Swagelok Western New York

WHITE PAPER | INDUSTRIAL FLUID SYSTEMS

Fluid System Assembly Method Cost Comparison

Brazed Copper/Brass • Swagelok Brass • Swagelok 316 Stainless Steel Tube Fittings

Representative system: 100 ft. of tube, 40 fittings, evaluated in 1/4 in., 3/8 in., and 1/2 in. tube sizes

1. Executive Summary

This proposal compares the installed cost of assembling a fluid distribution system using three methods: brazed copper/brass fittings, genuine Swagelok compression-style brass tube fittings, and genuine Swagelok compression-style 316 stainless steel tube fittings, across three common tube sizes (1/4 in., 3/8 in.,1/2 in.). The comparison is built around a representative system scope of 100 ft. of tube and 40 fittings (elbows, tees, unions, and crosses).

Across all three sizes, the mechanical fitting approach (genuine Swagelok brass or stainless steel tube fittings) shows a lower total installed cost than brazing, even though the fittings themselves cost more per piece. The reason is labor; brazing requires a certified brazer, longer per-joint cycle time (cleaning, fluxing, heating, cooling), and fire watch, while Swagelok joints are made by a trained technician in a fraction of the time with a simple gap-inspection check. The stainless steel Swagelok option costs more than the brass Swagelok option due to material and fitting cost, but is still competitive with, or less expensive than brazing.

About These Estimates

These figures are planning-level estimates built from representative market pricing and typical labor rates, not a formal quote.

2. Scope and Basis of Estimate

System Scope

- Tube length: 100 ft., evaluated separately at 1/4 in., 3/8 in., and 1/2 in. OD
- Fittings: 40 total (blended mix of unions, elbows, tees, and crosses)
- Estimated joints to fabricate and leak-test: 92 (assumes an average of 2.3 tube-end connections per fitting to account for branch fittings)
- Three assembly methods, each priced independently for all three sizes:
    - Brazed brass — copper/brass wrot fittings joined with silver-braze alloy
    - Genuine Swagelok two-ferrule compression fittings, brass body
    - Genuine Swagelok two-ferrule compression fittings, 316 stainless steel body, with 316 stainless steel tube

Cost Components Included

- Tube material (copper or 316 stainless steel, per foot)
- Fitting material (per piece, blended average across fitting types)
- Consumables — braze rod, flux, and fuel gas for brazing; cutting wheel for Swagelok
- Fabrication and assembly labor, at a fully loaded shop rate
- Quality control (QC) and leak-test labor for every joint
- One-time tooling and capital (torch set and fixtures for brazing; tube cutter, deburring tool, and gap-inspection gauge, for Swagelok)
- Rework/scrap contingency, applied as a percentage reflecting each method's typical first-pass yield

Key Assumptions

- Certified brazer labor rate: $65/hr.; Swagelok assembly technician: $55/hr. (fully loaded — adjust to your local/union rates)
- Brazing cycle time: 15 to 22 min/joint depending on size; Swagelok assembly time: 5 to 7 min/joint
- Rework/scrap contingency: 6% for brazing (heat-affected defects, flux entrapment, burn-through)[1] vs. 1.5% for Swagelok (gap-inspection catches)
- Tooling is charged in full to this single job, which is conservative — Swagelok and brazing tooling are both reusable across future jobs, so the real per-job tooling burden falls as volume increases
- Pricing does not include engineering, design, permitting, freight, or site-specific labor premiums (confined space, overtime, prevailing wage, etc.)

3. Cost Comparison Results

Total Installed Cost by Method and Size

Figures below represent the full 100 ft., 40-fitting system.

Tube Size	Brazed Brass	Swagelok — Brass	Swagelok — 316 SS
1/4 in.	$3077	$1593	$2199
3/8 in.	$3654	$1996	$2825
1/2 in.	$4420	$2490	$3672

Cost per Installed Foot

Normalizing for length makes it easy to scale the estimate to a longer or shorter run.

Tube Size	Brazed Brass	Swagelok — Brass	Swagelok — 316 SS
1/4 in.	$30.77/ft.	$15.93/ft.	$21.99/ft.
3/8 in.	$36.54/ft.	$19.96/ft.	$28.25/ft.
1/2 in.	$44.20/ft.	$24.90/ft.	$36.72/ft.

Where the Cost Comes From (1/4 in. example)

Swagelok fittings cost more to buy but far less to install. The labor and QC lines, not material, are what separate the three methods.

Cost Component (1/4 in. example)	Brazed Brass	Swagelok Brass	Swagelok SS
Tube material (100 ft.)	$250	$250	$450
Fittings (40 ea.)	$100	$280	$680
Consumables (92 joints)	$110	$7	$23
Fabrication / assembly labor	$1495	$422	$422
QC / leak-test labor (8 minutes/joint brazing vs 3 minutes/joint Swagelok)	$797	$253	$253
Tooling (one-time)	$750	$350	$350
Rework/scrap contingency	$174	$16	$22
TOTAL	$3077	$1577	$2199

4. Qualitative Comparison

Installed cost is only part of the decision. The table below compares each method across various assembly and system factors.

Factor	Brazed Brass	Swagelok Brass	Swagelok 316 SS
Installer skill required	Certified brazer	Trained technician	Trained technician
Install speed	Slowest	Fastest	Fastest
Rework/serviceability	Cut and re-braze	Loosen and remake	Loosen and remake
Vibration fatigue resistance	Good	Excellent	Excellent
Corrosion resistance	Fair (dezincification risk)	Fair (dezincification risk)	Excellent
Pressure/temp rating	Moderate	Moderate	Highest
Typical best fit	Fixed, permanent runs	General shop air/fluid, cost-sensitive	Process, corrosive media, high spec

5. Discussion

Brazing typically wins on raw fitting cost and is a proven, permanent joining method well suited to fixed runs where the system will rarely be modified or serviced. Its drawbacks in this comparison are labor time, the need for a certified brazer, and a higher rework allowance driven by the sensitivity of braze quality to joint prep, gap, and heat control.

Genuine Swagelok tube fittings cost more per piece but are quicker to install, require less specialized labor, and can be disassembled and remade during commissioning, troubleshooting, or maintenance without cutting the tube. That serviceability advantage is not quantified in the cost tables above but is often decisive for systems that will be modified, calibrated, or serviced over their life (instrumentation, sample systems, analytical skids).

Stainless steel is the appropriate choice when the fluid or environment would corrode brass, and when higher pressure/temperature ratings are needed. Where brass is acceptable, brass Swagelok fittings are the lowest-installed-cost option in every size evaluated here.

6. Recommendation

- If brass is chemically acceptable and the system will require future service or modification: Swagelok brass tube fittings offer the lowest total installed cost in this comparison.
- If the application involves corrosive fluids, higher pressure/temperature, or a spec calling for stainless wetted parts: Swagelok 316 stainless steel is the recommended path — still faster and less labor-intensive to install than brazing, at a moderate material premium.
- Brazed brass remains a reasonable choice for permanent, low-modification runs where minimizing piece cost is the priority and a certified brazer is already on staff or included in the labor rate.

7. Next Steps

- Confirm current fitting and tube pricing with Swagelok Western New York— the figures here are planning-level market estimates, not quotes.
- Validate labor rates and per-joint cycle times against your own shop or field crew.
- If code compliance (e.g., ASME B31.3, local mechanical code) governs the installation, confirm brazer certification and/or fitting approval requirements before finalizing method selection.

References:
1 – Estimating allowance based on field observations of inexperience vs. experienced brazers

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