

## Interna-Rail®:

Interna-Rail is uniquely designed for easy assembly and superior strength. The all-mechanical assembly requires no welding.

## Tee Connections:

Interna-Rail's tee connections feature a threaded, tubular rivet that provides a more substantial thread engagement between the bolt and post.

## Splice Connections:

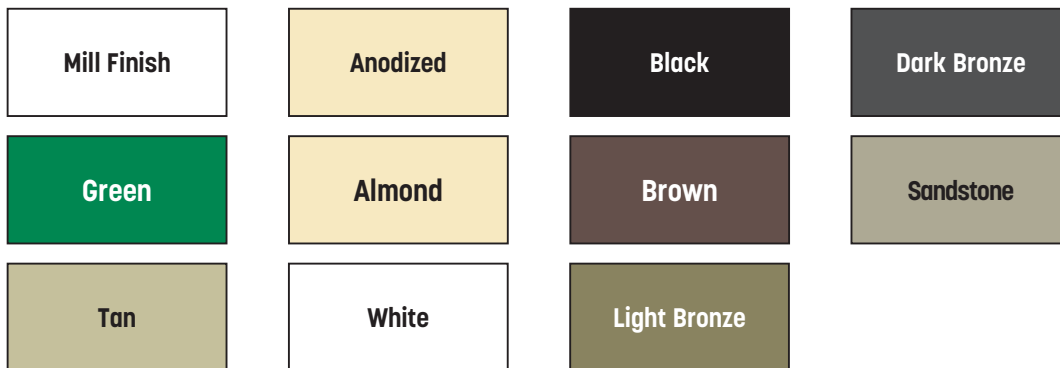
Splice connections make use of a set screw that tightens through the pipe wall and component to spread the fitting tangs. The combined strength of the screw, connecting the fitting to the pipe, and the expansion of the tangs, firmly secures the fitting to the pipe.

## Fittings:

Interna-Rail fittings are cast of corrosion-resistant, aluminum/ magnesium alloy. When combined with stainless steel connectors, this system is an excellent choice for any industrial or architectural application in virtually any environment or climate.

## Finish:

Interna-Rail's smooth, continuous surface gives any railing application an attractive, streamlined appearance. The standard finish on all Interna-Rail fittings is clear anodized. Other architectural finishes, as well as in-fill panels are also available. Contact Wagner for more information about these and other options available to you.



## Hardware:

Unlike other railing systems, every Interna-Rail assembly comes complete with all of the necessary hardware. This is true whether you specify vertical posts or pre-fabricated systems. Specify Interna-Rail to suit your application.

## Fabrication:

To assist you in selecting the best method of assembly for your application, Wagner can supply you with a list of qualified fabricators in your area or supply fabricated, pre-finished railings per your specifications. Contact Wagner with your requirements.

### Interna-Rail® Test Data:

Based on 1-1/2" Schedule 40 Aluminum Pipe The Pittsburgh Testing Laboratory conducted tests on the Interna-Rail System. The results far exceed OSHA side load requirements as well as a wide range of regional and local regulations. The tests were performed on 12" high handrail assemblies and 42" high single posts. While all of the tests used 1-1/2" IPS schedule 40 aluminum pipe, the alloy temper, type of mounting and reinforcement were varied. Test results are detailed on the chart below.

Load	Rail Assembly				Single Post			
	Alloy 6063-T6 No Reinforcement Base Flange		Alloy 6061-T6 No Reinforcement Wall Flange		Alloy 6061-T6 20" Reinforcement Wall Flange		Alloy 6061-T6 12" Reinforcement Wall Flange	
	Deflection	Permanent Set	Deflection	Permanent Set	Deflection	Permanent Set	Deflection	Permanent Set
200	.84"	.00"	.56"	.00"	.81"	.00"	1.22"	.00"
250	1.47"	.00"	.91"	.00"	1.31"	.00"	1.53"	.00"
300	2.31"	.00"	1.28"	.00"	1.81"	.00"	1.90"	.00"
350	2.72"	.00"	1.62"	.00"	2.34"	.00"	2.40"	.00"
400	3.31"	.00"	2.00"	.00"	3.82"	.00"	2.84"	.00"
450	4.09"	.09"	2.47"	.00"	4.07"	.53"	3.34"	.00"
500			3.03"	.00"			4.26"	.16"
550			3.40"	.00"				
600			3.84"	.00"				
650			4.31"	.00"				
700			4.88"	.25"				

These results exceed OSHA side load requirements. Test results show that, when fabricated and installed properly, Interna-Rail exceeds OSHA side load requirements listed in OSHA General Industry Standards, 29 CFR 1910.23, Chapter XVII, paragraph (5) (iv) for pipe railings, revised publication date November 7, 1978, as follows:

"The mounting of handrails shall be such that the completed structure is capable of withstanding a load of at least 200 pounds applied in any direction, at any point on the top rail."

### Railing Formulas:

The following railing formulas may be used to determine maximum post spacing under a uniform load and stress at the base of the post under a concentrated load. Consult your local code to determine your structural requirements.

#### Uniform Load:

$$L = (f_s \times S) / (w / 12 \times h)$$

L = Span between centerline of posts (in)

f = Unit Stress (psi)

f<sub>s</sub> = Allowable Stress (psi)

S = Section Modulus (in<sup>3</sup>)

w = Uniform Load (lb/ft)

#### Concentrated Load:

$$L = (f \times h) / S$$

F = Concentrated Load (lb)

h = Post Height (inches)

	Allowable Stress (psi)	Minimum Yields (psi)	Modulus of Elasticity (psi x 10 <sup>6</sup> )
6061-T6 Pipe	24,000	35,000	10.0
6063-T6 Pipe	18,000	25,000	10.0

Pipe Size	Schedule	Outside Diameter	Inside Diameter	Wall	Section Modulus
1 1/2"	40	1.900"	1.610"	.145"	.326in <sup>2</sup>
1 1/2"	80	1.900"	1.500"	.200"	.412in <sup>2</sup>

### Load Distribution:

In pipe railing load distribution is fairly uniform. On railings having two or fewer spans, multiply the concentrated load (F) by .85 for end posts and .65 for intermediate posts. On railings having three or more spans, multiply the concentrated load (F) by .84 for end posts and .60 for intermediate posts.