Field Installation Guide

Aerogel Insulation · Pipe Fittings

All pipe sizes 2” through 30” NPS · Cryogel Z · Pyrogel XTE

DOCUMENT	CBS-FIG-AERO-01 · Revision 1.1
APPLIES TO	CB Solutionz pre-fabricated aerogel insulation kits — all pipe fittings 2”–30” NPS
STANDARDS	CBS-SEG-001 · CBS-FIT-001 · ASME B36.10M · ASME B16.9 · OSHA 29 CFR 1910.1053
CONTACT	(855) 722-7658 · support@cbsolutionz.com · cbsolutionz.com

ZERO FIELD CUTTING REQUIRED. Every piece arrives pre-fabricated to exact specification. Do NOT cut, trim, or modify any piece. Install exactly as supplied. Patent Pending USPTO May 2026.

1. About This Guide

This guide covers field installation of CB Solutionz pre-fabricated aerogel insulation kits for pipe elbow fittings. All kits are fabricated off-site at our Houston TX CNC facility using Aspen Aerogel Cryogel Z and Pyrogel XTE materials. Every piece is precision-cut using CBS-SEG-001 segment geometry and CBS-FIT-001 fit clearance standards. Zero field cutting is required or permitted. This guide applies to all pipe sizes 2” through 30” NPS.

Read the Key Terms below before opening any kit. If you have not installed CB Solutionz lobster-tail aerogel elbows before, also read Sections 4–6 fully before placing the first piece. Most install errors happen in Step 2 (positioning the first piece) and are unfixable once tape is applied.

2. Key Terms — Read First

Elbow — A curved pipe fitting that changes direction by 90° or 45°. The CB Solutionz kit wraps the elbow with multiple insulation pieces stacked around the curve.

Extrados — The *outside* of the curve (the long side, farthest from the pipe centerline). All longitudinal seams close here.

Intrados — The *inside* of the curve (the short side, closest to the pipe centerline). Never place seams here.

Apex — The outermost point of the elbow’s bend — the middle of the extrados. Mark this with paint before starting (see Step 1).

Starter piece — An end piece. Has *one straight edge* (the end that meets the straight pipe) and *one curved edge* (the end that meets the next piece). One starter goes at each end of the elbow.

Full wrap piece — A middle piece. Has *curved edges on both ends*. Full wraps fill the space between the two starters.

Longitudinal seam — The lengthwise seam on each individual piece, where the two long edges meet after you wrap the piece around the pipe. Runs parallel to the pipe.

Circumferential joint — The curved joint *between two adjacent pieces*. Runs around the pipe, not along it.

Butt joint — Any joint where two edges meet flush without overlap. In this guide, both the longitudinal seam and the circumferential joint are butt joints.

NPS — Nominal Pipe Size. The pipe’s nominal diameter in inches (4” NPS, 6” NPS, etc.). Match the kit label to the pipe.

LR / **SR** — Long Radius / Short Radius elbow. LR has centerline radius = 1.5 × NPS; SR has centerline radius =

1.0 × NPS. The kit label specifies which.

3. Tools and Materials Required

- ✓ Aluminum foil tape — 2” minimum width
- ✓ Wire ties or temporary holding straps
- ✓ White paint marker — for apex marking
- ✓ QR scanner — phone camera works
- ✓ CB Solutionz IsoKit app — for QR lookup
- ✓ Safety glasses
- ✓ Nitrile gloves
- ✓ N95 respirator — precautionary
- ✓ Clean dry rags for pipe surface prep
- ✓ Pipe insulation knife — for foil tape only

Note: Stainless steel banding is applied to outer cladding only — not to aerogel.

4. Pre-Installation Checklist

Complete every item before placing the first piece. If any item fails, stop and contact support.

- ☐ **Verify pipe size** — Measure the pipe OD and confirm it matches the NPS on the kit label. A 4” kit will NOT fit a 6” pipe.
- ☐ **Verify fitting type** — Confirm LR or SR, and 90° or 45°, matches the kit label and the actual elbow on the pipe.
- ☐ **Scan QR code** — Scan one piece. Confirm job number, line number, and layer match the work order.
- ☐ **Count and sort pieces** — Lay all pieces flat. Identify the two starter pieces (one straight edge each) and the full wrap pieces (curved on both ends). The total piece count is printed on the bag label.
- ☐ **Inspect for damage** — Reject any piece that is torn, crushed, or shows moisture marks. Contact support for a replacement before continuing.
- ☐ **Check pipe surface** — Pipe must be clean, dry, and free of scale, corrosion, oil, weld slag, or wet insulation. Wipe with a clean dry rag.
- ☐ **Check temperature** — Pipe must be at or near ambient temperature during installation. Do not install on a hot or cold pipe; let it stabilize first.
- ☐ **Confirm flow direction** — Identify the INLET end (flow in) and OUTLET end (flow out) before placing any piece.
- ☐ **Layer color check** — Layer 1 = Yellow · Layer 2 = Blue · Layer 3 = Green · Layer 4 = Red. If multi-layer, complete each layer fully before starting the next.
- ☐ **OSHA confirmed** — Zero field cutting; OSHA 29 CFR 1910.1053 silica compliance is pre-certified for this kit.

5. Installation Procedure — Elbow Fittings

Applies to 90°LR, 90°SR, 45°LR, and 45°SR elbows.

Step 1 — Mark the apex on the pipe

Find the outermost point of the elbow’s bend — this is the apex. On a 90° elbow, the apex is at the 45° midpoint of the curve, on the side farthest from the pipe centerline. Mark a small dot on the bare metal with paint marker. **Every longitudinal seam will line up directly above this mark.** Do not skip this step — it is the reference for every piece that follows.

Step 2 — Place the inlet STARTER piece

The inlet starter is the piece whose straight edge will meet the straight pipe at the inlet side. **This end piece will extend 2” to 3” onto the straight pipe beyond the weld, depending on pipe size.**

Wrap the starter around the pipe so that:

- The straight edge sits flush against the straight pipe insulation at the inlet end.
- The curved edge points toward the outlet (toward the next piece).
- The two long edges come together to form the longitudinal seam directly over the apex paint mark.

Hold the piece closed with a temporary wire tie around the middle. The wire tie should be snug enough to hold position — not tight enough to compress the aerogel. **If the piece does not close cleanly with the seam over the apex mark, rotate it before tightening. Do not force.**

Step 3 — Install FULL WRAP pieces in order

Working from the inlet toward the outlet, place each full wrap piece one at a time. For each piece:

- Wrap it around the pipe.
- Rotate the piece so its longitudinal seam lines up directly over the apex mark, in a straight line with the previous piece's seam.
- Slide the piece up against the previous piece. The curved edges should meet flush — no gap visible, no overlap.
- Hold with a temporary wire tie before placing the next piece.

Critical: All longitudinal seams must form a single straight line down the extrados of the elbow. If a seam falls anywhere else, that piece is rotated wrong — loosen the wire tie, re-rotate, and re-tighten.

Step 4 — Place the outlet STARTER piece

The outlet starter is the second piece with one straight edge. **This end piece will also extend 2" to 3" onto the straight pipe beyond the weld, depending on pipe size.** Place it at the outlet end with:

- The straight edge against the straight pipe insulation at the outlet.
- The curved edge butted flush against the previous full wrap piece.
- The longitudinal seam aligned with all other seams over the apex mark.

Hold with a temporary wire tie. All pieces are now in place.

Step 5 — Verify alignment before taping

Before applying any tape, walk around the elbow and visually check:

- All longitudinal seams form one straight line down the extrados.
- No circumferential joint shows a gap or overlap larger than 1/16".
- Both starter pieces sit flush against the straight pipe insulation at inlet and outlet.
- No piece is upside-down (starter pieces only go at the ends).

If anything is off, fix it now. **Tape is the final step — once taped, repositioning damages the aerogel.**

Step 6 — Apply foil tape

Apply 2" aluminum foil tape in this order:

1. Over each circumferential joint (between adjacent pieces), running tape around the full circumference of the pipe.
2. Down the full length of the longitudinal seam line on the extrados.
3. At the inlet and outlet ends, overlapping onto the adjacent straight pipe insulation by at least 2".

Press tape firmly. No loose edges, no air pockets, no exposed aerogel.

Step 7 — Final inspection

- All seams sealed, no exposed aerogel.
- Scan one QR code to confirm correct kit installed at correct location.
- Remove all temporary wire ties.
- Photograph the finished elbow with the job tag visible. Log piece numbers and layer for QA records.

6. Multi-Layer Installation

When a kit contains multiple layers, complete the entire previous layer (all pieces installed, all tape applied, final inspection passed) before opening the next layer's bag.

Layer order: Layer 1 (Yellow) goes against the pipe first. Layer 2 (Blue) wraps over Layer 1. Layer 3 (Green) wraps over Layer 2. Layer 4 (Red) wraps over Layer 3.

Critical: Each layer is dimensioned for the layer beneath it. Do not skip a layer. Do not mix layers (e.g., do not install Layer 2 pieces under Layer 1). The layer color is printed on every QR label — check before opening.

Seam orientation between layers: Rotate Layer 2 so its apex seam line is 90° offset from Layer 1's (i.e., on the side of the elbow rather than directly on top). This prevents thermal short paths through aligned seams. Layer 3 returns to top. Layer 4 returns to side. This is called *staggered seam orientation*.

7. Troubleshooting — Common Field Problems

Pieces don't butt cleanly — gap on one side, overlap on the other.
The unplaced piece is rotated wrong relative to the previous piece. Loosen the wire tie on the unplaced piece, rotate it 5–15° in the direction that closes the gap, and re-seat. The longitudinal seams must line up; if they don't, the curves on the circumferential joint won't mate.

First piece won't close with the seam over the apex mark.
Check that you have a starter piece (one straight edge) and not a full wrap. If correct, the pipe OD may be slightly oversized due to scale or out-of-round; clean the pipe surface again and retry. Do not force the seam closed by stretching — aerogel that is stretched at install will gap open in service.

Wire tie compresses the insulation more than 1/8".
Tie is too tight. Loosen until the tie just contacts the surface without indenting. Compressed aerogel loses insulation value permanently.

Visible gap (over 1/16") between two adjacent pieces.
Rotational misalignment between pieces. Loosen and re-rotate both adjacent pieces so seams line up over the apex mark. If the gap persists after re-rotation, a piece may be incorrectly labeled — scan both QR codes and verify they belong to this kit and this position.

Piece appears too short or too long.
Verify the kit is for the correct pipe size and elbow type (LR vs. SR, 90° vs. 45°). A LR piece will not fit an SR elbow. Scan the QR. **Do not cut to fit** — contact support for a corrected piece.

End piece extends 2" to 3" past weld.
This is correct and by design. The starter (end) pieces are dimensioned to extend 2" to 3" onto the straight pipe beyond the weld, depending on pipe size — ensuring full coverage of the heat-affected zone and a clean transition to the adjacent straight-pipe insulation. Do not trim the overhang.

QR code won't scan.
Wipe the label with a dry rag and try again in better lighting. If it still won't scan, the kit can still be installed as long as the bag label, work order, pipe size, and piece count all agree — but log the scan failure and call support after the install for kit traceability.

Kit is missing a piece.
Stop. Do not partially install. Contact support with the kit lot number and the missing piece number. A single missing piece means the elbow cannot be completed — partial installs trap moisture and fail in service.

Piece is damaged (torn, crushed, wet).
Set aside. Do not install. Contact support for a replacement piece. Photograph the damage with the QR label visible for the warranty claim.

Tape won't stick.
Pipe or insulation surface is too cold or has moisture. Wipe dry and warm the surface to above 50°F before retaping. Aluminum foil tape requires a dry, clean surface above 50°F to bond.

Stop work and call support immediately if: the kit is missing pieces, two or more pieces are damaged, the pipe size doesn't match the kit label, you find evidence of wet or contaminated aerogel inside the bag, or any piece fails to fit after correct orientation has been verified. **Do not field-cut to compensate.** Support: (855) 722-7658.

8. Quality Checkpoints

Seam location — All longitudinal seams on the extrados, aligned over the apex mark. Never on the intrados.

Joint quality — Circumferential joints butt flush. Gaps over 1/16" must be corrected before taping.

Tape coverage — 100% on every circumferential joint, every longitudinal seam, and at both end transitions. No exposed aerogel anywhere.

Compression — No piece compressed by wire ties or hand pressure beyond 1/8". Aerogel loses thermal value when crushed.

No field modifications — No piece cut, trimmed, stretched, folded, or modified. If a piece does not fit, contact support; do not adapt.

Cladding — Stainless steel banding and metal jacketing applied to the outer cladding layer only, never to the aerogel.

Traceability — One QR code scanned and logged per installation. Photograph the finished elbow with job tag visible.

9. Piece Count Reference — 90° LR Elbow — Cryogel Z 10mm

Use this table to verify the piece count on your kit label matches the standard for that pipe size. Dimensions in inches. CBS-FIT-001 clearance 0.50mm. CBS-SEG-001 segment standard.

NPS	Pipe OD	Insul OD	Cut Length	CR	Seg Angle	Segs	Total Pcs
2"	2.3752"	3.1823"	9.997"	3.000"	22.5000°	2	4
2.5"	2.8752"	3.6823"	11.568"	3.750"	22.5000°	2	4
3"	3.5000"	4.3071"	13.531"	4.500"	22.5000°	2	4
3.5"	4.0000"	4.8071"	15.102"	5.250"	22.5000°	2	4
4"	4.5000"	5.3071"	16.673"	6.000"	22.5000°	2	4
5"	5.5630"	6.3701"	20.012"	7.500"	22.5000°	2	4
6"	6.6252"	7.4323"	23.349"	9.000"	18.0000°	3	5
8"	8.6252"	9.4323"	29.632"	12.000"	15.0000°	4	6
10"	10.7500"	11.5571"	36.308"	15.000"	12.8571°	5	7
12"	12.7500"	13.5571"	42.591"	18.000"	12.8571°	5	7
14"	14.0000"	14.8071"	46.518"	21.000"	11.2500°	6	8
16"	16.0000"	16.8071"	52.801"	24.000"	10.0000°	7	9
18"	18.0000"	18.8071"	59.084"	27.000"	9.0000°	8	10
20"	20.0000"	20.8071"	65.367"	30.000"	9.0000°	8	10
24"	24.0000"	24.8071"	77.934"	36.000"	7.5000°	10	12
30"	30.0000"	30.8071"	96.783"	45.000"	6.0000°	13	15

10. OSHA 29 CFR 1910.1053 Compliance

All aerogel insulation pieces supplied by CB Solutionz are fabricated entirely off-site at our Houston TX CNC facility. The installing contractor does not perform or require any field cutting. Because no field cutting is required, the cutting step that generates the most respirable silica dust is eliminated from the job site. This helps contractors reduce silica exposure and the compliance burden under the OSHA 29 CFR 1910.1053 Respirable Crystalline Silica Standard. Compliance documentation is included with every kit.

Technical Support
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Before calling: try the matching item in Section 7 (Troubleshooting) first. Have the kit lot number, piece number, and a photo ready when you call.