

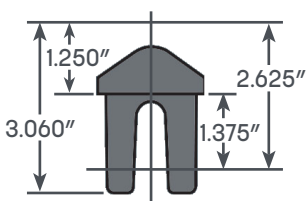
Recommended Tools:

- Tape Measure
- Chalk Line
- Portable Chop Saw
- Apex Bit Holder with 3/16" Bit
- 3/8" Ratchet
- Drill with 27/64" Drill Bit
- Rivet Nut Tool (IR-TS)*

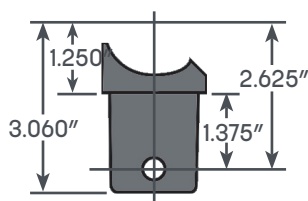
** Rivet Nut Tool is also necessary to fabricate Interna-Rail®. A wide range of these tools are available, please contact Wagner to determine which is best suited for your particular application.*

Handrail systems utilizing Interna-Rail® "in-line" fittings provide a sleek architectural finish with anodized fittings and aluminum pipe. Interna-Rail has the clean look of welded rail with all the benefits of a mechanical system. Interna-Rail systems can be designed to meet any building code and are constructed of anodized aluminum and stainless steel hardware for corrosion resistance. Systems are shipped either completely assembled in panels, or sub assembled— posts assembled with fittings, pipe shipped separately for final assembly on site.

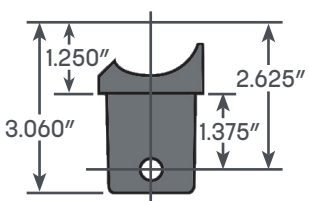
Interna-Rail® Components



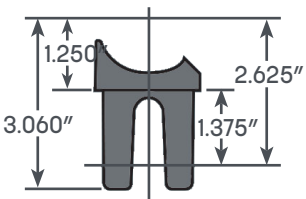
IR155 Tee



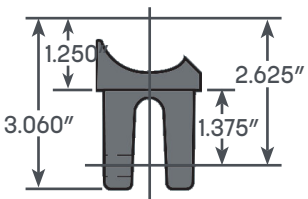
IR159 Corner Tee



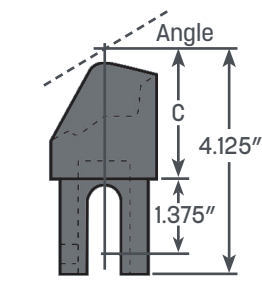
IR159L Corner Tee



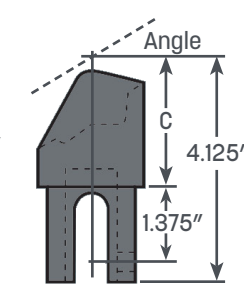
IR171 Adj. Acute Angle Tee



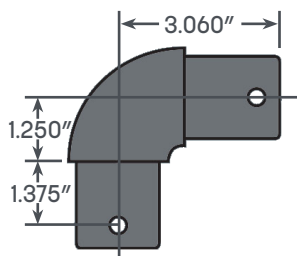
IR171 Adj. Obtuse Angle Tee



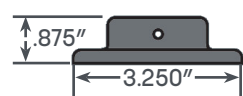
IR173 Acute Tee



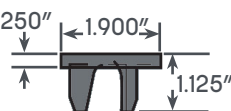
IR174 Obtuse Tee



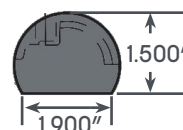
IR130 Elbow



IR140 Grout Cover Ring



IR162 Plug



IR170 Trunion

Hardware



3/8"-16 UNC Stainless Steel Set Screw with Reverse Knurl Cup



5/16"-18 UNC Tubular Rivet Nut



5/16"-18 UNC Socket Head Cap Screw

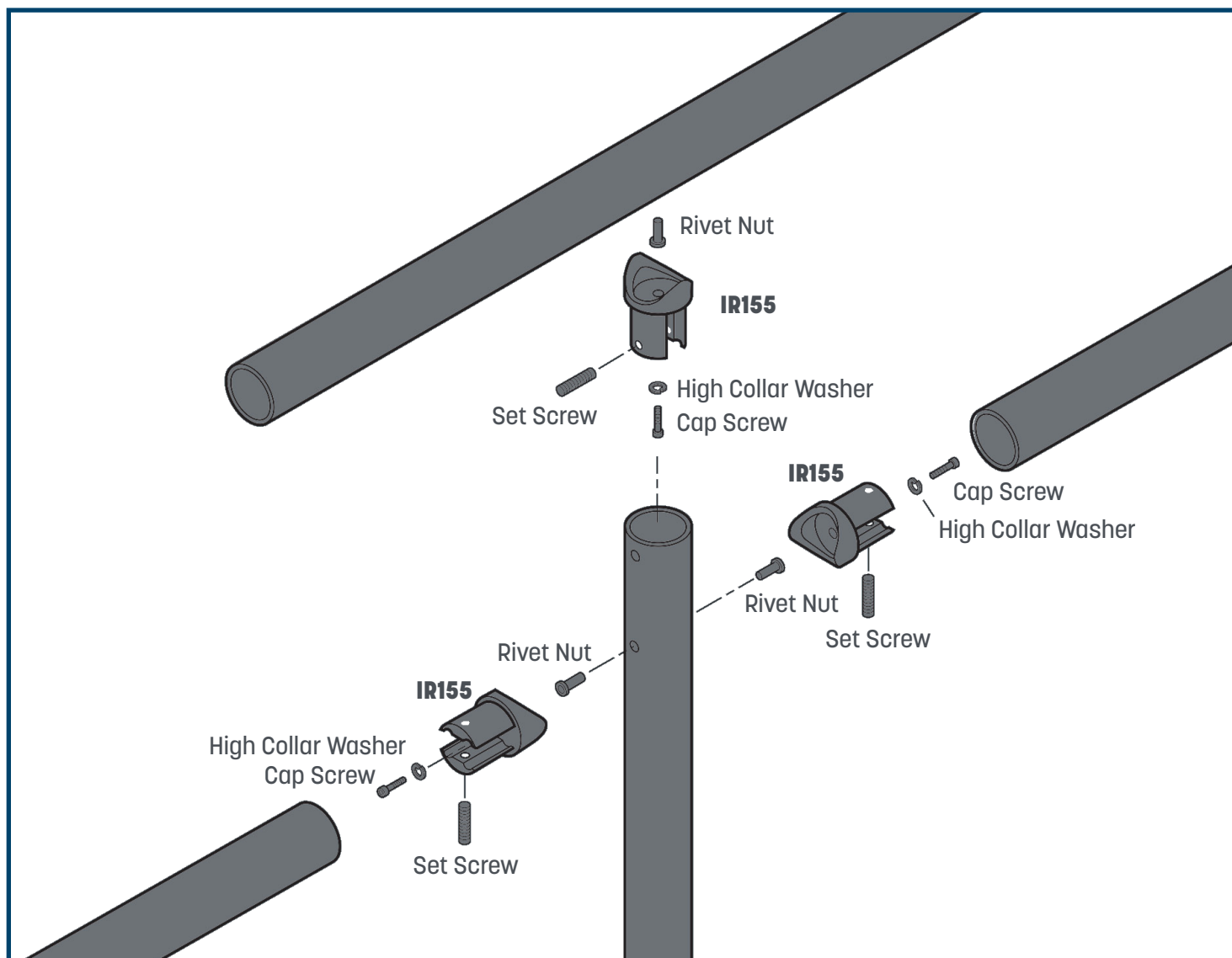


5/16"-18 UNC Square Nut

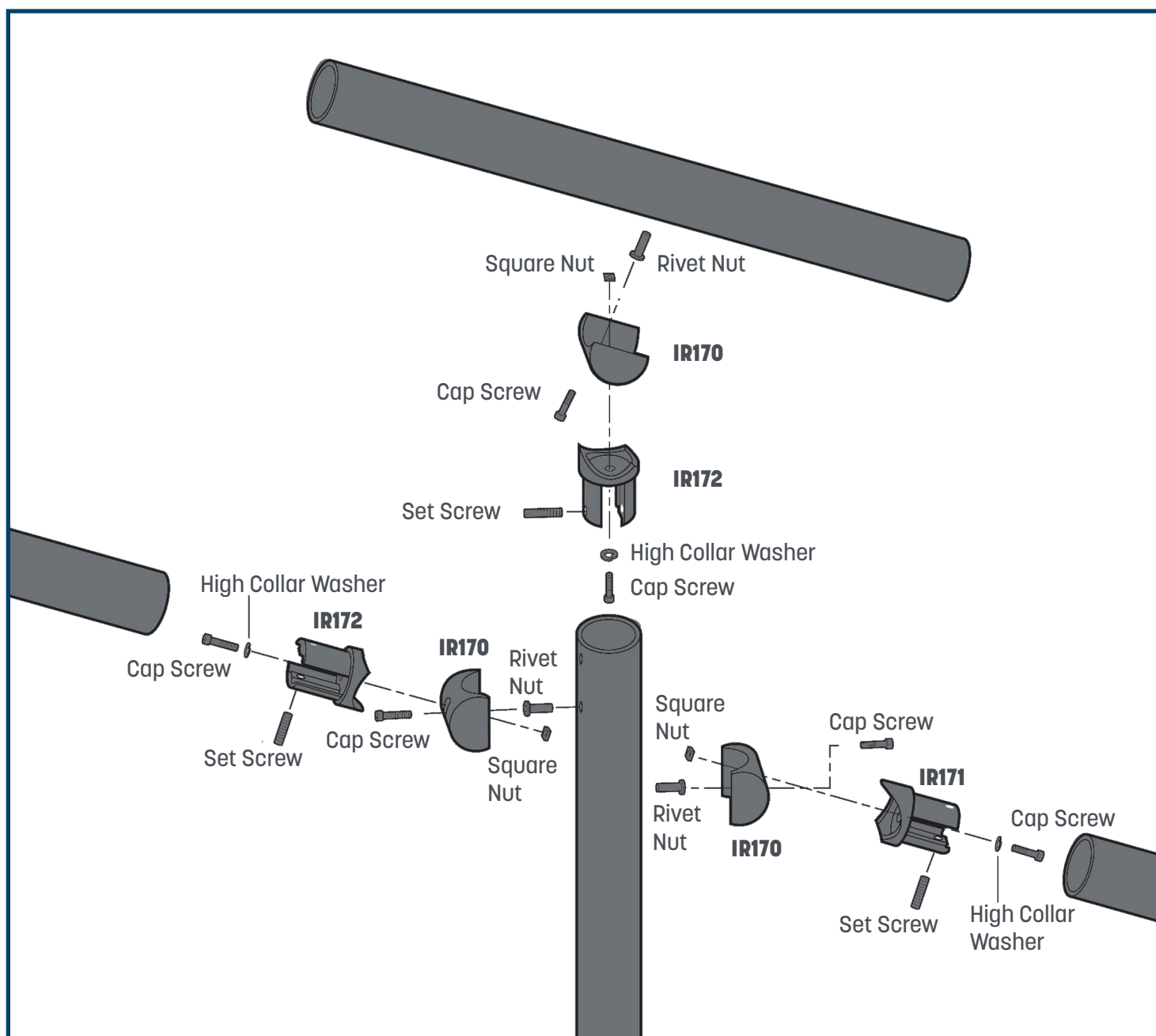


5/16" High Collar Washer

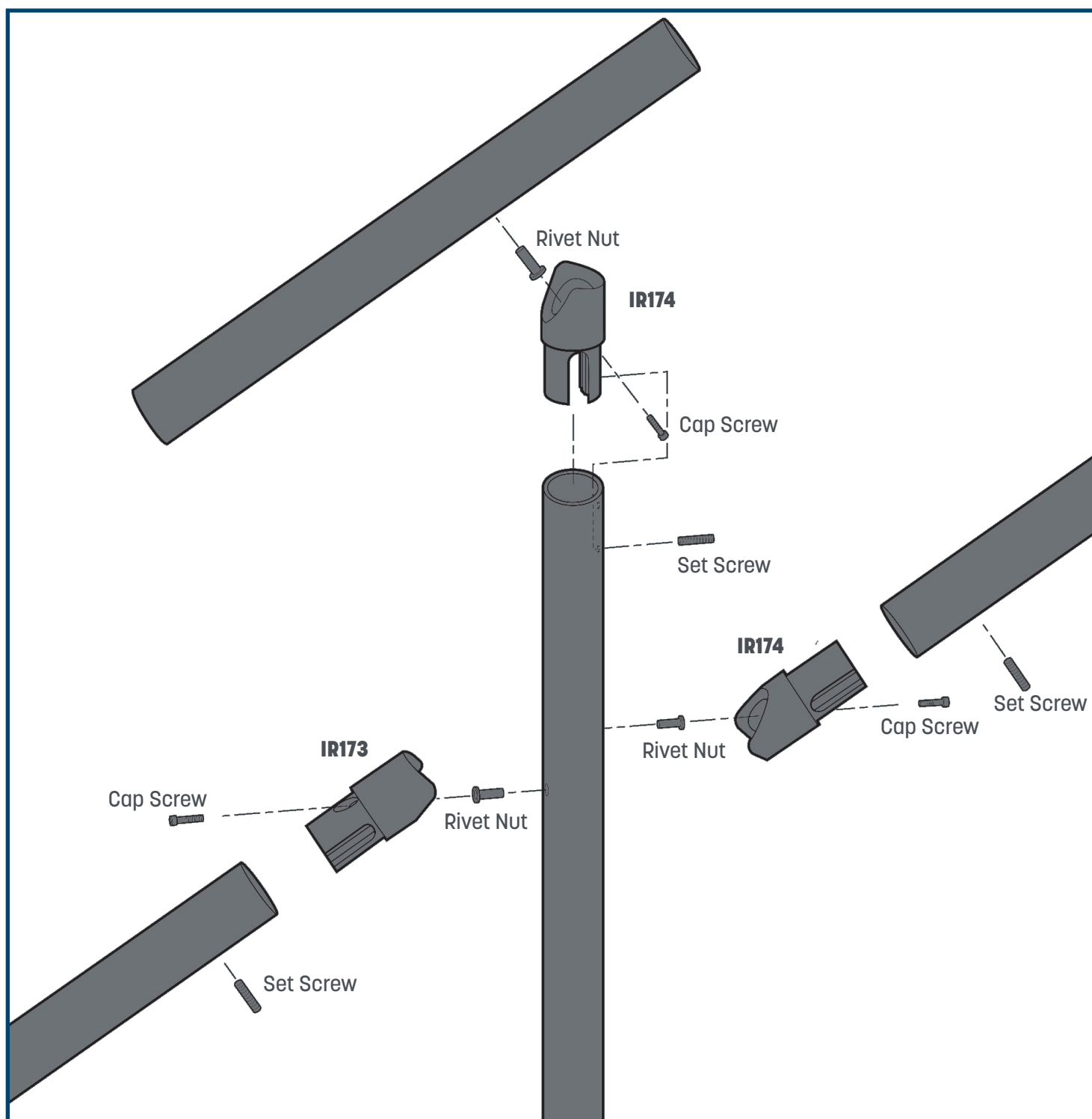
Post Assembly Details Level Line Post



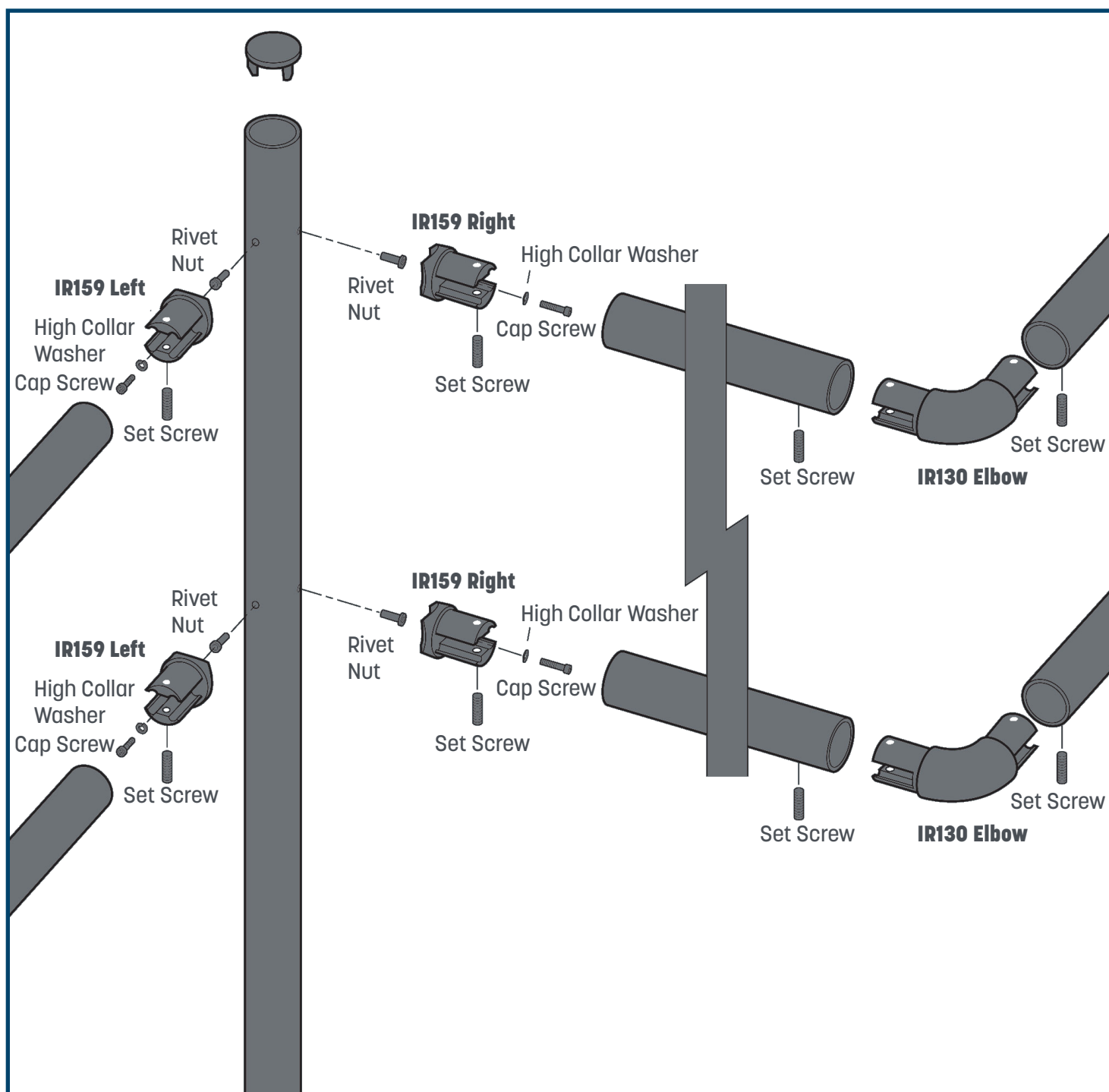
Post Assembly Details Sloping Post with 170/171/172



Post Assembly Details Sloping Post with 173/174



Post Assembly Details Corner Post



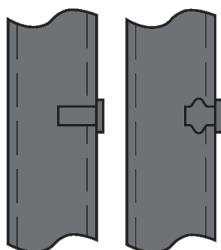
Fitting Attachment Details Level Handrail

1



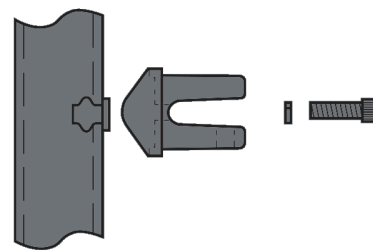
Drill a 27/64" hole in the post.

2



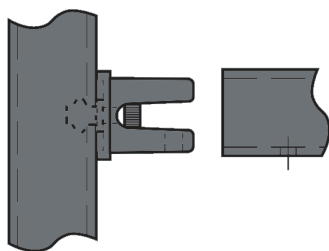
Insert a tubular rivet nut into the hole and crimp using the rivet nut tool.

3



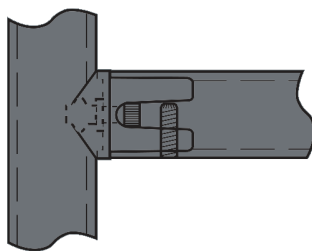
To attach the fitting to the post, insert a socket head cap screw with a washer through the fitting and into the rivet nut. Tighten the cap screw to 16 ft. lbs.

4



Drill a 27/64" hole in the midrail at 1.375" from the end of the pipe. Place the midrail over the ends of the fittings and align the hole in the pipe with the tapped hole in the fitting.

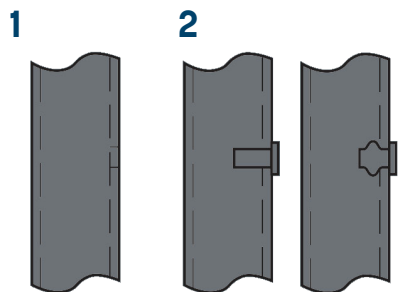
5



Insert a set screw through the hole in the midrail and into the fitting. Tighten the set screw to 22 to 28 ft. lbs.

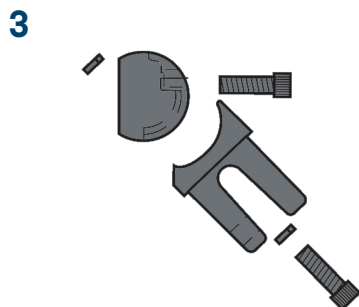
Same procedure to be used when attaching post to top rail.

Fitting Attachment Details Sloping Handrail with 170/171/172

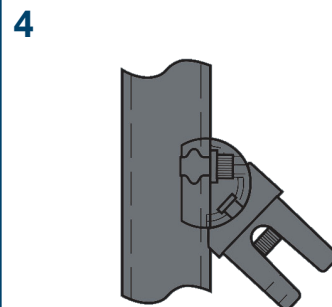


Drill a 27/64" hole in the post.

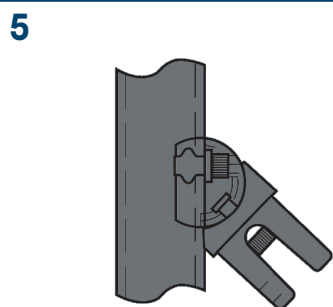
Insert a tubular rivet nut into the hole and crimp using the rivet nut tool.



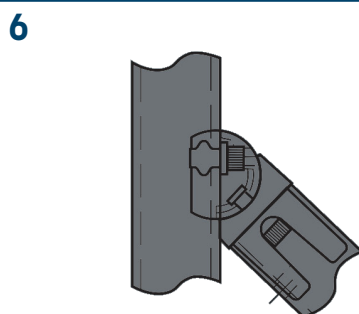
A. Insert cap screw into trunion, loose fit only.
B. Attach the fitting to the trunion using a square nut and a socket head cap screw with a washer, hand tighten only.



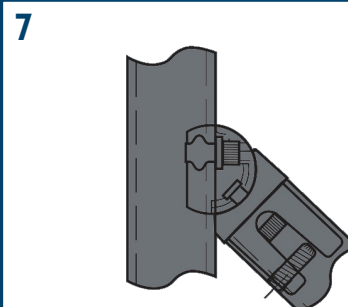
Attach trunion and fitting assembly to post by inserting a cap screw through the trunion and into the rivet nut. Cap screw should be tightened to 16 ft. lbs.



Adjust the fitting to the required angle and tighten the cap screw which holds the fitting in place to 16 ft. lbs.



Drill a 27/64" hole in the midrail at 1.375" from the end of the pipe. Place the midrail over the ends of the fittings and align the hole in the pipe with the tapped hole in the fitting.

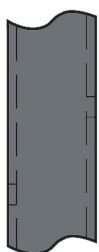


Insert a set screw through the hole in the midrail and into the fitting. Tighten the set screw to 22 to 28 ft. lbs.

Same procedure to be used when attaching post to top rail.

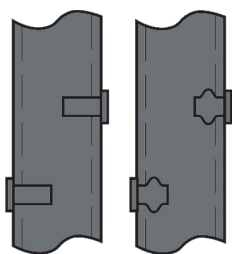
Fitting Attachment Details Sloping Handrail with 170/171/172

1



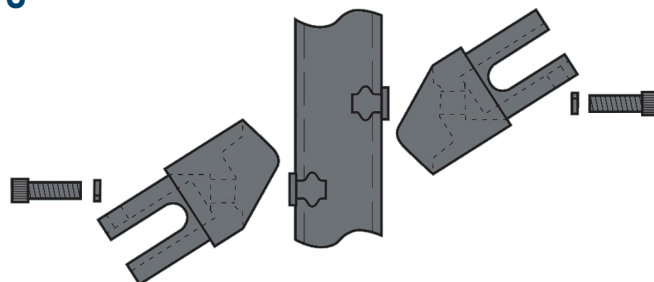
Drill a 27/64" hole in the post.

2



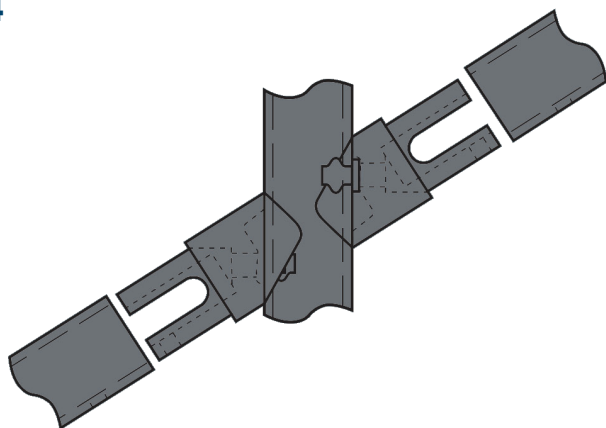
Insert a tubular rivet nut into the hole and crimp using the rivet nut tool.

3



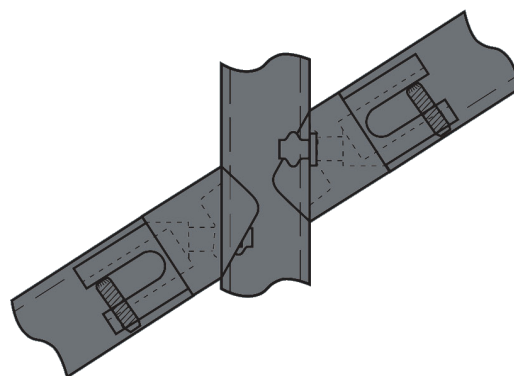
Attach fittings to post by inserting a cap screw through the fittings and into the rivet nut. Cap screw should be tightened to 16 ft. lbs.

4



Drill a 27/64" hole in the midrail at 1.375" from the end of the pipe. Place the midrail over the ends of the fittings and align the hole in the pipe with the tapped hole in the fitting.

5

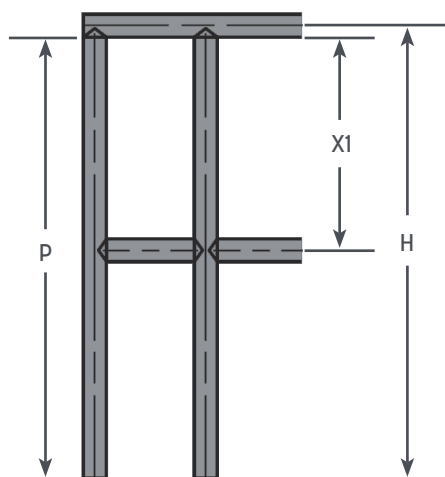


Insert a set screw through the hole in the midrail and into the fittings. Tighten the set screw to 22 to 28 ft. lbs.

Same procedure to be used when attaching post to top rail.

Trim Cutting & Drilling

End Post/Line Post Cut Lengths and Drill Locations

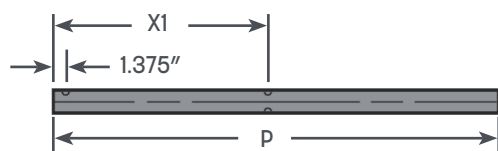


P - Height of Post

H - Distance from bottom of post to center of top rail

X1 - Distance from top of post to center of drill for first midrail (X2 will represent distance to center of drill for second midrail)

Note: in most cases a distance of 42" from the walking surface to the center of the top rail will be used.



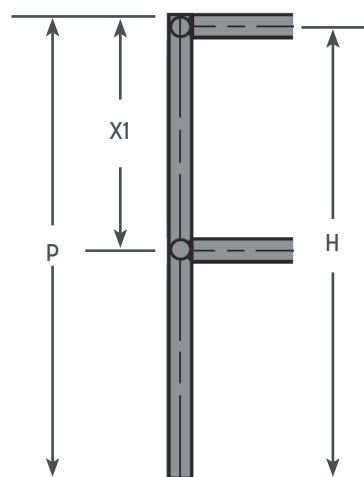
Drill one side for midrail only on end posts

Post Cut Length: $P = H - 1.250''$

Drill Locations: Holes drilled at 1.375" to attach top rail
Two line system (one midrail)
 $X1 = 42/2 - 1.250''$
Three line system (two midrail)
 $X1 = 42/3 - 1.250''$
 $X2 = (2/3)42 - 1.250''$

Drill locations for midrails based on 42" from walking surface to center of top rail

Corner Post Cut Lengths and Drill Locations

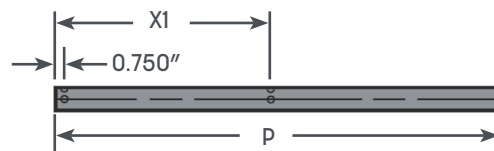


P - Height of Post

H - Distance from bottom of post to center of top rail

X1 - Distance from top of post to center of drill for first midrail (X2 will represent distance to center of drill for second midrail)

Note: in most cases a distance of 42" from the walking surface to the center of the top rail will be used.



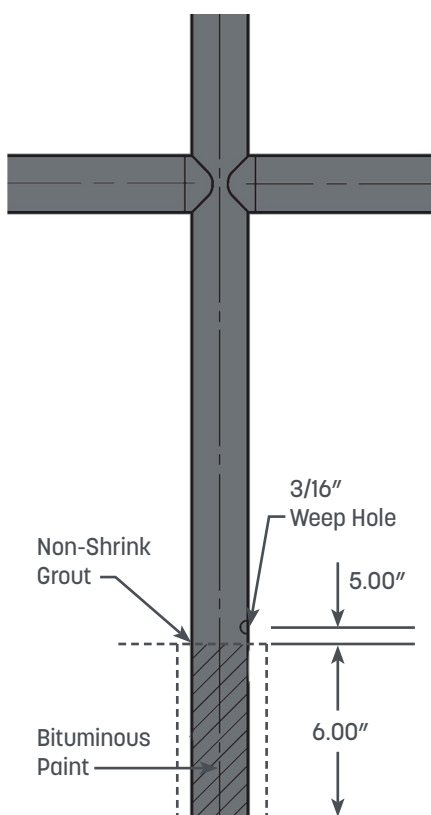
Post Cut Length: $P = H + 0.750''$

Drill Locations: Holes drilled at 0.75" to attach top rail
Two line system (one midrail)
 $X1 = 42/2 + 0.750''$
Three line system (two midrail)
 $X1 = 42/3 + 0.750''$
 $X2 = (2/3)42 + 0.750''$

Drill locations for midrails based on 42" from walking surface to center of top rail

Trim Cutting & Drilling

Weep Hole and Bituminous Paint

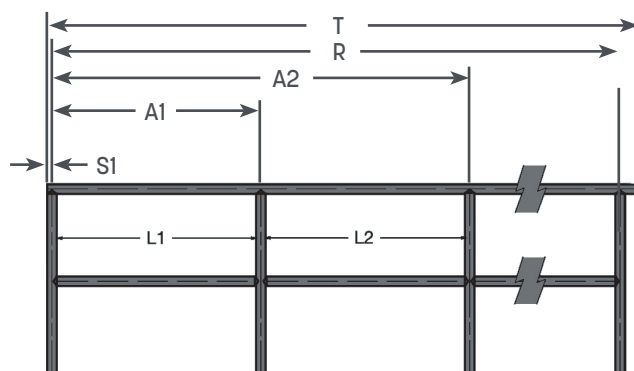


Drill one side for midrail only on end posts

Posts which have been mounted in a sleeve or a core drilled hole using non-shrink grout should have a weep hole to allow for drainage and a 6" coat of bituminous paint to separate dissimilar materials.

6" post embedment recommended—minimum to be 4"

Top Rail Cut Lengths and Drill Locations



Reference Dimension: $L1+L2+L\#$

Top Rail Cut Length: $T=R+P1+P2$

Top Rail Drill Locations: $A1=P1+L1$

$A2=A1+L2$

$A\#=A(\#-1)+L\#$

Final Drill Location: $A\#=A(\#-1)+L\#+(P2-S2)$

R- Reference dimension (total of bay lengths in handrail section)

T- Top rail cut length

P1- Change in top rail cut length related to first post type

P2- Change in top rail cut length related to last post type

L#- Distance between posts of bay length

A#- Distance from end of top rail to each drill location after first

S1- Distance from beginning of top rail to first drill location

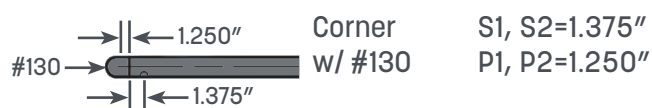
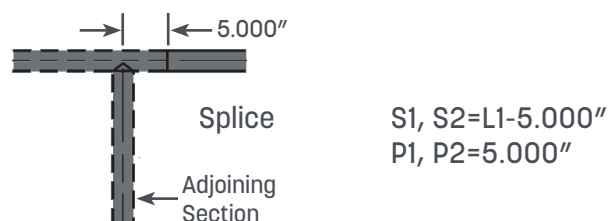
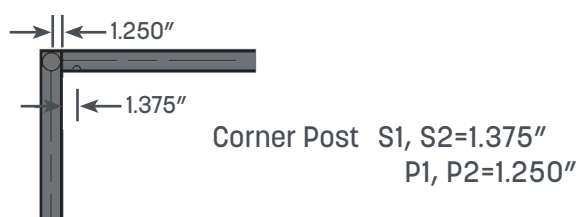
S2- Distance from last drill location to end of top rail

Cut length T is dependent upon the first and last post types as well as the number and size of bays in handrail section. Drill locations S1 and S2 are dependent upon the first and last post types.

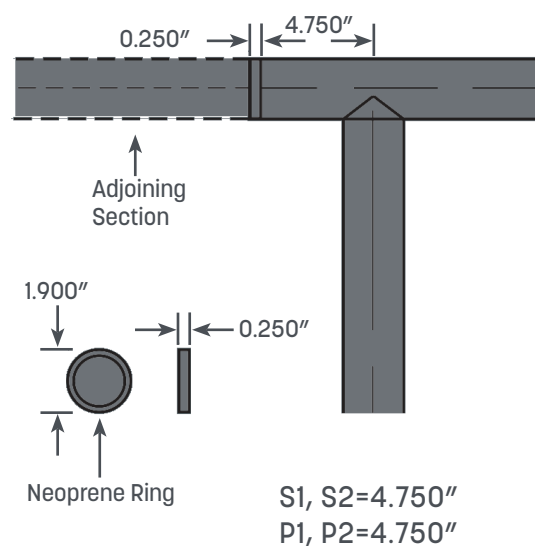
See next page for S1, S2 and P1, P2 values.

Trim Cutting & Drilling

Top Rail Termination Data



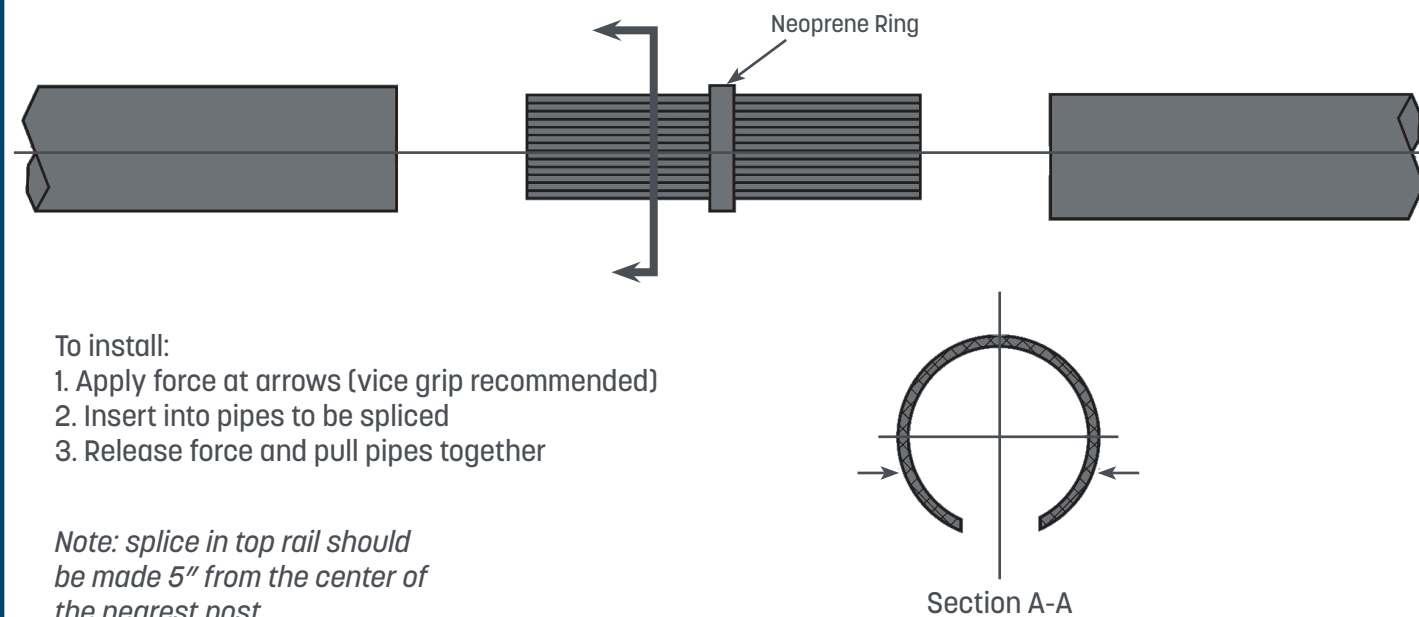
Expansion and Contraction in Top Rail



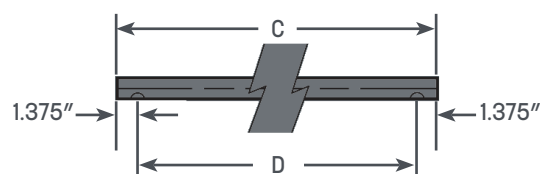
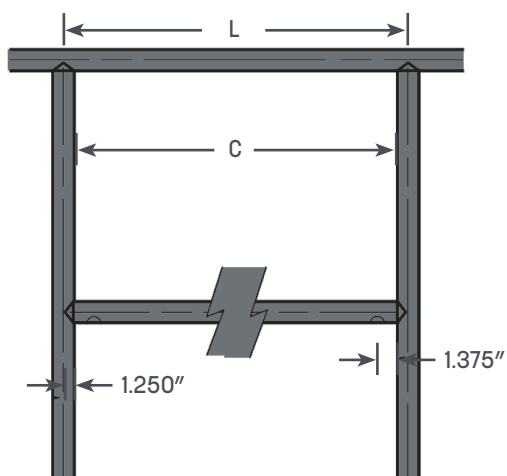
This assembly is recommended for most outdoor environments

Trim Cutting & Drilling

Top Rail Splice



Midrail Cut Lengths and Drill Locations



Calculations for cut length: $C = L - 2.500''$

Calculations for distance between drills: $D = C - 2.750''$

Note: minimum bay length to be 6 1/8"

L - Distance between posts or bay length
 C - Midrail cut lengths
 D - Distance between drill location centers

Trim Cutting & Drilling with 170/171/172

Sloping Handrail Cut Lengths and Drill Locations

A°	B	X	C
12°	.174	.201	2.22
14°	.138	.256	2.23
16°	.102	.272	2.24
18°	.066	.308	2.25
20°	.029	.345	2.26
22°	.008	.383	2.27
24°	.047	.442	2.28
26°	.088	.463	2.30
28°	.130	.505	2.32
30°	.173	.548	2.34
32°	.218	.593	2.37
34°	.265	.640	2.39
36°	.315	.690	2.42
38°	.367	.742	2.45
40°	.422	.797	2.49
42°	.480	.855	2.52
44°	.542	.917	2.57

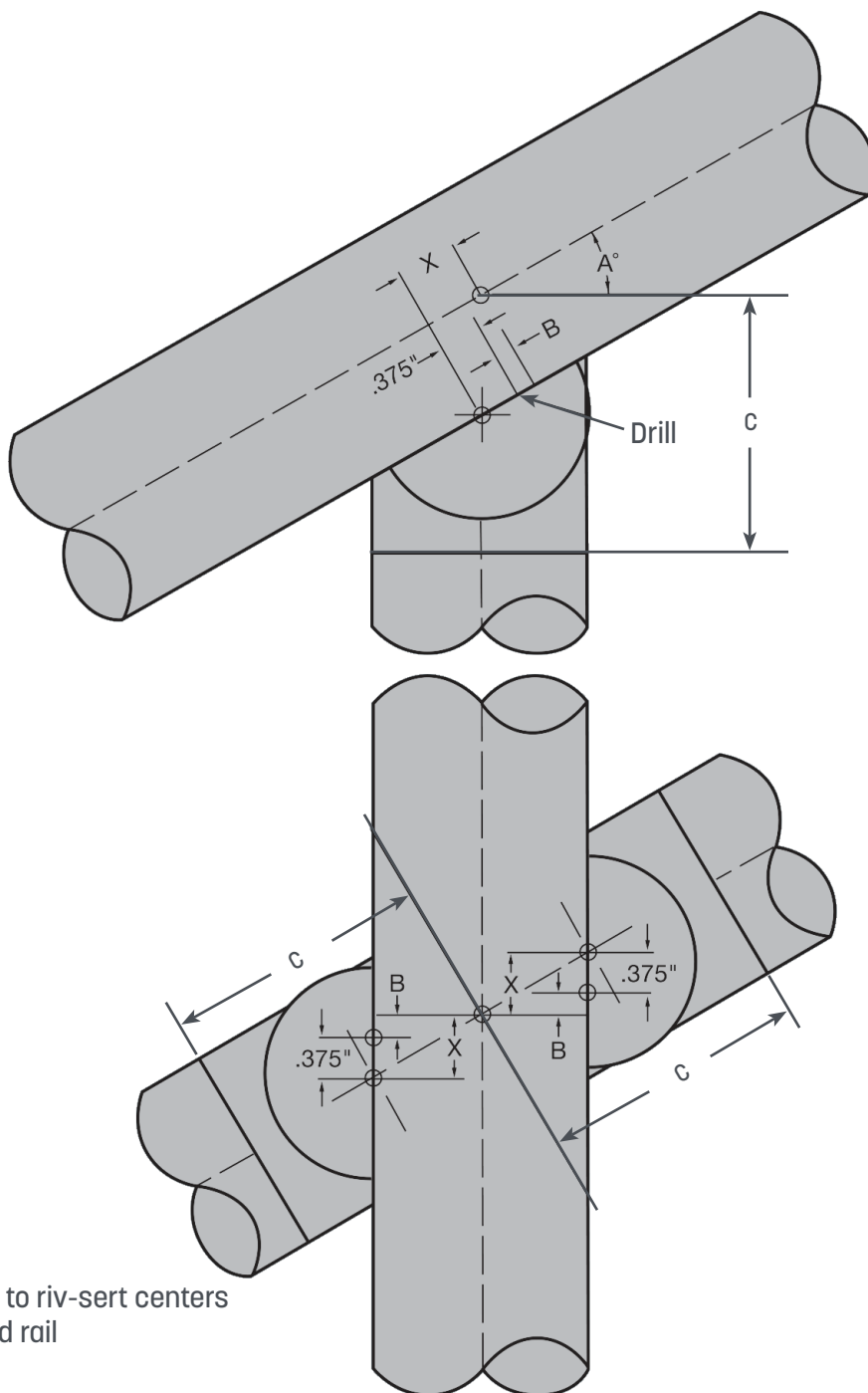
A° - Angle of slope or rake

B - Variation of intersecting centerlines to riv-sert centers

C - Length to be deducted from post and rail

O - Datum

X - Variation on intersecting centerlines



Trim Cutting & Drilling with 173/174

Sloping Handrail Cut Lengths and Drill Locations

A°	B	X	C
5°	.000	.083	1.336
18°	.316	.309	1.976
29°	.136	.527	2.373
32°	.304	.594	2.422
35°	.377	.665	2.481
38°	.431	.742	2.552

A° - Angle of slope or rake

B - Variation of intersecting centerlines to riv-sert centers

C - Length to be deducted from post and rail

X - Variation on intersecting centerlines

