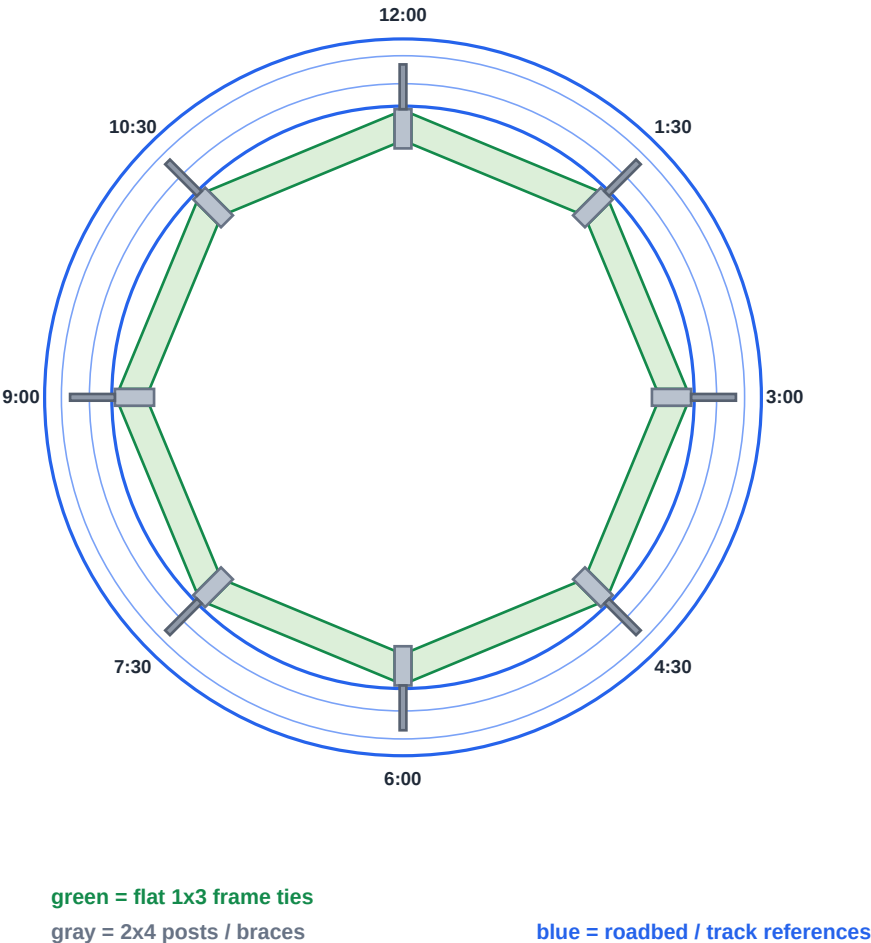


HELIX CONSTRUCTION PLAN - LOCKED BUILD VERSION

Flat 1x3 top/bottom frames, 4x4 steel braces, entry seam, extra loop, and verified 15-piece roadbed cut set.



LOCKED BUILD GEOMETRY

Track center radii: 28.000 / 30.500 in

Roadbed radii: 26.000 / 31.750 in

Helix roadbed: 3/4 in plywood; no cork

Pitch: 4.000 in / 360 deg

Posts: 8 x 2x4, 18.750 in tall; 45 deg stations; 3.5 radial x 1.5 tangential

Flat 1x3 frame ties: 18.000 in OUTSIDE/LONG edge

Short/inside edge: 15.929 in; 22.5 deg mirrored end cuts

Required frames: lower + upper; optional middle flat frame

Derived post-center radius: 23.976 in (from 18.000 in ties)

Curved path: 1335 deg total = 45 entry + 1290 after 6:00

After 6:00: 1290 deg = 1260 regular + 30 final

Exit straight: 20-15/16 in

Regular bracket grid: 29 supports through 1260 deg

Roadbed blanks: 15 standard blanks; P1/P15 trimmed

KEY DATUMS

Benchwork datum: existing approach plywood top = -15.000 in; profile uses normalized railhead elevations.

Structural datum: 0.000 in = underside of helix plywood at 6:00.

Normal overlap clearance: ~3.090 in nominal with ~0.160 in overall track height; verify actual track.

Post outer-face radius: 25.726 in; corner radius: 25.737 in.

Corner clearance to 26 in opening: 0.263 in.

Exit straight + following D01-underpass curve = cork/elevation easing zone.

Post A = 6:00 entry support; B-H continue every 45 deg.

DATUM CAUTION

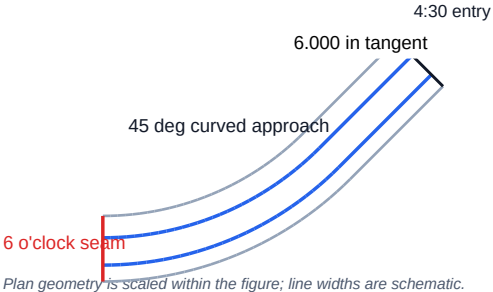
"Benchwork datum" (-15.000 in) and "Structural datum" (0.000 in) are two different zero points, not the same measurement. Benchwork datum is the existing layout's coordinate system (entry/exit railhead elevations).

Structural datum restarts fresh at 0.000 in at the new helix plywood underside, for post heights and bracket elevations only. Before cutting the 18.750 in posts, physically mark the real -15.000 in reference point on the benchwork.

ENTRY / EASEMENT GEOMETRY

Plan and profile are separated so the 6 in tangent, 45 deg curve, corked approach, and 6 o'clock seam are not confused.

PLAN VIEW - 4:30 TO 6 O'CLOCK



ENTRY CONSTRUCTION

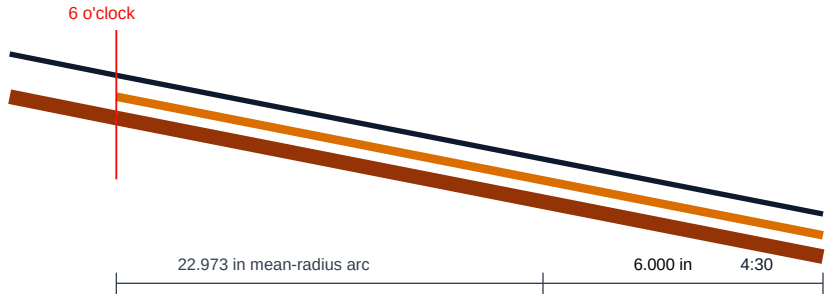
- Cookie-cut the existing 6.000 in straight and following 45 deg approach while preserving its track and full 6 mm cork.
- Raise that tongue on adjustable risers. At the 6 o'clock seam, align railheads with the new bare-plywood helix; do not force the two plywood tops flush.
- At the seam, the approach plywood top is 0.236 in below the helix plywood top because the approach still carries 6 mm cork.
- P1 is trimmed at its entry to the exact 6 o'clock radial seam; its normal 1.875 deg backward half-lap extension is NOT used here.
- The first brace is a special edge support: keep the entire 0.600 in strap on the helix side of the height step. Its leading edge may align with the seam; do not center it across the seam.

PLANNING VALUES TO 6 O'CLOCK

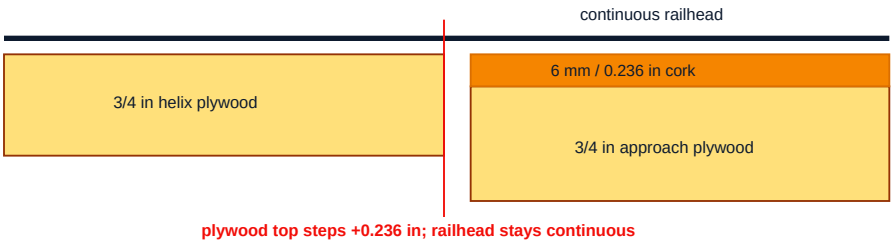
Mean planning grade	2.176%
6 in straight rise	0.131 in
45 deg mean arc length	22.973 in
45 deg rise	0.500 in
Total railhead rise	0.631 in
Mean path length	28.973 in

PROFILE ALONG TRACK

Profile: vertical rise is exaggerated; brown = plywood, orange = cork, black = railhead.



6 O'CLOCK LOCAL STACK



VERTICAL GEOMETRY, CLEARANCE, AND EXIT

The curved helix geometry is fixed; the exit straight is deliberately left as the vertical easing/cork-restoration zone.

HELIX GRADES

28 in inner track	2.274%
30.5 in outer track	2.087%
29.25 in planning radius	2.176%
Rise per 45 deg	0.500 in
Rise per full turn	4.000 in

OVERHEAD CLEARANCE

- Railhead-to-railhead pitch is 4.000 in throughout the overlapping helix.
- Clearance = 4.000 - 0.750 - Ttrack, where Ttrack is full bottom-of-tie-to-railhead height.
- Using nominal Atlas Code 83 overall height ~0.160 in gives ~3.090 in; measure actual track.
- The 0.080 in brace is recessed; verify no screw tip, washer, or hardware projects below.

RAILHEAD PROFILE - FIXED VS. FLEXIBLE

Normalized profile: lower corked benchwork = -15; upper corked benchwork = 0.
Physical railheads are both offset upward by the same 6 mm cork + full track height.

Point	Increment	Rise	Railhead
Start of 6 in entry	-	0.000	-15.000 in
6 o'clock after 6 in + 45 deg	+0.631	0.631	-14.369 in
End of 1290 deg new helix	+14.333	14.964	-0.036 in
End 20-15/16 in straight - reference*	+0.456	15.420	0.420 in

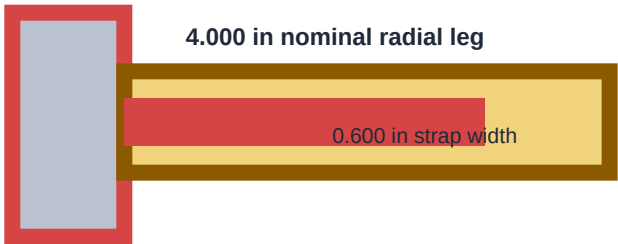
EXIT INTERPRETATION

Profile values use a normalized railhead datum tied to the conventional corked benchwork surfaces: lower benchwork = -15.000 in and upper benchwork = 0.000 in. Physical railheads are both offset upward by 6 mm cork plus the full track assembly height. Therefore the fixed curved geometry still finishes about -0.036 in below the downstream corked-track target. The +0.420 in straight-end value remains the reference case if the 20.94 in exit straight continued at the full 2.176% grade.

For the actual build, use the exit straight and following curve under D01 to ease the vertical profile and restore 6 mm cork. Do not change the 4 in/turn helix pitch to force an exact zero. For physical absolute elevations, measure the installed track bottom-of-tie-to-railhead height.

4 x 4 IN STEEL BRACE DETAIL

Selected Wideskall brace remains square to the post and radial; the 3/32 in pocket absorbs the tiny local helix twist.



SELECTED BRACE

Nominal size	4 x 4 in
Material	zinc-plated steel
Thickness	0.080 in / ~2.0 mm
Strap width	0.600 in - measured
Hole diameter	0.185 in - listing
Pack	20 - listing
Mounting	vertical leg UP; horizontal under roadbed
Orientation	square to post; radial to helix

ROUTER POCKET

- Route 3/32 in = 0.09375 in deep; nominal extra depth over 0.080 in steel is 0.01375 in.
- Across the 0.600 in strap, the 2.176% planning slope changes elevation only about 0.013 in.
- Make the pocket about 1/32 in wider on each side for alignment tolerance.
- At the 6:00 seam, keep the full strap on the helix side of the 0.236 in plywood step.

NOMINAL REACH / LOCKED FLAT-FRAME VERIFICATION

2x4 orientation: 3.5 in RADIAL x 1.5 in TANGENTIAL mounting face.

Derived post center radius: 23.976 in; outside brace face: 25.726 in.

Post outer-corner radius: 25.737 in; clearance to 26 in opening: 0.263 in.

Nominal 4 in brace tip radius: 29.726 in.

Outer track center is 0.774 in beyond tip; roadbed edge is 2.024 in beyond tip.

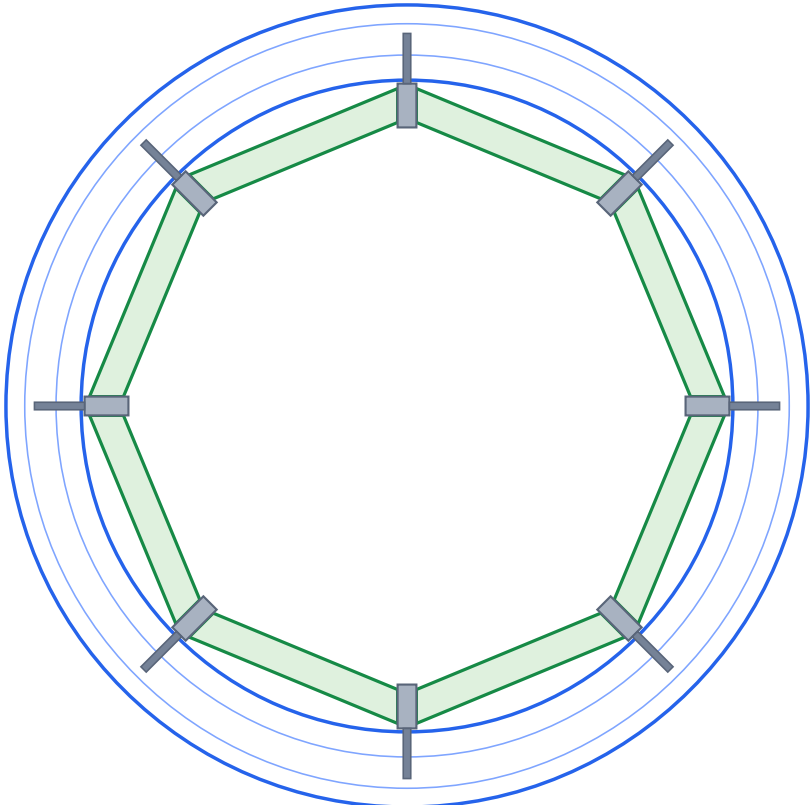
Bench-test one received brace/plywood assembly before batch routing.

Product: Wideskall 4 in Heavy Duty Corner Brace - ASIN B07P1XZ4Q1

Listing dimensions retained from prior plan: zinc-plated steel, 0.08 in thick, 0.185 in holes, pack of 20; selected strap width 0.600 in.

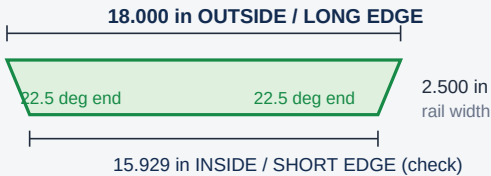
FLAT 1x3 FRAME - LOCKED SHOP PLAN

18.000 in outside/long edge controls the geometry; ties lie flat and center on the 3.5 in side faces of the radial 2x4 posts.



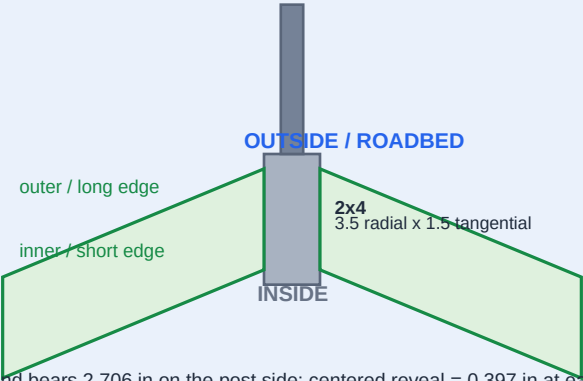
green = exact flat 1x3 trapezoids; gray = 2x4 posts / braces; blue = 26/31.75 in roadbed + track reference

SINGLE 1x3 TIE - PLAN / CUT DETAIL



Long and short edges are PARALLEL; only the two end faces are angled.

ONE POST - TOP VIEW (EXACT MEMBER SHAPE)



Each mitered end bears 2.706 in on the post side; centered reveal = 0.397 in at each radial edge. Bracket mounts on the outside 1.5 in face and projects radially outward.

CONTROLLING CUT LIST

Stock:	nominal 1x3; actual 0.750 x 2.500 in; laid FLAT
Required ties:	16 = 8 lower + 8 upper
Optional middle:	+8 ties (24 total)
Outside / long edge:	18.000 in EXACT - controlling dimension
Inside / short edge:	15.929 in - check only
End cuts:	22.5 deg both ends, mirrored
Fastening: glue + #0 biscuit recommended for alignment; screws/pocket screws optional.	

FIELD LAYOUT FROM EXISTING 26 IN CIRCLE

Post center radius (derived): 23.9758 in. Do not try to locate the hidden center in the field.

Practical post placement: set BOTH outside post corners about 1/4 in inside the 26 in line.
Exact outside-corner clearance = 0.263 in; outside face center = 0.274 in inside the circle.

At each rail midpoint (22.5 deg between posts), mark inward from the 26 in circle:

outer edge = 2-5/16 in rail centerline = 3-9/16 in inner edge = 4-13/16 in

Station check: 6:00-12:00 = 52.000 in; true 3:00/9:00 = 36.7696 in from both ends.

REGULAR BRACKET SUPPORT ELEVATIONS

Datum 0.000 in = helix plywood underside at 6 o'clock. After the special first edge support, the regular post grid remains every 45 deg / +0.500 in.

Post	Nominal angle	Support planes (in)	Count	Highest vertical-leg end
A	0 deg	0.0, 4.0, 8.0, 12.0	4	16.0 in
B	45 deg	0.5, 4.5, 8.5, 12.5	4	16.5 in
C	90 deg	1.0, 5.0, 9.0, 13.0	4	17.0 in
D	135 deg	1.5, 5.5, 9.5, 13.5	4	17.5 in
E	180 deg	2.0, 6.0, 10.0, 14.0	4	18.0 in
F	225 deg	2.5, 6.5, 10.5	3	14.5 in
G	270 deg	3.0, 7.0, 11.0	3	15.0 in
H	315 deg	3.5, 7.5, 11.5	3	15.5 in

FIRST SUPPORT + END OF GRID NOTES

At 6 o'clock, Post A is the nominal 0.000 in support location, but the 0.600 in-wide first brace must sit entirely on the helix side of the entry seam rather than straddling the 0.236 in plywood step. Set that first brace by the fitted roadbed; the offset is only about 0.3 in tangentially. Thereafter use the nominal table above. The regular grid ends at 1260 deg after 6 o'clock on Post E at +14.000 in. The helix continues another 30 deg to the curved exit, reaching +14.333 in relative to the 6 o'clock datum. Support that final partial arc and the exit straight independently after they clear the loop below.

CURVED ROADBED, HALF-LAPS, AND END-PIECE TRIMS

The verified 93.75 deg blank remains the standard routing profile; only P1 and P15 are trimmed for the non-lapped entry and partial exit.

STANDARD SECTION GEOMETRY

Inside / outside radius	26.000 / 31.750 in
Roadbed width	5.750 in
Physical blank angle	93.750 deg
Installed advance	90.000 deg
Extension per nominal end	1.875 deg
Adjacent overlap	3.750 deg
Overlap arc @ 28.875 in mean radius	1.890 in
Support spacing	45 deg

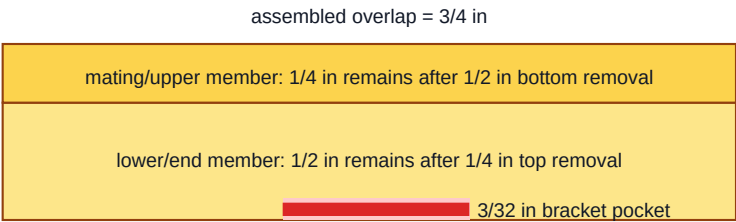
HALF-LAP MACHINING

- Within a normal overlap: lower/end member removes 1/4 in from the TOP, leaving 1/2 in; mating/upper member removes 1/2 in from the BOTTOM, leaving 1/4 in. Together they return to 3/4 in total thickness.
- At bracketed half-lap joints, route the 3/32 in brace pocket into the underside of the 1/2 in lower member. Remaining wood there is 0.40625 in.
- The nominal 90 deg joint/support line is centered within the 3.75 deg physical overlap.
- P1 ENTRY: trim away its 1.875 deg backward extension so the piece begins exactly at the 6 o'clock seam; this seam is a stepped butt/handoff, not a half-lap.
- P15 EXIT: retain its 1.875 deg entry extension to lap P14, then trim the far end at the final ~30 deg exit line after dry fit.

BLANK CHECKS - TAPE MEASURE (corner to corner)

Inside chord, 26 in corners (93.75 deg)	37.953 in (37-15/16 in)
Outside chord, 31.75 / 32 in corners	46.346 / 46.711 in
Diagonals, 31.75 / 32 in outside (equal)	42.333 / 42.530 in
Nominal 90 deg marks: in from end, inside edge	0.851 in
Inside chord between nominal 90 deg marks	36.770 in
Lap length along 26 in edge / 31.75 in edge	1.701 in / 2.078 in
Inside chord is independent of outside radius. 1/32 in on the inside chord = ~0.1 deg.	

NORMAL OVERLAP - SECTION THROUGH LAP



VERIFIED ROUTER-FRIENDLY CUT SET

- Cut 15 standard blanks from 3/4 in plywood: P1-P10 on Sheet 1 and P11-P15 on Sheet 2.
- After routing, trim P1 at its entry seam and P15 at the final partial exit. Do not alter the verified nested profiles before they are cut.
- 48 x 96 in sheets; 0.750 in verified minimum clear waste strip between finished profiles.
- 10-piece center advance: 8.611136 in 10-piece group span: 91.476821 in
- Use the companion SVG/DXF files for full-scale routing/CNC geometry. The appendix reproduces the verified sheet layouts with the legacy turn-count note corrected for this build.

WIDER BLANK OPTIONS (26 in inside radius, 0.750 in min gap)

Width / Ro	Center adv.	10-pc span	Side margin	Top/btm	Per 96 in
5.75 / 31.75	8.611 in	91.477 in	2.262 in	0.827 in	10
6.00 / 32.00	8.918 in	94.493 in	0.754 in	0.644 in	10
6.50 / 32.50	9.530 in	100.49 in	2.52 in (9 pc)	0.279 in	9
6.5 in: only 9 per sheet; 15 blanks still fit on 2 sheets (9 + 6).					

BUILD SEQUENCE / PRE-CUT AND PRE-TRACK CHECKS

Use this order so the locked flat frame, entry seam, brace fit, and final exit are verified before permanent track installation.

1

1. Cut the flat 1x3 frame ties

Cut 16 required ties with an 18.000 in outside/long edge and mirrored 22.5 deg ends. Short edge is 15.929 in (check only). Cut 8 more only if using the optional middle frame.

2

2. Prepare the eight posts

Cut 8 x 2x4 uprights to 18.750 in. Orient every post 3.5 in RADIAL x 1.5 in TANGENTIAL. With post bottoms at the -15.000 in benchwork datum, 1/2 in D01 plywood on top places the D01 plywood surface at +4.250 in. Mark each 3.5 in side-face center at 1.750 in.

3

3. Assemble the lower and upper flat frames

Lay the 1x3s flat. Center the 2.706 in mitered end contact on each 3.5 in post side. Lower frame occupies 0-0.75 in; upper frame 18.00-18.75 in. Optional middle frame centers at 9.375 in.

4

4. Place / verify the frame against the existing 26 in circle

At each 45 deg station, set BOTH outside corners of the 2x4 about 1/4 in inside the 26 in circle (exact corner clearance 0.263 in). At rail midpoints, check outer edge 2-5/16 in, centerline 3-9/16 in, inner edge 4-13/16 in inward from the 26 in circle.

5

5. Establish / verify the eight 45 deg stations

If 6:00 and 12:00 are known, verify 52.000 in between them. A true 3:00/9:00 point is 36.7696 in from both ends. Use 45 deg / 22.5 deg layout lines for intermediate stations; adjacent 45 deg points on the 26 in circle are 19.8995 in apart.

6

6. Cookie-cut the entry

Free the 6 in straight and 45 deg approach while preserving track and 6 mm cork. Add adjustable risers below the tongue.

7

7. Dry-fit the 6:00 handoff

Trim P1 to the seam. Set the first bare 3/4 in helix roadbed at structural datum 0. Raise the approach until railheads align, preserving the 0.236 in plywood-top step.

8

8. Test one bracket assembly

Bench-test one actual 4x4 brace with a 3/32 in pocket and representative 3/4 in plywood load before batch-routing.

9

9. Route pockets and install braces

Use flat 3/32 in pockets. At the first seam, keep the brace fully on the helix side. Thereafter follow the 45 deg / +0.500 in grid; keep every brace square and radial.

10

10. Assemble the roadbed spiral

Use verified P1-P15 blanks and normal half-laps. Check 26/31.75 in radii and 4.000 in railhead pitch continuously. P1 entry and P15 exit are the only planned trims.

11

11. Fit the final 30 deg and exit

The regular post grid stops at 1260 deg after 6:00. Independently support the last 30 deg and the 20-15/16 in exit straight once they clear the loop below.

12

12. Restore cork and tie into D02

Use the exit straight plus the following curve under D01 to ease the profile and reintroduce 6 mm cork. Do not alter the 4 in/turn helix pitch. Dry-fit the 1/2 in D01 deck over this easing zone before permanent attachment.

FINAL CHECK BEFORE TRACK

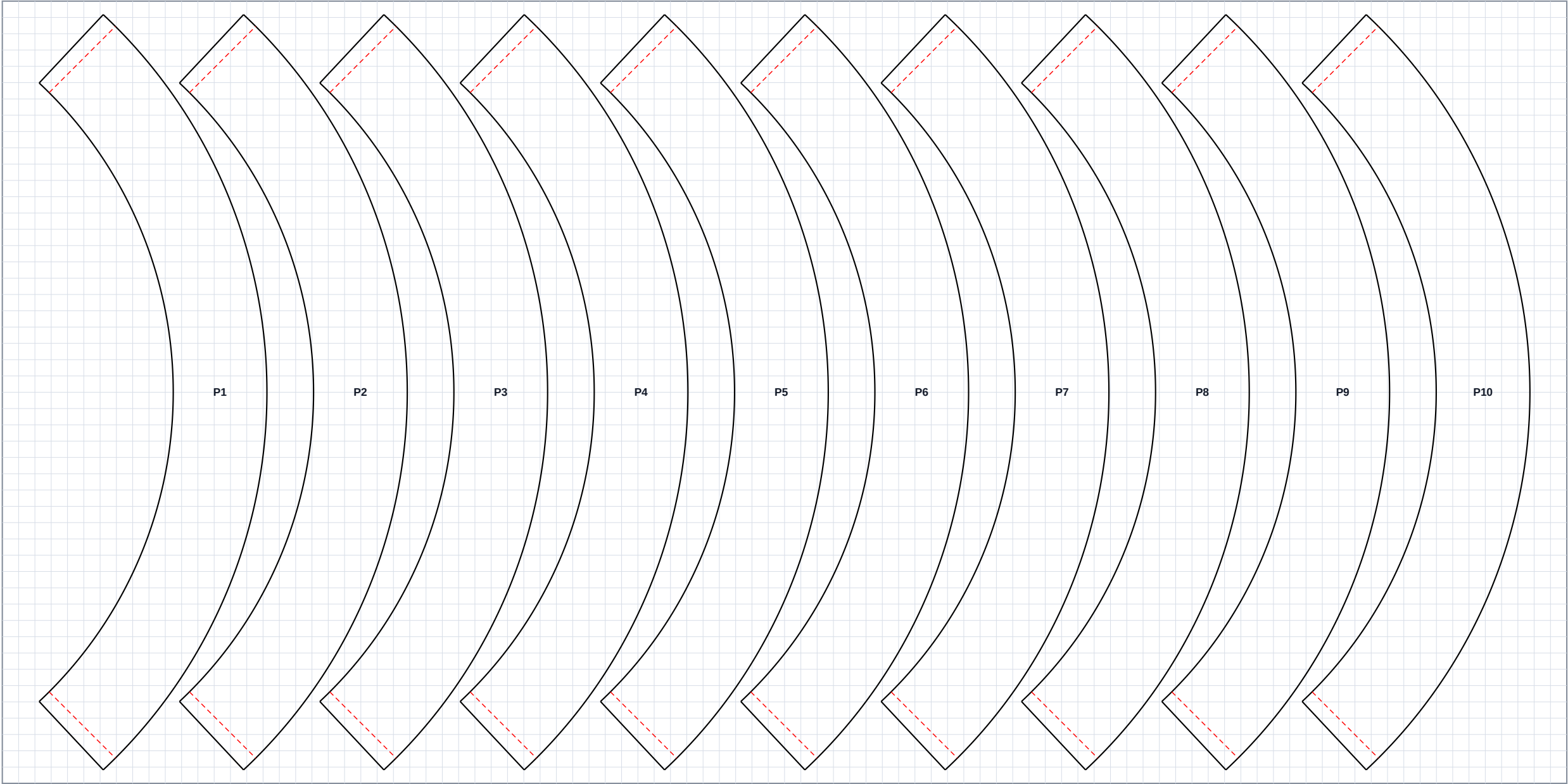
Confirm -3.090 in nominal overhead clearance using measured overall track height, no protruding hardware, smooth transitions, half-lap seating, frame clearance, and D01/D02 clearance.

VERIFIED ROUTER CUT SHEET - SHEET 1 - 10 SECTIONS

THIS BUILD: cut P1-P10 on this sheet. P1 will be trimmed at the 6 o'clock entry seam after routing.

3/4 in plywood | 26 / 31.75 in radii | 93.75 deg physical / 90 deg installed | deliberate 0.750 in minimum separation

48.000 in



96.000 in

CUT GEOMETRY

Ri 26.000 in / Ro 31.750 in

Roadbed width 5.750 in

Physical section 93.750 deg

Installed advance 90.000 deg

End extension 1.875 deg

Actual mating overlap 3.750 deg

ROUTER NESTING

Pieces on this sheet: 10

Center advance: 8.611136 in

Min profile separation: 0.750 in

Group span: 91.477 in

Left/right margin: 2.262 in

Top/bottom margin: 0.827 in

BLACK = physical cut profile

RED DASH = nominal 90 deg joint

3/4 in waste strip is intentional.

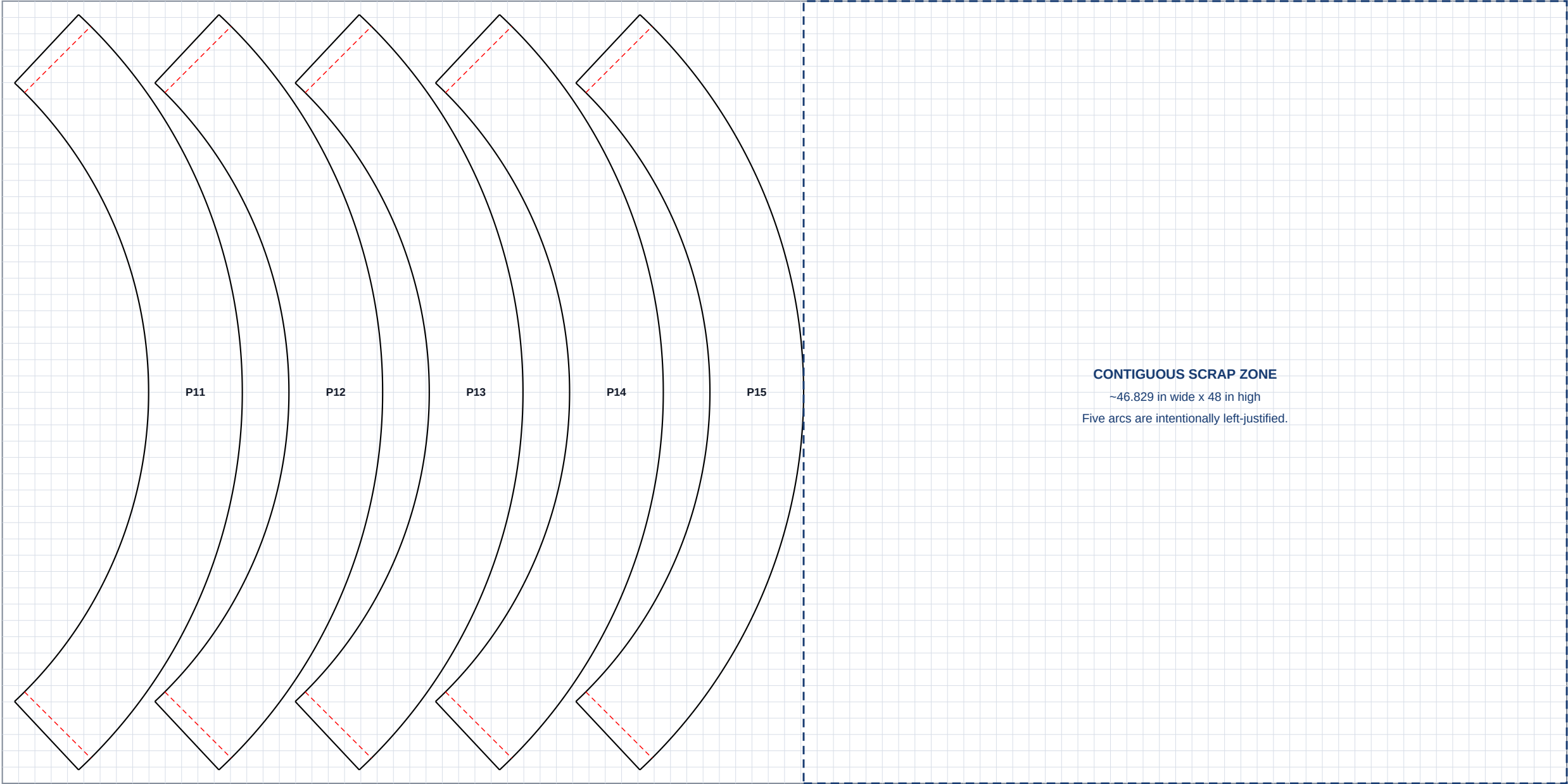
Use a sacrificial spoil board under plywood.

VERIFIED ROUTER CUT SHEET - SHEET 2 - 5 SECTIONS

THIS BUILD: cut P11-P15. P15 will be trimmed after dry fit for the final ~30 deg exit segment.

3/4 in plywood | 26 / 31.75 in radii | 93.75 deg physical / 90 deg installed | deliberate 0.750 in minimum separation

48.000 in



96.000 in

CUT GEOMETRY

Ri 26.000 in / Ro 31.750 in

Roadbed width 5.750 in

Physical section 93.750 deg

Installed advance 90.000 deg

End extension 1.875 deg

Actual mating overlap 3.750 deg

ROUTER NESTING

Pieces on this sheet: 5

Center advance: 8.611136 in

Min profile separation: 0.750 in

Group span: 48.421 in

Left margin: 0.750 in

Right clear remainder: 46.829 in

Top/bottom margin: 0.827 in

BLACK = physical cut profile

RED DASH = nominal 90 deg joint

3/4 in waste strip is intentional.

Use a sacrificial spoil board under plywood.

ROUTER-FRIENDLY LAYOUT - VERIFIED DIMENSIONS

Build quantity: 15 standard blanks total. P1 and P15 are the only planned end trims.
The 0.750 in dimension is clear material between finished profiles; Sheet 2 is left-justified to preserve a large contiguous remainder.

Plywood sheet	48 x 96 x 3/4 in
Roadbed radii	26.000 in inside / 31.750 in outside
Roadbed width	5.750 in
Physical piece angle	93.750 deg
Installed advance	90.000 deg
Half-lap extension per physical end	1.875 deg
Actual adjacent lap overlap	3.750 deg
Overlap @ 28.875 in mean radius	1.890 in
10-piece center spacing	8.611136 in
Minimum cut-profile separation	0.750000 in
10-piece group span	91.476821 in
Sheet 1 left/right margin	2.261590 in
Sheet 2 left margin	0.750000 in
Sheet 2 right clear remainder	46.828858 in
Top/bottom margin	0.826816 in

ROUTER NOTES

The 0.750 in dimension is clear material between finished profiles, not merely centerline spacing or a nominal saw kerf.

For a plunge-router/circle-jig method, cut the concentric 26 in and 31.75 in arcs first, then make the radial end cuts.

For a template/pattern-bit method, the extra waste strip provides room to establish the next edge without the pieces touching.

Sheet 2 places P11-P15 against the left side with a 0.750 in margin. This preserves approximately 46.829 in of full-height sheet to the right as a contiguous offcut rather than splitting the waste into two halves.

Use a spoil board so the router can cut completely through without depending on the sheet edge for support.

Red dashed lines are layout/routing references only; they are not through-cut lines. They mark the final 90 deg installed boundaries.

ADJACENT-PIECE CLEARANCE

Exact minimum finished-profile gap = 0.750 in.
This occurs where the next piece's inner endpoint approaches the preceding outer arc.



DIAGONAL BRACE BRACING - CUT LIST AND LAYOUT

Racking bracing added after the flat-frame lock: 4 of 8 bays braced with split, herringbone diagonals through the middle ring.

HALF-BRACE GEOMETRY (ONE BAY)

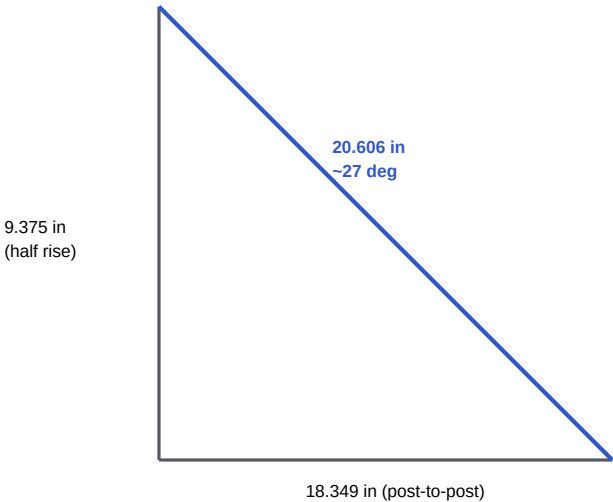


Diagram schematic; not to scale. Each braced bay uses two of these, mirrored so upper and lower halves lean opposite directions (herringbone).

SELECTED BRACING PATTERN

Braced bays (4 of 8): A-B, C-D, E-F, G-H.
Open bays (4 of 8, no diagonal): B-C, D-E, F-G, H-A.
Each braced bay: two half-height diagonals, split at the middle ring so the shelf stays continuous - lower ring to middle ring, and middle ring to upper ring.
Herringbone: within each bay, upper and lower half-braces lean opposite directions. Consistent around the ring or mirrored bay-to-bay - either is structurally equivalent; build whichever is easier to lay out.

DIAGONAL CUT LIST

Stock:	nominal 1x3; actual 0.750 x 2.500 in (same as frame ties)
Quantity:	8 pieces (4 braced bays x 2 half-braces)
Cut length:	20.606 in (20-5/8 in) point-to-point on centerline
Rise / run:	9.375 in half-height rise / 18.349 in post-to-post run
Angle:	27 deg from horizontal, both ends
Blank length:	cut blanks ~22 in; dry-fit first piece, trim to fit, then batch-cut the rest
Lumber needed:	2 additional 12 ft 1x3 boards (beyond tie-ring stock)

FASTENING

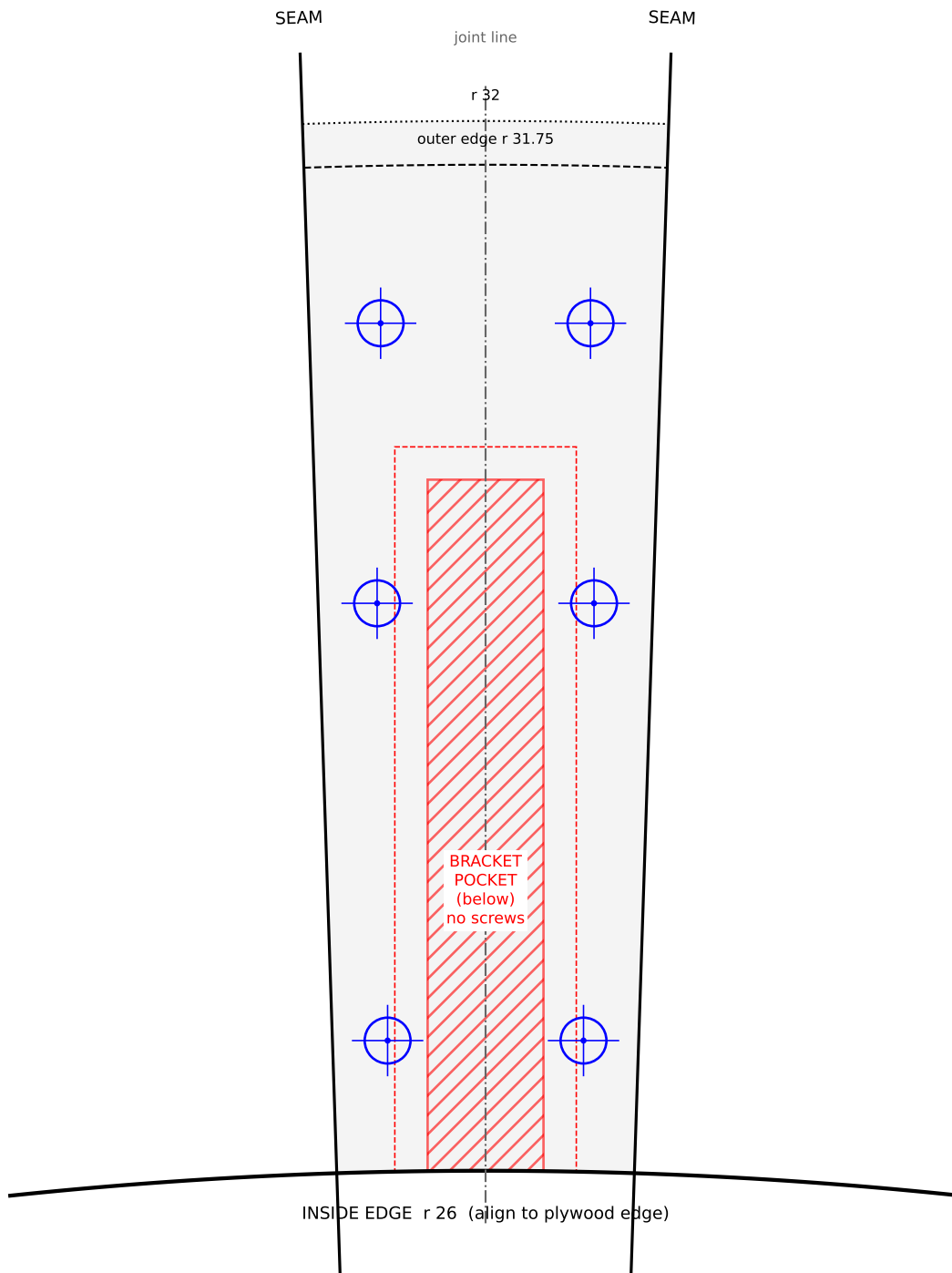
2 in coarse-thread, star-drive general-purpose screws (T-25 bit); 2 screws per end, both ends, each half-brace = 32 screws total for all 8 pieces.
Predrill the angled ends before driving; glue the joint in addition to screws.

OPTIONAL ALTERNATIVE - PLYWOOD SHEAR PANELS

In place of a stick diagonal, a solid plywood panel spanning ring-to-ring (split at the middle ring the same way) may be substituted in a bay for greater stiffness, at the cost of fully blocking reach-through in that bay. Not required for this build; documented here as an optional upgrade path only.

HALF-LAP SCREW TEMPLATE — print at 100% / Actual size (no scaling)

1. Check the scale bars below. 2. Cut along the inside-edge arc and one seam line.
 3. Put the arc on the 26 in inside edge and the seam line on the visible top seam (either side: symmetric).
 4. Tape down, poke each crosshair with an awl, drill: countersink bit, 9/64 clearance thru upper, 7/64 pilot into lower. #6 x 5/8 flat head, flush. Glue first.
- Lap: upper 0.26 / lower 0.46 in. Screws stay 3/16+ from the pocket and 1/4+ from both seams.



2.000 in

50 mm