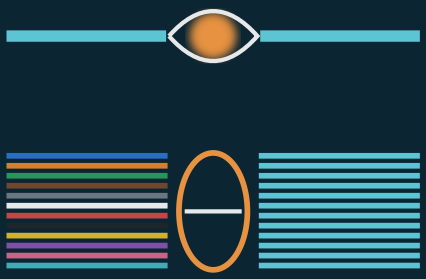
FIELD REFERENCE GUIDE



# Single-Fiber & Ribbon-Fiber Fusion Splicing

A visual, step-by-step guide for clean preparation, consistent fusion, splice protection, testing, and shift handoff.

**Prepared for:** Iron Service Global (ISG) field teams
**Project context:** Meta data center work - New Albany, Ohio
**Sites referenced:** VNA / NAO / NLH / LCO / QNO
**Project partners:** Vantage and Turner
**Prepared by:** Tarek Kharroubi
**Version:** 1.0 | September 2026

**Field-reference supplement.** Follow the current site method of procedure (MOP), safety rules, approved material list, splice plan, and the exact equipment manufacturer's manual. If this guide conflicts with a controlled document, the controlled document wins.

# How to use this guide

Use the workflow pages at the splice table, then use the acceptance, troubleshooting, testing, and handoff pages before closing the work.


**1.** Safety first p. 3

**2.** Tools & pre-job checks p. 4

**3.** Single-fiber workflow p. 5

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**Important:** Strip lengths, cleave lengths, heater programs, ribbon-holder types, and splice modes are machine- and cable-specific. This guide deliberately does not replace those model-specific values.

## Symbols used

**DO**
A required quality or safety action.

**VERIFY**
A checkpoint before moving forward.

**STOP**
A condition that requires correction or escalation.

The best splice starts before the arc: correct fiber identification, clean glass, a good cleave, and the correct machine program.

# 1. Safety first

Bare fiber is nearly invisible, sharp, and easy to transfer. Control the optical, glass, chemical, and electrical hazards before opening the cable.

## Personal protection

- Wear approved safety glasses with side protection.
- Keep food and drinks away from the splice area.
- Wash hands after fiber handling and before touching eyes or face.
- Use the PPE required by the site and chemical safety data sheet.

## Optical safety

- Never look into a fiber, connector, adapter, or transceiver port.
- Treat every fiber as live until the approved method confirms otherwise.
- Do not use an inspection microscope on a potentially energized fiber unless the instrument is designed and approved for that condition.

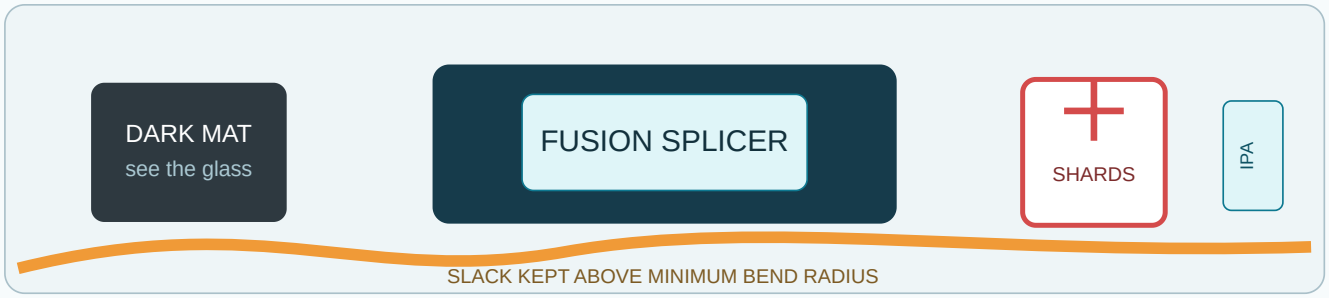



Figure 1. Example controlled splice workstation. Layout is illustrative; follow site housekeeping and ESD requirements.

## Glass control

- Collect every cleave immediately in a dedicated, closable shard container.
- Use tweezers; never pick up scraps with bare fingers.
- Do not brush scraps onto the floor or into ordinary waste.

## Arc and chemical control

- Keep isopropyl alcohol away from ignition sources.
- Do not operate fusion equipment in a hazardous atmosphere unless specifically approved.
- Keep the splicer dry, stable, and correctly powered.

# 2. Tools and pre-job checks

Use clean, compatible tools. A worn cleaver blade, dirty V-groove, incorrect holder, or wrong program can defeat otherwise good technique.

### Common tools

- Fusion splicer and charged battery/power supply
- Precision cleaver
- Fiber coating stripper
- Lint-free wipes and approved high-purity IPA
- Splice sleeves and tray
- Fiber shard container and tweezers

### Ribbon-specific

- Matched ribbon holders
- Approved thermal or hot-jacket stripper
- Ribbon cleaver
- Ribbon splice sleeves
- Tools for rollable ribbon, if specified

### Verification

- Visual fault locator only when approved
- Optical power meter and source
- Optical time-domain reflectometer (OTDR)
- Inspection scope for connectors/end faces, as approved
- Labels and electronic work record

## Pre-job control points

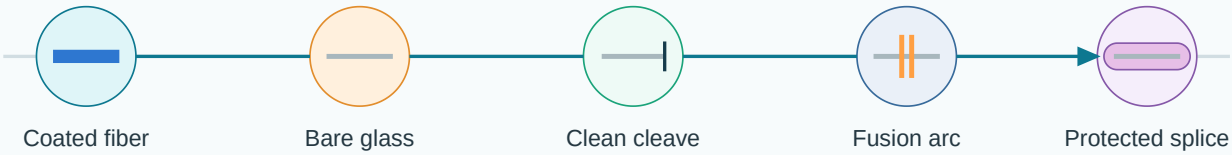
| Check | Confirm before splicing | If not correct |
|---|---|---|
| Work package | Cable IDs, fiber/ribbon count, A/Z direction, splice matrix, tray assignment, acceptance limits. | Stop and resolve the record mismatch. |
| Fiber compatibility | Fiber type and product family are compatible with the approved splice program. | Use the controlled plan or engineering direction. |
| Machine condition | Correct date/time, clean V-grooves and cameras, electrodes within maintenance interval, arc calibration/check complete when required. | Clean, maintain, or calibrate per manufacturer. |
| Tool condition | Correct holders and stripper; cleaver blade clean and producing acceptable cleaves. | Clean, rotate, adjust, or replace only per manual. |
| Environment | Stable table; adequate lighting; low dust/airflow; dry work zone; safe temperature range. | Control the environment before exposing glass. |

**Rule:** Before the first production splice, perform the manufacturer's required startup checks and verify the configured fiber type, holder type, fiber count, splice mode, and heater mode.

# 3. Single-fiber workflow

Complete the sequence without touching the cleaned bare glass or the cleaved end face.

1. Identify › 2. Sleeve › 3. Strip › 4. Clean › 5. Cleave › 6. Load › 7. Fuse › 8. Protect




Never clean after cleaving. If the end face is touched or contaminated, strip as needed, clean again, and make a new cleave.

Figure 2. Single-fiber fusion sequence. Dimensions and fixtures vary by tool model.

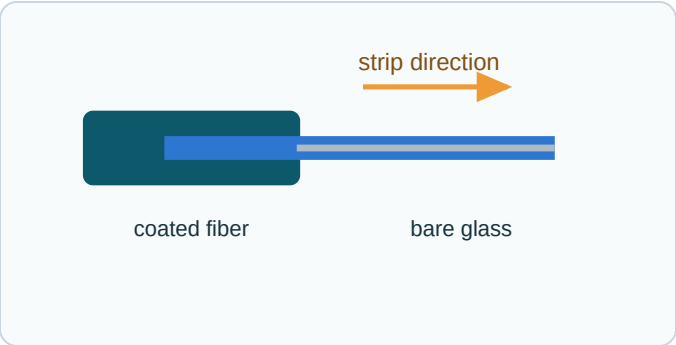
1. **Identify.** Confirm the exact cable, buffer tube, fiber color/position, end direction, tray, and splice destination against the approved splice plan.
2. **Install the sleeve.** Slide the correct protection sleeve onto one side before stripping. Keep it away from the preparation area.
3. **Strip.** Use the correct tool and model-specific strip length. Strip smoothly; do not nick, score, bend, or scrape bare glass.
4. **Clean.** Use a fresh lint-free area and approved IPA. Wipe away from the coating toward the fiber end.
5. **Cleave.** Set the specified cleave length, place the fiber flat, and complete one controlled cleave. Capture the scrap immediately.
6. **Load.** Keep the tip clear of V-grooves, electrodes, clamps, and covers. Seat the coating in the correct clamp location.
7. **Fuse.** Run the correct program. Review both camera views, cleave checks, machine messages, and estimated loss.
8. **Protect and route.** Center the sleeve, run the correct heater cycle, cool fully, then route without twist or macro-bending.

# 4. Single-fiber preparation

Preparation quality controls splice quality. Work in short, clean cycles so bare glass is not exposed longer than necessary.

## Strip without damaging the glass

- Use the stripper opening intended for the coating diameter.
- Hold the fiber straight and support it close to the strip point.
- Remove the coating with a smooth, controlled motion.
- Inspect for coating residue, scratches, nicks, or unexpected bending.
- If damage is suspected, cut back to undamaged fiber and prepare again.




## Clean once, clean correctly

**DO**

- Use a fresh lint-free wipe area for each fiber.
- Use only the cleaning chemical approved by the site/tool maker.
- Wipe from the coating toward the bare end.
- Let the glass dry before cleaving.

**AVOID**

- Touching bare glass with fingers or gloves.
- Back-and-forth wiping that returns contamination.
- Reusing a visibly dirty wipe.
- Flooding holders, V-grooves, or the splicer.

## Cleave: the critical geometry step

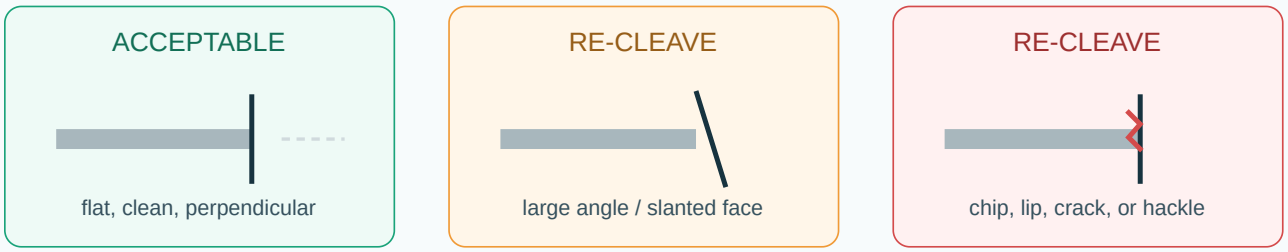



Figure 3. Cleave examples are schematic. Use the splicer's image and error criteria plus the cleaver manual.

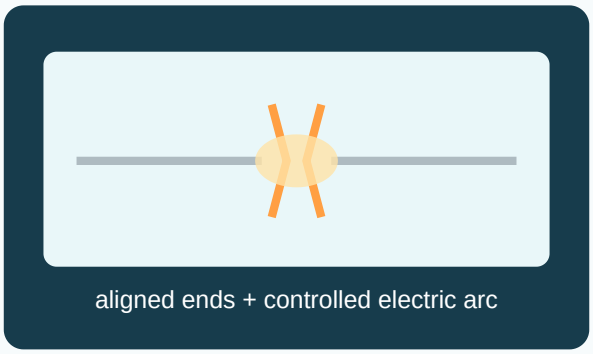
> **After cleaving:** do not touch the end face, wipe it, or allow it to contact any surface. If contact occurs, prepare a fresh end.

# 5. Fuse, protect, and route

The machine automates alignment and the arc. The technician controls the setup, cleanliness, response to warnings, sleeve placement, and final routing.

## Load and fuse

1. Select the approved fiber type and splice program.
2. Place each fiber into its guide/holder without contacting the prepared tip.
3. Confirm the coating sits in the intended clamp area and the fibers are not under side load.
4. Close the wind protector and start the automatic cycle.
5. Review X/Y views, cleave-angle messages, alignment, arc result, and estimated loss.
6. Perform the machine's proof test when required.




**Redo the splice** when the machine rejects a cleave, shows a major offset, bubble, bulge, neck-down, incomplete fusion, or a result outside the project/manufacturer acceptance criteria. Do not keep adding arcs unless the machine manual specifically permits it.

## Protect the joint

1. Release the clamps in the sequence specified by the splicer. Keep light, even control of the fiber.
2. Slide the sleeve over the joint and center the splice under the strength member.
3. Place the sleeve in the heater without twisting or sharply bending the fiber.
4. Run the correct heater mode. Let the sleeve cool fully before moving it into the tray.

## Route in the splice tray

- Keep the sleeve seated in its assigned holder and maintain the tray's bend-radius rules.
- Avoid crossing fibers over sharp edges, hinges, screws, fasteners, or other sleeves.
- Do not force excess slack into a small loop. Re-dress the route using the tray's intended path.
- Verify fiber identification remains traceable after the tray is closed.

**Final visual check:** sleeve centered and fully shrunk, no trapped air or deformation, fibers relaxed, correct tray position, slack secure, labels readable, and no shard left on the work surface.

# 6. Ribbon-fiber workflow

Mass fusion handles the ribbon as one assembly. One orientation or preparation error can affect every fiber in the array.

1. Verify › 2. Sleeve › 3. Hold › 4. Strip › 5. Clean › 6. Cleave › 7. Fuse › 8. Protect

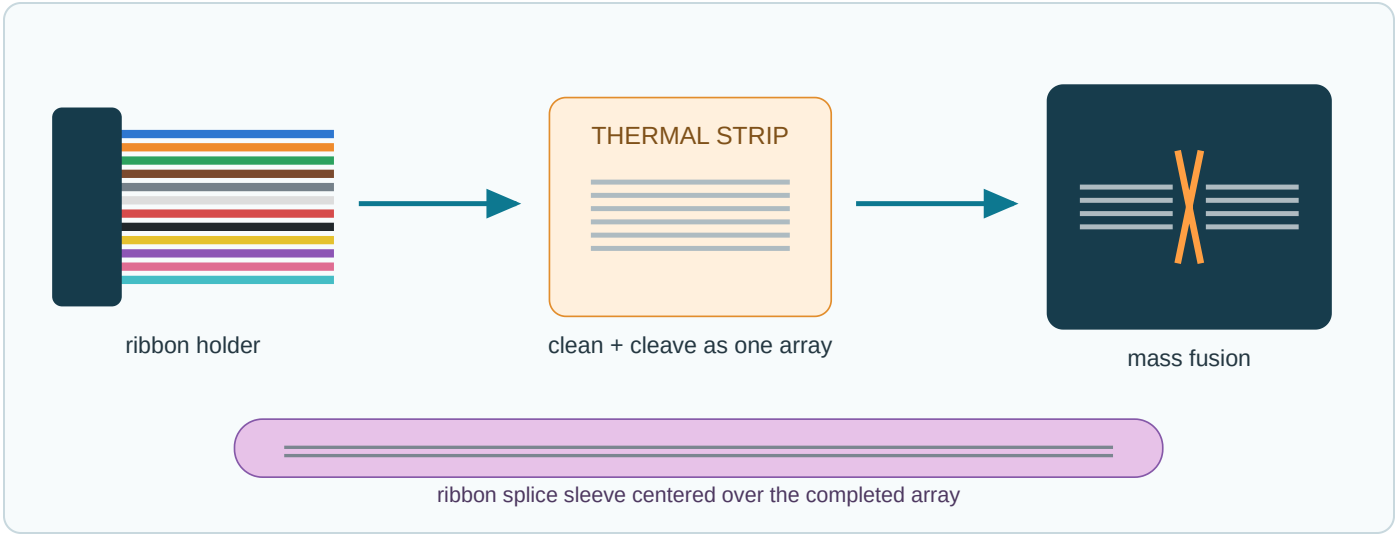



Figure 4. Ribbon mass-fusion sequence. Ribbon constructions and compatible preparation tools vary.

## Orientation is a quality control

- Confirm ribbon number, fiber count, edge-fiber colors/positions, A/Z direction, and holder orientation before stripping.
- Keep the same orientation through both holders, cleaver, splicer, sleeve, and tray.
- For rollable or partially bonded ribbons, use only the approved organizer, holder, and preparation method.

## One bad fiber can stop the array

- All fiber ends must be clean, parallel, correctly spaced, and acceptably cleaved.
- Overlapping, crossed, fanned, damaged, or contaminated fibers require correction before loading.
- Never force a ribbon into an incompatible holder or V-groove.

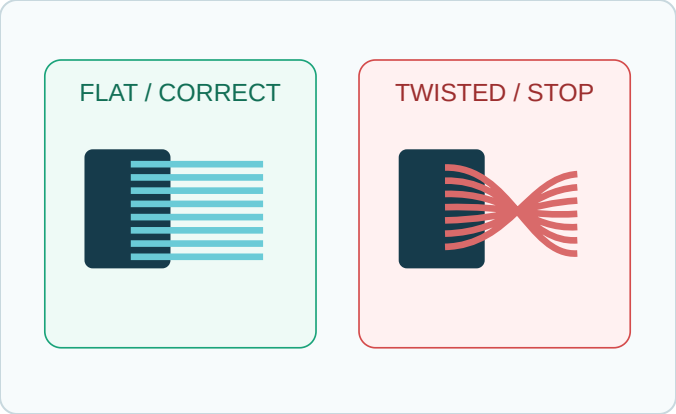
**Color sequence:** a common 12-fiber order is Blue, Orange, Green, Brown, Slate, White, Red, Black, Yellow, Violet, Rose, Aqua. Always verify the project splice matrix and the actual cable manufacturer's identification scheme.

# 7. Ribbon-fiber preparation

Prepare the ribbon while it remains controlled in its holder. Protect edge fibers, preserve orientation, and inspect the entire array at every step.

## Load the holders

1. Confirm the correct matched left/right holders and fiber count.
2. Slide the approved ribbon sleeve onto one side.
3. Place the ribbon flat in the holder slot with the required color/position orientation.
4. Close the flap without pinching, rolling, or shifting the ribbon.
5. Leave the manufacturer-specified projection from the holder.




## Thermal strip and clean

1. Set the holder into the approved thermal stripper and confirm the correct heating condition for the ribbon type.
2. Close the clamp and lid. Complete the prescribed heating cycle; do not guess the temperature or dwell time.
3. Pull the holder/body in the direction and speed specified by the tool manual. Do not twist or jerk the array.
4. Clean the exposed fibers with a fresh lint-free wipe and approved high-purity IPA. Use gentle, even pressure.
5. Verify all fibers are separated/arranged correctly, parallel, and undamaged. If fibers overlap after cleaning, use the equipment-approved method to realign them.

## Cleave the full array

- Place the holder squarely into the ribbon cleaver at the specified cleave length.
- Confirm every fiber is flat in the intended path before operating the blade.
- Complete one controlled cleave; all fibers must be cleaved in the same operation.
- Remove and contain the complete scrap array immediately.
- Do not touch or wipe the cleaved ends. Load them directly into the splicer.

> **Stop and prepare again** if any fiber is missing, crossed, chipped, out of plane, contaminated, uneven in length, or outside the splicer's cleave-angle acceptance.

# 8. Mass fusion and ribbon protection

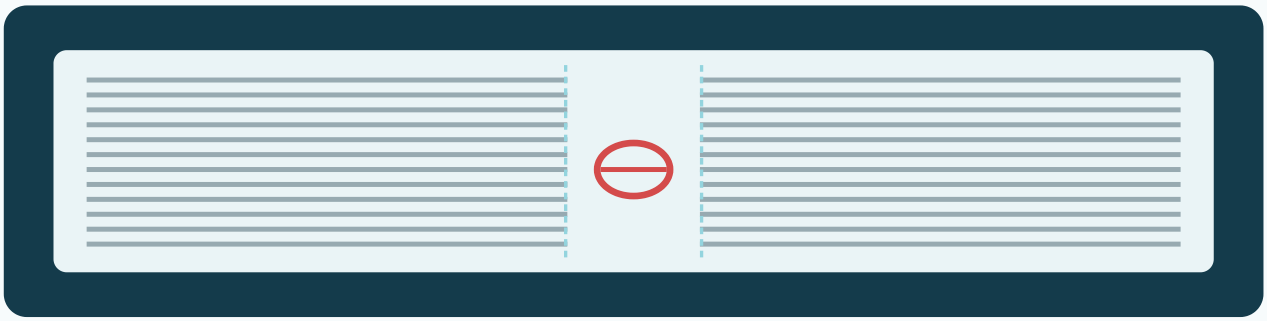
Correct fiber count and holder seating are essential. The splicer must see every fiber pair clearly before the arc.

## Configure and load

1. Select the approved ribbon-fiber splice mode.
2. Confirm the correct fiber count and fiber type.
3. Place both holders on the guide pins/platforms without touching the prepared tips.
4. Confirm the holders sit flat and fully located.
5. Close the cover and review the full array on the display.

## Review before the arc

- Correct number of fiber pairs visible.
- Consistent spacing and no crossing.
- Acceptable cleave on every fiber.
- No dust, coating residue, or debris.
- Edge fibers aligned and not fanned.
- No machine warning or holder error.



Review every pair; one abnormal fiber can require remaking the full ribbon splice.

Figure 5. Simplified mass-fusion display. Actual splicer views and warning symbols vary.

## Fuse, proof test, and protect

1. Start the automated cycle only after the full array passes the on-screen check.
2. Review the estimated result for each fiber and any overall machine message.
3. Complete the approved proof test, if required by the machine/work instruction.
4. Lift and control the ribbon as specified; do not twist the new array splice.
5. Center the ribbon sleeve over the entire splice and run the correct heater program.
6. Cool fully before installing the sleeve in its tray holder.

> **Tray quality:** keep the ribbon flat, preserve orientation, respect the tray's bend radius, avoid torsion at the sleeve ends, and do not stack sleeves beyond the tray design.

# 9. Splice acceptance and visible defects

A splicer estimate supports the decision; it does not replace the project's acceptance limit or end-to-end optical testing.

### Indicators of an acceptable splice

- Machine completes without unresolved warning.
- Fiber axes appear continuous in both views.
- No obvious bubble, bulge, neck-down, or large offset.
- Estimated loss is within the approved criterion.
- Proof test passes when required.
- Sleeve is centered, fully recovered, and undamaged.

### Remake or investigate

- Rejected cleave or repeated cleave-angle error.
- Core/cladding offset or misalignment.
- Bubble, inclusion, black spot, bulge, or constriction.
- Incomplete fusion or separation.
- Result outside project criteria.
- Ribbon fiber missing, crossed, or individually abnormal.

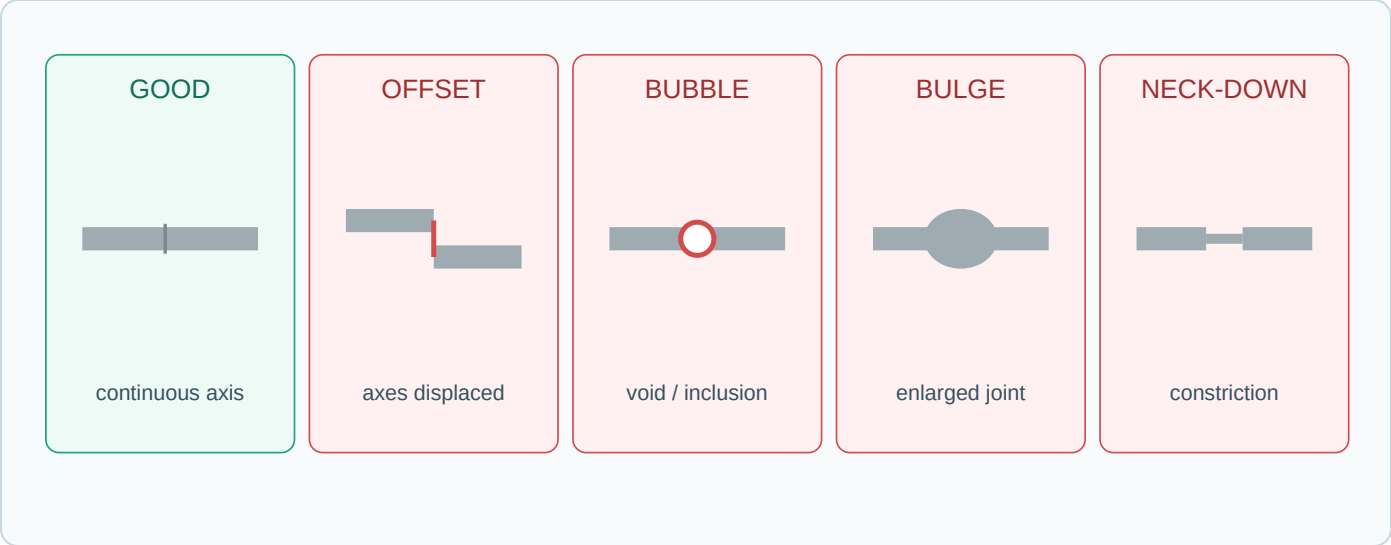



Figure 6. Simplified visual signatures. Some fiber designs may show lines that are not defects; use the manufacturer guidance and optical results.

## Decision sequence

**Machine warning?** › **Visual defect?** › **Estimate in limit?** › **Proof test pass?** › **Protect + test**

**Do not chase the display number.** A very low estimated loss does not prove the installed link is good, and a poor one-way OTDR event can be influenced by backscatter differences. Use the complete acceptance method.

# 10. Troubleshooting matrix

Correct the preparation or machine condition that caused the symptom; do not repeatedly re-arc a questionable splice.

| Symptom | Likely checks | Corrective action |
|---|---|---|
| Repeated bad cleave / high angle | Fiber seated flat; coating residue; cleaver blade contamination, wear, height, or position; correct holder. | Clean tool, re-seat, prepare a new end, and service/adjust only per cleaver manual. |
| Dust or contamination warning | Bare glass, V-grooves, clamps, camera field, wind protector, wipes, work area. | Remove fiber, clean approved surfaces and tools, then strip-clean-cleave again. |
| Fiber offset / alignment failure | Fiber loaded in groove; coating clamp position; bent fiber; wrong holder; dirty V-groove. | Re-load without side pressure; clean; verify holder and preparation length. |
| Bubble or inclusion | Contaminated end face, poor cleave, residue, incorrect program/arc condition. | Remake both ends; confirm correct mode and required arc calibration. |
| Bulge or neck-down | Incorrect arc/feed/gap condition, electrodes, wrong fiber program. | Remake; run maintenance/calibration; use manufacturer program. |
| Ribbon fibers crossed or fanned | Ribbon orientation, holder seating, strip technique, cleaning pressure, ribbon construction/tool compatibility. | Remove; re-prepare the entire array using approved organizer/holder method. |
| One ribbon channel abnormal | Individual cleave, contamination, spacing, missing fiber, edge-fiber damage. | Inspect full array; normally re-prepare and re-splice the ribbon. |
| High test loss but good splice display | Wrong fiber IDs, dirty connectors, launch/receive setup, bends, additional events, bidirectional behavior. | Verify route and test setup; inspect connectors; test per method; isolate the event before resplicing. |

## Machine maintenance clues

- Increasing frequency of arc-related defects
- Persistent alignment errors across known-good fibers
- Electrode life/cleaning reminder
- Arc calibration failure
- Dirty camera or V-groove indications

## Escalate when

- Fiber type or splice program is uncertain
- Cable/ribbon construction does not match tools
- Splice matrix or labeling conflicts
- Repeated failures remain after approved cleaning and re-preparation
- Acceptance result exceeds the controlled limit

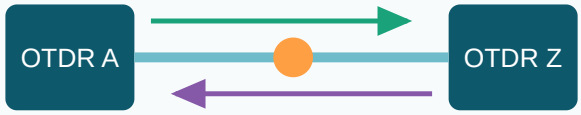
**Stop-work condition:** any optical safety uncertainty, uncontrolled fiber shards, damaged equipment, hazardous environment, or work-package conflict must be resolved before continuing.

# 11. Testing, documentation, and handoff

The splice is complete only when the required optical result, physical routing, labels, and work record all agree.

## Testing sequence

1. Verify all test ports/connectors are inspected and cleaned using the approved process.
2. Confirm fiber ID, direction, wavelength, launch/receive conditions, and test limit.
3. Run the project-approved insertion-loss and/or OTDR test.
4. If required, test OTDR from both directions and average the event loss to reduce backscatter mismatch effects.
5. Save traces/results with traceable file names and link them to the work record.




same splice measured A→Z and Z→A

True event loss may require **bidirectional averaging**

## Minimum splice record

| Record item | What to capture |
|---|---|
| Work identity | Ticket/work order, site/building/room, date/time, technician, cable A/Z IDs. |
| Fiber identity | Buffer tube, ribbon number, fiber number/color/position, tray and sleeve position. |
| Equipment | Splicer model/asset, splice mode, cleaver/tool set, maintenance or arc-check status if required. |
| Splice result | Estimated loss, warnings/remakes, proof-test status, count completed. |
| Optical result | Method, wavelength(s), direction(s), measured result, limit, pass/fail, trace/result file. |
| Physical closeout | Sleeves secure, routing/bend radius acceptable, tray closed, enclosure sealed/grounded as applicable, area clean. |

## Ready-to-use English ticket note

**Fusion splicing completed for [cable/ribbon/fiber range] at [location].** Fiber identification and A/Z orientation were verified against the approved splice plan. Fibers were stripped, cleaned, cleaved, fused, protected, and routed in the assigned tray. [Count] splices completed; [count] remade. Final testing at [wavelength/method] measured [result] against a limit of [limit]: [PASS/FAIL]. Test files/photos are attached under [reference]. No remaining physical blockers / Remaining issue: [issue and owner].

> **Never guess a field.** If a test, direction, limit, or attachment is not available, mark it pending and state the owner/action instead of presenting an assumed result.

# 12. Field checklists and references

## Start-work checklist

- ☐ Approved MOP/work package and splice matrix available
- ☐ Cable, tube, ribbon, fiber, A/Z, and tray verified
- ☐ Optical state made safe by approved method
- ☐ Safety glasses and shard container in place
- ☐ Clean, stable work area established
- ☐ Correct splicer, holders, stripper, cleaver, sleeves
- ☐ Machine maintenance and required arc check complete
- ☐ Correct fiber type, count, splice mode, heater mode

## Per-splice checklist

- ☐ Sleeve installed before preparation
- ☐ Strip without nicking or twisting
- ☐ Clean with fresh lint-free wipe
- ☐ Cleave acceptable; scrap contained
- ☐ Prepared end touches nothing
- ☐ Fiber/holder seated without side load
- ☐ Screen and warnings reviewed
- ☐ Result meets controlled acceptance criteria
- ☐ Sleeve centered, heated, cooled, routed

## Closeout checklist

- ☐ Splice count and IDs reconciled
- ☐ Tray routing and bend radius verified
- ☐ Sleeves secure; no pinched or twisted fibers
- ☐ Required optical tests complete
- ☐ Bidirectional results averaged when required
- ☐ Traces/results and photos saved
- ☐ Labels and electronic record complete
- ☐ Closure/enclosure finished per design
- ☐ All shards removed; work area clean
- ☐ Open blocker has owner and next action

### Shift handoff in one line

State exactly what was spliced, what passed, what remains, where evidence is stored, and who owns the next action.

## References


1. **The Fiber Optic Association (FOA), "Fusion Splicing."** Single-fiber and ribbon-fiber process, cleaving, machine operation, evaluation, protection, maintenance, and OTDR testing. thefoa.org/tech/ref/termination/fusion.html
2. **Sterlite Technologies, "Mass Fusion Splicing of Optical Fiber Ribbon."** Ribbon holders, thermal stripping, cleaning, ribbon cleaving, parameter selection, mass fusion, proof testing, sleeve protection, and bidirectional OTDR averaging. stl.tech/.../Mass-Fusion-Splicing.pdf
3. **Sterlite Technologies, "Safety Procedure - Optical Fibre Cable."** Optical-fiber handling, laser caution, sharp fiber ends, scrap control, and cable handling precautions. stl.tech/.../Safety_Procedure-Optical_Fibre_Cable.pdf


**Use note:** Product names, splice modes, tolerances, fiber-count settings, heater programs, and acceptance thresholds must come from the current approved project documents and equipment manuals.

This field guide is an independently prepared training/reference aid. It is not an official publication of Meta, ISG, Vantage, Turner, or any equipment manufacturer.