Villanova University, Mark B. Thompson Associates, LLC, Villanova, PA (Architect), Roy J. Shelton, Inc. (Fabricator), ML Baird & Company (Landscape Architect), Hunter Roberts Construction Group (General Contractor).

Since 1910, Julius Blum & Co., Inc. continues its tradition of excellence and innovation with the release of our latest comprehensive resource of stock components for architectural metal work.

A family business, operating under third and fourth generation leadership, Julius Blum & Co., Inc. has not lost sight of our founder's mission: to best serve our customers with prompt service and in-stock quality components.

In addition to our product descriptions, our Catalog and website contain Engineering Data to aid in the design of structurally sound and code compliant railing systems for various applications.

Additional information, including photographs of finished jobs and products, drawings files, and technical data is available online at juliusblum.com. We look forward to your calls and emails.

IN STOCK FOR PROMPT SHIPMENT

Julius Blum & Co., Inc. is unique in the industry. While most companies choose to maintain minimum stock, we have always had substantial quantities on hand of the items shown in our catalog. We take pride in our prompt service and generally ship within a day or two of receiving an order.

SHIPPING AND PACKAGING

All components are produced and handled with great care and protected for shipment by wrapping and/or crating to assure a product well-suited for architectural metal work.

Aluminum bars, angles, channels and tubing—except for structural shapes—are stocked in mill-wrapped bundles of approximately 100 pounds. Each bundle is paper-interleaved to protect the surface during storage and shipment.

Small package shipments are made via courier service. All other shipments are by common carrier, FOB, Carlstadt NJ.

PROTECTING THE ENVIRONMENT

With a firm belief that we must all do our part to protect the environment, Julius Blum & Co., Inc. has long worked to reduce waste in our daily operations. By using old newspapers as packing material, reusing storage boxes and bins in the warehouse, recycling unused business forms into memo pads, and placing solar panels on the roof of our building, we seek to lessen our impact on our surroundings.

The architectural metals we stock are largely composed of recycled material. We are glad to provide information on the recycled content of our material for those seeking LEED certification.

This brochure is printed on FSC® certified paper. 100% of the electricity used to make the paper is offset with Green-e® certified renewable energy. The paper contains a minimum of 10% post-consumer recovered fiber.

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JULIUSBLUM.COM 800.526.6293 BLUMINFO@JULIUSBLUM.COM JB

Julius Blum & Co., Inc. supplies stock material only and does not offer custom design, fabricating or installation services. It has always been our philosophy never to compete with our customers. As Julius Blum wrote in 1938, "We want our customers to sell our goods at a profit... and for our Iron Master customers to be successful."

If you need help finding a local fabricator, we are always glad to suggest firms in your area that are familiar with our products.

Quality Control
Providing quality material is a tradition at Blum. With very few exceptions, all components are manufactured in the USA. Understanding that the majority of our items are purchased for architectural use, we take care to provide an excellent finish. We have a dedicated staff member whose responsibility includes careful scrutiny of all incoming material. Returns are subject to approval by Julius Blum & Co., Inc.

Finishes
Except as noted, all items shown in our catalog are supplied in a mill finish. Additional polishing, painting or anodizing of these components is not handled by Blum and would be handled by a professional polisher or the metal fabricator. For additional information on this subject, refer to the Metal Finishes Manual published by the National Association of Architectural Metal Manufacturers (www.naamm.org) and the National Ornamental & Miscellaneous Metals Association (www.nomma.org).

Dimensions, weights, and technical data published in this catalog and on our website have been assembled with care but cannot be guaranteed. Details and availability are subject to change. Please call with specific questions.

Nickel-Silver

Julius Blum & Co., Inc. is proud to have reintroduced nickel-silver to the architectural marketplace. When finished, nickel-silver has the appearance of stainless steel with golden highlights. Like bronze, it is a copper alloy which, if left unprotected, will oxidize, although at a much slower rate. Nickel-silver is best cold-worked and may crack when worked at high temperatures. Its chemical composition is 47.7% copper, 40.9% zinc, 7.4% nickel, 2% manganese and 2% lead. Samples are available upon request.

Bronze vs. Brass
One of the constant questions we get is, "What is the difference between bronze and brass?"

Brass and bronze are both copper alloys. In fact, architectural bronze is a sub-classification of brass—sometimes referred to as leaded brass. Blum stocks extrusions in architectural bronze, C38500, exclusively. We stock architectural bronze for several reasons:

1. It has a rich golden color as opposed to brass, which is more yellow.
2. It is more malleable than brass, making it easier to work with.
3. Architectural bronze tubing is extruded with a thicker wall (between .100" and .125" thick) than you will find in brass (usually .062" thick), making it a stronger section and better suited for bending.

All of our cast fittings and brackets are cast in alloy C86500 while our drawn pipe is stocked in alloy C23000—both of these alloys are considered a color match for architectural bronze. Because we exclusively use Architectural Bronze, our cast handrail fittings will not necessarily match with handrail supplied by others.

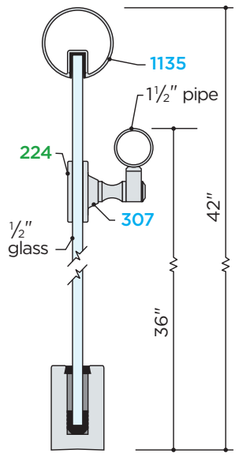
Fabricating Stainless Steel
Care should be taken when working with stainless steel so as not to contaminate it with ferrous particles. This will occur if the stainless is fabricated using steel or iron tools (i.e. steel files or steel wool). Ferrous particles from steel tools will embed themselves in the stainless steel and will eventually start to rust, which makes it seem that the stainless is rusting. Recovery of the finish is possible with appropriate chemical washes, but proper fabrication will avoid the problem entirely. It is important to note that roll-formed stainless steel handrail shapes require special attention at the joints to assure proper alignment.

Fittings
Julius Blum & Co., Inc. carries a wide range of fittings designed to match with our Connectorail® system and our traditional handrail styles. Due to differences in designs and tolerances, our fittings will not necessarily match with similar handrail and pipe supplied by others. It is important to be aware that differences in tolerances between lengths of handrail moulding and cast fittings require special attention to ensure proper match.

Handrail and Guardrail
Julius Blum & Co., Inc. has always stocked a wide range of handrail mouldings to suit many needs and conditions, but not all Blum handrails are suitable for all applications. Accessibility standards and code authorities often have dimensional limitations on handrail size which eliminate larger handrail mouldings from consideration. Confirm whether size limitations apply to your installation before specifying.

Most building codes differentiate between handrails and guardrails. Handrails are generally defined as being used for guidance and support, while the purpose of guardrails is to prevent accidental falls. Handrail heights are commonly between 34" and 38", while guardrails are 42" in height.

Guardrails are often required to have an included handrail.



The detail above provides an example of a JB® Glass Railing used as both a guardrail and a handrail. The 3 **½"** cap rail is at a height of 42"—too high and too large for use as a handrail. A 1 **½"** pipe handrail section is mounted at a proper handrail height of 36". As shown, the handrail is mounted using a 307 bracket and a 224 glass mounting adapter kit. The tempered glass must be drilled prior to tempering to permit use of the adapter kit (see page 12 for more information).

Structural Strength and Testing
In recent years, load requirements for handrails and guardrails have increased significantly. It is important to perform the appropriate calculations to determine the suitability of your chosen handrail and support system.

For example, many of our ornamental handrail sections, while well suited for mounting above a picket rail, would tend to exhibit too much vertical deflection when wall mounted at a standard bracket spacing of 4'-0". Bracket spacing would have to be reduced dramatically, or a structural support bar added underneath the handrail, to allow for better bracket spacing.

Blum railing systems have been developed to meet industry standards and code safety requirements when designed in accordance with engineering data and instructions provided in this catalog. Handrail brackets and fascia mountings have been tested thoroughly. Copies of test reports are available upon request.

Construction Codes and Standards
Like all other aspects of building construction, handrails, balusters and guards must conform to various regulatory requirements. Unfortunately, the requirements are not uniform, therefore, they must be verified for the jurisdiction in which a project is located. Generally, in the United States, the following model building codes have been adopted.

International Code Council (ICC)
- International Building Code 2021
- International Residential Code 2021

The model code organizations known as BOCA, ICBO, and SBCCI merged and collaborated to develop a single model building code entitled the International Building Code (IBC), and a separate model code for one- and two-family dwellings and attached single-family dwellings not exceeding three stories entitled the International Residential Code (IRC). The IBC and IRC have gradually replaced the other model building codes in the United States.

Americans with Disabilities Act
In addition to the applicable building code, construction must comply with the requirements of the Americans with Disabilities Act (ADA) and the Architectural Barriers Act (ABA) adopted by Congress. These laws require that all new and certain existing places of public accommodation and commercial facilities be designed and constructed to be accessible to and usable by persons with disabilities.

The Americans with Disabilities Act adopted by Congress in 1992 required circular handrails to be 1 **¼"** minimum and 1 **½"** maximum. However, the Guidance on the 2010 ADA Standards for Accessible Design, published by the US Department of Justice, has now properly clarified the intent of the dimensional requirements to be an outside diameter of 1 **¼"** to 2".

Americans with Disabilities Act (ADA), 2010 ADA Standards for Accessible Design.

Code Requirements

Building code requirements and safety rules vary from one locality and from one type of structure to another, and are subject to periodic revision. Therefore, it is critical that designers acquaint themselves and comply with the various codes and regulations governing each project.

Handrail Dimensions
At the present time, the following handrail dimensions are specified by the International Building Code, the International Residential Code and the ICC/ANSI A117.1-17 Accessible and Usable Buildings and Facilities.

Circular Cross Section. Handrails shall have a circular cross section with an outside diameter of 1 **¼"** (32mm) minimum and 2" (51mm) maximum.

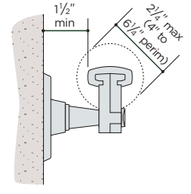
Non-Circular Cross Section. Handrails with other shapes shall be permitted provided they have a perimeter dimension of 4" (100mm) minimum and 6 **¼"** (160mm) maximum, and provided their largest cross-section dimension is 2 **¼"** (57mm) maximum.

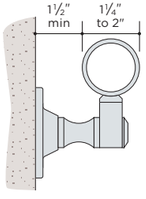
Handrail Clearance
During the past several years the amount of finger clearance required for handrails has been the subject of regulatory discussion. A consensus has emerged on the required clearance, based on the most predominantly enforced codes and standards. The traditional clear space between a wall or other surface and a handrail has been accepted as the most beneficial space by the following codes and standards:

- International Building Code 2021
- International Residential Code 2021
- ICC/ANSI A117.1-17

The Access Board Guidelines
At the present time, the Access Board rules in use are from September 15, 2010. The Access Board website, www.access-board.gov, contains information on the status of each edition and explains where each edition is to be followed and the effective date.

Another current regulatory issue has been finger clearance from handrail brackets. The International Building Code 2021, ICC/ANSI A117.1-17 and the Access Board Guidelines published in the Federal Register on September 15, 2010 all contain requirements for under-handrail clearance similar to those contained in the IBC, as shown below.





"1014.4 Continuity. Handrail gripping surfaces shall be continuous, without interruption by newel posts or other obstructions.

*Exceptions: 3. Handrail brackets or balusters attached to the bottom surface of the handrail that do not project horizontally beyond the sides of the handrail within 1 **½"** (38mm) of the bottom of the handrail shall not be considered obstructions. For each 0.5" (12.7mm) of additional handrail perimeter dimension above 4" (102mm), the vertical clearance dimension of 1 **½"** (38mm) shall be permitted to be reduced by 0.125" (3mm).*

The following table illustrates the approximate minimum clearance required from the bottom of a circular handrail with a perimeter of 4" or greater, to a handrail bracket.

NOMINAL IPS DIAMETER	ACTUAL OUTSIDE DIAMETER
N.A.	1.25"
1 **¼"**	1.66"
1 **½"**	1.90"

OUTSIDE PERIMETER	CLEARANCE REQUIRED
3.93"	1 **¼"**
5.21"	1 **½"**
5.97"	1 **⅛"**

Structural Requirements
Structural requirements for handrails, guardrails and grab bars are frequently expressed in two ways: 1) an applied load distributed uniformly along the rail, and, nonconcurrently, 2) a concentrated load applied at any point along the top rail. The designer should consult the governing codes, local ordinance, project specifications and regulatory authorities to determine specific structural requirements. An excellent source of design load requirements can be found in ASCE/ANSI 7-16 Minimum Design Loads for Buildings and Other Structures published by the American Society of Civil Engineers.

The information on this page is intended to be helpful to architects and specifiers. However it is imperative to contact the appropriate local code authority for current information.

NOMMA CBSCA

We dedicate Catalog 22 to Ernie Hulsizer our vice president for 56 years. Ernie studied metallurgical engineering at Lafayette College and holds an MBA from the Wharton School of Business.

A devoted husband, father, grandfather and great-grandfather and a lifelong Yankee fan, we wish Ernie many years of happy retirement.

JB® GLASS RAILING COMPONENTS

JB® Glass Railing is a system of metal railing components for use with ½″ or ¾″ tempered glass panels as structural balusters. Matching stock parts speed fabrication and assembly.

Aluminum Shoe Mouldings are designed to support a design load of 300 lbs. applied at any point at the top of a railing up to 42″ in height. **Proper mounting of the shoe moulding is crucial to the strength of JB® Glass Railing. Test results are available upon request or from our website, www.juliusblum.com**. Mechanical properties of glass may be verified with supplier of glass panels.

Shoe mouldings are supplied in two configurations and two alloys. Available for ½″ and ¾″ tempered glass, the heavier sections, in alloy 6063-T52, may be anodized and are better suited for bending and fascia mounting. The lighter section is extruded in high-strength alloy 6061-T6 to provide the required strength with minimum weight. All three sections can be surface mounted—exposed or with a sheet metal trim—or set flush with the floor surface.

Protective Insert prevents direct metal to glass contact and fits closely inside the recess in the handrail mouldings that are mounted to the glass with an adhesive selected at the specifier's discretion.

The setting block supports and cushions the lower edge of the glass while centering it in the channel of the shoe moulding. Glass panels are set in the shoe moulding using a filler selected at the discretion of the architect or fabricator. Do not use epoxy-based fillers.

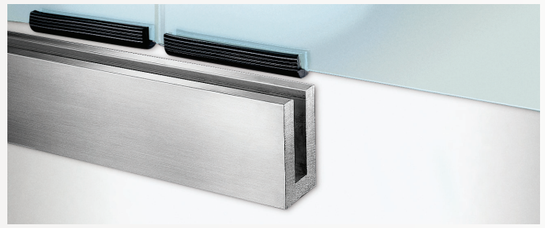
For matching wall-mounted or glass-mounted handrails, use Carlstadt® wall brackets with matching tubing sections or JB® Glass Railing sections and concealed, inserted closure.

The glass tempering process requires that all fabrication be completed prior to tempering. Attempts to cut, drill, or grind the edges after tempering are likely to cause breakage.

- **Aluminum** glass rail sections are extruded from alloy 6063-T52 and, when properly fabricated, are suitable for anodizing, including most of the hard-coat anodic processes. Black anodizing may result in inconsistent matches. Consult your anodizer before specifying.
- **Bronze** glass rail sections are extruded from alloy C38500, architectural bronze.
- **Nickel-Silver** extrusions are of alloy C79800. Nickel-silver is a copper alloy, similar in appearance to stainless steel with golden highlights.
- **Stainless Steel** glass rail sections are roll-formed, type 302/304 (18-8). It is important to be aware that connections of roll-formed stainless steel shapes require special attention to assure proper alignment.

Bar stock is sold mill finish except as noted. All items are carried in stock in substantial quantities for prompt shipment.

Center of Theological Inquiry, Princeton, NJ, Capitol Steel Products, Inc., Trenton, NJ (Fabricator), Michael Graves Architect, Princeton, NJ (Architect), © Jeffrey Totaro, 2024 (Photo Credit).

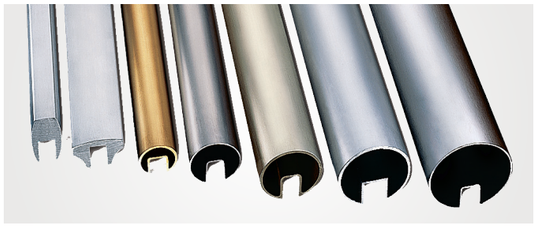


GLASS MOUNTING

Resilient setting blocks support and cushion glass panels as they are inserted into the shoe. Setting blocks should be 4″ to 6″ long and placed at points ¼″ and ¾″ distance from edge of the length of the panel from each end. Space is allowed for plumbing and setting of glass—choice of filler material is at the discretion of the specifier/fabricator. Spacer blocks, ¼″ thick, should be inserted between adjoining glass panels to prevent glass to glass contact.

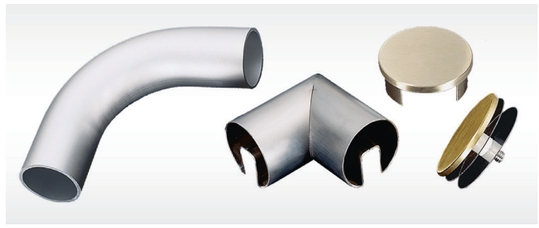
HANDRAIL ASSEMBLY

A vinyl protective insert protects the top edge of the glass panel and fits closely inside the handrail moulding—a windshield sealer-type clear adhesive is recommended. Intermediate rails may be attached directly to the glass (holes must be drilled before tempering) using the JB® Glass-Mounted Handrail Adapter Kit and Carlstadt® wall brackets. Splice connections for tubular sections are accomplished with internal connector sleeves and structural epoxy.



HANDRAILS AND TUBING

JB® Glass Railing top mouldings are available in several shapes and sizes in aluminum, bronze, nickel-silver, stainless steel, and oak acrylic/wood. Handrails may be wall mounted using Carlstadt® brackets with an anchor plug or by using available matching 1.900″, 2 ½″, 3″, 3 ½″ and 4″ tubing. Handrails may be mounted directly to the glass using a JB® Glass-Mounted Handrail Adapter Kit with Carlstadt® wall brackets. Brackets may be mounted on ½″ or ¾″ tempered glass using a JB® Glass-Mounted Handrail Adapter Kit.



CORNER BENDS, MITER CORNERS, END CAPS

Radius and miter elbows match the contour of 1.900″, 2½″, 3″, 3½″, and 4″ round tubing shapes. Either style of elbow may be used as a wall return and is attached to handrail by use of internal connector sleeves and structural adhesive. End caps are available for most sections and may be attached by structural adhesive.

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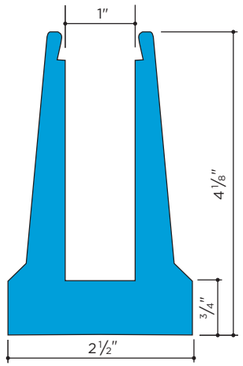
● ALUMINUM ● PLASTIC

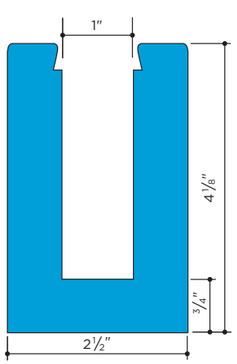
SHOE MOULDING

Aluminum, 20′ lengths
For use with ½″ glass, except as noted



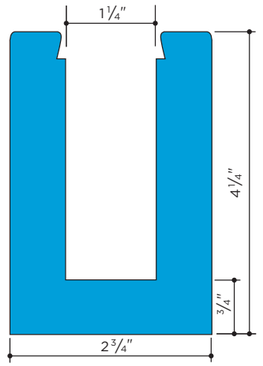
Alloy 6061-T6

● **1141** Aluminum	5.42 lb/ft



Alloy 6063-T52

● **1142*** Aluminum	8.64 lb/ft



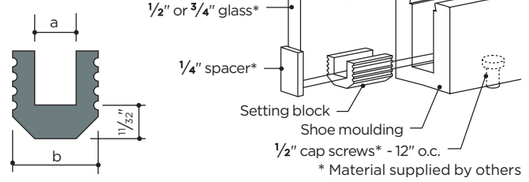
Alloy 6063-T52

● **1143*** Aluminum	8.64 lb/ft

* For use with ¾″ glass

SETTING BLOCK

Polyvinyl Chloride



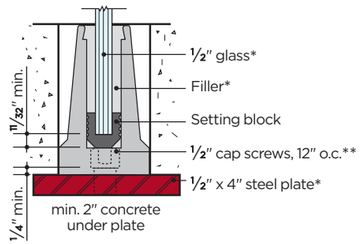
	a	b	Coil Length
● **8711**	½″	1″	25′
● **8710**	¾″	1¼″	40′

SHOE MOUNTING DETAILS

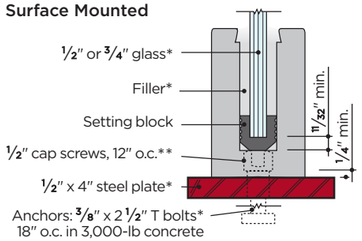
Proper mounting of the shoe moulding is crucial to the strength of JB® Glass Railing. While there are alternate methods of attachment, the assembly details on this page depict the four ways in which the shoe mouldings have been tested.

Assembly Details

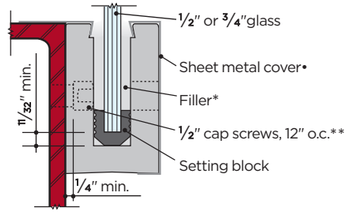
Flush Mounted



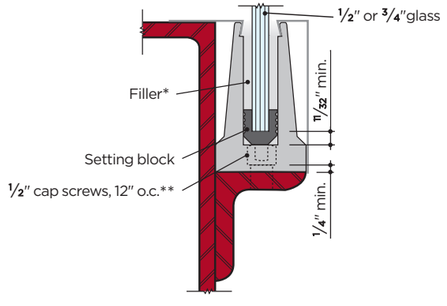
Surface Mounted



Fascia Mounted

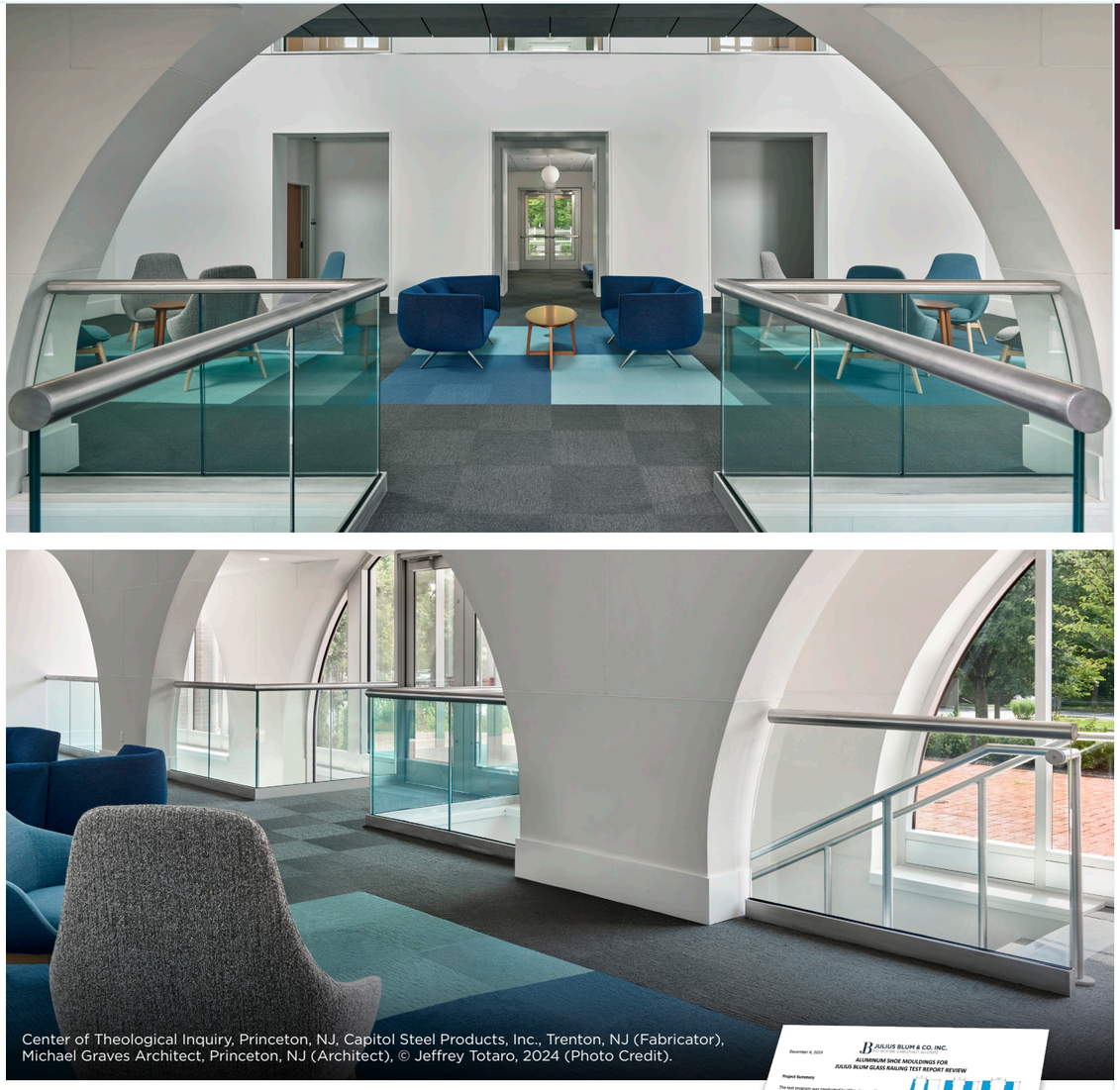


Shelf Angle Mounted



* Material supplied by others
**Mounting Bolt: ½″ stainless steel socket head cap screw. Used on 12″ centers

Aluminum must not be placed in direct contact with concrete or dissimilar metals. Use appropriate paint or primer. (See Guide Specifications Section 057300 at juliusblum.com)



Center of Theological Inquiry, Princeton, NJ, Capitol Steel Products, Inc., Trenton, NJ (Fabricator), Michael Graves Architect, Princeton, NJ (Architect), © Jeffrey Totaro, 2024 (Photo Credit).

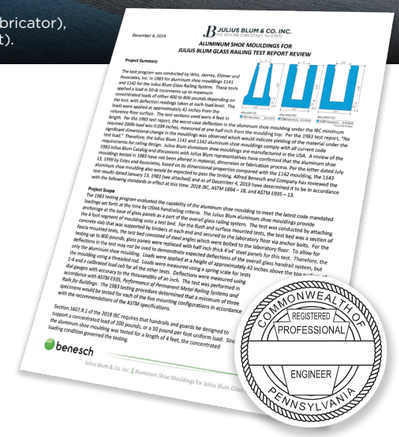
STRUCTURAL TEST RESULTS

JB® Glass Rail shoe mouldings were subjected to structural testing by the independent testing lab of Wiss, Janney, Elstner Associates, Inc. of Northbrook, Illinois.

The complete JB® Glass Rail Shoe Moulding test report is available upon request.

Reprinted to the right is the summary, reviewed in 2019 by engineering firm Benesch, of the structural test of the JB® Glass Rail Shoe Moulding.

Complete test report available to download *juliusblum.com/testreport*


JULIUS BLUM & CO., INC.

ALUMINUM SHOE MOULDINGS FOR JULIUS BLUM GLASS RAILING TEST REPORT REVIEW

Project Summary

Project Scope

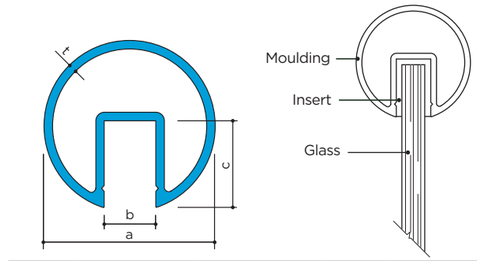
benesch

COMMONWEALTH OF REGISTERED PROFESSIONAL ENGINEER PENNSYLVANIA

ALUMINUM STAINLESS PLASTIC

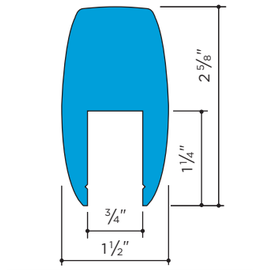
HANDRAIL MOULDINGS

20′ lengths. For use with ½″ glass, except as noted

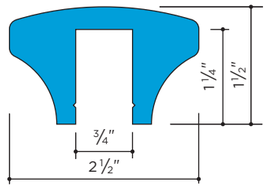


		a	b	c	t	lb/ft
1130	Aluminum	1.900"	¾"	1¼"	.109"	1.01
1132	Aluminum	2½"	¾"	1¼"	.125"	1.52
1137	Aluminum	3"	¾"	1¼"	.125"	1.72
1154†	Aluminum	3"	1"	1¼"	.125"	1.73
1135	Aluminum	3½"	¾"	1¼"	.125"	1.95
1155†	Aluminum	3½"	1"	1¼"	.125"	1.97

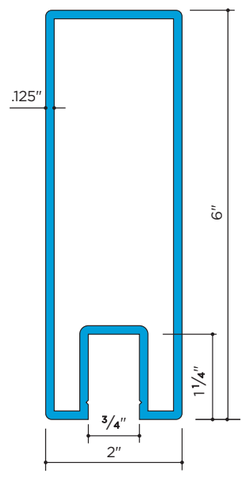
† For use with ¾" glass



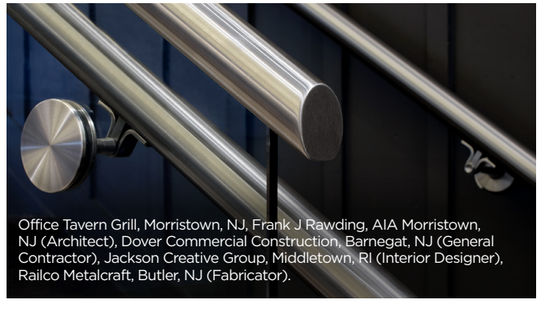
1133 Aluminum 3.02 lb/ft



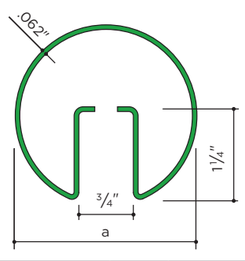
1134 Aluminum 2.40 lb/ft



1136 Aluminum 2.70 lb/ft


Office Tavern Grill, Morristown, NJ, Frank J Rawding, AIA Morristown, NJ (Architect), Dover Commercial Construction, Barnegat, NJ (General Contractor), Jackson Creative Group, Middletown, RI (Interior Designer), Railco Metalcraft, Butler, NJ (Fabricator).

20′ lengths



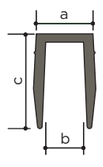
		a	lb/ft	Finish
1430*	Stainless	1.900"	1.70	No.2B
1432*	Stainless	2½"	1.96	No.2B
1452	Stainless	2½"	1.96	No.4
1433*	Stainless	3"	2.46	No.2B
1453	Stainless	3"	2.46	No.4
1472*	Stainless	4"	3.17	No.2B
1473	Stainless	4"	3.17	No.4

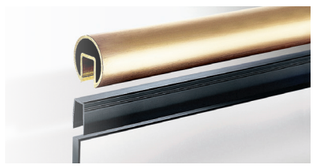
* Suitable for polishing

It is important to be aware that connections of roll-formed stainless steel shapes require special attention to ensure proper alignment.

PROTECTIVE INSERTS

Polyvinyl Chloride, 7′ lengths.
Fasten with windshield sealer type of clear adhesive

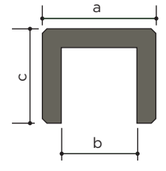


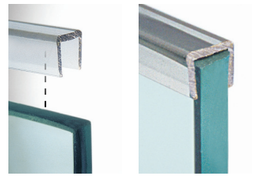


		Glass Size	a	b	c
8709	Polyvinyl Chloride	½"	¾"	½"	1"
8713	Polyvinyl Chloride	½"	¾"	½"	1 1/8"
8714	Polyvinyl Chloride	¾"	1"	¾"	1¼"

EDGE PROTECTOR

Clear Copolymer, 7′ lengths





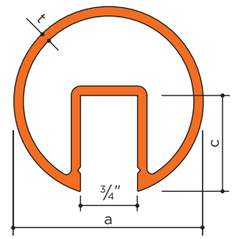
Fasten with windshield sealer type of clear adhesive or clear double-stick foam tape.

	Glass Size	a	b	c
8715	½"	.510"	½"	5/8"
8716	¾"	.760"	¾"	5/8"

BRONZE NICKEL-SILVER PLASTIC

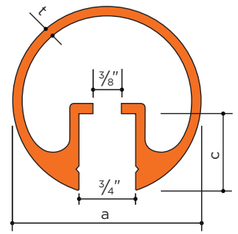
HANDRAIL MOULDINGS

20′ lengths, except as noted

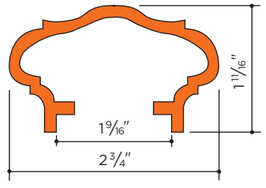


		a	c	t	lb/ft
1230	Bronze	1.900"	¾"	.100"	3.43
1233*	Bronze	3"	1¼"	.125"	6.05
1235**	Bronze	3½"	1¼"	.187"	8.70

* 16′ lengths ** 12′ lengths

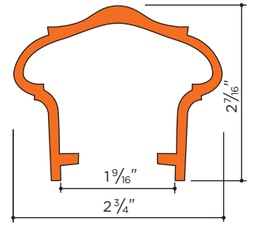


		a	c	t	lb/ft
1232	Bronze	2½"	1"	.125"	5.19



4538* Bronze 3.15 lb/ft

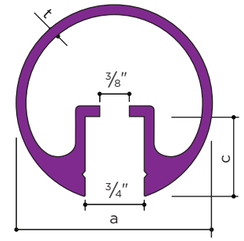
* 16′ lengths Use with **8738** insert for ½" glass



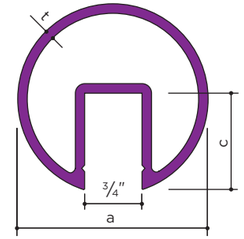
4533* Bronze 3.66 lb/ft

* 16′ lengths; Use with **8738** insert for ½" glass

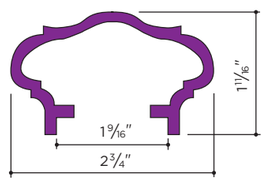
16′ lengths, except as noted



		a	c	t	lb/ft
1330	Nickel-Silver	1.900"	¾"	.125"	3.43
1332	Nickel-Silver	2½"	1"	.125"	5.19



		a	c	t	lb/ft
1333	Nickel-Silver	3"	1¼"	.125"	5.28

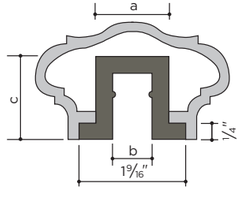


5538* Nickel-Silver 2.96 lb/ft

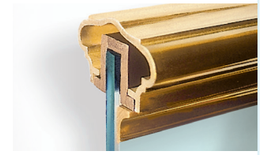
* 20′ lengths; Use with **8738** insert for ½" glass

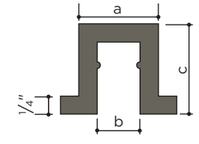
PROTECTIVE INSERTS

Polyvinyl Chloride
7′ lengths.
Fasten with windshield sealer type of clear adhesive



5538 or **4538** with **8738** insert used with **6121** moulding (see pg. 105) on ½" glass





	a	b	c
8738	1"	½"	1¼"

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

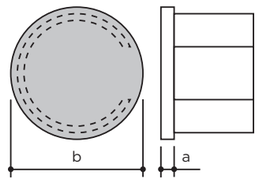
Private Residence, Raleigh, NC, Leo Gaev Metalworks, Chapel Hill, NC (Fabricator), Louis Cherry Architecture, Raleigh, NC (Architect), Rufty Homes, Raleigh, NC (General Contractor).

FITTINGS AVAILABILITY FOR JB® GLASS RAILING

Handrail Moulding	90° Radius Elbow	90° Miter Elbow	Connector Sleeve	End Cap	Matching Tubing
1130	7210		1160	7280	Yes
1132	1110	1111	1163	1180	Yes
1135	1122	1112	1164	1181	Yes
1136				1186	Yes
1137	1120	1115	1170	1182	Yes
1154	1120	1113	1170	1182	Yes
1155	1122	1114	1164	1181	Yes
1230	1222	1214†	1160	1282†	Yes
1232	1210	1211†	1163	1280†	Yes
1233	1220	1213†	1170	1283†	Yes
1235		1212†	1264	1281†	Yes
1330	1330C		1363	1330N†	Yes
1332	1332C		1163	1332N†	Yes
1333	1333C		1170	1333N†	Yes
1430	9310**	1414**	9363	9380**	Yes
1432/52	1410*	1411**	1463	1480**	Yes
1433/53	1420*	1413**	1464	1482**	Yes
1472/73		1473M**	1474	1473N**	Yes
4538				4538N•†	
5538				5538N•†	

* No. 2B Finish ** No. 4 Finish
† Polished and lacquered, 180 grit • Matches profile

END CAPS

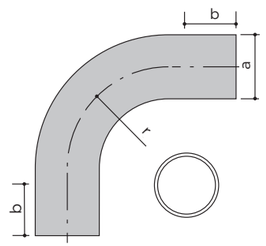


1186

		a	b
7280	Aluminum	1/8"	1.900"
1180	Aluminum	1/8"	2½"
1182	Aluminum	1/8"	3"
1181	Aluminum	1/8"	3½"
1186•	Aluminum	¼"	2"
1282	Bronze	¼"	1.900"
1280	Bronze	¼"	2½"
1283	Bronze	¼"	3"
1281	Bronze	¼"	3½"
4538N	Bronze	2"	•
1330N	Nickel-Silver	¼"	1.900"
1332N	Nickel-Silver	¼"	2½"
1333N	Nickel-Silver	¼"	3"
5538N	Nickel-Silver	2"	•
9380	Stainless	1/8"	1.900"
1480	Stainless	1/8"	2½"
1482	Stainless	1/8"	3"
1473N	Stainless	1/8"	4"

• Matches profile

90° RADIUS ELBOW

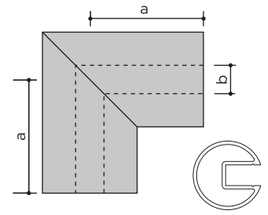


9310

		a	r	Wall	b
7210	Aluminum	1.900"	3"	.109"	2"
1110	Aluminum	2½"	5"	.125"	2½"
1120	Aluminum	3"	5"	.125"	2½"
1122	Aluminum	3½"	5"	.125"	2½"
1222	Bronze	1.900"	3"	.100"	2½"
1210	Bronze	2½"	5"	.125"	2½"
1220	Bronze	3"	6"	.125"	2½"
1330C	Nickel-Silver	1.900"	3"	.109"	2½"
1332C	Nickel-Silver	2½"	5"	.125"	2½"
1333C	Nickel-Silver	3"	5"	.125"	2½"
9310	Stainless	1.900"	3"	.062"	2"
1410	Stainless	2½"	5"	.062"	2½"
1420	Stainless	3"	5"	.062"	2½"

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

90° MITER ELBOW

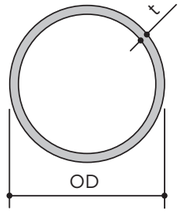


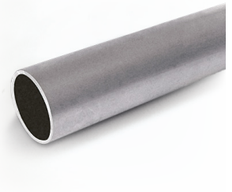
1115

		OD	Wall	a	b
1111	Aluminum	2½"	.125"	3"	¾"
1115	Aluminum	3"	.125"	4½"	¾"
1113	Aluminum	3"	.125"	4½"	1"
1112	Aluminum	3½"	.125"	4½"	¾"
1114	Aluminum	3½"	.125"	4½"	1"
1214	Bronze	1.900"	.100"	3"	¾"
1211	Bronze	2½"	.125"	3"	¾"
1213	Bronze	3"	.125"	4½"	¾"
1212	Bronze	3½"	.187"	4½"	¾"
1414	Stainless	1.900"	.062"	3"	¾"
1411	Stainless	2½"	.062"	3"	¾"
1413	Stainless	3"	.062"	4½"	¾"
1473M	Stainless	4"	.062"	4½"	¾"

OD ROUND TUBING

Mill finish only, except as noted .
20' lengths, except as noted





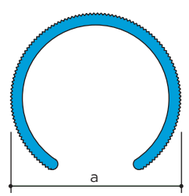
Aluminum	6063 T52
Bronze	C38500
Nickel-Silver	C79800
Stainless	Type 304

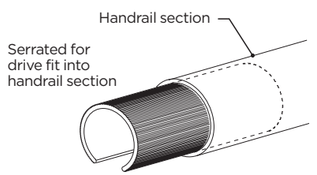
	OD	t	lb/ft	Area	I	s
Aluminum	1.900"	.109"	.721	.614	.247	.260
Aluminum	2½"	.125"	1.119	.933	.659	.527
Aluminum	3"	.125"	1.328	1.129	1.169	.779
Aluminum	3½"	.125"	1.559	1.325	1.890	1.080
Bronze	1.900"	.100"	2.070	.565	.230	.242
Bronze	2½"	.125"	3.441	.933	.659	.527
Bronze	3"	.125"	4.500	1.129	1.169	.779
Bronze††	3½"	.125"	4.850	1.325	1.890	1.080
Nickel-Silver	1.900"	.109"	2.250	.614	.247	.260
Nickel-Silver†	2½"	.125"	3.400	.933	.659	.527
Nickel-Silver†	3"	.125"	4.500	1.129	1.169	.779
Stainless**	1.900"	.062"	1.274	.375	.158	.166
Stainless	2½"	.062"	1.691	.479	.356	.285
Stainless	3"	.062"	1.930	.577	.622	.415
Stainless	4"	.062"	2.550	.804	1.556	.778

** No. 4 Finish † 16' lengths †† 12' lengths

CONNECTOR SLEEVE

5" lengths



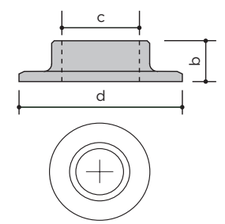


Fasten with Scotch-Weld® adhesive, page 21.

		a
7063	Aluminum for 6489 Bronze and 5289 Nickel-Silver	1.500"
1363	Aluminum for 1330 handrail	1.650"
1160	Aluminum for 1130 and 1230 handrails	1.682"
9363	Aluminum for 1430 handrail	1.770"
1163	Aluminum for 1132, 1232, and 1332 handrails	2.250"
1463	Aluminum for 1432 and 1452 handrails	2.375"
1170	Aluminum for 1137, 1154, 1233 and 1333 handrails	2.750"
1464	Aluminum for 1433 and 1453 handrails	2.875"
1264	Aluminum for 1235 handrail	3.125"
1164	Aluminum for 1135 and 1155 handrails	3.250"
1474	Aluminum for 1472 and 1473 handrails	3.875"

COVER FLANGE

Satin Finish



711

		OD	b	c	d
711	Aluminum	1.900"	1"	1.94"	4"
1125	Aluminum	2½"	1"	2.54"	4¾"
1123	Aluminum	3"	1"	3.04"	5"
811	Bronze	1.900"	1"	1.94"	4"
1225	Bronze	2½"	1"	2.54"	4¾"
1223	Bronze	3"	1"	3.04"	5"
411	Nickel-Silver	1.900"	1"	1.94"	4"
1325	Nickel-Silver	2½"	1"	2.54"	4¾"
1323	Nickel-Silver	3"	1"	3.04"	5"
211	Stainless	1.900"	7/8"	1.94"	4½"
1425	Stainless	2½"	1 1/16"	2.54"	4⅞"
1423	Stainless	3"	1 7/16"	3.04"	6⅛"

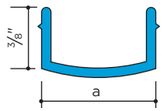
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

WALL-MOUNTED HANDRAIL

Matching tubing sections are available for wall mount using Carlstadt® rail wall brackets. JB® Glass Rail sections may also be wall mounted using the appropriate hardware. An anchor plug slips into the recess of the handrail and is locked in place by the bracket mounting screws. The handrail bracket flange is concealed inside the recess of the handrail. The underside of the handrail may be closed with an aluminum closure or stainless flat.

CLOSURES

5′ lengths, Flat

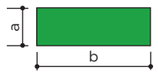


		a	lb/ft
● **1138**	Aluminum	3/4"	.10
● **1139**	Aluminum	1"	.13

For use with aluminum, nickel-silver and bronze handrails

TRUE BAR

12′ to 14′ lengths, sharp corners

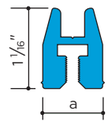


		a	b	lb/ft
●	Stainless	3/16"	3/4"	.48

For use with stainless steel handrails

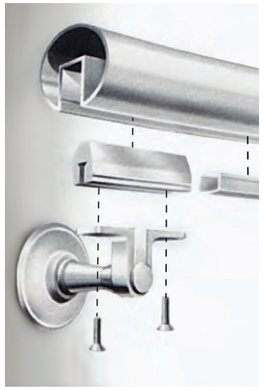
ANCHOR PLUG

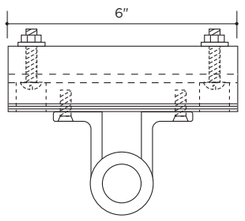
Fits recess in handrail

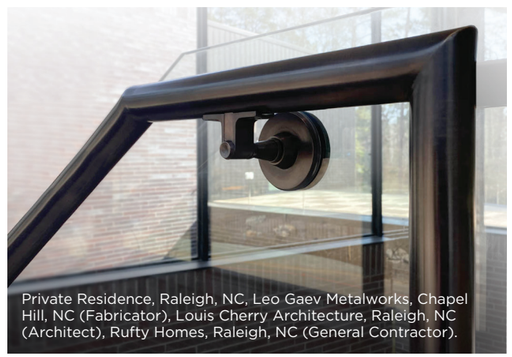


		a
● **1162**	Aluminum	3/4"
● **1161**	Aluminum	1"

Bottom of anchor plug has continuous thread for #10–32 screw







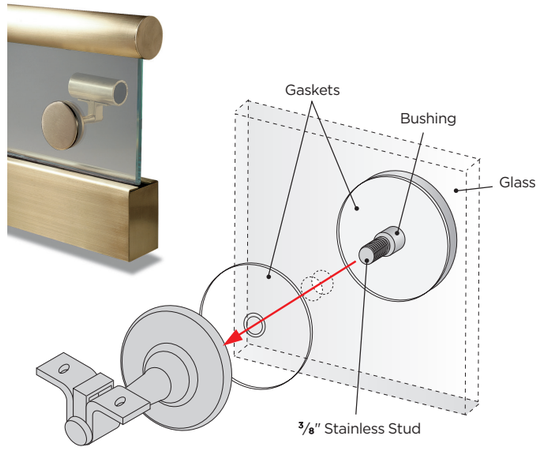
Private Residence, Raleigh, NC, Leo Gaev Metalworks, Chapel Hill, NC (Fabricator), Louis Cherry Architecture, Raleigh, NC (Architect), Rufty Homes, Raleigh, NC (General Contractor).

GLASS-MOUNTED HANDRAIL

Handrail may be mounted to the face of the tempered glass balustrade using a combination of wall brackets and our JB® Glass-Mounted Handrail Adapter Kit. The kit contains a disc with a 3/8" stud weld, a bushing, and two gaskets.

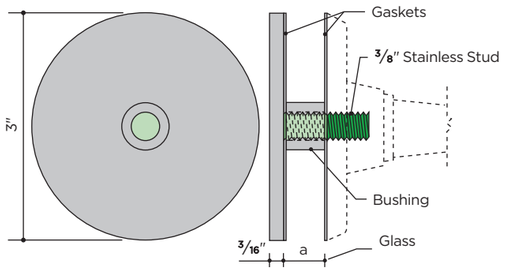
TO ASSEMBLE:

1. Prior to tempering, for 1/2" glass drill a 5/8" clear hole; for 3/4"glass drill a 7/8" clear hole.
   (Do not attempt to drill a hole in tempered glass—it will most likely break).
2. Insert the bushing in the hole.
3. Insert the stud welded disc with gasket through the bushing; place the gasket on the other side.
4. Thread on bracket and tighten.



GLASS-MOUNTED HANDRAIL ADAPTER KIT

For 1/2" and 3/4" glass
Satin Finish



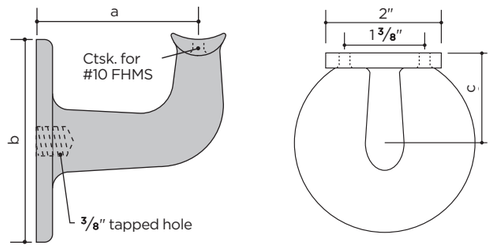
		Glass Size	a	Bushing Diameter
● **824**	Bronze	1/2"	1/2"	5/8"
● **840**	Bronze	3/4"	3/4"	7/8"
● **224***	Stainless	1/2"	1/2"	5/8"
● **240***	Stainless	3/4"	3/4"	7/8"
● **1624**	Nickel-Silver	1/2"	1/2"	5/8"
● **1640**	Nickel-Silver	3/4"	3/4"	7/8"

* For use with aluminum and stainless brackets

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

WALL BRACKETS

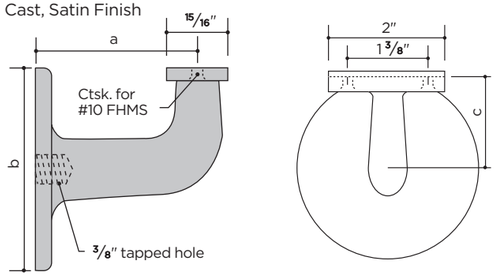
Cast, Satin Finish, for use with pipe railing



		a	b	c
● **376**	Aluminum	2 1/2"	3 1/8"	1 9/16"
● **389**	Aluminum	3 1/8"	3 3/4"	1 7/8"
● **375**	Bronze	2 1/2"	3 1/8"	1 9/16"
● **319**	Bronze	3 1/8"	3 3/4"	1 7/8"
● **176**	Nickel-Silver	2 1/2"	3 1/8"	1 9/16"
● **275**	Stainless	2 1/2"	3 1/8"	1 9/16"

WALL BRACKETS

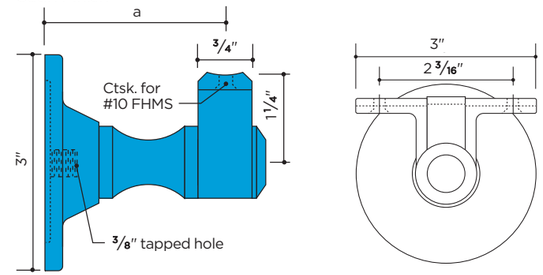
Cast, Satin Finish



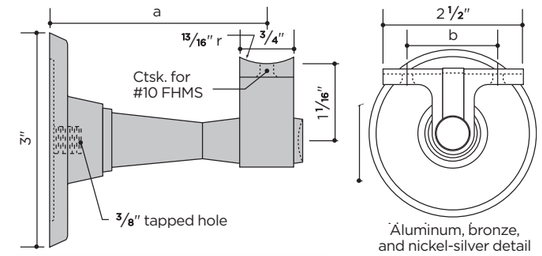
		a	b	c
● **371**	Aluminum	2 1/2"	3 1/8"	1 9/16"
● **302**	Aluminum	3 1/8"	3 3/4"	1 7/8"
● **370**	Bronze	2 1/2"	3 1/8"	1 9/16"
● **304**	Bronze	3 1/8"	3 3/4"	1 7/8"
● **170**	Nickel-Silver	2 1/2"	3 1/8"	1 9/16"
● **270**	Stainless	2 1/2"	3 1/8"	1 9/16"

CARLSTADT® SELF-ALIGNING WALL BRACKETS

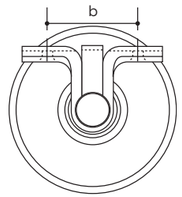
Satin Finish

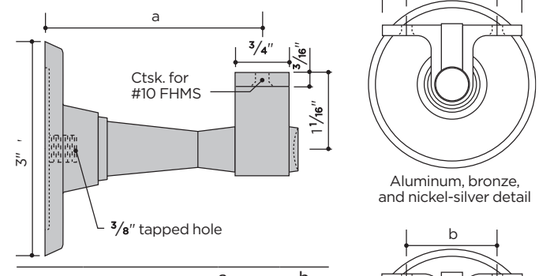


		a
● **307**	Aluminum	2 1/2"
● **308**	Aluminum	3"

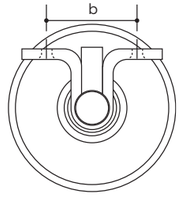


		a	b
● **321**	Aluminum	2 1/4"	1 5/8"
● **403**	Aluminum	3"	1 5/8"
● **405**	Aluminum	3 1/2"	1 5/8"
● **842**	Bronze	2 1/4"	1 5/8"
● **801**	Bronze	2 1/2"	1 5/8"
● **803**	Bronze	3"	1 5/8"
● **1342**	Nickel-Silver	2 1/4"	1 5/8"
● **1303**	Nickel-Silver	3"	1 5/8"
● **242**	Stainless	2 1/4"	1 13/16"
● **221**	Stainless	2 1/2"	1 13/16"
● **223**	Stainless	3"	1 13/16"

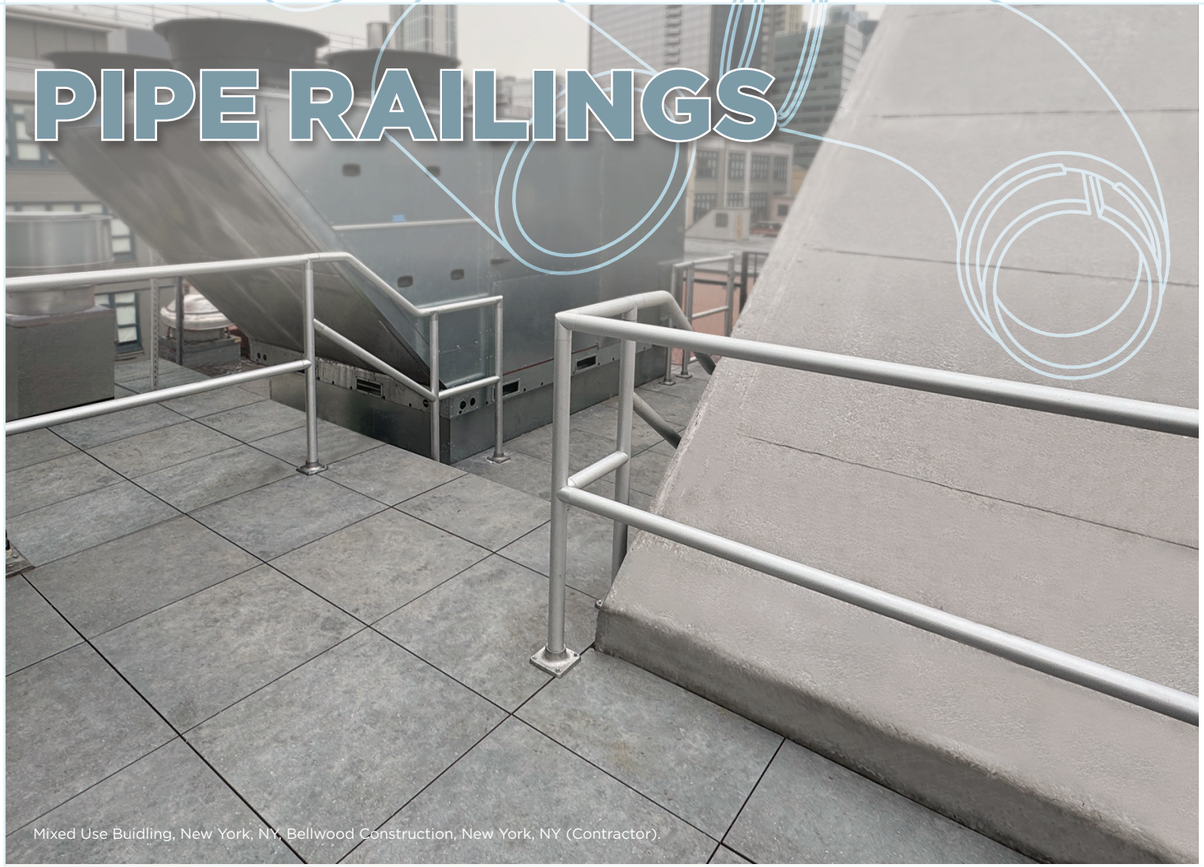




		a	b
● **443**	Aluminum	3"	1 5/8"
● **444**	Aluminum	3 1/2"	1 5/8"
● **844**	Bronze	2 1/2"	1 5/8"
● **843**	Bronze	3"	1 5/8"
● **1343**	Nickel-Silver	3"	1 5/8"
● **271**	Stainless	2 1/4"	1 13/16"
● **243**	Stainless	3"	1 13/16"



PIPE RAILINGS



Mixed Use Buidling, New York, NY. Bellwood Construction, New York, NY (Contractor).

Connectorail® is an easy-to-assemble pipe railing system that is fabricated quickly without welding. Components slip together and are joined by concealed mechanical fasteners at intersections and by epoxy structural adhesive at splice joints.

The Connectorail® system has been engineered and tested to ensure structural strength and integrity when properly installed. Test results are available upon request. Connectorail® meets established safety standards when installed in accordance with our data and instructions.

- **Aluminum** Connectorail® components are stocked in 1¼″ and 1½″ pipe sizes—schedules 10 and 40—in alloy 6063 with either clear anodized—AA-M10-C22-A31 (204R1)—or smooth mill finish. Connectorail® pipe is specially extruded to close dimensional tolerances with a clean smooth surface finish. Aluminum pipe is stocked in mill-wrapped, paper-interleaved bundles of approximately 100 pounds. Aluminum pipe is suitable for powder coating and anodizing, including most of the hard coat anodic processes. Black anodizing may result in inconsistent matches. Consult your anodizer before specifying.
- **Bronze** Connectorail® is supplied in 1¼″ and 1½″ pipe sizes in drawn pipe alloy C23000 (Red Brass) with a smooth mill finish. Bronze fittings are satin finished—(180 grit)—and lacquered.
- **Nickel-Silver** Connectorail® is available in extruded 1½″schedule 10 pipe in alloy C79800 with a smooth mill finish. Radius elbows are supplied similarly. All other components are satin finished—(180 grit)—and lacquered.
- **Stainless Steel** (type 304) components are furnished with a No. 4 satin finish in 1½″ schedule 5 pipe size in an Ornamental Grade with a guaranteed expected yield of 55,000 [psi]. The pipe is sleeved for surface protection.

Stainless Connectorail® can also be fabricated by welding. The use of Connectorail® stainless steel fittings eliminates notching and grinding and permits rapid welding with a minimum addition of weld metal.

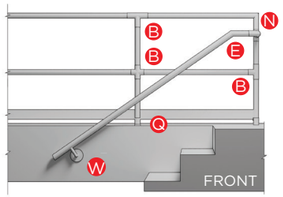
Fittings for welded assembly are available in cast aluminum, bronze, iron, malleable iron, formed steel, and stainless steel. Flanges and elbows are available for aluminum, bronze, nickel-silver, and stainless OD tubing. All items are carried in stock in substantial quantities and are available for immediate shipment. The *Americans with Disabilities Act* adopted by Congress in 1992 specified circular handrails to be 1¼″ minimum and 1½″ maximum. However, the *Guidance on the 2010 ADA Standards for Accessible Design - September 2010*, published by the US Department of Justice, has now properly clarified the intent of the dimensional requirements to be an outside diameter of 1¼″ to 2″.

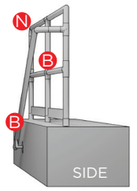
FITTING KEY:

A 90° Radius Elbow	D Heavy-Duty Floor Flange	G Angle Tee	L Gate Latch & Stop	Q Toe Board	U Return Elbow
B 90° Tee	E Rail Elbow	H Post Elbow	M 90° Corner Tee	R Ramp Rail Tee	W Wall Bracket
C Connector Sleeve	F Ramp Rail Elbow	J Gate Hinge	N 90° Miter Elbow	S Cover Flange	X Socket
		K Post Bracket	P 90° 3-Way Elbow	T Fascia Flange	Y Panel Clip

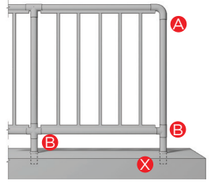
Verify all dimensions before cutting. Aluminum components and pipe are carried in stock with a mill finish or a clear anodized finish—AA-M10-C22-A31 (204R1). When specifying anodized fittings, add the suffix -A to catalog number listed (e.g. **7140-A**).

STAIR ELEVATION

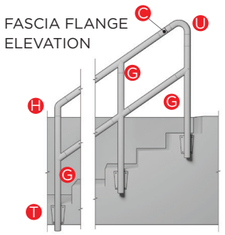




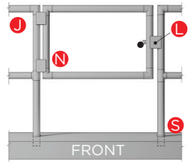
BALUSTER RAIL



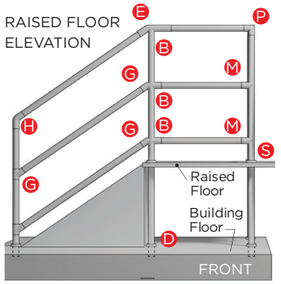
FASCIA FLANGE ELEVATION

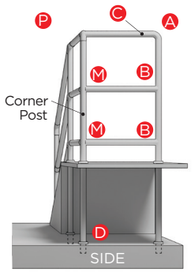


GATE ASSEMBLY

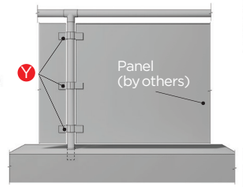


RAISED FLOOR ELEVATION

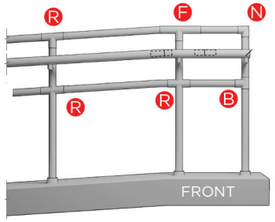




PANEL RAIL



RAMP RAIL ELEVATION (Offset Handrail Optional)



FULL RANGE OF FITTINGS

A complete selection of fittings is offered for the Connectorail® system. A suitable fitting is available for practically any stair or ramp railing condition. Adjustable handrail brackets and ramp rail tees are recommended for unusual ramp or stair angles.

OPTIONS FOR MOUNTING

Connectorail® posts may be embedded in floor slab with a cover flange, surface mounted with a heavy-duty floor flange, or side mounted on fascia or stringer by means of a fascia flange. A reinforcing insert is used at the base of the post for added strength and stiffness. A socket for removable railings—with cover—is also available.

MECHANICAL CONNECTIONS

Non-welded connections eliminate welding discoloration and expensive grinding. Structural adhesive, stainless steel machine screws with lock washers, and threaded tubular rivets provide positive connections at joints. Mechanical connections avoid the reduced allowable design stress effect of welding heat on the structural properties of aluminum handrail pipe.

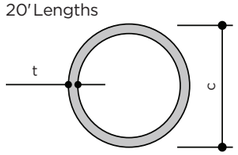
CONTINUOUS POSTS AND RAILS

Posts and top rails run in continuous lengths, thus providing a system that is inherently stronger than one with cast tee and cross connections. Connectorail® has a continuous, smooth top surface as required by established safety standards and code requirements. The structural integrity of the railing depends on the proper selection of components, location of posts, and proper assembly and installation.

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

CONNECTORAIL® PIPE

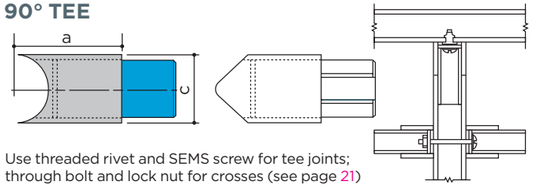
20' Lengths



- Aluminum: Alloy 6063-T52 and Alloy 6063-T832 clear anodized or mill finish
- Bronze: C23000, smooth mill finish
- Nickel-Silver: C79800, smooth mill finish
- Stainless: Type 304, ornamental grade, No. 4 finish

	Pipe	Sched.	t	c	lb/ft
Aluminum	1¼"	10	.109"	1.660"	.625
Aluminum	1¼"	40	.140"	1.660"	.785
Aluminum	1½"	10	.109"	1.900"	.721
Aluminum	1½"	40	.145"	1.900"	.940
Bronze	1¼"	40	.146"	1.660"	2.630
Bronze	1½"	40	.150"	1.900"	3.130
Nickel-Silver	1½"	10	.109"	1.900"	2.250
Stainless	1½"	5	.062"	1.900"	1.274

90° TEE

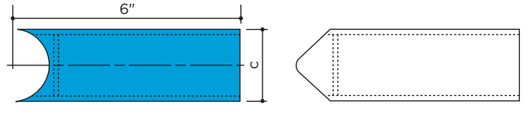


Use threaded rivet and SEMS screw for tee joints; through bolt and lock nut for crosses (see page 21)

		Pipe	Sched.	c	a
7140	Aluminum	1¼"	10	1.660"	2"
7440	Aluminum	1¼"	40	1.660"	2"
7240	Aluminum	1½"	10	1.900"	2"
7540	Aluminum	1½"	40	1.900"	2"
8640	Bronze	1¼"	40	1.660"	3"
8840	Bronze	1½"	40	1.900"	3"
1340	Nickel-Silver	1½"	10	1.900"	2"
9340	Stainless	1½"	5	1.900"	3"

90° 6" TEE

Aluminum only



		Pipe	Sched.	c
7150	Aluminum	1¼"	10	1.660"
7450	Aluminum	1¼"	40	1.660"
7250	Aluminum	1½"	10	1.900"
7550	Aluminum	1½"	40	1.900"

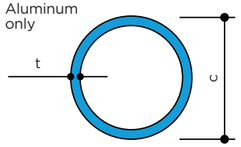
CONNECTOR SLEEVES

Serrated for drive fit into **Connectorail®** pipe

		Pipe	Sched.	b
7163	Aluminum	1¼"	10	1.442"
7463	Aluminum	1¼"	40	1.380"
7263	Aluminum	1½"	10	1.682"
7563	Aluminum	1½"	40	1.610"
9363	Aluminum	1½"	5	1.770"

HIGH STRENGTH CONNECTORAIL® POSTS

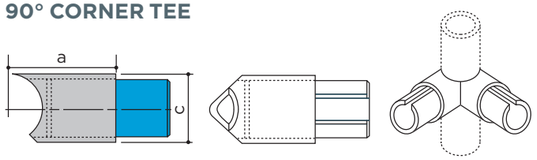
Aluminum only



Alloy 6063-T832
Drawn pipe precut to post lengths.
Clear anodized or mill finish

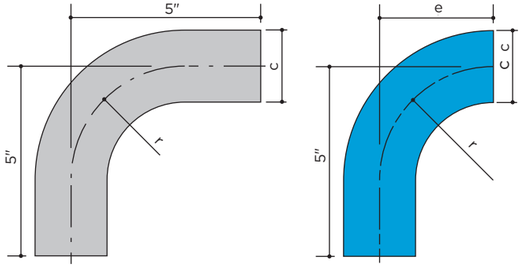
		Pipe	Sched.	Length	c	t
7103	Aluminum	1¼"	10	38"	1.660"	.109"
7104	Aluminum	1¼"	10	50"	1.660"	.109"
7403	Aluminum	1¼"	40	38"	1.660"	.140"
7404	Aluminum	1¼"	40	50"	1.660"	.140"
7203	Aluminum	1½"	10	38"	1.900"	.109"
7204	Aluminum	1½"	10	50"	1.900"	.109"
7503	Aluminum	1½"	40	38"	1.900"	.145"
7504	Aluminum	1½"	40	50"	1.900"	.145"

90° CORNER TEE



		Pipe	Sched.	c	a
7141	Aluminum	1¼"	10	1.660"	2"
7441	Aluminum	1¼"	40	1.660"	2"
7241	Aluminum	1½"	10	1.900"	2"
7541	Aluminum	1½"	40	1.900"	2"
9341	Stainless	1½"	5	1.900"	3"

90° RADIUS ELBOW

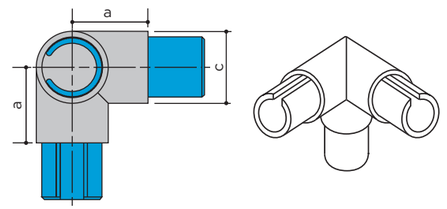


		Pipe	Sched.	c	r	e
7110	Aluminum	1¼"	10	1.660"	2½"	
7120*	Aluminum	1¼"	10	1.660"	2½"	2½"
7410	Aluminum	1¼"	40	1.660"	2½"	
7420*	Aluminum	1¼"	40	1.660"	2½"	2½"
7210	Aluminum	1½"	10	1.900"	3"	
7220*	Aluminum	1½"	10	1.900"	3"	3"
7510	Aluminum	1½"	40	1.900"	3"	
7520*	Aluminum	1½"	40	1.900"	3"	3"
8610	Bronze	1¼"	40	1.660"	2½"	
8810	Bronze	1½"	40	1.900"	3"	
1330C	Nickel-Silver	1½"	10	1.900"	3"	
9310	Stainless	1½"	5	1.900"	3"	

* For wall return

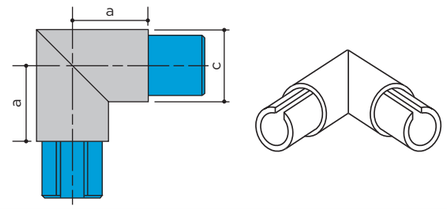
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

90° THREE-WAY ELBOW



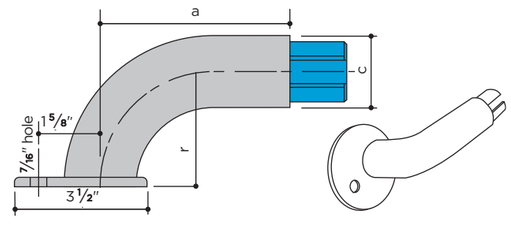
		Pipe	Sched.	c	a
7130	Aluminum	1¼"	10	1.660"	2"
7430	Aluminum	1¼"	40	1.660"	2"
7230	Aluminum	1½"	10	1.900"	2"
7530	Aluminum	1½"	40	1.900"	2"
9330	Stainless	1½"	5	1.900"	3"

90° MITER ELBOW



		Pipe	Sched.	c	a
7111	Aluminum	1¼"	10	1.660"	2"
7411	Aluminum	1¼"	40	1.660"	2"
7211	Aluminum	1½"	10	1.900"	2"
7511	Aluminum	1½"	40	1.900"	2"
9311	Stainless	1½"	5	1.900"	3"

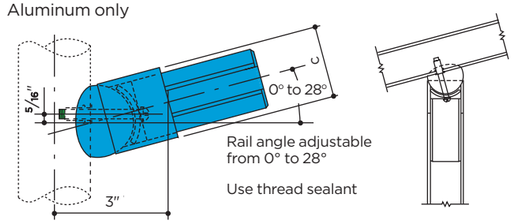
WALL RETURN



		Pipe	Sched.	c	r	a
7173	Aluminum	1¼"	10	1.660"	2½"	5"
7473	Aluminum	1¼"	40	1.660"	2½"	5"
7473-3	Aluminum	1¼"	40	1.660"	3"	5"
7273	Aluminum	1½"	10	1.900"	3"	5"
7573	Aluminum	1½"	40	1.900"	3"	5"
8673	Bronze	1¼"	40	1.660"	2½"	5"
8873	Bronze	1½"	40	1.900"	3"	5"
1373	Nickel-Silver	1½"	10	1.900"	3"	6"
9373	Stainless	1½"	5	1.900"	3"	5"
9372	Stainless	1½"	5	1.900"	2½"	5"

RAMP RAIL TEE

Aluminum only

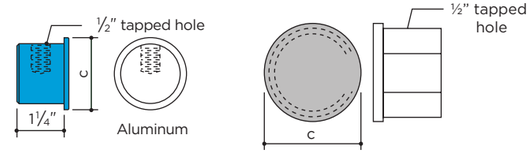


Rail angle adjustable from 0° to 28°

Use thread sealant

		Pipe	Sched.	c
7443	Aluminum	1¼"	40	1.660"
7243	Aluminum	1½"	10	1.900"
7543	Aluminum	1½"	40	1.900"

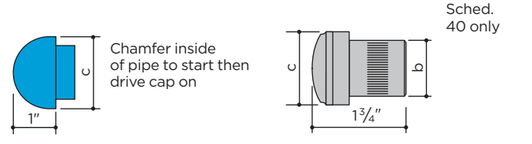
POST CAPS



		Pipe	Sched.	c
7180	Aluminum	1¼"	10	1.660"
7480	Aluminum	1¼"	40	1.660"
7280	Aluminum	1½"	10	1.900"
7580	Aluminum	1½"	40	1.900"
1330N	Nickel-Silver	1½"	10	1.900"
9380	Stainless	1½"	5	1.900"

Flat post caps are drilled and tapped to provide secure mounting for handrail brackets

END CAPS



		Pipe	Sched.	c
7181	Al.	1¼"	10	1.660"
7481	Al.	1¼"	40	1.660"
7281	Al.	1½"	10	1.900"
7581	Al.	1½"	40	1.900"

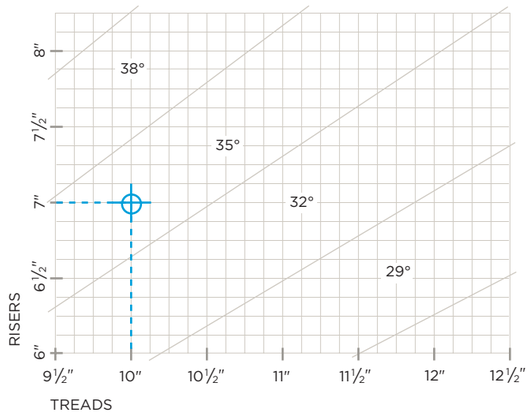
		Pipe	b	c
707*	Al.	1¼"	1.38	1.660"
708*	Al.	1½"	1.61	1.900"
807*	Br.	1¼"	1.37	1.660"
808*	Br.	1½"	1.60	1.900"

* Satin Finish

9330

807

ANGLE FITTING SELECTOR CHART



Angle fittings are carried in stock for 29°, 32°, 35°, and 38° angles of inclination. To select the correct angle fitting for a stairway, plot the intersection of riser and tread dimensions on the chart above. The zone into which the intersection falls will indicate the correct angle value for fittings.

Example: A 7″ riser and a 10″ tread require 35° angle fittings.

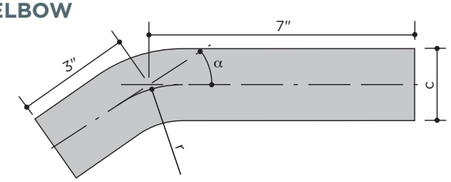
POST ELBOW

b = 4″ for 4° post elbows, while b = 3″ for all other post elbows.

45°α		Pipe	Sched.	c	r
7408	Alum.	1¼″	40	1.660″	2½″
7208	Alum.	1½″	10	1.900″	3″
7508	Alum.	1½″	40	1.900″	3″

4°α	29°α	32°α	35°α	38°α		Pipe	Sched.	c	r
	7119	7122	7125	7128	Alum.	1¼″	10	1.660″	2½″
7416	7419	7422	7425	7428	Alum.	1¼″	40	1.660″	2½″
7216	7219	7222	7225	7228	Alum.	1½″	10	1.900″	3″
7516	7519	7522	7525	7528	Alum.	1½″	40	1.900″	3″
9316	9319	9322	9325	9328	St. St.	1½″	5	1.900″	3″

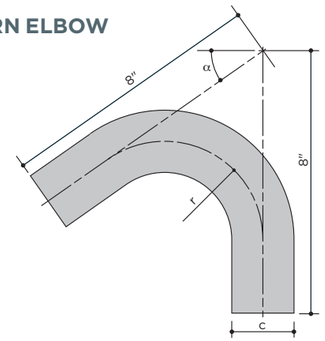
RAIL ELBOW



29°α	32°α	35°α	38°α		Pipe	Sched.	c	r
7109	7112	7115	7118	Alum.	1¼″	10	1.660″	2½″
7409	7412	7415	7418	Alum.	1¼″	40	1.660″	2½″
7209	7212	7215	7218	Alum.	1½″	10	1.900″	3″
7509	7512	7515	7518	Alum.	1½″	40	1.900″	3″
9309	9312	9315	9318	St. St.	1½″	5	1.900″	3″

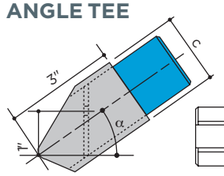
ALUMINUM STAINLESS

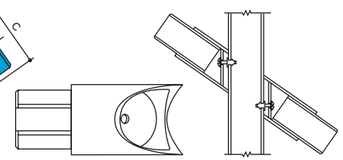
RETURN ELBOW



29°α	32°α	35°α	38°α		Pipe	Sched.	c	r
7179	7182	7185	7188	Alum.	1¼″	10	1.660″	2½″
7479	7482	7485	7488	Alum.	1¼″	40	1.660″	2½″
7279	7282	7285	7288	Alum.	1½″	10	1.900″	3″
7579	7582	7585	7588	Alum.	1½″	40	1.900″	3″
9379	9382	9385	9388	St. St.	1½″	5	1.900″	3″

ANGLE TEE





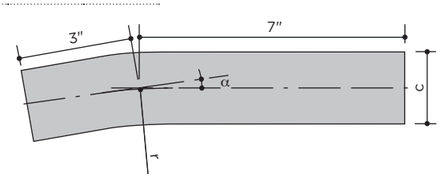
45°α		Pipe	Sched.	c
7451	Alum.	1¼″	40	1.660″
7551	Alum.	1½″	40	1.900″

4°α	29°α	32°α	35°α	38°α		Pipe	Sched.	c
	7139	7142	7145	7148	Alum.	1¼″	10	1.660″
7444*	7439	7442	7445	7448	Alum.	1¼″	40	1.660″
7244*	7239	7242	7245	7248	Alum.	1½″	10	1.900″
7544*	7539	7542	7545	7548	Alum.	1½″	40	1.900″
9344*	9339	9342	9345	9348	St. St.	1½″	5	1.900″

*On 4°α angle tees, the screw hole is located in the center of the washer.

RAMP RAIL ELBOW

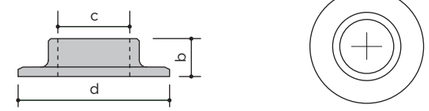
angle	slope	gradient
4°	14:1	7.0%
7°	8:1	12.3%
10°	6:1	17.6%



4°α	7°α	10°α		Pipe	Sched.	c	r
7405	7406	7407	Alum.	1¼″	40	1.660″	2½″
7205	7206	7207	Alum.	1½″	10	1.900″	3″
7505	7506	7507	Alum.	1½″	40	1.900″	3″
9305			St. St.	1½″	5	1.900″	3″

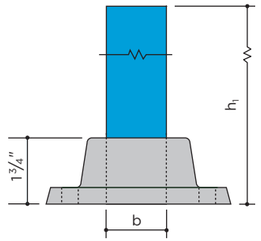
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

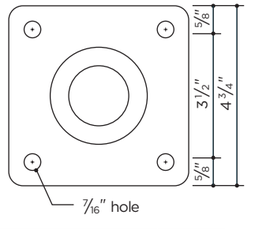
COVER FLANGE



		Pipe	Sched.	b	c	d
710	Aluminum	1¼″	all	1″	1.688″	3 13/16″
711	Aluminum	1½″	all	1″	1.938″	4″
810	Bronze	1¼″	all	1″	1.688″	3 13/16″
811	Bronze	1½″	all	1″	1.938″	4″
411	Nickel-Silver	1½″	all	1″	1.938″	4″
211	Stainless	1½″	all	7/8″	1.938″	4½″

HEAVY-DUTY FLOOR FLANGE

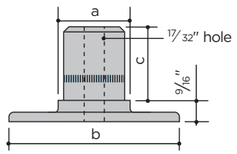


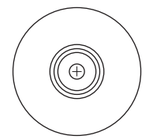


		Pipe	Sched.	h_1	b
7471	Aluminum	1¼″	40	12″	1.360″
7271	Aluminum	1½″	10	12″	1.667″
7571	Aluminum	1½″	40	12″	1.585″
9371*	Aluminum	1½″	5	18″	1.750″

* For use with Stainless Steel System. See page 21 for anchor bolt.

FLOOR FLANGE †

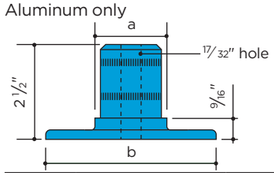


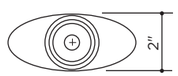


		Pipe	Sched.	a	b	c
7170	Aluminum	1¼″	10	1.660″	4″	1 13/16″
727	Aluminum	1¼″	40	1.660″	4″	1 13/16″
7270	Aluminum	1½″	10	1.900″	4½″	2 1/16″
728	Aluminum	1½″	40	1.900″	4½″	2 1/16″
827	Bronze	1¼″	40	1.660″	4″	1 13/16″
828	Bronze	1½″	40	1.900″	4½″	2 1/16″
1328	Nickel-Silver	1½″	10	1.900″	4½″	2 1/16″

OVAL FLOOR FLANGE †

Aluminum only



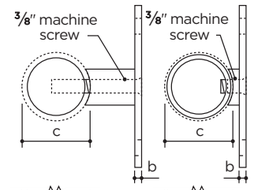


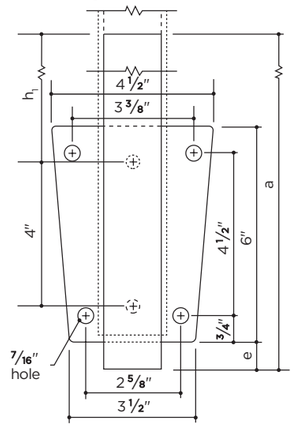
		Pipe	Sched.	a	b
749	Aluminum	1¼″	40	1.660″	4″
750	Aluminum	1½″	40	1.900″	4½″

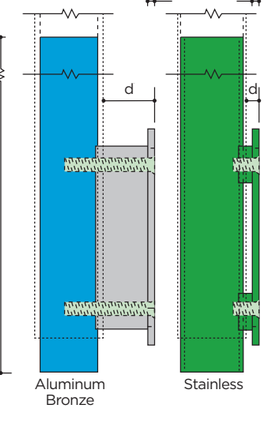
† When using these floor flanges for surface mounting of posts, care must be taken to provide adequate lateral bracing or end support. For freestanding railings, use the heavy-duty floor flange.

FASCIA FLANGE

Fascia flanges are supplied complete with two 3/8″ stainless steel bolts for assembly to pipe posts. Stainless steel fascia flanges use two round stand-offs and a stainless steel tubular reinforcing bar. The aluminum and bronze fascia flanges use a single adapter bar and a solid aluminum reinforcing bar.





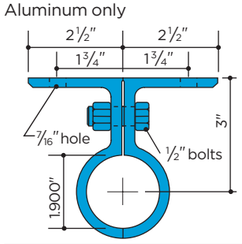


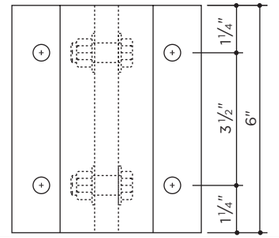
		Pipe	Sched.	a	b	c	d	e	h_1
7190	Alum.	1¼″	10	15″	5/16″	1.660″	7/16″	3/4″	9¼″
7191	Alum.	1¼″	10	15″	5/16″	1.660″	19/16″	3/4″	9¼″
755	Alum.	1¼″	40	15″	5/16″	1.660″	7/16″	3/4″	9¼″
756	Alum.	1¼″	40	15″	5/16″	1.660″	19/16″	3/4″	9¼″
7290	Alum.	1½″	10	15″	5/16″	1.900″	7/16″	1″	9¼″
7291	Alum.	1½″	10	15″	5/16″	1.900″	19/16″	3/4″	9¼″
7293	Alum.	1½″	10	24″	5/16″	1.900″	7/16″	3/4″	18¼″
7294	Alum.	1½″	10	24″	5/16″	1.900″	19/16″	1″	18¼″
757	Alum.	1½″	40	15″	5/16″	1.900″	7/16″	1/2″	9¼″
758	Alum.	1½″	40	15″	5/16″	1.900″	19/16″	1/2″	9¼″
7593	Alum.	1½″	40	24″	5/16″	1.900″	7/16″	1″	18¼″
7594	Alum.	1½″	40	24″	5/16″	1.900″	19/16″	1/2″	18¼″
8893	Bronze	1½″	40	24″	5/16″	1.900″	7/16″	3/4″	18¼″
8894	Bronze	1½″	40	24″	5/16″	1.900″	19/16″	3/4″	18¼″
9390	St. St.	1½″	5	26″	1/4″	1.900″	3/8″	1/2″	20½″
9391	St. St.	1½″	5	26″	1/4″	1.900″	11/2″	1/2″	20½″

See page 21 for anchor bolt.

ROOF RAILING FLANGE

Aluminum only





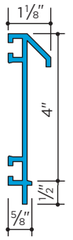
		Pipe	Sched.
748	Aluminum	1½″	all

See page 21 for anchor bolt.

● ALUMINUM ● BRONZE ● NICKEL-SILVER ● STAINLESS

TOE BOARD

20′ lengths

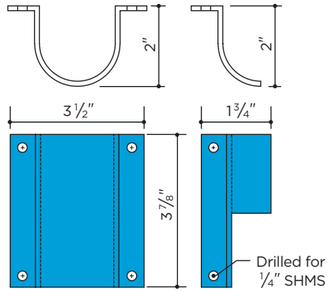


		lb/ft
● **6446**	Alum.	1.13

Toe board clamps are supplied with stainless steel screws and nuts.

TOE BOARD CLAMPS

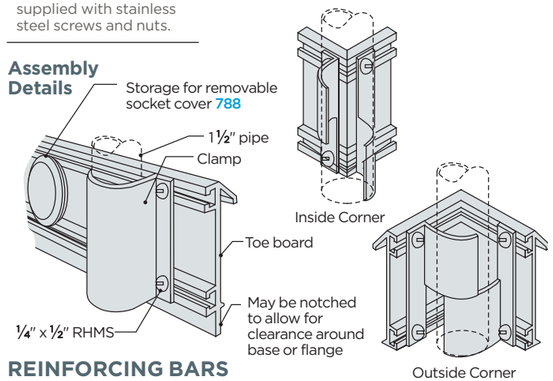
For 1½″ pipe



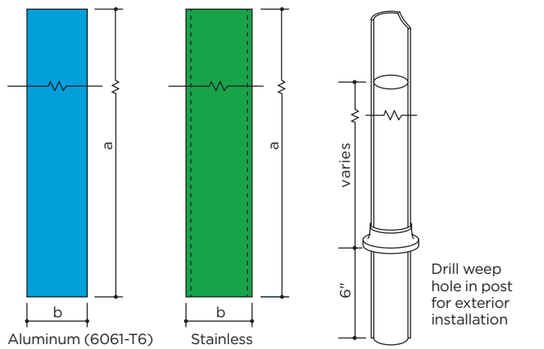
● **746**	Aluminum	● **747** Aluminum


Mixed Use Building, New York, NY, Bellwood Construction, New York, NY (General Contractor).

Assembly Details



REINFORCING BARS



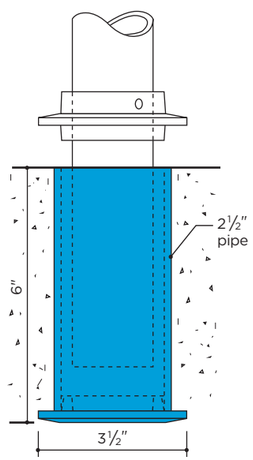
Aluminum (6061-T6) Stainless

		Pipe	Sched.	b	a
● **7192**	Aluminum	1¼″	10	1.427″	15″
● **7492****	Aluminum	1¼″	40	1.360″	15″
● **7292***	Aluminum	1½″	10	1.667″	15″
● **7295***	Aluminum	1½″	10	1.667″	24″
● **7592****	Aluminum	1½″	40	1.585″	15″
● **7595****	Aluminum	1½″	40	1.585″	24″
● **9392**	Stainless	1½″	5	1.750″ x .120″ wall	26″

* For use with aluminum and nickel-silver pipe.
** For use with aluminum and bronze pipe.
Floor mounting is best accomplished by mounting in concrete.
Post inserts are recommended for reinforcing floor-mounted posts.

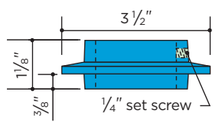
REMOVABLE RAIL SOCKET, COVER AND COLLAR

SOCKET



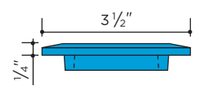
● **786** Aluminum

PIPE COLLAR
For 1½″ pipe only



● **787** Aluminum

SOCKET COVER



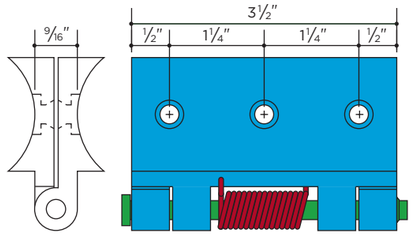
● **788** Aluminum

Socket cover fits tightly but can be pried loose with a screwdriver. When railing is in place, cover may be stored in the side of the toe board.

● ALUMINUM ● STAINLESS ● STEEL

GATE HINGE

For 1½″ aluminum pipe only

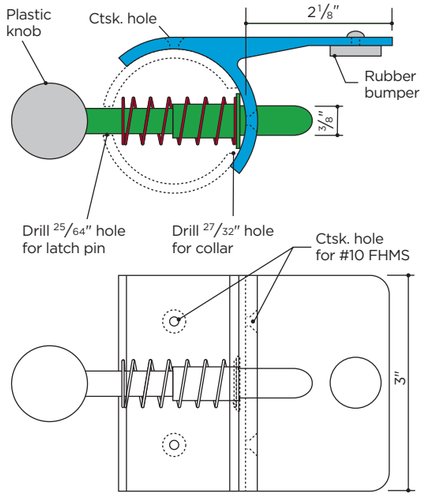


● **782/3**	Aluminum

Supplied in sets of two—one plain and one with a self-closing spring

GATE LATCH AND STOP

For 1½″ aluminum pipe only



● **784**	Aluminum

SCOTCH-WELD® EPOXY ADHESIVE

Catalog No. 3M EC-2216 B/A ClearAmber
Recommended for splice joints using connector sleeves.
The areas to be joined should be cleaned thoroughly.
The adhesive is mixed according to manufacturer's directions.

Tubes — 4 oz. total

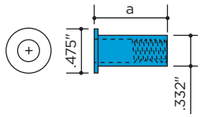
MANUAL RIVET HEADER

The Manual Rivet Header is a low-cost hand tool for setting the internally threaded tubular rivets.

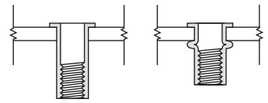
Thread Setter™

TUBULAR RIVETS

● Aluminum



Set tubular rivet in hole, using setting tool. Upset rivet by pressing handles together.

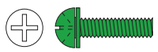


		a	
● **A25-140**	Aluminum	.745″	Use with schedule 5 or 10 pipe
● **A25-200**	Aluminum	.808″	Use with schedule 40 pipe

The internally threaded tubular rivet is easily set in Connectorail® pipe wall. The rivet provides high-strength ¼″– 20 threads for blind attachment of Connectorail® tee fittings.

SEMS SCREWS AND THROUGH BOLT

● Stainless Steel



SEMS Screw
RHMS ¼″– 20 × 1″
with lock washer

RHMS ¼″– 20 × 2½″ or 3″
with lock nut

SEMS Screws: SEMS Screws prevent accidental omission of lock washers and subsequent loosening of joints. The combination of ¼″– 20 x 1″ stainless steel RHMS with lock washers and internally threaded tubular rivet fasteners provides connections of ample strength to develop the full loading capacity of Connectorail® pipe.

Through Bolts: Where two 90° tees are mounted opposite each other to form a cross assembly, a stainless steel through bolt with lock nut may be used.

For 1¼″ pipe, use ¼″–20 x 2½″ RHMS with lock nut.
For 1½″ pipe, use ¼″–20 x 3″ RHMS with lock nut.

SLEEVE ANCHOR BOLT

● ⅜″ x 3″ Steel

GSA Spec. FF-S-325, 3.2.2.3.1.2

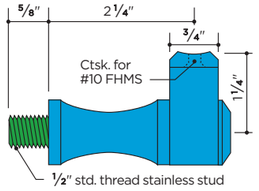
The **Sleeve Anchor Bolt** is an all steel, rust-proofed, multi-purpose anchor bolt intended for use in a wide range of masonry materials. The ⅜″ bolt is recommended for use with **Heavy-Duty Floor Flanges**.

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

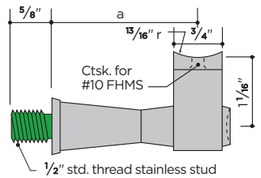
Aluminum brackets are available with a mill finish or a clear anodized finish—AA-M32-C22-A31 (204R1).
When designating clear anodized brackets, add the suffix -A to catalog number listed (e.g. **322-A**).

POST BRACKETS

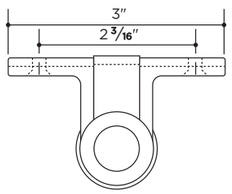
Satin Finish

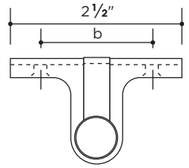


322	Aluminum	

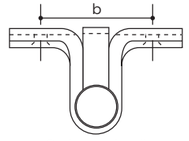


For use with pipe railings		a	b
402	Aluminum	2 1/4"	1 5/8"
402L	Aluminum	2 1/2"	1 5/8"
404	Aluminum	2 3/4"	1 5/8"
802	Bronze	2 1/4"	1 5/8"
1302	Nickel-Silver	2 1/4"	1 5/8"
222	Stainless	2 1/4"	1 13/16"
222L	Stainless	2 1/2"	1 5/8"





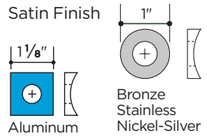
Aluminum, bronze and nickel-silver detail

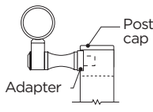


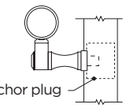
Stainless detail

BRACKET POST ADAPTERS

Satin Finish

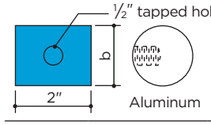


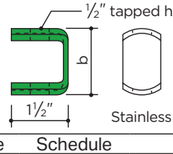




		Pipe Size	Schedule	Clear Hole
7161	Aluminum	1 1/4"	all	1/2"
7261	Aluminum	1 1/2"	all	1/2"
8661	Bronze	1 1/4"	all	1/2"
8861	Bronze	1 1/2"	all	1/2"
1361	Nickel-Silver	1 1/2"	all	1/2"
9161	Stainless	1 1/4"	all	1/2"
9361	Stainless	1 1/2"	all	1/2"

ANCHOR PLUGS



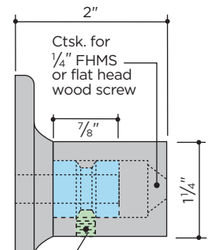


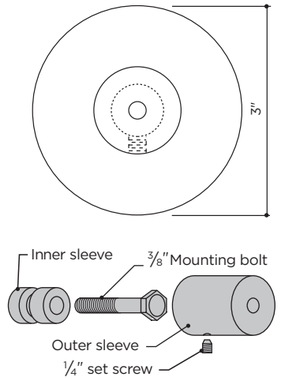
		Pipe Size	Schedule	b
7162	Aluminum	1 1/4"	10	1.427"
7462	Aluminum	1 1/4"	40	1.360"
7262	Aluminum	1 1/2"	10	1.667"
7562	Aluminum	1 1/2"	40	1.585"
9362	Stainless	1 1/2"	5	1.750"

Anchor plugs provide secure mounting for brackets supporting intermediate rails. Aluminum anchor plugs are machined from solid extruded stock; the stainless steel anchor plug is fabricated from heavy metal.

TWO-PIECE MOUNTING BRACKETS

Satin Finish



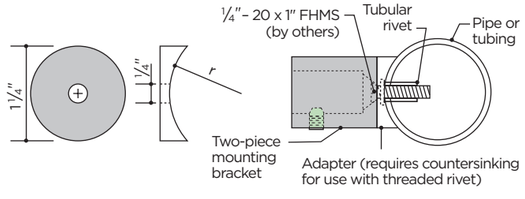


168	Aluminum
898	Bronze
298	Stainless

For elevator car handrails

166	Aluminum
896	Bronze
196	Nickel-Silver
296	Stainless

ADAPTERS



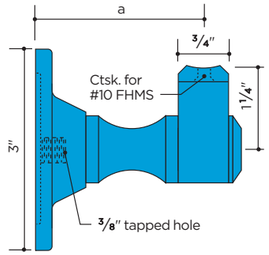
		r	Use With
7164	Aluminum	.830"	1.660" OD
7264	Aluminum	.950"	1.900" OD
8864	Bronze	.950"	1.900" OD
8964	Bronze	.750"	1.500" OD
5264	Nickel-Silver	.750"	1.500" OD
5364	Nickel-Silver	.950"	1.900" OD
9164	Stainless	.830"	1.660" OD
9364	Stainless	.950"	1.900" OD

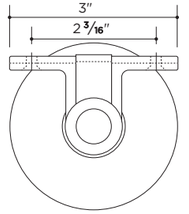
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

Aluminum brackets are available with a mill finish or a clear anodized finish—AA-M32-C22-A31 (204R1).
When designating clear anodized brackets, add the suffix -A to catalog number listed (e.g. **307-A**).

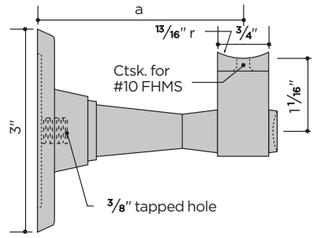
SELF-ALIGNING

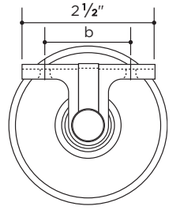
Satin Finish, except as noted



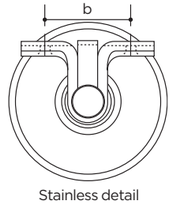


		a
307	Aluminum	2 1/2"
308	Aluminum	3"





Aluminum, bronze and nickel-silver detail



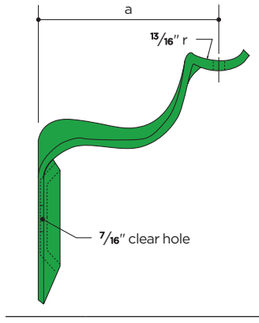
Stainless detail

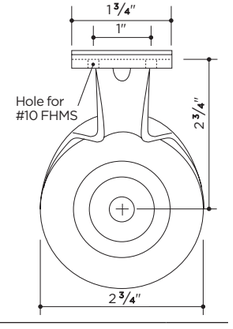
		a	b
321	Aluminum	2 1/4"	1 5/8"
403	Aluminum	3"	1 5/8"
405	Aluminum	3 1/2"	1 5/8"
842*	Bronze	2 1/4"	1 5/8"
801*	Bronze	2 1/2"	1 5/8"
803*	Bronze	3"	1 5/8"
1303*	Nickel-Silver	3"	1 5/8"
1342*	Nickel-Silver	2 1/4"	1 5/8"
242	Stainless	2 1/4"	1 13/16"
221	Stainless	2 1/2"	1 13/16"
223	Stainless	3"	1 13/16"

*Lacquered

STAMPED

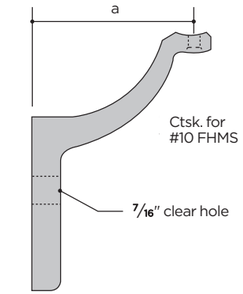
Burnished Finish

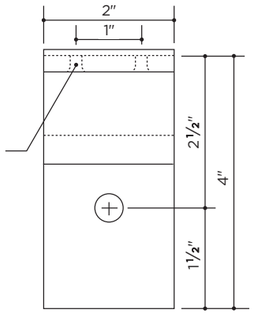




		a
1022	Stainless	2 1/2"
1026	Stainless	3"

EXTRUDED

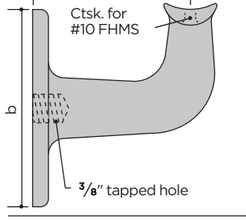


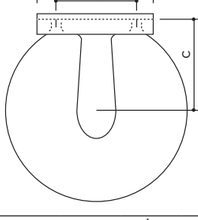


		a
478	Aluminum	2 1/2"
498	Aluminum	3"
892	Bronze	2 1/2"
894	Bronze	3"
192	Nickel-Silver	2 1/2"
218†	Stainless	2 1/2"
220†	Stainless	3"

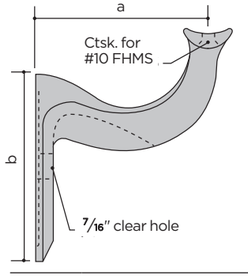
† Satin Finish

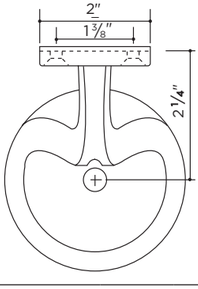
CAST





		a	b	c
376	Aluminum	2 1/2"	3 1/8"	1 9/16"
389	Aluminum	3 1/8"	3 3/4"	1 7/8"
375*	Bronze	2 1/2"	3 1/8"	1 9/16"
319*	Bronze	3 1/8"	3 3/4"	1 7/8"
176*	Nickel-Silver	2 1/2"	3 1/8"	1 9/16"
275	Stainless	2 1/2"	3 1/8"	1 9/16"





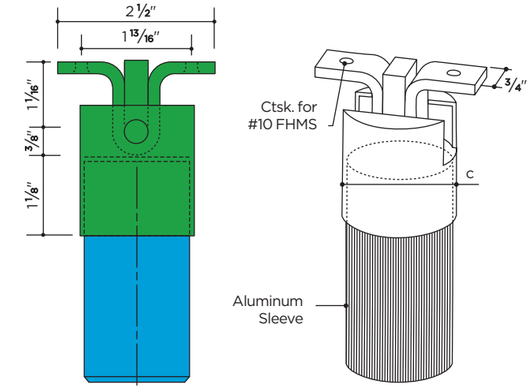
		a	b
384	Aluminum	2 1/2"	2 3/4"
316	Aluminum	3"	3 1/4"
388*	Bronze	2 1/2"	2 3/4"
318*	Bronze	3"	3 1/4"
1088	Stainless	2 1/2"	2 3/4"

*Lacquered

ALUMINUM STAINLESS

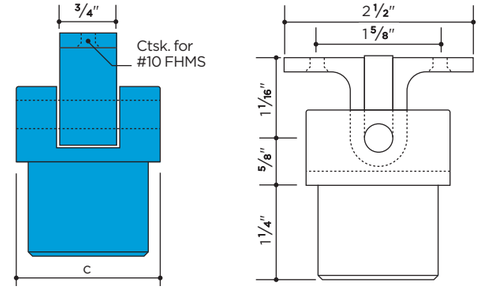
CENTER POST BRACKETS

Mill Finish



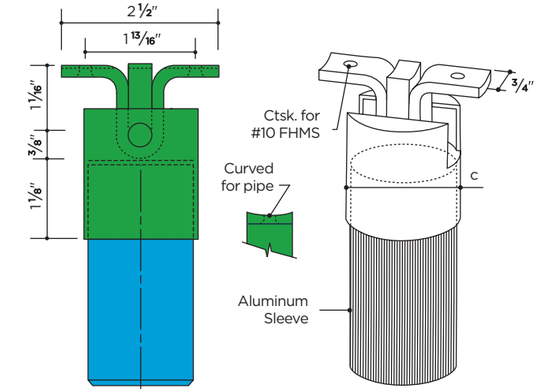
For center mounting of flat-bottomed handrail moulding onto stainless Connectorail® posts

Flat		Pipe	Sched.	c
207	Stainless Steel	1½"	5	1.900"



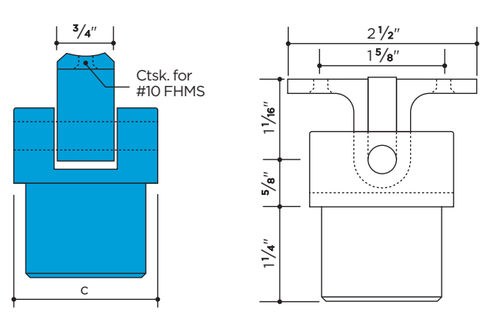
For center mounting of flat-bottomed handrail onto aluminum Connectorail® posts

Flat		Pipe	Sched.	c
144	Aluminum	1¼"	40	1.660"
145	Aluminum	1½"	40	1.900"



For center mounting of handrail pipe or rounded handrail onto stainless Connectorail® posts

Curved		Pipe	Sched.	c
208	Stainless Steel	1½"	5	1.900"



For center mounting of pipe or rounded handrail onto aluminum Connectorail® posts

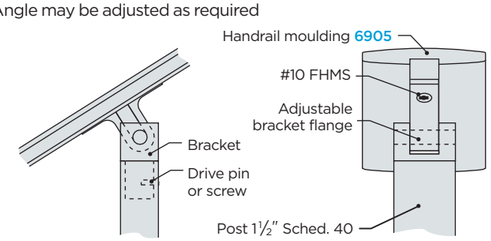
Curved		Pipe	Sched.	c
142*	Aluminum	1¼"	40	1.660"
143*	Aluminum	1½"	40	1.900"

* Also available in clear anodized AA-M32-C22-A31 (204R1)

Weldon E Howitt School, Farmingdale NY, Hamilton Metal Works, Westbury, NY (Fabricator).

Assembly Details

Angle may be adjusted as required

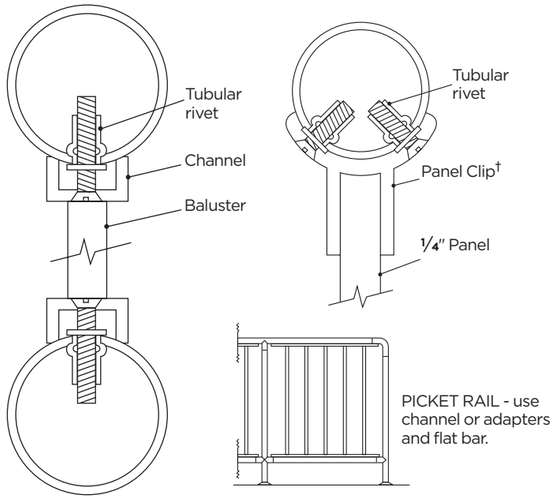


Verify all dimensions before cutting.

ALUMINUM BRONZE NICKEL-SILVER STAINLESS PVC

INSTALLATION OF PICKET RAILS

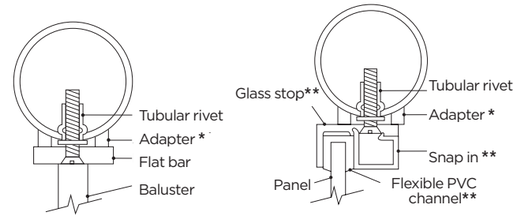
Most current safety codes require reduced openings in railings where they might present a hazard to small children. Pipe railings, including the Connectorail® System, are easily adapted to comply with this requirement, where it applies, by adding balusters or panels. Typical details are shown on this page.



†Panel Clip—Aluminum only	1¼" Pipe	1½" Pipe
Aluminum	7160*	7260*
Aluminum	7460	7560

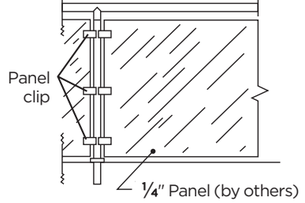
* Two-piece panel clips, see below

INSTALLATION OF PANEL RAILS



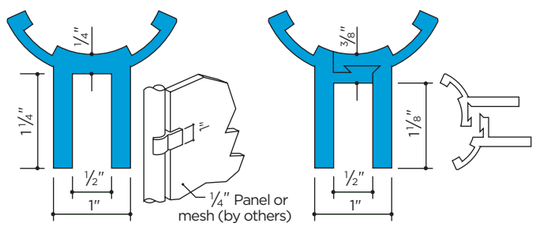
* Adapters	1¼" Pipe	1½" Pipe
Aluminum	7161	7261
Bronze	8661	8861
Stainless	9161	9361

** Glass Stop	Glass Stop	Snap-in
Aluminum, Mill Finish	8106	8107
Aluminum, Anodized	8206	8207
Bronze	4506	4507
Flexible PVC	8708	



PANEL CLIPS

For aluminum pipe only



		Pipe
7460-5*	Aluminum	1¼"
7460†	Aluminum	1¼"
7560-5*	Aluminum	1½"
7560†	Aluminum	1½"

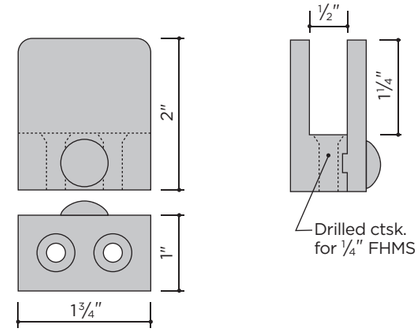
† Packages of 4 pieces

Packages of 4 sets		Pipe
7260**	Aluminum	1½"

* 5′ Length
** Two-piece assembly

PANEL CLIPS

For mounting to flat surface, Satin Finish



113	Aluminum	**413**	Nickel-Silver
813	Bronze	**213**	Stainless

Plug (packed separately) is inserted following installation and may be held in place with epoxy or other sealant.

SPECIAL CHARACTERISTICS

Connectorail® is a pre-engineered pipe railing system with pre-fabricated components. It is fabricated with ordinary tools and without welding. It is designed to meet established safety standards.

The structural integrity of the railing system depends on proper selection of components, proper number and location of supports, and correct assembly and installation. The data and instructions in this catalog make it easy to meet these conditions (see engineering data on pages 122-129). Most fittings are dimensioned in whole inches to facilitate layout. Confirm dimensions prior to cutting and assembly.

POSTS

High-strength posts and the use of reinforcing inserts are recommended to permit longer spans and to comply with the most stringent loading requirements. Fascia Flanges and Heavy-Duty Floor Flanges include reinforcing inserts. Refer to page 129 for post spacing tables.

EXPANSION JOINTS

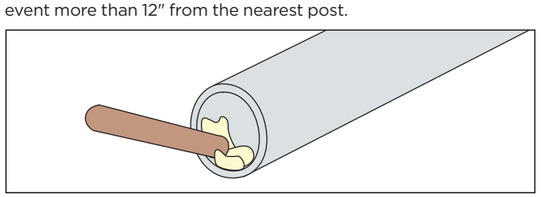
Expansion joints should be provided for continuous runs in excess of 40′ or at places where building structure provides expansion joints. If a joint is provided every 20′, the width of the gap should allow 1/8″ expansion for each 40°F of expected temperature rise. To make an expansion joint, the internal connector sleeve is left unattached at one end so that it is free to move in and out of the pipe.

SPLICE JOINTS

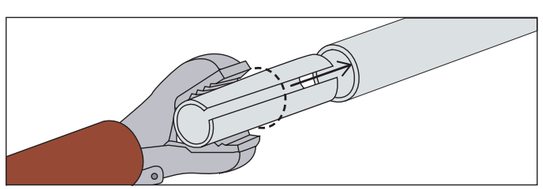
Splice joints are secured by internal connector sleeves with the use of epoxy adhesive. Connector sleeves must be ordered separately unless a sleeve is already welded into the fitting, as it is in tees, wall returns, and miter elbows. Sleeves are made for a tight press fit and must be compressed with pliers or “C” clamps to permit them to slip into the pipe. Care must be taken to keep the sleeves round. Pipe ends must be cut square and to accurate length to assure smooth, tight joints.

The areas to be joined should be cleaned thoroughly. The adhesive is mixed according to manufacturer’s directions. Do not mix more than you can use within 1/2 hour. Apply adhesive to inside of pipe. Fit components together and wipe off excess adhesive. Leave undisturbed for eight hours—longer in cold weather.

All splices should be made as near as possible to a post, in no event more than 12″ from the nearest post.



Apply adhesive to inside of pipe.

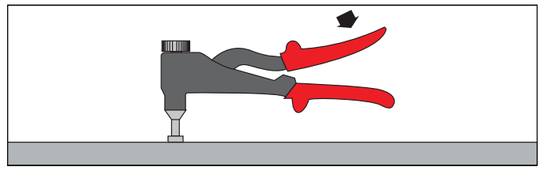


About one half of the 5″-long sleeve should be inside each of the pipe ends.

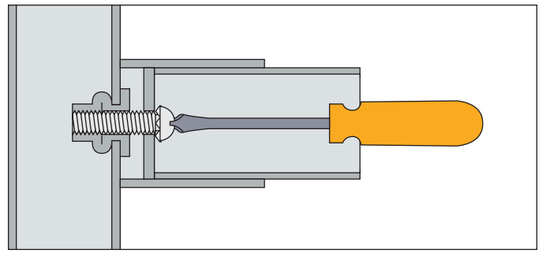
TEE FITTINGS

Tee fittings are secured to the post or rail by means of an internally threaded tubular rivet inserted into the wall of the pipe and a stainless steel machine screw and lock washer. When two 90° tees are mounted directly opposite each other to form a cross, a stainless steel through bolt and lock nut may be used.

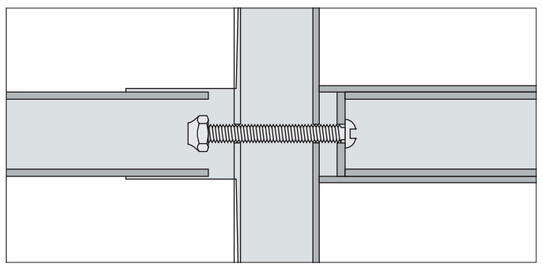
Drill pipe with drill size Q or 11/32″ hole. Screw a rivet sleeve-side first onto the mandrel of the tool. Hold the tool in one hand. Using the tool, insert the rivet into the hole until the tool comes to rest against the parent material. Upset rivet by pressing handles together.



Set tubular rivet in hole, using setting tool. Upset rivet by pressing handles together.



Draw the fitting up tight with a stainless steel screw and lock washer.



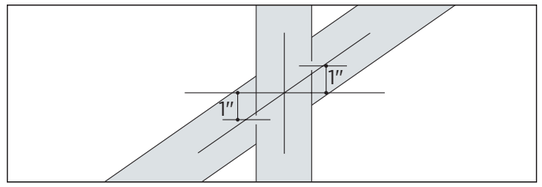
Draw the fittings up tightly from both sides, using a stainless steel lock nut.

The use of a lock washer or lock nut is essential because the assembly must remain tight once it is completed. There is no way to re-tighten an assembled railing. Stainless steel screws are required because they provide maximum strength. The 1″-long screws are supplied with the lock washer already in place.

To locate holes to be drilled for angle tees and crosses, request our drilling template or make your own template as follows: Draw a rectangle of a width equal to the circumference of the pipe (5.21″ for 1 1/4″ pipe, 5.97″ for 1 1/2″ pipe), about 3″ to 4″ high.

ANGLED TEE FITTINGS

Draw the horizontal and vertical center lines. Draw two more vertical lines at half the distance between center line and edges of the rectangle. On the new lines, mark 1″ above and below the horizontal center line. Wrap the template around the post so that its horizontal center line is on a level with the intersection of center lines of the post and the rail. The marks on the template will indicate the location of holes.



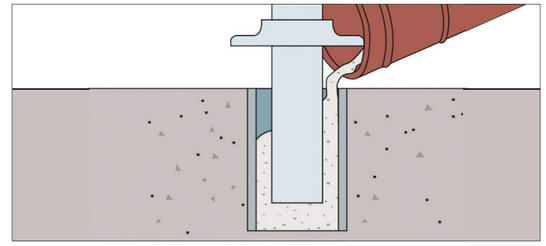
Holes for angle tees, except 4° ramp tee, are located 1″ above and below intersection of center lines of pipe, regardless of stair angle.

MOUNTING POSTS

Embedding in concrete: Posts embedded in concrete should be set to a depth of 5″ below the surface of the floor or tread. Allow for a 1″ grout pad beneath post. Provide a hole 2 1/2″ to 3″ in diameter to leave room for grouting cement and to allow for adjustment to field variations. A quick-setting grout is recommended for setting posts. For outdoor installation, weep holes should be drilled in the posts just above the ground. The reinforcing insert will prevent water from collecting below ground level. Where aluminum surfaces are embedded in concrete that contains corrosive components, a coat of zinc chromate primer or equivalent must be applied.

Surface Mounting: Sleeve anchor bolt 3/8″ x 3″ is recommended for use with heavy-duty floor flange. Drill 3/8″ hole in concrete or masonry to 3″ depth. Drill holes which conform to ANSI standard carbide bit dimension (.390″ to .398″). Clean out dust in hole after drilling. Insert sleeve bolt in hole, hand tighten, then tighten with wrench to a maximum torque of 30 ft. lbs. Use heavy-duty floor flange as a template for locating holes. Minimum distance from centerline of hole to edge of concrete is 2″.

Fascia Mounting: Disassemble the fascia flange, which includes a reinforcing bar, by removing two screws from the back of the plate. Drill two 7/16″ holes in the post, one hole 1 1/4″ from the lower end, the second one 4″ on center from the first, so that they align with holes in the reinforcing insert. The reinforcing insert is slipped inside the post, and the unit is reassembled and mounted, using 3/8″ bolts. While the unit is disassembled, the plate of the fascia flange may be used as a template to locate the holes for mounting the flange.



Use reinforcing bar and cover flange. Drill weep hole 1/4″ above cover flange. Apply zinc chromate primer or equivalent to surfaces embedded in concrete. Set in floor to a depth of 5″ and grout.

For outdoor installation of aluminum, the metal must be kept from direct contact with concrete or dissimilar metal by application of bituminous paint or methacrylate lacquer.

ANODIZED FINISHES

When clear anodized components are supplied, no further finishing is necessary. Any other specified finishes are the fabricator’s responsibility and components will be supplied with mill finish only.

All stainless steel fasteners must be removed before anodizing.

Weldon E. Howitt School, Farmingdale, NY, Hamilton Metalcraft, Westbury, NY (Fabricator).

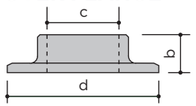
ALUMINUM BRONZE NICKEL-SILVER STAINLESS MALLEABLE IRON / STEEL

CAST FLUSH FITTINGS FOR WELDED ASSEMBLY

Stainless fittings are furnished with a satin finish. Aluminum components are 6063 alloy, mill finish. Cast aluminum components are Almag 35. Satin finish. Cast bronze fittings are lacquered bronze alloy (C86500), which matches the color of red brass (C23000) satin finish. Cast nickel-silver components are lacquered nickel-silver alloy, which matches the color of nickel-silver (C79800), satin finish. Cast iron fittings are cast to match carbon steel (C1010). Fittings shown are made to fit standard pipe sizes.

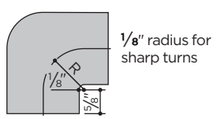
See pages 16 through 24 for other non-ferrous pipe fittings for 1 1/4" and 1 1/2" pipe.

PIPE COVER FLANGE



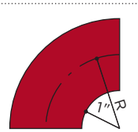
		Pipe	Sched.	b	c	d
714	Aluminum	1"	all	.813"	1.34"	3.625"
710	Aluminum	1 1/4"	all	1"	1.69"	3.813"
711	Aluminum	1 1/2"	all	1"	1.94"	4"
712	Aluminum	2"	all	1"	2.41"	5"
810	Bronze	1 1/4"	all	1"	1.69"	3.810"
811	Bronze	1 1/2"	all	1"	1.94"	4"
411	Nickel-Silver	1 1/2"	all	1"	1.94"	4"
214	Stainless	1"	all	7/8"	1.34"	3.750"
210	Stainless	1 1/4"	all	7/8"	1.69"	3.750"
211	Stainless	1 1/2"	all	7/8"	1.94"	4.500"
913	Pressed Steel	3/4"	all	3/4"	1.08"	3.500"
914	Pressed Steel	1"	all	7/8"	1.34"	3.750"
910	Pressed Steel	1 1/4"	all	7/8"	1.69"	3.750"
911	Pressed Steel	1 1/2"	all	7/8"	1.94"	4.500"
912	Pressed Steel	2"	all	7/8"	2.41"	4.750"
614	Cast Iron/Black	1"	all	.813"	1.34"	3.625"
610	Cast Iron/Black	1 1/4"	all	.813"	1.69"	3.875"
611	Cast Iron/Black	1 1/2"	all	.813"	1.94"	4.188"
612	Cast Iron/Black	2"	all	.813"	2.41"	4.625"
1614	Cast Iron/Galv.	1"	all	.813"	1.34"	3.625"
1610	Cast Iron/Galv.	1 1/4"	all	.813"	1.69"	3.875"
1611	Cast Iron/Galv.	1 1/2"	all	.813"	1.94"	4.188"
1612	Cast Iron/Galv.	2"	all	.813"	2.41"	4.625"

90° ELBOWS



		Pipe	R
958	Steel	1 1/4"	15/16"
959	Steel	1 1/2"	1 1/16"
258*	Stainless	1 1/4"	15/16"
259*	Stainless	1 1/2"	1 1/16"

* Satin Finish



		Pipe	R
917	Steel	1"	1 11/16"
918	Steel	1 1/4"	1 13/16"
919	Steel	1 1/2"	1 15/16"
920	Steel	2"	2 3/16"

FITTINGS FOR WELDED ASSEMBLY

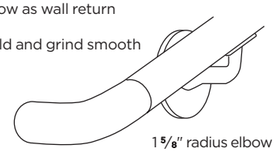
All fittings are for IPS Schedule 40 pipe, except as noted.

TEES

In welded railings, no fittings are used for tee and cross connections. The ends of the pipe are notched with a special tool known as the Arc Fit Pipe Notcher to match the contour of the pipe to be joined. The joint is then welded.

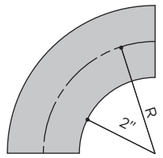
90° ELBOWS

Detail showing 1 5/8" radius 90° elbow as wall return



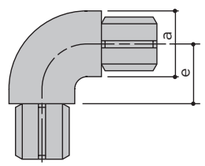
1 5/8" radius elbow is suitable for use as wall return

		Pipe	R
948	Steel	1 1/4"	2 7/16"
949	Steel	1 1/2"	2 9/16"



		Pipe	R
232*	Stainless	1"	2 11/16"
225*	Stainless	1 1/4"	2 13/16"
226*	Stainless	1 1/2"	2 15/16"
915	Steel	1"	2 11/16"
925	Steel	1 1/4"	2 13/16"
926	Steel	1 1/2"	2 15/16"

* Satin Finish

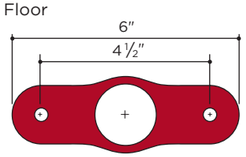


Black	Galv.		Pipe	a	e
618	**1618**	Malleable Iron	1 1/4"	1 21/32"	1 1/4"
619	**1619**	Malleable Iron	1 1/2"	1 29/32"	1 1/2"
620		Malleable Iron	2"	2 3/8"	1 7/8"
720*		Aluminum	2"	2 3/8"	1 7/8"

* Satin Finish

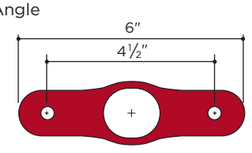
OVAL POST FLANGES

Floor



		Pipe
927	Steel	1 1/4"
928	Steel	1 1/2"

Angle



		Pipe
942	Steel	1 1/4"
943	Steel	1 1/2"

ALUMINUM BRONZE STAINLESS CAST IRON / STEEL

FITTINGS FOR WELDED ASSEMBLY

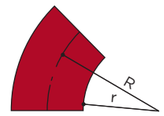
All fittings are for IPS Schedule 40 pipe, except as noted.

90° THREE-WAY ELBOW

For corner posts

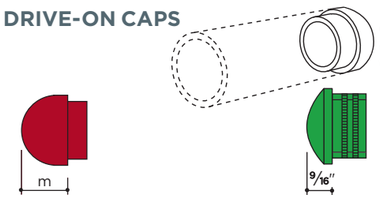
		Pipe	r	R
903	Steel	1 1/4"	1/8"	5/16"
904	Steel	1 1/2"	1/8"	1 1/16"

45° ELBOWS



		Pipe	r	R
929	Steel	1"	1"	1 11/16"
930	Steel	1 1/4"	1"	1 13/16"
933	Steel	1 1/4"	2"	2 13/16"
931	Steel	1 1/2"	1"	1 15/16"
934	Steel	1 1/2"	2"	2 15/16"
932	Steel	2"	1"	2 3/16"

DRIVE-ON CAPS

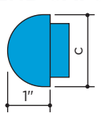


		Pipe	m
906	Steel	1"	1"
907	Steel	1 1/4"	1 1/8"
908	Steel	1 1/2"	1 1/4"
909	Steel	2"	1 3/8"

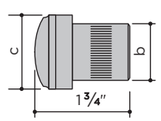
		Pipe
212*	Stainless	1"
277*	Stainless	1 1/4"
278*	Stainless	1 1/2"

* Satin Finish

END CAPS



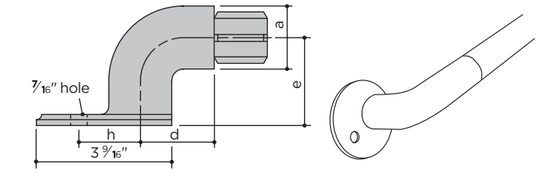
		Pipe	Sched.	c
7181	Al.	1 1/4"	10	1.660"
7481	Al.	1 1/4"	40	1.660"
7281	Al.	1 1/2"	10	1.900"
7581	Al.	1 1/2"	40	1.900"



		Pipe	b	c
707*	Al.	1 1/4"	1.38	1.660"
708*	Al.	1 1/2"	1.61	1.900"
807*	Br.	1 1/4"	1.37	1.660"
808*	Br.	1 1/2"	1.60	1.900"

* Satin Finish

WALL RETURN



For schedule 40 pipe

Black	Galv.		Pipe	a	d	h	e
604	**1604**	Cast Iron	1 1/4"	1 21/32"	1 15/16"	1 5/8"	2 1/2"
664	**1664**	Cast Iron	1 1/4"	1 21/32"	1 15/16"	1 5/8"	3"
605	**1605**	Cast Iron	1 1/2"	1 29/32"	2 1/16"	1 11/16"	2 1/2"
665	**1665**	Cast Iron	1 1/2"	1 29/32"	2 1/16"	1 11/16"	3"

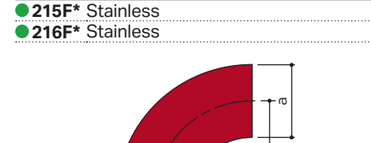
For light wall structural pipe schedule 10

			Pipe	a	d	h	e
3604		Cast Iron	1 1/4"	1 21/32"	1 15/16"	1 5/8"	2 1/2"
3605		Cast Iron	1 1/2"	1 29/32"	2 1/16"	1 11/16"	2 1/2"

For schedule 40 pipe

			Pipe	a	d	h	e
705*		Aluminum	1 1/2"	1 29/32"	2 1/16"	1 11/16"	2 1/2"
759*		Aluminum	1 1/4"	1 21/32"	1 15/16"	1 5/8"	3"

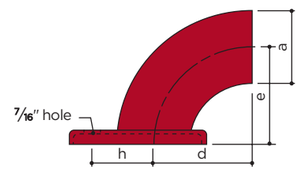
* Satin Finish



Schedule 40 pipe return and 1/8" formed flange are joined by a concealed weld.

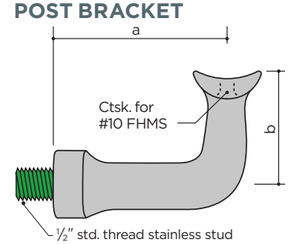
		Pipe	e
215F*	Stainless	1 1/4"	2 1/2"
216F*	Stainless	1 1/2"	2 1/2"

* Satin Finish



		Pipe	a	d	h	e
983	Steel	1 1/4"	1 21/32"	2 7/16"	1 5/8"	2 1/2"
984	Steel	1 1/4"	1 21/32"	2 13/16"	1 5/8"	3"
985	Steel	1 1/2"	1 29/32"	2 1/4"	1 15/32"	2 1/2"
986	Steel	1 1/2"	1 29/32"	2 15/16"	1 15/32"	3"

POST BRACKET



		a	b
373	Al.	2 1/2"	1 9/16"
303	Br.	2 1/2"	1 9/16"
374	Mal. Iron	2 1/2"	1 9/16"

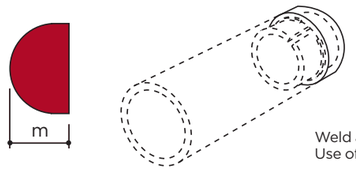
•Post bracket adapter, pg. 94

ALUMINUM STAINLESS CAST IRON / MALLEABLE IRON / STEEL

FITTINGS FOR WELDED ASSEMBLY

All fittings are for IPS Schedule 40 pipe, except as noted.

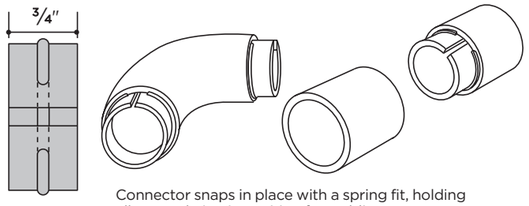
WELD-ON CAPS



Weld and grind smooth.
Use of connector is optional.

		Pipe	m
936	Steel	1"	1"
937	Steel	1¼"	1⅛"
938	Steel	1½"	1¼"
939	Steel	2"	1⅜"

CONNECTOR

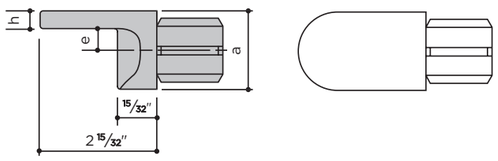


Connector snaps in place with a spring fit, holding elbow and pipe in position for welding.

				Pipe
951	Steel	291	Stainless	1"
952	Steel	292	Stainless	1¼"
953	Steel	293	Stainless	1½"
954	Steel			2"

SQUARE POST FITTING

Cast

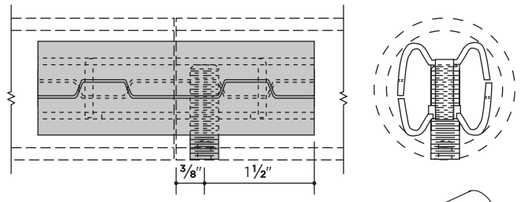


For schedule 40 pipe		Pipe	a	h	e
601	Malleable Iron	1¼"	1 21/32"	3/8"	29/64"
602	Malleable Iron	1½"	1 29/32"	7/16"	33/64"
For light wall structural pipe schedule 10					
3601	Malleable Iron	1¼"	1 21/32"	3/8"	29/64"
3602	Malleable Iron	1½"	1 29/32"	7/16"	33/64"
For schedule 40 pipe					
701*	Aluminum	1¼"	1 21/32"	3/8"	29/64"
702*	Aluminum	1½"	1 29/32"	7/16"	33/64"

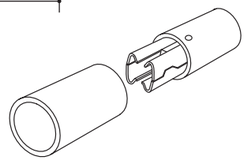
* Satin Finish

PIPE SPLICE LOCK

A single allen screw locks the joint



For quick, weldless end-to-end connection of pipe in the shop or in the field. Connections made with the pipe splice lock are flush, permanent, and in perfect alignment. Also suited for expansion joints.



For schedule 40 pipe			For light wall structural pipe schedule 10	
Steel	Galv. Steel	Stainless Steel		Pipe
921		289		1"
922	1922	287	901	1¼"
923	1923	288		1½"
924				2"
		For schedule 5 pipe		
		286		1¼"

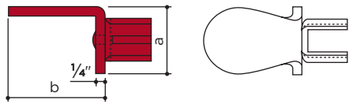
PIPE PLUGS

For schedule 40 pipe				Pipe
Black	Galv.			
606	1606	Cast Iron		1"
607	1607	Cast Iron		1¼"
608		Cast Iron		1½"
609	1609	Cast Iron		2"

For light wall structural pipe schedule 10		
Black		Pipe
3607	Cast Iron	1¼"
3608	Cast Iron	1½"

SQUARE POST FITTING

Stamped Steel



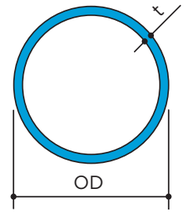
For schedule 40 pipe		Pipe	a	b
987	Malleable Iron	1¼"	1 5/8"	2 5/8"

Sun Valley Music Pavillion, Sun Valley, Idaho, Ruscitto/Latham/Blanton, Sun Valley, Idaho (Architect), Diversified Metal Products, Inc., Idaho Falls, Idaho (Fabricator).

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

OD ROUND TUBING

20′ lengths, except as noted
Mill Finish only, except as noted



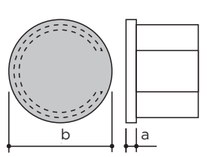
Aluminum	6063-T52
Bronze	C38500
Nickel-Silver	C79800
Stainless	Type 304

	OD	t	lb/ft	Area	I	S
Aluminum	1.900"	.109"	.721	.614	.247	.260
Aluminum	2½"	.125"	1.119	.933	.659	.527
Aluminum	3"	.125"	1.328	1.129	1.169	.779
Aluminum	3½"	.125"	1.559	1.325	1.890	1.080
Bronze	1.500"	.100"	1.750	.440	.108	.144
Bronze	1.900"	.100"	2.070	.565	.230	.242
Bronze	2½"	.125"	3.441	.933	.659	.527
Bronze	3"	.125"	4.500	1.129	1.169	.779
Bronze††	3½"	.125"	4.850	1.325	1.890	1.080
Nickel-Silver	1.500"	.100"	1.750	.440	.108	.144
Nickel-Silver	1.900"	.109"	2.250	.614	.247	.260
Nickel-Silver†	2½"	.125"	3.400	.933	.659	.527
Nickel-Silver†	3"	.125"	4.500	1.129	1.169	.779
Stainless**	1.900"	.062"	1.274	.375	.158	.166
Stainless	2½"	.062"	1.691	.479	.356	.285
Stainless	3"	.062"	1.930	.577	.622	.415
Stainless	4"	.062"	2.550	.804	1.556	.778

** No. 4 Finish
† 16′ lengths †† 12′ lengths

END CAPS

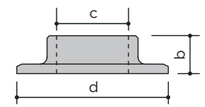
Satin Finish, except as noted



		a	b
7280*	Aluminum	⅛"	1.900"
1180*	Aluminum	⅛"	2½"
1182*	Aluminum	⅛"	3"
1181*	Aluminum	⅛"	3½"
1282	Bronze	¼"	1.900"
1280	Bronze	¼"	2½"
1283	Bronze	¼"	3"
1281	Bronze	¼"	3½"
6489N	Bronze	¼"	1.500"
6489D	Bronze	•	1.500"
5289N	Nickel-Silver	¼"	1.500"
1330N	Nickel-Silver	¼"	1.900"
1332N	Nickel-Silver	¼"	2½"
1333N	Nickel-Silver	¼"	3"
9380	Stainless	⅛"	1.900"
1480	Stainless	⅛"	2½"
1482	Stainless	⅛"	3"
1473N	Stainless	⅛"	4"

* Mill Finish • Dome-shaped; extends 1" beyond end of tube.

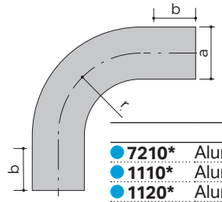
COVER FLANGE



		OD	b	c	d
711	Aluminum	1.900"	1"	1.94"	4"
1125	Aluminum	2½"	1"	2.54"	4¾"
1123	Aluminum	3"	1"	3.04"	5"
811	Bronze	1.900"	1"	1.94"	4"
1225	Bronze	2½"	1"	2.54"	4¾"
1223	Bronze	3"	1"	3.04"	5"
411	Nickel-Silver	1.900"	1"	1.94"	4"
1325	Nickel-Silver	2½"	1"	2.54"	4¾"
1323	Nickel-Silver	3"	1"	3.04"	5"
211	Stainless	1.900"	⅞"	1.94"	4½"
1425	Stainless	2½"	1 1/16"	2.54"	4⅞"
1423	Stainless	3"	1 7/16"	3.04"	6⅛"

90° RADIUS ELBOW

Satin Finish, except as noted



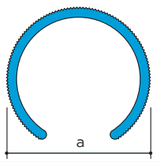
Elbow may be trimmed for use as wall return. For brackets, see pages 22-23.

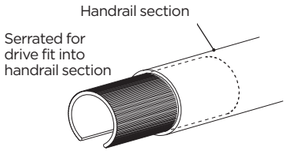
		a	r	Wall	b
7210*	Aluminum	1.900"	3"	.109"	2"
1110*	Aluminum	2½"	5"	.125"	2½"
1120*	Aluminum	3"	5"	.125"	2½"
1122*	Aluminum	3½"	5"	.125"	2½"
1222*	Bronze	1.900"	3"	.100"	2½"
1210*	Bronze	2½"	5"	.125"	2½"
1220*	Bronze	3"	6"	.125"	2½"
6489C*	Bronze	1.500"	3"	.100"	2½"
1330C*	Nickel-Silver	1.900"	3"	.109"	2½"
1332C*	Nickel-Silver	2½"	5"	.125"	2½"
1333C*	Nickel-Silver	3"	5"	.125"	2½"
9310	Stainless	1.900"	3"	.062"	2"
1410	Stainless	2½"	5"	.062"	2½"
1420	Stainless	3"	5"	.062"	2½"

* Mill Finish

CONNECTOR SLEEVES

Aluminum, 5" lengths





Fasten with Scotch-Weld® Adhesive

		a
7063	for 6489 Bronze and 5289 Nickel-Silver	1.500"
1363	for 1.900" Nickel-Silver	1.650"
1160	for 1.900" Aluminum and 1.900" Bronze	1.682"
1163	for 2½" Aluminum, 2½" Bronze and 2½" Nickel-Silver	2.250"
1170	for 3" Aluminum, 3" Bronze and 3" Nickel-Silver	2.750"
1164	for 3½" Aluminum	3.250"
9363	for 1.900" Stainless	1.770"
1463	for 2½" Stainless	2.375"
1464	for 3" Stainless	2.875"
1264	for 3½" Bronze	3.125"
1474	for 4" Stainless	3.875"

TRADITIONAL RAILING COMPONENTS

This section illustrates the numerous handrail mouldings, fittings, and ornamental railing components carried in stock in aluminum, bronze, nickel-silver, steel, and stainless steel. Most can be used with the various railing systems described elsewhere in this catalog.

- **Aluminum** extrusions are of alloy 6063 which is preferred for its bright color, corrosion resistance and ease of fabrication. It is suitable for anodizing, including most of the hard coat color finishes.
- **Bronze** extrusions are of alloy C38500, architectural bronze, preferred for its rich gold color and workability.
- **Nickel-Silver** extrusions are of alloy C79800. Sometimes referred to as white bronze, nickel-silver is a copper/nickel alloy. It is similar in color to stainless steel, with golden highlights.
- **Stainless Steel** components are of type 304, 18-8, chrome nickel alloy which has high resistance to corrosion.
- **Steel** handrails are hot-rolled carbon steel, C1010.

Cast aluminum fittings are produced from Almag 35, suitable for clear anodizing. Bronze castings are of alloy C86500 for a good color match with extruded bronze. Nickel-silver fittings are cast to match extrusions. All non-ferrous fittings are satin finished; bronze and nickel-silver fittings are protected with a clear lacquer. Fittings for use with steel handrail are cast from malleable iron, which is weldable and bendable.

It is important to be aware that due to the difference in tolerances between extruded handrail and cast fittings, butt joints require special attention to ensure proper match.

All items are carried in stock in substantial quantities and are available for immediate shipment. Materials are produced and handled with great care. Items are thoroughly protected for shipment by wrapping and/or crating so as to ensure a product well-suited for architectural finishing. For structural engineering data, see pages 122-129. For handrail brackets, see pages 89-97.

The *Americans with Disabilities Act* adopted by Congress in 1992 required circular handrails to be 1¼" minimum and 1½" maximum. However, the *Guidance on the 2010 ADA Standards for Accessible Design - September 2010*, published by the US Department of Justice, has clarified the intent of the dimensional requirements to be an outside diameter of 1¼" to 2".

ADAAG also allows handrails which provide an equivalent gripping surface. ANSI117.1-17 defines this alternative: *equivalent gripping surfaces are permitted provided they have a perimeter dimension of 4" (100 mm) minimum and 6 ¼" (160 mm) maximum and provided their largest cross-section dimension is 2 ¼" (57 mm) maximum.*

Yale University, New Haven, CT, Shepard Steel, Harford, CT (Fabricator), Robert A.M. Stern Architects, New York, NY (Architect), © Francis Dzikowski/OTTO (Photo Credit).

Private Residence, Greenwich, CT, Artistic Ironworks LLC, Norwalk, CT (Fabricator).

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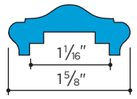
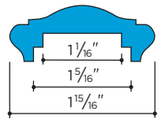
ALUMINUM Alloy 6063-T52, Mill Finish, 20′ Lengths

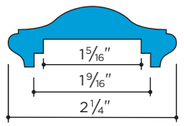
Scale: 6″ = 1′-0″



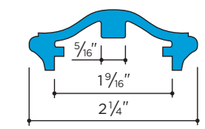
6931 Aluminum .615 lb/ft
Fittings: B-C-CC-CL-CR-E-GL-GR-L-N-S-T-V



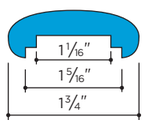
6934 Aluminum .804 lb/ft
Fittings: B-C-CC-CL-CR-E-GL-GR-J-L-N-S-T-V



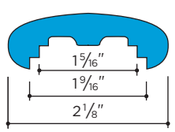
6930 Aluminum .936 lb/ft
Fittings: B-C-CC-CL-CR-E-GL-GR-J-L-N-S-T-V



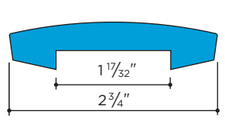
6929 Aluminum .670 lb/ft
Use fittings for **6930**
Outside profile identical to **6930**, for straight runs only



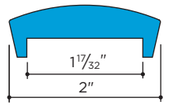
6933 Aluminum .770 lb/ft
Fittings: B-C-CC-CL-CR-GL-GR-N-S-V



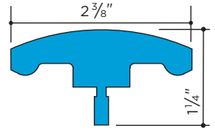
6935 Aluminum .980 lb/ft
Fittings: B-C-CC-CL-CR-E-GL-GR-N-S-T-V



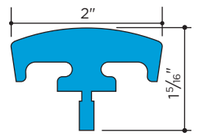
6984* Aluminum 1.301 lb/ft
Fittings: C-N
*Use 1½″ x ¼″ flat bar for splicing and closing ends



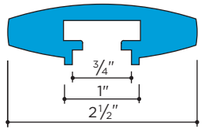
6985* Aluminum .977 lb/ft
Fittings: C-N
*Use 1½″ x ¼″ flat bar for splicing and closing ends



6402 Aluminum 1.51 lb/ft
Fittings: C-N Use fittings for **6902**

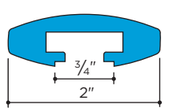


6405 Aluminum 1.39lb/ft
Fittings: C-N Use fittings for **6985**

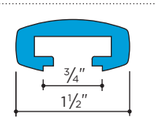


6532 Aluminum 1.440 lb/ft
Fittings: C-N

Mouldings **6530**, **6531**, and **6532** are used with Carlsrail® self-aligning brackets on page 82. Clamping action eliminates drilling and tapping and helps in field alignment with posts and wall attachments. See page 68 for splices, support bar and end cap. Carlsrail® mouldings are designed for non-welded assembly.

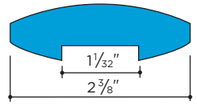


6530 Aluminum .900 lb/ft
Fittings: C-N



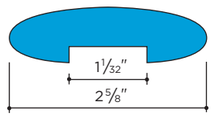
6531 Aluminum .600 lb/ft
Fittings: C-N

Channel corner bends and channel lateral scrolls are available in aluminum and malleable iron.

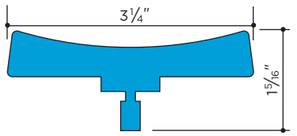


6902 Aluminum 1.464 lb/ft
Fittings: C-N

Mouldings **6901** and **6902** are specially designed for use with **Carlstadt**® aluminum self-aligning brackets **309**, **312**, **313** and **314** shown on pages 92 and 93. A 1″ x ¼″ flat bar can be used for splicing and for closing the recess in the handrail moulding.

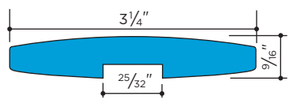


6901 Aluminum 1.661 lb/ft
Fittings: C-N

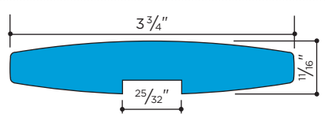


6407 Aluminum 2.00 lb/ft
Fittings: C-N Use fittings for **6907**

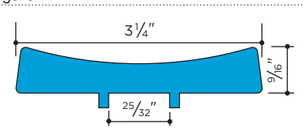
T-handrail mouldings **6402**, **6405**, and **6407** are used with **Carlstadt**® self-aligning brackets on pages 92 and 93. Clamping action eliminates drilling and tapping and helps in field alignment with posts and wall attachment.



6905 Aluminum 1.752 lb/ft
Fittings: C-N



6906 Aluminum 2.448 lb/ft
Fittings: C-N

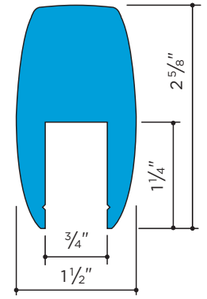


6907 Aluminum 1.776 lb/ft
Fittings: C-N

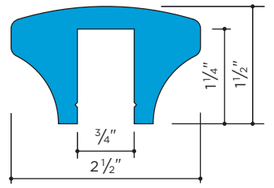
Mouldings **6905**, **6906**, and **6907** are specially designed for use with **Carlstadt**® self-aligning brackets shown on pages 90 and 91. A **3/4″ x 3/16″** flat bar may be used for closing the recess in the handrail moulding.

ALUMINUM Alloy 6063-T52, Mill Finish, 20′ Lengths

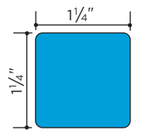
Scale: 6″ = 1′-0″



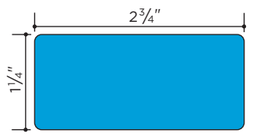
1133* Aluminum 3.02 lb/ft



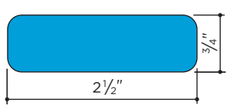
1134* Aluminum 2.40 lb/ft



6423* Aluminum 1.876 lb/ft



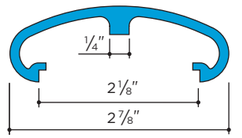
6424* Aluminum 4.124 lb/ft



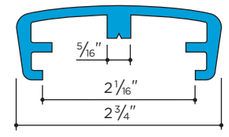
6939* Aluminum 2.214 lb/ft

6988* Aluminum 1.138 lb/ft

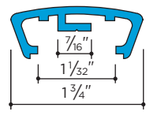
6986* Aluminum 2.684 lb/ft



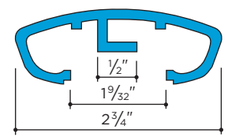
6932 Aluminum .852 lb/ft
Fittings: B-C-N-S



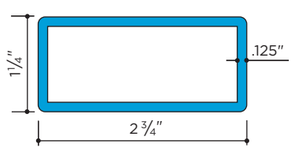
6987 Aluminum .858 lb/ft
Fittings: C-N



6903* Aluminum .446 lb/ft
*Use with 1″ x ½″ x ⅛″ channel

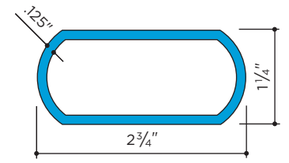


6904* Aluminum .858 lb/ft
*Use with 1¼″ x ¾″ x ⅛″ channel

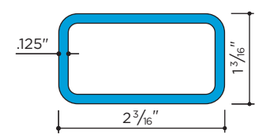


6434 Aluminum 6063-T6 1.123 lb/ft
Fittings: N (see page 81)

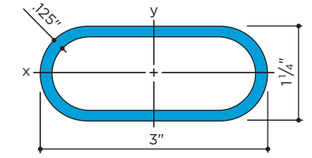
* No fittings available.



6435 Aluminum 6063-T6 1.075 lb/ft
Fittings: C-N (see pages 38 and 81)



6436 Aluminum .888 lb/ft
Fittings: N



6437 Aluminum 1.057 lb/ft
Fittings: N

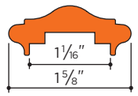
Aluminum Handrail Fittings
Symbols and Letter Designations

When specifying a fitting, add fitting designation to handrail moulding number (e.g. **6930-V**). See pages 111 and 114 for available channel sizes.

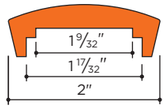
ALUMINUM	
B	Bevel Lamb's Tongue
C	Corner Bend
CC	Channel Corner Bend
CL	Left Channel Lateral Scroll
CR	Right Channel Lateral Scroll
E	Terminal
GL	Left Lateral Scroll
GR	Right Lateral Scroll
J	J Scroll, Round
L	Corner Piece
N	Square End Piece
S	Straight Lamb's Tongue
T	Center Piece
V	Volute
MALLEABLE IRON	
CC	Channel Corner Bend
CL	Left Channel Lateral Scroll
CR	Right Channel Lateral Scroll

BRONZE Alloy C38500, Mill Finish, 20′ lengths, except as noted

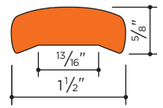
Scale: 6″ = 1′-0″



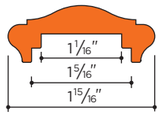
4531 Bronze 1.93 lb/ft
Fittings: B-C-E-GL-GR-J-L-N-S-U-V



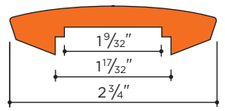
4575 Bronze 2.37 lb/ft
Fittings: C-N



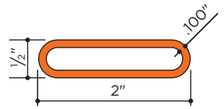
4503 Bronze 2.73 lb/ft
No fittings available



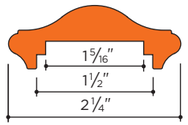
4534 Bronze 2.80 lb/ft
Fittings: B-C-E-GL-GR-J-L-N-S-T-V



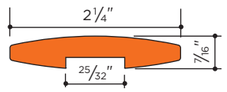
4574 Bronze 3.71 lb/ft
Fittings: C-N



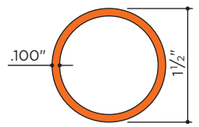
6488 Bronze 1.56 lb/ft
Fittings: N
16' lengths



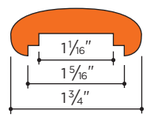
4530 Bronze 3.10 lb/ft
Fittings: B-C-E-GL-GR-J-L-N-S-T-V



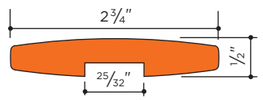
4572 Bronze 2.50 lb/ft
Fittings: C-N



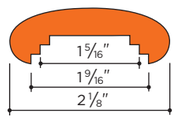
6489 Bronze 1.75 lb/ft
Fittings: C-D-N



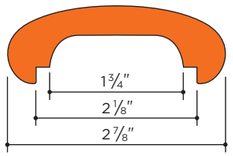
4539 Bronze 2.66 lb/ft
Fittings: B-C-CC-CL-CR-GL-GR-N-S-V



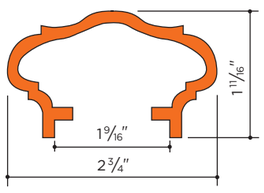
4573 Bronze 4.05 lb/ft
Fittings: C-N



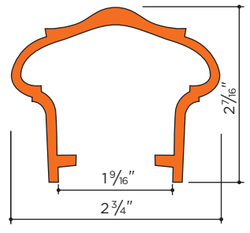
4535 Bronze 3.35 lb/ft
Fittings: B-C-CC-CL-CR-GL-GR-N-S-T-V



4529 Bronze 4.87 lb/ft
Fittings: N



4538 Bronze 3.15 lb/ft
Fittings: N
16' lengths



4533 Bronze 3.66 lb/ft
No fittings available
16' lengths

Channel corner bends and channel lateral scrolls are available in bronze and malleable iron.

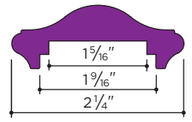
Bronze Handrail Fittings
Symbols and Letter Designations

When specifying a fitting, add fitting designation to handrail moulding number (e.g. **4530-V**). See pages 114-115 for available channel sizes.

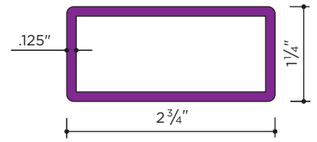
BRONZE	
B	Bevel Lamb's Tongue
C	Corner Bend
CC	Channel Corner Bend
CL	Left Channel Lateral Scroll
CR	Right Channel Lateral Scroll
D	Domed End Cap
E	Terminal
GL	Left Lateral Scroll
GR	Right Lateral Scroll
J	J Round Terminal
L	Corner Piece
N	Square End Piece
S	Straight Lamb's Tongue
T	Center Piece
U	End Urn Base
V	Volute
MALLEABLE IRON	
CC	Channel Corner Bend
CL	Left Channel Lateral Scroll
CR	Right Channel Lateral Scroll

NICKEL-SILVER Alloy C79800, Mill Finish, 20′ lengths, except as noted

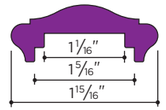
Scale: 6″ = 1′-0″



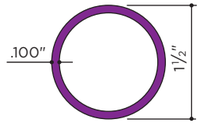
5530 Nickel-Silver 2.91 lb/ft
Fittings: B-C-GL-GR-N-S-V
16' lengths



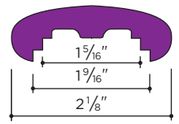
1334 Nickel-Silver 3.40 lb/ft
Fittings: N (See page 81)
16' lengths



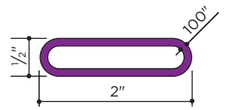
5534 Nickel-Silver 2.52 lb/ft
Fittings: B-C-GL-GR-N-S-V



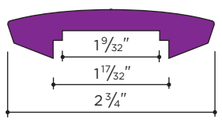
5289 Nickel-Silver 1.75 lb/ft
Fittings: N



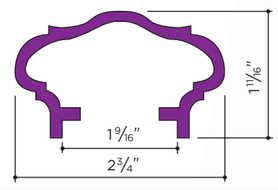
5235 Nickel-Silver 3.16 lb/ft
Fittings: B-C-GL-GR-N-S-V



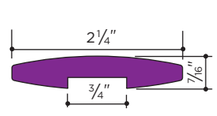
5288 Nickel-Silver 1.56 lb/ft
Fittings: N



5274 Nickel-Silver 3.71 lb/ft
Fittings: C-N



5538 Nickel-Silver 2.96 lb/ft
Fittings: N



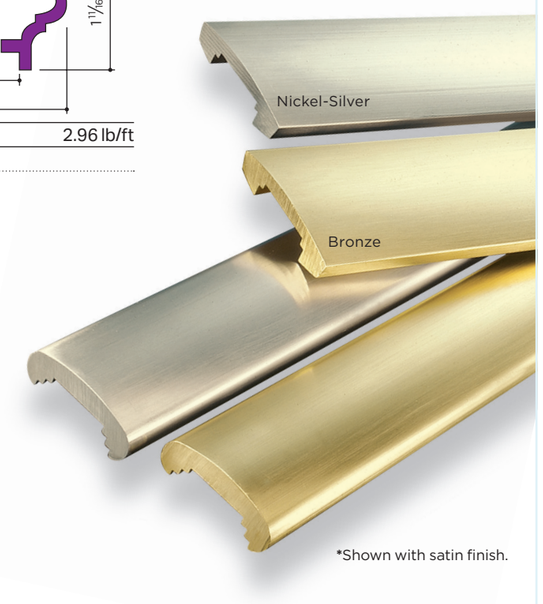
5572 Nickel-Silver 2.50 lb/ft
Fittings: C-N

Channel corner bends and channel lateral scrolls are available in nickel-silver and malleable iron.

Nickel-Silver Handrail Fittings
Symbols and Letter Designations

When specifying a fitting, add fitting designation to handrail moulding number (e.g. **5534-V**). See pages 114 and 118 for available channel sizes.

NICKEL-SILVER	
B	Bevel Lamb's Tongue
C	Corner Bend
CC	Channel Corner Bend
CL	Left Channel Lateral Scroll
CR	Right Channel Lateral Scroll
E	Terminal
GL	Left Lateral Scroll
GR	Right Lateral Scroll
L	Corner Piece
N	Square End Piece
S	Straight Lamb's Tongue
V	Volute
MALLEABLE IRON	
CC	Channel Corner Bend
CL	Left Channel Lateral Scroll
CR	Right Channel Lateral Scroll

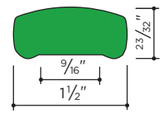


*Shown with satin finish.

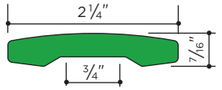
TRADITIONAL RAILING COMPONENTS

STAINLESS Type 304 (18-8), 20′ lengths, except as noted STEEL C1010, 20′ lengths

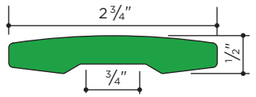
Scale: 6″ = 1′-0″, except as noted



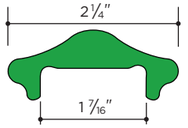
6503 Stainless 2.54 lb/ft
No fittings available
16′ lengths



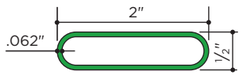
6502 Stainless 2.80 lb/ft
No fittings available
16′ lengths



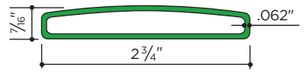
6501 Stainless 4.05 lb/ft
No fittings available
16′ lengths



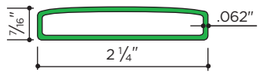
6513 Stainless 2.85 lb/ft
Fittings: N



4488 Stainless .944 lb/ft
Fittings: N Suitable for elevator cab handrails



6511 Stainless 1.25 lb/ft
Fittings: N



6512 Stainless 1.00 lb/ft
Fittings: N

Stainless Steel Handrail Fittings
Symbols and Letter Designations

When specifying a fitting, add fitting designation to handrail moulding number (e.g. **4488-N**). See page 120 for available channel sizes.

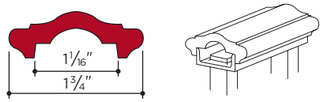
STAINLESS		
C		Corner Bend
N		Square End Piece

Steel Handrail Fittings
Symbols and Letter Designations

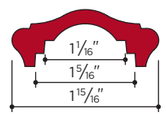
When specifying a fitting, add fitting designation to handrail moulding number (e.g. **4441-V**). See page 114 for available channel sizes.

MALLEABLE IRON		
B		Bevel Lamb's Tongue
C		Corner Bend
CC		Channel Corner Bend
CL		Left Channel Lateral Scroll
CR		Right Channel Lateral Scroll
E		Terminal
F		Forged Lamb's Tongue
GL		Left Lateral Scroll
GR		Right Lateral Scroll
JL		Left Junior Lateral Scroll
JR		Right Junior Lateral Scroll
L		Corner Piece
N		Square End Piece
S		Straight Lamb's Tongue
SL		Left Junior Lateral Channel
SR		Right Junior Lateral Channel
T		Center Piece
U		End Urn Base
UC		Center Urn Base
UL		Corner Urn Base
V		Volute

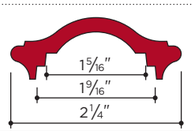
Steel mouldings are hot-rolled carbon steel, C1010. Fittings are cast in malleable iron, making them weldable and bendable.



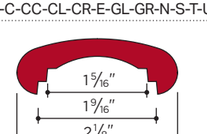
4429 used with 1" channel
4429 Prime Domestic Steel 1.50 lb/ft
Fittings: B-C-CC-CL-CR-E-F-GL-GR-JL-JR-L-N-S-SL-SR-T-U-UC-UL-V



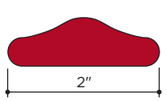
4428 Steel 2.25 lb/ft
Fittings: B-C-CC-CL-CR-E-GL-GR-L-N-S-V



4441 Steel 2.14 lb/ft
Fittings: B-C-CC-CL-CR-E-GL-GR-N-S-T-U-UC-V



4435 Steel 2.65 lb/ft
Fittings: V

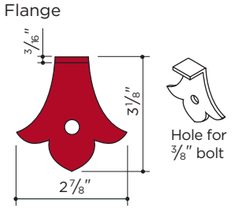


4416 Steel 3.15 lb/ft
No fittings available

Loafer Rail

4445 Steel .688 lb/ft
Loafer rail fits over pipe or flat surface to discourage lounging or skating on fences, planters, railings, or storefronts.

Wall Flange

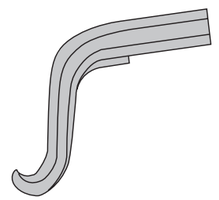


401* Steel
*Scale: 3" = 1'-0"

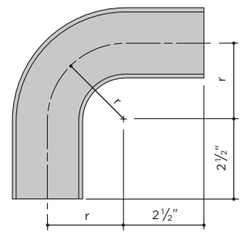
ALUMINUM BRONZE NICKEL-SILVER STAINLESS MALLEABLE IRON / STEEL

HANDRAIL FITTINGS

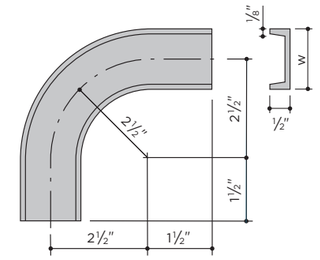
Satin finish, except as noted. Bronze and nickel-silver fittings are lacquered. See pages 40-42 for specific fittings availability.



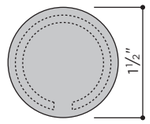
B Bevel Lamb's Tongue



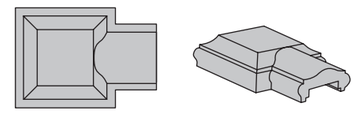
C Corner Bend
Trim one leg for use as a wall return.
Combine two corner bends together for 180° turns.



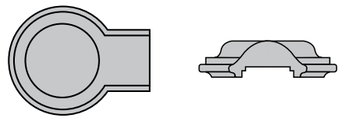
CC Channel Corner Bend
"As Cast" finish
Fits the underside of moulding corner bend.



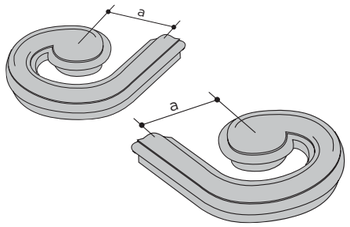
D Domed End Cap



E Terminal

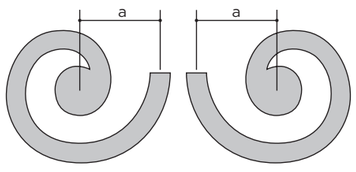


J J Round Terminal

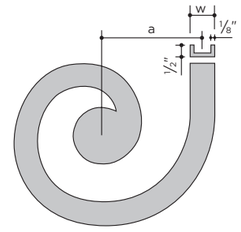


MOULDING LATERAL SCROLLS

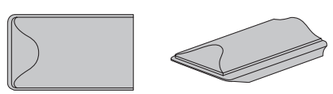
Satin finish, except as noted. Moulding lateral scrolls may be bent to meet the pitch of stair railings. Cast channel and steel flat bar scrolls fit the underside of moulding lateral scrolls. They may be punched for round or square balusters. Malleable iron produced in "As Cast" finish.



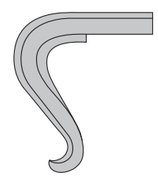
GL Left Lateral Scroll
GR Right Lateral Scroll



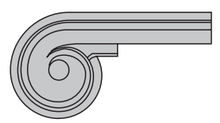
CL Left Channel Lateral Scroll
CR Right Channel Lateral Scroll
Fits the underside of moulding lateral scroll.



N** Square End Piece
** Stainless and steel with square front corners



S Straight Lamb's Tongue



V Volute

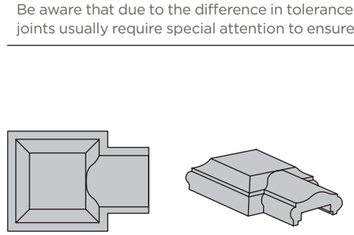
Be aware that due to the differences in tolerances between extruded handrail and cast fittings, butt joints usually require special attention to ensure a proper match.

ALUMINUM BRONZE MALLEABLE IRON

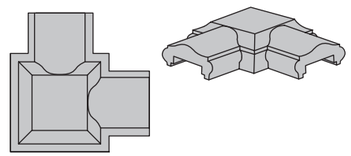
FINIAL BASES, CENTER PIECES, CORNER PIECES, TERMINALS AND URN BASES

Satin finish, except as noted. Bronze and nickel-silver fittings are lacquered. See page 53 for Urn and Ball Finials.
Urn bases may be welded or bolted in place with the finial stud.

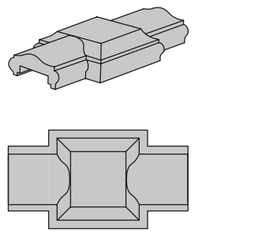
Be aware that due to the difference in tolerances between extruded handrail and cast fittings, butt joints usually require special attention to ensure a proper match.



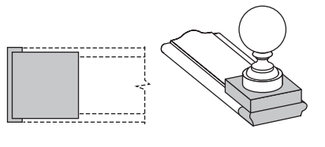
E Terminal



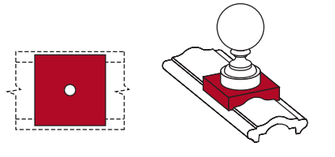
L Corner Piece



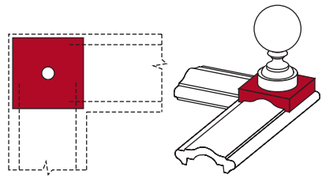
T Center Piece



U End Urn Base



UC Center Urn Base



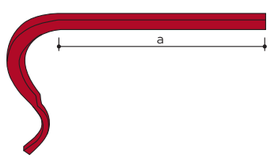
UL Corner Urn Base

TERMINALS, CENTER PIECES & CORNER PIECE FITTING AVAILABILITY

Handrail Moulding	Terminal End Piece (E)	Corner Piece (L)	Center Piece (T)	End Urn Base (U)
6929	6930E	6930L	6930T	–
6930	6930E	6930L	6930T	–
6931	6931E	6931L	6931T	–
6934	6934E	6934L	6934T	–
6935	6935E	–	6935T	–
4530	4530E	4530L	4530T	–

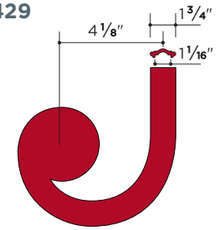
Handrail Moulding	Terminal End Piece (E)	Corner Piece (L)	Center Piece (T)	End Urn Base (U)
4531	4531E	4531L	–	4531U
4534	4534E	4534L	4534T	–
4535	–	–	4535T	–
4428	4428E	4428L	–	–
4429	4429E	4429L	4429T	4429U
4441	4441E	–	–	4441U

HANDRAIL FITTINGS FOR USE WITH 4429



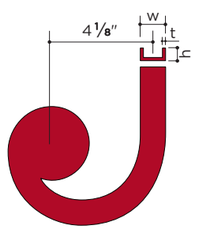
F Forged Lamb's Tongue

		a
4429F	Steel	18"
4429F-3	Steel	36"
4429F-4	Steel	48"
4429F-5	Steel	60"
4429F-6	Steel	72"



Lateral Scroll

SL	Left Junior Lateral Scroll
SR	Right Junior Lateral Scroll
4429SL	Malleable Iron
4429SR	Malleable Iron

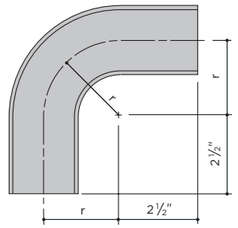


Lateral Channel

		w	h	t
JL	Left Junior Lateral Channel			
JR	Right Junior Lateral Channel			
100JL	Malleable Iron	1"	1/2"	1/8"
100JR	Malleable Iron	1"	1/2"	1/8"

ALUMINUM BRONZE NICKEL-SILVER MALLEABLE IRON

CORNER BEND RADIUS



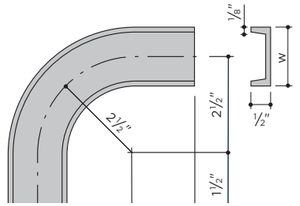
Corner Bend (C)	Bend Radius (r)
6435C Aluminum	3"
6530C Aluminum	4"
6531C Aluminum	4"
6532C Aluminum	4"
6901C Aluminum	2 1/2"
6902C Aluminum	2 1/2"

Corner Bend (C)	Bend Radius (r)
6905C Aluminum	3"
6906C Aluminum	3"
6907C Aluminum	3"
6930C Aluminum	2 1/2"
6931C Aluminum	2 1/2"
6932C Aluminum	3"
6933C Aluminum	2 1/2"
6934C Aluminum	2 1/2"
6935C Aluminum	2 1/2"
6984C Aluminum	3"
6985C Aluminum	2 1/2"
6987C Aluminum	3"
4530C Bronze	2 1/2"
4531C Bronze	2 1/2"
4534C Bronze	2 1/2"

Corner Bend (C)	Bend Radius (r)
4535C Bronze	2 1/2"
4539C Bronze	2 1/2"
4572C Bronze	2 1/2"
4573C Bronze	3"
4574C Bronze	3"
4575C Bronze	2 1/2"
6489C Bronze	5"
5235C Nickel-Silver	2 1/2"
5274C Nickel-Silver	3"
5530C Nickel-Silver	2 1/2"
5534C Nickel-Silver	2 1/2"
5572C Nickel-Silver	2 1/2"
4428C* Malleable Iron	2 1/2"
4429C* Malleable Iron	2 1/2"
4441C* Malleable Iron	2 1/2"

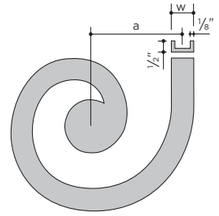
* "As Cast" finish, no lacquer

CHANNEL CORNER BEND DIMENSIONS



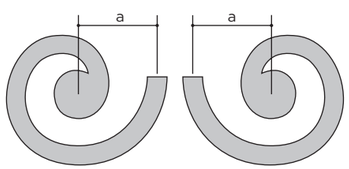
Channel Corner Bend (CC)	w
600CC Aluminum	1"
615CC Aluminum	1 1/4"
650CC Aluminum	1 1/2"
400CC Bronze	1"
425CC Bronze	1 1/4"
450CC Bronze	1 1/2"
1315CC Nickel-Silver	1 1/4"
1350CC Nickel-Silver	1 1/2"
100CC Malleable Iron	1"
125CC Malleable Iron	1 1/4"
150CC Malleable Iron	1 1/2"

CHANNEL LATERAL SCROLL DIMENSIONS



Channel Lateral Scroll (CL/CR)	Lateral "a"	w
600CL/CR Aluminum	5 9/16"	1"
615CL/CR Aluminum	5 1/2"	1 1/4"
650CL/CR Aluminum	6 3/8"	1 1/2"
400CL/CR Bronze	5 9/16"	1"
425CL/CR Bronze	5 1/2"	1 1/4"
450CL/CR Bronze	6 3/8"	1 1/2"
1315CL/CR Nickel-Silver	5 1/2"	1 1/4"
1350CL/CR Nickel-Silver	6 3/8"	1 1/2"
100CL/CR Malleable Iron	5 9/16"	1"
125CL/CR Malleable Iron	5 1/2"	1 1/4"
150CL/CR Malleable Iron	6 3/8"	1 1/2"

LATERAL SCROLL DIMENSION



Lateral Scroll (GL/GR)	Lateral "a" Dimension
6930GL/GR Aluminum	6 3/8"
6931GL/GR Aluminum	5 9/16"
6933GL/GR Aluminum	5 1/2"
6934GL/GR Aluminum	5 1/2"
6935GL/GR Aluminum	6 3/8"
4530GL/GR Bronze	6 3/8"
4531GL/GR Bronze	5 9/16"
4534GL/GR Bronze	5 1/2"
4535GL/GR Bronze	6 3/8"
4539GL/GR Bronze	5 1/2"
5235GL/GR Nickel-Silver	6 3/8"
5530GL/GR Nickel-Silver	6 3/8"
5534GL/GR Nickel-Silver	5 1/2"
4428GL/GR Malleable Iron	5 1/2"
4429GL/GR Malleable Iron	5 5/8"
4441GL/GR Malleable Iron	6 1/8"

* Verify all dimensions before cutting.

HANDRAIL FITTINGS AVAILABILITY

ALUMINUM BRONZE NICKEL-SILVER STAINLESS MALLEABLE IRON

Handrail Moulding	Corner Bend (C)	Non-Ferrous Corner Bend *	Iron Corner Bend *
6402 Aluminum	**6902C** Aluminum	–	–
6405 Aluminum	**6985C** Aluminum	–	–
6407 Aluminum	**6907C** Aluminum	–	–
6434 Aluminum	**6434C** Aluminum	–	–
6435 Aluminum	**6435C** Aluminum	–	–
6436 Aluminum	–	–	–
6437 Aluminum	–	–	–
6530 Aluminum	**6530C** Aluminum	–	–
6531 Aluminum	**6531C** Aluminum	–	–
6532 Aluminum	**6532C** Aluminum	–	–
6901 Aluminum	**6901C** Aluminum	**600CC** Aluminum	**100CC** Malleable Iron
6902 Aluminum	**6902C** Aluminum	**600CC** Aluminum	**100CC** Malleable Iron
6905 Aluminum	**6905C** Aluminum	–	–
6906 Aluminum	**6906C** Aluminum	–	–
6907 Aluminum	**6907C** Aluminum	–	–
6929 Aluminum	**6930C** Aluminum	**650CC** Aluminum	**150CC** Malleable Iron
6930 Aluminum	**6930C** Aluminum	**650CC** Aluminum	**150CC** Malleable Iron
6931 Aluminum	**6931C** Aluminum	**600CC** Aluminum	**100CC** Malleable Iron
6932 Aluminum	**6932C** Aluminum	–	–
6933 Aluminum	**6933C** Aluminum	**615CC** Aluminum	**125CC** Malleable Iron
6934 Aluminum	**6934C** Aluminum	**615CC** Aluminum	**125CC** Malleable Iron
6935 Aluminum	**6935C** Aluminum	**650CC** Aluminum	**150CC** Malleable Iron
6984 Aluminum	**6984C** Aluminum	–	–
6985 Aluminum	**6985C** Aluminum	**650CC** Aluminum	**150CC** Malleable Iron
6987 Aluminum	**6987C** Aluminum	–	–
4529 Bronze	–	–	–
4530 Bronze	**4530C** Bronze	**450CC** Bronze	**150CC** Malleable Iron
4531 Bronze	**4531C** Bronze	**400CC** Bronze	**100CC** Malleable Iron
4534 Bronze	**4534C** Bronze	**425CC** Bronze	**125CC** Malleable Iron
4535 Bronze	**4535C** Bronze	**450CC** Bronze	**150CC** Malleable Iron
4538 Bronze	–	–	–
4539 Bronze	**4539C** Bronze	**425CC** Bronze	**125CC** Malleable Iron
4572 Bronze	**4572C** Bronze	–	–
4573 Bronze	**4573C** Bronze	–	–
4574 Bronze	**4574C** Bronze	–	–
4575 Bronze	**4575C** Bronze	**450CC** Bronze	**150CC** Malleable Iron
6488 Bronze	–	–	–
6489 Bronze	**6489C** Bronze	–	–
5235 Nickel-Silver	**5235C** Nickel-Silver	**1350CC** Nickel-Silver	**150CC** Malleable Iron
5274 Nickel-Silver	**5274C** Nickel-Silver	–	–
5288 Nickel-Silver	–	–	–
5289 Nickel-Silver	–	–	–
5530 Nickel-Silver	**5530C** Nickel-Silver	**1350CC** Nickel-Silver	**150CC** Malleable Iron
5534 Nickel-Silver	**5534C** Nickel-Silver	**1315CC** Nickel-Silver	**125CC** Malleable Iron
5538 Nickel-Silver	–	–	–
5572 Nickel-Silver	**5572C** Nickel-Silver	–	–
4428 Steel	**4428C*** Malleable Iron	–	**125CC** Malleable Iron
4429 Steel	**4429C*** Malleable Iron	–	**100CC** Malleable Iron
4441 Steel	**4441C*** Malleable Iron	–	**150CC** Malleable Iron
4488 Stainless	–	–	–
6511 Stainless	–	–	–
6512 Stainless	–	–	–

* "As Cast" finish, no lacquer

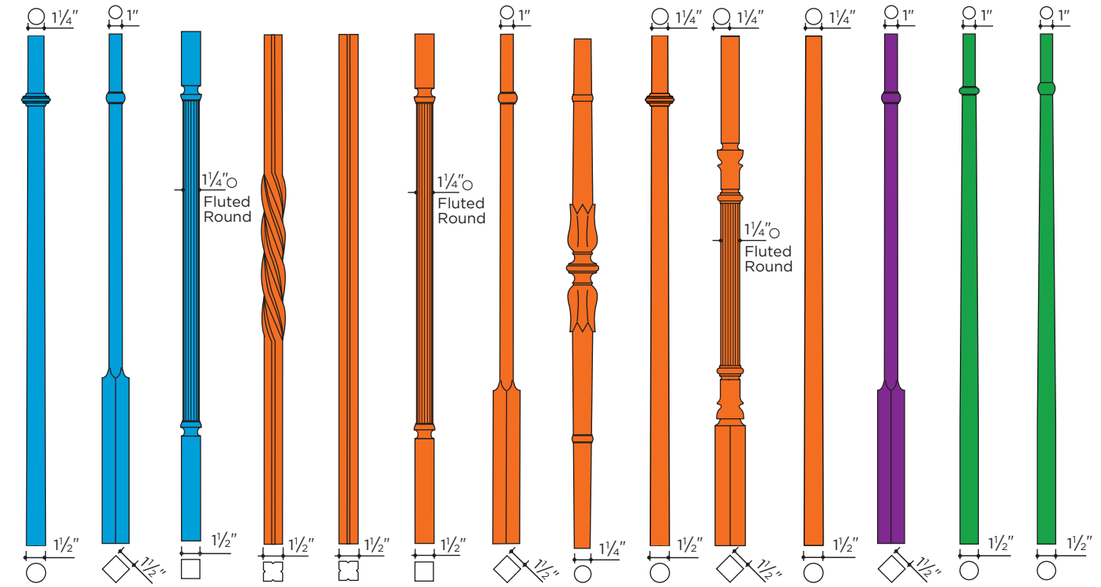
Be aware that due to the differences in tolerances between extruded handrail and cast fittings, butt joints usually require special attention to ensure a proper match.

Private Residence, Newport, RI, CDA, Salmon Studios. Florence, MA (Designer/Fabricator), Parker CCI, Rumford, RI (General Contractor).

ALUMINUM BRONZE NICKEL-SILVER MALLEABLE IRON/STEEL STAINLESS

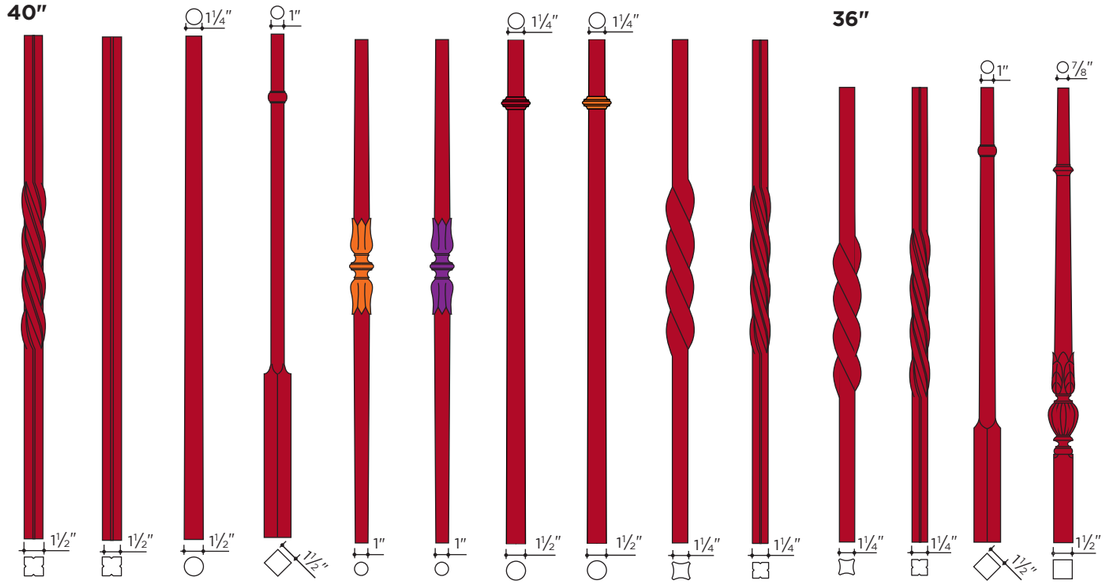
Starting Posts from Julius Blum & Co., Inc. have been engineered and tested to conform to the ASTM E985 concentrated test load requirement. Copies of the Test Reports are available. Scale: 1" = 1'-0" Available bases, flanges and collars on pages 50-52.

40"



703	731L	709	143L	142L	209	131	134	157	135	136	132	686	687
Aluminum	Aluminum	Aluminum	Forged Bronze	Bronze	Bronze	Bronze	Bronze	Bronze	Bronze	Bronze	Nickel-Silver	Stainless	Stainless

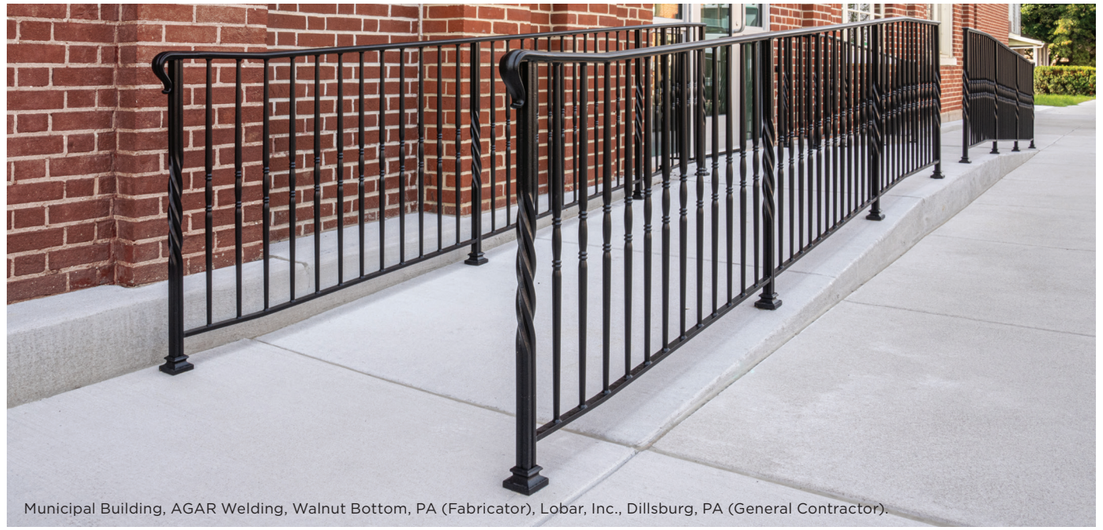
40"



36"

347L	345L	326L	331L	340	341	155	156	332L	343L	332	343	331	333
Forged Steel	Forged Steel	Forged Steel	Forged Steel	Steel w/ Bronze Center	Steel w/ Nickel-Silver Center	Forged Steel	Forged Steel w/ Bronze	Forged Steel	Forged Steel	Forged Steel	Forged Steel	Forged Steel	Malleable Iron

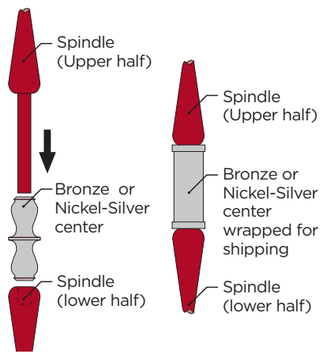
BRONZE NICKEL-SILVER STEEL



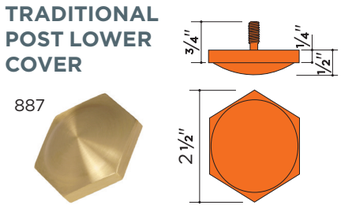
Municipal Building, AGAR Welding, Walnut Bottom, PA (Fabricator), Lobar, Inc., Dillsburg, PA (General Contractor).

Bronze and Nickel-Silver Center Detail

Forged steel spindles with decorative centers are forged in two halves with one end turned down to ½" diameter solid rod. This rod is force-fit into a recess drilled in the other half of the spindle forming a permanent assembly with a full ½" of solid steel at the center, thereby overcoming the weakness of an assembly using a threaded stud.



TRADITIONAL POST LOWER COVER



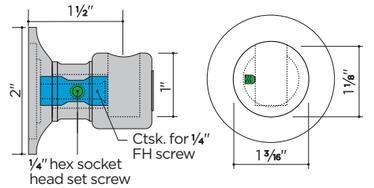
887

887	Bronze

Spindle Cups are machined from solid stock. Bronze and nickel-silver cups are furnished in a satin finish and laquered. Steel cups are furnished in a black oxide machined finish suitable for painting. Spindle cups are not intended or designed to be a structural member.

RINGED SPINDLE CUP

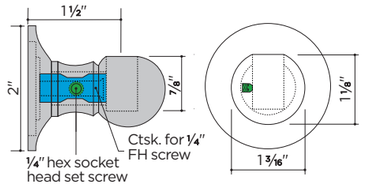
Rounded Hole



		Hole
884	Bronze	½"
184	Nickel-Silver	½"
1984	Steel	½"

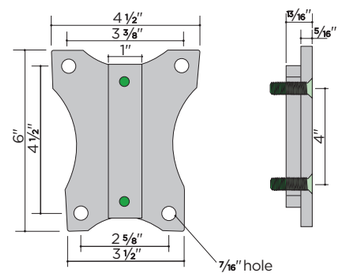
PLAIN SPINDLE CUP

Rounded Hole



		Hole
883	Bronze	½"
183	Nickel-Silver	½"
1983	Steel	½"

TRADITIONAL POST FASCIA FLANGE



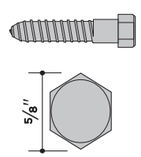
888	Bronze	
198	Nickel-Silver	
1988	Steel	

184

883

DECORATIVE HEX HEAD LAG SCREW

For mounting fascia flange

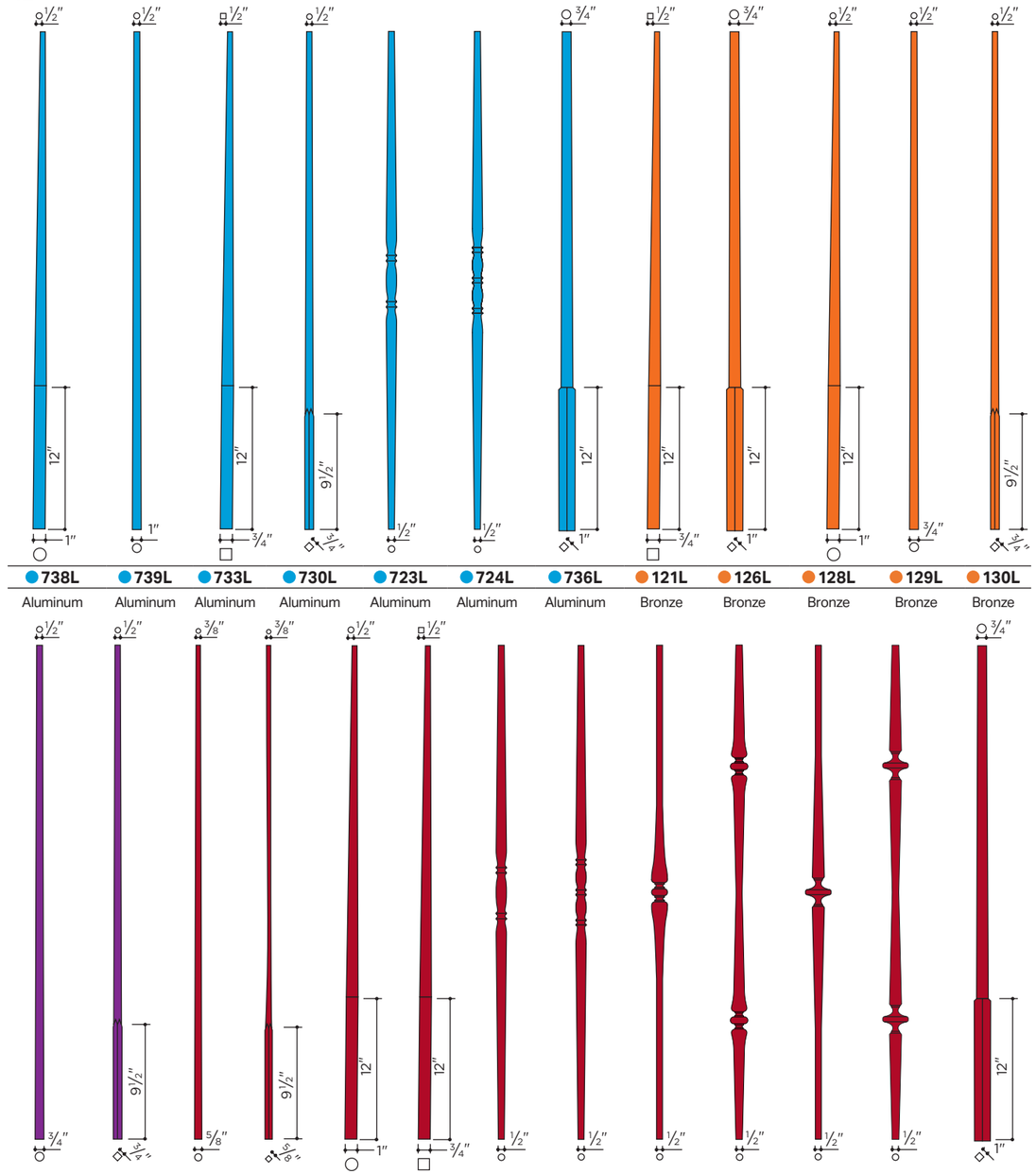


Brass	Finished Head	⅜" × 2"
Nickel-Silver	Finished Head	⅜" × 2"

ALUMINUM BRONZE NICKEL-SILVER MALLEABLE IRON / STEEL

Spindles are produced from solid stock and have a surface suitable for polishing or painting. Forged spindles with bronze and nickel-silver centers are permanently assembled and are equal in strength to solid spindles. Bronze and nickel-silver centers are polished and protected for shipment and installation. Aluminum spindles are machined from solid 6063 aluminum rod and have a surface suitable for painting or anodizing. Important: spindles are not structural members nor intended to be starting posts. Available bases, flanges and collars on pages 50-52.

42" Scale: 1" = 1'-0"

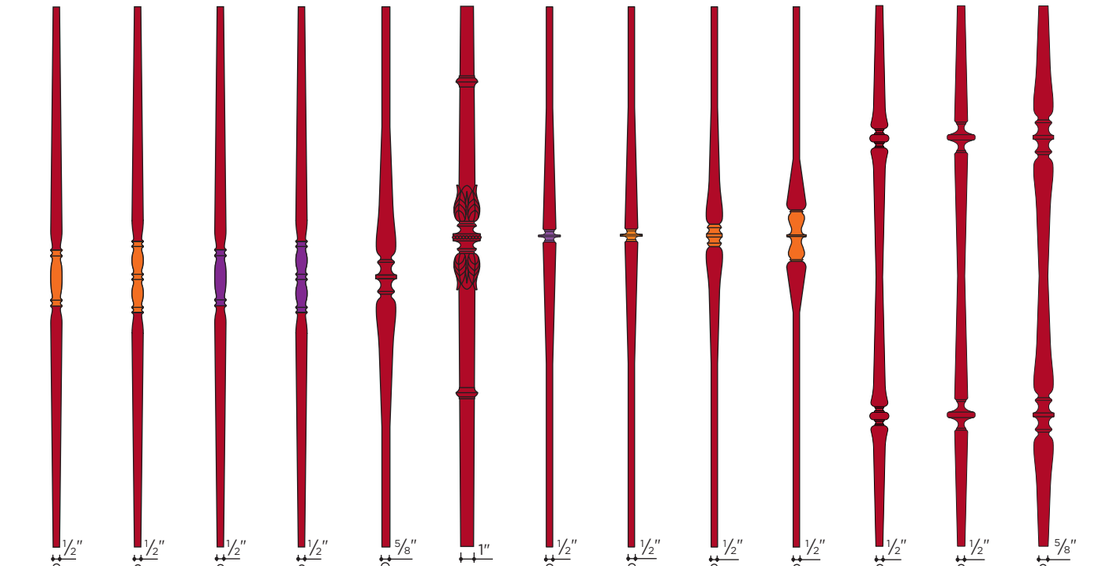


738L	739L	733L	730L	723L	724L	736L	121L	126L	128L	129L	130L
Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Bronze	Bronze	Bronze	Bronze	Bronze

29L	30L	329L	330L	28L	33L	323L	324L	325L	325DL	327L	327DL	36L
Nickel-Silver	Nickel-Silver	Steel	Steel	Steel	Steel	Forged Steel	Forged Steel	Forged Steel	Forged Steel	Forged Steel	Forged Steel	Steel

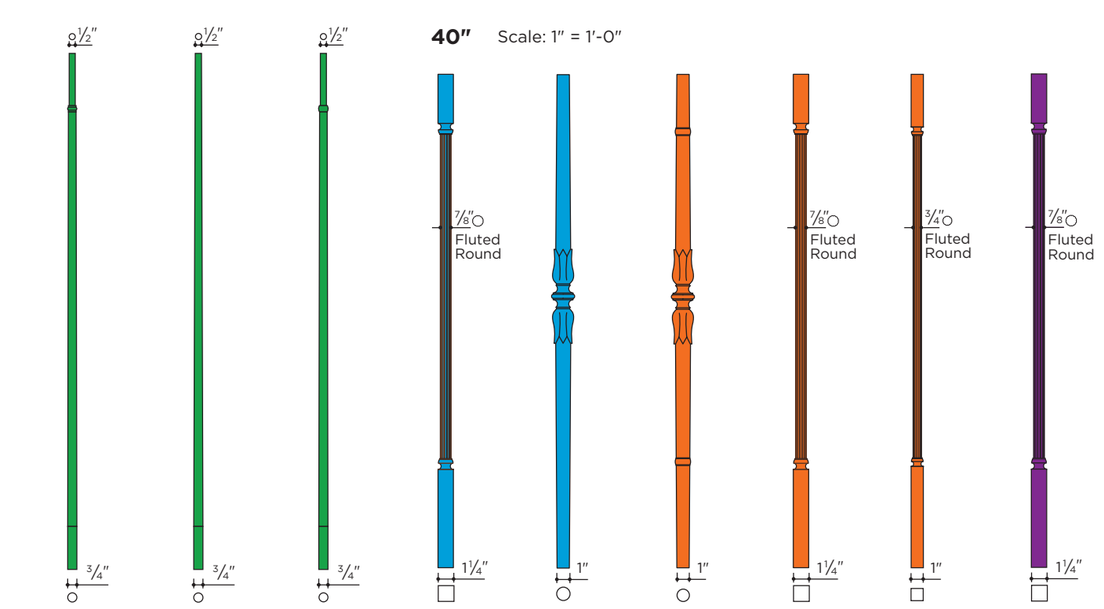
ALUMINUM BRONZE NICKEL-SILVER STAINLESS MALLEABLE IRON / STEEL

42" Scale: 1" = 1'-0"



123L	124L	23L	24L	328L	328DL	334L	336L	337L	338L	339L
Forged Steel w/ Bronze	Forged Steel w/ Bronze	Forged Steel w/ Nickel-Silver	Forged Steel w/ Nickel-Silver	Forged Steel	Forged Steel	Malleable Iron	Forged Steel w/ Nickel-Silver	Forged Steel w/ Bronze	Forged Steel w/ Bronze	Forged Steel w/ Bronze

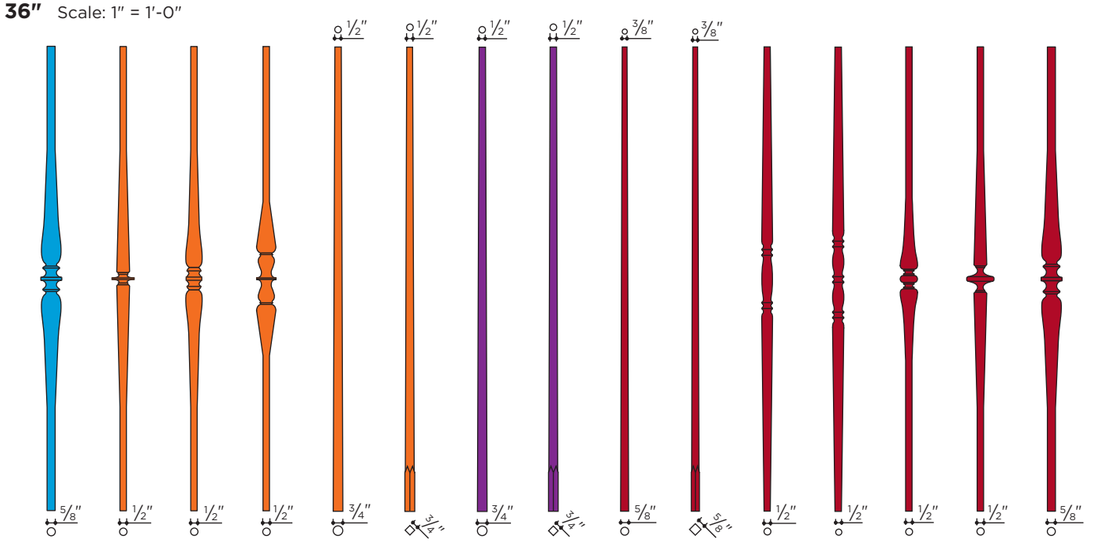
40" Scale: 1" = 1'-0"



682L	683L	684L	735	740	234	235	239	236
Stainless	Stainless	Stainless	Aluminum	Aluminum	Bronze	Bronze	Bronze	Nickel-Silver

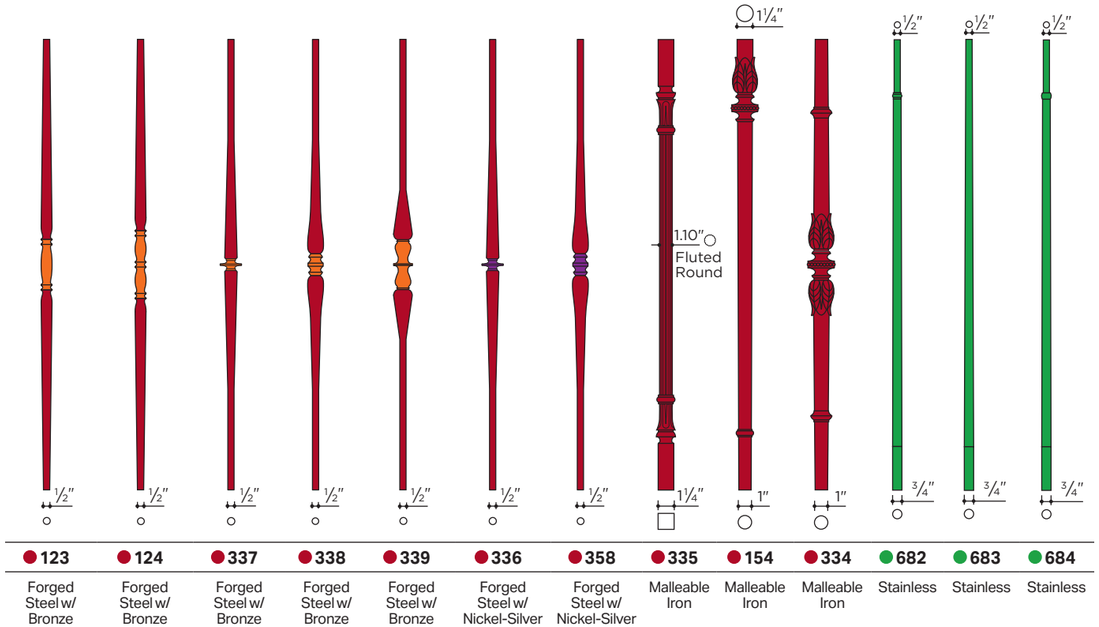
ALUMINUM BRONZE NICKEL-SILVER STEEL

36″ Scale: 1″ = 1′-0″



718	137	138	139	129	130	29	30	329	330	323	324	325	327	328
Aluminum	Bronze	Bronze	Bronze	Bronze	Bronze	Nickel-Silver	Nickel-Silver	Steel	Steel	Forged Steel	Forged Steel	Forged Steel	Forged Steel	Forged Steel

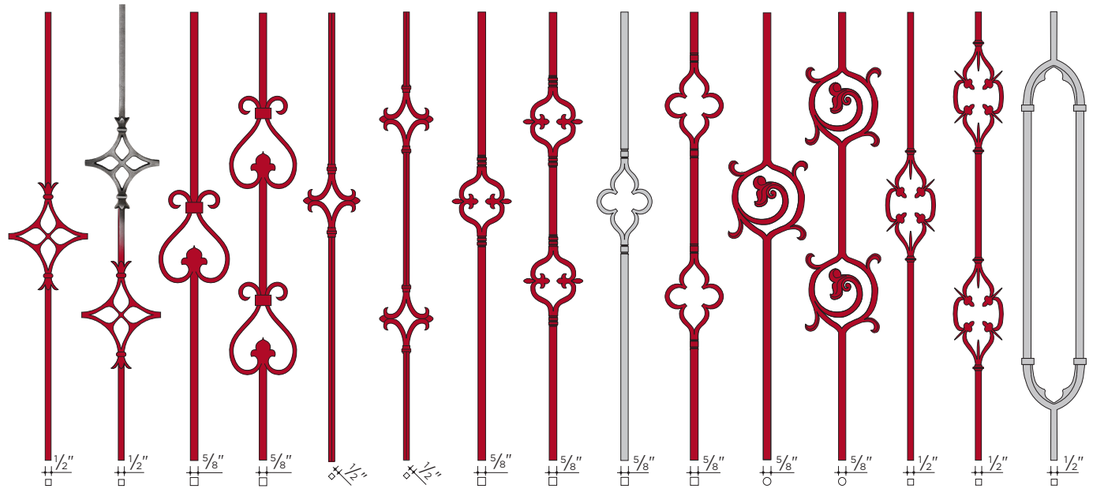
36″ Scale: 1″ = 1′-0″



123	124	337	338	339	336	358	335	154	334	682	683	684
Forged Steel w/ Bronze	Forged Steel w/ Bronze	Forged Steel w/ Bronze	Forged Steel w/ Bronze	Forged Steel w/ Bronze	Forged Steel w/ Nickel-Silver	Forged Steel w/ Nickel-Silver	Malleable Iron	Malleable Iron	Malleable Iron	Stainless	Stainless	Stainless

ALUMINUM MALLEABLE IRON

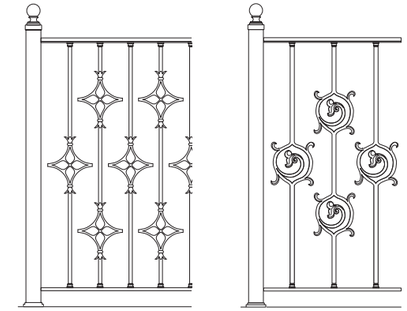
36″ Scale: 1″ = 1′-0″



528	158	529	159	534	153	530	530D	531	531D	532	532D	533	533D	973*
Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron

1531	1973*
Aluminum	Aluminum

*Conforms to 4″ sphere requirement



*Intermediate bar may be required to meet code requirements

Spindle		Width at widest point
1973*	Aluminum	5 1/4″
1531	Aluminum	4 3/4″
531	Malleable Iron	4 3/4″
531D	Malleable Iron	4 3/4″
533	Malleable Iron	5″
533D	Malleable Iron	5″
973*	Malleable Iron	5 1/4″
529	Malleable Iron	5 5/8″
530	Malleable Iron	5 5/8″

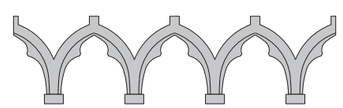
Spindle		Width at widest point
530D	Malleable Iron	5 7/8″
153	Malleable Iron	6″
159	Malleable Iron	6″
534	Malleable Iron	6″
532	Malleable Iron	6 7/16″
532D	Malleable Iron	6 7/16″
528	Malleable Iron	7″
158	Malleable Iron	7″

* See page 49

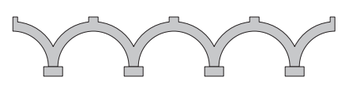
ORNAMENTAL VALANCES

Scale: 1 1/2″ = 1′-0″

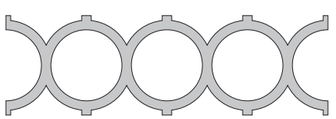
These castings are useful in various combinations to create ornamental railings with minimal openings. When used with 1/2″ square bars, the maximum opening will be 3 3/4″, thereby conforming to the 4″ sphere requirement.



		lbs	ht	wd
1970	Aluminum	1.2	4 5/8″	17″
970	Malleable Iron	3.4	4 5/8″	17″



		lbs	ht	wd
1971	Aluminum	.8	3″	17″
971	Malleable Iron	2.2	3″	17″



		lbs	ht	wd
1972	Aluminum	1.1	5″	17″
972	Malleable Iron	3.3	5″	17″

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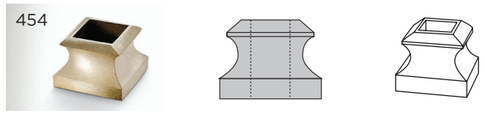
ALUMINUM BRONZE NICKEL-SILVER MALLEABLE IRON / STEEL

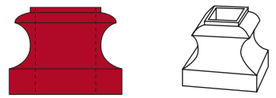
Bases, collars and flanges are furnished with clear holes for bar sizes shown. Non-ferrous (aluminum, bronze, nickel-silver) items are machined to match extruded sections and are satin finished, except as noted. Polished bronze and nickel-silver components are lacquered. Ferrous items are cast in malleable iron.

SQUARE HOLE BASES



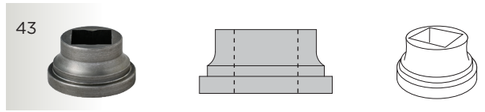
Square Hole

Aluminum	Bronze	Nickel-Silver	Hole	Width	Height
752	252	452	1/2"	1 1/4"	15/16"
753	253		5/8"	1 1/4"	15/16"
754	254	454	3/4"	1 3/8"	15/16"
767	267	467	1"	1 9/16"	1 1/16"
768	268	448	1 1/4"	2 3/4"	1 1/2"
769	269	479	1 1/2"	3"	1 1/2"



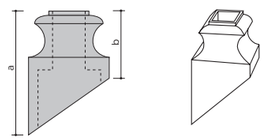
Square Hole

		Hole	Width	Height
352	Malleable Iron	1/2"	1 1/4"	1 1/16"
353	Malleable Iron	5/8"	1 1/4"	1 1/16"
354	Malleable Iron	3/4"	1 3/8"	1 1/16"
367	Malleable Iron	1"	1 3/4"	1 1/8"
368	Malleable Iron	1 1/4"	2 3/4"	1 5/8"
369	Malleable Iron	1 1/2"	3"	1 3/4"



Round Base / Square Hole

		Hole	Width	Height
39	Aluminum	3/4"	1 9/16"	3/4"
47	Bronze	3/4"	1 9/16"	3/4"
51	Nickel-Silver	3/4"	1 9/16"	3/4"
43	Steel	5/8"	1 7/16"	3/4"



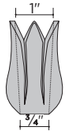
Square Hole

		Hole	a	b	Width
362	Malleable Iron	1/2"	2"	1"	1 1/4"
363	Malleable Iron	5/8"	2 1/4"	1"	1 1/4"
262	Bronze	1/2"	2"	1"	1 1/4"
263	Bronze	5/8"	2 1/4"	1"	1 1/4"

Round Hole

		Hole	Height
264	Bronze	1"	2 5/8"
434	Nickel-Silver	1"	2 5/8"

Matches center of **234**, **340**, and **341** post



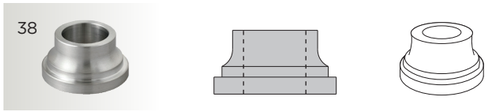
ROUND HOLE BASES

Round Hole

Bronze	Turned Steel	Hole	Width	Height
182	486	3/8"	1 1/2"	1"
181	485	1/2"	1 1/2"	1"
180	484	5/8"	1 7/8"	1 1/4"
179	483	3/4"	3"	1 1/2"
178	482	1"	3"	1 1/2"
177	481	1 1/4"	3 1/2"	2 1/8"
346	300	1 1/2"	3 1/2"	2 1/8"

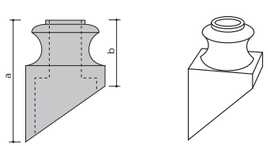
Round Hole

		Hole	Width	Height
80	Turned Brass—unpolished	1/2"	1 1/4"	3/4"
480	Nickel-Silver	1/2"	1 1/4"	3/4"
77	Turned Steel	1/2"	1 1/4"	3/4"
75	Turned Steel	3/8"	1 1/4"	3/4"



Round Base / Round Hole

		Hole	Width	Height
38	Aluminum	3/4"	1 7/16"	3/4"
44	Bronze	3/4"	1 7/16"	3/4"
48	Nickel-Silver	3/4"	1 7/16"	3/4"
40	Steel	5/8"	1 1/4"	3/4"



Round Hole

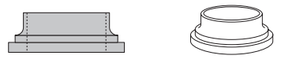
		Hole	a	b	Width
359	Malleable Iron	3/8"	1 7/8"	1"	1 1/4"
360	Malleable Iron	1/2"	1 7/8"	1"	1 1/4"
361	Malleable Iron	5/8"	2 3/16"	1 1/8"	1 3/8"
260	Bronze	1/2"	1 7/8"	1"	1 1/4"
261	Bronze	5/8"	2 3/16"	1 1/8"	1 3/8"
461	Nickel-Silver	5/8"	2 3/16"	1 1/8"	1 1/2"

ALUMINUM BRONZE NICKEL-SILVER STAINLESS MALLEABLE IRON/STEEL

ROUND HOLE BASES

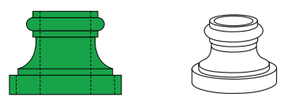
Round Hole

Aluminum	Bronze	Nickel-Silver	Malleable Iron	Hole	Width	Height
	255		355	3/8"	1 1/4"	15/16"
	256	456	356	1/2"	1 1/4"	15/16"
717	257		357	5/8"	1 3/8"	1 1/8"
		457		5/8"	1 1/2"	1 1/8"
760	250	455		3/4"	2 1/2"	1 5/8"
719	249	449	349	1"	2 1/2"	1 5/8"
	251			1 1/4"	2 1/2"	1 5/8"



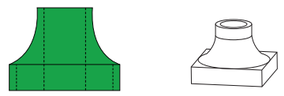
Round Hole

Bronze	Turned Steel	Hole	Width	Height
147	347	1 1/2"	2 1/4"	3/4"



Round Hole

	Hole	Width	Height
690 Stainless	1 1/2"	3 1/4"	2 7/16"



Round Hole

	Hole	Width	Height
694 Stainless	3/4"	2"	1 1/2"

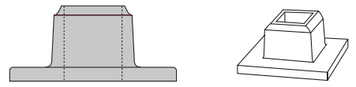
Round Hole

	Hole	Width	Height
691 Stainless	1 1/2"	3 1/4"	1 13/16"

Round Hole

	Hole	Width	Height
695 Stainless	3/4"	2"	1 13/16"

TUBE SOCKETS



Square Hole

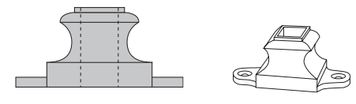
Mal. Iron	Aluminum	Bronze	Hole	Base	Height
201	1201		1"	3"	1 3/8"
202	1202		1 1/4"	3 1/4"	1 1/2"
203	1203		1 1/2"	3 1/2"	1 3/4"
204	1204		2"	4"	1 3/4"
205	1205		2 1/2"	4 1/2"	1 7/8"
206	1206	1206	3"	5 1/4"	2 3/8"

FLANGES

Square Hole

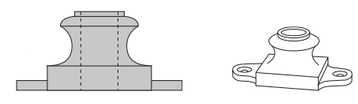
		Hole	Base	Height
342	Malleable Iron	7/16"	1 1/8"	1 1/8"
344*	Malleable Iron	1/2"	1 1/8"	1 1/8"
350*	Malleable Iron	1/2"	1 1/8"	1 3/16"
351	Malleable Iron	5/8"	1 3/16"	1 3/16"
398	Malleable Iron	3/4"	1 7/16"	7/8"
400	Malleable Iron	7/8"	1 5/8"	1"
399	Malleable Iron	1"	1 3/4"	1 1/8"

* **344** is similar to **350** but is high enough to permit adjustment of baluster height for uneven steps



Square Hole

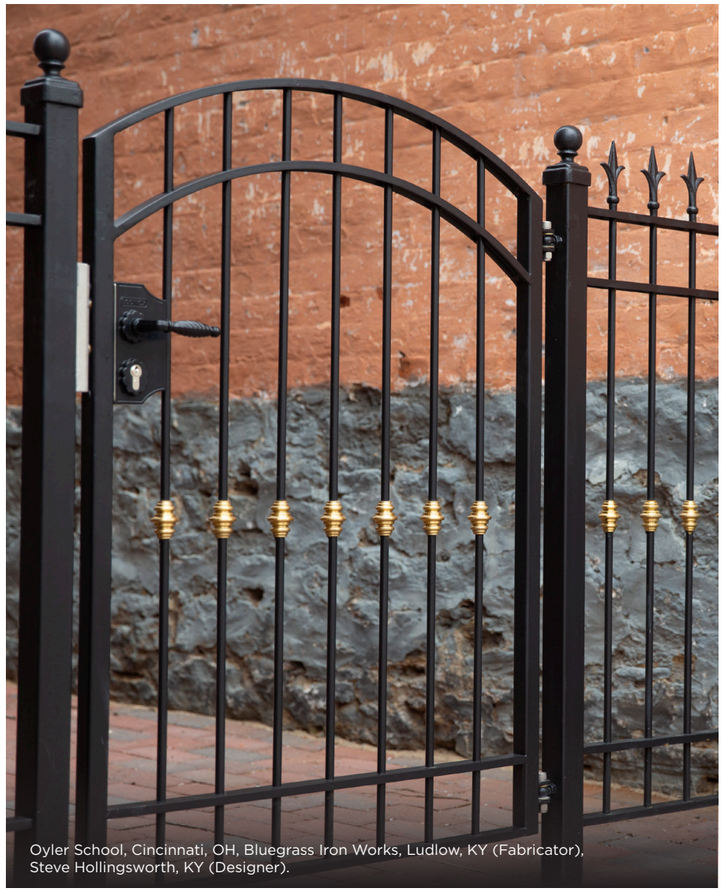
Malleable Iron	Hole	Base	Height
390	1/2"	1 5/16"	1"
391	5/8"	1 5/16"	1"
393	1"	1 13/16"	13/16"



Round Hole

Malleable Iron	Aluminum	Bronze	Hole	Base	Height
395			3/8"	1 5/16"	1"
396	776	276	1/2"	1 5/16"	1"
397	797	297	5/8"	1 7/16"	1 1/8"

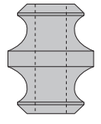
ALUMINUM BRONZE NICKEL-SILVER MALLEABLE IRON/STEEL



Oyler School, Cincinnati, OH, Bluegrass Iron Works, Ludlow, KY (Fabricator), Steve Hollingsworth, KY (Designer).

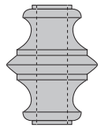
COLLARS

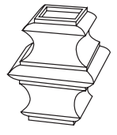
Bronze, nickel silver and steel collars can be used to add decoration to square or round bar. Bronze and nickel-silver collars are polished and clear lacquered.



Square Hole

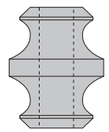
Aluminum	Bronze	Hole	Width	Height
765	265	1/2"	1 3/8"	1 3/4"
766	266	5/8"	1 3/8"	1 3/4"





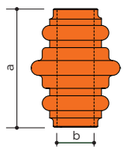
Square Hole

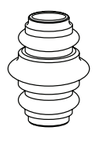
		Hole	Width	Height
365	Malleable Iron	1/2"	1 9/16"	2"
366	Malleable Iron	5/8"	1 11/16"	1 7/8"
348	Malleable Iron	3/4"	1 15/16"	2"
866	Bronze	5/8"	1 11/16"	1 7/8"



Round Hole

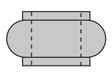
		Hole	Width	Height
281	Bronze	1/2"	1 1/4"	1 3/4"
282	Bronze	5/8"	1 1/4"	1 3/4"
406	Nickel-Silver	5/8"	1 1/4"	1 3/4"





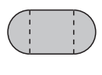
Round Hole

		Hole	Width	Height
310	Bronze	1/2"	1 1/2"	2"
311	Bronze	5/8"	1 1/2"	2"



Round Hole, Turned

Steel	Bronze	Nickel-Silver	Hole	OD	Height
72	272	472	1/2"	1"	9/16"
	273	473	1"	1 1/4"	3/4"



Round Hole, Turned

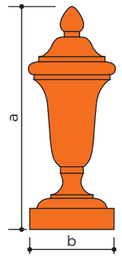
Steel	Bronze	Nickel-Silver	Hole	OD	Height
73	872		3/8"	3/4"	13/32"
74	274	474	5/8"	1"	1/2"

ALUMINUM BRONZE NICKEL-SILVER MALLEABLE IRON / STEEL

Oyler School, Cincinnati, OH, Bluegrass Iron Works, Ludlow, KY (Fabricator), Steve Hollingsworth, KY (Designer).

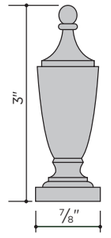
URN AND BALL FINIALS

Bronze, nickel-silver and aluminum urns and finials are satin-finished. Bronze and nickel-silver items are clear lacquered. All urns and finials are supplied with a 3/8" tapped hole in the base. Finial and urn bases, see page 40.



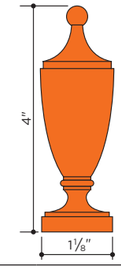
Square Base		a	b
3134	Bronze	4"	1 1/2"
3133	Bronze	3"	1"

Round Base		a	b
3034	Bronze	4"	1 1/2"
3033	Bronze	3"	1"

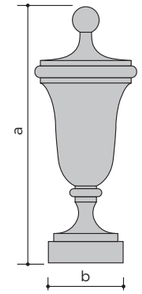


Round Base		
3277†	Aluminum	
3073	Bronze	

† Unpolished

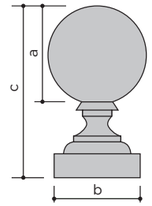


Round Base		
3064	Bronze	



Square Base		a	b
3323	Aluminum	3"	1"
3126	Bronze	6"	1 3/4"
3125	Bronze	5"	1 1/2"
3124	Bronze	4"	1 1/4"
3123	Bronze	3"	1"
3526	Malleable Iron	6"	1 3/4"
3525	Malleable Iron	5"	1 1/2"
3524	Malleable Iron	4"	1 1/4"
3523	Malleable Iron	3"	1"

Round Base		a	b
3025	Bronze	5"	1 1/2"
3024	Bronze	4"	1 1/4"
3023	Bronze	3"	1"
4024	Nickel-Silver	4"	1 1/4"



Square Base		a	b	c
3145	Bronze	2"	1 3/4"	3 1/2"
3144	Bronze	1 3/4"	1 1/2"	3 1/8"
3143	Bronze	1 1/2"	1 1/4"	2 3/4"
3142	Bronze	1 1/4"	1 1/8"	2 3/8"
3545	Mal. Iron	2"	1 3/4"	3 1/2"
3544	Mal. Iron	1 3/4"	1 1/2"	3 1/8"
3543	Mal. Iron	1 1/2"	1 1/4"	2 3/4"
3542*	Mal. Iron	1 1/4"	1 1/8"	2 3/8"
3541	Mal. Iron	1"	7/8"	1 3/4"

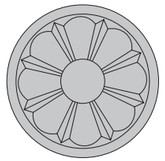
Round Base		a	b	c
3243	Aluminum	1 1/2"	1 1/4"	2 3/4"
3045	Bronze	2"	1 3/4"	3 1/2"
3044	Bronze	1 3/4"	1 1/2"	3 1/8"
3043	Bronze	1 1/2"	1 1/4"	2 3/4"
3042	Bronze	1 1/4"	1 1/8"	2 3/8"
3041	Bronze	1"	7/8"	1 3/4"

ALUMINUM BRONZE NICKEL-SILVER MALLEABLE IRON

All castings are double-faced

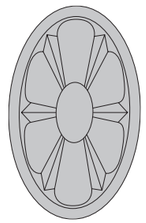
CAST ROSETTES

Thickness: Approx. 1/4"
Burnished, except as noted



		OD
● **2454**	Aluminum	2 3/4"
● **2654**	Bronze	2 3/4"
● **1654**	Nickel-Silver	2 3/4"
● **2554***	Malleable Iron	2 3/4"

* As Cast



		OD
● **2453**	Aluminum	3 5/16" x 2 1/16"
● **2653**	Bronze	3 5/16" x 2 1/16"
● **1653**	Nickel-Silver	3 5/16" x 2 1/16"
● **2553***	Malleable Iron	3 1/2" x 2 3/16"

* As Cast

		OD
● **6603**	Bronze	1 3/4"
● **1603**	Nickel-Silver	1 3/4"
● **6203***	Malleable Iron	1 3/4"

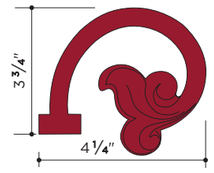
* As Cast

		OD
● **6601**	Bronze	1 7/8"
● **1601**	Nickel-Silver	1 7/8"
● **6201***	Malleable Iron	1 7/8"

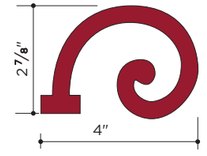
* As Cast

SPINDLE TOPS

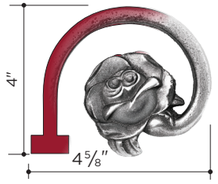
Spindle tops may be used above and/or below 1/2" square bar and may be adjusted to any angle. Scale: 3" = 1'-0"



● **526-R** 1.04 lbs



● **598-R** 0.60 lbs



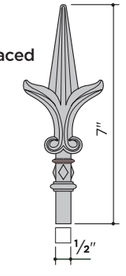
● **572-R** 1.00 lbs

PICKETS

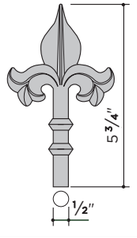
Shanks: 1" lengths

All castings are double-faced

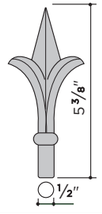
54



● **53** Aluminum
● **54** Malleable Iron

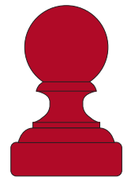


● **11** Aluminum
● **12** Malleable Iron



● **3** Aluminum
● **4** Malleable Iron

BALL CAPS

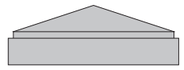


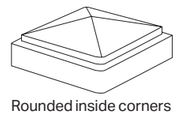
Rounded inside corners

		Tube Size	Ball Diam.	Height
● **5320**	Malleable Iron	2" × 2"	1 13/16"	3 3/4"
● **5325**	Malleable Iron	2 1/2" × 2 1/2"	2 1/8"	4 1/8"
● **5330**	Malleable Iron	3" × 3"	2 3/16"	4 5/8"
● **5335**	Malleable Iron	3 1/2" × 3 1/2"	2 1/2"	5 1/8"
● **5340**	Malleable Iron	4" × 4"	2 3/4"	5 1/2"

CAP TYPE A

Type A bronze and aluminum caps are satin finished. Cast aluminum caps are Almag 35. Bronze caps are cast from C86500 bronze—to match closely the color of extruded architectural bronze—and are lacquered.





Rounded inside corners

		Tube Size
● **5615**	Mal. Iron	1 1/2" × 1 1/2"
● **5620**	Mal. Iron	2" × 2"
● **5625**	Mal. Iron	2 1/2" × 2 1/2"
● **5632**	Mal. Iron	3" × 2"
● **5630**	Mal. Iron	3" × 3"
● **5635**	Mal. Iron	3 1/2" × 3 1/2"
● **5640**	Mal. Iron	4" × 4"
● **5642**	Mal. Iron	4" × 2"
● **56425**	Mal. Iron	4" × 2 1/2"
● **5643**	Mal. Iron	4" × 3"
● **5652**	Mal. Iron	5" × 2"
● **56525**	Mal. Iron	5" × 2 1/2"
● **5653**	Mal. Iron	5" × 3"
● **5650**	Mal. Iron	5" × 5"
● **5663**	Mal. Iron	6" × 3"
● **5664**	Mal. Iron	6" × 4"
● **5660**	Mal. Iron	6" × 6"
● **5683**	Mal. Iron	8" × 3"
● **5684**	Mal. Iron	8" × 4"

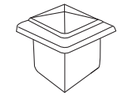
Satin Finish

		Tube Size
● **5720**	Cast Bronze	2" × 2"
● **5730**	Cast Bronze	3" × 3"
● **5740**	Cast Bronze	4" × 4"
● **5784**	Cast Bronze	8" × 4"

Satin Finish

		Tube Size
● **5820**	Cast Alum.	2" × 2"
● **5830**	Cast Alum.	3" × 3"
● **5840**	Cast Alum.	4" × 4"
● **5863**	Cast Alum.	6" × 3"
● **5864**	Cast Alum.	6" × 4"
● **5883**	Cast Alum.	8" × 3"
● **5884**	Cast Alum.	8" × 4"

DRIVE-ON CAP



● **5411**	Mal. Iron	Drive fit for 1" × 1" × .073" structural tubing

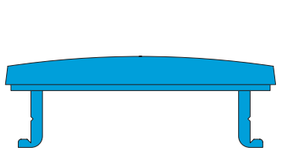
CAP TYPE C

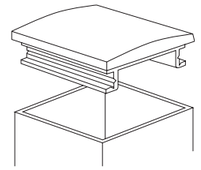
		Tube Size*
● **5415**	Malleable Iron	1 1/2" × 1 1/2"
● **5440**	Malleable Iron	4" × 4"

* 11 ga. maximum thickness

CAP TYPE D

Type D Post Caps are extruded and machined from aluminum alloy 6063 and are suitable for anodizing. Lugs fit inside 1/8" wall tubing with sharp corners and are easily ground down to fit 3/16" or 1/4" wall tubing.

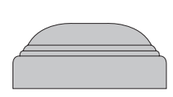




		Tube Size
● **5120**	Extruded Aluminum	2" × 2"
● **5130**	Extruded Aluminum	3" × 3"
● **5132**	Extruded Aluminum	3" × 2"
● **5140**	Extruded Aluminum	4" × 4"
● **5142**	Extruded Aluminum	4" × 2"
● **5143**	Extruded Aluminum	4" × 3"
● **5152**	Extruded Aluminum	5" × 2"
● **5153**	Extruded Aluminum	5" × 3"
● **5162**	Extruded Aluminum	6" × 2"
● **5163**	Extruded Aluminum	6" × 3"
● **5164**	Extruded Aluminum	6" × 4"
● **5183**	Extruded Aluminum	8" × 3"
● **5184**	Extruded Aluminum	8" × 4"

DRIVE-ON CAP, TYPE W

For drive fit. Caps do not require fastening. 18 ga.



		Tube Size
● **5920**	Pressed Steel	2" × 2"
● **5925**	Pressed Steel	2 1/2" × 2 1/2"
● **5930**	Pressed Steel	3"× 3"
● **5935**	Pressed Steel	3 1/2" × 3 1/2"
● **5943**	Pressed Steel	4" × 3"
● **5940**	Pressed Steel	4" × 4"
● **5963**	Pressed Steel	6" × 3"
● **5933**	Pressed Stainless Steel	3" × 3"
● **5944**	Pressed Stainless Steel	4" × 4"

TREILLAGE AND ORNAMENTAL RAILING PANELS

Private Residence, MA, Make Architectural Metalworking, West Wareham, MA (Fabricator), Platemark, Boston, MA (Architect), FBN Construction, Hyde Park, MA (General Contractor).

ORNAMENTAL RAILING PANELS

Julius Blum & Co., Inc.'s malleable iron railing panels are also used to provide architectural details on both stairs and straight runs. Some of the panels have been slightly redesigned to meet current code requirements.

ORNAMENTAL COLLARS

Designed to fit over 1/2" or 5/8" square bars, ornamental collars are a cost effective way of providing details to a stair, fence, or gate. A wide variety of design options are possible using a combination of ornamental collars.

TREILLAGE

All Julius Blum & Co., Inc. treillage panels are double-faced and superbly detailed. Because they are malleable iron, they may be welded and bent cold and will not break or shatter in the course of normal handling.

Many of the Julius Blum Treillage patterns are available in both aluminum and malleable iron. Aluminum castings are recommended where it is important to keep weight at a minimum, as in gates or removable screens. Otherwise, malleable iron castings are preferred for their strength and resistance to breakage. All castings are double-faced and cleanly finished. Made in USA.

- **Aluminum** items are cast from Almag 35. Anodizing of aluminum panels is not recommended as the material will not anodize consistently and will not match the color of anodized extruded aluminum.
- **Malleable Iron** is similar in weight, feel, and appearance to gray iron—commonly known as cast iron. Gray iron is suitable for small, simple pieces such as post caps or heavy, solid pieces such as manhole covers. It is not suitable for delicate ornamental cast patterns such as scrolls and flowers. Gray iron is brittle and shatters easily when dropped or hit and is subject to cracking when exposed to uneven heat during welding. Malleable iron will not break or shatter in the course of ordinary handling or shipping and withstands considerable abuse. To some degree, malleable iron castings can be bent cold, and they are easily welded. The special properties of malleable iron are produced by heat treating.

Malleable Iron Castings are not priced to compete with gray iron castings. Despite the unsuitability of gray iron for intricate ornamental castings, many ornamental patterns are offered in this cheaper material. Since the manufacture of gray iron castings requires fewer operations than heat-treated malleable iron, and since they are not finished with the care of Julius Blum ornamental castings, they can be sold for less. However, breakage during shipping, fabrication, installation, and everyday use often eradicates savings from the initial lower cost. In the long run, the permanence and quality of the final product make malleable iron more desirable. When panels are assembled into screens spanning more than three panels' width or height, it is important to provide adequate intermediate supports.

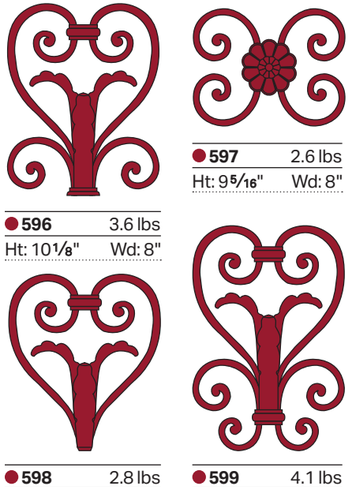
All items are carried in stock in substantial quantities and are available for prompt shipment.

● MALLEABLE IRON

CAMBRIDGE

Ornamental Panels

The four elements of the Cambridge design can be combined in many different ways to form panels, columns or friezes. The castings are cored to slide over a 1/2" square bar.



● **596** 3.6 lbs
Ht: 10 1/8" Wd: 8"

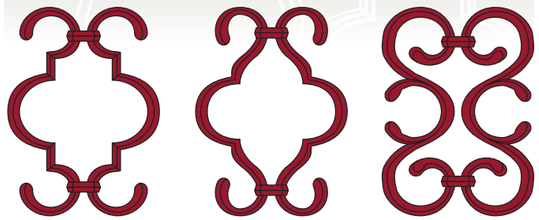
● **597** 2.6 lbs
Ht: 9 5/16" Wd: 8"

● **598** 2.8 lbs
Ht: 6 3/16" Wd: 8"

● **599** 4.1 lbs
Ht: 11 7/8" Wd: 8"

EMPIRE

For 1/2" square bar. Diamond-shaped cross section gives these panels a distinctive style.



● **963** 1.76 lbs
Ht: 11" Wd: 8"

● **964** 2.03 lbs
Ht: 11" Wd: 8"

● **965** 2.72 lbs
Ht: 11" Wd: 8"

● **967** 1.04 lbs
Ht: 5 1/2" Wd: 5 1/4"

● **968** 1.14 lbs
Ht: 5 1/2" Wd: 5 1/4"

● **969** .82 lbs
Ht: 5" Wd: 5"

TYPICAL SECTION THROUGH COLLARS

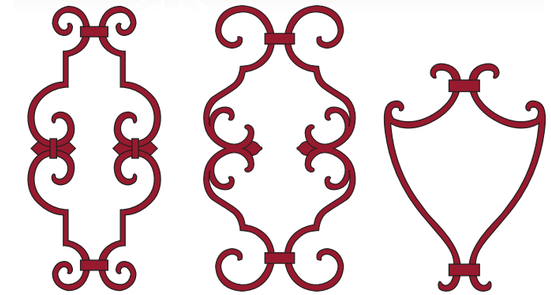
Empire and Florentine collars are open on the reverse to fit over square bar. Cambridge and Ornamental Collars are cored to slide over square bar.

FLORENTINE

Railing Panels

For 1/2" square bar, except as noted

Florentine collars are open on one side for easy installation over square bar by tack welding.



● **559** 3.0 lbs
Ht: 15" Wd: 7"

● **560** 3.6 lbs
Ht: 16" Wd: 8 1/2"

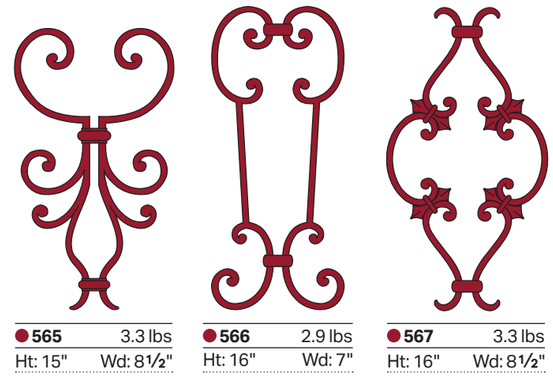
● **561** 1.9 lbs
Ht: 12" Wd: 8 1/2"

● **562*** 3.8 lbs
Ht: 15" Wd: 7"

● **563*** 3.9 lbs
Ht: 16" Wd: 8 1/2"

● **564*** 2.6 lbs
Ht: 12" Wd: 8 1/2"

* For 5/8" square bar



● **565** 3.3 lbs
Ht: 15" Wd: 8 1/2"

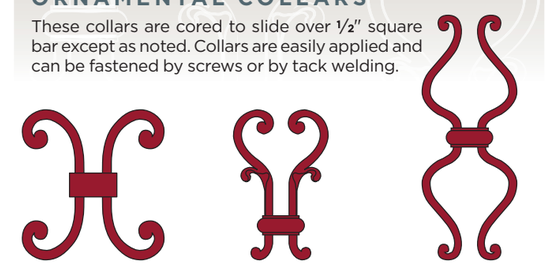
● **566** 2.9 lbs
Ht: 16" Wd: 7"

● **567** 3.3 lbs
Ht: 16" Wd: 8 1/2"

FLORENTINE

ORNAMENTAL COLLARS†

These collars are cored to slide over 1/2" square bar except as noted. Collars are easily applied and can be fastened by screws or by tack welding.



● **543** .870 lbs
Ht: 4 3/4" Wd: 4 1/2"

● **544** .685 lbs
Ht: 4 3/4" Wd: 3"

● **546** .767 lbs
Ht: 7 3/4" Wd: 3"

● **535*** 1.160 lbs
Ht: 4 7/8" Wd: 4 1/2"

● **545*** .686 lbs
Ht: 4 3/4" Wd: 3"

● **547*** .865 lbs
Ht: 7 3/4" Wd: 3"

† Scale: 2 1/2" = 1'- 0" * For 5/8" square bar

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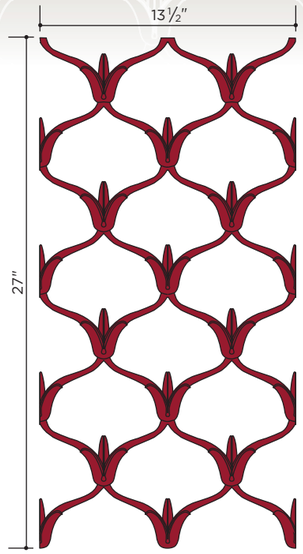
All castings are double-faced. Scale: 1 ½" = 1'-0"

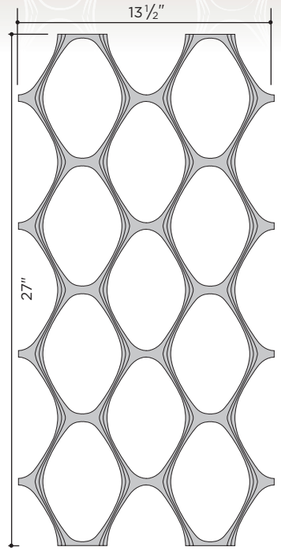
● ALUMINUM ● MALLEABLE IRON

AMSTERDAM



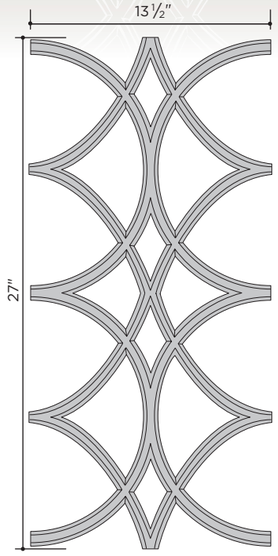
● **590**	Malleable Iron	10.5 lbs

GOSSAMER



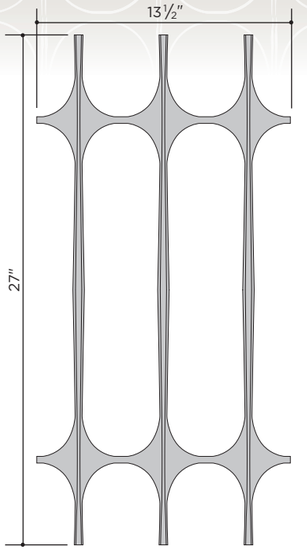
● **1585**	Aluminum	3.4 lbs
● **585**	Malleable Iron	10.2 lbs

ARABESQUE



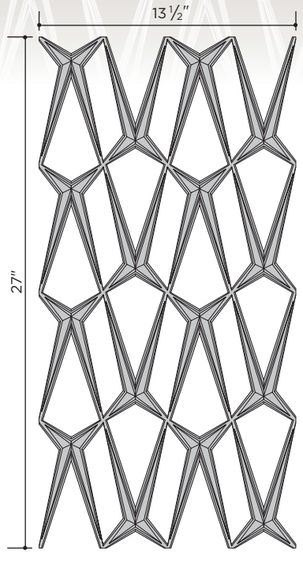
● **1961**	Aluminum	2.6 lbs
● **961**	Malleable Iron	7.7 lbs

SENTRY



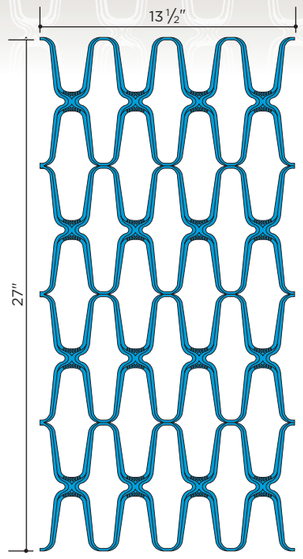
● **1579**	Aluminum	2.8 lbs
● **579**	Malleable Iron	8.4 lbs

CASCADE



● **1583**	Aluminum	4.3 lbs
● **583**	Malleable Iron	12.8 lbs

LATTICE

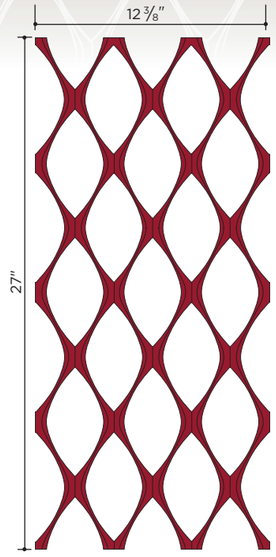


● **1508**	Aluminum	3.1 lbs

● ALUMINUM ● MALLEABLE IRON

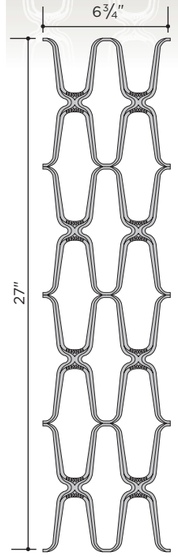
All castings are double faced. Scale: 1 ½" = 1'-0", except as noted.

ONDINE



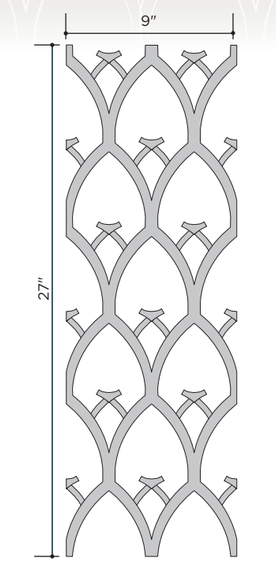
● **960**	Mal. Iron	7.9 lbs

LATTICE



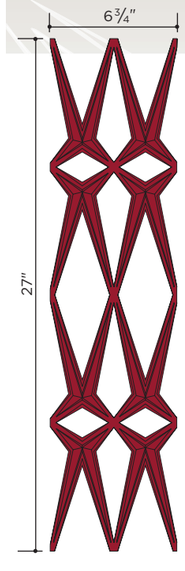
● **1504**	Aluminum	1.5 lbs
● **504**	Mal. Iron	4.5 lbs

CANTERBURY



● **1589**	Aluminum	3.0 lbs
● **589**	Mal. Iron	8.8 lbs

DIAMOND

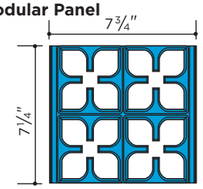


● **542**	Mal. Iron	6.4 lbs

TRECENTO

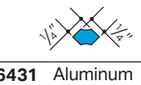
Trecento panel **1963** dovetails with mullions **6433** or **6432**. Panels can be arranged in continuous runs or make right-angle turns, tees, or crosses. Panels can be stacked to form solid screens or separated by lengths of filler rod **6431** to achieve a more open effect. Filler rod **6431** may also be used to close the recess in the exposed sides of the mullion. Panels may be locked into position by tack welding, caulking, set screws, or pins.

Modular Panel



● **1963**	Aluminum	.80 lb/ft

Filler Rod*

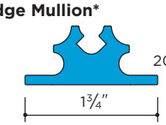


6' lengths

● **6431**	Aluminum	.063 lb/ft

*Scale: 6" = 1'-0"

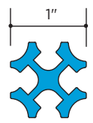
Edge Mullion*



20' lengths

● **6432**	Aluminum	.660 lb/ft

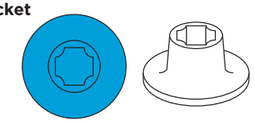
Mullion*



20' lengths

● **6433**	Aluminum	.493 lb/ft

Socket

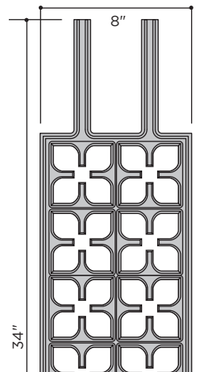


● **763**	Aluminum	

For mullion **6433** 2¾" diameter flange

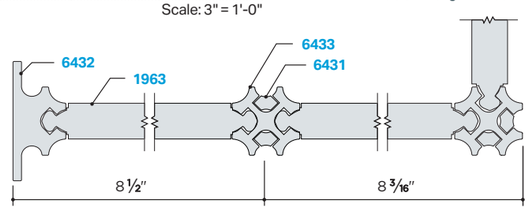
Scale: 3" = 1'-0"

Railing Panel



● **1962**	Aluminum	4.3 lbs
● **962**	Mal. Iron	12.6 lbs

Assembly Detail



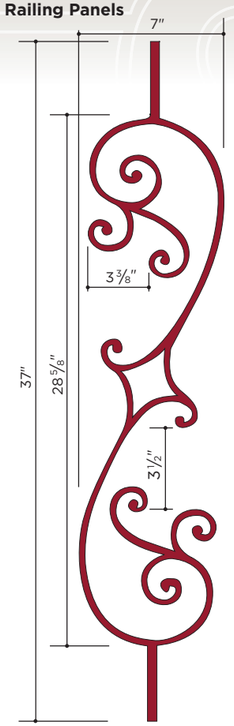
Panels can be joined both vertically and horizontally to form screens and grilles.

All castings are double-faced. Scale: 1½" = 1'-0"

● MALLEABLE IRON

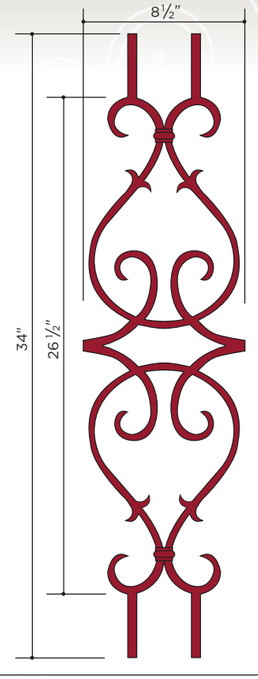
CHATEAU

Railing Panels

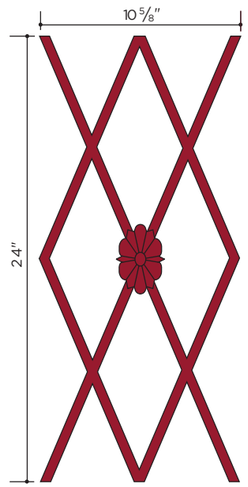


● **537*** Malleable Iron 5.5 lbs
Cross Section: Scroll – ½" × 5/16"
Ends – ½" × ½"

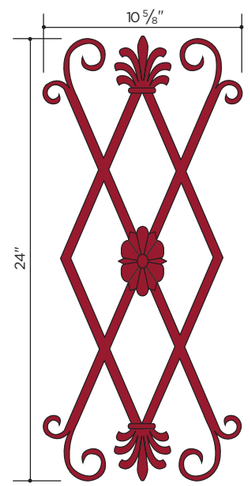
● **538*** Malleable Iron 7.0 lbs
Cross Section: Scroll – ⅝" × 7/16"
Ends – ½" × ½"



● **539*** Malleable Iron 7.8 lbs
Cross Section: Scroll – ⅝" × 7/16"
Ends – ½" × ½"



● **540** Malleable Iron 9 lbs
Cross Section: ⅝" × ½"



● **541*** Malleable Iron 10 lbs
Cross Section: ⅝" × ½"

The illustration is intended to be an example of ways Treillage and Traditional Railing components may be combined.

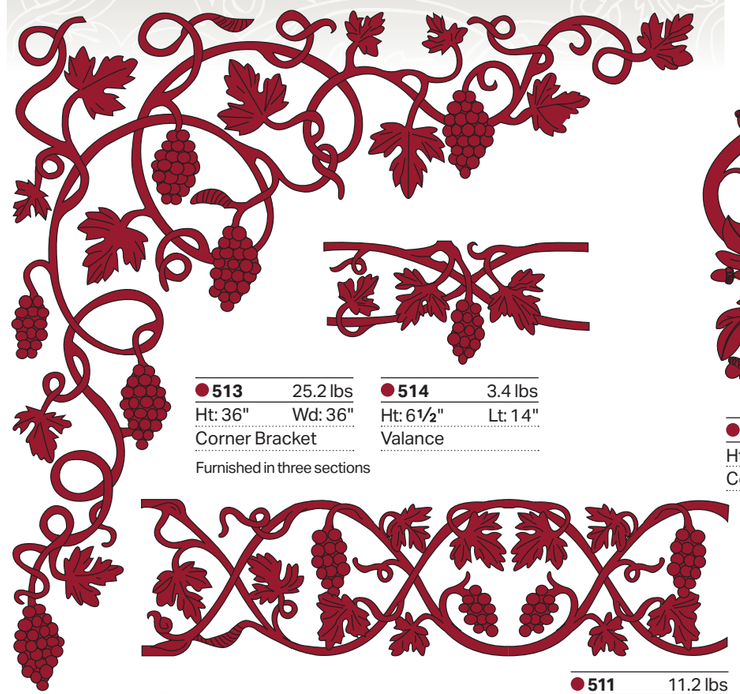
When framed, the open spaces will conform to 4" sphere requirement.

Panels **540** and **541** may be combined both horizontally and vertically and combined with spindles.

● MALLEABLE IRON

All castings are double faced. Scale: 1½" = 1'-0"

BORDEAUX



● **513** 25.2 lbs
Ht: 36" Wd: 36"
Corner Bracket
Furnished in three sections

● **514** 3.4 lbs
Ht: 6½" Lt: 14"
Valance

● **511** 11.2 lbs
Ht: 8¼" Lt: 31"
Frieze

● **510** 13.6 lbs
Ht: 29" Wd: 8¼"
Railing Panel

● **515B** 4.9 lbs
Ht: 21" Wd: 11½"
Corner Bracket

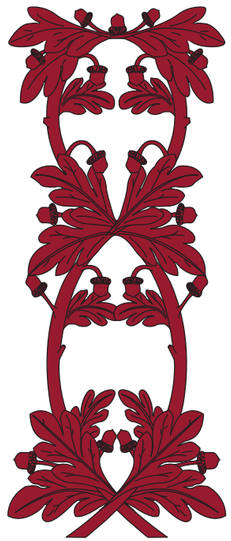
● **512** 4.0 lbs
Ht: 8¼" Wd: 8¼"
Corner Rosette

● **515** 8.7 lbs
Ht: 23½" Wd: 25"
Corner Bracket
Furnished in two sections

CHARNWOOD

● **555** 9.2 lbs
Ht: 20¾" Wd: 9¼"
Continuous design

● **548** 12.3 lbs
Ht: 27¾" Wd: 8"
Railing Panel

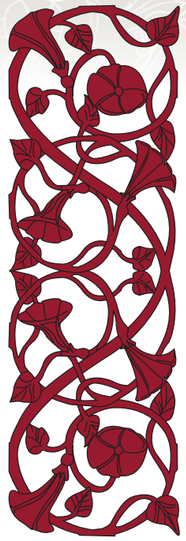


● **558** 16.8 lbs
Ht: 28" Wd: 11½"
Railing Panel

All castings are double faced. Scale: 1 ½" = 1'-0"

● MALLEABLE IRON

SOMERSET



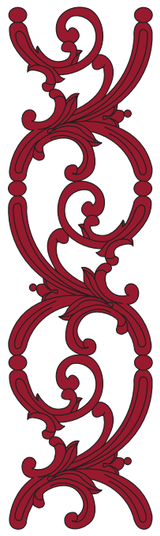
● **580** 13.0 lbs
Ht: 28" Wd: 9"
Railing Panel

● **581** 4.1 lbs
Ht: 9" Wd: 9"
Corner Rosette

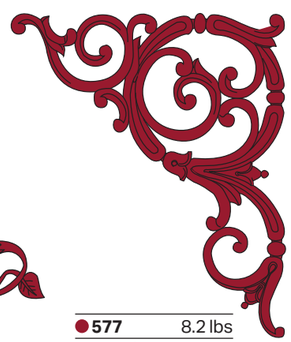
● **582** 6.5 lbs
Ht: 14" Wd: 19"
Corner Bracket

REGENCE

● **525** 4.2 lbs
Ht: 13⅝" Wd: 6⅞"
End Panel



● **576** 10.1 lbs
Ht: 29" Wd: 8"
Railing Panel



● **577** 8.2 lbs
Ht: 15¼" Wd: 18"
Corner Bracket

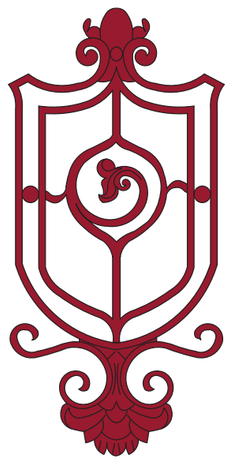
SIENA

● **523** 6.9 lbs
Ht: 20¼" Wd: 6⅞"
Continuous design

● **522** 8.4 lbs
Ht: 20⅜" Wd: 6⅞"
Continuous design

Repeat or alternate **522** and **523** for continuous runs in columns or friezes.

● **520** 10.5 lbs
Ht: 24⅞" Wd: 6⅞"
Railing Panel



● **521** 16.0 lbs
Ht: 24⅞" Wd: 12"
Railing Panel

● **532** 5.0 lbs
Ht: 36"
Baluster Bar

● **524** 4.3 lbs
Ht: 12" Wd: 6⅞"
Starting Panel

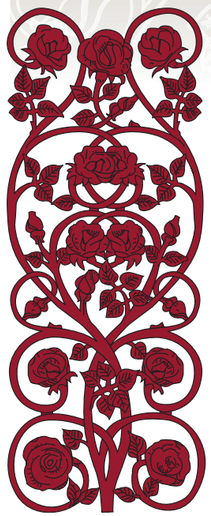
● **526** 2.6 lbs
Ht: 6⅞" Wd: 6⅞"
Corner Rosette

● **578** 3.2 lbs
Ht: 8" Wd: 8"
Corner Rosette

● MALLEABLE IRON

All castings are double faced. Scale: 1 ½" = 1'-0"

DRESDEN

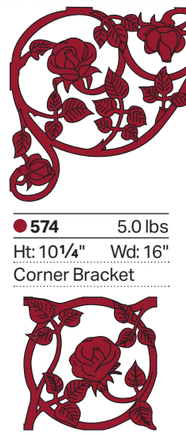


● **571** 14.0 lbs
Ht: 28" Wd: 11"
Railing Panel

● **568** 8.7 lbs
Ht: 28" Wd: 8½"
Railing Panel
Use together with **569**

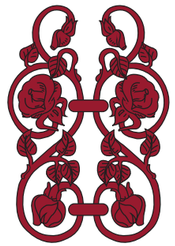
● **569** 6.5 lbs
Ht: 21" Wd: 8½"
Continuous design

● **572** 5.7 lbs
Ht: 22½" Wd: 7"
Continuous design



● **573** 2.3 lbs
Ht: 7" Wd: 7"
Corner Rosette

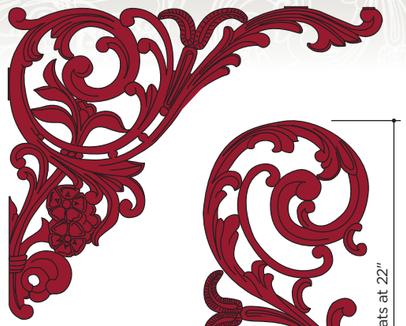
● **574** 5.0 lbs
Ht: 10¼" Wd: 16"
Corner Bracket



● **570** 4.1 lbs
Ht: 12½" Wd: 8½"
Collar

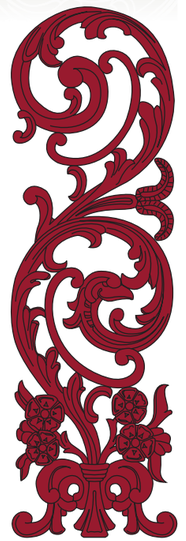
Collar is open on one side to fit over ½" square bar

ROCOCO



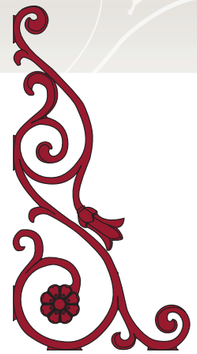
● **588** 10.5 lbs
Ht: 16½" Wd:19¾"
Corner Bracket

● **587** 10.7 lbs
Ht: 23¼" Wd: 8¾"
Continuous design



● **586** 14.9 lbs
Ht: 28" Wd: 8¾"
Railing Panel

CORINTHIAN



● **552** 4.3 lbs
Ht: 10" Wd: 19"
Corner Bracket

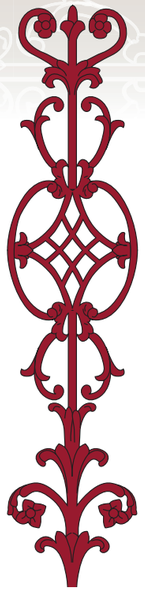
● **551** 2.4 lbs
Ht: 7⅛" Wd: 7⅛"
Corner Rosette

● **550** 6.7 lbs
Ht: 34" Wd: 7⅛"
Continuous design

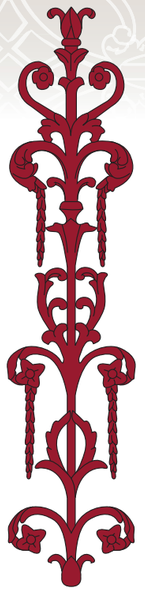
MALLEABLE IRON

MILAN

519 12.5 lbs
Ht: 32" Wd: 7⅝"
Railing Panel

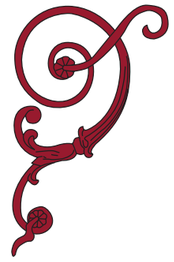


518 11.3 lbs
Ht: 35½" Wd: 7⅝"
Railing Panel



517 12.0 lbs
Ht: 34½" Wd: 7⅝"
Railing Panel

Being of equal width, Milan panels may be stacked vertically.



516 3.7 lbs
Ht: 8¼" Wd: 13¼"
Corner Bracket

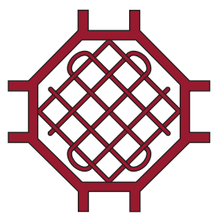
PRIMAVERA

584 9.9 lbs
Ht: 29" Wd: 6½"
Railing Panel

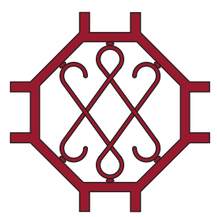
591 3.9 lbs
Ht: 10" Wd: 10"
(Without legs: 8" x 8")

592 3.4 lbs
Ht: 10" Wd: 10"
(Without legs: 8" x 8")

595 3.7 lbs
Ht: 10" Wd: 10"
(Without legs: 8" x 8")



593 3.2 lbs
Ht: 10" Wd: 10"
(Without legs: 8" x 8")



594 3.0 lbs
Ht: 10" Wd: 10"
(Without legs: 8" x 8")

All castings are double-faced. Scale: 1½" = 1'-0" except as noted

MALLEABLE IRON / PRESSED STEEL

PRESSED STEEL MOULDINGS

10' lengths, 100' minimum order

2855 Wd: 3¼"
Pressed Steel

2870 Wd: 3¼"
Pressed Steel

2866 Wd: 3¼"
Pressed Steel

2859 Wd: 2"
Pressed Steel

2861 Wd: 15/16"
Pressed Steel

PRESSED STEEL LEAVES**

2016 Lt: 4½"

2017 Lt: 4½"

2023 Lt: 5"

2003 Lt: 3½"

2023 Lt: 5"

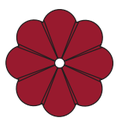
2932 Wd: 2½"

	Length
2012	6"
2014	10¼"
2015	11"

2982 Lt: 9¼"

PRESSED STEEL ROSETTES**

Malleable Iron



	OD
2515	1½"
2528	2"
2538	3"

2524 Wd: 1⅜"

	OD
2611	2⅜"
2616	3⅝"

PRESSED STEEL CANDLE PANS AND HUSKS**

Malleable Iron

2726
Ht: 5½" Wd: 2¼"

2719
Ht: 5½" Wd: 2¼"

2640 OD: 3¾"

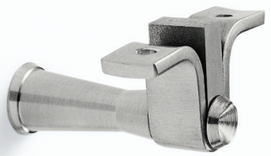
2717
Ht: 3¼" Wd: 3¼"

** 100 piece packages

CARLSTADT® RAILING SYSTEMS

Shawnee County Courthouse, Topeka, KS, Senne Company Topeka, KS (Fabricator), HTK Architects, Topeka, KS (Architect).

222



6532

813

The **Carlstadt®** railing system features a full range of components available in aluminum, bronze, nickel-silver, and stainless steel to meet virtually any installation requirement. Posts and handrails may be combined with a variety of post, wall, and fascia brackets to achieve a wide range of design alternatives while meeting code and other regulatory requirements. The Carlstadt® system is designed for non-welded assembly.

- **Aluminum** railing components are made of alloy 6063, except for cast flanges, corner bends, and floor flanges, which are cast from Almag 35. Aluminum extrusions are produced and handled with great care for use in architectural applications and are suitable for most of the hard coat anodic processes. Black anodizing may result in inconsistent matches. Consult your anodizer before specifying.
- **Bronze** components are made of extruded architectural bronze alloy C38500, except for cast cover flanges, corner bends, and terminals, which are cast from alloy C86500.
- **Nickel-Silver** components are extruded of alloy C79800. Nickel-silver is a copper alloy which has the color of stainless steel with golden highlights.
- **Stainless Steel** components are made of type 302/304 (18-8) stainless steel.

The *Americans with Disabilities Act* adopted by Congress in 1992 required circular handrails to be **1¼**″ minimum and **1½**″ maximum. However, the *Guidance on the 2010 ADA Standards for Accessible Design - September 2010*, published by the US Department of Justice, has now clarified the intent of the dimensional requirements to be an outside diameter of **1¼**″ to 2″.

Americans With Disabilities Act Accessibility Guidelines (ADAAG) also allows handrails that provide an equivalent gripping surface. ANSI117.1-17 defines this alternative: *equivalent gripping surfaces are permitted provided they have a perimeter dimension of 4″ (100mm) minimum and 6 ¼″ (160mm) maximum and provided their largest cross-section dimension is 2 ¼″ (57mm) maximum.*

CARLSTADT® FITTINGS

A complete selection of fittings is available for the Carlstadt® system. Self-aligning wall, post, and mounting brackets are recommended for unusual ramp or stair angles. Handrails may be mounted using flat bars and channels, joined with non-welded corner bends, or closed with end caps. A wide range of cover flanges, fascia flanges, reinforcing bars, and post caps are also available.

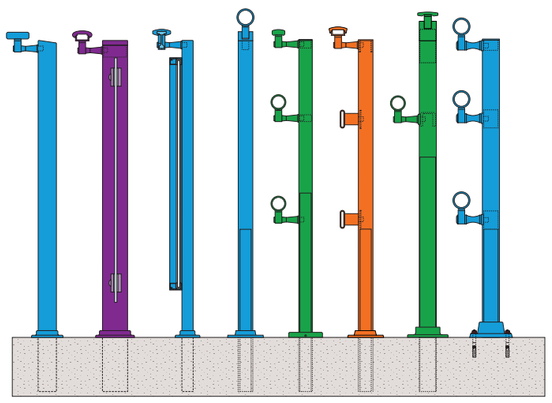
CARLSTADT® RAILING

The Carlstadt® railing system provides a flexible range of railing and post components in aluminum, bronze, nickel-silver, and stainless steel to meet almost any installation or code requirement. The Carlstadt® railing system uses Carlstadt® self-aligning handrail brackets. It is the engineer of record's responsibility to evaluate base metal and sleeve compatibility with dissimilar metals.

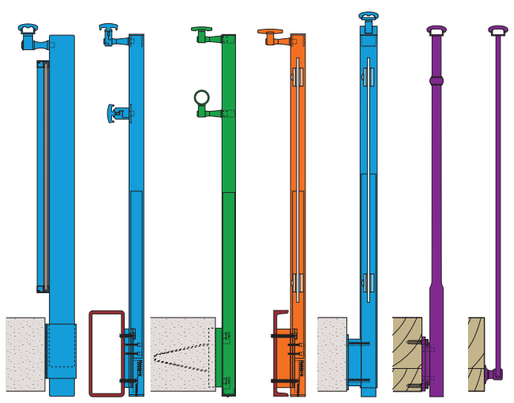
EXAMPLES OF CARLSTADT® RAILING CONFIGURATIONS

The illustrations are intended to be examples of ways Connectorail®, Carlstadt®, and Traditional Railing components may be combined. See Juliusblum.com for part numbers and details.

SURFACE-MOUNTED



FASCIA-MOUNTED



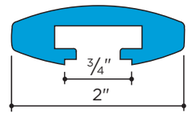
JULIUSBLUM.COM 800.526.6293 BLUMINFO@JULIUSBLUM.COM

ALUMINUM

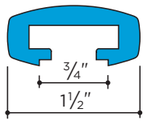
CARLSRAIL® HANDRAIL

20′ lengths

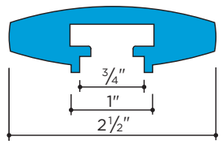
The Carlstadt® system for non-welded assembly also features a range of components. Carlsrail® handrail sections may be mounted using channels and then applied directly to the top of a picket or post.



● **6530** Aluminum .900 lb/ft
Fittings: C-N



● **6531** Aluminum .600 lb/ft
Fittings: C-N

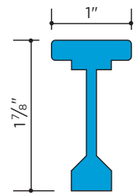


● **6532** Aluminum 1.440 lb/ft
Fittings: C-N

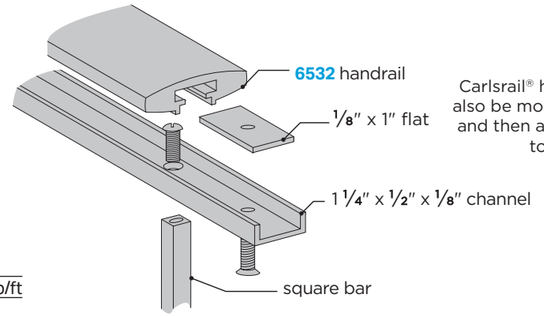
SUPPORT BAR

6063-T6

A slip fit support bar adds both vertical and horizontal stiffness to the handrail mouldings, when required.



● **6540** Aluminum .753 lb/ft

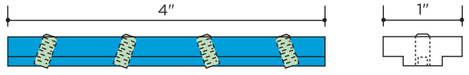


Carlsrail® handrail sections may also be mounted using channels and then applied directly to the top of a picket or post.

Splicing

An internal splice is used to attach corner bends and wall returns, as a connector for continuous runs, and for expansion joints. A set screw tightens and draws components together.

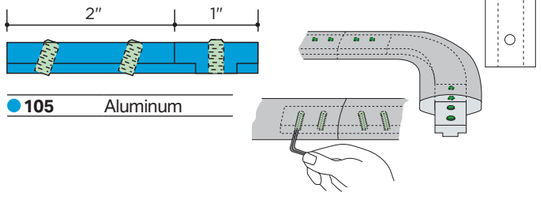
SPLICE INSERT



● **104** Aluminum
Also available in 16′ lengths without holes or set screws **104-16**

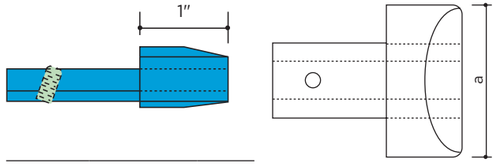
CORNER SPLICE INSERT

Cast, Almag 35



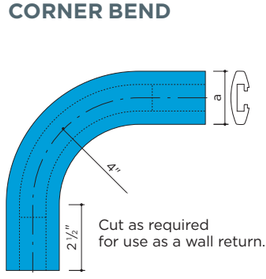
● **105** Aluminum

END CAP

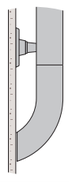


		a
● **6531N**	Aluminum	1½″
● **6530N**	Aluminum	2″
● **6532N**	Aluminum	2½″

CORNER BEND



Cut as required for use as a wall return.

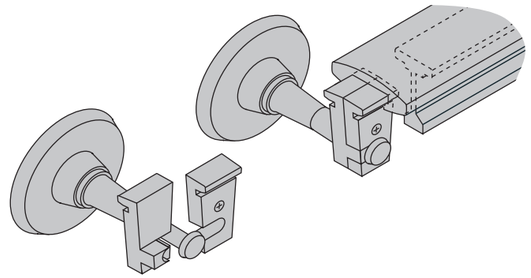


		a
● **6531C**	Aluminum	1½″
● **6530C**	Aluminum	2″
● **6532C**	Aluminum	2½″

ALUMINUM BRONZE NICKEL-SILVER STAINLESS PVC

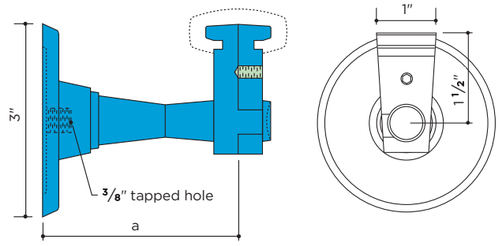
CARLSRAIL® BRACKET ASSEMBLY

The Carlstadt® bracket assembly features a two-part clamp that, upon slipping together, simultaneously engages the bracket arm and the handrail without requiring drilling or tapping.



CARLSTADT® SELF-ALIGNING WALL BRACKETS

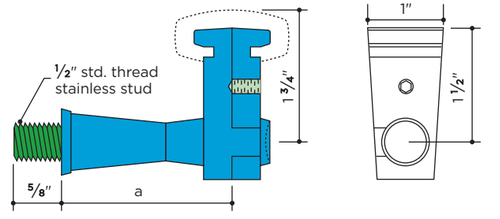
Satin Finish



For use with Carlsrail® handrail moulding		a
● **173**	Aluminum	3″
● **174**	Aluminum	3½″
● **175**	Aluminum	2¼″

CARLSTADT® SELF-ALIGNING POST BRACKETS

Satin Finish

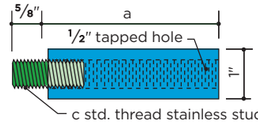


For use with Carlsrail® handrail moulding		a
● **171**	Aluminum	2¼″
● **172**	Aluminum	2¾″

CARLSTADT® WALL & POST BRACKET EXTENSIONS

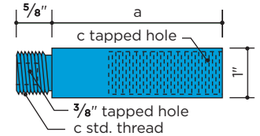
Satin Finish

For Post Brackets



		a	c
● **462***	Aluminum	1¾″	½″
● **463***	Aluminum	3″	½″

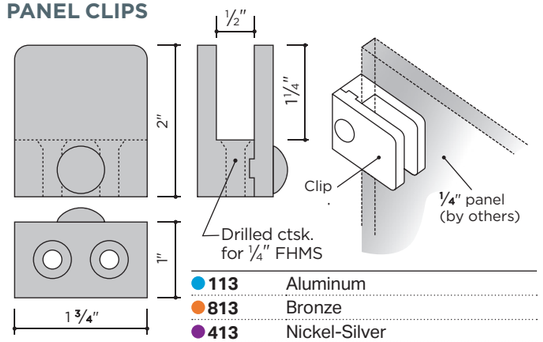
For Wall Brackets



		a	c
● **464**	Aluminum	1¾″	¾″
● **465**	Aluminum	3″	¾″

Extensions may be cut to length to suit individual conditions. Trim wall bracket extensions to no shorter than 1 ⅝″. Designers should note that extending a bracket increases stress at its base and reduces allowable load.

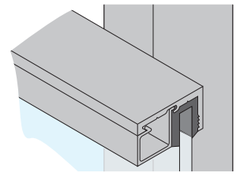
PANEL CLIPS



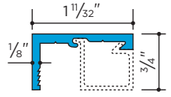
● **113**	Aluminum	
● **813**	Bronze	
● **413**	Nickel-Silver	
● **213**	Stainless	

GLAZING MEMBERS

Aluminum glass stop/snap-in and flexible PVC glazing channel serve to mount panels of ¼″ glass, plastic, wire mesh, or other material.



Glass Stop 20′ lengths

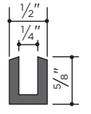


● **8106**	Aluminum	.276 lb/ft
● **8206**	Aluminum Anodized	.276 lb/ft

Snap-in 20′ lengths

● **8107**	Aluminum	.138 lb/ft
● **8207**	Aluminum Anodized	.138 lb/ft

Flexible PVC Channel 50′ coils



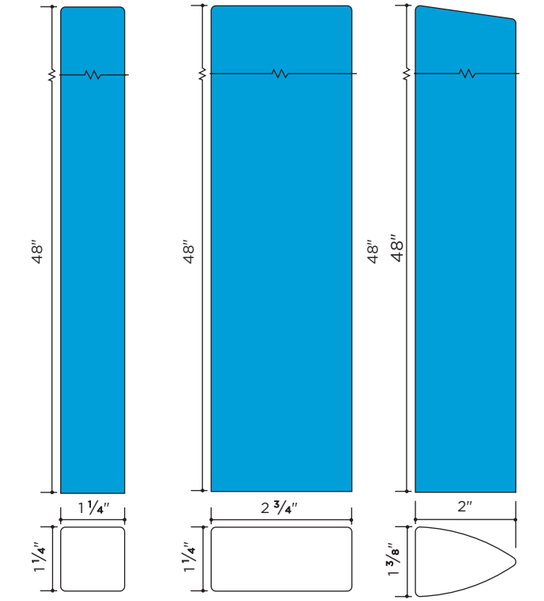
● **8708**	Flexible PVC	90 durometer

CARLSTADT® RAILINGS SYSTEMS

ALUMINUM

PRECUT SOLID ALUMINUM POSTS

Aluminum 6063-T52, Mill Finish, 48″ lengths
Upper end has been trimmed as shown—no post cap is required. Lower end may be cut to achieve required post height. Drill and tap to receive Carlstadt® post brackets.



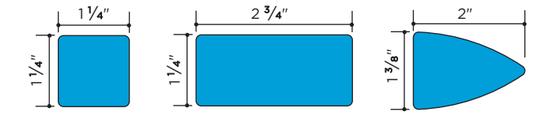
423 Aluminum

424 Aluminum

427 Aluminum

BAR STOCK FOR RAILING POSTS

Aluminum 6063-T52, 20′ lengths. Mill Finish.



6423 Aluminum — 1.876 lb/ft

6424 Aluminum — 4.124 lb/ft

6427 Aluminum — 2.256 lb/ft

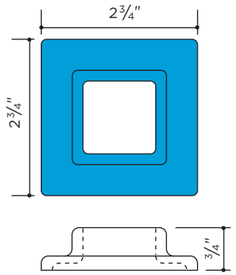
Installation Details

Post is set in metal sleeve in concrete and grouted. Embed post to a depth of 4″ to 6″ in slab. Allow for a 1″ grout pad beneath post. Sleeve should provide ample clearance around post for grouting and to allow for adjustment to field variations. For outdoor installations, weep holes should be drilled in the posts to prevent water from collecting below ground level. A cover flange conceals the floor opening.

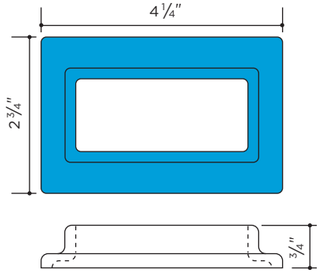
ALUMINUM

COVER FLANGES

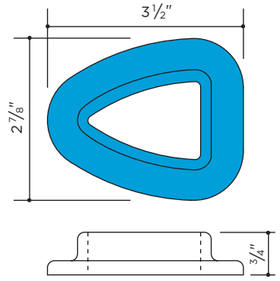
Satin Finish



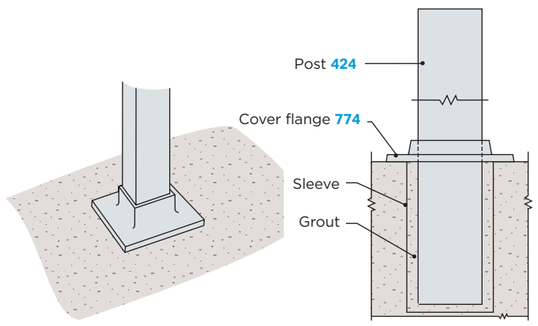
773 Aluminum — Fits aluminum posts **423** and **6423**



774 Aluminum — Fits aluminum posts **424**, **6424**, and **6434**



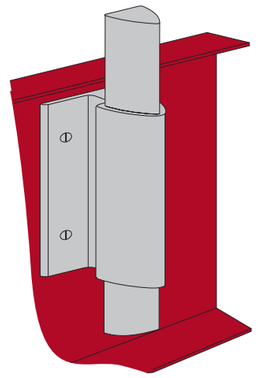
777 Aluminum — Fits aluminum posts **427** and **6427**

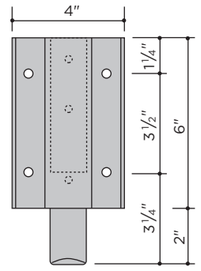


ALUMINUM

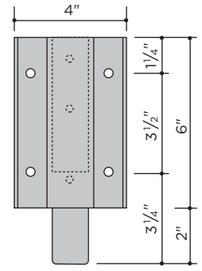
FASCIA FLANGES

Sleeve-type fascia flanges are provided with two clearances for mounting on solid or channel fascias and stringers. The post slips into the pocket of the fascia flange and is anchored with concealed set screws. The bottom extension of each fascia flange matches the profile of the post and is trimmed to match its top.

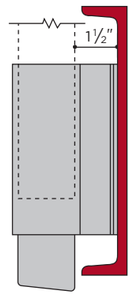




Elevation of **425** and **426**

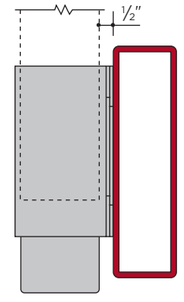


Elevation of **408**, **421**, and **422**



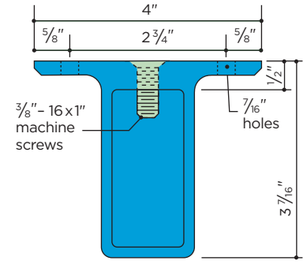
Fascia flange **426** used with channel stringer.

Fascia flange **422** is similar.

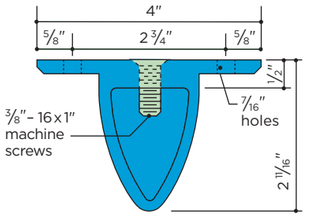


Fascia flange **408** used with box stringer.

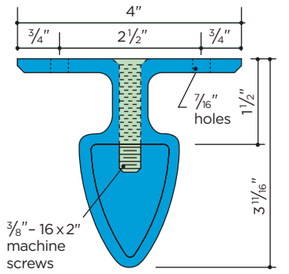
Fascia flanges **421** and **425** are similar.



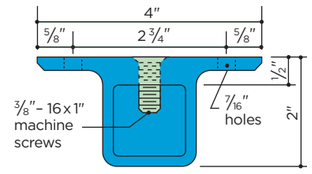
408 Aluminum
Fits aluminum posts **424**, **6424**, **6434**



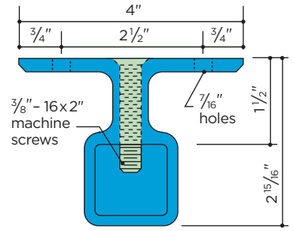
425 Aluminum
Fits aluminum posts **427** and **6427**



426 Aluminum
Fits aluminum posts **427** and **6427**



421 Aluminum
Fits aluminum posts **423** and **6423**



422 Aluminum
Fits aluminum posts **423** and **6423**

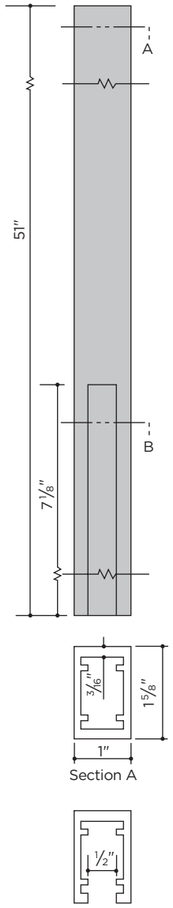
CARLSTADT® RAILINGS SYSTEMS

ALUMINUM BRONZE

PRECUT POST

For fascia mounting, 51″ lengths, Mill Finish

Aluminum 6063-T6
Bronze C38500



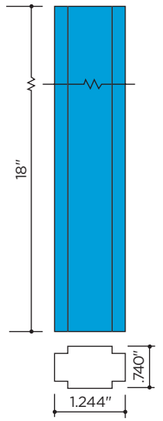
● **430***	Aluminum	
● **830***	Bronze	

* Cut and machined for use with fascia brackets

430

REINFORCING BARS

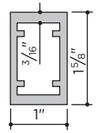
Aluminum 6063-T6



● **436E**	Aluminum	
Fits posts **430** or **830**		

TUBING FOR FLOOR-MOUNTED POSTS

20′ lengths, Mill Finish

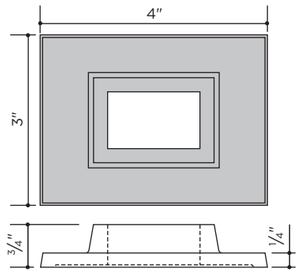


		lb/ft
● **6430**	Aluminum	.899
● **4830**	Bronze	2.950

Aluminum items are suitable for anodizing, including most of the hardcoat color finishes. Properties of sections for handrail posts are listed on page 123. Refer to pages 122-127 for detailed information on the structural design of handrail installations.

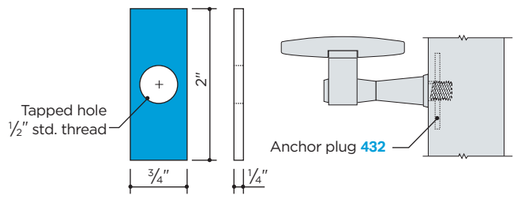
COVER FLANGES

Satin Finish



● **435**	Aluminum	Fits aluminum post **430** or **6430**
● **835**	Bronze	Fits bronze post **830** or **4830**

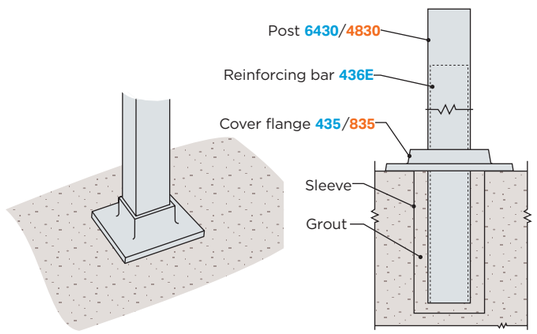
POST BRACKET ANCHOR PLUGS



● **432**	Aluminum	Fits posts **430** and **830**

Floor Mounted Post Detail

Reinforcing bar is placed within mating hollow post. Post is set in metal sleeve in concrete and grouted. Embed post to a depth of 4″ to 6″ in slab. Allow for a 1″ grout pad beneath post. Sleeve should provide ample clearance around post for grouting and to allow for adjustment to field variations. For outdoor installations, weep holes should be drilled in the posts to prevent water from collecting below ground level. A cover flange conceals the floor opening.

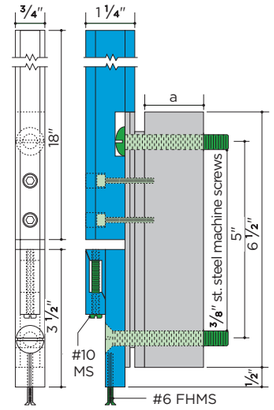


ALUMINUM BRONZE STAINLESS

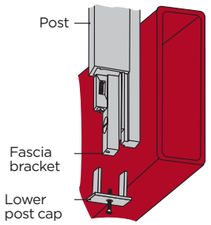
FASCIA BRACKETS

Mill Finish

Fascia brackets are available for concealed fastening of hollow posts of aluminum, bronze, and stainless steel—both for solid and channel fascias. The fastening mechanism provides for vertical field adjustment.



Fascia Bracket Assembly Detail

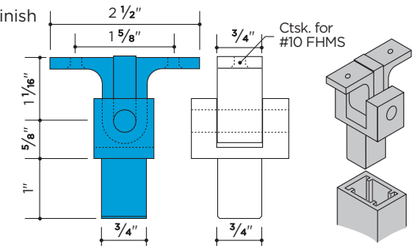


Fascia bracket is bolted to fascia. Slotted post slides into grooves on fascia bracket and is positioned for proper height. Wedge is then tightened to secure post in position. Lower post cap is then attached, completing assembly.

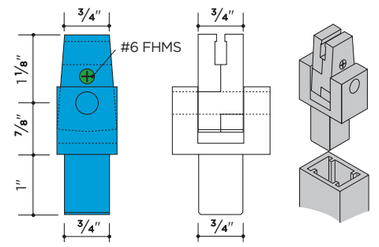
		a	
● **428**	Aluminum	½″	For box stringers, fits aluminum post **430**
● **429**	Aluminum	1½″	For channel stringers, fits aluminum post **430**
● **838**	Bronze	½″	For box stringers, fits bronze post **830**
● **839**	Bronze	1½″	For channel stringers, fits bronze post **830**

CENTER POST BRACKETS

Satin Finish



● **161**	Aluminum	Curved for pipe, fits aluminum posts **430** and **6430**
● **162**	Aluminum	Flat for moulding, fits aluminum posts **430** and **6430**



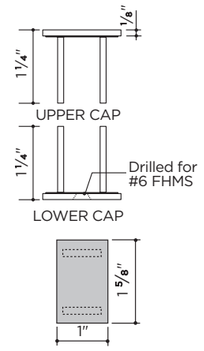
● **152**	Alum. For Carlstadt® T-handrail, fits aluminum posts **430** and **6430**	

Center post brackets permit handrail to be centered directly over post, while allowing the bracket to tilt to conform to stair incline. Bracket is secured to post with pin or screw.

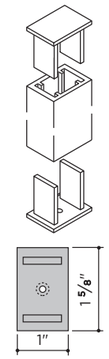
POST CAPS

Satin Finish

Caps for hollow Carlstadt® posts have a flange extending inside to receive and support the thread of the bracket arm.



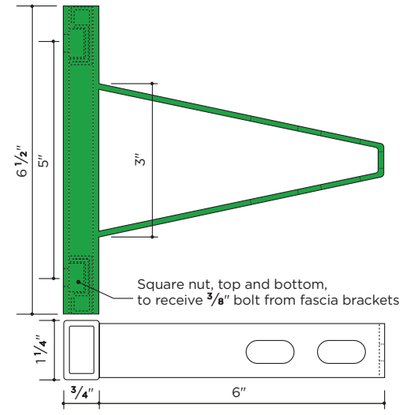
Upper Cap	
● **431**	Aluminum
● **831**	Bronze



Lower Cap	
● **433**	Aluminum
● **833**	Bronze

Fits aluminum posts **430** and **6430** and bronze posts **830** and **4830**

POST ANCHOR FOR CAST STEPS

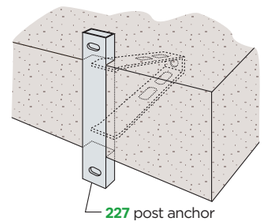


● **227**	Stainless	For use with aluminum and bronze railings

Post anchor **227** can be used with fascia brackets **428**, **429**, **838**, **839**, or to mount Carlstadt® aluminum or bronze posts. Cast post anchor into concrete with minimum slab thickness of 3″ and minimum compressive strength of 3500 psi. Maximum recommended post spacing for 3″ slabs is 30″; for slabs 4″ thick and thicker, recommended maximum post spacing is 48″.

Post Anchor Installation

Anchor is embedded in slab with anchor centered vertically in slab thickness. Front face of anchor should be flush with edge of slab. Square nuts move freely in pockets, and receive 3/8″ mounting bolts of Carlstadt® fascia brackets. Wide slots provide for lateral adjustment and vertical alignment.

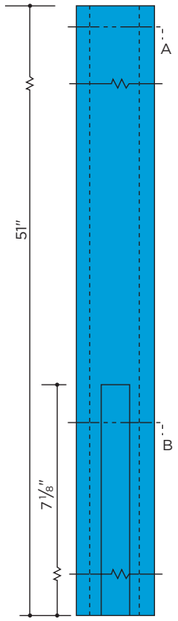


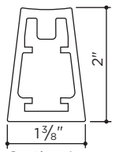
ALUMINUM

PRECUT POST

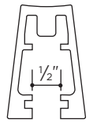
For fascia mounting, 51″ lengths, Mill Finish

Aluminum 6063-T6





Section A

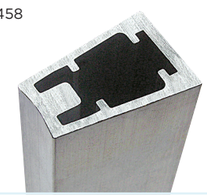


Section B

● **458***	Aluminum

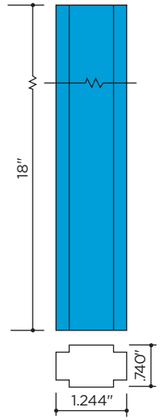
* Cut and machined for use with fascia brackets

458



REINFORCING BARS

Aluminum 6063-T6

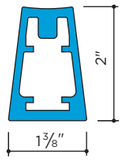


● **436E**	Aluminum

Fits aluminum post **458**

TUBING FOR FLOOR-MOUNTED POSTS

20′ lengths, Mill Finish

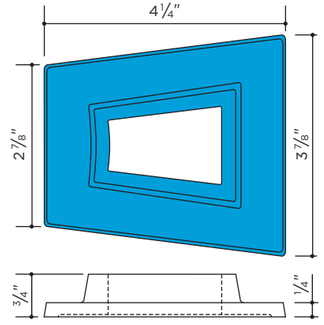


		lb/ft
● **6458**	Aluminum	1.326

Aluminum items are suitable for anodizing, including most of the hardcoat color finishes. Properties of sections for handrail posts are listed on page 123. Refer to pages 122-127 for detailed information on the structural design of handrail installations.

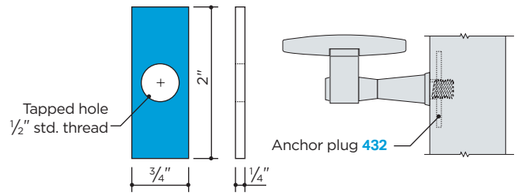
COVER FLANGES

Satin Finish



● **495**	Aluminum	Fits aluminum post **458** or **6458**

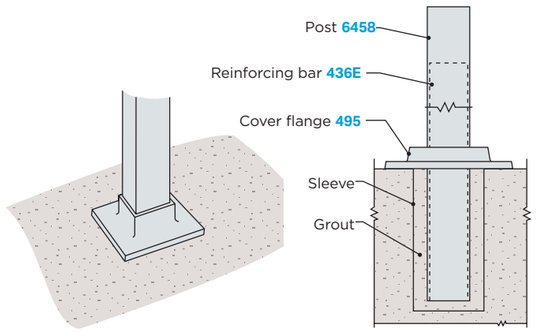
POST BRACKET ANCHOR PLUGS



● **432**	Aluminum	Fits aluminum post **458**

Floor Mounted Post Detail

Reinforcing bar is placed within mating hollow post. Post is set in metal sleeve in concrete and grouted. Embed post to a depth of 4″ to 6″ in slab. Allow for a 1″ grout pad beneath post. Sleeve should provide ample clearance around post for grouting and to allow for adjustment to field variations. For outdoor installations, weep holes should be drilled in the posts to prevent water from collecting below ground level. A cover flange conceals the floor opening.

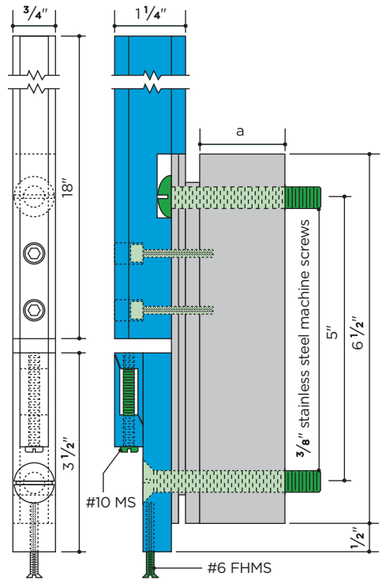


ALUMINUM STAINLESS

FASCIA BRACKETS

Mill Finish

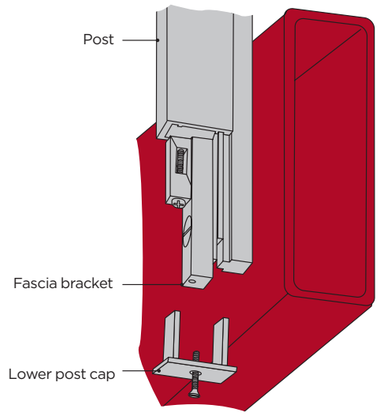
Fascia brackets are available for concealed fastening of hollow posts of aluminum, bronze, and stainless steel—both for solid and channel fascias. The fastening mechanism provides for vertical field adjustment.



		a	
● **428**	Aluminum	½″	For box stringers, fits aluminum post **458**
● **429**	Aluminum	1½″	For channel stringers, fits aluminum post **458**

Fascia Bracket Assembly Detail

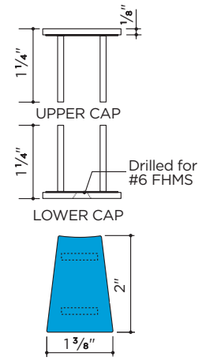
Fascia bracket is bolted to fascia. Slotted post slides into grooves on fascia bracket and is positioned for proper height. Wedge is then tightened to secure post in position. Lower post cap is then attached, completing assembly.

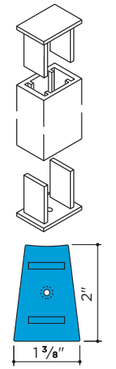


POST CAPS

Satin Finish

Caps for hollow Carlstadt® posts have a flange extending inside to receive and support the thread of the bracket arm.





Upper Cap

● **468**	Aluminum

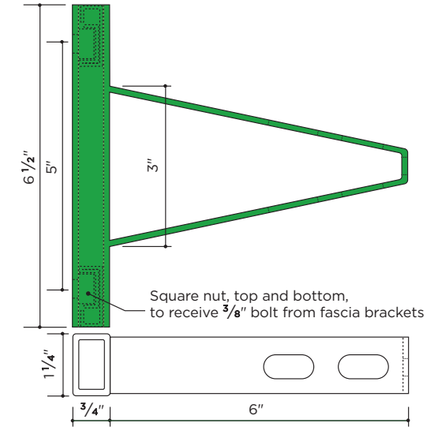
Fits aluminum posts **458** and **6458**

Lower Cap

● **469**	Aluminum

Fits aluminum posts **458** and **6458**

POST ANCHOR FOR CAST STEPS

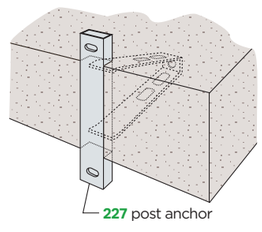


● **227**	Stainless	For use with aluminum and bronze railings

Post anchor **227** can be used with fascia brackets **428** and **429** to mount Carlstadt® aluminum or bronze posts. Cast post anchor into concrete with minimum slab thickness of 3″ and minimum compressive strength of 3500 psi. Maximum recommended post spacing for 3″ slabs is 30″; for slabs 4″ thick and thicker, recommended maximum post spacing is 48″.

Post Anchor Installation

Anchor is embedded in slab with anchor centered vertically in slab thickness. Front face of anchor should be flush with edge of slab. Square nuts move freely in pockets, receive 3/8″ mounting bolts of Carlstadt® fascia brackets. Wide slots provide for lateral adjustment and vertical alignment.



CARLSTADT® RAILINGS SYSTEMS

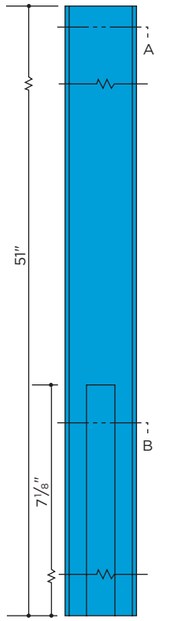
JULIUSBLUM.COM 800.526.6293 BLUMINFO@JULIUSBLUM.COM

ALUMINUM

PRECUT POST

For fascia mounting, 51″ lengths, Mill Finish

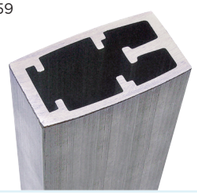
Aluminum 6063-T6



459* Aluminum

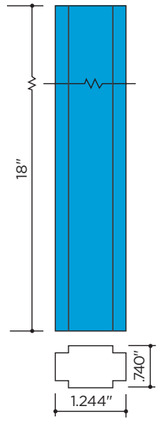
* Cut and machined for use with fascia brackets

459



REINFORCING BARS

Aluminum 6063-T6

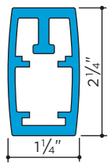


436E Aluminum

Fits aluminum post **459**

TUBING FOR FLOOR-MOUNTED POSTS

20′ lengths, Mill Finish

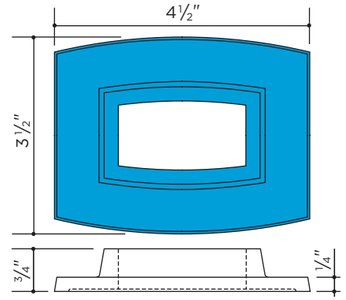


	lb/ft
6459 Aluminum	1.240

Aluminum items are suitable for anodizing, including most of the hardcoat color finishes. Properties of sections for handrail posts are listed on page 123. Refer to pages 122-127 for detailed information on the structural design of handrail installations.

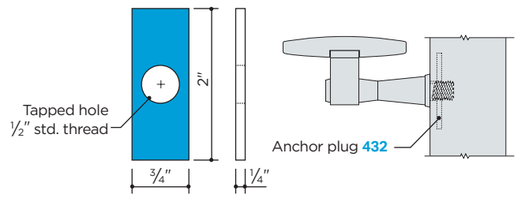
COVER FLANGES

Satin Finish



496 Aluminum — Fits aluminum post **459** or **6459**

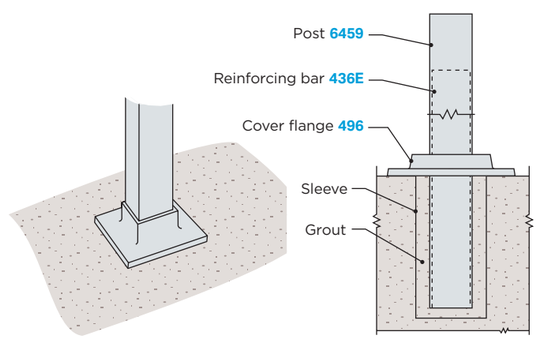
POST BRACKET ANCHOR PLUGS



432 Aluminum — Fits aluminum post **459**

Floor Mounted Post Detail

Reinforcing bar is placed within mating hollow post. Post is set in metal sleeve in concrete and grouted. Embed post to a depth of 4″ to 6″ in slab. Allow for a 1″ grout pad beneath post. Sleeve should provide ample clearance around post for grouting and to allow for adjustment to field variations. For outdoor installations, weep holes should be drilled in the posts to prevent water from collecting below ground level. A cover flange conceals the floor opening.

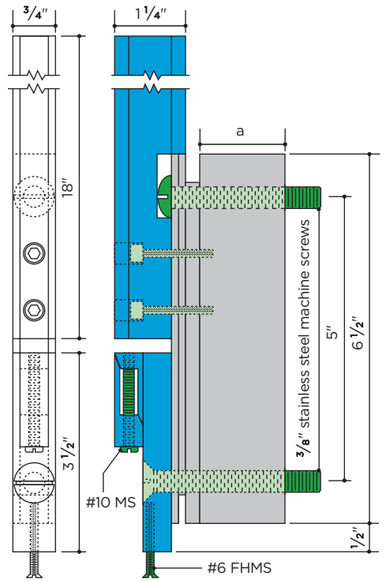


ALUMINUM STAINLESS

FASCIA BRACKETS

Mill Finish

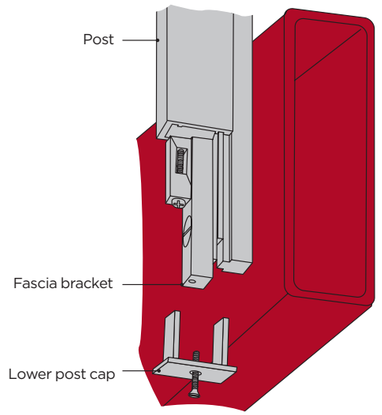
Fascia brackets are available for concealed fastening of hollow posts of aluminum, bronze, and stainless steel—both for solid and channel fascias. The fastening mechanism provides for vertical field adjustment.



a		
428 Aluminum	½″	For box stringers, fits aluminum post **458**
429 Aluminum	1½″	For channel stringers, fits aluminum post **458**

Fascia Bracket Assembly Detail

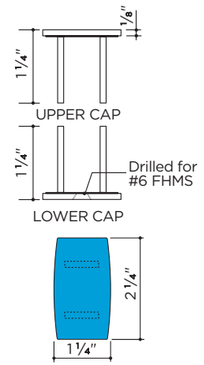
Fascia bracket is bolted to fascia. Slotted post slides into grooves on fascia bracket and is positioned for proper height. Wedge is then tightened to secure post in position. Lower post cap is then attached, completing assembly.



POST CAPS

Satin Finish

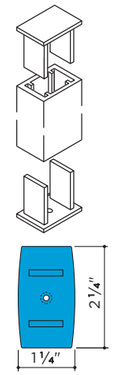
Caps for hollow Carlstadt® posts have a flange extending inside to receive and support the thread of the bracket arm.



Upper Cap

451 Aluminum

Fits aluminum posts **459** and **6459**

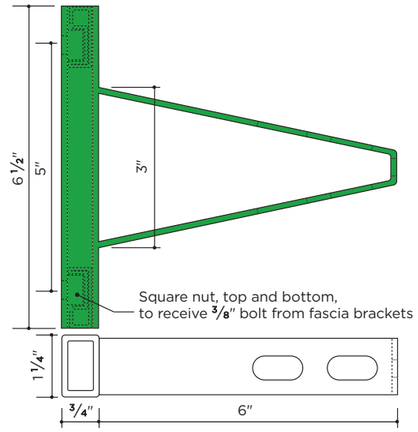


Lower Cap

453 Aluminum

Fits aluminum posts **459** and **6459**

POST ANCHOR FOR CAST STEPS

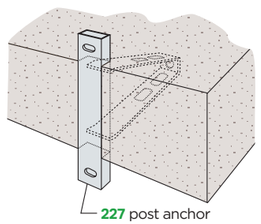


227 Stainless — For use with aluminum and bronze railings

Post anchor **227** can be used with fascia brackets **428** and **429** to mount Carlstadt® aluminum or bronze posts. Cast post anchor into concrete with minimum slab thickness of 3″ and minimum compressive strength of 3500 psi. Maximum recommended post spacing for 3″ slabs is 30″; for slabs 4″ thick and thicker, recommended maximum post spacing is 48″.

Post Anchor Installation

Anchor is embedded in slab with anchor centered vertically in slab thickness. Front face of anchor should be flush with edge of slab. Square nuts move freely in pockets, receive ⅜″ mounting bolts of Carlstadt® fascia brackets. Wide slots provide for lateral adjustment and vertical alignment.

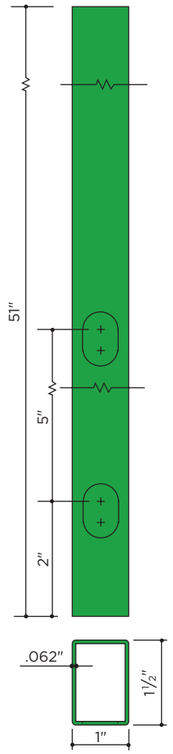


ALUMINUM STAINLESS

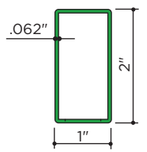
PRECUT POST

For fascia mounting,
51″ lengths, 2B Mill Finish

Stainless Type 304



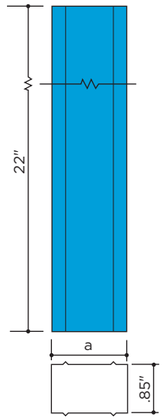
● **230*** Stainless



● **280*** Stainless

* Cut and punched for fascia block

REINFORCING BARS

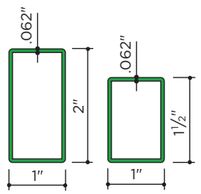


		a
● **294**	Aluminum	1.34″
Fits stainless post **230**		

		a
● **295**	Aluminum	1.84″
Fits stainless post **280**		

TUBING FOR FLOOR-MOUNTED POSTS

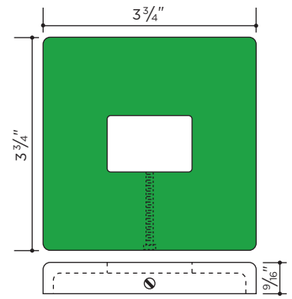
20′ lengths, 2B Mill Finish



● Stainless Tubing

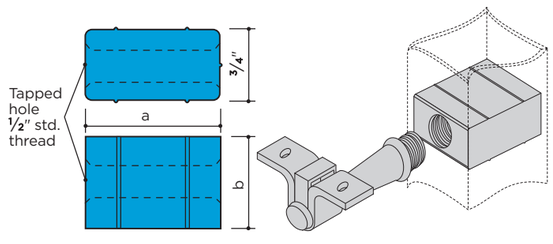
COVER FLANGES

Satin Finish



● **237**	Stainless	Fits stainless post **230** or tubing
● **285**	Stainless	Fits stainless post **280** or tubing

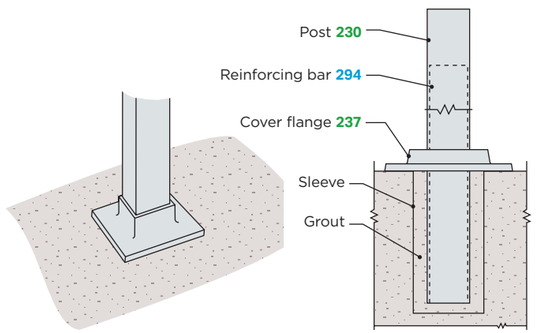
POST BRACKET ANCHOR PLUGS



		a	b	
● **238**	Aluminum	1.34″	1⅛″	Fits with stainless post **230**
● **279**	Aluminum	1.84″	1¼″	Fits with stainless post **280**

Floor Mounted Post Detail

Reinforcing bar is placed within mating hollow post. Post is set in metal sleeve in concrete and grouted. Embed post to a depth of 4″ to 6″ in slab. Allow for a 1″ grout pad beneath post. Sleeve should provide ample clearance around post for grouting and to allow for adjustment to field variations. For outdoor installations, weep holes should be drilled in the posts to prevent water from collecting below ground level. A cover flange conceals the floor opening.

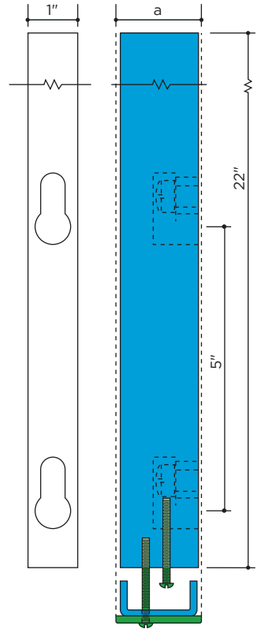


Properties of sections for handrail posts are listed on page 123. Refer to pages 122-127 for detailed information on the structural design of handrail installations.

ALUMINUM STAINLESS

ANCHOR BAR WITH LOWER POST CAP

Mill Finish

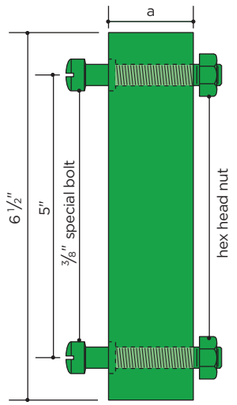


		a	post	
● **233B**	Aluminum	1½″	**230**	
With stainless steel lower post cap*				
● **283**	Aluminum	2″	**280**	
With stainless steel lower post cap*				

* Satin Finish

FASCIA SPACER BLOCK

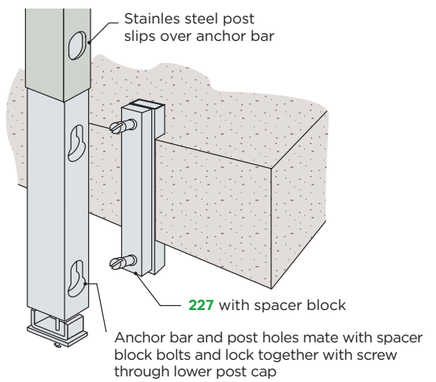
Satin Finish



		a
● **228**	Stainless	½″
Use with box stringers		
● **229**	Stainless	1½″
Use with channel stringers		

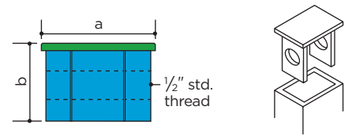
Fascia Spacer Block Assembly

The spacer block is first fastened to the stringer. The keyhole in the anchor bar aligns with the holes in the tubular post. Post and anchor bar assembly are then fed over the bolt heads, into the keyhole slot and seated manually. Final tightening is achieved by drawing up the tightening screw in the lower post cap.



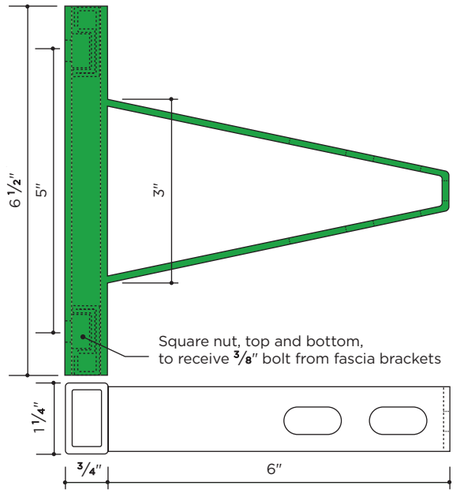
UPPER POST CAP

Satin Finish



Upper Cap		a	b	
● **231**	Stainless	1½″	1¼″	Fits stainless post **230**
● **284**	Stainless	2″	1⁷⁄₁₆″	Fits stainless post **280**

POST ANCHOR FOR CAST STEPS

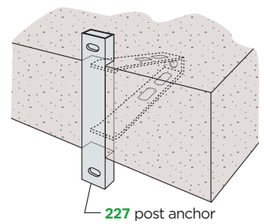


● **227** Stainless — For use with aluminum and bronze railings

Post anchor **227** can be used with fascia brackets **228** and **229** to mount Carlstadt® aluminum or bronze posts. Cast post anchor into concrete with minimum slab thickness of 3″ and minimum compressive strength of 3500 psi. Maximum recommended post spacing for 3″ slabs is 30″; for slabs 4″ thick and thicker, recommended maximum post spacing is 48″.

Post Anchor Installation

Anchor is embedded in slab with anchor centered vertically in slab thickness. Front face of anchor should be flush with edge of slab. Square nuts move freely in pockets, receive ⅜″ mounting bolts of Carlstadt® fascia brackets. Wide slots provide for lateral adjustment and vertical alignment.



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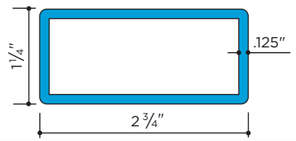
ALUMINUM NICKEL-SILVER STAINLESS

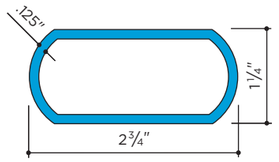
TUBING FOR RAILING POSTS

Mill Finish

Aluminum
6063-T6
20′ lengths

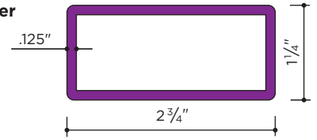


6434	Aluminum	1.123 lb/ft	Fittings: N



6435	Aluminum	1.075 lb/ft	Fittings: N

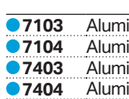
Nickel-Silver
C79800
16′ lengths



1334	Nickel-Silver	3.40 lb/ft	Fittings: N

HIGH STRENGTH CONNECTORAIL® POSTS

Aluminum only, Alloy 6063-T832

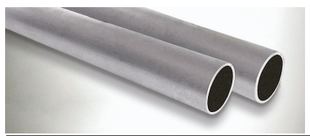


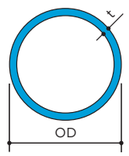
Drawn pipe precut to post lengths.
Clear anodized or mill finish

		Pipe	Sched.	Length	c	t
7103	Aluminum	1¼"	10	38"	1.660"	.109"
7104	Aluminum	1¼"	10	50"	1.660"	.109"
7403	Aluminum	1¼"	40	38"	1.660"	.140"
7404	Aluminum	1¼"	40	50"	1.660"	.140"
7203	Aluminum	1½"	10	38"	1.900"	.109"
7204	Aluminum	1½"	10	50"	1.900"	.109"
7503	Aluminum	1½"	40	38"	1.900"	.145"
7504	Aluminum	1½"	40	50"	1.900"	.145"

DRAWN ALUMINUM HANDRAIL PIPE

Aluminum Alloy 6063-T832, 20′ lengths

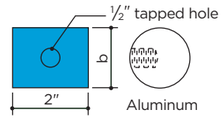


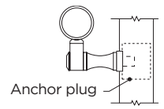


Nominal Size	Sched.	OD	ID	t	lb/ft
1¼"	10	1.660"	1.442"	.109"	.625
1¼"	40	1.660"	1.380"	.140"	.785
1½"	10	1.900"	1.682"	.109"	.721
1½"	40	1.900"	1.610"	.145"	.940

This premium quality drawn pipe has an extra smooth surface. Its harder temper gives it high strength. See pages 16-27 for stock pipe fittings. Available in clear anodized or mill finish.

PIPE ANCHOR PLUGS



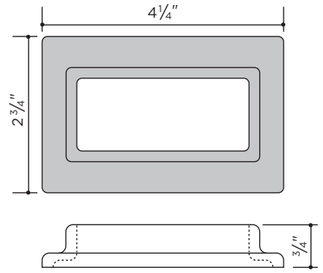


		Pipe	Sched.	b
7162	Aluminum	1¼"	10	1.427"
7462	Aluminum	1¼"	40	1.360"
7262	Aluminum	1½"	10	1.667"
7562	Aluminum	1½"	40	1.585"
9362	Stainless	1½"	5	1.750"

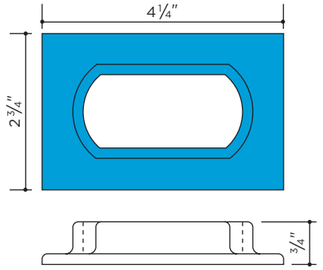
Anchor plugs provide secure mounting for brackets supporting second or third rails. Aluminum anchor plugs are machined from solid extruded stock; the stainless steel anchor plug is fabricated from heavy metal.

COVER FLANGES

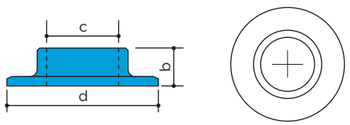
Satin Finish



774	Aluminum	Fits posts 424, 6424, and 6434
1374	Nickel-Silver	Fits Nickel-Silver post 1334



775	Aluminum	Fits aluminum post 6435



		Pipe	b	c	d
710*	Aluminum	1¼"	1"	1.688"	3 13/16"
711*	Aluminum	1½"	1"	1.938"	4"

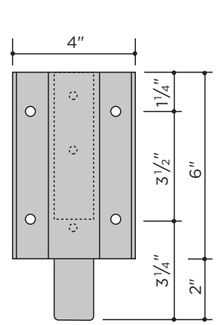
* Also available in clear anodized AA-M32-C22-A31 (204R1)

ALUMINUM NICKEL-SILVER

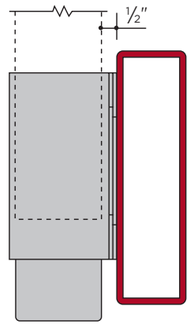
FASCIA FLANGES

Mill Finish

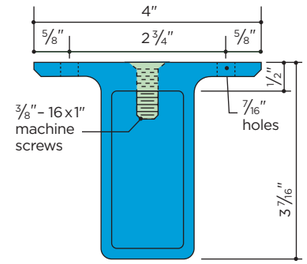
Sleeve-type fascia flanges are provided for mounting on solid or channel fascias and stringers. The post slips into the pocket of the fascia flange and is anchored with concealed set screws. The bottom extension of each fascia flange matches the profile of the post and is trimmed to match its top.



Elevation of 408

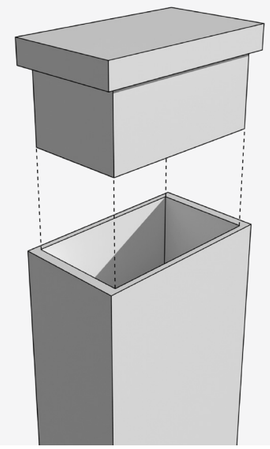


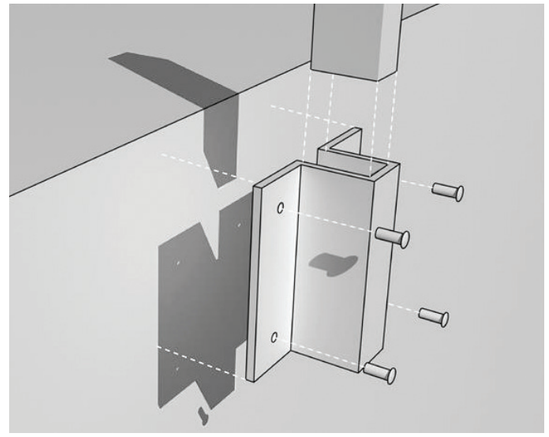
Fascia flange 408 used with box stringer.



408	Aluminum
Fits aluminum post 6434	

See page 71 for a complete range of Carlstadt® fascia flanges.

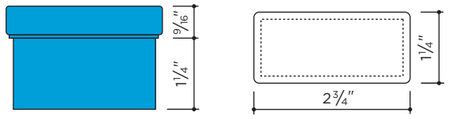




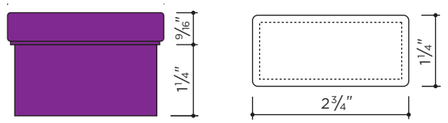
POST CAPS

Satin Finish, except as noted

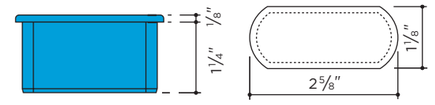
Caps for hollow Carlstadt® posts have a flange extending inside to receive and support the thread of the bracket arm.



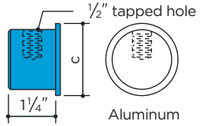
6434N	Aluminum



1334N	Nickel-Silver



6435N	Aluminum



		Pipe	Sched.	c
7180*	Aluminum	1¼"	10	1.660"
7480*	Aluminum	1¼"	40	1.660"
7280*	Aluminum	1½"	10	1.900"
7580*	Aluminum	1½"	40	1.900"

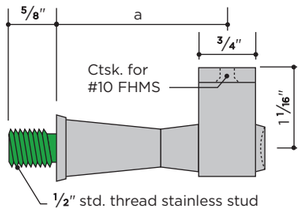
*Clear anodized AA-M32-C22-A31 (204R1)

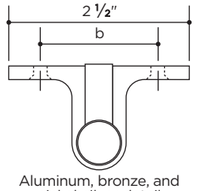
CARLSTADT® RAILINGS SYSTEMS

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

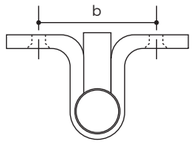
SELF-ALIGNING

Satin Finish



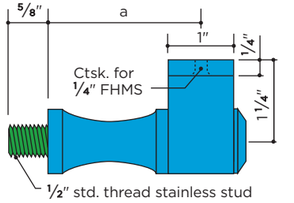


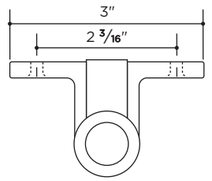
Aluminum, bronze, and nickel-silver detail



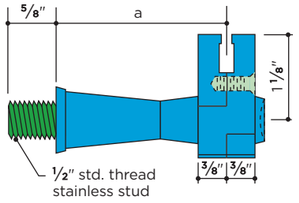
Stainless detail

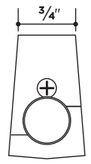
		a	b
● **441**	Aluminum	2 1/4"	1 5/8"
● **442**	Aluminum	2 3/4"	1 5/8"
● **841**	Bronze	2 1/4"	1 5/8"
● **1341**	Nickel-Silver	2 1/4"	1 5/8"
● **241**	Stainless	2 1/4"	1 13/16"



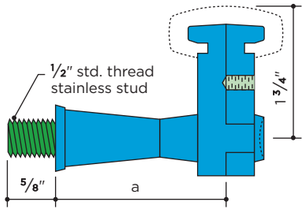


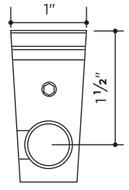
For use with Carlstadt® handrail moulding		a
● **309**	Aluminum	3 1/4"
● **312**	Aluminum	2 3/8"





For use with Carlstadt® T-handrail moulding		a
● **439**	Aluminum	2 1/4"
● **440**	Aluminum	2 3/4"

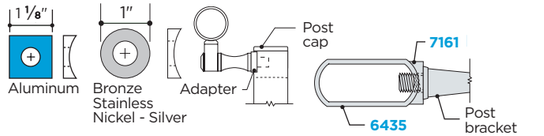




For use with Carlsrail® handrail moulding		a
● **171**	Aluminum	2 1/4"
● **172**	Aluminum	2 3/4"

POST BRACKET ADAPTER

Satin Finish

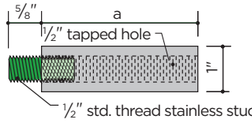


		Pipe Size	Schedule	Clear Hole
● **7161***	Aluminum	1 1/4"	all	1/2"
● **7261***	Aluminum	1 1/2"	all	1/2"
● **8661**	Bronze	1 1/4"	all	1/2"
● **8861**	Bronze	1 1/2"	all	1/2"
● **1361**	Nickel-Silver	1 1/2"	all	1/2"
● **9161**	Stainless	1 1/4"	all	1/2"
● **9361**	Stainless	1 1/2"	all	1/2"

* Also available in clear anodized AA-M10-C22-A31 (204R1)

POST BRACKET EXTENSIONS

Satin Finish

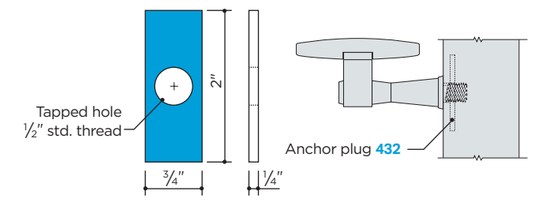


Designers should note that extending a bracket increases stress at its base and reduces its allowable load.

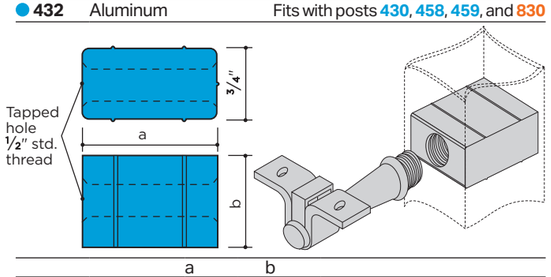
Post		a
● **462***	Aluminum	1 3/4"
● **463***	Aluminum	3"
● **862**	Bronze	1 3/4"
● **863**	Bronze	3"
● **1362**	Nickel-Silver	1 3/4"
● **1366**	Nickel-Silver	3"
● **245**	Stainless	1 3/4"
● **246**	Stainless	3"

Extensions may be cut to length to suit individual conditions.
* Also available in clear anodized AA-M10-C22-A31 (204R1)

POST BRACKET ANCHOR PLUGS



● **432**	Aluminum	Fits with posts **430**, **458**, **459**, and **830**



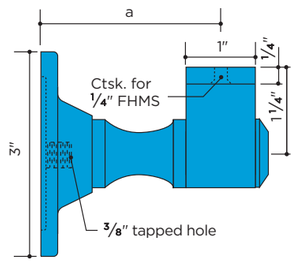
		a	b	
● **238**	Aluminum	1.34"	1 1/8"	Fits with stainless post **230**
● **279**	Aluminum	1.84"	1 1/4"	Fits with stainless post **280**

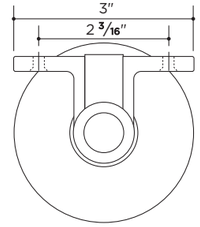
For Pipe Post Anchor Plugs, see page 22.

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

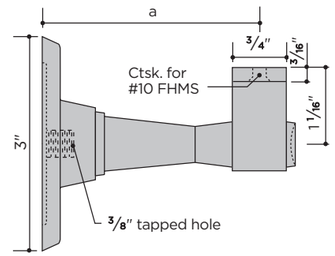
SELF-ALIGNING WALL BRACKETS

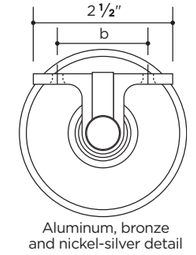
Satin Finish



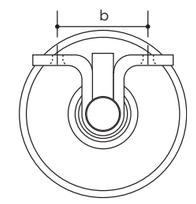


For use with Carlstadt® handrail moulding		a
● **313**	Aluminum	2 5/8"
● **314**	Aluminum	3 1/8"



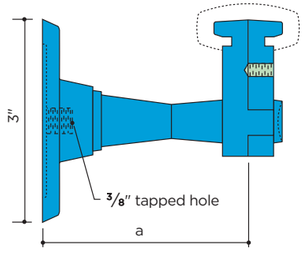


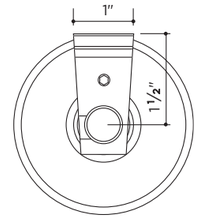
Aluminum, bronze and nickel-silver detail



Stainless detail

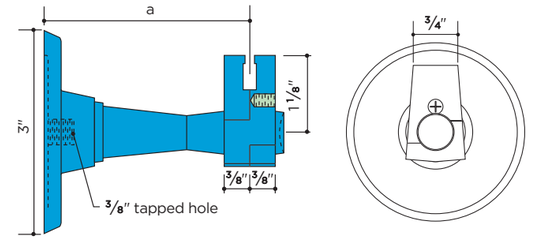
		a	b
● **443**	Aluminum	3"	1 5/8"
● **444**	Aluminum	3 1/2"	1 5/8"
● **844**	Bronze	2 1/2"	1 5/8"
● **843**	Bronze	3"	1 5/8"
● **1343**	Nickel-Silver	3"	1 5/8"
● **271**	Stainless	2 1/4"	1 13/16"
● **243**	Stainless	3"	1 13/16"





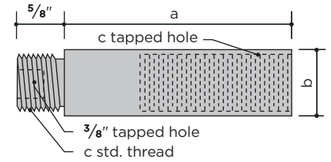
For use with Carlsrail® handrail moulding		a
● **175**	Aluminum	2 1/4"
● **173**	Aluminum	3"
● **174**	Aluminum	3 1/2"

For use with Carlstadt® T-handrail moulding		a
● **418**	Aluminum	3"
● **419**	Aluminum	3 1/2"



WALL BRACKET EXTENSIONS

Satin Finish



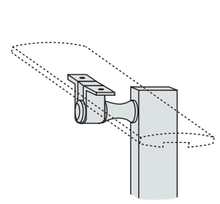
Designers should note that extending a bracket increases stress at its base and reduces its allowable load.

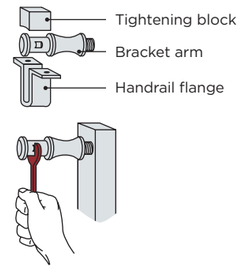
		a	b	c
● **414*†**	Aluminum	1 3/4"	1 1/8"	7/8"
● **415*†**	Aluminum	3"	1 1/8"	7/8"
● **464**	Aluminum	1 3/4"	1"	3/4"
● **465**	Aluminum	3"	1"	3/4"
● **864**	Bronze	1 3/4"	1"	3/4"
● **865**	Bronze	3"	1"	3/4"
● **1364**	Nickel-Silver	1 3/4"	1"	3/4"
● **1365**	Nickel-Silver	3"	1"	3/4"
● **247**	Stainless	1 3/4"	1"	3/4"
● **248**	Stainless	3"	1"	3/4"

Extensions may be cut to length to suit individual conditions.
* Also available in clear anodized AA-M10-C22-A31 (204R1)
† For use with **307**, **308**, **313**, and **314** wall brackets.

Adjustable Bracket Detail

Post and upper post caps must be drilled and tapped to accept bracket arm. Recess of bracket arm has flat sides to accommodate wrench, which permits tightening without marring exposed surfaces. Handrail flange tilts to adjust to stair angle and is attached to handrail with machine screws. Pressure on tightening block prevents looseness and rattling.





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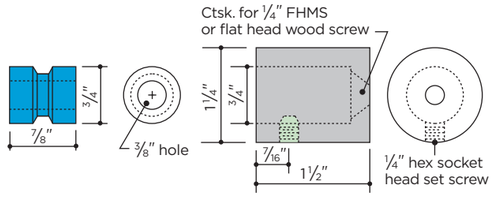
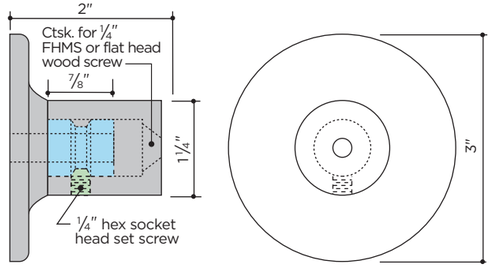
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

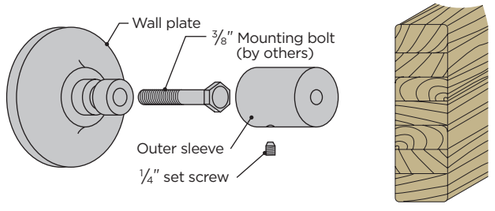
TWO-PIECE MOUNTING BRACKETS

Satin Finish

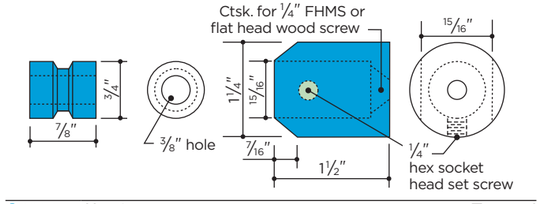


●	**166***	Aluminum
●	**896**	Bronze
●	**196**	Nickel-Silver
●	**296**	Stainless





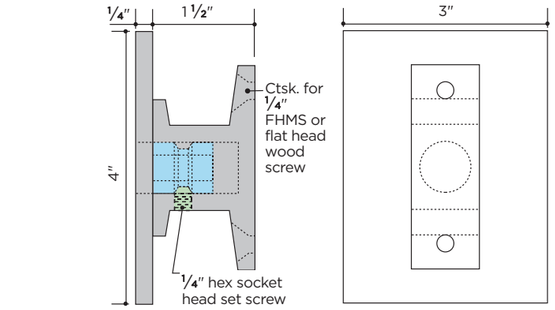
●	**168***	Aluminum
●	**898**	Bronze
●	**298**	Stainless



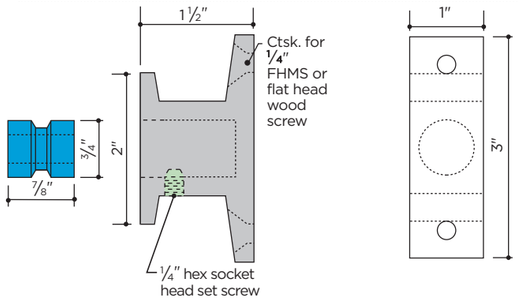
●	**167**	Aluminum	Tapered

TWO-PIECE MOUNTING BRACKETS

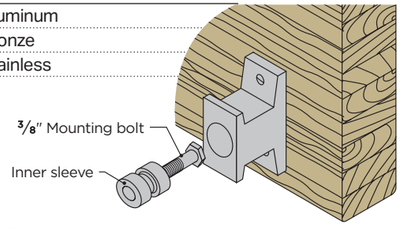
Satin Finish
For wide wood handrails or metal handrails



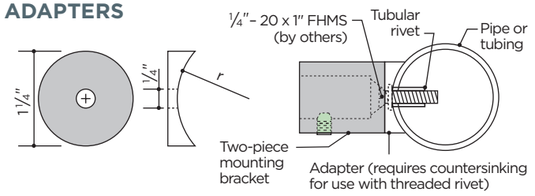
●	**160***	Aluminum
●	**890**	Bronze
●	**290**	Stainless



●	**169***	Aluminum
●	**899**	Bronze
●	**299**	Stainless



ADAPTERS



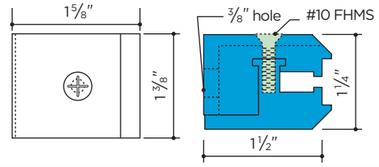
		r	Use With
●	**7164*** Aluminum	.830"	1.660" OD
●	**7264*** Aluminum	.950"	1.900" OD
●	**8864** Bronze	.950"	1.900" OD
●	**8964** Bronze	.750"	1.500" OD
●	**5264** Nickel-Silver	.750"	1.500" OD
●	**5364** Nickel-Silver	.950"	1.900" OD
●	**9164** Stainless	.830"	1.660" OD
●	**9364** Stainless	.950"	1.900" OD

* Also available in clear anodized AA-M32-C22-A31 (204R1)

ALUMINUM BRONZE NICKEL-SILVER STAINLESS STEEL

VERTICAL MOUNTING BRACKET

Satin Finish

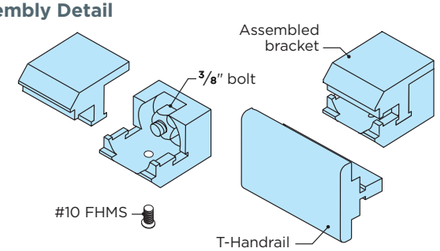


●	**151***	Aluminum

* Also available in clear anodized AA-M10-C22-A31 (204R1)

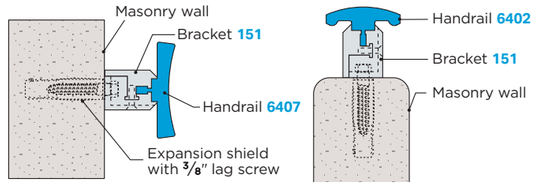
Vertical mounting bracket **151** is designed for mounting handrail on edge to provide a wall guard or bumper. Carlstadt® T-handrail mouldings **6402**, **6405**, or **6407** can be mounted without drilling and tapping. Bracket is also suitable for mounting handrail on top of a parapet or wall.

Assembly Detail



Use ⅜" machine screw, stud or hex head bolt for fastening to wall.

Installation Details



BOLTS AND ANCHORS for handrail wall brackets

Hanger Bolt

● Steel ⅜" × 3"

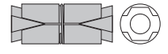
Hex Head Lag Screw

● Aluminum ⅜" x 2"
● Brass ⅜" x 2" (Plain or Finished)
● Nickel-Silver ⅜" x 2" (Finished)
● Stainless ⅜" × 2"

Post Bracket Hanger Bolt

● Steel 5/16" × 1 1/2" / 1/2"–13 × ⅜"

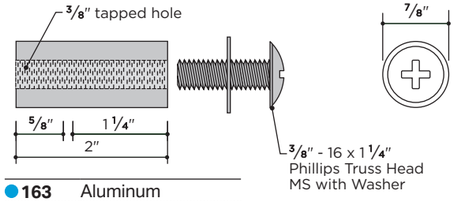
Heavy-Duty Double Machine Bolt Anchor (Zinc Alloy)



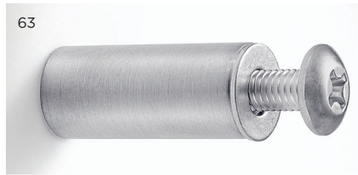
Non-calking machine bolt anchor for use in masonry materials of questionable strength or where heavy shear loads are encountered. Thread accommodates ⅜" – 16 stud or machine bolt (supplied by others). Drill hole size of ¾" diameter by 2 ¼" deep.

THREADED BUSHING BRACKETS

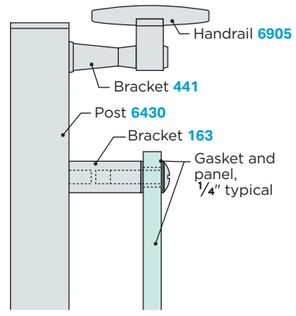
Satin Finish



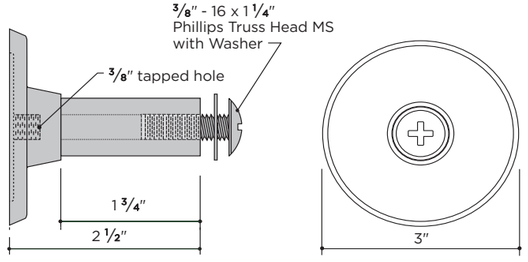
●	**163**	Aluminum
●	**63**	Stainless



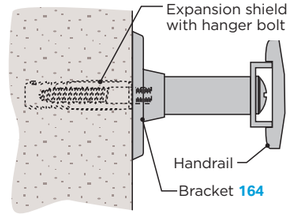
Installation Details



Threaded Bushing Brackets are used with threaded studs, machine screws, or bolts to install handrails or panels. Brackets may be cut to length as required. Brackets are furnished with aluminum Phillips Truss Head machine screws and washers.



●	**164**	Aluminum
●	**64**	Stainless

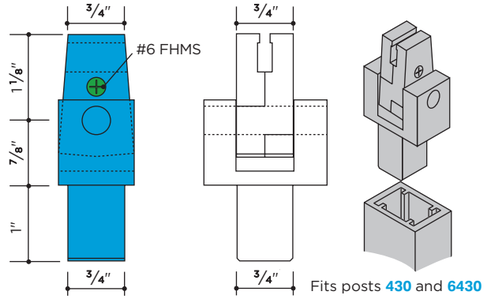


CARLSTADT® RAILINGS SYSTEMS

ALUMINUM

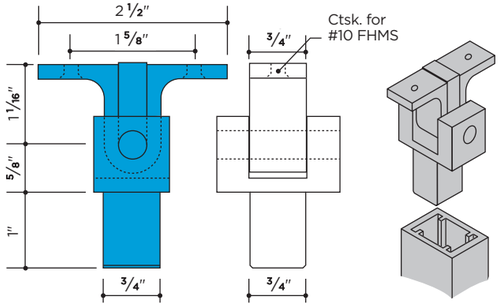
CENTER POST BRACKETS

Satin Finish, except as noted

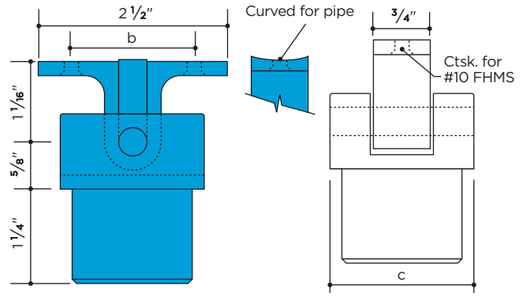


Center post brackets permit handrail to be centered directly over post, yet allow it to tilt to conform to stair incline. Bracket is secured to post with pin or screw.

● **152**	Aluminum for Carlstadt® T-handrail moulding	



● **161**	Aluminum	Curved for pipe, fits posts 430 and 6430
● **162**	Aluminum	Flat for moulding, fits posts 430 and 6430



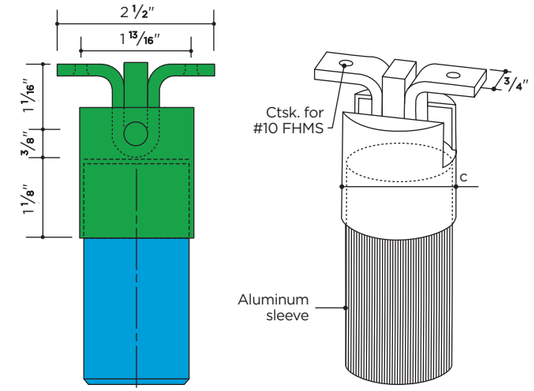
For center mounting of flat-bottomed handrail onto aluminum Connectorail® posts

Flat		Pipe	Sched.	c	b
● **144**	Aluminum	1¼"	40	1.660"	1⅝"
● **145**	Aluminum	1½"	40	1.900"	1⅝"

For center mounting of pipe or rounded handrail onto aluminum Connectorail® posts

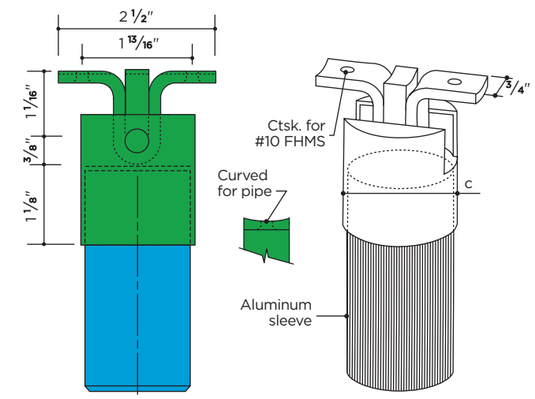
Curved		Pipe	Sched.	c	b
● **142***	Aluminum	1¼"	40	1.660"	1⅝"
● **143***	Aluminum	1½"	40	1.900"	1⅝"

* Also available in clear anodized AA-M10-C22-A31 (204R1)



For center mounting of flat-bottomed handrail moulding onto stainless Connectorail® posts

Flat		Pipe	Sched.	c
● **207**	Stainless Steel	1½"	5	1.900"



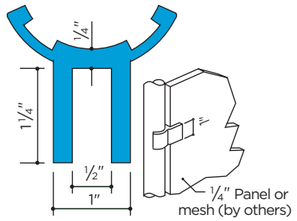
For center mounting of handrail pipe or rounded handrail onto stainless Connectorail® posts

Curved		Pipe	Sched.	c
● **208**	Stainless Steel	1½"	5	1.900"

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

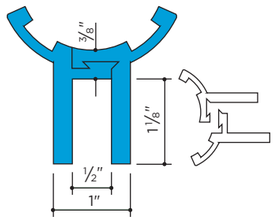
PANEL CLIPS

For aluminum pipe only, Mill Finish or Clear Anodized



		Pipe
● **7460-5***	Aluminum	1¼"
● **7460†**	Aluminum	1¼"
● **7560-5***	Aluminum	1½"
● **7560†**	Aluminum	1½"

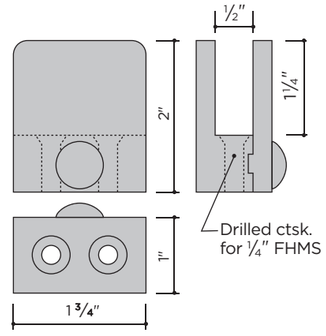
* 5' Length
† Packages of 4 pieces



		Pipe
● **7260****	Aluminum	1½"

Packages of 4 sets. ** Two-piece assembly

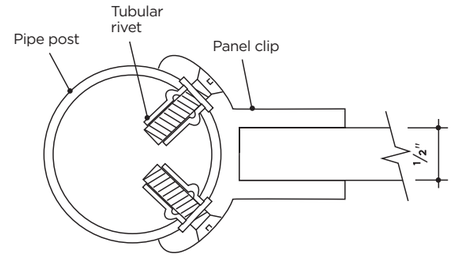
For mounting to flat surface, Satin Finish

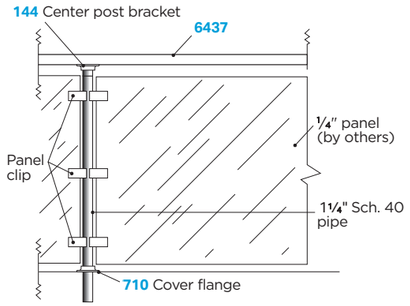


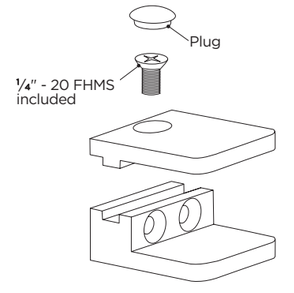
● **113**	Aluminum	● **413**	Nickel-Silver
● **813**	Bronze	● **213**	Stainless

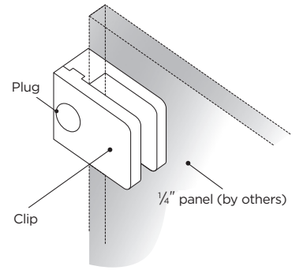
Plug (packed separately) is inserted following installation and may be held in place with epoxy or other sealant.

Installation Detail

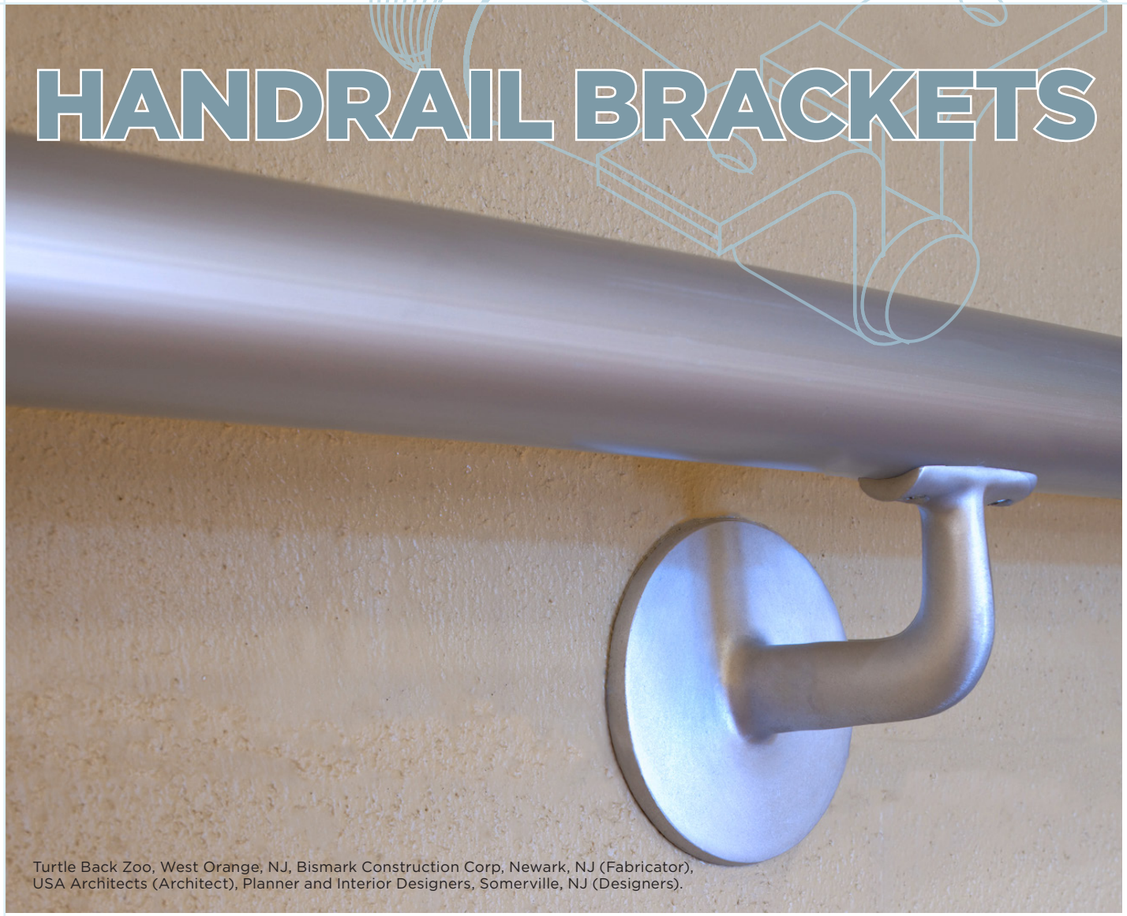








HANDRAIL BRACKETS



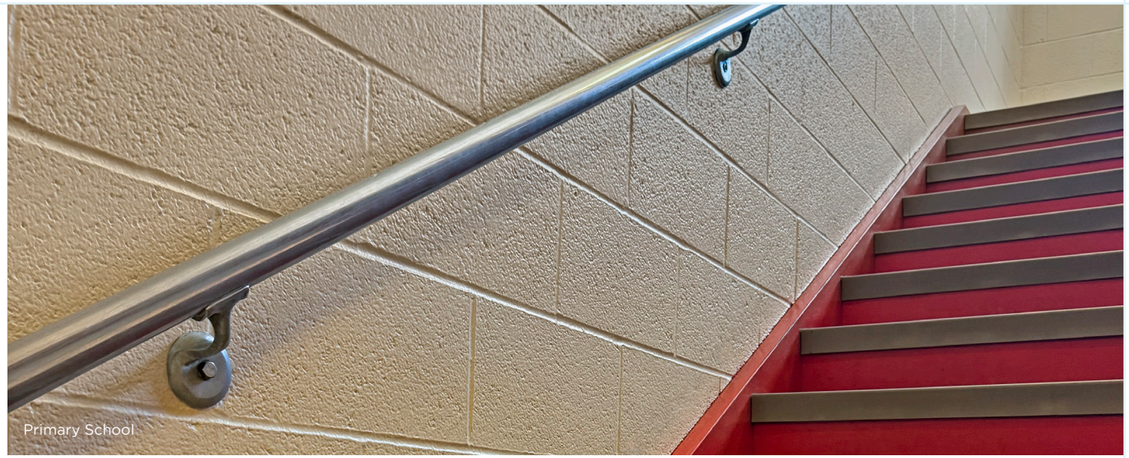
Turtle Back Zoo, West Orange, NJ, Bismark Construction Corp, Newark, NJ (Fabricator), USA Architects (Architect), Planner and Interior Designers, Somerville, NJ (Designers).

For convenience and ease of reference, all of the handrail brackets that appear in various sections of our catalog are brought together in this section. **Included are brackets for wall, post, center rail and vertical mounting; for use with moulding or flat bars; for pipe railings; and for specific applications.**

- **Aluminum:** Cast brackets are made of high-strength alloy Almag 35—suitable for clear anodizing. Extruded and machined brackets are of alloy 6063—suitable for anodizing, including most of the hard coat anodic processes (black anodizing may result in inconsistent matches; consult your anodizer before specifying). **All, except as noted, are satin finished.** Pipe rail brackets are stocked with a clear anodized finish—AA-M32-C22-A31 (204R1)—as well as plain. Aluminum brackets cover a wide range of applications, including wall-and post-mounted brackets, brackets for center rails, and brackets for vertical mounting of rails or panels.
- **Bronze:** Cast brackets are made of alloy C86500 for close color match with extruded architectural bronze C38500 and red brass C23000. Extruded and machined brackets are of C38500. All, except as noted, are satin finished and lacquered.
- **Nickel-Silver:** Cast brackets closely match extruded nickel-silver handrails. Extruded and machined brackets are of alloy C79800. All, except as noted, are satin finished and lacquered.
- **Stainless Steel:** Brackets are made of 18-8 chrome-nickel alloy, stainless type 304, for high corrosion resistance. All, except as noted, are satin finished.
- **Malleable Iron and Stamped Steel:** All types are stocked with flat top member for mouldings and with curved top member for pipe rails. They may be welded or mechanically fastened to the rail. Pipe rail brackets are supplied galvanized as well as plain.
- **Titanium:** Silver-gray and softly reflective in appearance, titanium is a non-reactive metal and can be combined with bronze, aluminum, steel, or stainless handrails. Eco-friendly and low maintenance, it has outstanding corrosion resistance and requires no additional finishing. Because of its high strength, Julius Blum & Co., Inc. is able to design thinner and lighter handrail brackets.

Julius Blum & Co., Inc.'s handrail brackets have been designed to meet or exceed accepted safety standards and have been laboratory tested. Test results are available upon request.

Fasteners, except as noted, are not included. All items are carried in stock in substantial quantities and are available for prompt shipment.



Primary School

CARLSTADT® SELF-ALIGNING WALL BRACKETS

These wall brackets, available in aluminum, bronze, nickel-silver, and stainless steel, are self-aligning. Once the concealed wall attachment is made, the bracket yoke—which attaches to the handrail—rotates freely until the chosen handrail is properly aligned. Various styles are available to coordinate with different handrail mouldings and with pipe railings.


313


173


370


1622


843


321


478


275

CARLSTADT® SELF-ALIGNING POST BRACKETS

Post brackets, available in aluminum, bronze, nickel-silver, and stainless steel, are post-mounted variations of the Carlstadt® wall brackets. A solid post is prepared by drilling and tapping to provide a match to the ½" stainless stud included as part of the bracket. The stainless stud may be replaced with a post bracket hanger bolt for attachment to a wood post. Hollow posts require a clear hole to be drilled with a tapped post cap or anchor plug inserted to accept the stud.


439


1341

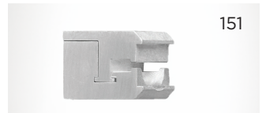

163


290


222


309


896

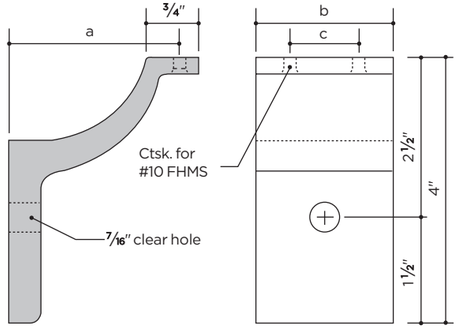

151

VERTICAL MOUNTING BRACKETS

The mounting brackets are useful for mounting handrails vertically, as in an elevator cab or hospital corridor. These brackets are often used with wood handrails, vertically mounted. They are also suitable for mounting handrails on top of a parapet or knee wall. Adapters are available to permit attachment to pipe or round tube.

ALUMINUM BRONZE NICKEL-SILVER STAINLESS MALLEABLE IRON / STEEL TITANIUM

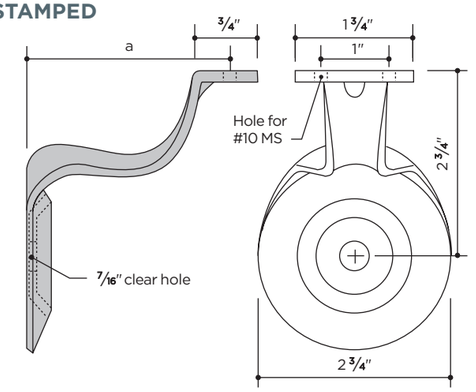
EXTRUDED – UNPOLISHED



		a	b	c
● **477**	Aluminum	2 1/2"	2"	1"
● **497**	Aluminum	3"	2"	1"
● **891**	Bronze	2 1/2"	2"	1"
● **893**	Bronze	3"	2"	1"
● **193**	Nickel-Silver	3"	2"	1"
● **217†**	Stainless	2 1/2"	2"	1"
● **219†**	Stainless	3"	2"	1"
● **9977**	Titanium	2 1/2"	1 1/2"	3/4"

† Satin Finish

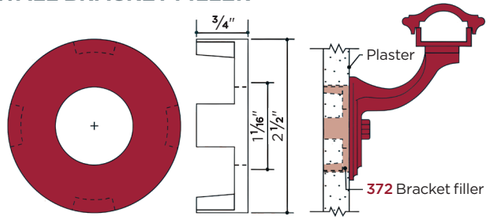
STAMPED



		a
● **621**	Steel	2 1/2"
● **625**	Steel	3"
● **1021††**	Stainless	2 1/2"

†† Burnished

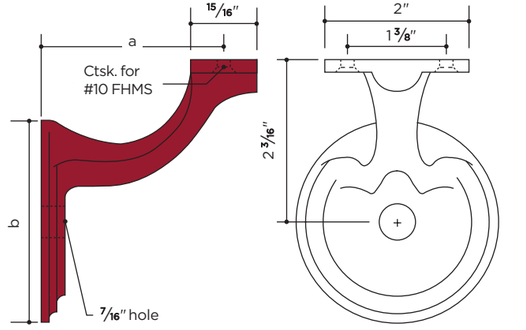
WALL BRACKET FILLER



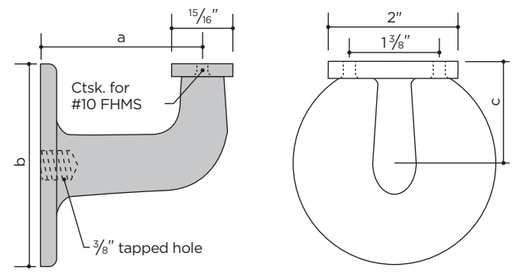
● **372**	Malleable Iron

Set bracket filler in plaster wall before mounting handrail bracket.

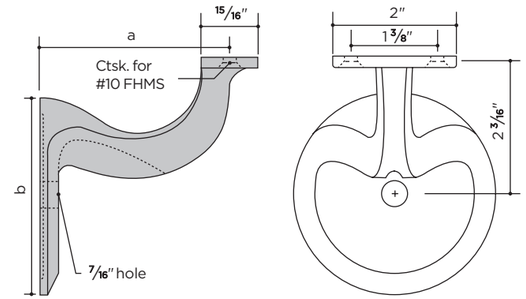
CAST



		a	b
● **381**	Malleable Iron	2 1/2"	2 3/4"
● **305**	Malleable Iron	3"	3 1/4"



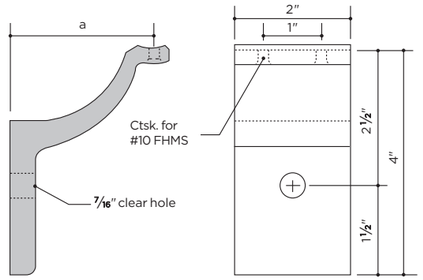
		a	b	c
● **371**	Aluminum	2 1/2"	3 1/8"	1 9/16"
● **302**	Aluminum	3 1/8"	3 3/4"	1 7/8"
● **370**	Bronze	2 1/2"	3 1/8"	1 9/16"
● **304**	Bronze	3 1/8"	3 3/4"	1 7/8"
● **170**	Nickel-Silver	2 1/2"	3 1/8"	1 9/16"
● **270**	Stainless	2 1/2"	3 1/8"	1 9/16"
● **377**	Malleable Iron	2 1/2"	3 1/8"	1 9/16"
● **385**	Malleable Iron	3"	3 1/8"	1 9/16"



		a	b
● **383**	Aluminum	2 1/2"	2 3/4"
● **315**	Aluminum	3"	3 1/4"
● **387**	Bronze	2 1/2"	2 3/4"
● **317**	Bronze	3"	3 1/4"
● **1087**	Stainless	2 1/2"	2 3/4"

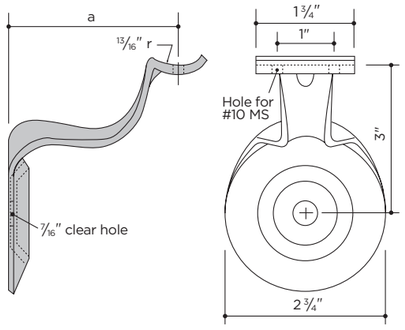
ALUMINUM BRONZE NICKEL-SILVER STAINLESS MALLEABLE IRON / STEEL

EXTRUDED – UNPOLISHED



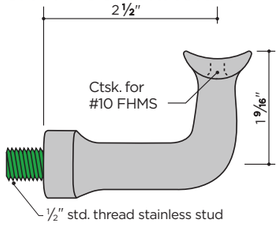
		a
● **478***	Aluminum	2 1/2"
● **498***	Aluminum	3"
● **892**	Bronze	2 1/2"
● **894**	Bronze	3"
● **192**	Nickel-Silver	2 1/2"
● **218†**	Stainless	2 1/2"
● **220†**	Stainless	3"

STAMPED



		a
● **622**	Steel	2 1/2"
● **1622****	Steel (Galvanized)	2 1/2"
● **1022††**	Stainless	2 1/2"
● **626**	Steel	3"
● **1626****	Steel (Galvanized)	3"
● **1026††**	Stainless	3"

CAST POST BRACKET

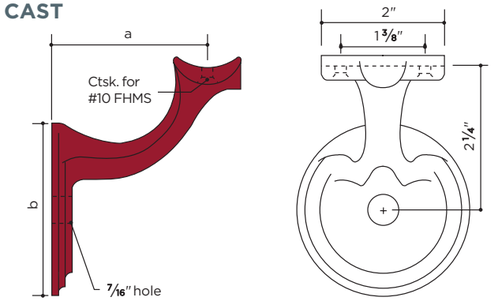


		a	b
● **373**	Al.	2 1/2"	1 9/16"
● **303**	Br.	2 1/2"	1 9/16"
● **374**	Mal. Iron	2 1/2"	1 9/16"

•Post bracket adapter, pg. 94

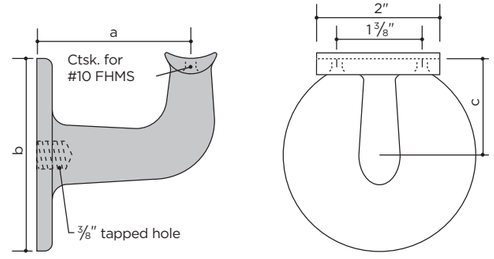
* Also available in clear anodized AA-M10-C22-A31 (204R1)
† Satin Finish †† Burnished
** Galvanized brackets may require redrilling and tapping of holes fouled by zinc

CAST

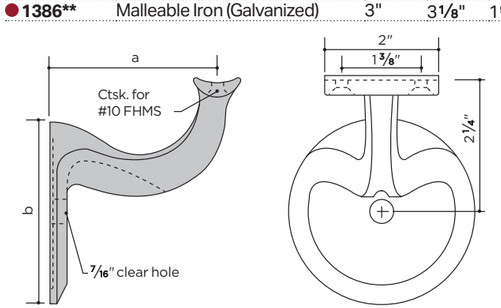


		a	b
● **382**	Malleable Iron	2 1/2"	2 3/4"
● **382-B**	Malleable Iron (Black)^	2 1/2"	2 3/4"
● **382-W**	Malleable Iron (White)^	2 1/2"	2 3/4"
● **1382****	Malleable Iron (Galvanized)	2 1/2"	2 3/4"
● **306**	Malleable Iron	3"	3 1/4"
● **1306****	Malleable Iron (Galvanized)	3"	3 1/4"

^ Powdercoated



		a	b	c
● **376***	Aluminum	2 1/2"	3 1/8"	1 9/16"
● **389***	Aluminum	3 1/8"	3 3/4"	1 7/8"
● **375**	Bronze	2 1/2"	3 1/8"	1 9/16"
● **319**	Bronze	3 1/8"	3 3/4"	1 7/8"
● **176**	Nickel-Silver	2 1/2"	3 1/8"	1 9/16"
● **275**	Stainless	2 1/2"	3 1/8"	1 9/16"
● **378**	Malleable Iron	2 1/2"	3 1/8"	1 9/16"
● **386**	Malleable Iron	3"	3 1/8"	1 9/16"
● **1378****	Malleable Iron (Galvanized)	2 1/2"	3 1/8"	1 9/16"
● **1386****	Malleable Iron (Galvanized)	3"	3 1/8"	1 9/16"

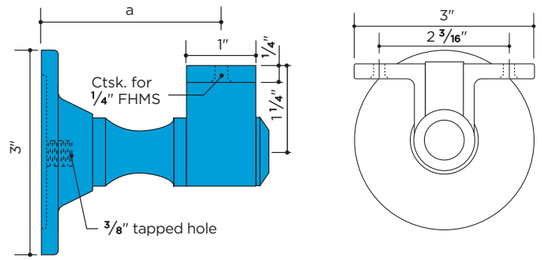


		a	b
● **384***	Aluminum	2 1/2"	2 3/4"
● **316***	Aluminum	3"	3 1/4"
● **388**	Bronze	2 1/2"	2 3/4"
● **318**	Bronze	3"	3 1/4"
● **1088**	Stainless	2 1/2"	2 3/4"

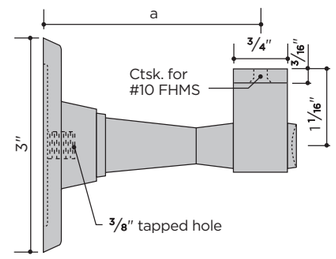
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

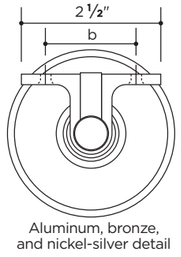
SELF-ALIGNING

Satin Finish

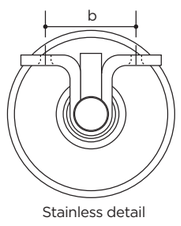


For use with **Carlstadt**® handrail moulding		a
● **313**	Aluminum	2 5/8"
● **314**	Aluminum	3 1/8"

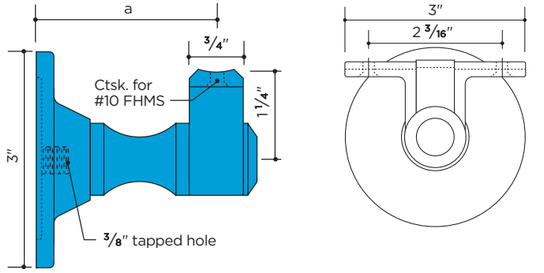




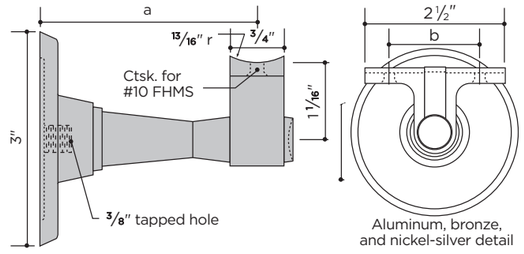
		a	b
● **443**	Aluminum	3"	1 5/8"
● **444**	Aluminum	3 1/2"	1 5/8"
● **844**	Bronze	2 1/2"	1 5/8"
● **843**	Bronze	3"	1 5/8"
● **1343**	Nickel-Silver	3"	1 5/8"
● **271**	Stainless	2 1/4"	1 13/16"
● **243**	Stainless	3"	1 13/16"



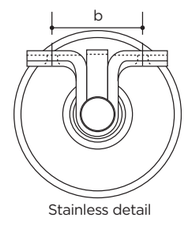
For use with pipe railings

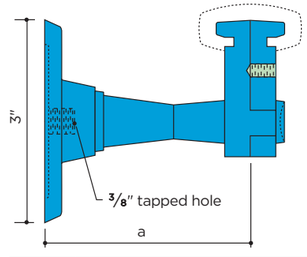


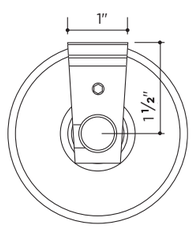
		a
● **307***	Aluminum	2 1/2"
● **308***	Aluminum	3"



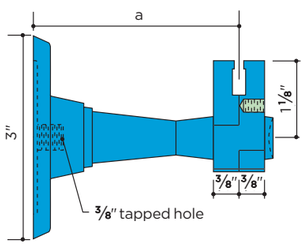
		a	b
● **321***	Aluminum	2 1/4"	1 5/8"
● **403***	Aluminum	3"	1 5/8"
● **405***	Aluminum	3 1/2"	1 5/8"
● **842**	Bronze	2 1/4"	1 5/8"
● **801**	Bronze	2 1/2"	1 5/8"
● **803**	Bronze	3"	1 5/8"
● **1342**	Nickel-Silver	2 1/4"	1 5/8"
● **1303**	Nickel-Silver	3"	1 5/8"
● **242**	Stainless	2 1/4"	1 13/16"
● **221**	Stainless	2 1/2"	1 13/16"
● **223**	Stainless	3"	1 13/16"

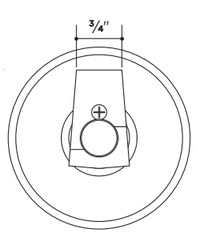






For use with **Carlsrail**® handrail moulding		a
● **175**	Aluminum	2 1/4"
● **173**	Aluminum	3"
● **174**	Aluminum	3 1/2"





For use with **Carlstadt**® T-handrail moulding		a
● **418**	Aluminum	3"
● **419**	Aluminum	3 1/2"

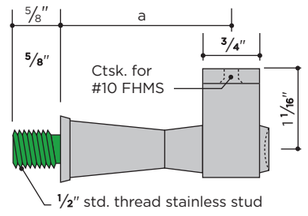
* Also available in clear anodized AA-M32-C22-A31 (204R1) Wall bracket extensions, pg. 94

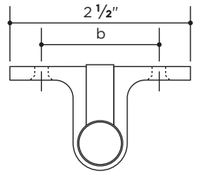
ALUMINUM BRONZE NICKEL-SILVER STAINLESS MALLEABLE IRON

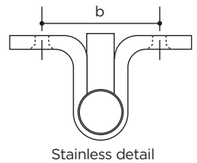
SELF-ALIGNING

Carlstadt® Post Brackets are supplied with 1/2" stainless steel studs for attachment to metal posts.
To mount Carlstadt® Post Brackets onto wood, use the post bracket hanger bolt shown on page 94.

Satin Finish

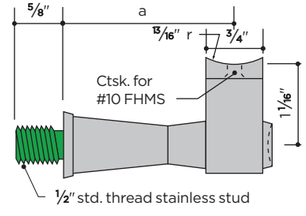


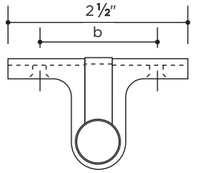


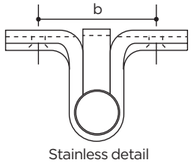


		a	b
● **441**	Aluminum	2 1/4"	1 5/8"
● **442**	Aluminum	2 3/4"	1 5/8"
● **841**	Bronze	2 1/4"	1 5/8"
● **1341**	Nickel-Silver	2 1/4"	1 5/8"
● **241**	Stainless	2 1/4"	1 13/16"

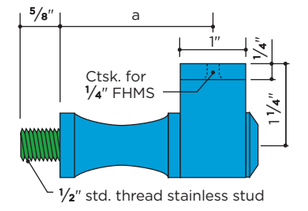
For use with pipe railings

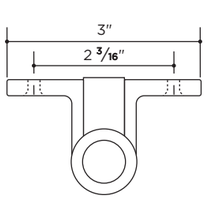




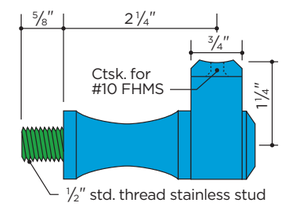


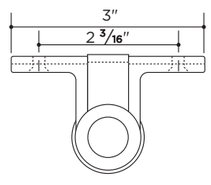
		a	b
● **402***	Aluminum	2 1/4"	1 5/8"
● **402L***	Aluminum	2 1/2"	1 5/8"
● **404***	Aluminum	2 3/4"	1 5/8"
● **802**	Bronze	2 1/4"	1 5/8"
● **1302**	Nickel-Silver	2 1/4"	1 5/8"
● **222**	Stainless	2 1/4"	1 13/16"
● **222L**	Stainless	2 1/2"	1 5/8"



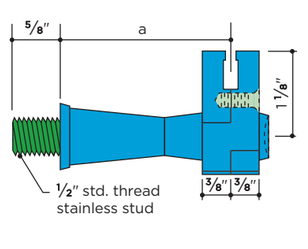


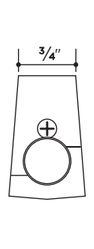
For use with Carlstadt® handrail moulding		a
● **309**	Aluminum	3 1/4"
● **312**	Aluminum	2 3/8"



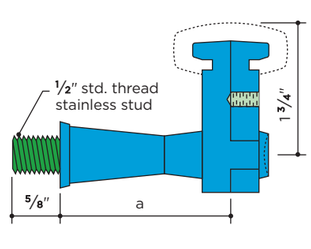


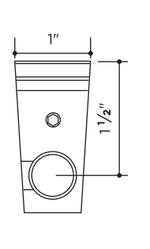
● **322***	Aluminum





For use with **Carlstadt**® T-handrail moulding		a
● **439**	Aluminum	2 1/4"
● **440**	Aluminum	2 3/4"





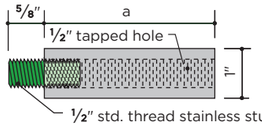
For use with **Carlsrail**® handrail moulding		a
● **171**	Aluminum	2 1/4"
● **172**	Aluminum	2 3/4"

* Also available in clear anodized AA-M32-C22-A31 (204R1) Post bracket extensions, pg. 94

HANDRAIL BRAKETS

ALUMINUM BRONZE NICKEL-SILVER STAINLESS CAST IRON/MALLEABLE IRON/STEEL

POST BRACKET EXTENSIONS



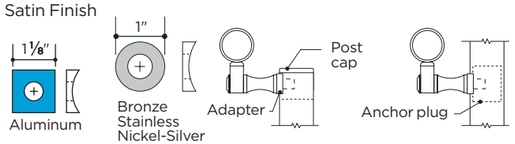
		a
● **462***	Aluminum	1¾"
● **463***	Aluminum	3"
● **862**	Bronze	1¾"
● **863**	Bronze	3"
● **1362**	Nickel-Silver	1¾"
● **1366**	Nickel-Silver	3"
● **245**	Stainless	1¾"
● **246**	Stainless	3"

Extensions may be cut to length to suit individual conditions.

Designers should note that extending a bracket increases stress at its base and reduces its allowable load.

POST BRACKET ADAPTER

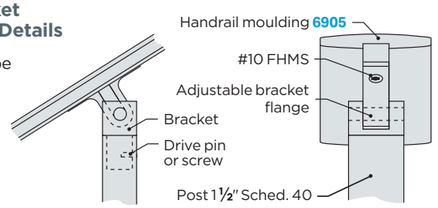
Satin Finish



		Pipe Size	Schedule	Clear Hole
● **7161***	Aluminum	1¼"	all	½"
● **7261***	Aluminum	1½"	all	½"
● **8661**	Bronze	1¼"	all	½"
● **8861**	Bronze	1½"	all	½"
● **1361**	Nickel-Silver	1½"	all	½"
● **9161**	Stainless	1¼"	all	½"
● **9361**	Stainless	1½"	all	½"
● **3164**	Malleable Iron	1½"	all	½"

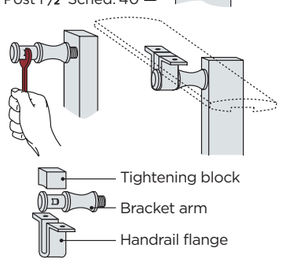
Post Bracket Assembly Details

Angle may be adjusted as required.

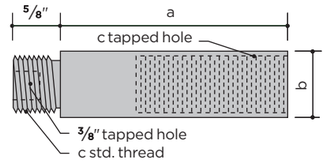


Adjustable Bracket Detail

Post and upper post cap must be drilled and tapped to accept bracket arm. Recess of bracket arm has flat sides to accommodate wrench, which permits tightening without marring exposed surfaces. Handrail flange tilts to adjust to stair angle and is attached to handrail with machine screws. Pressure on tightening block prevents looseness and rattling.



WALL BRACKET EXTENSIONS



For use with **307**, **308**, **313**, and **314** wall brackets

		a	b	c
● **414***	Aluminum	1¾"	1⅛"	⅞"
● **415***	Aluminum	3"	1⅛"	⅞"

For use with Carlstadt® wall brackets

		a	b	c
● **464**	Aluminum	1¾"	1"	¾"
● **465**	Aluminum	3"	1"	¾"
● **864**	Bronze	1¾"	1"	¾"
● **865**	Bronze	3"	1"	¾"
● **1364**	Nickel-Silver	1¾"	1"	¾"
● **1365**	Nickel-Silver	3"	1"	¾"
● **247**	Stainless	1¾"	1"	¾"
● **248**	Stainless	3"	1"	¾"

Extensions may be cut to length to suit individual conditions but not shorter than 1⅝".

Extending the reach of a handrail bracket reduces its load-bearing capacity. To compensate for the reduced strength, the number of brackets may be increased and their spacing reduced.

BOLTS AND ANCHORS

For handrail wall brackets

Hanger Bolt

● Steel ⅜" x 3"

Hex Head Lag Screw

● Aluminum ⅜" x 2"
● Brass ⅜" x 2" (Plain or Finished)
● Nickel-Silver ⅜" x 2" (Finished)
● Stainless ⅜" x 2"

Post Bracket Hanger Bolt

● Steel 5/16" x 1 1/2" / 1/2"-13 x ⅜"

Heavy-Duty Double Machine Bolt Anchor
(Zinc Alloy)

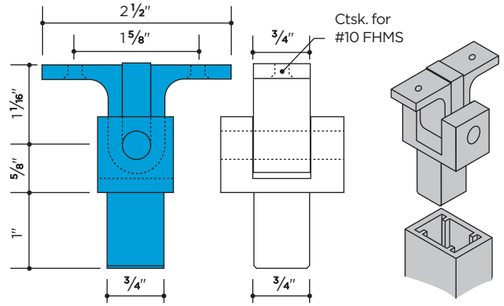
Non-calking machine bolt anchor for use in masonry materials of questionable strength or where heavy shear loads are encountered. Thread accommodates ⅜" – 16 stud or machine bolt (supplied by others). Drill hole size of ¾" diameter by 2 ¼" deep.

* Also available in clear anodized AA-M10-C22-A31 (204R1)

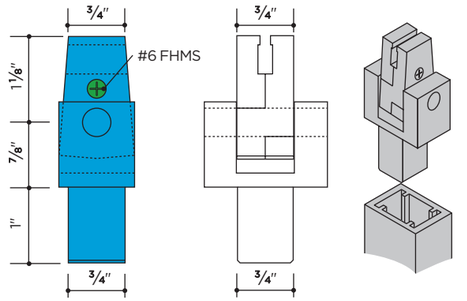
ALUMINUM STAINLESS

CENTER POST BRACKETS

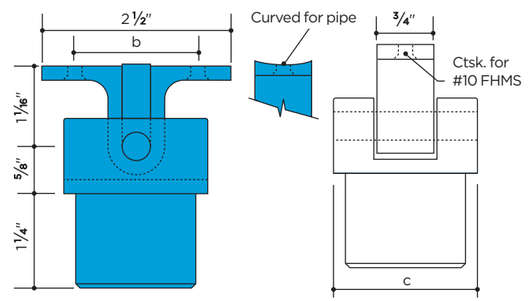
Center post brackets permit handrail to be centered directly over post, yet allow it to tilt to conform to stair incline. Bracket is secured to post with pin or screw.



● **161**	Aluminum	Curved for pipe, fits posts **430** and **6430**
● **162**	Aluminum	Flat for moulding, fits posts **430** and **6430**



● **152** Aluminum Fits posts **430**, **6430**, and Carlstadt® T-handrail moulding

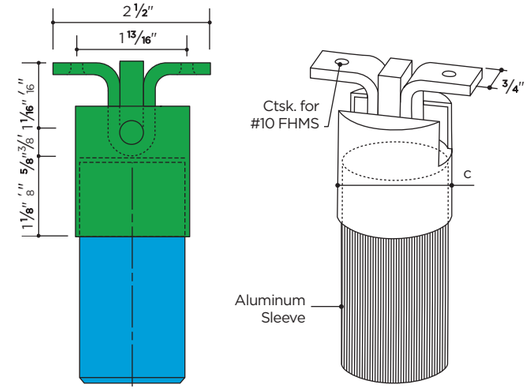


For center mounting of flat-bottomed handrail onto aluminum Connectorail® posts

Flat		Pipe	Sched.	c	b
● **144**	Aluminum	1¼"	40	1.660"	1⅝"
● **145**	Aluminum	1½"	40	1.900"	1⅝"

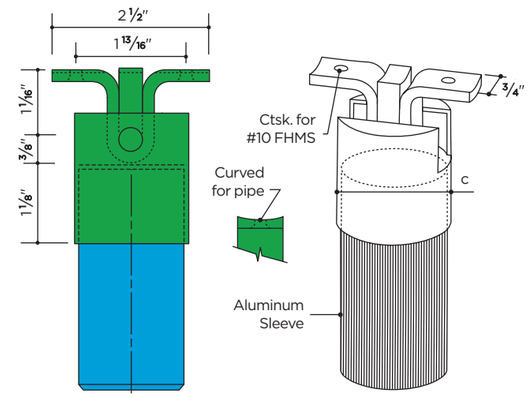
For center mounting of pipe or rounded handrail onto aluminum Connectorail® posts

Curved		Pipe	Sched.	c	b
● **142**	Aluminum	1¼"	40	1.660"	1⅝"
● **143**	Aluminum	1½"	40	1.900"	1⅝"



For center mounting of flat-bottomed handrail moulding onto stainless Connectorail® posts

Flat		Pipe	Sched.	c
● **207**	Stainless Steel	1½"	5	1.900"



For center mounting of handrail pipe or rounded handrail onto stainless Connectorail® posts

Curved		Pipe	Sched.	c
● **208**	Stainless Steel	1½"	5	1.900"

HANDRAIL BRAKETS

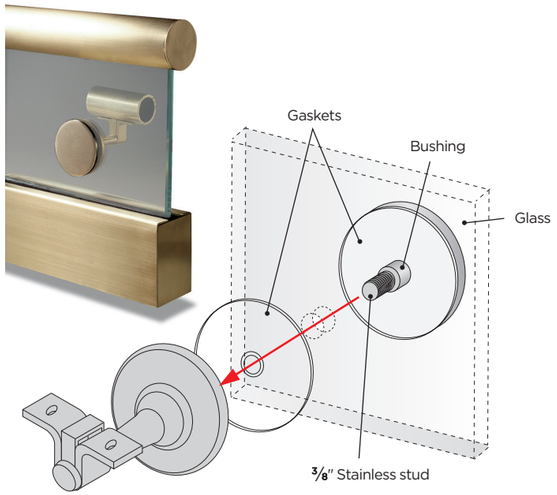
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

GLASS-MOUNTED HANDRAIL

Handrail may be mounted to the face of the tempered glass balustrade using a combination of Carlstadt® wall brackets and our glass mounting adapter kit. The kit contains a disc with a ⅜" stud weld, a bushing, and two gaskets.

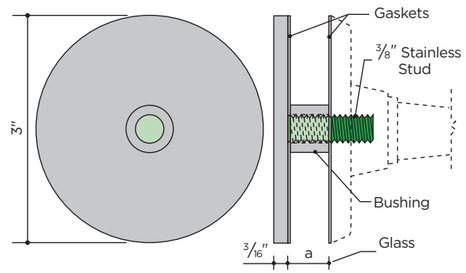
To assemble:

1. Prior to tempering, for ½" glass drill a ⅝" clear hole; for ¾" glass drill a ⅞"clear hole. **(Do not attempt to drill a hole in tempered glass — it will most likely break).**
2. Insert the bushing into the hole.
3. Insert the stud welded disc with gasket through the bushing; place the gasket on the other side.
4. Thread on bracket and tighten.



GLASS-MOUNTED HANDRAIL ADAPTER KIT

For ½" and ¾" glass, Satin Finish

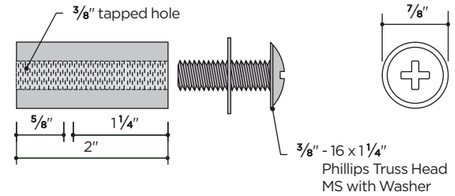


		Glass Size	a	Bushing Diameter
824	Bronze	½"	½"	⅝"
840	Bronze	¾"	¾"	⅞"
224*	Stainless	½"	½"	⅝"
240*	Stainless	¾"	¾"	⅞"
1624	Nickel-Silver	½"	½"	⅝"
1640	Nickel-Silver	¾"	¾"	⅞"

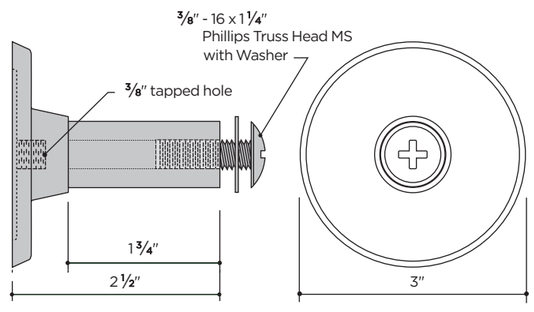
* For use with aluminum and stainless brackets

THREADED BUSHING BRACKETS

Satin Finish

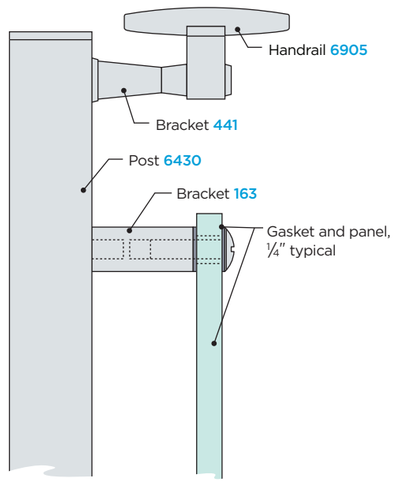


163	Aluminum
63	Stainless



164	Aluminum
64	Stainless

Installation Details

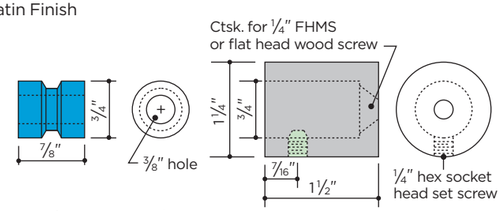


Threaded bushing brackets are used with threaded studs, machine screws, or bolts to install handrails or panels. Brackets may be cut to length as required. Brackets are furnished with aluminum Phillips Truss Head machine screws and washers.

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

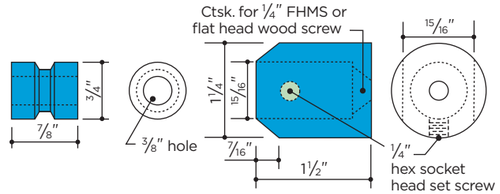
TWO-PIECE MOUNTING BRACKETS

Satin Finish



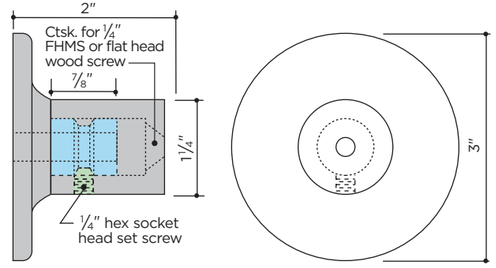
For elevator car handrails

166*	Aluminum
896	Bronze
196	Nickel-Silver
296	Stainless



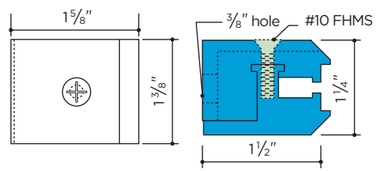
167	Aluminum	For narrow posts

Versatile two-piece mounting brackets with concealed fasteners are suitable for mounting wall handrails and elevator car rails. 167 is tapered for mounting on a post of 1" or greater width.



168*	Aluminum
898	Bronze
298	Stainless

VERTICAL MOUNTING BRACKET

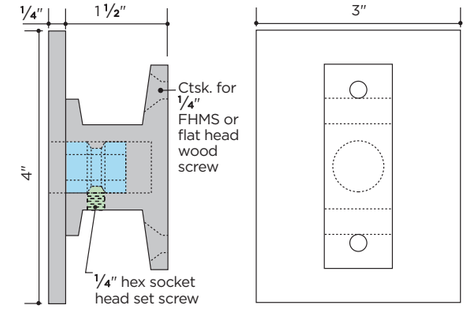


151	Aluminum

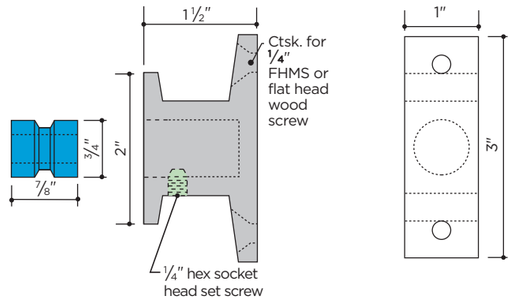
Vertical mounting bracket 151 is designed for mounting handrail on edge to provide a wall guard or bumper. T-handrail mouldings 6402, 6405, or 6407 can be mounted without drilling and tapping. Bracket is also suitable for mounting handrail on top of a parapet or wall.

TWO-PIECE MOUNTING BRACKETS

Satin Finish
For wide wood handrail

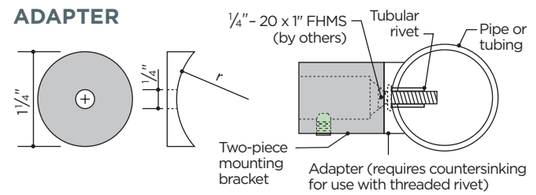


160*	Aluminum
890	Bronze
290	Stainless



169*	Aluminum
899	Bronze
299	Stainless

ADAPTER

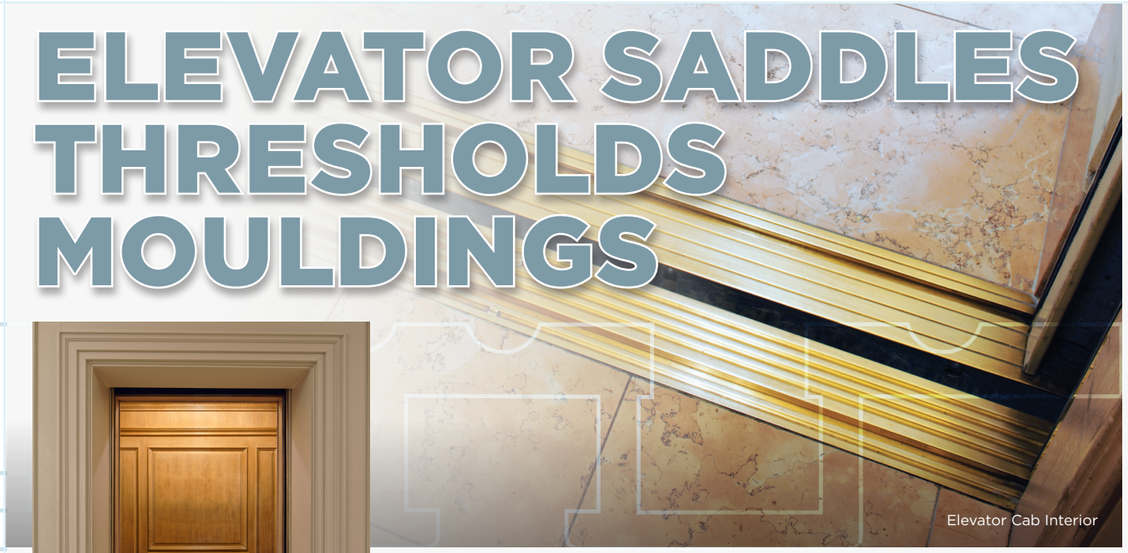


		r	Use With
7164*	Aluminum	.830"	1.660" OD
7264*	Aluminum	.950"	1.900" OD
8864	Bronze	.950"	1.900" OD
8964	Bronze	.750"	1.500" OD
5264	Nickel-Silver	.750"	1.500" OD
5364	Nickel-Silver	.950"	1.900" OD
9164	Stainless	.830"	1.660" OD
9364	Stainless	.950"	1.900" OD

* Also available in clear anodized AA-M32-C22-A31 (204R1)

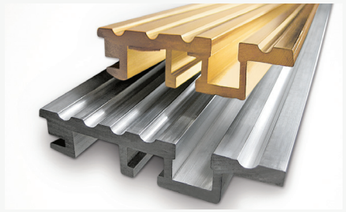
HANDRAIL BRAKETS

ELEVATOR SADDLES THRESHOLDS MOULDINGS



This section details our components that are of particular use in the assembly of elevator cabs. Included are Elevator Door Saddles, Flat Fluted Sections, Thresholds and Mouldings, Glass Framing Sections, Door Edgings, and Handrail Mouldings and Brackets suitable for vertical mounting. All brackets are satin finished.

- **Aluminum** components are of alloy 6063; extrusions are T52 temper while machined brackets are T6 temper. When properly fabricated, they are suitable for anodizing, including most of the hard coat anodic processes. Black anodizing may result in inconsistent matches—consult your anodizer before specifying.
- **Bronze** components are of extruded architectural bronze alloy, C38500.
- **Nickel-Silver** saddles, fluted sections, and handrail are extruded from copper-nickel-zinc alloy, C79800.
- **Stainless Steel** components are made of Type 302/304 (18-8) stainless steel.

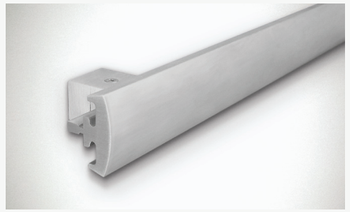


SADDLES

Elevator and door saddles are available in aluminum, bronze, nickel-silver, stainless steel, and steel. To extend width, flat fluted sections may be combined with single-or double-speed saddles. Saddle alloy matches handrail alloy. Components sold mill finish.

MOULDINGS

A variety of architectural mouldings are available from stock. These mouldings provide for alternate methods of glass framing or door edgings. In restoration work, mouldings are frequently combined.



HANDRAILS AND BRACKETS

Julius Blum & Co., Inc. stocks a large variety of handrail mouldings and brackets for both horizontal and vertical mounting in elevator cabs. Matching elbows and end caps are also available for most sections. Handrail sections are supplied with a smooth mill finish suitable for architectural finishes. All brackets satin finished.

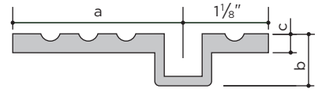
TUBING, BARS, AND SHAPES

A large selection of tubing, bars, and shapes are available from stock in aluminum, bronze, steel, nickel-silver and stainless steel. Refer to pages 106-121. Shapes are extruded to high tolerances and have the sharp corners required for architectural work. Angles and tees are frequently used in dropped ceilings as well as in other areas of elevator cabs.

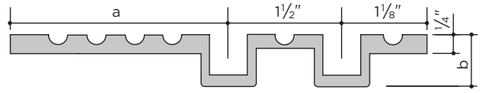
ALUMINUM BRONZE NICKEL-SILVER STAINLESS

ELEVATOR DOOR SADDLES

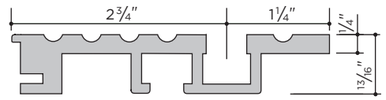
Mill Finish



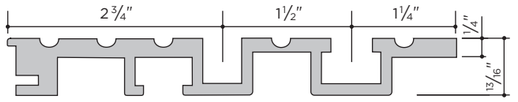
		a	b	c	lb/ft	Lengths
6963	Aluminum	2¼"	11/16"	¼"	.85	20'
6969	Aluminum	2⅞"	11/16"	¼"	1.08	20'
4563	Bronze	2¼"	11/16"	¼"	2.96	6', 8', 10', 16'
4569	Bronze	2⅞"	11/16"	¼"	3.93	6', 8', 10', 16'
5563	Nickel-Silver	2¼"	¾"	¼"	3.58	6', 8', 10'
5569	Nickel-Silver	2⅞"	11/16"	¼"	4.16	6', 8', 10'
5569X	Nickel-Silver	2⅞"	11/16"	⅜"	5.40	6', 8'



		a	b	lb/ft	Lengths
6964	Aluminum	2¼"	11/16"	1.25	20'
6979	Aluminum	2⅞"	11/16"	1.44	20'
4564	Bronze	2¼"	11/16"	4.25	6', 8', 10', 16'
4579	Bronze	2⅞"	11/16"	5.09	6', 8', 10', 12'
5564	Nickel-Silver	2¼"	¾"	5.42	6', 8', 10'
5579	Nickel-Silver	2⅞"	11/16"	6.35	6', 8', 10'



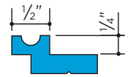
		lb/ft	Lengths
6989	Aluminum	1.54	20'
4589	Bronze	4.79	8', 10'
5589	Nickel-Silver	5.05	8', 10'



		lb/ft	Lengths
6999	Aluminum	2.10	20'
4599	Bronze	6.55	8', 10'
5599	Nickel-Silver	7.00	8', 10'

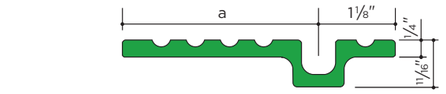
EXTENSIONS

20' lengths, Mill Finish

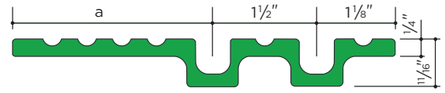


		lb/ft
6967	Aluminum	.314

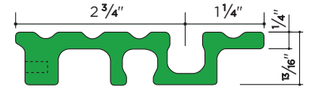

Interior Office Building, New York, NY.
National Elevator Cab & Door Corp. Woodside, NY (Fabricator).



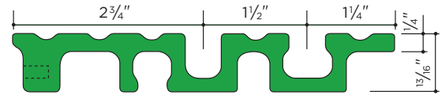
		a	lb/ft	Lengths
6569	Stainless	2⅞"	3.71	8'
6571	Stainless	2¼"	3.32	8'



		a	lb/ft	Lengths
6579	Stainless	2⅞"	5.53	8'
6572	Stainless	2¼"	5.18	8'



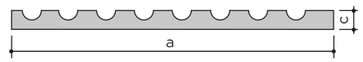
6589	Stainless	5.35 lb/ft	8' lengths



6599	Stainless	7.52 lb/ft	8' lengths

FLAT FLUTED SECTIONS

20' lengths, except as noted. For assembled saddles, Mill Finish



		a	c	lb/ft
6980* **	Aluminum	1"	¼"	.234
6970	Aluminum	1½"	¼"	.361
6971	Aluminum	2"	¼"	.482
6973	Aluminum	3"	¼"	.723
6975	Aluminum	4"	¼"	.964
4566	Bronze	1"	¼"	.720
4558	Bronze	1½"	¼"	1.150
4557	Bronze	2"	¼"	1.480
4557X*	Bronze	2"	⅜"	2.390
4556	Bronze	2½"	¼"	1.840
4555	Bronze	3"	¼"	2.230
4554* **	Bronze	3½"	¼"	2.550
4553	Bronze	4"	¼"	2.890
4553Q	Bronze	4¼"	¼"	3.260
4552	Bronze	4½"	¼"	3.290
4551	Bronze	5"	¼"	3.670
4550*	Bronze	5½"	¼"	4.050
4559	Bronze	6⅛"	¼"	4.550
5558* **	Nickel-Silver	1½"	¼"	1.150
5553* **	Nickel-Silver	4"	¼"	3.040
6573 **	Stainless	2⅜"	¼"	1.780
6575 **	Stainless	4"	¼"	3.050

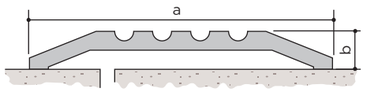
* 16' lengths ** 8' lengths *** 10' lengths

ALUMINUM BRONZE STEEL

DOOR SADDLES

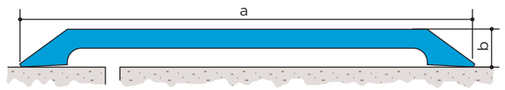
Mill Finish

FLUTED



		lb/ft	a	b	Lengths
6924	Aluminum	.72	3"	½"	16'-3"
6923	Aluminum	1.05	4"	½"	20'
6926	Aluminum	.83	4"	½"	16'-3"
6922	Aluminum	1.27	5"	½"	20'
6921	Aluminum	1.23	6"	½"	16'-3"
6925	Aluminum	1.76	7"	½"	20'
4524	Bronze	2.11	3"	⅜"	20'
4523	Bronze	3.05	4"	½"	20'
4522	Bronze	3.79	5"	½"	20'
4520	Bronze	4.64	6"	⅝"	20'
4519	Bronze	5.14	7"	½"	12'

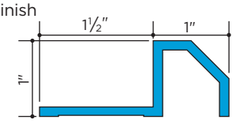
SMOOTH



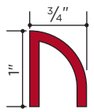
		lb/ft	a	b	Lengths
6910	Aluminum	.365	2½"	¼"	20'
6914	Aluminum	.476	3"	¼"	16'-3"

BATHROOM DOOR SADDLES

20' lengths, Mill Finish

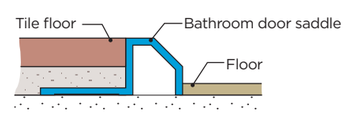


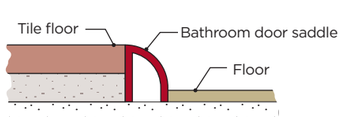
6948 Aluminum .576 lb/ft



4487 Steel .93 lb/ft

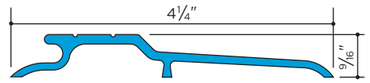
Typical Details



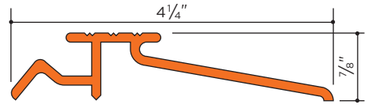


WEATHER STRIP DOOR SADDLES

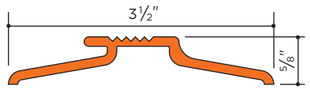
20' lengths, except as noted, Mill Finish



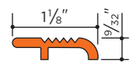
6991 Aluminum 16'-3" lengths .689 lb/ft



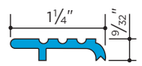
4596 Bronze 2.21 lb/ft



4590 Bronze 1.92 lb/ft



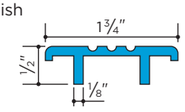
4598 Bronze .62 lb/ft



6998 Aluminum 16'-3" lengths .18 lb/ft

BUTT SADDLE

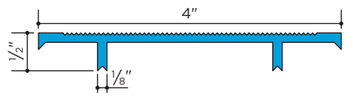
21'-1" lengths, Mill Finish



6915 Aluminum .398 lb/ft

CARPET SADDLE

21'-1" lengths, Mill Finish

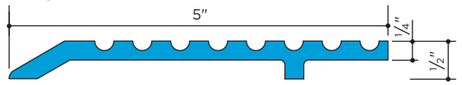


6916 Aluminum .653 lb/ft

ALUMINUM BRONZE

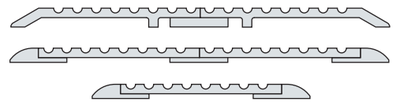
DOOR SADDLE SECTION

21'- 4" lengths, Mill Finish



6913 Aluminum 1.48 lb/ft

TYPICAL DOOR SADDLE DETAILS



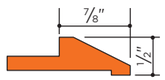
Cutouts for floor hinges can be made easily before assembly.

Wider saddles can be constructed by adding a flat fluted section in the center. The pattern of all fluted sections is identical, and joints with saddle sections will not be apparent.

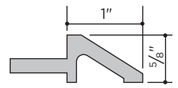
Saddles of extreme width can be constructed by using bevel end sections and two or more flat fluted sections with a plate underneath.

BEVEL END SECTIONS

20' lengths, Mill Finish



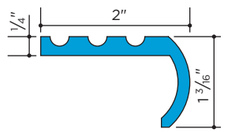
4526 Bronze 1.35 lb/ft



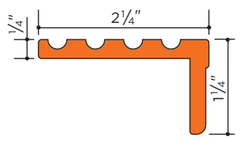
6927 Aluminum .45 lb/ft
4527 Bronze 1.48 lb/ft

NOSINGS

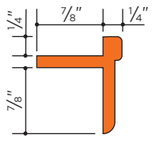
20' lengths, except as noted, Mill Finish



6961 Aluminum .722 lb/ft



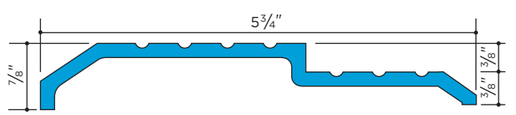
4560* Bronze 2.45 lb/ft
* 12' lengths



4565 Bronze 1.31 lb/ft

ROOF DOOR SADDLE

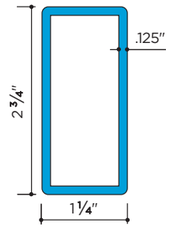
20' lengths, Mill Finish



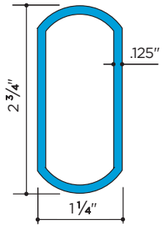
6997 Aluminum 1.45 lb/ft

HANDRAIL MOULDINGS

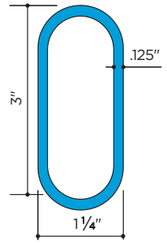
Aluminum 6063-T52, 20' lengths, Mill Finish



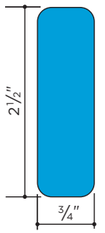
6434* 1.123 lb/ft
Fittings: end cap



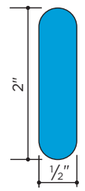
6435* 1.075 lb/ft
*6063-T6
Fittings: end cap



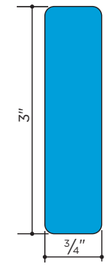
6437 1.057 lb/ft
Fittings: end cap



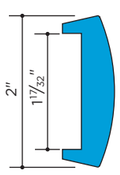
6939 2.214 lb/ft



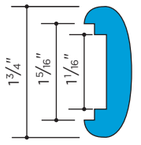
6988 1.138 lb/ft



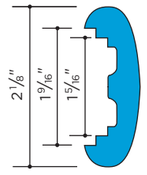
6986 2.684 lb/ft



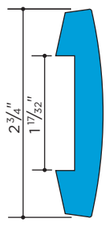
6985 .980 lb/ft
Fittings: end cap



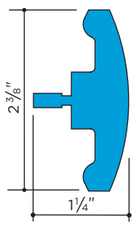
6933 .770 lb/ft
Fittings: end cap



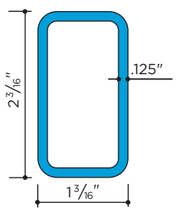
6935 .977 lb/ft
Fittings: end cap



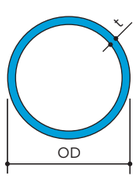
6984 1.301 lb/ft
Fittings: end cap



6402 1.510 lb/ft
Fittings: end cap



6436 .888 lb/ft
Fittings: end cap



Pipe size	OD	Sch.	t	lb/ft
1¼"	1.66"	10	.109"	.625
1¼"	1.66"	40	.140"	.785
1½"	1.90"	10	.109"	.721
1½"	1.90"	40	.145"	.940

Fittings: end cap

Additional mouldings on pages 34-38

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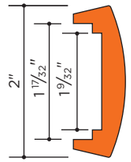
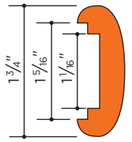
BRONZE NICKEL-SILVER STAINLESS

HANDRAIL MOULDINGS

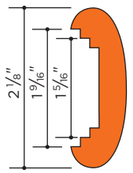
Bronze C38500, 20′ lengths, except as noted
Mill Finish



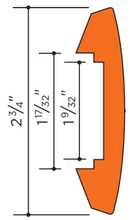
4575 2.37 lb/ft
Fittings: end cap



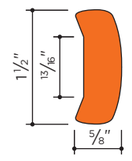
4539 2.66 lb/ft
Fittings: end cap



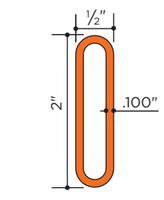
4535 3.35 lb/ft
Fittings: end cap



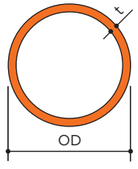
4574 3.71 lb/ft
Fittings: end cap



4503 Bronze 2.73 lb/ft
No fittings available

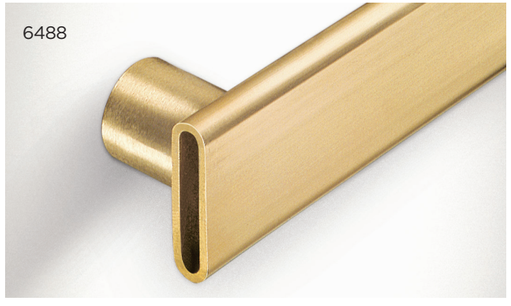


6488* 1.56 lb/ft
Fittings: end cap * 16′ lengths

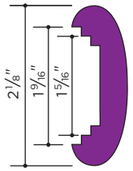


	OD	t	lb/ft
6489	1½"	.100"	1.75
	1.90"	.100"	2.07

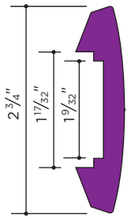
Fittings: end cap, elbow



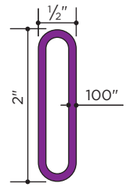
Nickel-Silver 79800, 20′ lengths,
Mill Finish



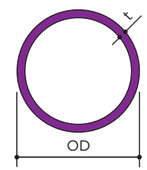
5235 3.16 lb/ft
Fittings: end cap



5274 3.71 lb/ft
Fittings: end cap



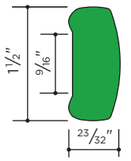
5288 1.56 lb/ft
Fittings: end cap



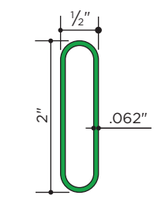
	OD	t	lb/ft
5289	1½"	.100"	1.75
	1.90"	.109"	2.25

Fittings: end cap

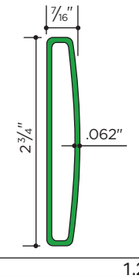
Stainless Type 302/304 (18-8), 20′ lengths, except as noted
Mill Finish



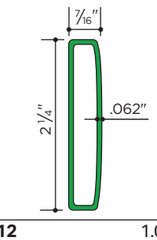
6503 2.54 lb/ft
16′ lengths. No fittings available



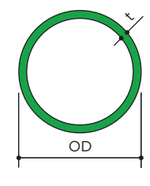
4488 .944 lb/ft
Fittings: end cap



6511 1.25 lb/ft
Fittings: end cap



6512 1.00 lb/ft
Fittings: end cap



Satin Finish			
Pipe size	OD	t	lb/ft
¾"	1.06	.113"	1.20
1"	1.32	.120"	1.46
1¼"	1.66	.062"	1.11
1¼"	1.66	.148"	2.15
1½"	1.90	.062"	1.27
1½"	1.90	.148"	2.55

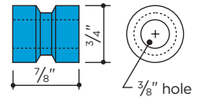
Fittings: end cap

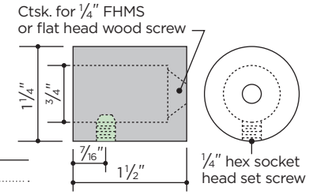
Additional mouldings on pages 34-38

ALUMINUM BRONZE NICKEL-SILVER STAINLESS

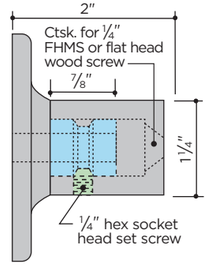
TWO-PIECE MOUNTING BRACKETS

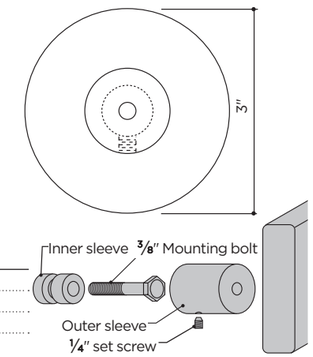
Satin Finish





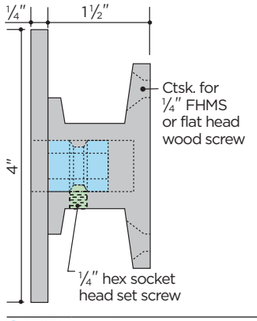
166* Aluminum
896 Bronze
196 Nickel-Silver
296 Stainless

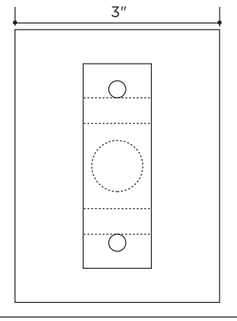




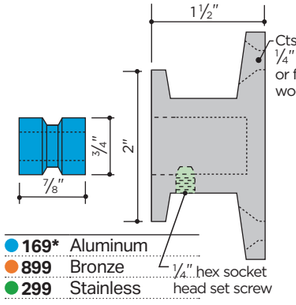
168* Aluminum
898 Bronze
298 Stainless

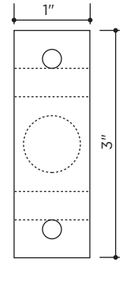
For wide wood handrails





160* Aluminum
890 Bronze
290 Stainless



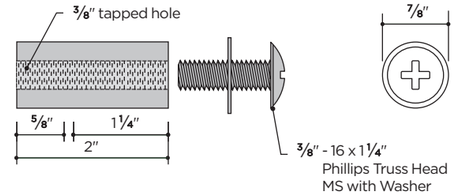


169* Aluminum
899 Bronze
299 Stainless

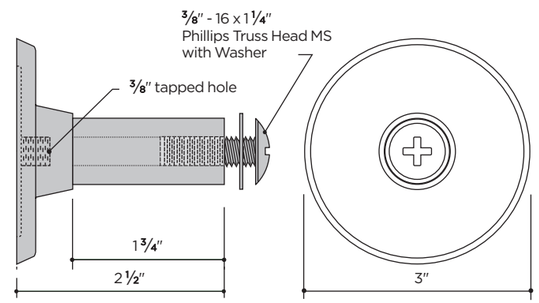
* Also available in clear anodized AA-M32-C22-A31 (204R1).

THREADED BUSHING BRACKETS

Satin Finish



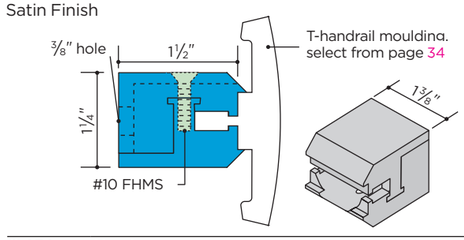
163 Aluminum
63 Stainless



164 Aluminum
64 Stainless

VERTICAL MOUNTING BRACKET

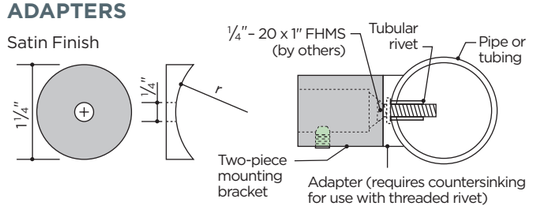
Satin Finish



151 Aluminum

ADAPTERS

Satin Finish



		r	Use With
7164*	Aluminum	.830"	1.660" OD
7264*	Aluminum	.950"	1.900" OD
8864	Bronze	.950"	1.900" OD
8964	Bronze	.750"	1.500" OD
5264	Nickel-Silver	.750"	1.500" OD
5364	Nickel-Silver	.950"	1.900" OD
9364	Stainless	.950"	1.900" OD

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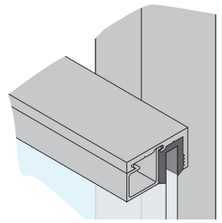
ALUMINUM BRONZE NICKEL-SILVER PLASTIC

Full Scale

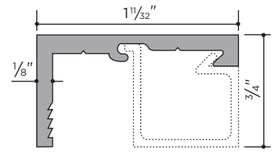
GLAZING MEMBERS

20′ lengths, except as noted

Aluminum and bronze glass stop/snap-in and flexible PVC glazing channel serve to mount panels of 1/4″ glass, plastic, wire mesh, or other material.



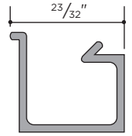
GLASS STOP



		lb/ft
● **8106**	Aluminum Mill Finish	.276
● **8206**	Aluminum Clear Anodized, AA-M10-C22-A31 (204R1)	.276
● **4506***	Bronze	.950

* 16′ lengths

SNAP-IN

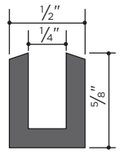


		lb/ft
● **8107**	Aluminum Mill Finish	.138
● **8207**	Aluminum Clear Anodized, AA-M10-C22-A31 (204R1)	.138
● **4507***	Bronze	.510

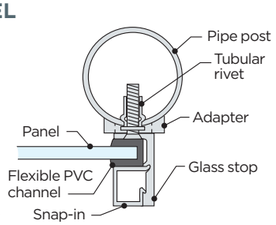
* 16′ lengths

FLEXIBLE PVC CHANNEL

50′ coils

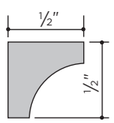


● **8708** Flexible PVC

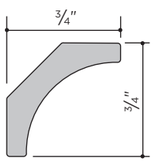


COVE MOULDINGS AND GLASS STOPS

20′ lengths



		lb/ft
● **6952**	Aluminum	.166
● **6102**	Bronze	.500

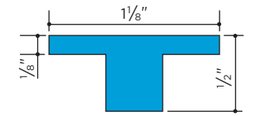


		lb/ft
● **6955**	Aluminum	.260
● **6105**	Bronze	.670

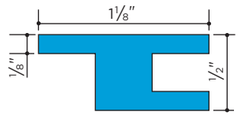
Full Scale

GLASS FRAMING SECTIONS

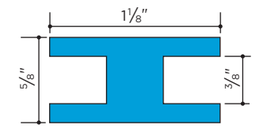
20′ lengths, except as noted



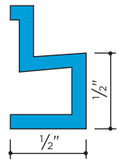
● **6958** Aluminum .338 lb/ft



● **6959** Aluminum .394 lb/ft



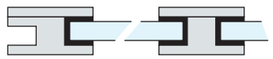
● **6960** Aluminum .507 lb/ft



● **6953*** Aluminum .183 lb/ft

* 16′ lengths

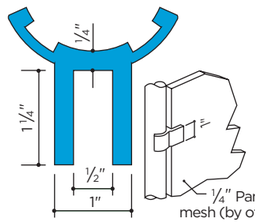
Framing Detail

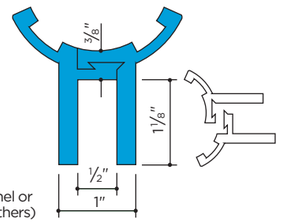


Sections **6958** and **6959** with flat bars

PANEL CLIPS

For aluminum pipe only





		Pipe
● **7460-5***	Aluminum	1 1/4″
● **7460†**	Aluminum	1 1/4″
● **7560-5***	Aluminum	1 1/2″
● **7560†**	Aluminum	1 1/2″

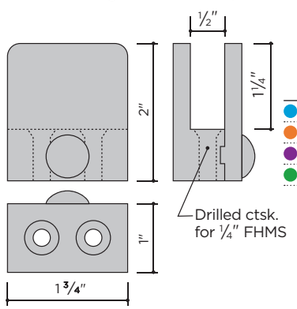
†Packages of 4 pieces

Packages of 4 sets		Pipe
● **7260****	Aluminum	1 1/2″

* 5′ Length

** Two-piece assembly

For mounting to flat surface, Satin Finish



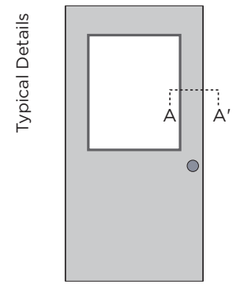
● **113**	Aluminum
● **813**	Bronze
● **413**	Nickel-Silver
● **213**	Stainless

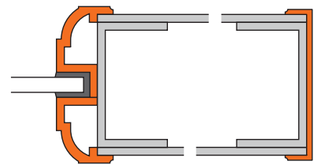
Plug (packed separately) is inserted following installation and may be held in place with epoxy or other sealant. Installation detail page 87.

ALUMINUM BRONZE

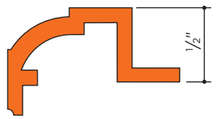
DOOR EDGINGS

16′ lengths, except as noted. Full Scale





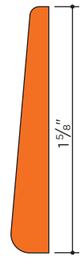
Detail at A–A′ with **6643**, **6645**, and **6646**



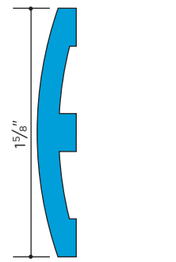
● **6645*** Bronze .79 lb/ft

● **6646*** Bronze .67 lb/ft

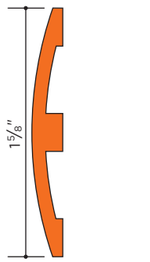
* 20′ lengths



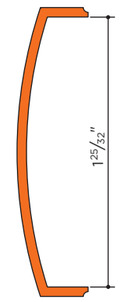
● **6648*** Bronze 1.10 lb/ft



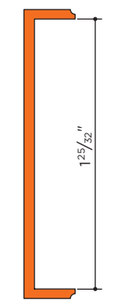
● **6947** Aluminum .384 lb/ft



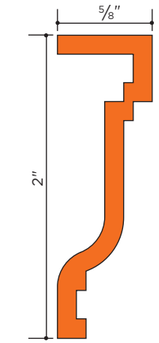
● **6647** Bronze .64 lb/ft



● **6642** Bronze .56 lb/ft



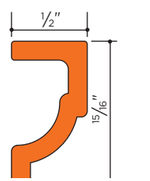
● **6643** Bronze .56 lb/ft



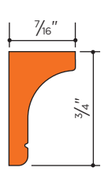
● **6138*** Bronze 1.35 lb/ft

VARIOUS MOULDINGS

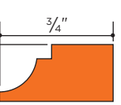
20′ lengths



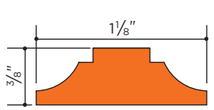
● **6130** Bronze .70 lb/ft



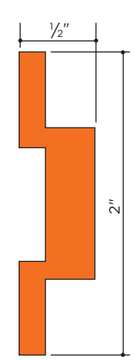
● **6121** Bronze .60 lb/ft



● **6473** Bronze .76 lb/ft



● **6474** Bronze 1.01 lb/ft



● **6140** Bronze 1.97 lb/ft

TUBING, BARS, AND SHAPES

Our extensive stock of tubing, bars and shapes in aluminum, bronze, nickel-silver, steel, and stainless steel has been selected especially to meet the requirements of ornamental and miscellaneous metal work.

All items are carried in stock in substantial quantities and shipment is made promptly upon receipt of order. All tubing, bars, and shapes are supplied in stock lengths with a mill finish, except as noted. Julius Blum & Co., Inc. does not provide cutting or metal finishing services.

- **Aluminum** architectural shapes, bars, and tubes are extruded from alloy 6063-T52, except as noted. These items have a smooth, uniform surface and, when properly fabricated, are suitable for anodizing—including most of the hard coat anodic processes. Black anodizing may result in inconsistent matches. Consult your anodizer before specifying. Aluminum extrusions are packed in bundles of approximately 100 lbs., which are wrapped and paper-interleaved at the mill. Ordering in full bundles ensures surface quality and speeds shipping from our warehouse. Aluminum Structural shapes are extruded from alloy 6061-T6.
- **Steel** angles and channels are carbon steel C1010, except as noted. Cold rolled channel and angle have a square root and square edge.
- **Bronze** tubing, bars, and shapes are of extruded alloy C38500, architectural bronze. Round pipe is drawn alloy C23000, red brass. When polished, red brass will provide a generally acceptable match to architectural bronze.
- **Nickel-Silver** shapes are extruded from C79800. Nickel-silver is a copper/nickel alloy and contains no silver. When polished, nickel-silver has the appearance of stainless steel with golden highlights.
- **Stainless Steel** shapes are type 304 (18-8), except as noted. True bars have sharp corners and are not sheared from plate. Stainless steel tubing is of ornamental grade with a smooth surface that is simple to polish.

All extrusions are produced and handled with great care to ensure a product is well suited for architectural finishing. Items are thoroughly protected for shipment by wrapping and/or crating, with the exception of aluminum structural and steel shapes, which are normally shipped in strapped bundles. Elements of sections are shown alongside each item in this section. This data has been ascertained with care but cannot be guaranteed. For additional engineering information, see pages 122 to 129.

Cincinnati Museum Center at Union Terminal, Cincinnati, OH, Savage Metal Restoration, Austerlitz, NY (Fabricator), John G. Waite Associates, Architects PLLC, Albany , NY (Restoration Architect), GBBN, Cincinnati, OH (Architect), © Brad Feinknopf/OTTO (Photo Credit).

Cincinnati Union Terminal, Cincinnati, OH, Savage Metal Restoration, Austerlitz, NY (Fabricator), John G. Waite Associates, Architects PLLC, Albany, NY (Restoration Architect), GBBN, Cincinnati, OH (Architect), ©Brad Feinknopf/OTTO (Photo Credit).

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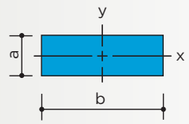
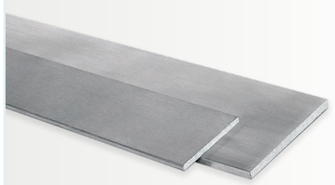
ALUMINUM Alloy 6063-T52

All dimensions in inches and weight in pounds per lineal foot

FLAT BARS

Sharp Corners, Mill Finish,
16′ lengths





a	b	lb/ft	Bars per Bundle†	Area	Ix	Sx	Iy	Sy
1/8	1/2	.075	60	.063	.000	.001	.001	.005
1/8	5/8	.094	48	.078	.000	.002	.003	.008
1/8	3/4	.113	59	.094	.000	.002	.004	.012
1/8	1	.150	48	.125	.000	.003	.010	.020
1/8	1 1/8	.169	29	.141	.000	.003	.015	.026
1/8	1 1/4	.187	29	.156	.000	.003	.020	.032
1/8	1 1/2	.226	27	.188	.000	.004	.035	.047
1/8	1 3/4	.263	19	.219	.000	.005	.056	.064
1/8	2	.300	20	.250	.000	.005	.083	.083
1/8	2 1/2	.376	15	.313	.000	.007	.163	.130
1/8	3	.450	12	.375	.000	.008	.281	.187
1/8	3 1/2	.526	12	.438	.001	.009	.447	.255
1/8	4	.600	10	.500	.001	.010	.667	.334
1/8	5	.750	8	.625	.001	.013	1.302	.521
3/16	1/2	.113	60	.094	.000	.002	.002	.008
3/16	3/4	.169	37	.141	.000	.004	.007	.018
3/16	1	.226	30	.188	.001	.006	.016	.032
3/16	1 1/4	.282	23	.235	.001	.007	.031	.050
3/16	1 1/2	.337	19	.282	.001	.009	.053	.071
3/16	1 3/4	.394	16	.329	.001	.010	.084	.096
3/16	2	.450	12	.376	.001	.012	.125	.125
3/16	2 1/2	.564	12	.470	.001	.015	.244	.195
3/16	3	.677	10	.564	.002	.018	.422	.281
3/16	4	.900	7	.752	.002	.023	1.000	.500
1/4	1/2	.150	50	.125	.001	.005	.003	.010
1/4	5/8	.187	31	.156	.001	.007	.005	.016
1/4	3/4	.224	28	.188	.001	.008	.009	.023
1/4	1	.300	20	.250	.001	.008	.021	.042
1/4	1 1/4	.374	16	.313	.002	.016	.041	.066
1/4	1 1/2	.450	12	.375	.002	.016	.070	.093
1/4	1 3/4	.525	12	.438	.002	.016	.112	.128
1/4	2	.600	10	.500	.003	.024	.167	.167
1/4	2 1/2	.750	9	.625	.003	.024	.326	.261
1/4	3	.900	7	.750	.004	.032	.563	.375
1/4	3 1/2	1.050	5	.875	.005	.040	.893	.510
1/4	4	1.200	5	1.000	.005	.040	1.333	.667
1/4	5	1.500	4	1.250	.007	.056	2.604	1.042
1/4	6	1.800	3	1.500	.008	.064	4.500	1.500
5/16	1	.374	20	.313	.003	.019	.026	.052
5/16	1 1/2	.562	11	.469	.004	.026	.088	.117
5/16	2	.749	8	.625	.005	.032	.208	.208
5/16	6	2.170	3	1.875	.015	.096	5.625	1.875
3/8	1/2	.224	24	.188	.002	.012	.004	.016
3/8	5/8	.281	20	.234	.003	.015	.008	.024
3/8	3/4	.338	15	.281	.003	.018	.013	.035
3/8	1	.450	12	.375	.004	.021	.031	.062
3/8	1 1/4	.563	10	.469	.005	.027	.061	.098
3/8	1 1/2	.674	9	.563	.007	.037	.106	.141
3/8	1 3/4	.784	7	.656	.008	.043	.168	.192
3/8	2	.900	7	.750	.009	.048	.250	.250
3/8	2 1/2	1.126	5	.938	.011	.059	.488	.390
3/8	3	1.350	4	1.125	.013	.069	.844	.563
3/8	3 1/2	1.576	4	1.313	.015	.080	1.340	.767
3/8	4	1.800	3	1.500	.018	.096	2.000	1.000
3/8	5	2.260	3	1.875	.022	.177	3.906	1.563
1/2	3/4	.450	14	.375	.008	.031	.018	.047
1/2	1	.600	10	.500	.010	.040	.042	.084
1/2	1 1/4	.750	8	.625	.013	.052	.081	.130
1/2	1 1/2	.900	6	.750	.016	.064	.141	.188
1/2	1 3/4	1.050	5	.875	.018	.072	.223	.255

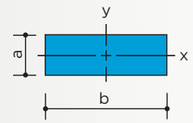
†Aluminum extrusions are pre-wrapped in 100-lb paper-interleaved bundles to speed shipment and prevent damage. Quantities are subject to change without notice.

ALUMINUM Alloy 6063-T52

All dimensions in inches and weight in pounds per lineal foot

FLAT BARS

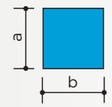
(continued)
Sharp Corners, 16′ lengths



a	b	lb/ft	Bars per Bundle†	Area	Ix	Sx	Iy	Sy
1/2	2	1.200	6	1.000	.021	.084	.333	.333
1/2	2 1/2	1.500	4	1.250	.026	.104	.651	.520
1/2	3	1.800	3	1.500	.031	.124	1.125	.750
1/2	3 1/2	2.100	3	1.750	.036	.144	1.787	1.020
1/2	4	2.400	2	2.000	.042	.168	2.667	1.333
5/8	1	.750	8	.625	.020	.064	.052	.104
5/8	1 1/4	.937	6	.781	.025	.080	.102	.163
5/8	1 1/2	1.124	5	.938	.031	.099	.176	.235
5/8	2	1.500	4	1.250	.041	.131	.417	.417
5/8	3	2.250	2	1.875	.061	.195	1.406	.937
3/4	1	.900	6	.750	.035	.094	.063	.125
3/4	1 1/4	1.126	5	.938	.044	.117	.122	.195
3/4	1 1/2	1.350	5	1.125	.053	.141	.210	.281
3/4	1 3/4	1.576	4	1.313	.062	.166	.335	.388
3/4	2	1.800	3	1.500	.070	.188	.500	.500
3/4	2 1/2	2.250	2	1.875	.088	.234	.977	.781
3/4	3	2.700	2	2.250	.106	.281	1.688	1.125
3/4	3 1/2	3.150	2	2.625	.123	.329	2.680	1.530
3/4	4	3.600	1	3.000	.141	.375	4.000	2.000
1	1 1/4	1.500	4	1.250	.104	.208	.163	.261
1	1 1/2	1.800	3	1.500	.125	.250	.281	.375
1	1 3/4	2.100	3	1.750	.146	.292	.447	.510
1	2	2.400	2	2.000	.167	.333	.667	.667
1	2 1/2	3.000	2	2.500	.208	.417	1.302	1.042
1	3	3.600	1	3.000	.250	.500	2.250	1.500
1	4	4.800	1	4.000	.333	.667	5.333	2.667

SQUARE BARS

Sharp Corners
16′ lengths, except
as noted

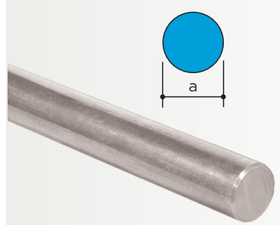


a	b	lb/ft	Bars per Bundle†	Area	I	S
5/16	5/16	.116	48	.097	.001	.005
3/8	3/8	.169	40	.141	.002	.009
1/2*	1/2	.300	20	.250	.005	.021
5/8*	5/8	.468	12	.391	.013	.041
3/4	3/4	.674	10	.563	.026	.070
1	1	1.200	5	1.000	.083	.167
1 1/4	1 1/4	1.875	3	1.563	.204	.326
1 1/2	1 1/2	2.700	2	2.250	.422	.563
1 3/4	1 3/4	3.676	1	3.063	.782	.893
2	2	4.800	2	4.000	1.333	1.333

* 16′ & 20′ lengths

ROUND BARS

16′ lengths, except as noted

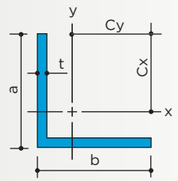


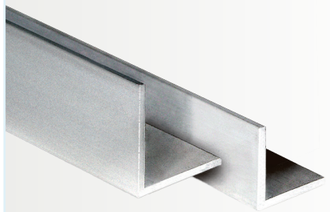
a	lb/ft	Bars per Bundle†	Area	I	S
3/8	.132	50	.110	.001	.005
1/2	.235	25	.196	.003	.012
5/8	.368	18	.307	.008	.024
3/4	.530	12	.442	.016	.041
7/8*•	.727	12	.601	.029	.066
1*	.942	7	.785	.049	.098
1 1/8*	1.192	7	.994	.079	.140
1 1/4*	1.472	3	1.227	.120	.192
1 1/2	2.120	3	1.767	.249	.331
1.600**	2.415	3	2.010	.322	.402
1.625	2.740	–	2.074	.342	.421
1 3/4	2.886	3	2.404	.460	.526
2*	3.770	–	3.142	.785	.785
2 5/8•	6.500	–	5.412	2.331	1.030
3*•	8.483	–	7.069	3.974	2.649
4••	15.079	–	12.568	12.566	6.283

* 6063-T6 ** 6061-T6 • 12′ lengths •• 10′ lengths

†Aluminum extrusions are pre-wrapped in 100-lb paper-interleaved bundles to speed shipment and prevent damage. Quantities are subject to change without notice.

ANGLES
Sharp Corners
16′ lengths





ALUMINUM Alloy 6063-T52

All dimensions in inches and weight in pounds per lineal foot

Equal Legs

a	b	t	lb/ft	Bars per Bundle†	Area	I	S	Cx Cy
1/2	1/2	1/16	.070	78	.058	.001	.004	.352
1/2	1/2	1/8	.131	40	.109	.002	.006	.330
5/8	5/8	1/8	.168	39	.141	.005	.011	.424
3/4	3/4	1/16	.108	47	.089	.005	.009	.540
3/4	3/4	1/8	.206	30	.172	.009	.017	.517
1	1	1/16	.145	40	.120	.012	.016	.727
1	1	1/8	.281	20	.234	.022	.031	.704
1	1	3/16	.408	15	.341	.030	.044	.682
1 1/4	1 1/4	1/8	.356	15	.297	.044	.049	.891
1 1/4	1 1/4	3/16	.519	11	.435	.062	.071	.869
1 1/2	1 1/2	1/8	.431	14	.359	.078	.072	1.079
1 1/2	1 1/2	3/16	.633	10	.529	.110	.104	1.056
1 1/2	1 1/2	1/4	.824	7	.688	.139	.134	1.034
1 3/4	1 3/4	1/8	.506	12	.422	.126	.099	1.266
2	2	1/8	.581	11	.484	.190	.131	1.454
2	2	3/16	.857	6	.717	.273	.191	1.431
2	2	1/4	1.124	5	.938	.348	.247	1.408
2 1/2	2 1/2	1/8	.731	8	.609	.378	.206	1.829
3	3	1/8	.881	6	.734	.661	.300	2.203
3	3	3/16	1.308	5	1.093	.964	.442	2.180
3 1/2	3 1/2	1/8	1.031	6	.859	1.059	.411	2.578
4	4	1/8	1.181	5	.984	1.591	.539	2.953

Unequal Legs

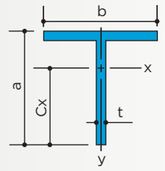
b	a	t	lb/ft	Bars per Bundle†	Area	Ix	Sx	Cx	Iy	Sy	Cy
3/8	3/4	3/32	.116	60	.096	.003	.007	.465	.001	.001	.277
1/2	1	1/8	.206	29	.172	.017	.027	.619	.003	.008	.369
1/2	1 1/4	1/8	.244	25	.203	.032	.042	.755	.003	.008	.380
1/2	1 1/2	1/8	.281	25	.234	.053	.060	.888	.003	.008	.388
1/2	2	1/8	.355	20	.297	.118	.103	1.148	.003	.008	.398
3/4	1	1/8	.244	25	.203	.020	.029	.668	.009	.017	.543
3/4	1 1/2	1/8	.319	18	.266	.061	.064	.952	.010	.018	.577
3/4	2	1/8	.394	15	.328	.136	.111	1.223	.011	.019	.598
1	1 1/2	1/8	.356	15	.300	.068	.068	1.003	.024	.032	.753
1	1 3/4	1/8	.394	16	.328	.104	.091	1.146	.025	.033	.771
1	2	1/8	.431	15	.359	.150	.117	1.285	.026	.033	.785
1	2	3/16	.633	10	.529	.215	.170	1.262	.037	.048	.762
1	2 1/2	1/8	.506	12	.422	.277	.178	1.558	.028	.034	.808
1	3	1/8	.581	10	.484	.456	.250	1.825	.029	.035	.825
1 1/4	3 1/2	1/8	.694	9	.578	.750	.347	2.160	.057	.055	1.035
1 1/2	1 3/4	1/8	.469	14	.391	.120	.097	1.233	.081	.073	1.108
1 1/2	2	1/8	.506	12	.422	.173	.125	1.382	.085	.075	1.132
1 1/2	2 1/2	1/8	.581	10	.484	.319	.191	1.671	.090	.077	1.171
2	2 1/2	1/8	.656	10	.554	.344	.194	1.779	.196	.129	1.523
2	3	1/8	.731	9	.069	.580	.282	2.053	.213	.137	1.553
2	3 1/2	1/8	.806	8	.672	.881	.377	2.339	.222	.140	1.589
2	4	1/8	.881	7	.734	1.266	.483	2.618	.229	.141	1.382
2 1/4	5 1/4	1/8	1.106	6	.992	2.749	.817	3.363	.340	.182	1.863
2 1/2	3 1/2	1/8	.881	7	.734	.951	.391	2.432	.416	.215	1.932
3	3 1/2	1/8	.956	6	.797	1.009	.402	2.511	.692	.306	2.261
3	4	1/8	1.031	6	.859	1.452	.517	2.810	.719	.311	2.310
3	5	1/8	1.181	5	.984	2.658	.784	3.390	.762	.319	2.390
4	5	1/8	1.331	5	1.109	2.924	.820	3.564	1.698	.554	3.064

†Aluminum extrusions are pre-wrapped in 100-lb paper-interleaved bundles to speed shipment and prevent damage. Quantities are subject to change without notice.

ALUMINUM Alloy 6063-T52

All dimensions in inches and weight in pounds per lineal foot

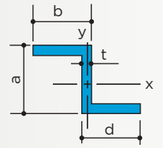
TEES
Sharp Corners
16′ lengths



b	a	t	lb/ft	Bars per Bundle†	Area	Ix	Sx	Cx	Iy	Sy
3/4	3/4	1/8	.206	30	.171	.009	.017	.518	.004	.012
3/4	1 1/4	1/8	.280	20	.233	.037	.045	.814	.004	.012
1	3/4	1/8	.244	23	.202	.009	.017	.544	.010	.021
1	1	1/8	.281	20	.233	.022	.031	.705	.011	.021
1 1/8	1/2	●	.338	20	.282	.005	.016	.318	.020	.032
1 1/8	1 1/8	1/8	.319	19	.265	.031	.039	.924	.015	.027
1 1/4	7/8	1/8	.300	21	.249	.016	.024	.649	.020	.033
1 1/2	1 1/2	1/8	.431	12	.358	.077	.072	1.080	.035	.047
2	3/4	1/8	.394	16	.322	.010	.017	.600	.083	.083
2	2	3/16	.856	6	.717	.271	.190	1.430	.126	.126

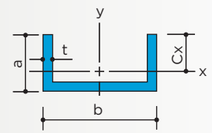
● Item No. 6958 Table 1/8", Leg 3/8"

ZEES
Sharp Corners
16′ lengths



a	b	d	t	lb/ft	Bars per Bundle†	Area	Ix	Sx	Iy	Sy
1/2	1/2	1/2	3/32	.148	40	.169	.004	.017	.006	.016
3/4	3/4	3/4	1/8	.300	21	.250	.020	.053	.027	.039
7/8	3/4	3/4	1/8	.319	20	.266	.029	.067	.027	.039
1	5/8	7/8	1/8	.337	18	.281	.056	.063	.015	.047
1	1 1/8	1 1/8	1/8	.450	14	.375	.058	.117	.100	.094

CHANNELS
Sharp Corners
16′ lengths, except as noted



b	a	t	lb/ft	Bars per Bundle†	Area	Ix	Sx	Cx	Iy	Sy
1/2	3/8	1/8	.150	38	.128	.002	.007	.219	.004	.014
1/2	1/2	3/32	.148	35	.126	.003	.009	.348	.004	.017
1/2	3/4	1/8	.263	22	.224	.011	.027	.402	.007	.028
5/8	5/8	1/8	.244	23	.207	.007	.020	.370	.011	.034
5/8	1	1/8	.356	16	.297	.028	.050	.569	.017	.053
3/4	3/8	1/8	.187	35	.159	.002	.009	.238	.011	.028
3/4	1/2	1/8	.225	30	.191	.004	.013	.323	.014	.037
3/4	3/4	1/8	.300	20	.250	.014	.030	.453	.020	.053
1*	1/2	1/8	.263	18	.219	.005	.014	.330	.028	.057
1	5/8	1/8	.304	25	.250	.009	.022	.406	.035	.069
1	3/4	1/8	.337	20	.281	.015	.031	.479	.040	.081
1	1	1/8	.413	12	.344	.034	.055	.619	.053	.105
1*	2	1/8	.713	8	.594	.236	.200	1.148	.101	.202
1 1/4*	1/2	1/8	.300	16	.250	.005	.015	.344	.050	.080
1 1/4*	5/8	1/8	.337	12	.281	.010	.023	.424	.060	.096
1 1/4*	3/4	1/8	.374	12	.312	.016	.032	.500	.070	.112
1 1/4	1 1/4	1/8	.526	12	.438	.069	.088	.853	.110	.176
1 1/2*	1/2	1/8	.337	16	.281	.005	.015	.354	.080	.106
1 1/2*	5/8	1/8	.374	12	.312	.010	.023	.437	.094	.126
1 1/2	3/4	1/8	.413	16	.344	.017	.033	.517	.109	.146
1 1/2	1	1/8	.487	12	.406	.039	.059	.668	.139	.185
1 1/2	1 1/2	1/8	.637	8	.531	.123	.129	.952	.198	.264
1 3/4	1/2	1/8	.374	15	.312	.005	.015	.362	.118	.135
1 3/4	3/4	1/8	.450	12	.375	.018	.034	.531	.159	.182
1 3/4	1	1/8	.524	12	.438	.042	.060	.688	.200	.229
2	1/2	1/8	.413	14	.344	.006	.015	.369	.166	.166
2	1	1/8	.564	8	.469	.043	.062	.704	.276	.276
2	2	1/8	.863	6	.719	.301	.234	1.285	.496	.496
2 1/4	7/8	1/8	.563	11	.469	.031	.048	.637	.331	.294
2 1/2	3/4	1/8	.564	10	.469	.020	.036	.562	.383	.307
2 1/2	1 1/2	1/8	.787	8	.656	.147	.140	1.045	.648	.518
2 1/2	2 1/2	1/8	1.062	6	.906	.599	.370	1.619	1.001	.801
3	1/2	1/8	.563	11	.469	.006	.017	.387	.475	.317
3	1	1/8	.713	8	.594	.049	.065	.753	.734	.489
3	2	1/8	.955	6	.844	.346	.250	1.382	1.250	.834
3	3	1/8	1.293	4	1.094	1.050	.538	1.952	1.767	1.178
4	1 1/2	1/8	1.013	6	.844	.169	.150	1.132	1.960	.979
4 1/2	1 1/2	1/8	1.090	4	.906	.174	.152	1.157	2.698	1.199
4 1/2**	2	1/8	1.238	4	1.031	.394	.265	1.483	3.190	1.420
5	2	3/16	1.940	2	1.621	.584	.393	1.486	5.900	2.360

* 20′ lengths ** For glass block

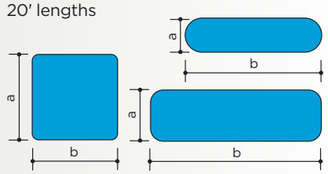
†Aluminum extrusions are pre-wrapped in 100-lb paper-interleaved bundles to speed shipment and prevent damage. Quantities are subject to change without notice

ALUMINUM Alloy 6063-T52, except as noted

All dimensions in inches and weight in pounds per lineal foot

ROUND CORNER BARS

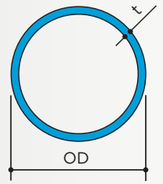
20′ lengths



		a	b	Corner Radius	lb/ft	Bars per Bundle†	Area	Ix	Sx	Iy	Sy
6988	Oval	1/2	2	1/4	1.138	4	.946	.019	.075	.285	.285
6939	Rect.	3/4	2 1/2	3/16	2.214	2	1.845	.085	.225	.932	.746
6986	Rect.	3/4	3	1/8	2.684	2	2.237	.104	.277	1.658	1.106
6423	Square	1 1/4	1 1/4	3/32	1.876	2	1.555	.201	.321	.201	.321
6424	Rect.	1 1/4	2 3/4	3/32	4.124	1	3.430	.445	.712	2.153	1.566

EXTRUDED HANDRAIL PIPE

20′ lengths



Nominal Size	Sched.	OD	ID	t	lb/ft	Bars per Bundle†	Area	I	S	r
3/4	40	1.050	.824	.113	.391	14	.333	.037	.071	.334
1	40	1.315	1.049	.133	.581	9	.494	.087	.133	.421
1 1/4*	10	1.660	1.442	.109	.625	6	.531	.161	.193	.550
1 1/4*	40	1.660	1.380	.140	.785	6	.669	.195	.235	.540
1 1/2*	10	1.900	1.682	.109	.721	5	.614	.247	.260	.634
1 1/2*	40	1.900	1.610	.145	.940	5	.800	.310	.326	.623
2	40	2.375	2.067	.154	1.264	3	1.075	.666	.561	.787

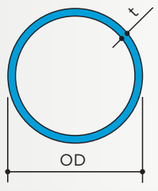
* Carried in stock with mill finish and with a clear anodized – AA-M10-C22-A31 (204R1) – finish.

This pipe is of tubing quality and has a smooth, clean surface and close dimensional tolerances which make it suitable for architectural work and for anodizing. It is easy to bend. Pipe is furnished and carefully wrapped for protection in handling and shipping. See pages 16-31 for stock pipe fittings.

DRAWN HANDRAIL PIPE

Alloy 6063-T832

20′ lengths



Nominal Size	Sched.	OD	ID	t	lb/ft	Area	I	S	r
1 1/4*	10	1.660	1.442	.109	.625	.531	.161	.193	.550
1 1/4*	40	1.660	1.380	.140	.785	.669	.195	.235	.540
1 1/2*	10	1.900	1.682	.109	.721	.614	.247	.260	.634
1 1/2*	40	1.900	1.610	.145	.940	.800	.310	.326	.623

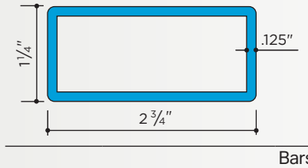
* Carried in stock with mill finish and with a clear anodized – AA-M10-C22-A31 (204R1) – finish.

This premium quality drawn pipe has an extra smooth surface. Its harder temper gives it high strength. See pages 16-31 for stock pipe fittings.

TUBING

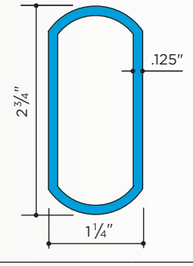
Round Corner

20′ lengths

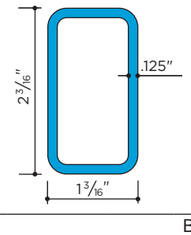


		lb/ft	Bars per Bundle†
6434*	Aluminum	1.123	5

* 6063-T6 For Elements of Section, see page 123.



		lb/ft	Bars per Bundle†
6435*	Aluminum	1.075	5



		lb/ft	Bars per Bundle†
6436*	Aluminum	.888	6

†Aluminum extrusions are pre-wrapped in 100-lb paper-interleaved bundles to speed shipment and prevent damage. Quantities are subject to change without notice.

ALUMINUM Alloy 6063-T52

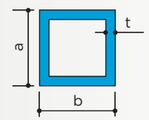
All dimensions in inches and weight in pounds per lineal foot

TUBING

SQUARE

Sharp Corners

21′-1″ lengths

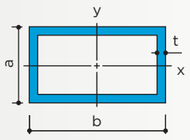


a	b	t	lb/ft	Bars per Bundle†	Area	I	S
1/2	1/2	.062	.130	36	.109	.003	.014
5/8	5/8	.062	.167	31	.142	.007	.024
3/4	3/4	.062	.205	24	.171	.013	.036
3/4	3/4	.125	.374	10	.312	.021	.056
1	1	.062	.278	16	.233	.034	.068
1	1	.125	.525	8	.437	.057	.114
1 1/4	1 1/4	.078	.438	9	.366	.084	.134
1 1/4	1 1/4	.125	.675	8	.562	.120	.192
1 1/2	1 1/2	.078	.532	8	.444	.150	.200
1 1/2	1 1/2	.125	.825	6	.687	.218	.291
1 3/4	1 3/4	.125	.975	4	.812	.360	.411
2	2	.078	.720	6	.600	.370	.370
2	2	.125	1.124	4	.937	.552	.552
2 1/2	2 1/2	.125	1.424	3	1.187	1.119	.896
3	3	.125	1.724	2	1.437	1.984	1.323
4	4	.125	2.324	2	1.937	4.854	2.427

RECTANGULAR

Sharp Corners

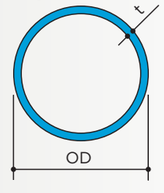
21′-1″ lengths



a	b	t	lb/ft	Bars per Bundle†	Area	Ix	Sx	Iy	Sy
1/2	1	.125	.374	12	.312	.009	.003	.033	.066
3/4	1 1/2	.125	.588	8	.500	.040	.106	.130	.173
1	1 1/2	.125	.661	6	.562	.081	.162	.159	.212
1	2	.125	.825	6	.687	.105	.210	.332	.332
1	3	.125	1.119	4	.937	.153	.307	.950	.633
1 1/4	2 1/2	.125	1.050	4	.875	.219	.351	.678	.543
1 1/4	3	.125	1.200	4	1.000	.259	.415	1.079	.720
1 1/2	2	.125	.967	4	.812	.278	.370	.442	.442
1 1/2	2 1/2	.125	1.124	4	.937	.337	.449	.767	.613
1 1/2	3	.125	1.276	4	1.022	.384	.512	1.167	.778
1 1/2	6	.125	2.135	2	1.812	.752	1.002	7.197	2.399
1 3/4	2 1/4	.125	1.125	4	.937	.442	.505	.661	.588
1 3/4	3	.125	1.323	3	1.125	.566	.647	1.338	.892
1 3/4	3 1/2	.125	1.470	3	1.250	.649	.742	1.962	1.121
1 3/4	4	.125	1.650	3	1.375	.732	.836	2.742	1.371
1 3/4	4 1/2	.125	1.765	2	1.500	.814	.931	3.693	1.641
1 3/4	5	.125	1.910	2	1.625	.897	1.025	4.833	1.933
2	3	.125	1.395	3	1.187	.772	.772	1.467	.978
2	4	.125	1.710	3	1.438	.992	.992	2.976	1.488
2	5	.125	2.025	2	1.687	1.212	1.212	5.204	2.082
2	6	.125	2.326	2	1.937	1.432	1.432	8.276	2.759
3	5	.125	2.326	2	1.937	3.018	2.012	6.690	2.676
3	6	.188	3.882	–	3.226	5.010	3.340	15.032	5.010

ROUND

20′ lengths

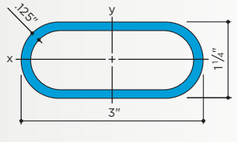


OD	t	lb/ft	Bars per Bundle†	Area	I	S
2 1/2	.125	1.119	6	.933	.659	.527
3	.125	1.330	4	1.129	1.169	.779
3 1/2	.125	1.560	2	1.325	1.890	1.080

See page 129 for fittings

OVAL

20′ lengths



	lb/ft	Bars per Bundle†	Area	Ix	Sx	Iy	Sy
6437	1.057	5	.879	.210	.336	.799	.532

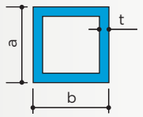
†Aluminum extrusions are pre-wrapped in 100-lb paper-interleaved bundles to speed shipment and prevent damage. Quantities are subject to change without notice.

ALUMINUM STEEL

STRUCTURAL TUBING
Aluminum Alloy 6061-T6, 24' lengths

All dimensions in inches and weight in pounds per lineal foot

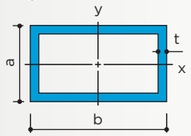
Square



Square

a	b	t	lb/ft	Area	I	S
2	2	1/8	1.126	.937	.552	.552
2	2	3/16	1.627	1.343	.743	.745
2½	2½	3/16	2.087	1.739	1.559	1.247
3	3	3/16	2.538	2.115	2.798	1.865
4	4	3/16	3.440	2.867	6.957	3.479

Rectangular

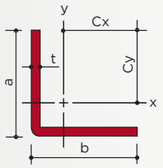


Rectangular

a	b	t	lb/ft	Area	Ix	Sx	Iy	Sy
2	3	3/16	2.123	1.739	1.064	1.064	2.055	1.370
2	4	3/16	2.538	2.115	1.374	1.374	4.226	2.113
3	6	3/16	3.892	3.226	5.010	3.340	15.032	5.010

STEEL C1010

COLD-ROLLED ANGLES
Square Root and Square Edge
20' lengths



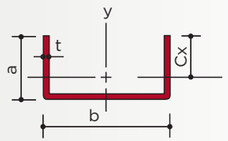
Equal Legs

a	b	t	lb/ft	Area	I	S	Cx Cy
½	½	1/8	.38	.109	.002	.007	.330
5/8	5/8	1/8	.48	.141	.005	.011	.424
¾	¾	1/16	.30	.089	.005	.009	.539
¾	¾	1/8	.59	.172	.009	.017	.517
1	1	1/8	.81	.234	.022	.031	.704
1	1	3/16	1.16	.341	.030	.044	.682
1¼	1¼	1/8	1.02	.297	.044	.049	.891
1¼	1¼	3/16	1.48	.435	.062	.071	.869
1½	1½	1/8	1.24	.359	.078	.072	1.079
1½	1½	3/16	1.80	.529	.110	.104	1.056
2	2	1/8	1.65	.484	.190	.131	1.454
2	2	3/16	2.44	.717	.273	.191	1.431

Unequal Legs

a	b	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy	Cy
1	5/8	1/8	.64	.187	.018	.029	.646	.005	.012	.163
1¼	¾	1/8	.80	.234	.037	.045	.812	.010	.018	.562
1½	1	1/8	1.01	.297	.068	.068	1.003	.024	.032	.753
2	1	1/8	1.23	.359	.149	.116	1.285	.026	.033	.785

COLD-ROLLED CHANNELS
Square Root and Square Edge
20' lengths, except as noted



Equal Sides

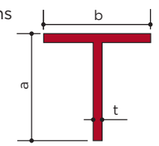
	b	a	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy
4730	½	½	.093	.40	.122	.003	.010	.299	.004	.016
4732	¾	¾	.093	.57	.192	.011	.023	.465	.017	.044
4734	1	1	.109	1.03	.303	.030	.049	.625	.048	.096
4744	1¼	1¼	.109	1.32	.385	.061	.078	.792	.099	.158
4750	1½	1½	.109	1.59	.467	.109	.114	.958	.178	.237
4752	2	2	.125	2.41	.719	.309	.240	1.285	.496	.496

Unequal Sides

	b	a	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy
4735*	5/8	5/16	.078	.29	.085	.001	.003	.206	.004	.014
4736*	¾	3/8	.083	.40	.111	.001	.005	.252	.008	.022
4753	2 3/8	2 3/16	.156	3.41	1.005	.499	.351	1.420	1.880	1.583
4754	1½	1	.109	1.22	.358	.035	.052	.674	.117	.155
4759	1¾	1⅛	.109	1.40	.412	.052	.067	.768	.198	.226
4760	2	1	.125	1.59	.469	.044	.062	.704	.276	.276

* 22' lengths

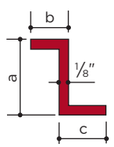
HOT-ROLLED TEES
20' lengths



	a	b	t	lb/ft
4724	1	1	1/8	.90

*For use with Loafer Rail 4445

HOT-ROLLED ZEES
Square Root
20' lengths

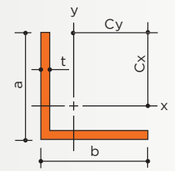


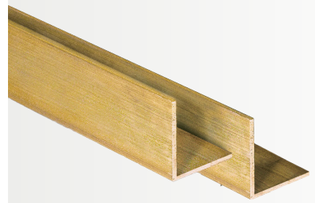
	a	b	c	lb/ft
4721	1 3/16	5/8	¾	.94

BRONZE Alloy C38500

All dimensions in inches and weight in pounds per lineal foot

ANGLES
Sharp Corners
20' lengths, except as noted





Equal Legs

a	b	t	lb/ft	Area	Ix	Sx	Cx Cy
½	½	1/8	.42	.109	.002	.006	.330
5/8	5/8	1/8	.52	.141	.005	.011	.424
¾	¾	1/8	.64	.172	.009	.017	.517
1	1	1/8	.89	.234	.022	.031	.704
1	1	3/16	1.24	.341	.030	.044	.682
1¼	1¼	1/8	1.09	.297	.044	.049	.891
1¼	1¼	3/16	1.60	.435	.062	.071	.869
1¼	1¼	¼	2.05	.562	.077	.091	.847
1½	1½	1/8	1.35	.359	.078	.072	1.079
1½	1½	3/16	1.92	.529	.110	.104	1.056
1½	1½	¼	2.52	.688	.139	.134	1.034
2	2	1/8	1.79	.484	.190	.131	1.454
2	2	3/16	2.61	.717	.273	.191	1.431
2	2	¼	3.37	.938	.348	.247	1.408
2½	2½	1/8	2.24	.609	.378	.206	1.829
2½	2½	¼	4.33	1.187	.703	.394	1.783
3*	3	¼	5.25	1.437	1.244	.577	2.160

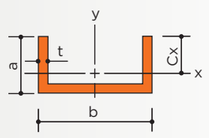
* 16' lengths

Unequal Legs

a	b	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy	Cy
¾	3/8	1/8	.45	.125	.007	.015	.453	.001	.004	.266
1	½	1/8	.65	.172	.017	.027	.619	.003	.008	.369
1	¾	1/8	.75	.203	.020	.029	.668	.009	.017	.543
1¼	¾	1/8	.88	.234	.037	.045	.812	.010	.018	.562
1½	¾	1/8	.97	.266	.061	.064	.952	.010	.018	.577
1½	1	1/8	1.10	.300	.068	.068	1.003	.024	.032	.753
2	1	1/8	1.33	.359	.150	.117	1.285	.026	.033	.785
3*	2	¼	4.32	1.187	1.087	.542	2.007	.392	.260	1.507
4*	2½	¼	5.70	1.562	2.602	.973	2.675	.805	.418	1.925

* 16' lengths

CHANNELS
Sharp Corners
20' lengths



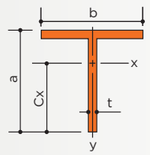
Equal Sides

b	a	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy
½	½	3/32	.44	.126	.003	.009	.348	.004	.017
¾	¾	1/8	.90	.250	.014	.030	.453	.020	.053
1	1	1/8	1.25	.344	.034	.055	.619	.053	.105
1¼	1¼	1/8	1.60	.438	.069	.088	.853	.110	.176
1½	1½	1/8	1.94	.531	.123	.129	.952	.198	.264

Unequal Sides

b	a	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy
5/8	5/16	3/32	.36	.099	.001	.004	.201	.005	.015
¾	3/8	1/8	.57	.159	.002	.009	.238	.011	.028
1	½	1/8	.85	.219	.005	.014	.330	.028	.057
1	¾	1/8	1.04	.281	.015	.031	.479	.040	.081
1¼	½	1/8	.91	.250	.005	.015	.344	.050	.080
1¼	5/8	1/8	1.06	.281	.010	.023	.424	.060	.096
1½	½	1/8	1.02	.281	.005	.015	.354	.080	.106
1½	5/8	1/8	1.12	.312	.010	.023	.437	.094	.126
1½	1	1/8	1.47	.406	.039	.059	.668	.139	.185
2	¾	1/8	1.47	.406	.025	.039	.543	.221	.221
2¼	⅞	1/8	1.75	.469	.031	.048	.637	.331	.294
2½	1	1/8	1.94	.531	.046	.064	.732	.471	.377

TEES
Sharp Corners
20' lengths



Tees

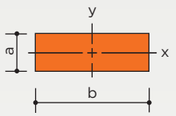
b	a	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy
¾	¾	1/8	.64	.171	.009	.017	.518	.004	.012
1	1	1/8	.89	.233	.022	.031	.705	.011	.021
1½	1½	1/8	1.35	.358	.077	.072	1.080	.035	.047
1½	1½	3/16	1.94	.529	.110	.104	1.056	.054	.071
2	2	3/16	2.61	.717	.271	.190	1.430	.126	.126

BRONZE Alloy C38500

All dimensions in inches and weight in pounds per lineal foot

FLAT BARS

Sharp Corners
16′ lengths, except as noted



a	b	lb/ft	Area	Ix	Sx	Iy	Sy
1/8	1/2	.23	.063	.000	.001	.001	.005
1/8	5/8	.29	.078	.000	.002	.003	.008
1/8	3/4	.35	.094	.000	.002	.004	.012
1/8	1	.46	.125	.000	.003	.010	.020
1/8	1 1/4	.58	.156	.000	.003	.020	.032
1/8	1 1/2	.69	.188	.000	.004	.035	.047
1/8	2	.92	.250	.000	.005	.083	.083
1/8	3	1.38	.375	.000	.008	.281	.187
3/16	1/2	.35	.094	.000	.002	.002	.008
3/16	5/8	.43	.118	.000	.004	.004	.012
3/16	3/4	.52	.141	.000	.004	.007	.018
3/16	1	.69	.188	.001	.006	.016	.032
3/16	1 1/2	1.04	.282	.001	.009	.053	.071
3/16	2	1.38	.376	.001	.012	.125	.125
3/16	2 1/2	1.73	.470	.001	.015	.244	.195
3/16	3	2.08	.564	.002	.018	.422	.281
3/16	3 1/2	2.42	.658	.002	.021	.670	.383
3/16	4	2.76	.752	.002	.023	1.000	.500
1/4	3/8	.34	.094	.000	.004	.001	.006
1/4	1/2	.46	.125	.001	.005	.003	.010
1/4	5/8	.58	.156	.001	.007	.005	.016
1/4	3/4	.69	.188	.001	.008	.009	.023
1/4	1	.92	.250	.001	.008	.021	.042
1/4	1 1/4	1.15	.313	.002	.016	.041	.066
1/4	1 1/2	1.38	.375	.002	.016	.070	.093
1/4	2	1.84	.500	.003	.024	.167	.167
1/4	2 1/2	2.30	.625	.003	.024	.326	.261
1/4	3	2.77	.750	.004	.032	.563	.375
1/4	4	3.87	1.000	.005	.040	1.333	.667
5/16†	6	6.67	1.875	.015	.096	5.625	1.875
3/8	1/2	.68	.188	.002	.012	.004	.016
3/8	5/8	.87	.234	.003	.015	.008	.024
3/8	3/4	1.04	.281	.003	.018	.013	.035
3/8	1	1.38	.375	.004	.021	.031	.062
3/8	1 1/4	1.73	.469	.005	.027	.061	.098
3/8	1 1/2	2.07	.563	.007	.037	.106	.141
3/8	2	2.76	.750	.009	.048	.250	.250
3/8	2 1/2	3.42	.938	.011	.059	.488	.390
3/8	3	4.11	1.125	.013	.069	.844	.563
3/8	4	5.53	1.500	.018	.096	2.000	1.000
1/2	3/4	1.37	.375	.008	.031	.018	.047
1/2	1	1.84	.500	.010	.040	.042	.084
1/2	1 1/4	2.28	.625	.013	.052	.081	.130
1/2	1 1/2	2.76	.750	.016	.064	.141	.188
1/2	1 3/4	3.22	.875	.018	.072	.223	.225
1/2	2	3.68	1.000	.021	.084	.333	.333
1/2	2 1/2	4.60	1.250	.026	.104	.651	.520
1/2	3	5.48	1.500	.031	.124	1.125	.750
1/2	4	7.36	2.000	.042	.168	2.667	1.333
3/4	1	2.74	.750	.035	.094	.063	.125
3/4	1 1/4	3.46	.940	.044	.117	.122	.195
3/4	1 1/2	4.11	1.125	.053	.141	.210	.281
3/4	2	5.53	1.500	.070	.188	.500	.500
1	1 1/4	4.56	1.250	.104	.208	.163	.261

†8′ lengths

ROUND BARS

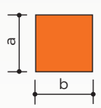
16′ lengths, except as noted

a	lb/ft	Area	I	S
3/8	.41	.110	.001	.005
1/2	.72	.196	.003	.012
5/8	1.13	.307	.008	.024
3/4	1.63	.442	.016	.041
7/8*	2.22	.601	.029	.066
1	2.89	.785	.049	.098
1 1/8	3.66	.994	.079	.140
1 1/4	4.52	1.227	.120	.192
1 1/2	6.51	1.767	.249	.331
1 3/4	8.86	2.405	.460	.526
2*	11.57	3.142	.785	.785
2 1/2	18.00	4.906	1.917	1.530
3**	26.10	7.069	3.974	2.649
3 1/2***	35.00	9.621	7.362	4.209

* 12′ lengths ** 10′ lengths *** random lengths

SQUARE BARS

Sharp Corners
16′ lengths, except as noted



a	b	lb/ft	Area	I	S
1/4	1/4	.23	.063	.000	.003
3/8	3/8	.52	.141	.002	.009
1/2	1/2	.92	.250	.005	.021
5/8	5/8	1.44	.391	.013	.041
3/4	3/4	2.08	.563	.026	.070
1	1	3.69	1.000	.083	.167
1 1/4	1 1/4	5.76	1.563	.204	.326
1 1/2	1 1/2	8.28	2.250	.422	.563
2	2	14.76	4.000	1.333	1.333
2 1/2**	2 1/2	23.06	6.250	3.255	2.604

** 10′ lengths

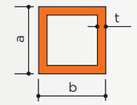
BRONZE Alloy C38500, except as noted

All dimensions in inches and weight in pounds per lineal foot

TUBING

SQUARE

Sharp Corners
16′ lengths

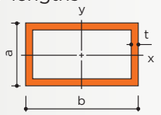


a	b	t	lb/ft	Area	I	S
1/2	1/2	.093	.56	.151	.004	.018
5/8	5/8	.093	.73	.198	.010	.031
3/4	3/4	.093	.90	.244	.018	.048
1	1	.100	1.32	.360	.049	.098
1 1/4	1 1/4	.100	1.70	.460	.102	.163
1 1/2	1 1/2	.100	2.07	.560	.184	.245
1 3/4	1 3/4	.100	2.43	.660	.300	.344
2	2	.125	3.46	.937	.552	.552
2 1/2	2 1/2	.100	3.48	.960	.923	.740
3	3	.125*	5.27	1.437	1.984	1.323

* Rounded inside corners, r = 1/4″

RECTANGULAR

Sharp Corners
16′ lengths

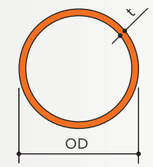


a	b	t	lb/ft	Area	Ix	Sx	Iy	Sy
1/2	1	.100	.95	.260	.009	.034	.029	.058
3/4	1 1/2	.100	1.50	.410	.035	.093	.110	.147
1	1 1/2	.100	1.70	.460	.070	.139	.135	.180
1/2	2	.100	1.70	.460	.017	.068	.252	.252
1	2	.100	2.07	.560	.090	.180	.278	.278
1 1/4	2 1/2	.125	3.23	.875	.219	.351	.678	.543
1	3	.125	3.46	.937	.153	.307	.950	.633
1 1/4	3	.125	3.69	1.000	.259	.415	1.071	.720
1 1/2	3	.125	3.88	1.022	.384	.512	1.167	.778
1 3/4	3	.125	4.15	1.125	.566	.647	1.338	.892
2**	3	.125	4.48	1.187	.772	.772	1.467	.978
1 3/4	4	.125	5.28	1.375	.732	.836	2.742	1.371

**12′ lengths

ROUND

20′ lengths, except as noted

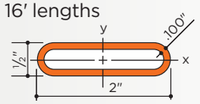


OD	t	lb/ft	Area	I	S
1 1/2 ●	.100	1.75	.440	.108	.144
1.900	.100	2.07	.565	.230	.242
2 1/2	.125	3.44	.933	.659	.527
3	.125	4.50	1.129	1.169	.779
3 1/2	.125	4.85	1.325	1.890	1.080

● Item No. **6489** 16′ length

OVAL

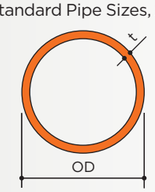
16′ lengths



	lb/ft	Area	Ix	Sx	Iy	Sy
● **6488** Bronze	1.56	.426	.011	.044	.152	.152

HANDRAIL PIPE

Red Brass Alloy C23000
Standard Pipe Sizes, 20′ lengths



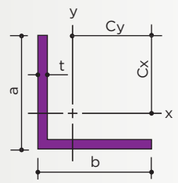
Nominal Pipe Size	Sched.	OD	ID	t	lb/ft	Area	I	S	r
1 1/4	40	1.660	1.368	.146	2.63	.695	.201	.242	.538
1 1/2	40	1.900	1.600	.150	3.13	.825	.318	.335	.621

This pipe is furnished with plain ends, unmarked, and with a smooth finish suitable for polishing.
See pages 16-27 for stock pipe fittings.

NICKEL-SILVER Alloy C79800

All dimensions in inches and weight in pounds per lineal foot

ANGLES
Sharp Corners
20′ lengths



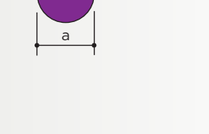
Equal Legs

a	b	t	lb/ft	Area	I	S	Cx Cy
3/4	3/4	1/8	.45	.125	.007	.015	.453
1	1	1/8	.89	.234	.022	.031	.704
1 1/2	1 1/2	1/8	1.35	.359	.780	.072	1.079
1 1/2	1 1/2	1/4	2.52	.688	.139	.134	1.034

Unequal Legs

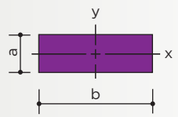
a	b	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy	Cy
2	1	1/8	1.33	.359	.150	.117	1.285	.026	.033	.785

CHANNELS
Sharp Corners
20′ lengths

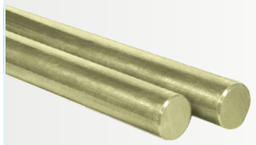


b	a	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy
1/2	1/2	3/32	.44	.126	.003	.009	.348	.004	.017
3/4	3/4	1/8	.90	.250	.014	.030	.453	.020	.053
1 1/4	1/2	1/8	.91	.250	.005	.015	.344	.050	.080
1 1/2	1/2	1/8	1.02	.281	.005	.015	.354	.080	.106

FLAT BARS
Sharp Corners
16′ lengths, except as noted



a	b	lb/ft	Area	Ix	Sx	Iy	Sy
1/8	1 1/4	.58	.156	.000	.003	.020	.032
1/8	1 1/2	.69	.188	.000	.004	.035	.047
1/4	3/4	.69	.188	.001	.008	.009	.023
1/4	1	.92	.250	.001	.008	.021	.042
1/4	1 1/4	1.15	.313	.002	.016	.041	.066
1/4	2	1.84	.500	.003	.024	.167	.167
1/4	3	2.77	.750	.004	.032	.563	.375
3/8	3/4	1.04	.281	.003	.018	.013	.035
3/8	1	1.38	.375	.004	.021	.031	.062
3/8	1 1/4	1.73	.469	.005	.027	.061	.098
3/8	1 1/2	2.07	.563	.007	.037	.106	.141
3/8	2	2.76	.750	.009	.048	.250	.250
3/8	3	4.11	1.125	.013	.069	.844	.563
5/16†	6	6.67	1.875	.015	.096	5.625	1.875
1/2	3/4	1.37	.375	.008	.031	.018	.047
1/2	1 1/2	2.76	.750	.016	.064	.141	.188
1/2	2	3.68	1.000	.021	.084	.333	.333
1/2	3	5.48	1.500	.031	.124	1.125	.750
3/4	1	2.74	.750	.035	.094	.063	.125
3/4	1 1/2	4.11	1.125	.053	.141	.210	.281
3/4	2	5.53	1.500	.070	.188	.500	.500



ROUND BARS
16′ lengths, except as noted

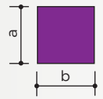
a	lb/ft	Area	I	S
1/2	.72	.196	.003	.012
5/8	1.13	.307	.008	.024
3/4	1.63	.442	.016	.041
7/8	2.22	.601	.290	.066
1	2.89	.785	.049	.098
1 1/4	4.52	1.227	.120	.192
1 1/2	6.51	1.767	.249	.331
1 5/8	7.50	2.074	.342	.421
2*	11.57	3.142	.785	.785
3**	26.10	7.069	3.974	2.649
3 1/2†	35.00	9.621	7.362	4.209

* 12′ lengths , ** 10′ lengths , †8′ lengths

NICKEL-SILVER Alloy C79800 Mill Finish, except as noted

All dimensions in inches and weight in pounds per lineal foot

SQUARE BARS
Sharp Corners
16′ lengths, except as noted

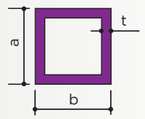


a	b	lb/ft	Area	I	S
1/2	1/2	.92	.250	.005	.021
3/4	3/4	2.08	.563	.026	.070
1	1	3.69	1.000	.083	.167
1 1/4	1 1/4	5.76	1.563	.204	.326
1 1/2**	1 1/2	8.28	2.250	.422	.563

** 10′ lengths

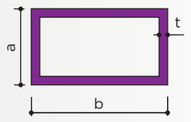
TUBING

Square
Sharp Corners
16′ lengths



a	b	t	lb/ft	Area	I	S
3/4	3/4	.093	.90	.244	.018	.048
1	1	.100	1.32	.360	.049	.098
1 1/4	1 1/4	.100	1.70	.460	.102	.163
1 1/2	1 1/2	.100	2.07	.560	.184	.245
2	2	.100	2.83	.760	.458	.459

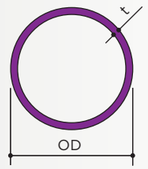
Rectangular
Sharp Corners
16′ lengths



a	b	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy	Cy
3/4	1 1/2	.100	1.50	.410	.035	.093	–	.110	.147	–
1	2	.100	2.07	.560	.090	.180	–	.278	.278	–
1 1/4 ●	2 3/4	.125	3.40	.930	.237	.379	.625	.851	.619	1.375
1 1/2	3	.125	3.88	1.022	.384	.512	–	1.167	.778	–
1 3/4	3	.125	4.15	1.125	.566	.647	–	1.338	.892	–
1 3/4	4	.125	5.28	1.375	.732	.836	–	2.742	1.371	–

● Item No. **1334** Rounded Corners

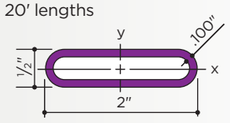
Round
16′ lengths, except as noted



OD	t	lb/ft	Area	I	S
1 1/2* ●	.100	1.75	.440	.108	.144
1.900*	.109	2.25	.721	.641	.247
2 1/2	.125	3.44	.933	.659	.527
3	.125	4.50	1.129	1.169	.779

● Item No. **5289** * 20′ lengths

Oval
20′ lengths

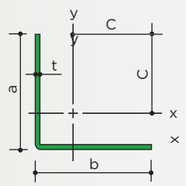


		lb/ft	Area	Ix	Sx	Iy	Sy
● **5288**	Nickel-Silver	1.56	.426	.011	.044	.152	.152

STAINLESS Type 304 (18-8) Mill Finish, smooth surface, suitable for polishing

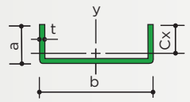
All dimensions in inches and weight in pounds per lineal foot

ROLLED ANGLES
20′ lengths



a	b	t	lb/ft	Area	I	S	Cx Cy
1/2	1/2	.062	.192	.058	.001	.004	.352
5/8	5/8	.062	.247	.074	.003	.006	.446
3/4	3/4	.062	.296	.089	.005	.009	.539
3/4	3/4	.125	.596	.172	.009	.017	.517
1	1	.062	.410	.120	.012	.016	.727
1	1	.125	.808	.234	.022	.031	.704
1 1/4	1 1/4	.062	.507	.151	.023	.025	.914
1 1/4	1 1/4	.125	1.020	.297	.044	.049	.891
1 1/2	1 1/2	.062	.605	.182	.041	.037	1.102
1 1/2	1 1/2	.125	1.240	.359	.078	.072	1.079

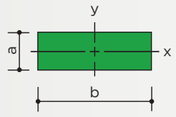
ROLLED CHANNELS
20′ lengths, except as noted



b	a	t	lb/ft	Area	Ix	Sx	Cx	Iy	Sy
1/2	1/2	.062	.284	.085	.002	.007	.310	.003	.013
5/8*	5/16	.078	.293	.085	.001	.003	.206	.004	.014
3/4	3/8	.062	.279	.085	.001	.004	.259	.001	.003
3/4	3/4	.062	.451	.132	.015	.024	.621	.012	.033
1	1/2	.062	.385	.116	.003	.007	.350	.017	.034
1	1	.062	.591	.178	.019	.029	.643	.031	.062
1 1/4	1/2	.062	.452	.132	.003	.008	.366	.029	.047
1 1/2	1/2	.062	.492	.147	.003	.008	.377	.046	.061

* 22′ lengths

TRUE BARS
Sharp Corners
12′ to 14′ lengths



a	b	lb/ft	Area	Ix	Sx	Iy	Sy
3/16	3/4	.478	.141	.000	.004	.007	.018
3/16	1	.638	.188	.001	.006	.016	.032
3/16	1 1/4	.797	.235	.001	.007	.031	.050
3/16	1 1/2	.957	.282	.001	.009	.053	.071
3/16	2	1.280	.376	.001	.012	.125	.125
3/16	3	1.990	.564	.002	.018	.422	.281
1/4	3/4	.636	.188	.001	.008	.009	.023
1/4	1	.850	.250	.001	.008	.021	.042
1/4	1 1/4	1.060	.313	.002	.016	.041	.066
1/4	1 1/2	1.280	.375	.002	.016	.070	.093
1/4	2	1.700	.500	.003	.024	.167	.167
1/4	2 1/2	2.120	.625	.003	.024	.326	.261
1/4	3	2.550	.750	.004	.032	.563	.375
1/4	4	3.400	1.000	.005	.040	1.333	.667
3/8	1	1.280	.375	.004	.021	.031	.062
3/8	1 1/4	1.590	.469	.005	.027	.061	.098
3/8	1 1/2	1.920	.563	.007	.037	.106	.141
3/8	2	2.550	.750	.009	.048	.250	.250
3/8	2 1/2	3.190	.938	.011	.059	.488	.390
3/8	3	3.830	1.125	.013	.069	.844	.563
3/8	4	5.100	1.500	.018	.096	2.000	1.000
1/2	3/4	1.280	.375	.008	.031	.018	.047
1/2	1	1.700	.500	.010	.040	.042	.084
1/2	1 1/2	2.550	.750	.016	.064	.141	.188
1/2	2	3.400	1.000	.021	.084	.333	.333
1/2	2 1/2	4.250	1.250	.026	.104	.651	.520
1/2	3	5.100	1.500	.031	.124	1.125	.750
1/2	4	6.800	2.000	.042	.168	2.667	1.333
3/4	1	2.550	.750	.035	.094	.063	.125
3/4	1 1/2	3.830	1.125	.053	.141	.210	.281
3/4	2	5.100	1.500	.070	.188	.500	.500
3/4	3	7.650	2.250	.106	.281	1.688	1.125
1	1 1/2	5.100	1.500	.125	.250	.281	.375

STAINLESS Type 304 (18-8) Mill Finish, smooth surface, suitable for polishing

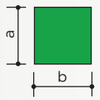
All dimensions in inches and weight in pounds per lineal foot

ROUND BARS
12′–14′ lengths

a	lb/ft	Area	I	S
3/8	.378	.110	.001	.005
1/2	.671	.196	.003	.012
9/16*	.850	.249	.005	.018
5/8	1.050	.307	.008	.024
3/4	1.510	.442	.016	.041
7/8*	2.060	.601	.029	.066
1*	2.680	.785	.049	.098
1 1/4*	4.200	1.227	.120	.192

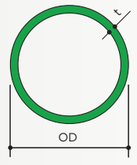
* Type 303

SQUARE BARS
Sharp Corners
12′–14′ lengths



a	b	lb/ft	Area	I	S
1/2	1/2	.855	.250	.005	.021
5/8	5/8	1.330	.391	.013	.041
3/4	3/4	1.920	.563	.026	.070
1	1	3.420	1.000	.083	.167
1 1/4	1 1/4	5.310	1.563	.204	.326

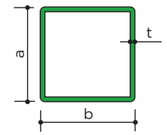
HANDRAIL PIPE
Cold-rolled Ornamental Grade
20′ lengths
No. 4 Finish, 180 grit, paper-wrapped



Nominal Pipe Size	Sched.	OD	t	lb/ft	Area	I	S	r
3/4	40	1.050	.113	1.200	.333	.037	.071	.334
1	40	1.315	.120	1.460	.494	.087	.133	.421
1 1/4	5	1.660	.062	1.110	.326	.104	.125	.564
1 1/4	40	1.660	.148	2.150	.669	.195	.235	.540
1 1/2	5	1.900	.062	1.274	.375	.158	.166	.649
1 1/2	40	1.900	.148	2.550	.800	.310	.326	.623

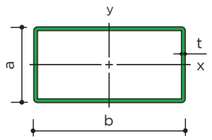
TUBING

Square
Ornamental Grade
20′ lengths



a	b	t	lb/ft	Area	I	S
3/4	3/4	.049	.472	.137	.011	.030
1	1	.062	.835	.234	.034	.069
1 1/4	1 1/4	.062	1.058	.297	.070	.112
1 1/2	1 1/2	.062	1.281	.359	.124	.166
1 3/4	1 3/4	.062	1.505	.422	.200	.230
2	2	.062	1.728	.484	.303	.304

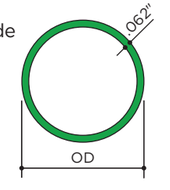
Rectangular
Ornamental Grade
20′ lengths, except as noted



a	b	t	lb/ft	Area	Ix	Sx	rx	Iy	Sy	ry
3/4	1 1/2	.062	.946	.266	.025	.066	.305	.076	.101	.533
1	1 1/2	.062	1.048	.297	.048	.096	.403	.092	.122	.556
1	2	.062	1.281	.359	.062	.124	.415	.186	.186	.719
1	3	.062	1.728	.484	.089	.179	.430	.517	.345	1.033
1 1/4	2 1/2	.062	1.616	.453	.125	.200	.525	.372	.297	.906
1 3/4*	3	.062	2.062	.578	.312	.356	.734	.720	.480	1.116
1 3/4*	4	.062	2.683	.703	.401	.458	.755	1.454	.727	1.438

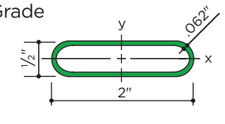
* 21′-1″ lengths

Round
Ornamental Grade
20′ lengths



OD	ID	lb/ft	Area	I	S
2 1/2	2.375	1.691	.497	.369	.295
3	2.875	1.930	.577	.622	.415
4	3.875	2.550	.804	1.556	.778

Oval
Ornamental Grade
20′ lengths



	lb/ft	Area	Ix	Sx	Iy	Sy
4488	.944	.284	.011	.046	.107	.107

ALUMINUM BRONZE NICKEL-SILVER STAINLESS STEEL

Availability of complete structural information enables architects and designers to make proper use of Blum's component systems to provide safe, durable handrail installations. The designer can engineer installations to conform to specific building code loading criteria or can establish design requirements for a given installation on the basis of anticipated traffic exposure.

The five major considerations for the structural designs of handrails are:

1. Structural loading criteria as established by governing building codes or special design requirements.
2. Properties of railing materials and allowable stresses for design.
3. Elements of sections for railing components.
4. Load, stress, and deflection relationships expressed as formulas for engineering design.
5. Proper attachment and sound supporting structure.

CODE REQUIREMENTS AND REGULATIONS

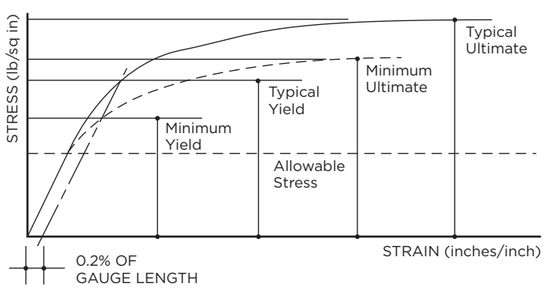
Structural requirements for railings are usually expressed in one of two ways, depending on governing codes and regulations. Some of these specify an applied loading distributed uniformly along the rail while others specify loading concentrated on the top rail. The designer should consult governing codes, local ordinances, project specifications and regulatory authorities to determine requirements for compliance.

The Americans with Disabilities Act (ADA): Refer to page 3 for information regarding handrail dimensions mentioned in the ADA Accessibility Guidelines and ANSI 117.1-17.

ALLOWABLE STRESSES

To provide adequate safety factors, the engineering profession assigns to each material an allowable design stress, which is usually expressed as a specific fraction of minimum yield, or sometimes as a smaller fraction of minimum ultimate strength. Allowable stresses vary with the composition and temper of the material and also, to some degree, with the kind of shape and the direction of stress.

Yield strength is the point of stress (in pounds per square inch) at which material fails to return to its original position after the stress has been removed and takes a permanent set. Minimum yield is defined as the test value exceeded by 99% of a large number of specimens. For non-ferrous metals, the yield point is arbitrarily defined as the point of stress at which permanent set is a specific fraction of 1% of the length of the test piece (0.2% offset as shown below or 0.5% elongation). Ultimate strength is considerably higher (see graph).



ELEMENTS OF SECTIONS

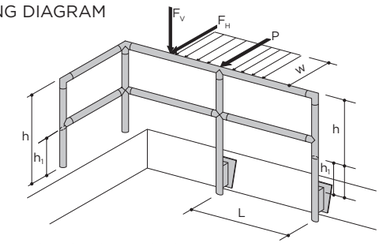
Properties of sections of JB® handrail mouldings, posts, and support sections are listed on page 123. For properties of bars, shapes and tubes, see pages 106-121.

MECHANICAL PROPERTIES OF MATERIALS

Below is a table of metals used in the architectural components described in this catalog, together with their yields, allowable stresses, and moduli of elasticity. These mechanical properties have been established by producers of the various materials.

Material	Allowable Bending Stress for Design (psi)	Expected Minimum Yield (psi)	Modulus of Elasticity (psi x 10^6)
Aluminum 6061-T6, shapes	19,500	35,000	10.0
major axis shapes minor axis	27,700	35,000	10.0
Aluminum 6063-T6, shapes	15,200	25,000	10.0
major axis shapes minor axis	19,700	25,000	10.0
Aluminum 6063-T52, bars and shapes	12,600	16,000	10.0
Aluminum 6063-T52, tubing	11,300	16,000	10.0
Aluminum 6063-T832, drawn pipe	24,800	35,000	10.0
Bronze C38500, extruded	9,700	16,000	14.0
Bronze C38500, handrail moulding and tubing	14,500	24,000	14.0
Bronze C38500, rectangular tubing, bars, and shapes	21,200	35,000	14.0
Red Brass C23000, drawn pipe, ASTM B43	11,000	18,000	17.0
Nickel-Silver C79800, extruded	24,000	40,000	18.0
Stainless Steel type 304, extruded, ASTM A276	15,000	25,000	28.0
Stainless Steel type 304, hot-rolled, ASTM A276	18,000	30,000	28.0
Stainless Steel type 304, cold-formed	15,100	28,000	28.0
Stainless Steel type 304 round tubing (as welded)	30,000	55,000	28.0
Carbon Steel C1010, roll-formed, ASTM A29	16,800	28,000	29.0
Carbon Steel C1010, hot-rolled, ASTM A29	16,800	28,000	29.0

LOADING DIAGRAM



EXPLANATION OF SYMBOLS

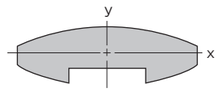
w*	= Uniform horizontal loading, perpendicular to the rail (lb/ft).
L	= Span between centerlines of posts or brackets (in.).
P	= Horizontal force, perpendicular to rail applied at top of post (lb).
F_H	= Horizontal force, perpendicular to rail at any point along the railing (lb).
F_V	= Vertical force, perpendicular to rail at any point between posts (lb).
h	= Height of post. Distance from point of load application above top of attachment (in.).
h_1	= Distance from top of post attachment to top of reinforcing insert (in.).
M	= Bending moment (in.-lb).
f	= Unit stress (psi)
f_s	= Allowable fibre stress for design (psi).
S_x & S_y	= Section modulus about the x- or y-axis respectively (in.^{3}).
I_x & I_y	= Moment of inertia about the x- or y-axis respectively (in.^{4}).
k	= Stiffness of member.
K	= Bending moment constant.
c	= Distance from the neutral axis to the extreme fibre of any section (in.).
E	= Modulus of elasticity (psi x 10^6).
Δ	= Deflection (in.).
R	= Stiffness ratio.
P_I	= Load proportion factor.
F_r	= Reaction factor (psi).

* Values for w (uniform load in lb/ft) are converted to lb/in. by dividing by 12

ELEMENTS OF SECTIONS

ALUMINUM BRONZE NICKEL-SILVER STAINLESS STEEL

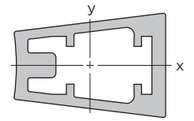
HANDRAILS



		Minor Axis			Major Axis		
Shape	Area	Ix (in4)	Sx (in3)	cx (in.)	Iy (in4)	Sy (in3)	cy (in.)
6402	1.250	0.083	0.098	0.845	0.412	0.347	1.188
6407	1.680	0.088	0.104	0.844	1.311	0.807	1.625
6436†	0.741	0.159	0.268	0.594	0.422	0.386	1.094
6437†	0.879	0.210	0.336	0.625	0.799	0.532	1.500
6530	0.810	0.032	0.082	0.395	0.315	0.315	1.000
6531	0.573	0.023	0.056	0.411	0.132	0.175	0.750
6532	1.090	0.039	0.084	0.465	0.616	0.493	1.250
6540	0.628	0.312	0.284	1.099	0.034	0.068	0.500
6901	1.387	0.042	0.106	0.396	0.709	0.540	1.313
6902	1.227	0.034	0.084	0.409	0.520	0.438	1.188
6903	0.361	0.013	0.029	0.448	0.109	0.125	0.875
6904	0.726	0.072	0.118	0.612	0.519	0.377	1.375
6905	1.414	0.026	0.089	0.297	1.167	0.718	1.625
6906	2.051	0.058	0.161	0.358	2.195	1.171	1.845
6907	1.441	0.031	0.077	0.402	1.263	0.777	1.625
6929	0.557	0.018	0.042	0.425	0.260	0.231	1.125
6930	0.779	0.023	0.052	0.449	0.300	0.267	1.125
6931	0.527	0.011	0.030	0.358	0.108	0.133	0.813
6932	0.684	0.059	0.100	0.586	0.616	0.429	1.438
6933	0.670	0.013	0.035	0.369	0.175	0.200	0.875
6934	0.669	0.017	0.040	0.427	0.208	0.214	0.969
6935	0.843	0.024	0.053	0.451	0.343	0.323	1.065
6939	1.845	0.085	0.225	0.375	0.932	0.746	1.250
6984	1.079	0.021	0.056	0.367	0.676	0.492	1.375
6985	0.805	0.017	0.040	0.413	0.254	0.254	1.000
6986	2.237	0.104	0.277	0.375	1.658	1.106	1.500
6987	0.746	0.056	0.084	0.662	0.648	0.471	1.375
6988	0.946	0.019	0.075	0.250	0.285	0.285	1.000
4529	0.684	0.059	0.100	0.586	0.616	0.429	1.438
4530 **5530**	0.779	0.023	0.052	0.449	0.300	0.267	1.125
4531	0.527	0.011	0.030	0.358	0.108	0.133	0.813
4533	0.937	0.457	0.372	1.229	0.785	0.571	0.916
4534 **5534**	0.669	0.017	0.040	0.427	0.208	0.214	0.969
4535 **5235**	0.799	0.024	0.052	0.454	0.344	0.323	1.063
4538 **5538**	0.806	0.194	0.202	0.958	0.661	0.481	1.375
4539	0.670	0.013	0.035	0.369	0.175	0.200	0.875
4572 **5572**	0.701	0.008	0.032	0.239	0.299	0.266	1.125
4573	1.054	0.016	0.059	0.268	0.654	0.476	1.375
4574 **5274**	0.919	0.020	0.053	0.376	0.654	0.476	1.375
4575	0.645	0.014	0.033	0.437	0.232	0.232	1.000
6488† **5288**†	0.426	0.011	0.044	0.250	0.152	0.152	1.000
6489† **5289**†	0.440	0.108	0.144	1.250	0.108	0.144	1.250
4488†	0.284	0.011	0.046	0.250	0.107	0.107	1.000
6501	1.054	0.017	0.067	0.256	0.629	0.457	1.375
6502	0.740	0.008	0.033	0.235	0.314	0.280	1.125
6503	0.739	0.014	0.050	0.341	0.126	0.168	0.750
6511†	0.386	0.006	0.031	0.238	0.189	0.137	1.375
6512†	0.291	0.008	0.034	0.236	0.136	0.121	1.125
4416	0.927	0.021	0.073	0.291	0.232	0.231	1.000
4428	0.569	0.017	0.041	0.416	0.209	0.215	0.969
4429	0.403	0.008	0.022	0.375	0.104	0.119	0.875
4435	0.746	0.018	0.044	0.406	0.349	0.328	1.062
4441	0.594	0.024	0.055	0.432	0.291	0.258	1.125

†Tubing

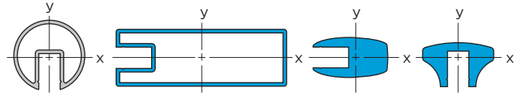
CARLSTADT® POSTS



		Minor Axis			Major Axis		
Shape	Area	Ix (in4)	Sx (in3)	cx (in.)	Iy (in4)	Sy(in3)	cy (in.)
436E††	0.655	0.029	0.078	0.370	0.087	0.140	0.622
6423 (423)	1.555	0.201	0.321	0.625	0.201	0.321	0.625
6424 (424)	3.430	0.445	0.712	0.625	2.153	1.566	1.375
6427 (427)	1.926	0.208	0.303	0.687	0.496	0.409	0.789
6430 (430)†	0.726	0.096	0.192	0.500	0.241	0.297	0.813
6434† **1334**†	0.930	0.237	0.379	0.625	0.851	0.619	1.375
6435† ††	0.871	0.210	0.337	0.625	0.710	0.516	1.375
6458 (458)† ††	1.110	0.177	0.258	0.687	0.529	0.508	1.042
6459 (459)† ††	1.030	0.201	0.322	0.687	0.708	0.679	1.041
4830 (830)†	0.726	0.096	0.192	0.500	0.241	0.297	0.813
230†	0.308	0.050	0.100	0.500	0.095	0.126	0.750
233B (294)* ††	1.021	0.052	0.133	0.390	0.146	0.223	0.655
283 (295)* ††	1.412	0.072	0.184	0.390	0.385	0.426	0.905
280†	0.373	0.064	0.128	0.500	0.193	0.193	1.000

* Aluminum, for use with stainless steel posts † Tubing †† T6 temper

GLASS RAILING SECTIONS



		Minor Axis			Major Axis		
Railing Number	Area	Ix (in4)	Sx (in3)	cx (in.)	Iy (in4)	Sy (in3)	cy (in.)
1130	0.874	0.227	0.236	0.962	0.295	0.311	0.950
1132 **1232**	1.245	0.632	0.500	1.263	0.717	0.574	1.250
1133	2.414	0.416	0.583	0.714	0.970	0.619	1.566
1134	1.980	0.296	0.300	0.988	1.022	0.817	1.250
1135	1.632	1.910	1.030	1.855	1.947	1.113	1.750
1136	2.250	1.488	1.488	1.000	9.196	2.821	3.260
1154	1.442	1.105	0.721	1.532	1.268	0.845	1.500
1155	1.638	1.875	1.024	1.831	1.989	1.136	1.750
1430	0.501	0.142	0.154	0.927	0.183	0.192	0.950
1432 **1452**	0.643	0.358	0.280	1.280	0.395	0.316	1.250
1433 **1453**	0.712	0.630	0.386	1.632	0.643	0.429	1.500
1472 **1473**	0.909	1.570	0.867	1.811	1.520	0.762	2.000
1230	0.766	0.202	0.223	0.907	0.278	0.292	0.950
1233 **1333**	1.442	1.160	0.743	1.568	1.229	0.819	1.500
1235	2.360	2.704	1.471	1.838	2.772	1.584	1.750
1330	0.840	0.236	0.262	0.901	0.324	0.340	0.950
1332	1.245	0.632	0.500	1.263	0.717	0.574	1.250
1141	4.353	6.068	4.106	1.478	2.314	1.851	1.250
1142	6.828	10.206	5.449	1.873	5.121	4.097	1.250
1143	7.199	12.497	6.598	1.894	6.735	4.898	1.375

Unless designated as T6 temper, all aluminum alloy is in the T52 temper. The values of these elements of sections are approximate and—while they have been ascertained with care—they cannot be guaranteed.
See page 128 for properties of Connectorail® pipe and reinforcing bars.

BENDING MOMENTS AND STRESSES

Determination of bending moments and stress in structural railing members follows conventional engineering design procedures. The resisting moment—calculated from the Section Modulus (S, which equals I/c) and Allowable Design Stress (f_s)—must be greater than or equal to the Applied Bending Moment (M).

$$\frac{I}{c} \times f_s = S \times f_s = M$$

This translates into railing formulas as described below.

RAILS: Connections between posts and rails are assumed to be free to pivot, although in practice the rail post connection is normally not a pivot. Distribution of loads through multiple spans decreases maximum bending moment in horizontal members. The effect of different numbers of spans may be taken into account by varying the Bending Moment Constant (K). Calculation of Unit Stress (f) and Length of Span (L) are accomplished by using the following formulas:

1. For uniform vertical or horizontal loads (w):

$M = \frac{w/12 \times L^2}{K}$ $\quad M = S \times f$

$f = \frac{w/12 \times L^2}{S \times K}$ $\quad K = 8$ for one or two spans

$K = 9.5$ for three or more spans of a continuous rail

$L = \sqrt{\frac{f \times K \times S}{w/12}}$

2. For concentrated loads (F) applied at mid span:

$M = \frac{F \times L}{K}$ $\quad M = S \times f$

$K = 4$ for one span

$f = \frac{F \times L}{S \times K}$ $\quad K = 5$ for two or more spans of a continuous rail

$L = \frac{S \times K \times f}{F}$

Values of K are defined based on the maximum bending moment developed under various numbers of spans.

POSTS: **Posts act as vertical cantilever beams in resisting horizontal thrust applied at the top rail. Bending moment produced by horizontal thrust normally controls design, and post spacing may be calculated using the following equations.**

1. For uniform horizontal loading (w):

$M = P \times h$ $\quad P = w/12 \times L$ $\quad M = S \times f$

$f = \frac{w/12 \times L \times h}{S}$ $\quad L = \frac{S \times f}{w/12 \times h}$

2. For concentrated horizontal loading (F_h):

When concentrated loading is specified, the horizontal load on the top rail is distributed among several posts adjacent to the point of loading. The load distribution is a function of the relative stiffness of post and top rail and of the number of spans in the railing. For a straight run of railing it may be calculated with the aid of the graph on page 129. This calculation will show what proportion (P_f) of the total load any one post may have to sustain. To the extent that it is less than 100%, it will justify the use of lighter and more economical construction. The following equation applies:

$M = P \times h$ $\quad P = F_h \times P_f$

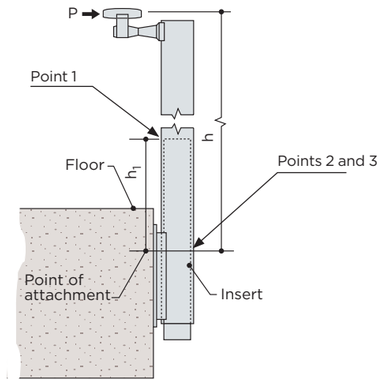
$f = \frac{F_h \times h \times P_f}{S}$

INTERNALLY REINFORCED POSTS

The load-carrying capacity of a post with reinforcing insert is limited by the allowable fibre stress at one of three points.

1. The post at the top of the insert, above which it is not reinforced.
2. The insert at its base, at the highest point of its attachment to the supporting structure.
3. The post at the same point of attachment.

The lowest of these three loading limits controls design for the combined post and reinforcing insert.



1. Post at top of insert:
   Moment in post (top of insert): $M = P \times (h - h_1)$
   Fibre stress in post (top of insert):

$f = \frac{M}{S} = \frac{P \times (h - h_1)}{S}$

Loading limit: $P = \frac{f_s \times S}{h - h_1}$

At the point of contact between the railing post and the reinforcing insert, the deflection of each is assumed to be the same but the resisting force of each is a function of its Moment of Inertia (I) and Modulus of Elasticity (E). The resultant combined Reaction Factor (F_r) at the top of the insert is determined as follows:

$$F_r = \left(\frac{h}{2 \times h_1} - 0.617 \right) \div \left(\frac{E_p \times I_p}{3 \times E_r \times I_r} + 0.333 \right)$$

E_r and I_r refer to the reinforcing insert
E_p and I_p refer to the post

The loading limits for points 2 and 3 are then determined as follows:

2. Insert at base:

   Moment in insert: $M = P \times (h - h_1)$
   Fibre stress in insert

$f = \frac{M}{S_r} = \frac{P \times F_r \times h_1}{S_r}$

Loading limit: $P = \frac{f_s \times S_r}{F_r \times h_1}$

3. Post at base:

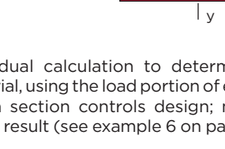
   Moment in post: $M = P \times [h - (F_r \times h_1)]$

   Fibre stress in post: $f = \frac{M}{S_p} = \frac{P \times [h - (F_r \times h_1)]}{S_p}$

   Loading limit: $P = \frac{f_s \times S_p}{h - (F_r \times h_1)}$

COMBINED HANDRAIL SECTIONS

When two sections of the same metal are combined by being fastened together to form a handrail (e.g. a steel moulding mounted on a steel channel), the sections develop the same deflection under load but act independently about their respective neutral axes.



Steel handrail with steel channel

I_a and I_b are the moments of inertia of the two sections. Since the Section Modulus (S) equals I/c, the combined value for S of the two sections would be:

$S = \frac{I_a + I_b}{c_{max}}$ (c_{max} is either c_a or c_b, whichever is greater)

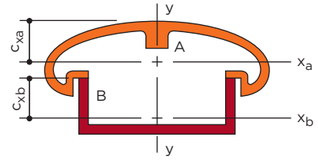
In the railing formulas, substitute the above equation for the value of S whenever combined sections of the same material are used.

COMBINED SECTIONS OF DISSIMILAR MATERIALS

To compute the loading of combined sections of dissimilar materials (e.g. a bronze handrail mounted on a steel channel), calculations involve the determination of the relative portion of the load carried by each section. The load distribution is a function of the relative stiffness of the two sections, which is determined by the Moments of Inertia (I) and their Moduli of Elasticity (E). The distribution of the total load between two sections is determined as follows:

Load Carried by $A = \frac{\text{Total Load}}{1 + \frac{E_b \times I_b}{E_a \times I_a}}$

Load Carried by B = Total Load – Total Load Carried by A



Individual calculation to determine the fibre stress for each material, using the load portion of each section, will then determine which section controls design; namely, the section giving the lesser result (see example 6 on page 127).

DEFLECTION CONSIDERATIONS

Excessive deflection of a railing under load, even though it meets strength requirements, will give the user a feeling of insecurity and may cause tripping or stumbling.

Lateral deflection of posts or vertical deflection of horizontal rails under load are computed as follows—these formulas must be used with caution:

For posts without reinforcing insert:

$\Delta = \frac{P \times h^3}{3 \times E \times I}$ or $\frac{w/12 \times L \times h^3}{3 \times E \times I}$

For posts with reinforcing insert of similar or dissimilar material:

$$\Delta = \frac{P \times (h - h_1)^3}{3 \times E_p \times I_p} + \frac{P \times [h^3 - (h - h_1)^3]}{3 \times [(E_p \times I_p) + (E_r \times I_r)]}$$

Where E_p and I_p apply to post
E_r and I_r apply to reinforcing insert

For rails (concentrated load, F):

$\Delta = \frac{F \times L^3}{K \times E \times I}$

Where K = 48 for simple span
66 for two or more spans, load on end span
87 for three or more spans, load on intermediate span

For rails (uniform load, w):

$\Delta = \frac{5 \times w/12 \times L^4}{384 \times E \times I}$ for simple spans

$\Delta = \frac{w/12 \times L^4}{145 \times E \times I}$ for two or more spans

There are few, if any, regulations or code requirements limiting deflection in a railing but ASTM has put forth the following criteria regarding Maximum Allowable Deflection (Δ_{max}) in their specification E985.

For horizontal load at midspan:

$\Delta_{max} = h/24 + L/96$

For horizontal load at top of post:

$\Delta_{max} = h/12$

For vertical load at midspan:

$\Delta_{max} = L/96$

In many instances, the anchorage of the railing to the floor, tread, or fascia is subject to a degree of rotation which will add an indeterminate amount to the deflection on the post and rail. Anchorage and supporting structure must be as secure and rigid as possible.

The equations presented have been taken from *NAAMM AMP 521-01: Pipe Railing Systems Manual Including Round Tube, 4th Edition" and "NAAMM AMP 510-92: Metal Stairs Manual, 5th Edition.*

These sample problems demonstrate how engineering data provided by Julius Blum & Co., Inc. can be used to obtain solutions to practical handrail design problems. Problems are solved by equating the maximum bending moment resulting from applied loading to the resisting moment determined from geometrical section properties and allowable stress. This method can be used to obtain solutions for most installation and loading conditions.

EXAMPLE PROBLEMS AND SOLUTIONS

EXAMPLE 1:

DETERMINE MAXIMUM POST SPACING REQUIREMENTS:
Uniform load, w = 50 lb/ft
Railing height, h = 38 in.

MATERIAL SPECIFIED:
Post: #**423** aluminum, 6063-T52
Allowable stress, f_s = 12,600 psi (refer to page 122);
Section modulus, S = .321 in³ (refer to page 123)

DETERMINE:
Maximum post spacing (simple span), L (in.)
Resisting bending moment, $M_{(resisting)} = f_s \times S$
Applied bending moment, $M_{(applied)} = w/12 \times L \times h$
$M_{(resisting)}$ must equal $M_{(applied)}$

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

$$L = \frac{f_s \times S}{w/12 \times h}$$

$$L = \frac{12{,}600 \times .321}{50/12 \times 38}$$

L = 25.54 in.

EXAMPLE 2:

DETERMINE REQUIRED SECTION MODULUS OF POST REQUIREMENTS:
Concentrated load, F = 200 lbs
Railing height, h = 42 in.

MATERIAL SPECIFIED:
Post: Steel tubing
Allowable stress, f_s = 16,800 psi (refer to page 122)

DETERMINE:
Section modulus, S, and select a suitable section
Resisting bending moment, $M_{(resisting)} = f_s \times S$
Applied bending moment, $M_{(applied)} = F \times h$
$M_{(resisting)}$ must equal $M_{(applied)}$

$$f_s \times S = F \times h$$

$$S = \frac{F \times h}{f_s}$$

$$S = \frac{200 \times 42}{16{,}800}$$

S = 0.500 in³

EXAMPLE PROBLEMS AND SOLUTIONS

EXAMPLE 3:

DETERMINE MAXIMUM SPAN FOR HANDRAIL MOULDINGS, CONCENTRATED LOAD REQUIREMENTS:
Concentrated load, F = 200 lbs

MATERIAL SPECIFIED:
Handrail moulding: #**6489**, 1 ½" O.D. bronze tubing
f_s = 14,500 psi; S_x = .144 in³

The railing will be installed with more than two consecutive spans, therefore the Bending Moment Constant, K = 5 (refer to page 124).

DETERMINE:
Maximum span for handrail moulding, L (in.)
Resisting bending moment, $M_{(resisting)} = f_s \times S$

Applied bending moment, $M_{(applied)} = \frac{F \times L}{K}$

$M_{(resisting)}$ must equal $M_{(applied)}$

$$f_s \times S = \frac{F \times L}{K}$$

$$L = \frac{f_s \times S \times K}{F}$$

$$L = \frac{14{,}500 \times .144 \times 5.0}{200} = 52.2 \text{ in.}$$

EXAMPLE 4:

DETERMINE MAXIMUM SPAN FOR A COMBINED HANDRAIL SECTION USING SECTIONS OF THE SAME METAL REQUIREMENTS:

Concentrated load, F = 200 lbs

MATERIALS SPECIFIED:
Handrail moulding: #**6932**, aluminum, 6063-T52
f_s = 12,600 psi; I_{xa} = .059 in⁴; c_{xa} = .586 in.
Support channel: 2" x ½" x ⅛" aluminum channel
f_s = 12,600 psi; I_{xb} = .006 in⁴; c_{xb} = .369 in.
c_{max} = .586 in. (greater of c_{xa} vs. c_{xb})

The railing will be installed with more than two consecutive spans, therefore the Bending Moment Constant, K = 5 (refer to page 124).

DETERMINE:
Maximum span for combined handrail section, L (in.)

Resisting bending moment, $M_{(resisting)} = f_s \times \left(\frac{I_{xa} + I_{xb}}{c_{max}} \right)$

Applied bending moment, $M_{(applied)} = \frac{F \times L}{K}$

$M_{(resisting)}$ must equal $M_{(applied)}$

$$f_s \times \left(\frac{I_{xa} + I_{xb}}{c_{max}} \right) = \frac{F \times L}{K}$$

$$L = \frac{f_s \times (I_{xa} + I_{xb}) \times K}{F \times c_{max}}$$

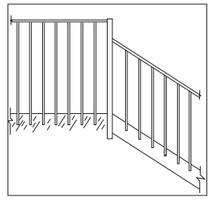
$$L = \frac{12{,}600 \times (.059 + .006) \times 5.0}{200 \times .586} = 35 \text{ in.}$$

EXAMPLE PROBLEMS AND SOLUTIONS

EXAMPLE 5: CONCENTRATED LOAD

LOAD DISTRIBUTION AMONG POSTS DESCRIPTION:

Railing for an air terminal public area—heavy pedestrian traffic is expected.



REQUIREMENTS:
Loading, F = 300 lbs
Railing height = 42" at platforms;
34" at stairs

Post height, h: Posts are fascia mounted; top of post attachment is 2" below walking surface. Therefore post height is railing height plus 2".
Maximum opening to be no more than 4"; 12 or more spans between posts.

MATERIALS SPECIFIED:
Handrail moulding: #**6901**, aluminum 6063-T52
f_s = 12,600 psi; E = 10 x 10⁶; I_y = .709 in⁴; S_y = .540 in³

Intermediate posts: #**430**, aluminum 6063-T6
f_s = 15,200 psi; E = 10 x 10⁶; I = .241 in⁴; S = .297 in³

End posts: 2½" x 2½" x 3/16" square aluminum – 6061-T6 – tubing
f_s = 19,500 psi; E = 10 x 10⁶; S = 1.247 in³

DETERMINE:
Structural compliance of proposed construction.

1. Stress at base of end posts (end posts are dissimilar from intermediate posts—they have to resist 100% of horizontal load):

$$f = \frac{P \times h}{S} = \frac{300 \times 44}{1.247} = 10{,}585 \text{ psi}$$

(19,500 psi allowable)

2. Stress at base of intermediate posts at platform (L= 4 in, h = 44 in.):

A. Stiffness ratio:

$$R = \frac{E_r \times I_r}{L} \div \frac{E_p \times I_p}{h} = \frac{.709 \times 44}{4 \times .241} = 32.36$$

B. Load proportion factor: (see graph, p. 131) = 0.236
C. Load per post: 300 x 0.236 = 70.8 lbs
D. Stress at base of post:

$$f = \frac{P \times h}{S} = \frac{70.8 \times 44}{.297} = 10{,}489 \text{ psi}$$

(15,200 psi allowable)

3. Stress at base of intermediate post at stairs (L= 4 in., h = 36 in.):

A. Stiffness ratio:

$$R = \frac{E_r \times I_r}{L} \div \frac{E_p \times I_p}{h} = \frac{.709 \times 36}{4 \times .241} = 26.47$$

B. Load proportion factor: (see graph, p. 131) = 0.248
C. Load per post: 300 x 0.248 = 74.4 lbs
D. Stress at base of post:

$$f = \frac{P \times h}{S} = \frac{74.4 \times 36}{.297} = 9{,}018 \text{ psi}$$

(15,200 psi allowable)

4. Stress on handrail at mid-span:

$$f = \frac{F_h \times L}{S \times K} = \frac{300 \times 4}{.540 \times 5} = 444 \text{ psi}$$

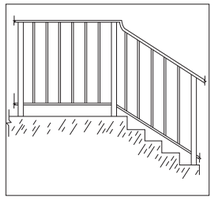
(12,600 psi allowable)

Railing meets structural designer's requirements.

EXAMPLE 6: UNIFORMLY DISTRIBUTED LOAD

COMBINED HANDRAIL SECTION OF DISSIMILAR MATERIALS

DESCRIPTION:
Stair railing of steel balusters, mounted between steel channel top and bottom rails, attached to square steel posts, with a bronze handrail.



REQUIREMENTS:
Loading, w = 50 lb/ft, horizontal and vertical.
Railing height, h = 34" at stair, 42" at landings.
Post spacing, L = 40"; 3 or more spans in each run.

MATERIALS SPECIFIED:
Handrail moulding: #**4530**, bronze C38500
f_s = 9,700 psi; I_x = .023 in⁴; c_x = 0.449 in.; E = 14 x 10⁶ psi
Posts: 1½" x 1½" x .140" structural steel tubing
f_s = 27,700 psi; S = .316 in³
Sub-rails: 1½" x ½" x ⅛" steel (C1010) channel — top and bottom: f_s = 16,800 psi; I_x = .005 in⁴; c_x = 0.354 in.; E = 29 x 10⁶ psi

DETERMINE:
Structural compliance of proposed construction

1. Stress at base of post:

$$\frac{M}{S} = \frac{w/12 \times L \times h}{S}$$ At stairs: $$\frac{50 \times 40 \times 34}{12 \times .316} = 17{,}932 \text{ psi}$$

At landings: $$\frac{50 \times 40 \times 42}{12 \times .316} = 22{,}152 \text{ psi}$$

(27,700 psi allowable)

2. Stress on rail:
Since I_y of both bronze$_{(b)}$ and steel$_{(s)}$ sections is greater than I_x, vertical load controls design.
A. Total load:

$$w/12 \times L = \frac{50 \times 40}{12} = 167 \text{ lbs}$$

B. Load per foot on bronze, w_b:

$$w_b = w \div \left(1 + \frac{E_s \times 2 \times I_{xs}}{E_b \times I_{xb}} \right)$$

$$w_b = 50 \div \left(1 + \frac{29 \times 10^6 \times 2 \times .005}{14 \times 10^6 \times .023} \right) = 26.31 \text{ lb/ft}$$

C. Load per foot on steel, w_s:

$w_s = w - w_b$
$w_s = 50 - 26.31 = 23.69$ lb/ft

D. Stress on bronze, f_{sb}:

$$f_{sb} = \frac{w_b/12 \times L^2 \times c_{max}}{I_{xb} \times K} = \frac{26.31/12 \times 40^2 \times 0.449}{.023 \times 9.5}$$

= 7,209 psi (9,700 psi allowable)

E. Stress on steel, f_{ss}:

$$f_{ss} = \frac{w_s/12 \times L^2 \times c_{max}}{I_{xs} \times K} = \frac{23.69/12 \times 40^2 \times 0.354}{2 \times .005 \times 9.5}$$

= 11,770 psi (16,800 psi allowable)

Design meets code structural requirements.

Resistance to vertical loading of upper and lower steel channels is additive. Therefore the value of Ixs is doubled. The additional resistance to vertical load by the truss action of the balusters has not been considered, making the result of the calculation more conservative.

CONNECTORAIL® SYSTEM DATA

ALUMINUM BRONZE STAINLESS

MECHANICAL PROPERTIES

Material	Allowable Stress (psi)	Minimum Yield (psi)	Modulus of Elasticity (psi x 10^6)
● Aluminum*			
6061-T6	19,500	35,000	10.0
6063-T52 pipe	11,300	16,000	10.0
6063-T832 pipe	24,800	35,000	10.0
● Red Brass C23000	11,000	18,000	17.0
● Stainless• Type 304	30,000	55,000	28.0

* Aluminum Association Specifications for Aluminum Structures.

• American Iron & Steel Institute Stainless Steel Cold-Formed Structural Design Manual.

SECTION PROPERTIES

Connectorail® Pipe (Aluminum, Bronze, Stainless)

Nominal Size	Sched.	OD	Wall	Area	I	S
1¼"	10	1.660"	.109"	.531	.161	.193
1¼"	40	1.660"	.140"	.669	.195	.235
1¼"	40	1.660"	.146"	.695	.201	.242
1½"	5	1.900"	.062"	.375	.158	.166
1½"	10	1.900"	.109"	.614	.247	.260
1½"	40	1.900"	.145"	.800	.310	.326
1½"	40	1.900"	.150"	.825	.318	.335

Connectorail® Reinforcing Bars (6061-T6)

No.	Sched.	Nominal Size	OD	Area	I	S
● **7192**	10	1¼"	1.427"	1.599	.204	.285
● **7292/7295**	10	1½"	1.667"	2.183	.379	.455
● **7492**	40	1¼"	1.328"	1.452	.168	.247
● **7592/ 7595**	40	1½"	1.585"	1.973	.310	.391
● **9392****	5	1½"	1.750"	.615	.205	.239

** Tubing with .120" wall, type 304 Stainless Steel

CONNECTORAIL® TEST RESULTS

1 ½" Aluminum and Stainless Steel Pipe—Single Span

	RAIL										POST					
Span (L) or Height (h)	57		75		96		96		96		42" w/24" re-bar		42" w/24" re-bar		42" w/24" re-bar	
Schedule	10		40		10		40		5		10		40		5	
Alloy and Temper	6063-T52		6063-T52		6063-T832		6063-T832		Type 304		6063-T832		6063-T832		Type 304	
Load (P)	Deflection	Permanent Set	Deflection	Permanent Set	Deflection	Permanent Set	Deflection	Permanent Set	Deflection	Permanent Set	Deflection	Permanent Set	Deflection	Permanent Set	Deflection	Permanent Set
200 lbs	.344"	.000"	.547"	.000"	1.466"	.000"	1.021"	.000"	.867"	.025"	1.389"	.000"	1.724"	.000"	1.006"	.036"
250 lbs	.388"	.000"	.669"	.000"	1.818"	.000"	1.317"	.000"	1.120"	.040"	1.659"	.000"	2.122"	.000"	1.160"	.056"
300 lbs	.496"	.000"	.845"	.000"	2.214"	.000"	1.594"	.000"	1.395"	.128"	1.926"	.000"	2.537"	.000"	1.369"	.080"
350 lbs	.565"	.000"	.998"	.000"	2.483"	.000"	1.882"	.000"	1.728"	.205"	2.206"	.000"	2.849"	.000"	1.633"	.112"
400 lbs	.739"	.047"	1.189"	.000"	2.984"	.000"	2.178"	.000"	1.992"	.322"	2.601"	.000"	3.211"	.000"		
450 lbs	1.368"	.488"	1.654"	.151"	3.464"	.047"	2.488"	.000"	2.563"	.652"	2.811"	.000"	3.603"	.000"	2.131"	.238"
500 lbs			1.990"	.656"	4.510"	.406"	2.775"	.000"	2.972"	.994"	3.122"	.000"	4.278"	.109"	2.270"	.452"
550 lbs							3.080"	.000"	4.176"	1.726"	3.484"	.000"	4.868"	.266"		
600 lbs							3.424"	.000"	5.591"	2.886"	3.860"	.146"			2.765"	
650 lbs							3.754"	.031"			4.267"	.391"				
700 lbs							4.213"	.192"							3.880"	
0.2% Specified Permanent set load	430 lbs		440 lbs		470 lbs		700 lbs		350 lbs		590 lbs		490 lbs		340lbs	

NOTE ON WELDED PIPE RAILINGS

An important consideration for welded pipe railings is the effect of welding heat on the structural properties of aluminum handrail pipe. For example, extruded pipe of aluminum alloy 6063-T52 has an allowable design stress of 11,300 psi. After welding, the allowable stress must be reduced to 8,000 psi within 1" of the weld. Since maximum bending moment generally occurs at points of support or attachment, the reduced stress will often control design. This consideration does not apply to non-welded Connectorail®.

LOADING TABLES

The values tabulated in the following page apply to installations fabricated and erected in accordance with Connectorail® specifications and using Connectorail® components exclusively. Chart values have been determined by assuming that reinforcing inserts are included with fascia mounted railings and with railings set into the floor, except where no insert is indicated.

For these tables, various post heights have been selected arbitrarily. Values of maximum post spacing for other post heights can be interpolated easily.

When Connectorail® posts are surface-mounted on floors, treads or stringers, using a floor flange, the entire bending moment of the post is transferred to the reinforcing insert and the allowable post loading has to be computed accordingly. The allowable load will be determined by the resisting moment of the reinforcing insert alone or the unreinforced post above the insert ($h - h_1$), whichever is less.

ALUMINUM BRONZE STAINLESS

CONNECTORAIL® LOAD TABLES

Maximum Allowable Spans—Post Spacing
Based on bending stress in post and insert
Load: 50 lbs per foot, applied horizontally at top rail

Calculations are for a dowel of similar material

Post Material Pipe size	Post height (h)	No insert	15" insert h1 = 9"	h1 = 12"	25" insert h1 = 19"
● Aluminum 6063-T832 1¼" Sch. 10	30"	38"	55"	64"	90"
	34"	34"	46"	52"	77"
	38"	30"	40"	44"	61"
	42"	27"	35"	38"	50"
	46"	25"	31"	34"	43"
● Aluminum 6063-T832 1¼" Sch. 40	30"	47"	67"	74"	90"
	34"	41"	56"	64"	79"
	38"	37"	48"	54"	71"
	42"	33"	42"	47"	61"
	46"	30"	38"	41"	52"
● Aluminum 6063-T832 1½" Sch. 10	30"	52"	74"	86"	134"
	34"	46"	62"	70"	104"
	38"	41"	53"	60"	82"
	42"	37"	47"	52"	68"
	46"	34"	42"	46"	58"
● Aluminum 6063-T832 1½" Sch. 40	30"	65"	92"	108"	134"
	34"	57"	78"	88"	118"
	38"	51"	67"	75"	103"
	42"	46"	59"	65"	85"
	46"	42"	52"	57"	72"
● Bronze (Red Brass) C23000 1¼" Sch. 40	30"	21"	30"		40"
	34"	18"	25"		35"
	38"	16"	21"		32"
	42"	15"	19"		27"
	46"	13"	17"		23"
● Bronze (Red Brass) C23000 1½" Sch. 40	30"	29"	41"		40"
	34"	25"	34"		35"
	38"	23"	30"		32"
	42"	21"	26"		27"
	46"	19"	23"		23"

	Post height (h)	No insert	25" insert h1 = 18"	26" insert h1 = 20"
● Stainless Steel Type 304 1½" Sch. 5	30"	40"	100"	120"
	34"	35"	75"	86"
	38"	32"	60"	67"
	42"	29"	50"	55"
	46"	26"	43"	46"

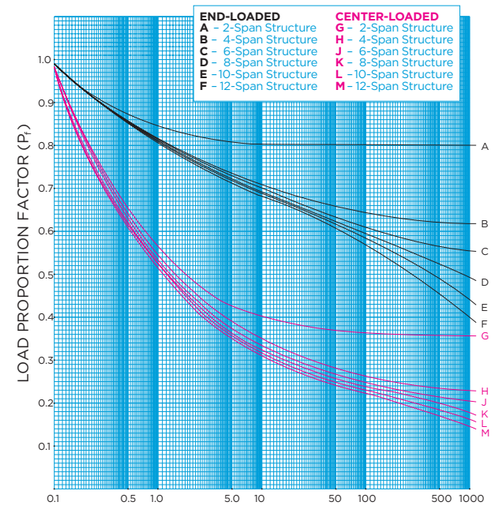
Maximum Allowable Spans—Handrail
Based on bending stress in rail.
Load: 50 lbs per foot

	1 or 2 spans	3 or more spans
● Aluminum 6063-T52		
1¼" Sch. 10	65"	71"
1¼" Sch. 40	71"	78"
1½" Sch. 10	75"	82"
1½" Sch. 40	84"	92"
● Bronze (Red Brass) C23000		
1¼" Sch. 40	70"	77"
1½" Sch. 40	83"	90"
● Stainless Steel Type 304		
1½" Sch. 5	98"	107"

If it is desired to use longer rail spans than allowed by the limits above, alloy 6063-T832 pipe should be used. Allowable rail span for 6063-T832 pipe is usually greater than allowable post spacing.

LOAD DISTRIBUTION CONSIDERATIONS

The graph below is used to determine railing load distribution. It has been determined by computer analysis and confirmed by laboratory test. The formula used in determining the graph assumes that all posts are of identical material and section.



The Stiffness (C) of a rail or post is:

$$C_r = \frac{E \times I}{L} = \text{for the rail}$$

$$C_p = \frac{E \times I}{h} = \text{for the post}$$

(see page 122 for definition of symbols)

The Stiffness Ratio (CR) is determined as: $CR = \frac{C_r}{C_p}$

The Stiffness Ratio is then plotted on the graph to obtain a Load Proportion Factor (P_f). When the load proportion factor has been determined, it is multiplied by the total load to determine the load one post must sustain.

If one or both ends of the railing are free standing, the end-loaded condition must be assumed. If both ends of the run are laterally braced by a change in direction or attachment to a firm structure, the center-loaded load proportion factor may be used.

NOTE: If end posts differ from intermediate posts in strength, the load distribution pattern becomes indeterminate and end posts should then be designed to carry 100% of the concentrated load. Intermediate posts may then be designed to the center loaded condition.

In single span railings, each post must be designed to carry the full concentrated load. When posts and rails are of identical material and section (as in pipe railing), and post spacing varies between 3' and 6' feet while post height is between 30" and 42" inches, load distribution is fairly uniform. In this situation, the greatest proportion of a concentrated load carried by any post can be estimated as follows:

End posts:		Intermediate posts:	
2-span railing	$P_f = 0.85$	2 span railing	$P_f = 0.65$
3 or more spans	$P_f = 0.82$	3 or more spans	$P_f = 0.60$

Thus, if a 200 lb concentrated load is specified for a pipe railing, actual design load to be applied at the top of the end post is .82 x 200 lb (164 lb), while design load to be applied to intermediate posts is .60 x 200 lb (120 lb). If railing posts are reinforced, the load proportion factor for posts is about 3 percentage points higher.