**Assembly Instructions**

**Internarail**

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.

**Tools Needed:**
- Tape Measure
- Chalk Line
- Portable Chop Saw - cut material square for best fitup
- Apex Bit Holder with 3/16” Bit
- 3/8” Ratchet
- Drill with 27/64” Drill Bit

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

**Section A**

**Internarail Components**

**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
Section B
Post Assembly Details

Level Line Post

- Rivet Nut IR155
- High Collar Washer
- Cap Screw
- Set Screw
- Cap Screw
- High Collar Washer
- Set Screw
- Rivet Nut IR155
- High Collar Washer
- Cap Screw
- Set Screw
**Section B**

**Post Assembly Details**

**Sloping Post with 170/171/172**
Section B
Post Assembly Details

Sloping Post with 173/174
Section B
Post Assembly Details

Corner Post

IR162 Cap

IR159 Left
Rivet Nut
High Collar Washer
Cap Screw
Set Screw

IR159 Left
Rivet Nut
High Collar Washer
Cap Screw
Set Screw

IR159 Right
Rivet Nut
High Collar Washer
Cap Screw
Set Screw

IR159 Right
Rivet Nut
High Collar Washer
Cap Screw
Set Screw

IR130 Elbow
Set Screw

IR130 Elbow
Set Screw
Assembly Instructions

Intern-a-Rail®

Section C

Fitting Attachment Details – Level Handrail

Step 1
Drill a 27/64˝ hole in the post.

Step 2
Insert a tubular rivet nut into the hole and crimp using the rivet nut tool.

Step 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.

Step 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.

Step 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.
Section C
Fitting Attachment Details – Sloping Handrail with 170/171/172

**Step 1**
Drill a 27/64˝ hole in the post.

**Step 2**
Insert a tubular rivet nut into the hole and crimp using the rivet nut tool.

**Step 3**
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.

**Step 4**
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.

**Step 5**
Adjust the fitting to the required angle and tighten the cap screw which holds the fitting in place to 16 ft. lbs.

**Step 6**
Drill a 27/64˝ hole in the midrail at 1.375˝ from the ends of the pipe. Place the midrail over the tines of the fitting and align the hole of the pipe with the tapped hole in the fitting.

**Step 7**
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
**Section C**

Fitting Attachment Details – Sloping Handrail with 173/174

**Step 1**
Drill 27/64˝ holes in the post.

**Step 2**
Insert tubular rivet nuts into the holes and crimp using the rivet nut tool.

**Step 3**
Attach fittings to posts by inserting cap screws through the fittings and into the rivet nuts. Cap screws should be tightened to 16 ft. lbs.

**Step 4**
Drill 27/64˝ holes in the midrails at 1.375˝ from the ends of the pipe. Place the midrails over the tines of the fitting and align the holes of the pipes with the tapped holes in the fittings.

**Step 5**
Insert set screws through the holes in the midrails and into the fittings. Tighten the set screws to 22 to 28 ft. lbs.

Same procedure to be used when attaching posts to top rails.
Section D
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

Post cut length: \[ P = H - 1.250'' \]
Drill Locations:

Two line system (one midrail)
\[ X1 = \frac{42}{2} - 1.250'' \]

Three line system (two midrails)
\[ X1 = \frac{42}{3} - 1.250''\]
\[ X2 = \frac{2}{3} \times 42 - 1.250'' \]

(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:

Hole drilled at 0.750” to attach top rail
Two line system (one midrail)
\[ X1 = \frac{42}{2} + 0.750'' \]

Three line system (two midrails)
\[ X1 = \frac{42}{3} + 0.750''\]
\[ X2 = \left(\frac{2}{3}\right) \times 42 + 0.750'' \]

(Drill locations for midrails based on 42” from walking surface to
center of top rail)
Weep Hole and Bituminous Paint

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: \( L_1 + L_2 + L\#
\)
Top Rail Cut Length: \( T = R + P_1 + P_2 \)
Top Rail Drill Locations:

\[
A_1 = P_1 + L_1 \\
A_2 = A_1 + L_2 \\
A\# = A(# - 1) + L\#
\]
Final Drill Location:

\[
A\# = A(# - 1) + L\# + (P_2 - S_2)
\]

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 or 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

Expansion and Contraction in Top Rail

Where expansion and contraction in the top rail due to temperature variation is a concern, a .25˝ gap should be left between the rails when splicing. A neoprene ring may be used to fill this gap.

End Post
- S1, S2 = 0.750
- P1, P2 = 0.750

Corner Post
- S1, S2 = 1.375
- P1, P2 = 1.250

Splice
- S1, S2 = 5.000
- P1, P2 = 5.000

Splice
- S1, S2 = L1 - 5.000
- P1, P2 = - 5.000

Corner with
- S1, S2 = 1.375
- P1, P2 = - 1.250

0.250
4.750

Adjoining Section

1.900
0.250
Neoprene Ring

S1, S2 = 4.750”
- P1, P2 = 4.750”

(This assembly is recommended for most outdoor environments)
**Top Rail Splice**

Note: Splice in top rail should be made 5” from the center of the nearest post

To Install:
1. Apply force at arrows (vice grip recommended)
2. Insert into pipes to be spliced
3. Release force and pull pipes together

**Midrail Cut Lengths and Drill Locations**

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

Calculation for cut length: \( C = L - 2.500" \)
Calculation for distance between drills: \( D = C - 2.750" \)

Note: Minimum bay length to be 6 1/8”
### Section D
Trim Cutting & Drilling with 170/171/172

#### Sloping Handrail Cut Lengths and Drill Locations

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

**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
Section D
Trim Cutting & Drilling with 173/174

Sloping Handrail Cut Lengths and Drill Locations

<table>
<thead>
<tr>
<th>A’</th>
<th>B</th>
<th>X</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>5°</td>
<td>.000</td>
<td>.083</td>
<td>1.336</td>
</tr>
<tr>
<td>18°</td>
<td>.316</td>
<td>.309</td>
<td>1.976</td>
</tr>
<tr>
<td>29°</td>
<td>.136</td>
<td>.527</td>
<td>2.373</td>
</tr>
<tr>
<td>32°</td>
<td>.304</td>
<td>.594</td>
<td>2.422</td>
</tr>
<tr>
<td>35°</td>
<td>.377</td>
<td>.665</td>
<td>2.481</td>
</tr>
<tr>
<td>38°</td>
<td>.431</td>
<td>.742</td>
<td>2.552</td>
</tr>
</tbody>
</table>

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