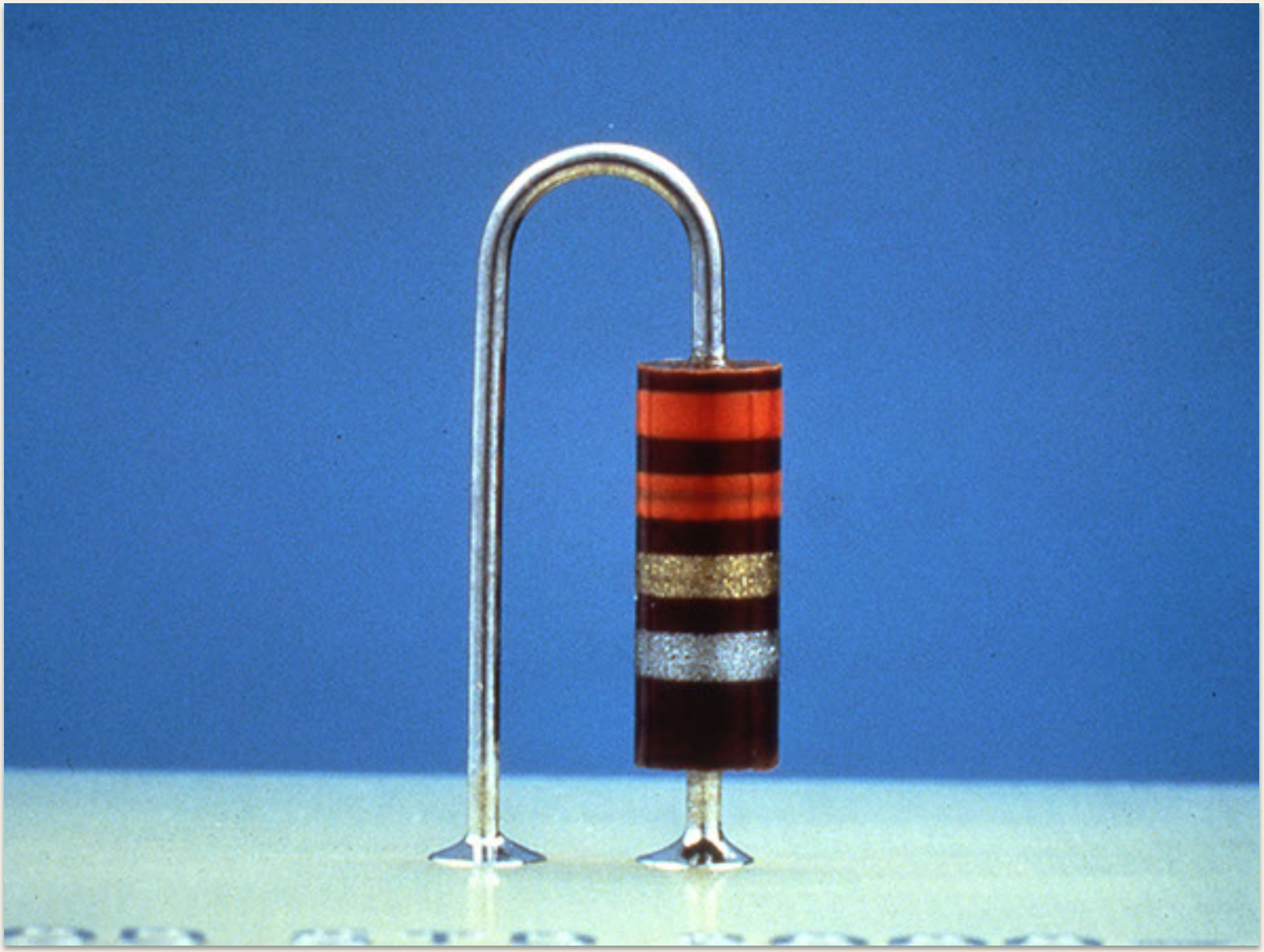
Preferred clinched lead - Accept

Excessive solder, lead not discernible - Reject

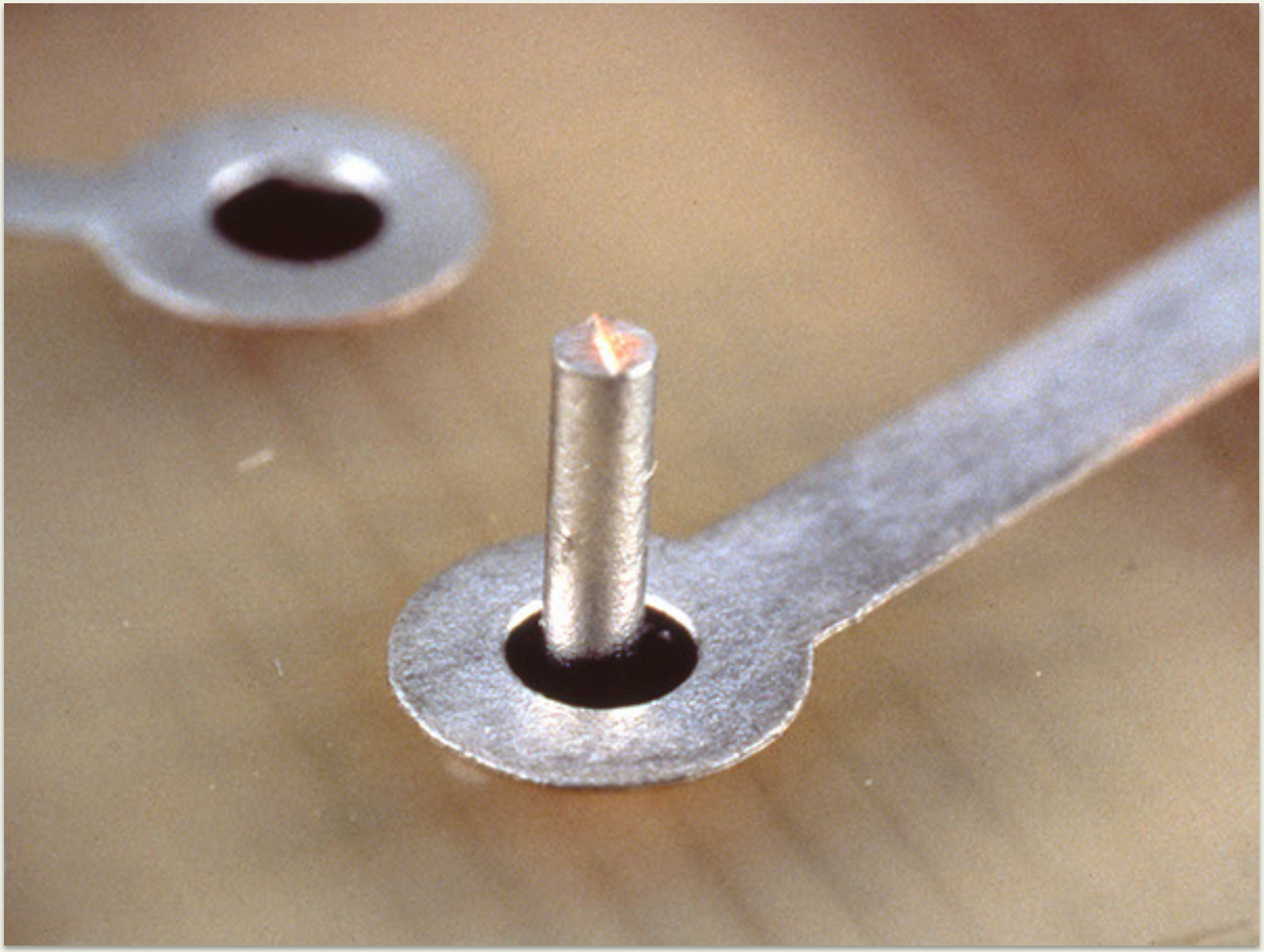


Poor wetting and exposed copper - Reject

Pits, grainy - Reject

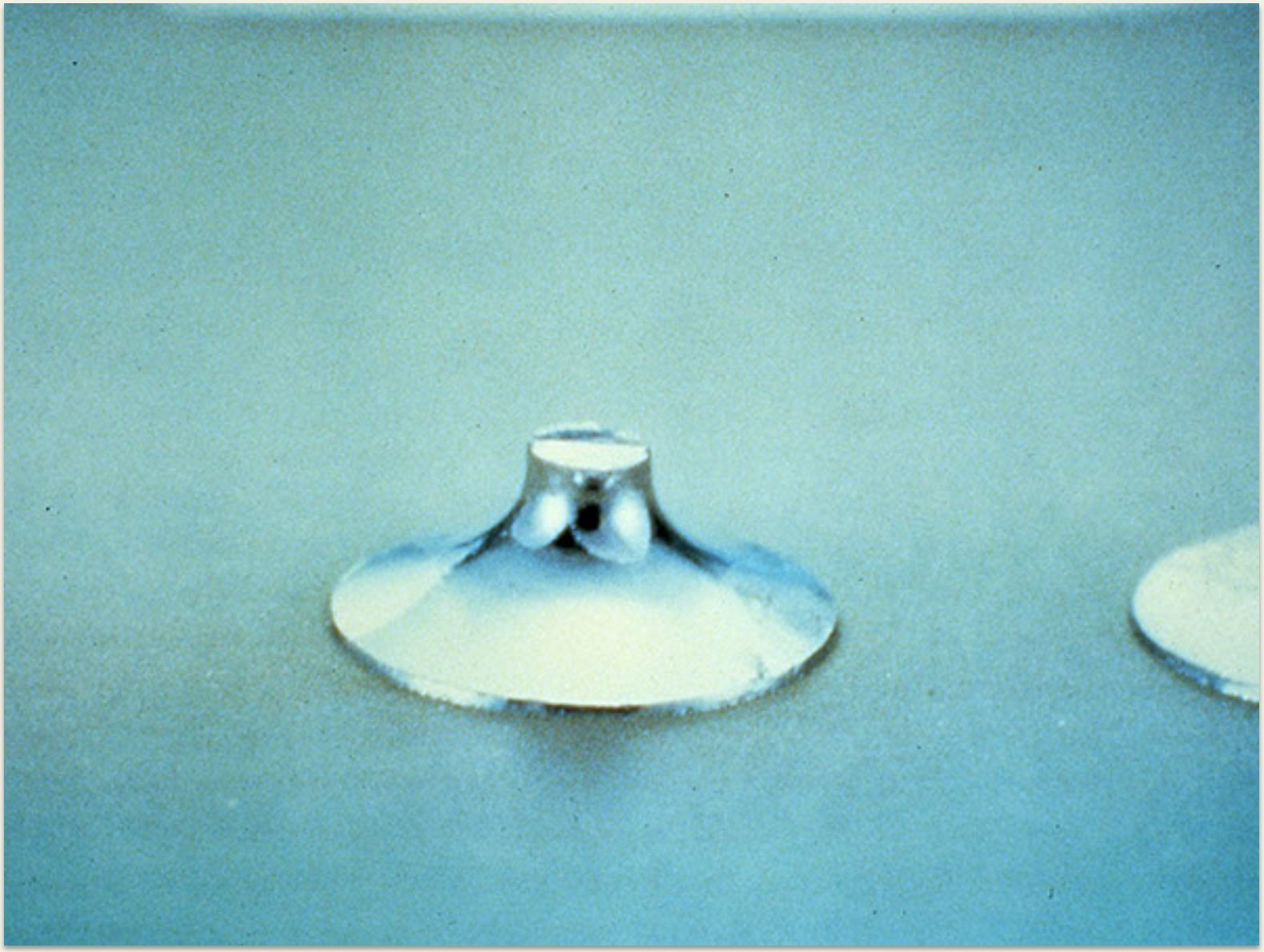


Vertical component mounting - Accept



Optimum lead protrusion, stud mount - Accept

Excessive lead spring back - Reject



Solder fillet - Accept